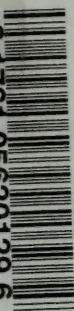


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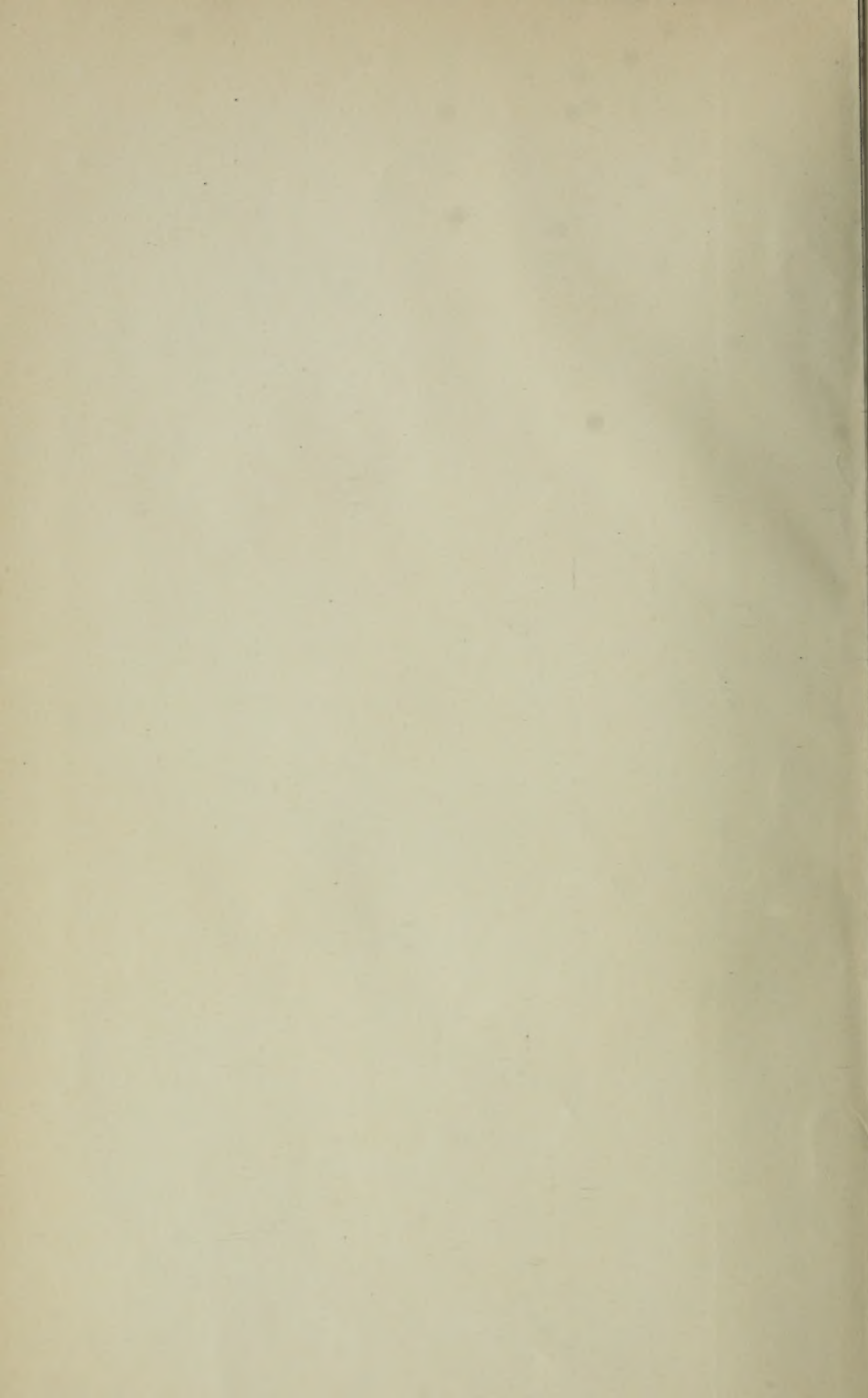
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BRITISH LICHENS.

THE END OF THE WORLD

Bot
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British Museum (Nat. Hist.). Dept. of Botany

A MONOGRAPH
OF
LICHENS
FOUND IN BRITAIN:

BEING
A DESCRIPTIVE CATALOGUE
OF THE SPECIES IN THE
HERBARIUM OF THE BRITISH MUSEUM.

BY THE
REV. JAMES M. CROMBIE, M.A.,
F.L.S., F.G.S., &c.

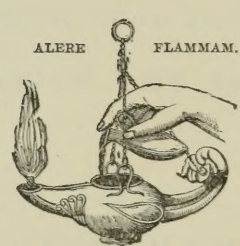
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PREFATORY NOTE.

THE rearrangement of the British Lichens in the Herbarium of the British Museum and the incorporation of a great series of specimens made a revised Catalogue of these plants a necessity.

The large number of authentic specimens from Dillenius, Hudson, Sowerby, Dawson Turner, T. Taylor, Salwey, Mudd, and Leighton contained in the Herbarium supplied material for determining the species of these lichenologists which does not exist elsewhere; while the extensive series of British Lichens, including the collections of Buddle, E. Forster, R. Brown, Carroll, Piggot, Holl, Crombie, and Lorbalestier, made it possible to determine with certainty the geographical distribution of the species within the British Islands.

The Rev. J. M. Crombie, M.A., undertook the preparation of a Monograph based on these materials. This volume contains descriptions of half the known British species. The remainder (consisting of the Lecideei, Graphidei, Pyrenocarpei, Peridiei, and Myriangiacei) is so advanced that it may be expected to appear in 1895, and will contain a complete index to the genera and species of the whole work.

WILLIAM CARRUTHERS.

March 1894.

UNION PROTESTANT

1850

THE UNION PROTESTANT is a quarterly journal of
theological and literary essays, and of
the proceedings of the General Assembly of the
Presbyterian Church in the United States of America.
It is published by the Board of Christian Education
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GLOSSARY OF THE PRINCIPAL TERMS EMPLOYED.

- Anaplyses*—Filaments springing from the upper inner surface of the hypothecium.
- Applicate*—Forming the thalline border in many crustaceous lichens.
- Arthrosterigmata*—Jointed sterigmata.
- Axial*—Composed of the basal but enclosed filaments of the axis.
- Basidia*—The filaments bearing stylospores.
- Cephalodia*—Tubercles containing gonimia.
- Cortex*—The limiting tissue of the thallus.
- Cretaceous*—Consisting chiefly of oxalate of lime.
- Crustaceous*—Forming a more or less thickish crust, generally attached by the whole under surface.
- Cyphellæ*—Minute empty cavities on the underside of the thallus.
- Determinate*—With a distinct margin.
- Discoid*—More or less basin-shaped.
- Effuse*—Without a clearly defined outline.
- Endospore*—Inner layer of wall of spore.
- Epispore*—Outer layer of wall of spore.
- Epithallus*—The external layer of the cortex.
- Epithecium*—The surface of the hymenium.
- Eralescent*—Reduced to mere gonidia scattered over the substratum.
- Exciple proper*—The hypothecium of a discoid apothecium.
- Gonidia*—The green cells of the thallus.
- Gonidimia*—Green cells smaller than gonidia and with the cell-wall less distinct.
- Gonimia*—Bluish-green naked granules.
- Heteromerous*—With the constituent elements stratified.
- Homæomerous*—With the constituent elements more or less mixed.
- Hymenial gelatine*—The colourless amyloid substance permeating the hymenium.
- Hymenium*—The layer of thecæ and paraphyses.
- Hypophloeodal*—Consists of a very thin film often concealed beneath the bark of trees and between the interstices of rocks.
- Hypophylline*—Consisting of the root-like filaments or rhizineæ.
- Hypothallus*—The basal tissue, being hypophylline, applicate, and axial.
- Hypothecium*—The fundamental structure bearing the fructification.

- Isidia*—Coral-like papillæ with dark apices.
Medulla—The usually colourless internal tissue.
Muriform—With transverse and irregular longitudinal divisions.
Nuclear—Roundish, with an apical pore.
Ostiole—An apical pore.
Paraphyses—Slender filaments among the thecæ.
Peridioid—Roundish, without a pore.
Peridium—The hypothecium of a peridioid apothecium.
Podetium—An erect cylindrical thallus terminated by the fruit.
Polari-bilocular—With a loculus at each end.
Pycnides—Conceptacles bearing stylospores.
Pyrenium—The hypothecium of a nuclear apothecium.
Scyphus—A dilated cup-shaped fruit borne on a podetium.
Soredia—Powdery masses of gonidia and hyphæ.
Stylospores—Asexual spores.
Thalamium—The paraphyses.
Thecæ—The spore-sacs.
Thecium=Hymenium.

CHEMICAL REACTIONS.

The solutions employed are:—(1) Hydrate of potash, denoted by the symbol K, and composed of equal weights of caustic potash and water; (2) Hypochlorite of lime, denoted by CaCl, and composed of chloride of lime and about half its weight of water; (3) Iodine, denoted by I, and composed of iodine 1 grain, iodide of potash 3 grains, and distilled water $\frac{1}{2}$ oz. For the sake of brevity, symbols are employed to express the reactions. The explanation of a few examples will be found sufficient to explain the rest. Thus CaCl+crimson indicates the *immediate* production of a crimson coloration upon the application of the solution CaCl. CaCl— means that no reaction occurs with this reagent. Kf+yellow means a faint yellow reaction with solution K. The reaction of the cortex is placed above that of the medulla; thus, K^{+yellowish}_{+orange} means that the reaction of the cortex is yellowish and that of the medulla orange. K(CaCl)+violet means that K alone gives no reaction, but when it is followed by the application of CaCl a violet colour is produced. On the other hand, the reaction given by K may be neutralized by the addition of CaCl, in which case it is expressed by K+(CaCl)—. A more or less fuscous colour produced by K or CaCl is disregarded, as not being a true reaction, and has the negative sign.

*SYNOPSIS OF THE FAMILIES, TRIBES, AND
GENERA OF BRITISH LICHENS.*

Family I. **EPHEBACEI** Nyl. Thallus slightly turgid when moist, cellular within; gonimia tunicated, not moniliform.

Tribe I. **SIROSIPHEI** Nyl. Thallus filamentoso-fruticulose; gonimia variously connate: apothecia biatorine or lecideine.

1. **Gonionema** Nyl. Thallus fibrillose, tubuliform; gonimia connate in one continuous series: apothecia biatorine, with simple spores and paraphyses; spermogones with simple sterigmata and minute oblong spermatia.

2. **Spilonema** Born. Thallus fruticulose, cylindrical, often pulvinate; gonimia connate in transverse layers: apothecia lecideine, with simple or 1-septate spores and articulate paraphyses; spermogones with jointed sterigmata and shortly cylindrical spermatia.

Tribe II. **PYRENOPSEI** Nyl. Thallus thinly granulose, rubricose within; gonimia simple or connate: apothecia lecanorine or pyrenocarpous.

3. **Euopsis** Nyl. Thallus granulato-areolate; gonimia simple or nodulose: apothecia lecanorine, with articulate paraphyses and simple spores; spermogones with simplish sterigmata and minute oblong spermatia.

4. **Pyrenopsis** Nyl. Thallus granulato-areolate or subsquamulose; gonimia simple or nodulose: apothecia pseudo-pyrenocarpous, with simple paraphyses and spores; spermogones with simplish sterigmata and minute oblong spermatia.

Tribe III. **HOMOPSIDEI** Nyl. Thallus either fruticulose, with seriate gonimia; or squamuliform or granulose, with subsolitary gonimia: apothecia pyrenocarpous.

Subtribe **EPHEBEI** Nyl. Thallus fruticulose, intricate, dioecious or monœcious; gonimia nodulose: apothecia pyrenocarpous, with or without paraphyses.

5. **Ephebe** Fr. Thallus dioecious; gonimia 2-4 in each nodule: apothecia in thalline incrassations, with simple or 1-3-septate spores and no paraphyses; spermogones with simplish sterigmata and shortly cylindrical spermatia.

6. **Ephebeia** Nyl. Thallus monœcious; gonimia 2-4 in each nodule: apothecia in thalline incrassations, with constantly simple spores and distinct paraphyses; spermogones with simplish sterigmata and shortly cylindrical spermatia.

Tribe IV. **MAGMOPSEI** Nyl. Thallus pyrenopsidian, containing syngonimia; gonimia without order: apothecia peridieine.

7. **Magmopsis** Nyl. Thallus furfuraceo-squamulose; syngonimia glomerulose or granuloso-diform, gonimia moderate: apothecia small, with 1-septate spores; spermogones not seen rightly developed.

Family II. **COLLEMACEI** Nyl. Thallus turgid when moist; sometimes with cortical layer; gonimia moniliform; medulla not discrete.

Tribe I. **LICHINEI** Nyl. Thallus fruticulose or radiately lacinate, or squamuloso-diform; gonimia elongately moniliform, subconnate: apothecia lecanorine or lecideine.

8. **Lichina** Ag. Thallus fruticuloso-cæspitose; gonimia arranged chiefly under the cortical layer: apothecia lecanorine, terminal, with simple spores; spermogones with simple sterigmata and oblong spermatia.

9. **Lichiniza** Nyl. Thallus squamuloso-diform, with subglobose papillæ; gonimia moniliform and radiate in the thalline globules: apothecia lecanorine?, terminal, with simple spores; spermogones unknown.

10. **Pterygium** Nyl. Thallus radiately lacinate; gonimia arranged chiefly under the cortical layer, usually moniliformly concrete: apothecia lecideine, with septate spores; spermogones with jointed sterigmata and straight spermatia.

11. **Leptogidium** Nyl. Thallus fruticulose; gonimia moniliformly concatenate: apothecia subbiatorine, with simple spores; spermogones not seen rightly developed.

Tribe II. **COLLEMEI** Nyl. Thallus membranaceous, lobate, rarely granulose, subsquamulose, or fruticulose; gonimia moniliform; cortical layer distinct or none: apothecia lecanorine, or rarely pyrenocarpous.

12. **Synalissa** Fr. Thallus fruticulose or granulose; gonimia usually scattered amongst the filaments; cortical layer obsoletely cellular: apothecia lecanorino-endocarpoid, with simple spores; spermogones with simplish sterigmata and oblong spermatia.

13. **Schizoma** Nyl. Thallus lineari-lacinate; gonimia arranged chiefly under both surfaces in roundish cells: apothecia unknown; spermogones with subsimple sterigmata and pistillari-bacillar spermatia.

14. **Collema** Wigg. Thallus membranaceo-lobate, rarely granulose; gonimia moniliform; cortical layer absent: apothecia lecanorine, with multilocular, rarely simple spores; spermogones with jointed sterigmata, rarely with simple sterigmata, and straight spermatia.

15. **Collemodium** Nyl. Thallus variously lobed or subfruticulose; cortical layer somewhat distinct; gonimia scattered, partly moniliform: apothecia lecanorine, rarely biatorine, with variously septate spores; spermogones with jointed sterigmata and straight spermatia.

16. **Leptogium** Gray. Thallus membranaceo-lobate, granulose, rarely fruticulose; gonimia usually moniliform; cortical layer distinct: apothecia lecanorine, with variously divided, rarely simple spores; spermogones with jointed sterigmata and straight spermatia.

17. **Dendriscoaulon** Nyl. Thallus fruticulose, with solid axis, branches covered with minute leprarioid laciniae, containing gonimia: frutification unknown.

18. **Collemopsis** Nyl. Thallus granulato-arcolate, glaucous-green within; gonimia submoniliform: apothecia lecanorine or pseudopyrenocarpous, with simple spores; spermogones with simplish sterigmata and oblong spermatia.

Tribe III. **PYRENIDIEI** Nyl. Thallus fibrillose, gonimia moniliform; cortical layer distinct: apothecia pyrenoid.

19. **Pyrenidium** Nyl. Thallus stellato-divided, cortical layer cellular: apothecia innate, with 3-septate spores; spermogones unknown.

Family III. **LICHENACEI** Nyl. Thallus not gelatinous, with a gonidial, rarely gonimic layer; medulla more or less distinct.

Series I. **EPICONIODEI** Nyl. Apothecia with the spores at length usually naked and pulverulent on their surface.

Tribe I. **CALICIEI** Nyl. Thallus horizontally expanded, sometimes none: apothecia stipitate, capituliform or sessile.

20. **Sphinctrina** Fr. Thallus none proper: apothecia subsessile, globoso-turbinate, black, with simple blackish spores; spermogones with simple sterigmata and arcuate spermatia.

21. **Calicium** Pers. Thallus granuloso-pulverulent: apothecia stipitate, globoso-turbinate, black, with simple or 1-septate, brownish-black spores; spermogones with simplish sterigmata and oblong spermatia.

22. **Stenocybe** Nyl. Thallus obsolete: apothecia stipitate, turbinate-clavate, black, with normally 3-septate, blackish spores, not in a mass; spermogones not rightly known.

23. *Coniocybe* Ach. Thallus pulverulent: apothecia stipitate, globoso-pulverulent, yellowish, with simple, colourless or yellowish spores: spermogones with simplish sterigmata and cylindrical, straight spermatia.

24. *Trachylia* Fr. Thallus granulose: apothecia cupuliform, sessile, black, with 1-septate, blackish spores; spermogones with simplish sterigmata and oblong or ellipsoid spermatia.

Tribe II. **SPHÆROPHOREI** Nyl. Thallus fruticulose, branched: apothecia terminal, innate, closed, at length open and variously dehiscent.

25. *Sphærophorus* Pers. Thallus cæspitose: apothecia globose, with spherical violet-black spores; spermogones with simplish short sterigmata and oblong spermatia.

Series II. *CLADODEI* Nyl. Apothecia terminal on podetia, rarely sessile, biatorine, rarely lecanorine.

Tribe III. **BÆOMYCETEI** Nyl. Thallus horizontally expanded: apothecia substipitate.

26. *Gomphillus* Nyl. Thallus gelatinoso-conglutinate: apothecia stipitate, clavato-capitate with filiform multiseptate spores; spermogones with simple sterigmata and cylindrical spermatia.

27. *Bæomyces* Pers. Thallus crustaceo-granulose or subsquamulose: apothecia stipitate or sessile, biatorine, with simple or 1-3-septate spores; spermogones with jointed sterigmata and straight spermatia.

Tribe IV. **PILOPHOREI** Nyl. Thallus verrucoso-granulate with rigid podetia: apothecia cephalodine on the podetia, with paraphyses prolonged into the hypothecium.

28. *Pilophorus* Fr. fil. Thallus bearing cephalodia: apothecia subglobose, black, with simple spores; spermogones with simplish sterigmata and curved or straight spermatia.

Tribe V. **STEREOCAULEI** Nyl. Thallus cæspitose, podetiiform, solid: apothecia terminal or lateral, lecideine or rarely lecanorine.

29. *Stereocaulon* Schreb. Thallus bearing cephalodia; podetia covered with fragile granules: apothecia brownish or blackish, with 3-9-septate spores; spermogones with simple sterigmata and subbacillar, straight or slightly curved spermatia.

30. *Leprocaulon* Nyl. Thallus not bearing cephalodia, with pseudo-podetia, which are more or less leprose: apothecia and spermogones unknown.

Tribe VI. **CLADONIEI** Nyl. Thallus foliaceous or fruticulose, with fistulose podetia: apothecia terminal on the podetia, rarely sessile on the basal thallus, biatorine.

31. **Pycnothelia** Duf. Thallus granuloso-crustaceous, podetia clavate, papillæform, glabrous: apothecia brown, with simple spores; spermogones with simplish sterigmata and curved spermatia.

32. **Cladonia** Hill. Thallus foliolose or squamulose; podetia branched or scyphose, pulverulent and squamose: apothecia brown or scarlet, with simple spores; spermogones with simplish sterigmata and cylindrical straight or somewhat curved spermatia.

33. **Cladina** Nyl. Thallus leafless: podetia ascyphous, branched, smoothish: apothecia brown, with simple spores; spermogones with simplish sterigmata and straight or usually curved spermatia.

Series III. **RAMALODEI** Nyl. Thallus efoliolose, fruticulose or filamentose: apothecia generally lecanorine or parmelioid.

Tribe VII. **ROCCELLEI** Nyl. Thallus simplish or branched, internally with filamentose medulla: apothecia often irregular, adnate, terminal or lateral.

34. **Roccella** DC. Thallus fruticulose from a common base: apothecia normally lecanorine, blackish, with 3-septate spores; spermogones with simplish sterigmata and arcuate spermatia.

Tribe VIII. **SIPHULEI** Nyl. Thallus podetiiform, simple or fruticulose, internally with filamentose or fistulose medulla: apothecia not rightly known.

35. **Thamnolia** Ach. Thallus subulato-stipitate, internally fistulose: apothecia unknown; spermogones with jointed sterigmata and cylindrical, slightly apically incrassate spermatia.

Tribe IX. **RAMALINEI** Nyl. Thallus fruticuloso-foliaceous, rounded or compressed, with woolly medulla: apothecia lecanorine, scutellate.

36. **Ramalina** Ach. Thallus ramoso-laciniate, medulla arachnoid: apothecia terminal or lateral, subconcolorous, with 1-septate spores; spermogones with pauci-articulate sterigmata and straight cylindrical or oblongo-cylindrical spermatia.

Tribe X. **USNEEI** Nyl. Thallus very much branched, rounded or compressed, with firm medullary axis: apothecia parmelioid, peltate.

37. *Usnea* Dill. Thallus filamentose, internally with chondroid axis: apothecia terminal or lateral, the margin often ramulose-ciliate, concolorous, with simple spores; spermogones with simplish sterigmata and straight spermatia.

Tribe XI. **ALECTORIEI** Nyl. Thallus much branched, rounded or compressed, with woolly medulla: apothecia parmelioid, scutelliform.

38. *Alectoria* Ach. Thallus usually filamentose and intricately branched; medulla arachnoid or lacunose: apothecia terminal or pseudo-terminal, discolorous, with simple or very rarely murali-divided spores; spermogones with pauci-articulate sterigmata and acicular straight spermatia.

Tribe XII. **CETRARIEI** Nyl. Thallus fruticulose or foliaceous, with white woolly medulla: apothecia parmelioid, marginal, obliquely affixed.

39. *Cetraria* Ach. Thallus fruticulose, laciniöse, rarely fistulose: apothecia subconcolorous, with simple spores; spermogones with simple sterigmata and cylindrical spermatia.

40. *Platysma* Nyl. Thallus fruticulose or membranaceo-lobed: apothecia discolorous, with simple spores; spermogones with simplish or pauci-articulate sterigmata, and various (not cylindrical) spermatia.

Series IV. **PHYLLODEI** Nyl. Thallus foliaceous, usually depressed, lobate: apothecia generally parmelioid or lecanorine, discolorous.

Tribe XIII. **PARMELIEI** Nyl. Thallus frondosely dilated, or lobate, or laciniate, with woolly, rarely solid medulla: apothecia parmeleine rarely lecanorine.

41. *Evernia* Ach. Thallus laciniöse or much branched, flaccid; medulla arachnoid or partly chondroid: apothecia lateral with simple spores; spermogones with pauci-articulate sterigmata and acicular straight spermatia.

42. *Parmelia* Ach. Thallus variously lobed or laciniate, usually fibrilloso-rhizinoöse, rarely glabrous beneath; medulla woolly, lax: apothecia superficial, with simple spores; spermogones with pauci-articulate sterigmata and acicular apically fusiformi-incrassate spermatia.

43. *Parmeliopsis* Nyl. Thallus stellato-laciniate, sparingly rhizinoöse beneath; medulla woolly, lax: apothecia superficial, with simple spores; spermogones with simple sterigmata and cylindrical arcuate spermatia.

Tribe XIV. **STICTEI** Nyl. Thallus large, membranaceo-lobed, cyphellate or cecyphellate beneath; gonidial layer containing gonimia or true gonidia; medulla woolly: apothecia lecanoroid or parmeleine.

Subtribe I. **STICTINEI** Nyl. Gonidial layer consisting of gonimia in plurilocular nodules.

44. **Stictina** Nyl. Thallus rhizinoso-tomentose and cyphellate beneath: apothecia lecanoroid, rarely parmeleine, usually with septate spores; spermogones innate, with jointed sterigmata and apically incrassate spermatia.

45. **Lobarina** Nyl. Thallus serobiculose, cecyphellate beneath: apothecia lecanoroid, with 3-septate spores; spermogones as in *Stictina*.

Subtribe II. **EUSTICTEI** Nyl. Gonidial layer consisting of gonidia or gonidimia (in *Ricasolia*).

46. **Lobaria** Hoffm. Thallus serobiculose, cecyphellate beneath: apothecia lecanoroid, with 1-3-septate spores; spermogones innate, with jointed sterigmata and apically incrassate spermatia.

47. **Sticta** Schreb. Thallus rhizinoso-tomentose and cyphellate beneath: apothecia lecanoroid, rarely parmeleine, with variously septate spores; spermogones as in *Lobaria*.

48. **Ricasolia** De Not. Thallus often entirely glabrous and very rarely cyphellate beneath: apothecia parmeleine, with septate spores; spermogones in mastoid prominences, with jointed sterigmata and apically thickish spermatia.

Tribe XV. **PELTIGEREI** Nyl. Thallus frondosely dilated, fragile; cortical layer usually wanting on the lower surface; gonidial stratum consisting either of gonidimia or usually of gonimia: apothecia peltiform.

Subtribe I. **PELTIDEI** Nyl. Thallus bearing cephalodia; gonidial layer consisting of gonidimia: apothecia variously situated.

49. **Peltidea** Ach. Thallus with the cortical layer not continuous on the underside: apothecia marginal on the upper surface, with septate spores; spermogones unknown.

50. **Solorina** Ach. Thallus with the cortical layer not continuous on the underside: apothecia scattered and innate on the upper surface of the thallus, with bilocular spores; spermogones unknown.

Subtribe II. **PELTIGERINEI** Nyl. Thallus destitute of cephalodia; gonidial layer consisting of gonimia: apothecia variously situated.

51. **Nephromium** Nyl. Thallus with the cortical layer continuous on the lower surface: apothecia marginal, adnate to the underside of the thallus, with septate spores; spermogones with jointed sterigmata and apically incrassate and obtuse spermatia.

52. **Peltigera** Willd. Thallus with the cortical layer not continuous on the lower surface: apothecia marginal on the upper surface of the thallus, with septate spores; spermogones unknown.

Tribe XVI. **PHYSICIEI** Nyl. Thallus stellato-orbicular, rarely fruticulose, internally with woolly medulla: gonidial layer consisting of true gonidia: apothecia lecanorine.

53. **Physcia** Schreb. Thallus laciniate or lobed, more or less fibrillose-rhizino-se beneath: apothecia usually with bilocular spores: spermogones with jointed sterigmata and oblongo-cylindrical, rarely acicular spermatia.

Tribe XVII. **GYROPHOREI** Nyl. Thallus usually monophyllous, umbilicately affixed, internally with woolly medulla; gonidial layer consisting of true gonidia: apothecia sublecanorine or lecideine.

54. **Umbilicaria** Hoffm. Thallus monophyllous, naked beneath: apothecia sublecanorine, simple, with spores solitary or 2næ, murali-divided; spermogones with jointed sterigmata and cylindrical, apically obtuse spermatia.

55. **Gyrophora** Ach. Thallus monophyllous or subpolyphyllous, naked or rhizino-se beneath; apothecia lecideine, compound, and somewhat gyrose, with spores 8næ, simple; spermogones as in the preceding.

Series V. **PLACODEI** Nyl. Thallus crustaceous, sometimes evanescent, rarely hypophlæodal; medullary layer not filamentose: apothecia lecanorine, or lecideine, or lirellæform.

Tribe XVIII. **LECANO-LECIDEI** Nyl. Thallus crustaceous (sometimes effigurate), rarely obsolete or none proper; gonidial layer consisting of gonidia, rarely of gonimia: apothecia lecanorine, lecideine, or biatorine.

Subtribe I. **PANNARIEI**, Nyl. Thallus with the gonidial layer consisting of gonimia.

56. **Pannaria** Del. Thallus squamulose or granulose, rarely laciniöse: apothecia lecanorine, with simple spores; spermogones with jointed sterigmata and cylindrical straight spermatia.

57. *Pannularia* Nyl. Thallus squamulose or granulose: apothecia biatorine or lecideine, with simple or 1-3-septate spores; spermogones with jointed sterigmata and cylindrical straight spermatia.

58. *Coccocarpia* Pers. Thallus typically monophyllous: apothecia biatorine, adnate, with simple spores; spermogones as in the preceding.

59. *Leproloma* Nyl. Thallus submonophyllo-lobed; cortical layer absent; gonidial layer consisting of gonimia: apothecia and spermogones unknown.

Subtribe II. *LECANOREI* Nyl. Thallus normally crustaceous; gonidial layer consisting of true gonidia.

60. *Lecanora* Ach. Thallus squamulose, or radiate, or granulose, rarely leprose or evanescent: apothecia lecanorine, occasionally biatoroid, with simple, rarely septate spores; spermogones with simple or jointed sterigmata, and variously cylindrical, straight, or arcuate spermatia.

61. *Dirina* Fr. Thallus crustaceous, continuous or rimulose: apothecia tuberculoso-lecanorine, with 3-septate spores; spermogones with simple sterigmata and acicular, arcuate spermatia.

Subtribe III. *PERTUSARIEI* Nyl. Thallus crustaceous, continuous; gonidial layer consisting of true gonidia: apothecia more or less enclosed in thalline verrucæ.

62. *Pertusaria* DC. Thallus verrucoso-unequal or smoothish: apothecia endocarpoid or lecanoroid, with large simple spores; spermogones with simple sterigmata and acicular, straight spermatia.

63. *Varicellaria* Nyl. Thallus thin or subleprarioid: apothecia subglobose, at length depressed, variolarioid, with very large 1-septate spores: spermogones not yet seen.

Subtribe IV. *THELOTREMEI* Nyl. Thallus crustaceous, continuous or areolate or pulverulent; gonidial layer consisting of true gonidia: apothecia urceolato-impressed, with double margin.

64. *Phlyctis* Wallr. Thallus thinly crustaceous or pulverulent: apothecia erumpent, rotundato-diform, with large murali-divided spores; spermogones with simple sterigmata and short, slender, straight spermatia.

65. *Thelotrema* Ach. Thallus thinly crustaceous, continuous: apothecia at length open, with a proper and a thalline margin, and murali-divided spores; spermogones with simple sterigmata and short straight spermatia.

66. *Urceolaria* Ach. Thallus crustaceous, continuous or areolate: apothecia urceolato-impressed, with a proper and a thalline margin, and spores septately murali-divided; spermogones with somewhat branched sterigmata and cylindrical spermatia.

Subtribe V. *LECIDEEI* Nyl. Thallus variously crustaceous, pulverulent, or none proper; gonidial layer consisting of gonidia (rarely of chrysogonidia): apothecia patellulate.

67. *Lecidea* Ach. Thallus squamose, areolate, pulverulent, or none proper: apothecia biatorine, gyalectoid, or lecideine, with simple or variously septate spores: spermogones with simple or simplish sterigmata and acicular, straight or arcuate, or shortly cylindrical spermatia.

68. *Odontotrema* Nyl. Thallus macular, indistinct: apothecia thelotremoideo-lecideine or gymnotremoid, with simple or thinly 3-septate spores; spermogones not observed.

Tribe XIX. *GRAPHIDEI* Nyl. Thallus crustaceous, thin, continuous, often but little visible, rarely wanting; gonidial layer consisting of gonidia: apothecia lirelline or rotundate.

69. *Xylographa* Fr. Thallus maculate, hypophlœodal: apothecia lirelline or oblong, with simple spores; spermogones with simple sterigmata and acicular curved spermatia.

70. *Agyrium* Fr. Thallus maculate, scarcely visible: apothecia oblong or rotundate, with simple spores; spermogones not known.

71. *Lithographa* Nyl. Thallus crustaceous or evanescent: apothecia lirelline, with simple spores; spermogones not yet seen.

72. *Opegrapha* Humb. Thallus usually hypophlœodal or obsolete: apothecia lineari-lanceolate, subrotundate or linear, with 1- or multi-septate spores; spermogones with simple sterigmata, and cylindrical, straight or arcuate spermatia.

73. *Platygrapha* Nyl. Thallus thin or obsolete: apothecia plane, simple, with spurious thalline margin and septate spores; spermogones with simple sterigmata, and cylindrical, straight or slightly curved spermatia.

74. *Stigmatidium* Mey. Thallus distinct, crustaceous, thickish: apothecia punctiform or elongate, with variously septate spores; spermogones with simple sterigmata and short straight spermatia.

75. *Arthonia* Ach. Thallus thin, or hypophlœodal and evanescent, rarely wanting, internally sometimes with chrysogonidia: apothecia roundish or difform, plane or tumid, with variously septate spores; spermogones with simple sterigmata, and cylindrical, straight or curved spermatia.

76. **Graphis** Adans. Thallus thin, epiphloeodal or hypophloeodal: apothecia linear, divided or simple, innate at the base, with plurilocular spores; spermogones with simple sterigmata and straight or slightly curved spermatia.

77. **Chiodecton** Ach. Thallus thin or thickish, pulverulento-verrucose: apothecia in the thalline verrucæ, substellato-radiate, often confluent, with 3-septate spores; spermogones with simple sterigmata and acicular, arcuate spermatia.

78. **Glyphis** Ach. Thallus usually hypophloeodal or obsolete, with large scattered verrucæ: apothecia in the thalline verrucæ, rotundate or elongate, compound, with plurilocular spores; spermogones not yet seen.

79. **Melaspilea** Nyl. Thallus thin or obsolete: apothecia arthonioid, superficial, with 1-septate spores; spermogones with simple sterigmata and straight spermatia.

Series VI. **PYRENODEI** Nyl. Thallus peltate, crustaceous, hypophloeodal, or evanescent: apothecia nuclear, the hymenium enclosed in a pyrenium, with an apical ostiole.

Tribe XX. **PYRENOCARPEI** Nyl. Thallus various, often maculate or obsolete; gonidial layer consisting of gonidia, rarely of gonimia: apothecia pyrenodeine, often destitute of paraphyses, the epithecium constricted, punctiform.

80. **Normandina** Nyl. Thallus squamulose, squamules thin, rounded: gonidial layer consisting of true gonidia: apothecia immersed, with septate spores; spermogones not seen.

81. **Endocarpon** Hedw. Thallus peltate, or squamæform, or areolate; gonidial layer consisting of gonidimia: apothecia immersed or somewhat prominent, with simple spores; spermogones with jointed sterigmata and short straight spermatia.

82. **Verrucarina** Nyl. Thallus crustaceous, areolate, mucoso-gelatinous, containing gonidimia: apothecia immersed or somewhat prominent, with simple spores; spermogones with simple sterigmata and short straight spermatia.

83. **Verrucaria** Pers. Thallus squamulose, or areolate, or pulverulent, or obsolete, containing gonidia: apothecia semi-immersed or sessile, with entire or dimidiate pyrenium, and simple or variously septate or murali-locular spores; spermogones with simple sterigmata and various spermatia.

84. **Thelenella** Nyl. Thallus epiphloeodal, thin, containing gonidia: apothecia innate, with immersed pyrenium and plurilocular spores; spermogones with simple sterigmata and filiform cylindrical spermatia.

85. *Thelopsis* Nyl. Thallus scarcely any visible, containing chrysogonia: apothecia tuberculoso-spherical, with entire pyrenium and numerous 3-septate spores; spermogones not seen.

86. *Obryzum* Wallr. Thallus none proper: apothecia on the thallus of *Collema*, endocarpoid, with simple or septate corniculate spores; spermogones unknown.

87. *Strigula* Fr. Thallus maculate, hypophlœodal, seldom effigurate, containing platygonidia: apothecia subinnate, with the pyrenium usually depressed, and with simple or 1-3-septate spores; spermogones with thin straight spermatia.

88. *Melanotheca* Fée. Thallus scarcely any: apothecia verrucarioid, numerous and confluent in the pyrenia, with septate spores; spermogones not observed.

Series VII. *PERIDIODEI* Nyl. Thallus thin, often wanting: apothecia peridiine, without any ostiole.

Tribe XXI. *PERIDIEI* Nyl. Thallus thin, maculate or none proper: apothecia forming a peridium.

89. *Thelocarpon* Nyl. Thallus crustaceous, thin, verrucose, or rarely none: apothecia immersed in the thalline verrucæ, with numerous simple spores; spermogones unknown.

90. *Endococcus* Nyl. Thallus none proper: apothecia minute, globulose, with 1-septate spores; spermogones with thin straight spermatia.

91. *Mycoporum* Flot. Thallus maculate or obsolete: apothecia rotundato-diform, containing many hymenia conjoined as in a common exciple, with variously septate spores; spermogones not observed.

Family IV. *MYRIANGIACEI* Nyl. Thallus unstratified, entirely cellular; thalamium cellular, with superimposed theciferous cavities: fructification not discrete.

92. *Myriangium* Mont. & Berk. Thallus noduloso-pulvinate: apothecia sublecanorine, with irregularly septate spores; spermogones not seen.

TABULAR CONSPECTUS

OF THE

FAMILIES, TRIBES, AND GENERA OF BRITISH LICHENS.

Family I. EPHEBACEI.

Genera.

Tribe I. SIROSIPHEI	1. <i>Gonionema</i> Nyl.
	2. <i>Spilonema</i> Born.
Tribe II. PYRENOPSEI	3. <i>Euopsis</i> Nyl.
	4. <i>Pyrenopsis</i> Nyl.
Tribe III. HOMOPSIDEI	5. <i>Ephebe</i> Fr.
	6. <i>Ephebeia</i> Nyl.
Tribe IV. MAGMOPSEI	7. <i>Magnopsis</i> Nyl.

Family II. COLLEMACEI.

Tribe I. LICHINEI	8. <i>Lichina</i> Ag.
	9. <i>Lichiniza</i> Nyl.
	10. <i>Pterygium</i> Nyl.
	11. <i>Leptogidium</i> Nyl.
Tribe II. COLLEMEI	12. <i>Synalissa</i> Fr.
	13. <i>Schizoma</i> Nyl.
	14. <i>Collema</i> Wigg.
	15. <i>Collemodium</i> Nyl.
	16. <i>Leptogium</i> Gray.
	17. <i>Dendroscocaulon</i> Nyl.
	18. <i>Collemopsis</i> Nyl.
Tribe III. PYRENIDIEI	19. <i>Pyrenidium</i> Nyl.

Family III. LICHENACEI.

Series I. EPICONIODEI.

Tribe I. CALICIEI	20. <i>Sphinctrina</i> Fr.
	21. <i>Calicium</i> Pers.
	22. <i>Stenocybe</i> Nyl.
	23. <i>Coniocybe</i> Ach.
	24. <i>Trachylia</i> Fr.
Tribe II. SPHÆROPHOREI	25. <i>Sphærophorus</i> Pers.

Series II. CLADODEI.

	Genera.
Tribe III. BÆOMYCETEI	26. <i>Gomphillus</i> Nyl.
	27. <i>Bæomyces</i> Pers.
Tribe IV. PILOPHOREI	28. <i>Pilophorus</i> Fr. fil.
Tribe V. STEREOCAULEI	29. <i>Stereocaulon</i> Schreb.
	30. <i>Leprocaulon</i> Nyl.
Tribe VI. CLADONIEI	31. <i>Pycnothelia</i> Duf.
	32. <i>Cladonia</i> Hill.
	33. <i>Cladina</i> Nyl.

Series III. RAMALODEI.

Tribe VII. ROCCELLEI	34. <i>Rocella</i> DC.
Tribe VIII. SIPHULEI	35. <i>Thamnolia</i> Ach.
Tribe IX. RAMALINEI	36. <i>Ramalina</i> Ach.
Tribe X. USNEI	37. <i>Usnea</i> Dill.
Tribe XI. ALECTORIEI	38. <i>Alectoria</i> Ach.
Tribe XII. CETRARIEI	39. <i>Cetraria</i> Ach.
	40. <i>Platysma</i> Nyl.

Series IV. PHYLLODEI.

Tribe XIII. PARMELIEI	41. <i>Evernia</i> Ach.
	42. <i>Parmelia</i> Ach.
	43. <i>Parmeliopsis</i> Nyl.
Tribe XIV. STICTEI.	
Subtribe I. <i>Stictinei</i>	44. <i>Stictina</i> Nyl.
	45. <i>Lobarina</i> Nyl.
Subtribe II. <i>Eustictiei</i>	46. <i>Lobaria</i> Hoffm.
	47. <i>Stictia</i> Schreb.
	48. <i>Ricasolia</i> De Not.
Tribe XV. PELTIGEREI.	
Subtribe I. <i>Peltidei</i>	49. <i>Peltidea</i> Ach.
	50. <i>Solorina</i> Ach.
Subtribe II. <i>Peltigerinei</i> ..	51. <i>Nephromium</i> Nyl.
	52. <i>Peltigera</i> Willd.
Tribe XVI. PHYSICIEI	53. <i>Physcia</i> Schreb.
Tribe XVII. GYROPHOREI	54. <i>Umbilicaria</i> Hoffm.
	55. <i>Gyrophora</i> Ach.

Series V. PLACODEI.

Tribe XVIII. LECANO-LECIDEI.	
Subtribe I. <i>Pannariei</i>	56. <i>Pannaria</i> Del.
	57. <i>Pannularia</i> Nyl.
	58. <i>Coccocarpia</i> Pers.
	59. <i>Leproloma</i> Nyl.
Subtribe II. <i>Lecanorei</i>	60. <i>Lecanora</i> Ach.
	61. <i>Dirina</i> Fr.

Series V. PLACODEI (*continued*).

Genera.

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| Subtribe III. <i>Pertusariei</i> | 62. <i>Pertusaria</i> DC. |
| | 63. <i>Varicellaria</i> Nyl. |
| Subtribe IV. <i>Thelotremai</i> | 64. <i>Phlyctis</i> Wallr. |
| | 65. <i>Thelotrema</i> Ach. |
| | 66. <i>Urceolaria</i> Ach. |
| Subtribe V. <i>Lecideei</i> | 67. <i>Lecidea</i> Ach. |
| | 68. <i>Odontotrema</i> Nyl. |
| Tribe XIX. GRAPHIDEI | 69. <i>Xylographa</i> Fr. |
| | 70. <i>Agyrium</i> Fr. |
| | 71. <i>Lithographa</i> Nyl. |
| | 72. <i>Opegrapha</i> Humb. |
| | 73. <i>Platygrapha</i> Nyl. |
| | 74. <i>Stigmatidium</i> Mey. |
| | 75. <i>Arthonia</i> Ach. |
| | 76. <i>Graphis</i> Adans. |
| | 77. <i>Chiodecton</i> Ach. |
| | 78. <i>Glyphis</i> Ach. |
| | 79. <i>Melaspilea</i> Nyl. |

Series VI. PYRENODEI.

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|----------------------------------|-----------------------------|
| Tribe XX. PYRENOCARPEI | 80. <i>Normandina</i> Nyl. |
| | 81. <i>Endocarpon</i> Hedw. |
| | 82. <i>Verrucarina</i> Nyl. |
| | 83. <i>Verrucaria</i> Pers. |
| | 84. <i>Thelenella</i> Nyl. |
| | 85. <i>Thelopsis</i> Nyl. |
| | 86. <i>Obryzum</i> Wallr. |
| | 87. <i>Strigula</i> Fr. |
| | 88. <i>Melanotheca</i> Fée. |

Series VII. PERIDIODEI.

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| Tribe XXI. PERIDIEI | 89. <i>Thelocarpon</i> Nyl. |
| | 90. <i>Endococcus</i> Nyl. |
| | 91. <i>Mycoporum</i> Flot. |

Family IV. MYRIANGIACEI.

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| 92. <i>Myriangium</i>
Mont. & Berk. |
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CATALOGUE

OF

BRITISH LICHENS.

Family I. **EPHEBACEI** Nyl. Flora, 1879, p. 223.

Thallus fruticulose, granulose, rarely subsquamulose, slightly turgid and gelatinous when moist, dark in colour, cellular in texture (without any medullary filaments), cells minute; gonimia somewhat large, gonidioid, tunicated, subglobose, glaucous, variously arranged, not moniliform. Apothecia biatorine, lecideine, lecanorine or pyrenocarpous; paraphyses various, sometimes wanting; spores 8næ, rarely numerous, usually ellipsoid or suboblong, simple, rarely 1-septate, colourless. Spermogones immersed in the thallus or enclosed in thalline tubercules, sterigmata generally simple or simplish, spermatia usually very minute, oblong.

Nylander, in originally distinguishing this family in Flora 1875, p. 103, named it *Byssacei* Fr.; but as the old genus *Byssus* in the Michelian acceptation referred to *Chroolepa*, which have gonidic thalli, this has been named *Ephebacei*.

The family (the diagnosis of which I owe to Nylander) is well characterized by the absence of medullary filaments, and by the nature of the gonimia, which are tunicated or involved in a gelatinous cellular stratum. On the tunic being ruptured, the gonimia, each of which has a very thin parietal membrane (more especially visible when suffused with ammonia, Nyl. Pyr. Or. p. 48), become free. Various genera recently separated from *Algæ* belong to this family; and no doubt, with further knowledge, others will be transferred to it.

Tribe I. **SIROSIPHEI** Nyl. ex Stiz. St. Gall. Nat. Ges. (1876), p. 192; *cfr.* Cromb. Grevillea, v. p. 76.

Thallus minute, byssoid, filamentoso-fruticulose, gonimia (sirogonimia) tunicated, variously connate; medullary filaments none. Apothecia minute, biatorine or lecideine; paraphyses thickish or slender; spores 8næ, ellipsoid, simple or rarely 1-septate, colourless. Spermogones innate; sterigmata simple, rarely articulate.

The various genera composing this tribe (of which Nylander has supplied the diagnosis) consist of minute algaoid plants, whose true relations have for the most part, until recently, been but little understood. In addition to those here described there are others which, occurring only in a sterile or imperfectly developed condition, do not admit of a

satisfactory diagnosis, and are consequently omitted. Among these are several species of *Sirosiphon*, e. g. *S. savicola* Naeg., *S. alpinum* Kütz., *S. pulvinatus* Bréb., *S. ocellatus* Kütz., which occur in Great Britain and Ireland. According to Nylander, in Lamy Mt. Dor. p. 1 (note), *Racodium ebencum* (Dillw.), which from general appearance might be supposed to belong to this tribe, has no analogy with *Sirosiphon*, but is quite different in structure, containing gonidia, and is probably some peculiar sterile *Lepraria*.

1. GONIONEMA Nyl.

Mém. Soc. Cherb. iii. (1855) p. 163; Syn. i. p. 88.—Thallus byssaceo-fibrillose, tubuliform, intricate; gonimia sub-moniliformly connate in one continuous series. Apothecia biatorine or gyalectoid; spores 8næ, simple, paraphyses slender; hymenial gelatine (especially the thecæ) bluish, becoming wine-red or tawny wine-coloured with iodine. Spermatogones lateral, or terminal, globose; sterigmata simple, slender; spermatia oblong, very minute.

Various *Scytonemas* probably belong to this genus. If this be so, the more recent name must give place to that of *Scytonema* Ag., in its stricter sense.

1. *G. velutinum* Nyl.

Mém. Soc. Cherb. iii. (1855) p. 163.—Thallus very thin, densely pan-nose, intricate, brownish when moist, dark-brown when dry. Apothecia minute, terminal, ap-

pressed, somewhat concave, dark-brown, pale within, the margin tumid; spores ellipsoid or oblongo-ellipsoid, 0,010-0,015 mm. long, 0,006-0,007 mm. thick.—Nyl. Syn. i. p. 88, t. 1. f. 11; Leight.

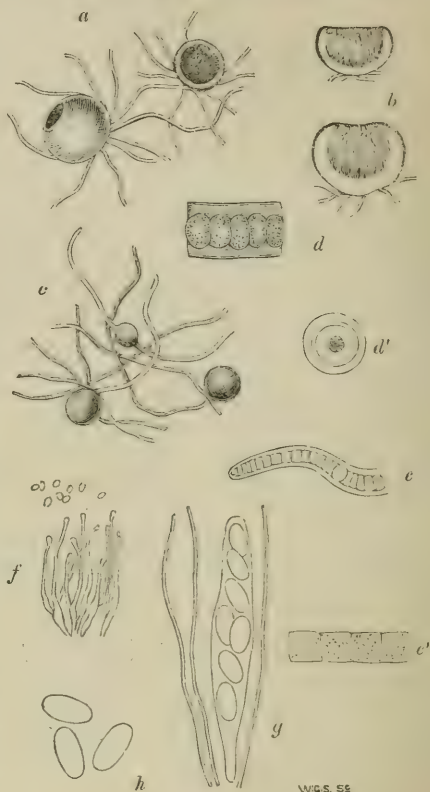


Fig. 1.

Gonionema velutinum Nyl.—a. Filaments with two apothecia, $\times 30$. b. Vertical sections of two apothecia, $\times 30$. c. Filaments with three spermatogones, $\times 30$. d. Short frustule of thallus, and d' transverse section of the same, $\times 350$. e. Apex of a filament containing a meionimium, $\times 200$, and e' fragment of a syngonimium composed of four gonimia, $\times 350$. f. Sterigmata and spermatia, $\times 500$. g. Theca and paraphyses, $\times 350$. h. Three spores, $\times 500$.

Ann. Mag. Nat. Hist. ser. 3, xvi. p. 8, t. 4. ff. 1-6; Lich. Fl. p. 11, ed. 3, p. 9; Cromb. Lich. Brit. p. 1.—*Polychidium velutinum* Gray, Nat. Arr. i. p. 402; *Lichen velutinus* Ach. Prodr. (1798) p. 218.

The thallus is very densely matted together, and sometimes spreads extensively over the substratum. When young and infertile it is with difficulty distinguished from some species of *Scytonema*. The apothecia, which are reddish when young, seem to be very rare in this country, nor are the spermogones often met with; they are nearly turbinate, pale reddish, the spermatia being 0,002 mm. long, 0,001 mm. thick.

Hab. On mica-schist rocks in mountainous districts.—*Distr.* Local and scarce in North Wales, and among the Grampians, Scotland; no doubt often overlooked elsewhere.—B. M.: Near Barmouth and Cader Idris, Merionethshire; Craig Breidden, Montgomeryshire. Ben Cruachan, Argyleshire; Ben Lawers and Craig Tulloch, Perthshire; Glen Callater, Braemar, Aberdeenshire.

2. *G. compactum* Nyl. Flora, 1883, p. 104.—Thallus thinly filamentose, dark-brown, filaments ascending and crowded, forming a subsending tomentum. Apothecia globose, reddish, the epithecium rather indistinct: spores oblong, 0,010-0,015 mm. long, 0,006-0,008 mm. thick.—Cromb. Journ. Bot. 1885, p. 195.—*Scytonema compactum* Ag. Disp. Alg. (1812) p. 39; Sm. Eng. Fl. v. p. 364. *Hassallia compacta* Hass. Br. Freshw. Alg. p. 232, t. 68. f. 3. *Sirosiphon compactus* Ktz., Leight. Lich. Fl. ed. 3, p. 9.

The recent discovery of the fructification in N.W. England has definitely placed this plant among Lichens. It differs from the preceding in the filaments, which are often curved, being more erect and branched towards the apices, and in the apothecia being globular, with the epithecium less distinct and the spores somewhat larger. The spermogones are globoso-adenate, with spermatia thin, 0,001 mm. long, 0,005 mm. thick.

Hab. On moist rocks in upland and subalpine districts.—*Distr.* Probably not unfrequent, though seen only from N. Wales, N.W. England, S. and Central Scotland, and N.W. Ireland.—B. M.: Lyn Aran, Dolgelly, Merionethshire; Mardale, Westmoreland (fr.); Wastdale Lake, Cumberland; Ben Lawers, Perthshire. Near Kylemore Lake, co. Galway.

2. *SPILONEMA* Born. Mém. Soc. Cherb. iv. (1856) p. 226; Nyl. Syn. i. p. 89.—Thallus minute, fruticulose, often pulvinate; gonimia 2 or 3, or several together, arranged in more or less regular series throughout the rounded thallus. Apothecia small, lecideine, lenticular; spores simple or 1-septate, paraphyses thickish, articulate; hymenial gelatine bluish with iodine. Spermogones tuberculose, with jointed sterigmata, spermatia shortly cylindrical.

This differs from *Gonionema* chiefly in the characters of the gonimia, paraphyses, and sterigmata. Some plants agreeing in the structure of the thallus and the apothecia with *Spilonema*, but the spermogones of which have not been detected, may also, for the present, be referred here, though eventually they may be found to belong to *Sirosiphon* (*vide* Cromb.

Journ. Bot. 1874, p. 331), which most probably is a distinct genus. *Spilonema* would then contain only one species, viz. *S. paradoxum*. From *Ephebe*, though differing but slightly in the structure of the thallus, *Spilonema* is readily distinguished by the fructification.

1. *S. paradoxum* Born. Mém. Soc. Cherb. iv. (1856) p. 226, t. 1, 2.—Thallus fruticulose, branched, thin, cylindrical, pannoso-intricate, the branchlets subsecund, dark-brown or brownish-black, usually opaque. Apothecia small, terminal, somewhat convex, im-marginate, black; spores oblong, simple, 0.009 mm. long, 0.004 mm. thick, hypothecium blackish; hymenial gelatine deep blue, then

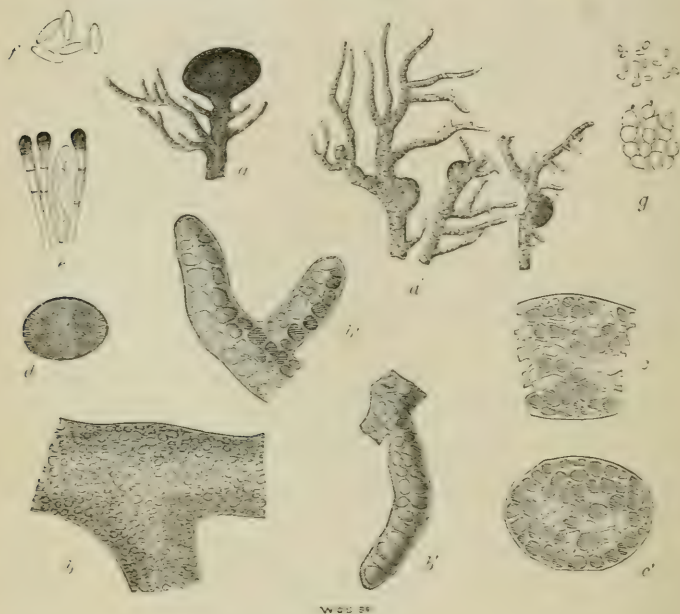


Fig. 2.

Spilonema paradoxum Born.—a. Thalline branch with apothecium, $\times 30$. a'. Three branches with spermogones, $\times 30$. b. Fragment of trunk and larger branch, and b', branchlets, $\times 200$. c. Very thin section of thalline trunk, and c' transverse section of the same, $\times 200$. d. Section of apothecium, $\times 30$. e. Theca and paraphyses, $\times 350$. f. Spores, $\times 500$. g. Jointed sterigmata and spermatia, $\times 500$.

dark-violet with iodine.—Nyl. Syn. i. p. 89, t. 2. f. 4; Mudd, Man. p. 35; Leight. Ann. Mag. Nat. Hist. ser. 3, xvi. p. 9, t. 4. ff. 7–11; Lich. Fl. p. 11, ed. 3, p. 10; Cromb. Lich. Brit. p. 1; Journ. Bot. 1874, p. 331.—*Brit. Exs.*: Leight. n. 347.

In an infertile or immature state this is difficult to distinguish from some species of allied genera. The thallus bears a considerable resemblance, when fully developed, to *Ephebe pubescens*, but is rather smaller,

while the moncecious fructification, the apothecia, and the spermogones prevent all confusion between them. The apothecia are rarely seen in British specimens, though the spermogones are not unfrequent; they are minute black tubercules, with sterigmata 4-6-articulate, spermatia 0,002-0,0025 mm. long, 0,005-0,001 mm. thick.

Hab. On schistose rocks in maritime and subalpine tracts.—*Distr.* Local and scarce in N. Wales, and the S.W. Highlands of Scotland; though no doubt it will be detected in other similar localities.—B. M. : Barmouth, Merionethshire; Barcaldine, Argyleshire.

2. *S. revertens* Nyl. Flora, 1865, p. 601.—Thallus effuse, minutely coralloideo-compact, in somewhat small, verruculose pulvinuli, black or brownish-black. Apothecia lecideine, adnate, somewhat convex, immarginate, black, dark-greyish within; spores oblong, simple, 0,008-0,011 mm. long, 0,005-6 mm. thick; paraphyses thickish, incrassate and denigrate at the apices; hymenial gelatine bluish, the apices of the thecae deep-blue with iodine.—Cromb. Journ. Bot. 1874, p. 331; Leight. Lich. Fl. ed. 3, p. 11.

In this species the pulvinuli are more or less crowded, and in a young or poorly developed state are frequently somewhat discrete. *Sirosiphon saxicola* Naeg. in great part is apparently a sterile leprarioid condition of this plant. In the only British specimen seen the apothecia are but sparingly present. On the thallus of the same specimen pycnides are also visible, which are minute, globose, immersed, colourless, with somewhat curved stylospores.

Hab. On moist schistose rocks in subalpine districts.—*Distr.* Very local and rare, at least in a mature condition, being known only from the Central Grampians, Scotland.—B. M. : Craig Tulloch, Blair Athole, Perthshire.

3. *S. scoticum* Nyl. Flora, 1869, p. 82.—Thallus effuse, minutely coralloid, in small, compact, verrucose, somewhat convex pulvinuli, black or brownish-black. Apothecia minute, thinly margined, black, epithecium impressed or slightly convex, vaguely obscure, hypothecium colourless: spores oviformi-oblong, 1-septate, 0,010-14 mm. long, 0,0045 mm. thick, paraphyses somewhat slender; hymenial gelatine bluish, the thecae violet with iodine.—Cromb. Journ. Bot. 1869, p. 105; Lich. Brit. p. 1; Leight. Lich. Fl. p. 12, ed. 3, p. 11.

The pulvinuli are usually discrete, though occasionally approximate, on the crustaceous thalli, or the decayed mosses on which the plant occurs. It is closely allied to the preceding, but is well distinguished by the apothecia and the spores. The sterile thallus seems to be not uncommon; but the apothecia are very rare. As in *S. revertens*, no spermogones have yet been detected, so that both species are only temporarily placed in *Spilonema*.

Hab. On mica-schist rocks, and on dead mosses (also on *Stereocaulon condensatum*) in subalpine tracts.—*Distr.* Probably not unfrequent in the mountainous districts of our Islands, though known only from N. Wales, N. England, and the S. Grampians, Scotland.—B. M. : Llyn Aran, Dolgelly, Merionethshire; Teesdale, Durham; Ben Lawers and Craig Calliach, Perthshire.

Tribe II. **PYRENOPSEI**, Nyl. *ex* Stiz. St. Gall. Nat. Ges. 1876, p. 192 (*cf.* Cromb. Grevillea, v. p. 76).

Thallus effuse, thinly granulose or subsquamulose, rarely subfruticulose, within rubricose; gonimia tunicated, single or several in gelatino-cellular, nodulose and variously arranged syngonimia; medullary filaments wanting. Apothecia small or minute, lecanorine or pyrenocarpous, paraphyses jointed or simple; spores 8næ, very rarely numerous, simple, ellipsoid, colourless. Spermatogones innate, with simplish sterigmata.

This tribe differs considerably in external appearance alike from the preceding and the following, though in the structure of the thallus and the character of the gonimia it nearly agrees with them. Both genera of which it consists occur in Britain, and may readily be recognized by the blood-red colour of the thallus, which becomes apparent when it is moistened.

3. **EUOPSIS** Nyl.

Flora, 1875, p. 363 (*cf.* Cromb. Grevillea, v. p. 76).—

Thallus thinly crustaceous, fragile, granulato-areolate; gonimia simple or several in nodulose syngonimia. Apothecia lecanorine, small or moderate, paraphyses articulate; spores 8næ; hymenial gelatine bluish with iodine. Spermatogones with oblong minute sterigmata.



Fig. 3.

Euopsis hæmalea Nyl.—a. Section of the thallus, $\times 200$. b. Two gonimia, $\times 350$. c. Two syngonimia, $\times 350$. d. Section of apothecium, $\times 30$. e. Section of part of hymenium, with theca and paraphyses, $\times 350$. f. Spores, $\times 500$. g. Section of spermatogone, $\times 30$. h. Sterigmata and spermatia, $\times 500$.

The old genus *Pyrenopsis* Nyl. has lately received so many additions that it has been broken up by its author into several genera. The present genus is well distinguished from *Pyrenopsis* by the lecanorine apothecia and the jointed paraphyses.

1. **E. hæmalea** Nyl. Flora, 1875, p. 363.—Thallus indeterminate, granulose, thinnish, verrucoso-diffract, dark blood-red. Apothecia moderate, plane or convex, somewhat shining, subconcolorous, or rather paler, the thalline margin thin, at length excluded; spores simple, 0.011–16 mm. long, 0.006–7 mm. thick; hymenial gelatine, especially the thecae, deep-blue with iodine.—Cromb. Grevillea, xv. p. 10.—*Pyrenopsis hæmalea* Nyl., Strn. Grevillea, ii. p. 71; Cromb. Journ. Bot. 1874, p. 332; Leight.

Lich. Fl. ed. 3, p. 15. *Collema hæmaleum*, Somm. Suppl. Fl. Lapp. (1826) p. 117.

The thallus occasionally occurs in small patches intermixed with other crustaceous lichens, but generally by itself, and spreading to a moderate extent over the substratum. Sometimes a sterile and less developed, though very similar, plant occurs which probably belongs to this species. The apothecia are usually numerous and crowded, becoming when old convex and darker in colour.

Hab. On mica-schist rocks in subalpine and alpine tracts.—*Distr.* Local and scarce among the S.W. Grampians, Scotland and in N.W. Ireland.—B. M.: Ben Cruachan, Argyleshire; Ben Lawers, Perthshire. Connemara, co. Galway.

2. *E. granatina* Nyl. Flora, 1875, p. 363.—Thallus effuse, thin, granulose, rimoso-diffract, reddish-brown or rubricosio-reddish, the granules somewhat plane, opaque, ruguloso-nodulose, contiguous, rotundato-diform. Apothecia small, shining, several in each thalline granule, subconcolorous, whitish within, the margin thin, entire; spores simple or spuriously 1-septate, 0,009–12 mm. long, 0,0045–55 mm. thick; hymenial gelatine, especially the thecae, bluish with iodine.—Cromb. Grevillea, xv. p. 10.—*Pyrenopsis granatina* Nyl, ex Cromb. Lich. Brit. p. 2; Leight. Lich. Fl. p. 14, ed. 3, p. 15. *Lecanora granatina* Somm. Suppl. Fl. Lapp. (1826) p. 90.

Distinguished from the preceding by the paler colour of the thallus, the nodulose and irregularly rotundate granules, and the apothecia. In manner of growth it is similar to *Pyrenopsis hæmatopis*, and is little conspicuous except in wet weather. The apothecia become at length nearly biatorine, with excluded margin.

Hab. On granitic rocks and schistose boulders in alpine localities.—*Distr.* Very local and rare among the mountains of N. Wales and the S. and W. Grampians, Scotland.—B. M.: Llyn Aran, near Dolgelly, Merionethshire. Ben Cruachan, Argyleshire; Craig Calliach and Ben Lawers, Perthshire.

4. **PYRENOPSIS** Nyl. Mém. Soc. Cherb. iii. (1855) p. 164; Syn. i. p. 97 (*cf.* Stiz. St. Gall. Nat. Ges. 1876, p. 193).—Thallus thinly crustaceous, granulose or subsquamulose, rarely subfruticulose; gonimia simple or several in nodulose syngonimia. Apothecia sublecanoroid or pseudo-pyrenocarpous, small or minute, paraphyses simple, slender; spores 8næ, very rarely numerous; hymenial gelatine bluish or wine-red with iodine. Spermatogones with oblong minute spermatia.

As re-arranged by Nylander, this is a very natural and well-defined genus, in consequence of *Euopsis* having been raised into a separate genus and *Colleopsis* relegated to the Collemaei. It is at once distinguished from *Euopsis* by having the disc of the apothecia subclosed, and by the paraphyses not being articulate. More recently it has been divided by Nylander into two subgenera, viz. *Euppyrenopsis* Nyl. and *Cladopsis* Nyl., of which only the former occurs in this country.

1. *P. hæmatopis* Fr. fil. N. Ac. Reg. Soc. Sc. Upsal. ser. 3, iii. (1861) p. 284.—Thallus effuse, crustose, opaque, verrucoso-unequal,

thickish, diffracto-rimose, dark- or rubricose-brown, within subconcolorous or darker in the lower portion. Apothecia superficial, urceolate, minute, subconcolorous or slightly darker, the margin thick, elevated, entire; spores 8næ, 0,010–12 mm. long, 0,005–6 mm. thick; hymenial gelatine, especially the thecæ, bluish with iodine.—Carroll, Journ. Bot. 1866, p. 22; Cromb. Lich. Brit. p. 2; Leight. Lich. Fl. p. 14, ed. 3, p. 14.—*Collema hæmaleum*, var. *hæmatopis*, Somm. Suppl. Fl. Lapp. (1826) p. 117.

From *Euopsis hæmalea*, with which it here grows associated, this is externally distinguished by the thicker thallus and the minute urceolate apothecia. With us it is not usually seen with apothecia, though, when present, these are numerous. The spermogones in otherwise sterile plants are frequent, with very minute ellipsoid spermatia.

Hab. On shady mica-schist rocks in alpine places.—*Distr.* Extremely local and rare, among the S. Grampians, Scotland.—B. M.: Summit of Ben Lavers, Perthshire.

2. *P. fuscata* Nyl. Mém. Soc. Cherb. v. (1857) p. 143.—Thallus effuse, noduloso-granulate, dark-brown or brownish-black, the granules agglomerate and confluent in somewhat depressed glomerules, which are more or less discrete and irregularly scattered. Apothecia small, somewhat impressed, concolorous, the margin concnivent; spores 8næ, 0,008–0,010 mm. long, 0,0045–0,0050 mm. thick; epithecium yellowish; hymenial gelatine bluish, then violet, with iodine.—Leight. Lich. Fl. p. 16, ed. 3, p. 14; Cromb. Journ. Bot. 1874, p. 332.

This is a small species, characterized chiefly by the noduloso-graniform thallus, which either spreads moderately over the substratum, when the glomerules are more discrete, or more frequently occurs in small interrupted patches. The apothecia are rarely met with rightly developed, though the spermogones are more common; they are very minute, with spermatia oblong or oblongo-cylindrical, 0,002 mm. long, about 0,0005 mm. thick.

Hab. On granitic and schistose rocks in maritime districts.—*Distr.* Rather local and rare, having been found only in the Channel Islands, N. Wales, and the S.W. Highlands of Scotland.—B. M.: La Moye and Boulay Bay, Island of Jersey. Near Barmouth, Merionethshire. Island of Lismore, Argyleshire.

3. *P. subareolata* Nyl. Lich. Scand. (1861) p. 27, *nomen*.—Thallus effuse or subeffuse, thinnish, diffracto-areolate, blackish, areolæ somewhat plane. Apothecia small, innate, subconcolorous, the epithecium impressed; spores 8næ, 0,015 mm. long, 0,008 mm. thick; hymenial gelatine bluish, then wine-reddish with iodine.—Cromb. Journ. Bot. 1882, p. 271.—To this also apparently is referable *Verrucaria imbrida* Tayl. Hook. Journ. Bot. vi. (1847) p. 153.

This species is comparable with *P. concordatula* Nyl., from which, among other characters, it at once differs in the smaller spores. The British specimens seen are not very typical, the apothecia being sparingly present, minute and scattered, but for the most part not well developed.

Hab. On moist schistose rocks in mountainous districts.—*Distr.* Very

local and scarce, in N. Wales and S.W. Ireland.—B. M. : Near Barmouth, Merionethshire. Near Killarney, co. Kerry.

4. *P. phylliscella* Nyl. Flora, 1875, p. 102.—Thallus effuse, squamulose, dark-brown, squamules somewhat subverrucoso-unequal, subadnate, aggregate but not contiguous, rotundato-difform. Apothecia endocarpoid, very minute, 5–15 in each thalline squamule; epithecium punctiform, concolorous, with thin thalline margin; spores 8næ, oblongo-ellipsoid, 0,005–7 mm. long, 0,003 mm. thick; paraphyses few; hymenial gelatine bluish, the thecæ dark-violet with iodine.—Cromb. Grevillea, iii. p. 190; Leight. Lich. Fl. ed. 3, p. 14.

The squamules of the thallus are composed of minute aggregate granules, which are usually distinct from each other, though here and there becoming contiguous. Its nearest ally is *P. tasmanica* Nyl., rather than any of our British species, though at first sight it somewhat resembles *P. fuscicula*. The apothecia are numerous and crowded in the fertile squamules, and the spermatogones are not unfrequent, with spermatia thin, oblong, or fusiformi-oblong.

Hab. On quartzose boulders in subalpine streams.—*Distr.* Extremely local and scarce, among the Central Grampians, Scotland.—B. M. : Ben-y-gloe, Blair Athole, Perthshire.

5. *P. homœopsis* Nyl. Flora, 1868, p. 342.—Thallus effuse, thin, subgranulose, unequal, subareolate, reddish-brown. Apothecia minute, lecanoroid, concolorous, pale within, the margin connivent, epithecium narrow, colourless; spores 8næ, 0,011–18 mm. long, 0,007–10 mm. thick; paraphyses slender; hymenial gelatine red or tawny wine-coloured with iodine.—Cromb. Journ. Bot. 1869, p. 48; Lich. Brit. p. 2; Leight. Lich. Fl. p. 15, ed. 3, p. 14.

This is closely allied to *P. granulifera*, Nyl., from which it differs chiefly in the larger spores and gonimia, as also in the thallus being internally paler, especially under the apothecia. In the few specimens gathered, the thallus, except in one instance, was associated with *Lecanora frustulosa*, and for the most part sterile.

Hab. On mica-schist rocks in alpine places.—*Distr.* Very local and rare, having been found only on two of the S. Grampians, Scotland.—B. M. : Summits of Ben Lawers and Craig Calliach, Perthshire.

6. *P. furfurea* Nyl. ex Cromb. Journ. Bot. 1874, p. 332.—Thallus effuse, thinnish, granulato-areolate, brownish-black or black, when moist rubricosely blackish or rubricosely reddish. Apothecia minute, at length nearly urceolariform, the margin tumid; spores 8næ, 0,010–12 mm. long, 0,007–8 mm. thick; hymenial gelatine wine-red with iodine.—Leight. Lich. Fl. ed. 3, p. 14.—*Collema furfureum* Nyl. Flora, 1865, p. 353; Carroll, Journ. Bot. 1865, p. 286; Cromb. Lich. Brit. p. 3; Leight. Lich. Fl. p. 17.

According to Nylander, *in litt.*, this somewhat anomalous species is perhaps referable rather to the genus *Phylliscum*, to which it approaches in the structure of the thallus. "This, which superficially is rubricoso-reddish, as in *Pyrenopsis*, is internally colourless, gelatinose, and excavated with minute, frequent, cellular cavities, among which are scattered somewhat large, oblong, simple, glaucous gonimia, as in *Phylliscum*, which

are enveloped in a thickish gelatinose tunic." The apothecia are rare in the few British specimens gathered, and the spores are seldom well developed. We have not detected any mature spermatogones on our specimens, though these would determine more definitely the place of this species, as the spermatia in the *Phylliscodei* (Nyl. Flora, 1887, p. 133) are elongate and arcuate.

Hab. On moist mica-schist rocks in alpine places.—*Distr.* Very local and rare, having been found only very sparingly among the S. Grampians.—B. M.: Summit of Ben Lawers, Perthshire.

Tribe III. **HOMOPSIDEI** Nyl. *ex* Stiz. St. Gall. Nat. Ges. 1876, p. 193; Flora, 1887, p. 133.

Thallus variable in form and texture, being either (1) fruticulose, with gonimia seriate, and chiefly contiguous or seriately connate in the branches and branchlets, or (2) squamuliform or granuloso-continuous, uniform, with gonimia (haplogonimia) somewhat large and subsolitary, or large and solitary, always gelatinoso-involute; medullary filaments wanting. Apothecia pyrenocarpous, innate in thalline protuberances, externally more or less eminent, or immersed and without any external protuberance; spores simple or rarely 1-septate; paraphyses slender or none. Spermatogones inclosed in thalline protuberances, or immersed and without any protuberance; spermatia either shortly cylindrical, straight (the sterigmata simple), or elongate, thin, arcuate (the sterigmata simple, somewhat short).

This tribe comprises various small brown or blackish plants, agreeing in the common character of having pyrenocarpous apothecia, though in other respects differing considerably in the several genera. According to the form and texture of the thallus, the arrangement of the gonimia, and the presence or absence of thalline protuberances enclosing the fructification, it is divided into two subtribes, viz. *Ephabei* and *Phylliscodei*. To the latter, according to Nylander *in litt.*, belongs *Collema granuliforme* Nyl. = *Phylliscodium granuliforme* Nyl., which, although recorded (erroneously) by Leighton (Lich. Fl. ed. 3, p. 22) from Galway, has not been gathered in our Islands.

Subtribe *EPHEBEI* Nyl. *ex* Stiz. St. Gall. Nat. Ges. 1876, p. 193; Flora, 1887, p. 133.

Thallus small, byssoid, fruticuloso-ramose; gonimia tunicated, in nodulose syngonimia. Apothecia minute, pyrenocarpous, in ellipsoid or pyriform incrustations of the thallus, paraphyses distinct or none; spores 8næ, ellipsoid, simple or 1-3-septate, colourless. Spermatogones innate in globular or shortly ellipsoid thalline tubercles, with slender, simplish sterigmata.

The thallus in its younger and immature state is entirely Sirospiphoid in structure; so that this subtribe might briefly be defined as consisting of "pyrenocarpous sirospiphoid Ephebacei." Its two genera are well distinguished from each other by the anatomical characters of the apothecia.

5. **EPHEBE** Fr. Pl. Hom. (1825) p. 256; Nyl. Syn. i. (1858) p. 85, emend. Flora, 1875, p. 6 (*cf.* Cromb. Grevillea, v. p. 124).—Thallus usually dioecious, cylindrical, intricate; within longitudinally cellular; gonimia chiefly towards the surface, 2–4 in each nodule.

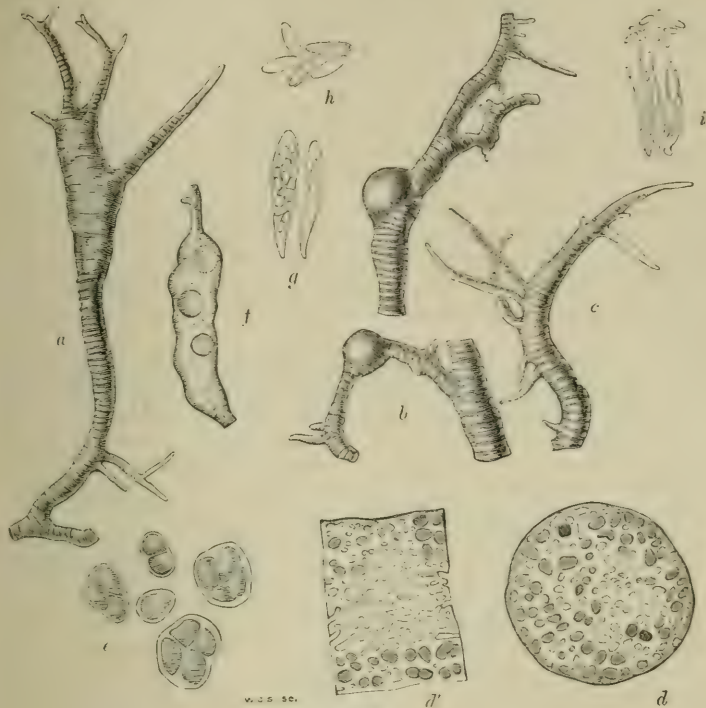


Fig. 4.

Ephebe pubescens Nyl.—*a.* Thalline branchlet, with apothecia, $\times 30$. *b.* Thalline branchlet, with spermatogones, $\times 30$. *c.* Sterile branchlets, $\times 30$. *d.* Transverse section of thallus, and *d'*, longitudinal section of thallus, $\times 200$. *e.* Four syngonimia, $\times 350$. *f.* Section of thalline receptacle of three apothecia, $\times 30$. *g.* Two thecae, $\times 350$. *h.* Five spores, $\times 500$. *i.* Sterigmata and spermatia, $\times 500$.

Apothecia solitary or aggregate, paraphyses none; spores simple or 1–3-septate; hymenial gelatine scarcely tinged with iodine. Spermatogones with long sterigmata and shortly cylindrical spermatia.

This differs from the following genus in the generally dioecious thallus, and more especially in the absence of paraphyses and in the septate spores. The apothecia in both genera have the “pyrenium” (*i. e.* the “perithecium,” in its former but erroneous acceptance, *vide* Nyl. Flora, 1875, p. 102) either colourless or slightly dark. In both also the spermatogones have the appearance of young apothecia.

1. **E. pubescens** Nyl. Syn. i. (1858) p. 90, t. ii. ff. 1, 17-20.—Thallus much branched, decumbent, slightly rugulose, somewhat shining, olive-green or brownish-black, branches very slender, capillary at the apices. Apothecia minute, pale; spores simple or 1-septate, 0.011-0.016 mm. long, 0.003-0.004 mm. thick; hymenial gelatine either not tinged, or obsoletely violet-coloured (the thecæ tawny-yellow) with iodine.—Mudd, Man. p. 34; Leight. Ann. Mag. Nat. Hist. ser. 3, xvi. p. 10, t. 4. ff. 12-14; Lich. Fl. p. 12, ed. 3, p. 10; Cromb. Lich. Brit. p. 1; Grevillea, v. p. 124.—*Cornicularia pubescens* Gray, Nat. Arr. i. p. 406. *Lichen pubescens* Linn. Fl. Suec. (1745) n. 1126, pro parte; Eng. Bot. t. 2318. *Lichen exilis* Lightf. Fl. Scot. ii. p. 894; With. Arr. ed. 3, iv. p. 47. *Lichen scaber* Huds. Fl. Angl. ed. 2, p. 562. *Conferva atrovirens* Dillw. Br. Conf. p. 60, t. 25. *Girardia atrovirens* Gray, Nat. Arr. i. p. 287. *Scytonema atrovirens* Ag. Hook. Fl. Scot. ii. p. 78. *Stigonema atrovirens* Sm. Eng. Fl. v. p. 363; Hass. Br. Freshw. Alg. p. 227, t. 66. f. 1.—Probably several of these synonyms relate to other species, the specimens seen being infertile.

This grows in close, matted, irregular tufts, which often spread extensively over the substratum. When young it is more or less suberect, becoming at length decumbent or prostrate. From *Parmelia lanata*, var. *reticulata*, with which it was frequently confounded by the older authors, it is externally distinguished when sterile by its softer, transversely rugose thallus, and when fertile by the apothecia, which apparently are rare in Britain. The spermogones, which are more frequent, are lateral, the sterigmata usually simple, 0.005 mm. long, 0.001 mm. thick.

Hab. On moist shady rocks, especially by streams, in upland and sub-alpine situations.—*Distr.* General and for the most part abundant where it occurs in the mountainous tracts of Great Britain and Ireland.—B. M.: Near Ivy Bridge and Chagford, Devonshire; Roughton, Cornwall; Barmouth and Dolgelly, Merionethshire; Snowdon and Llanberis, Carnarvonshire; Island of Anglesea; Teesdale, Durham; Mardale and near Kendal, Westmoreland; Ennerdale Lake, Cumberland. New Galloway, Kirkcudbrightshire; Appin and Head of Loch Awe, Argyleshire; Glen Lochay and Ben Lawers, Perthshire; Achallater and Craig Guie, Braemar, Aberdeenshire; Glen Nevis, Invernessshire; Loch Shin, Sutherlandshire; Applecross, Rossshire. Near Belfast, co. Antrim; Dublin Mts.; Coachford, near Cork; Glengariff and Cromaglow, co. Kerry; Kylemore, co. Galway.

6. **EPHEBEIA** Nyl. Flora, 1875, p. 6 (*cf.* Cromb. Grevillea, v. p. 125).—Thallus monœcious, cylindrical, intricate; internally as in the preceding genus. Apothecia solitary, paraphyses determinate, slender, slightly incrassate at the apices; spores constantly simple; hymenial gelatine wine-reddish with iodine. Spermogones discrete, internally as in *Ephebe*.

From *Ephebe*, with which it was formerly confounded, this has now been separated, on account chiefly of the apothecia having distinct paraphyses and conspicuous anaphyses (*vide* Nyl. l. c.), as also constantly simple spores. These characters seem sufficiently important to entitle it to rank as a distinct genus.

1. *E. hispidula* Nyl. Flora, 1877, p. 321.—Thallus decumbent, very much branched, rugulose, opaque, spinulose or verruculose towards the apices, olive-green or dark-brown. Apothecia externally subglobose-tuberculose, pale, the epithecium impressed; spores oblongo-ellipsoid, 0,010–0,015 mm. long, 0,004–5 mm. thick.—Cromb. Grevillea, xii. p. 89; Journ. Bot. 1885, p. 195.—*Cornicularia hispidula* Ach. Lich. Univ. (1810) p. 617. *Cornicularia pubescens* β . *hispidula* Gray, Nat. Arr. i. p. 406.—To this belongs also *Ephebe spinulosa* Fr. fil. *vide* Nyl. l. c.

The thallus is somewhat stellately expanded, with the branches verticillately proliferous. From *Ephebe pubescens* it differs in being hispid and monœcious, as also in the structure of the apothecia. Of the few British specimens seen, only one is sparingly fertile.

Hab. On damp quartzose and schistose rocks in subalpine districts.—*Distr.* Apparently local and scarce, being known only from N. Wales, and the S. and Central Grampians, Scotland.—B. M.: Cader Idris, Merionethshire; Snowdon, Carnarvonshire. Ben Lawers and Craig Tulloch, Perthshire.

Subsp. *E. Martindalei* Cromb. *ex* Nyl. Flora, 1883, p. 104.—Thallus scarcely spinulose: apothecia with the receptacle smaragdine above (or somewhat bluish in thin section); spores 0,009–14 mm. long, 0,004–6 mm. thick.—Cromb. Grevillea, xii. p. 89; Journ. Bot. 1885, p. 195.

This differs from the type, of which, as suggested by Nylander (*l. c.*), it is almost a variety, in the nearly smooth thallus and the colour of the receptacle. From *Ephebe pubescens* it could consequently with difficulty be distinguished in a sterile condition.

Hab. On moist rocks in mountainous districts.—*Distr.* Very local and scarce, having been gathered only in N.W. England.—B. M.: Mardale, Westmoreland.

Tribe IV. MAGMOPSEI Nyl. Flora, 1875, p. 103.

Thallus pyrenopsidian, consisting of syngonimia; gonimia moderate, without order. Apothecia forming a peridium; spores 8næ, oviform, in oblong thecæ. Spermogones not seen rightly developed.

This is a somewhat peculiar tribe, distinguished from all others in this family by the apothecia (if not parasitic, as Nylander is now rather inclined to think) constituting *peridia*—that is, a closed pyrenium without any true ostiole. It consequently holds an analogous relation among the *Ephebacei* to *Perididei* among the *Lichenacei*. From the *Phylliscodei* it differs in the characters of the apothecia and the gonimia.

7. *MAGMOPSIS* Nyl. Flora, 1875, p. 103.—Thallus indeterminate; syngonimia glomerulose or granuloso-diform, greenish-yellow, gonimia pale-glaucous or concolorous with the rest of the thallus. Apothecia small, the peridium (under the microscope)

dark violet-blackish ; spores 1-septate, colourless ; hymenial gelatine not tinged with iodine.

From *Pyrenidium*, with which it is comparable, this differs in having the thallus pyrenopsoid and indeterminate ; while from *Verrucarina*, to which it has some resemblance, it differs in the apothecia not presenting a true pyrenium. The genus as yet includes only two species, of which one has been detected in Britain.

1. *M. argilospila* Nyl. ex Cromb. Grevillea, xv. (1886) p. 10. —Thallus scattered, subfurfuraceous, very thin, olive-black. Apothecia innate, minute, peridium sufficiently thin, violet-black ; spores 0.022–26 mm. long, 0.007–9 mm. thick ; paraphyses slender, sparingly present. —*Verrucaria argilospila* Nyl. Flora, 1874, p. 15. *Verrucaria arenicola* Leight. Grevillea, v. (1877) p. 155 ; Lich. Fl. ed. 3, p. 470.

The plant spreads extensively over the substratum in small, scattered, more or less distinct maculæ. In structure the thallus is densely and minutely cellular, each cell containing a minute subglobose gonimium. The apothecia in the specimens seen are numerous, and are more conspicuous where the thallus is semi-obliterated.

Hab. On sandy and clayey soil in upland tracts.—*Distr.* Local and scarce, in W. England ; though it no doubt occurs elsewhere.—B. M. : Shelton Rough, near Shrewsbury, Shropshire.

Family II. **COLLEMACEI** Nyl. Mém. Soc. Cherb. ii. (1854) p. 8 ; Syn. i. p. 88 (*cfr.* Cromb. Grevillea, v. p. 76).

Thallus foliaceous, or fruticulose, or crustaceous, turgid and gelatinous when moist, black, brown, dark olive, leaden, rarely glaucescent ; gonimia somewhat small, nakedly conjoined, moniliform ; medulla not distinct, but confused with the gonimic layer. Apothecia most frequently lecanorine, occasionally biatorine, rarely endocarpoid, hypothecium colourless ; spores 8næ, rarely numerous, very rarely 4næ, ellipsoid, ovoid or fusiform, simple or septate, or variously divided, colourless, very rarely brown. Spermatogones usually with jointed sterigmata, occasionally with simple sterigmata, and short oblong spermatia.

This family, as now limited by Nylander, comprehends plants which in most essential respects are more closely related to each other than those referred to it in his previous classification. "It consists of a higher type of lichens than the *Ephebacei*, being superior in structure, and for the most part in figure, with the gonimic granules not or scarcely ever simple, but more or less (that is, two or several) moniliform (hormogonimia, Nyl.). The thallus also, when moistened, is more turgid, and though still somewhat Algid in external appearance, is almost always much better developed." In regard to the anatomical structure of the thallus, Nylander, in his observations on "gonidia &c." (Flora, 1877, p. 359), has pointed out that (in the higher genera at least) the whole thallus is to be regarded as one syngonimium. This syngonimium, he adds, *in litt.*, originates either from a single primitive gonimium, or from the coalescence of several gonimia into one syngonimic body.

Tribe I. **LICHINEI** Nyl. Mém. Soc. Cherb. ii. (1854) p. 8;
Syn. i. p. 88, Stiz. St. Gall. Nat. Ges. 1876, p. 193.

Thallus small, fruticulose or radiato-laciniate, firm or fragile; gonimia elongato-seriately moniliform, subconnate. Apothecia small, lecanorine, lecideine or sub-biatorine, paraphyses slender or thickish: spores 8næ, ellipsoid, simple or septate. Spermogones tuberculose, with simple sterigmata or jointed sterigmata.

The principal characteristic of this tribe is to be found in the gonimia being moniliformly arranged through long series. They are also much less connate than in *Gonionema*, so that the affinities of the tribe are rather with this family. Of the four genera of which it is composed, only one is at all common in Great Britain.

8. **LICHINA** Ag. Syn. Alg. (1817) p. xii; Tul. Ann. Sc. Nat. sér. 3, xvii. (1852) p. 87; Nyl. Syn. p. 88.—Thallus fruticulose, cartilaginous, dichotomously branched, within parallelly linear-cellular; gonimia arranged chiefly under the cortical layer, bluish or glaucous-bluish. Apothecia terminal, in globose thalline receptacles, lecanorine; spores simple, colourless; paraphyses slender, not crowded; hymenial gelatine not coloured with iodine. Spermogones terminal, with simple long sterigmata and oblong spermatia.

This small genus, though fucoid in appearance, belongs in all essential characters to Lichens. The few species of which it consists are strictly social in their habit, and often extensively cover the otherwise barren maritime rocks. It is in various respects somewhat parallel among the *Collema*cei to *Sphaerophorus* amongst the *Lichen*acei. The apothecia are truly lecanorine, though pyrenodean in appearance,

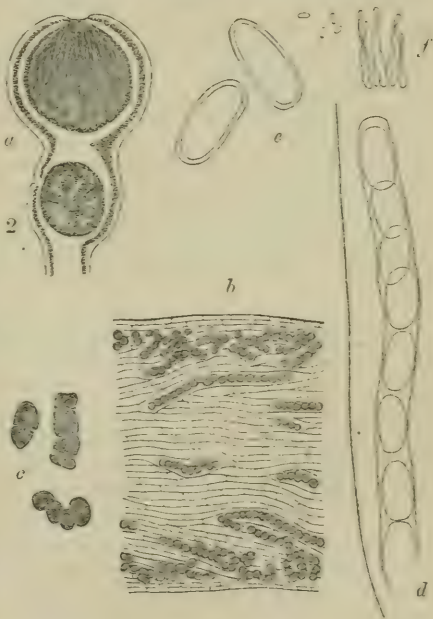


Fig. 5.

Lichina pygmaea Ag.—a. Section of apothecium (1) and of a spermogone (2), $\times 30$. b. Section of thallus, $\times 200$. c. Gonimia, $\times 350$. d. Theca and paraphysis, $\times 350$. e. Two spores, $\times 500$. f. Sterigmata and spermatia, $\times 500$.

while the spermogones are often situated around them.

1. *L. pygmæa* Ag. Syn. Alg. 1817, p. 9; Nyl. Syn. i. p. 91, t. ii. f. 16.—Thallus somewhat small, cæspitously branched, greenish- or brownish-black; branches erect, compressed upwards, obtuse at the apices. Apothecia small, concolorous, the ostiole slightly open or irregularly dehiscent; spores 0,022–29 mm. long, 0,011–16 mm. thick.—Gray, Nat. Arr. i. p. 388; Hook. Fl. Scot. ii. p. 96; Sm. Engl. Fl. v. p. 270; Grev. Scot. Crypt. t. 219; Tayl. in Mack. Fl. Hib. ii. p. 170; Mudd, Man. p. 33, t. i. f. 1; Cromb. Lich. Brit. p. 2; Leight. Ann. Mag. Nat. Hist. ser. 3, xvi. p. 12, t. iv. f. 21; Lich. Fl. p. 13, ed. 3, p. 11.—*Fucus pygmæus* Lightf. Fl. Scot. ii. (1777) p. 964, t. 32; With. Arr. ed. 3, p. 100; Turn. Hist. Fuc. t. 204. ff. *a-h*; Eng. Bot. t. 1322. *Fucus pumilus* Huds. Fl. Angl. ed. 2, p. 584.—*Brit. Ees.*: Leight. n. 260; Larbal. Cæsar. n. 51; Cromb. n. 1.

This plant, which is about half an inch or a little more in height, might certainly, at first sight, be taken for a diminutive *Fucus*. The fructification, however, sufficiently shows its true systematic place: and indeed, considering that Lightfoot (*l. c.*) pointed out how nearly it was related to Lichens, it is strange that it should have been so long referred to the Algæ. Both the apothecia and the spermogones are numerous, the latter with spermatia ellipsoid or oblongo-ellipsoid, about 0,003 mm. long, 0,001 mm. thick.

Hab. On rocks exposed to the action of the tide in maritime districts.—*Distr.* General and common on all the more rocky coasts of the Channel Islands, Great Britain, and Ireland, but apparently not occurring in the N.E. of Scotland.—B. M.: Islands of Guernsey, Sark, and Alderney. Ventnor, Isle of Wight: Ilsham rocks, near Torquay, Bigbury Bay, and Boveysand Bay, Devonshire; Mount's Bay, St. Minver, and Scilly Isles, Cornwall; near Peel, Isle of Man; near Whitehaven, Cumberland. Near Caroline Park, Edinburgh; Loch Creran and Island of Mull, Argyleshire. Near Castlefreke, co. Cork: coast of Connemara, Galway.

2. *L. confinis* Ag. Sp. Alg. 1823, p. 105.—Thallus rather small, densely cæspitously branched, olive- or brownish-black; branches erect, rounded, subfastigiate. Apothecia small, concolorous, the ostiole slightly open or irregularly dehiscent; spores 0,022–29 mm. long, 0,011–16 mm. thick.—Sm. Engl. Fl. v. p. 270; Tayl. in Mack. Fl. Hib. ii. p. 170; Mudd, Man. p. 34; Cromb. Lich. Brit. p. 2; Leight. Ann. Mag. Nat. Hist. ser. 3, xvi. p. 12, t. 4. f. 22; Lich. Fl. p. 13, ed. 3, p. 12.—*Lichen confinis* Ach. Prodr. (1798) p. 208; Eng. Bot. t. 2575. *Fucus pygmæus* β . *minor* Turn. Hist. Fuc. t. 204. ff. *i-o*. *Lichina pumila* Gray, Nat. Arr. i. p. 388. *Lichina pygmæa* β . *minor* Hook. Fl. Scot. ii. p. 98.—*Brit. Ees.*: Larbal. Cæsar. n. 1; Lich. Hb. n. 281.

From *L. pygmæa*, to which it is subsimilar, this is distinguished by being considerably smaller, scarcely $\frac{1}{2}$ in. high, even in favourable situations, and by having the branches more crowded and not compressed. The apothecia are frequent, though in situations farther removed from tidal action it often occurs infertile. The spermogones, especially in otherwise barren specimens, are very abundant, with spermatia 0,0030–35 mm. long, 0,001 mm. thick.

Hab. On intertidal rocks, and on those which are only washed by the spray of the sea, in maritime districts.—*Distr.* General and very abundant where it occurs on most of the rocky coasts of the Channel Islands, Great Britain, and Ireland; more frequent on the N.E. of Scotland.—B. M.: Islands of Jersey, Guernsey, and Alderney. Whitesand Bay, Mount's Bay, near Anthony, Gerrans, Land's End, and Scilly Islands, Cornwall; Tenby, Pembrokeshire; Southerndown, Glamorgan-shire; Barmouth, Merionethshire; Puffin Island, Anglesea; Port Soderick, Isle of Man; Morecambe Bay, Westmoreland; St. Bees, Cumberland. Portlethen, Kincardineshire; Island of Mull and Loch Creran, Argyre-shire. Kenmare, co. Kerry; coast of Connemara, co. Galway; Ballycastle, co. Antrim.

9. **LICHINIZA** Nyl. Flora, 1881, p. 6.—Thallus minutely squamulose, squamules adnate, difform, chestnut-brown, with prominent darker globules or subglobose papillæ; gonimia sordid-yellowish, radiately arranged in the thalline globules in moniliform series. Apothecia lecanorine?, terminal. Spermatogones not seen.

Though differing in external appearance from the preceding genus, this nearly agrees with it in texture. This, however, as observed by Nylander, is cellular, thinner, and more irregular, while the gonimia are differently coloured. Its true place, in the absence of rightly developed apothecia and of the spermatogones, is rather uncertain, though it is most probably allied to *Lichina*.

1. **L. Kenmorensis** Nyl. Flora, 1881, p. 6.—Apothecia minute, terminal on and concolorous with the thalline globules, lecanorine?; "spores 8næ, ellipsoid, simple, colourless."—Cromb. Grevillea, x. p. 22.—*Synalissa Kenmorensis* Holl, MS. (1872).

The thallus is effuse and apparently widely spreading. In the specimens seen by me only a single young apothecium was visible, similar in external appearance to the young apothecia of *Lichina*. Dr. Holl informed me that the spores were seen by him in a better-fruited specimen, though not well developed.

Hab. On moist mica-schist boulders in upland mountainous situations.—*Distr.* Very local and rare, having been found only in one locality in the S. Grampians.—B. M.: Shores of Loch Tay, Kenmore, Perthshire.

10. **PTERYGIUM** Nyl. Bull. Soc. Bot. i. (1854) p. 328; Syn. i. p. 92; Lich. Scand. p. 24.—Thallus appressed, thinly divided, radiate at the circumference, polished in section; gonimia often moniliformly concrete, arranged chiefly under the cortical layer; thin section of thallus bluish on the lower side. Apothecia lecideine; spores 8næ, ellipsoid or oviform, septate, colourless; hymenial gelatine, especially the thecæ, bluish with iodine. Spermatogones with long jointed sterigmata and straight spermatia.



Fig. 6.

Pterygium centrifugum Nyl.—a. Longitudinal section of thallus, $\times 275$.
b. Transverse section of the same. c. Vertical section of a spermogone,
 $\times 42$. d. Jointed sterigmata.

This genus is analogous to *Pannularia* among the *Lichenacei*, from which, however, it is distinguished by the absence of a hypothallus. In this country few species have occurred, but probably others will be detected.

1. *P. centrifugum* Nyl. Bull. Soc. Bot. i. (1854) p. 328; Syn. i. p. 92, t. ii. ff. 11–15.—Thallus small, laciniato-radiate, centrifugal, dark- or chestnut-brown, often blackish in the centre; laciniae divaricato-multifid, plane or somewhat convex, narrow, crowded, very thinly longitudinally rugulose. Apothecia unknown.

Externally this looks like a small *Physcia* near to dark vars. of *Ph. obscura*; but its anatomical structure is essentially different. The thallus is only about $\frac{1}{2}$ inch in diameter (even smaller in the only British specimen seen), and is more or less centrifugal. The gonimia are pale-greenish, often moniliform towards the upper surface. No apothecia have yet been detected, but the spermogones (not present in our specimen) are known; they are tuberculose, usually blackish above, with multi-articulate sterigmata; spermatia straight, slightly acute at the apices, 0,005–0,006 mm. long, 0,001 mm. thick.

Hab. On calcareous rocks in a subalpine hilly district.—*Distr.* Extremely local and scarce, having been found only very sparingly in S.W. England.—B. M.: Cheddar Cliffs, Somersetshire.

2. *P. pannariellum* Nyl. Sällsk. pro F. et Fl. Not. iv. (1859) p. 236; Flora, 1869, p. 41.—Thallus moderate, laciniato-radiate

at the circumference, subcoralloideo-multifid or microphylline and usually diffracto-globulose in the centre, dark-olive or olive-brownish-black, opaque; laciniae thin, plane, multifid, imbricately crowded, obsoletely rugulose. Apothecia small, plane or slightly convex, black; spores ellipsoid, 3-septate, 0,015–20 mm. long, 0,006–8 mm. thick; hymenial gelatine deep blue with iodine.—Cromb. Grevillea, v. p. 108; Leight. Lich. Fl. ed. 3, p. 12.

This is externally somewhat like *Pannaria triseptata* Nyl., but differs in the absence of a hypothallus, and in the laciniae being radiate at the circumference and usually digitate at the apices; the spores also are somewhat smaller. In the only fertile British specimen seen the apothecia are sparingly present.

Hab. On schistose rocks in alpine situations.—*Distr.* Very local and scarce amongst the S. Grampians, Scotland.—B. M.: Summit of Craig Calliach, Perthshire.

3. *P. Lismorensense* Cromb. Grevillea, v. (1877) p. 108.—Thallus thin, subfurfuraceous, thinly or obsoletely radiate, adnate, variously confluent, blackish or olive-black. Apothecia small, thinly margined, black, dark within; spores oviform, 1-septate, 0,010–0,011 mm. long, 0,005–0,006 mm. thick; epithecium bluish-black; hypothecium cellular, and (with the perithecium) violet-blackish; hymenial gelatine bluish, then dark-yellowish with iodine.—Nyl. Flora, 1877, p. 221; Leight. Lich. Fl. ed. 3, p. 12.—*Brit. Exs.*: Cromb. n. 101.

The thallus spreads rather extensively, though not continuously, over the substratum. In its younger state the radii are more discrete at the circumference. It is allied to *P. asperellum* Nyl., from which it differs in the thallus and the smaller spores.

Hab. On calcareous rocks in maritime tracts.—*Distr.* Local and scarce in the S.W. Highlands.—B. M.: Island of Lismore, Argyleshire.

11. LEPTOGIDIUM

Nyl. Flora, 1873, p. 195 (*cfr.* Cromb. Grevillea, v. p. 76).—Thallus minute, fruticulose, branched, somewhat fragile; gonimia moniliform; cortical layer cellular, distinct. Apothecia subbiatorine; spores 8næ, ellipsoid, simple, colourless; hymenial gelatine bluish with iodine. Spermatogones not seen rightly developed.

This genus, recently instituted by Nylander, is



Fig. 7.
Leptogidium dendriseum Nyl. — *a*. Thalline branch and branchlet, $\times 30$. *b*. Transverse section of a branch, $\times 200$. *c*. Apex of a bifurcate branchlet, showing the moniliform chains of the gonimia, $\times 200$. *d*. Two series of gonimia, $\times 350$.

rather difficult to arrange in the series. From the gonimia, it seems to have its most appropriate place in this tribe.

1. *L. dendriscum* Nyl. Flora 1873, p. 195 (note).—Thallus very much branched, intricate, slender, rounded or obsoletely compressed, opaque, greenish, or pale-yellowish at the base. Apothecia small, pale or pale-red, the epithecium at length somewhat convex: spores 0.010–16 mm. long, 0.006–8 mm. thick.—Cromb. Journ. Bot. 1874, p. 337; Leight. Lich. Fl. ed. 3, p. 13.—*Leptogium dendriscum* Nyl. Syn. i. (1858) p. 135. *Leptogium Moorei* Hepp, Carroll, Journ. Bot. 1865, p. 287; Cromb. Lich. Brit. p. 10; Leight. Lich. Fl. p. 27. *Ephche lyssoïdes* Carrington, Trans. Bot. Soc. Edinb. vii. p. 411, t. 10. f. 2.

This is one of the exotic lichens which find their way from sub-tropical regions to the S.W. of Ireland. It has a somewhat general resemblance to *Leptogium muscicola*, near to which it was originally placed by Nylander; but the gonimia and other characters remove it from *Leptogium* to an inferior position in the family. The apothecia are not visible in any of the Irish specimens, the organs described as such being spermogones. These, however, though not unfrequent as minute pale-brown tubercles, have not been seen rightly developed.

Hab. On mossy trunks of trees in moist upland situations.—*Distr.* Very local and rare in S.W. Ireland.—B. M.: Glengarriff and Gleng, Killarney, co. Kerry.

Tribe II. **COLLEMEI** Nyl. Mém. Soc. Sc. Nat. Cherb. ii. (1854) p. 9; Syn. i. p. 93 (*cf.* Cromb. Grevillea, v. p. 76).

Thallus usually membranaceous, lobed, lacinate or microphylline, occasionally fruticulosos-ramose, rarely crustaceous or granulose; gonimia glaucous-green, more or less moniliform: cortical layer either cellular or indistinct. Apothecia lecanorine, sometimes biatorine, rarely endocarpoid: spores 8 μ , rarely numerous, ellipsoid, ovoid or rarely fusiform, usually septate and divided, occasionally simple, colourless. Spermogones with the sterigmata articulate, occasionally simple or subsimple, and oblong, ellipsoid or bacillar spermatia.

This extensive tribe (notwithstanding its recent limitation) consists of genera diverse in various particulars, yet sufficiently connected by mutual links. It contains the best-developed members of the family, and in number of species, if not in their frequency of occurrence, is very well represented in our Islands. The plants for the most part very greedily imbibe moisture, and we often find a marked contrast in the appearance of the thallus when moist or dry.

12. **SYNALISSA** Fr. Pl. Hom. (1825) p. 297; Nyl. Syn. i. p. 93.—Thallus pulvinate, thinly crustaceous or fruticulosos-divided: gonimia (speirogonimia) either solitary or few, usually scattered among the filaments: cortical layer obsoletely cel-

lular. Apothecia terminal, innate, locanorino-endocarpoid, concolorous; spores ellipsoid or ovoid, usually 8næ, occasionally numerous, simple, colourless; hymenial gelatine variously tinged with iodine. Spermatogones terminal or subterminal, with simplish sterigmata and oblong spermatia.

Distinguished from *Omphalaria*, which does not occur in our islands, chiefly by the gonimic granules; these are in pairs between the thalline filaments or affixed to their branchlets. Only two species occur with us, rarely, and generally in poor condition.

1. *S. symphorea* Nyl. Syn. i. (1858) p. 94, t. 3. f. 2.—Thallus fruticulose, fastigiate divided, opaque, black; branches short, rounded, erect, obtuse at the apices, sometimes only nodulose. Apothecia minute, punctiformi-impressed, at length dilated, subconcolorous, the thalline margin tumid; spores 8-24næ, ellipsoid or spherical, 0,009-11 mm. long, 0,006-7 mm. thick; hymenial gelatine not tinged with iodine.—Mudd, Man. p. 35, t. 1. f. 2; Cromb. Lich. Brit. p. 3; Leight. Lich. Fl. p. 16, ed. 3, p. 13.—*Synalissa vulgaris* Thwaites, Ann. Mag. Nat. Hist. 1849, iii. p. 219. *Collema symphoreum* DC. Fl. Fr. ii. (1805) p. 382. *C. synalissa* Ach., Tayl. in Mack. Fl. Hib. ii. p. 108.

The thallus in our specimens is generally only noduliform. Elsewhere it often occurs amongst the squamules of *Lecidea lurida*, and further research may discover it in Britain also similarly associated. A reference to fig. 8 will show the peculiar arrangement of the gonimia affixed to the branchlets of the filaments. The apothecia are very rare in Great Britain, and the spermatogones are only seldom seen, with spermatia 0,003 mm. long, 0,001 mm. thick.

Hab. On calcareous rocks in maritime and upland districts.—*Distr.* Local and rare, having with certainty been gathered only very sparingly in S.W. England, and in the S.W. Highlands, Scotland; the Irish plant being very doubtful.—B. M.: Portland Island, Dorsetshire; Anstey's Cove, Torquay, Devonshire; St. Vincent's rocks, Gloucestershire. Barcaldine, Argyshire.



Fig. 8.

Synalissa symphorea Nyl.—a. Section of thallus with an apothecium, $\times 30$. b. Section of a spermatogone, $\times 30$. c. Syngonimia between the filaments, $\times 350$. d. Gonimia affixed to a racemously divided filament, $\times 350$. e. Sporiferous theca with three paraphyses, $\times 350$. f. Four spores, $\times 500$. g. Sterigmata and spermatia, $\times 500$.

2. *S. intricata* Nyl. Flora. 1883, p. 534.—Thallus effuse, fruticulose, radiate, laciniato-multifid, pitch-black, laciniae rounded, intricate, narrow, somewhat obtuse or slightly nodulose at the apices; apothecia not seen.—Cromb. Journ. Bot. 1885, p. 195.—*Omphalaria intricata* Arn. Flora, 1869, p. 254.

This peculiar plant was referred by Nylander to *Nematonostoc* (Flora, 1883, p. 104); he afterwards placed it in this genus with which it agrees in the character of the spermogones. At the same time the gonimia are hormogonimia and not speirogonimia, and so it may be a distinct genus, which Nylander proposes to term *Synalissina*. It may readily be known by the radiate thallus, giving it the aspect of a *Pterygium*. The apothecia have not been discovered, but the spermogones in the British specimens are not uncommon.

Hab. On moist granitic rocks in upland hilly districts.—*Distr.* Extremely local and rare, having been gathered only in S. Scotland.—B. M.: Black Craig, New Galloway, Kirkcudbrightshire.

13. **SCHIZOMA** Nyl. ex Cromb. Grevillea, v. (1877) p. 108 (note).—Thallus lineari-laciniate, internally at length composed of a firm gelatine, through which run thin, short, frequent tubules variously arranged, but chiefly longitudinally; gonimia nearly moderate, in subrotund cells, situated chiefly under either surface, but also sparingly seen smaller and scattered. Apothecia unknown. Spermogones innate, or indicated externally by a somewhat prominent thalline ostiole; sterigmata subsimple; spermatia minute, pistillari-bacillar. (Nyl. in litt.)

This approaches in the structure of the thallus to *Collemodium*, from which it differs in the tenuity of the tubules in the nearly obliterated cavity. This character and that of the spermogones entitle it to rank as a distinct genus; though only the discovery of the apothecia would definitely determine its place in the family, which is probably between *Omphalaria* and *Collema*. The gonimia are with difficulty expelled from the cells so as to be seen free.

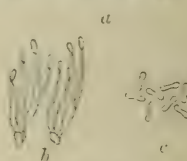
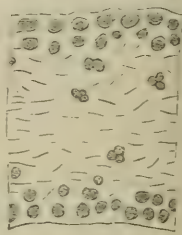


Fig. 9.

Schizoma lichinodeum Nyl.—a. Section of thallus, $\times 200$. b. Sterigmata. c. Spermatia.

1. *S. lichinodeum* Nyl. ex Cromb. Grevillea, v. p. 108, note.—Thallus small, loosely adnate, lineari-laciniose, brownish-black, laciniae plane or subcanaliculate, ligulate, simple or more frequently 2-3-divided, obtuse at the apices, naked, or sometimes sprinkled with concolorous isidioid globules. Apothecia not yet seen.—*Collema lichinodeum* Nyl. Flora, 1869, p. 293; Carroll, Journ. Bot. iii. p. 287; Cromb. Lich. Brit. p. 3; Leight. Lich. Fl. p. 18, ed. 3, p. 15; Cromb. Journ. Bot. 1874, p. 332.

The thallus is normally orbicular, with the laciniae slightly suberect

towards the extremities. In Journ. Bot. 1874, l. c., it was observed that this species probably constituted a separate genus, though, as neither form of fructification was then known, it might be retained as an anomalous section of *Collema*. I have since detected the spermogones in Great Britain, and I hope the apothecia may be also discovered. The description of the thallus of *Collema radiatum* Somm. (possibly an *Omphalaria*) and its habitat given by Sommerfelt, Lapp. p. 121, as well as the account of its internal structure and of the spermogones given by Fr. fil., Lich. Arct. p. 288, do not at all correspond with our plant; the two cannot be identical. On the thallus is rarely seen a parasitic fungus, viz. *Sphaeria schizomatis* Cromb., which must not be mistaken for the apothecia.

Hab. On decayed mosses and the ground in crevices of rocks in alpine places.—*Distr.* Extremely local, being confined apparently to one or two of the S. Grampians, Scotland.—B.M.: Ben Lawers and Craig Calliach, Perthshire.

14. **COLLEMA** Wigg. Prim. Fl. Hols. (1780) p. 89; Nyl. Mém. Soc. Sc. Nat. Cherb. iii. (1855) p. 164.—Thallus usually orbicular or suborbicular, membranaceo-lobed, very rarely squamulose or granulose; gonimia moniliform, cortical layer not discrete. Apothecia lecanorine; spores 8næ, simple or generally multilocular, colourless; hymenial gelatine usually bluish, rarely wine-red with iodine. Spermogones more or less immersed, sterigmata shortly articulate, rarely simple; spermatia straight, obtusely incrassate at either apex.

As now limited, this genus is more compact than formerly, though it still includes several species, diverse in thallus and fructification, as will be seen from the following sections. These differences, however, are not of sufficient importance to warrant its division into several genera.

In various species a thin section of the thallus, when dry, becomes reddish or blood-red with iodine, in consequence, as Nylander observes, of the gonimia being so coloured. In the species in which the spermogones have been detected, except in those belonging to Section A, the spermatia are identical in size, viz. 0.0035–0.0040 mm. long, 0.0007 mm. thick, or vary so slightly that the difference is scarcely perceptible. There is every reason to believe that some *Nostocs* are undeveloped states of different species of this and perhaps also of the following genus.

A. LEMPHOLEMMA (Koerb.

Syst. Lich. (1855) p. 400).

—Thallus thinnish, difform; gonimic granules moniliform. Apothecia innate; spores simple; spermogones with simple sterigmata.

a. Hymenial gelatine wine-red with iodine.

1. *C. chalazanum* Ach. Lich. Univ. (1810) p. 630.—Thallus pulvinate, thinnish, difformilobate or laciniate, crenulato-

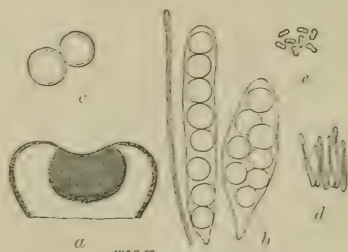


Fig. 10.

Collema myriococcum Ach.—a. Section of an apothecium, $\times 30$. b. Two thecae and a paraphysis, $\times 350$. c. Two spores, $\times 500$. d. Sterigmata, and e, spermatia, $\times 500$.

granulate at the circumference, blackish-green or black. Apothecia small, reddish, the margin somewhat tumid; spores ellipsoid, 0,020–24 mm. long, 0,008–13 mm. thick (or sometimes rather smaller), paraphyses slender, scarcely articulate.—Nyl. Syn. i. p. 104; Carroll, Journ. Bot. 1866, p. 22; Cromb. Lich. Brit. p. 4; Leight. Lich. Fl. p. 17, ed. 3, p. 16.—To this apparently is referable *C. maritimum* Tayl. Hook. Journ. Bot. 1847, p. 194.

In a moist state, when not fully developed, this might readily be taken for a Nostoc. The thallus, which is variable, is closely agglutinate to the substratum, with the lobes corrugato-difform, plicate, appressed, and usually more or less verrucoso-granulose. The apothecia, though numerous, are inconspicuous in the dry plant, being submersed in the small thalline verrucæ. The spermatogones are not unfrequent, with simple cylindrical sterigmata; spermatia thin, obtuse at either apex, 0,0025 mm. long, scarcely 0,001 mm. thick.

Hab. Among mosses on the ground in maritime and upland districts.—*Distr.* Apparently local and rare in S.W. England, N. Wales, the S.W. Highlands, Scotland, and in S.W. Ireland.—B. M.: Lipsom Hill, near Plymouth, Devonshire; Cheddar Cliffs, Somersetshire; near Barmouth, Merionethshire; near Kendal, Westmoreland. Appin, Argyleshire. Dunkerron, co. Kerry.

2. *C. chalazanodes* Nyl. Flora, 1869, p. 293.—Thallus difformi-lobate or laciniate, crenulato-lobed at the margins, dark-green or blackish. Apothecia small, reddish, the thalline margin tumid; spores in clavate thecæ, ellipsoid or subglobose, small, 0,012–17 mm. long, 0,008–15 mm. thick.—Cromb. Journ. Bot. 1869, p. 105; Lich. Brit. p. 4; Leight. Lich. Fl. p. 17, ed. 3, p. 16.

This is distinguished from the preceding species, to which it is closely allied, by its much smaller and often subglobose spores. In the few British specimens seen, the apothecia are numerous, but no spermatogones are visible.

Hab. Among mosses on old walls in wooded upland tracts.—*Distr.* Very local and scarce in W. England, though it may occur in mountainous districts, as in Scandinavia, where it was discovered.—B. M.: Bradley Wood, Newton Bushell, S. Devon; Coln Rogers, Gloucestershire.

3. *C. myriococcum* Ach. Lich. Univ. (1810) p. 638.—Thallus imbricato-lobed, or at length almost crustaceo-difform, olive-green or blackish; lobes crowded, complicate, crisp. Apothecia minute, numerous, aggregate in thalline tubercles, somewhat concave, reddish, the thalline margin tumid; spores in cylindrical thecæ, globose or subglobose, 0,009–12 mm. in diameter when globose, or 0,011–12 mm. long, 0,009–10 mm. thick, when subglobose.—Nyl. Syn. i. p. 104, t. iv. f. 21; Cromb. Journ. Bot. 1874, p. 146; Leight. Lich. Fl. ed. 3, p. 16.—*Lichen myriococcus* Ach. Prodr. (1798) p. 127.—*Brit. Ees.*: Cromb. n. 3.

This differs from *C. chalazanum* chiefly in the thallus being larger, the lobes more developed, the apothecia more aggregate, and the spores more

globose. The apothecia are generally abundant, almost obliterating the thallus, and becoming like it blackish when dry. The preceding species is intermediate between this and *C. chalazanum*.

Hab. Among mosses on old walls in shady places in upland districts.—*Distr.* Very local, though plentiful where it occurs in W. England, S. Wales, and N.E. Ireland, probably elsewhere overlooked.—B. M.: Near Cirencester, Stroud, and Abington, Gloucestershire; Pembroke-shire. Near Belfast, co. Antrim.

b. Hymenial gelatine bluish with iodine.

4. *C. confertum* Nyl. Flora, 1867, p. 330.—Thallus small, turgidly squamulose, blackish-brown; squamules crowded, usually cyathoid or podetiaform, almost all fertile. Apothecia small, urceolato-impressed, one at the summit of each thalline squamule or lobule, subconcolorous, the margin tumid; spores ellipsoid or fusiformi-ellipsoid, 0.017–23 mm. long, 0.008–10 mm. thick; paraphyses slender.—Leight. Ann. Mag. Nat. Hist. ser. 3, xx. p. 259; Lich. Fl. p. 18, ed. 3, p. 16; Croub. Lich. Brit. p. 4; Journ. Bot. 1874, p. 333.—*Collema turgidum* var. *confertum* Ach. L. U. (1810) p. 634.

The peculiar squamulose thallus and the situation of the apothecia at once distinguish this from other British species of *Collema*. It is allied to *C. lepidum* Nyl., a West-African plant, and the two form a distinct group, characterized by the thallus and the reaction of the hymenial gelatine. No authentic British specimen has been found in recent years; and indeed the plant is known only from the original specimen sent by Turner to Acharius, and from two fragments in Herb. Kew and Brit. Mus.

Hab. Amongst mosses on the ground in maritime tracts.—*Distr.* Known only from E. England.—B. M.: Dunwich, Suffolk.

B. EUCCOLLEMA Croub. Journ. Bot. 1874, p. 333. —Thallus variously lobed; rarely entirely granulose; gonimic granules usually moniliform. Apothecia lecanorine; spores septately divided, irregularly murali-locular, ovoid or ellipsoid; hymenial gelatine bluish with iodine; spermogones with jointed sterigmata.

a. Thallus entirely granulose.

5. *C. terrulentum* Nyl. Flora, 1874, p. 306. —Thallus small, scattered, thin, granulose, olive-brown or brownish-black. Apothecia small, concave, reddish-brown, the thalline margin thickish, entire; spores ellipsoid or oblong, submurali-divided (usually with 5 transverse septa), 0.018–24 mm.



Fig. 11.

Collema pulposum Ach.
Six spores, $\times 500$.



Fig. 12.

Collema melaleucum Ach.
Four spores, $\times 500$.

long, 0.010–12 mm. thick.—Cromb. *Grevillea*, iii. p. 22; *Journ. Bot.* 1874, pp. 140, 333; *Leight. Lich. Fl.* ed. 3, p. 25.

This rather inconspicuous plant is characterized by the apparently constantly granulose thallus. The only specimen gathered occurred in small scattered pulvinuli, most of which were infertile. The nature of the thallus and the form of the spores separate it from *Leptogium microphyllum*, to which it bears a general resemblance. The apothecia are at first somewhat urceolate.

Hab. On the bark of an old ash-tree in a wooded upland district.—*Distr.* Known only from the S.W. Highlands, Scotland.—B. M.: Shores of Loch Katrine, Perthshire.

b. Thallus acervulato-aggregate or pulvinato-congested.

6. *C. ceraniscum* Nyl. *Flora*, 1865, p. 353.—Thallus small, caespitose, smooth, opaque, pulvinato-congested, laciniato-divided, dark olive-greenish or olive-brown, divisions subrotundato-compressed, ceranoideo-dissected, somewhat obtuse and nodulose at the apices, erect or ascending. Apothecia small, somewhat concave, brownish-black, the thalline margin thin, smoothish; spores (4-) 8næ, ellipsoid, rounded at both apices, 2–6 transversely seriate and loculose, 0.027–34 mm. long, 0.018–21 mm. thick; paraphyses slender; hymenial gelatine bluish (the thecæ more intensely so) with iodine.—Carroll. *Journ. Bot.* 1865, p. 287; Cromb. *Lich. Brit.* p. 6; *Journ. Bot.* 1874, pp. 140, 333; *Leight. Lich. Fl.* p. 24, ed. 3, p. 17.—*Collema ceranoideum* Mudd (non Borr.), *Man.* p. 4, pro parte.

This very distinct species (of which Nylander has given me the above amended diagnosis) has the appearance of a larger condition of *Synalissa symphorea*. The thallus, which forms small pulvinuli, is often pale olive at the base, and has the gonimia moniliform. The apothecia, which are subconcolorous with the thallus, are not at all numerous in the specimens seen. "The character of the thallus with its crowded nodulose dark apices, and the form of the spores which are internally as if grossly botryoso-granulose, prevent this species being confounded with any other" (Nyl. *in litt.*).

Hab. On damp shaded rocks among small mosses in alpine places.—*Distr.* Found only very sparingly among the S. Grampians, Scotland.—B. M.: Summits of Ben Lawers and Craig Calliach, Perthshire.

c. Thallus macrophylline, variously lobed.

7. *C. auriculatum* Hoffm. *Deutsch. Fl.* ii. (1795) p. 98.—Thallus dilated, slightly rigid, roundly lobed, more or less granulose, opaque, sordid glaucous-green or olive-brown; lobes irregularly repandocrenate, transversely rugulose (I + blood-red). Apothecia moderate, scattered, concave, at length nearly plane, reddish-brown, the margin thick, entire; spores ovoid or ellipsoid, 3-septate, with a few longitudinal septa, 0.022–27 mm. long, 0.011–15 mm. thick.—Cromb. *Journ. Bot.* 1870, p. 96; *Leight. Lich. Fl.* p. 21, ed. 3, p. 17.—To this belongs *Collema dermatinum* Borr. *Eng. Bot. Suppl.* t. 2716. f. 2 (lower fig.). Var. *membranacea* Kremp., *Cromb. Journ. Bot.*

1874, p. 333, Leight. Lich. Fl. ed. 3, p. 17, is a slightly thinner state of the species.

The thallus is membranaceous in texture, and has rather small gonimia. From the allied species it is readily distinguished by the transversely rugulose lobes, and by the reaction with iodine in a thin section of the thallus, which takes place immediately on application. In the British specimens the apothecia are very rare.

Hab. On rocks and old walls, chiefly calcareous, in upland districts.—*Distr.* Local and scarce in W., Central, and N. England, N. Wales, in the S.W. Highlands and the S. Grampians, Scotland.—B. M.: Paignton, S. Devon; Sherbrook and Cole Heath, Buxton, Derbyshire; Island of Anglesea; Ashgill Force, Cumberland. Appin, Argyleshire; Killin, Perthshire.

Subsp. *C. granosum* Nyl. ex Cromb. *Grevillea*, xv. (1886) p. 11.—Thallus smaller, thickish, more rigid, somewhat smooth or granulate; lobes more elongate, variously incised, imbricate in the centre, crenate at the margins. Apothecia and spores as in the type.—*Collema dermatinum* Borr. Eng. Bot. Suppl. t. 2716. f. 2 (two upper figs); Sm. Eng. Fl. v. p. 212; Mudd, Man. p. 36. *Leptogium dermatinum* Leight. Lich. Fl. p. 29, ed. 3, p. 32. *Lichen granosus* Wulf. in Jacq. Coll. iii. (1789) p. 131, t. 10. f. 2. *Lichenoides gelatinosum atro-virens, auriculatum et granosum* Dill. Musc. 140, t. 19. f. 24 A.

This is well distinguished as a subspecies by the smaller subcoriaceous thallus and by the more incised, imbricate lobes. The apothecia are sessile and numerous on our fertile British specimens.

Hab. On calcareous rocks and walls in upland districts.—*Distr.* Local and scarce in W. England, N. Wales, and S.W. Ireland.—B. M.: Cheddar Cliffs and opposite St. Vincent's Rocks, Bristol, Somersetshire; near Cirencester, Gloucestershire; Pentraeger, Oswestry, Shropshire. Dunkerron, co. Kerry.

8. *C. furvum* Ach. Lich. Univ. (1810) p. 650.—Thallus roundly lobed, more or less granulate on both sides, dark greenish-brown or olive-black (I+ blood-red when dry); lobes irregularly complicate, usually undulate and crisp, entire. Apothecia moderate, somewhat scattered, plane, brown, the margin entire; spores ovoid or ellipsoid, 3-septate, becoming irregularly murali-locular, 0.018–24 mm. long, 0.009–11 mm. thick.—Hook. Fl. Scot. ii. p. 72; Mudd, Man. p. 36; Cromb. Lich. Brit. p. 5; Leight. Lich. Fl. p. 24, ed. 3, p. 17.—*Lathagrium furvum* Gray, Nat. Arr. i. p. 400. *Lichen furvus* Ach. Prodr. (1798) p. 132. *Collema granulatum* Sm. Eng. Fl. v. p. 211; Tayl. in Mack. Fl. Hib. ii. p. 110. *Lichen granulatus* Huds. Fl. Angl. ed. 2, p. 536, pro parte; With. Arr. ed. 3, p. 73, pro parte; Eng. Bot. t. 1757. *Lichenoides gelatinosum lobis crassioribus fusco-viridibus* Dill. Musc. 138, t. 19. f. 22.—*Brit. Ecs.*: Cromb. n. 102.

The thallus, usually of moderate size, is either naked or more frequently granulato-furfuraceous, from the presence of numerous isidia, occasionally giving origin to young lobules. By our older authors

it was mixed up with similar species, especially *C. granuliferum*. It is more likely to be confounded with states of *C. flaccidum*, but may be readily and certainly recognized by the reaction with iodine in a thin section of the thallus. The apothecia become, in old age, convex, dark, and immarginate.

Hab. On rocks and old walls, chiefly calcareous, rarely on the ground in maritime and upland tracts.—*Distr.* Local and rare in Great Britain and Ireland.—B. M.: Walthamstow and Ilford, Essex; East Barnet, Middlesex; Ditcham and Babbicombe, Devonshire; near Marlborough, Somersetshire; Rodmorton and near Cirencester, Gloucestershire; Ludlow, Shropshire; Garregwn rocks, Denbighshire; Rokeby, Durham; Kirby Lonsdale, Westmoreland; near Whitehaven, Cumberland. Appin, Argyleshire; Killin and Blair Athole, Perthshire. Killarney, co. Kerry.

Form *tunæforme* Nyl. *ex* Cromb. Journ. Bot. 1874, p. 333.—Thalline lobes rather longer, more deeply incised; otherwise as in the type.—*Collema tunæforme* Sm. Eng. Fl. v. p. 211; Mudd, Man. p. 36. *Lichen tunæformis* Ach. Prodr. (1798) p. 132; Dicks. Crypt. fasc. iv. p. 25. *Lichenoides gelatinosum foliis latioribus tuniformibus* Dill. Musc. 142, t. 19. f. 29 A, B.

This differs merely in the longer, more deeply incised lobes, which are also somewhat rugose. Like the species, it may be either naked or granulato-furfuraceous. It is very rare in a fertile condition.

Hab. On calcareous rocks and walls in maritime and upland situations.—*Distr.* Seen only from W. and N. England, the S.W. Highlands, Scotland, and S.W. Ireland.—B. M.: Near Winson, Gloucestershire; Teesdale, Durham. Island of Lismore, Argyleshire. Dunkerron, co. Kerry.

9. *C. flaccidum* Ach. Syn. (1814) p. 322.—Thallus broadly lobed, opaque, smoothish or blackish-granulate, dark-green or brownish-green (I—); lobes flaccid, discrete, round, flexuose, with entire margins. Apothecia moderate, scattered, plane, reddish-brown, the margin thin, entire; spores ovoid or broadly fusiformi-oblong, 3-septate, often becoming 5-septate, 0.023–28 mm. long, 0.007–10 mm. thick.—Nyl. Syn. i. p. 107; Hook. Fl. Scot. ii. p. 72; Sm. Eng. Fl. v. p. 211; Tayl. in Mack. Fl. Hib. ii. p. 110; Cromb. Lich. Brit. p. 5; Leight. Lich. Fl. p. 25, ed. 3, p. 23.—*Lathagrium flaccidum* Gray, Nat. Arr. i. p. 400. *Synechoblastus flaccidus* Mudd, Man. p. 42. *Lichen flaccidus* Ach. N. Act. Stock. v. (1795) p. 14, t. 1. f. 4. *Lichen rupestris* With. Arr. ed. 3, iv. p. 76.—*Brit. Exs.*: Leight. n. 345.

From the preceding, which it resembles, this is distinguished by the flaccid thallus, which gives no reaction with iodine. It is generally expanded, rather thin, loosely affixed to the substratum, and usually sprinkled, or when old nearly covered, on the upper surface with black pulverulent granules. The apothecia, which are rare in this country, are scattered, and from concave become somewhat convex.

Hab. On old walls, rocks, and trunks of trees, in shady places in upland districts.—*Distr.* General, and common where it occurs, in Great Britain and Ireland.—B. M.: Pyecombe, Sussex; St. Johns, Isle of Wight; near Plymstock, East Lyn, Kingskerswell, and Cockington,

Devonshire; Boconnoc, Camelford, and St. Minver, Cornwall; near Worcester and Malvern, Worcestershire; Barmouth, Dolgelly, and Lyn Gwernan, Merionethshire; Nant Gwynant, Carnarvonshire; Rievaulx, Yorkshire; near Kendal and Windermere, Westmoreland; Keswick, Cumberland. New Galloway, Kirkcudbrightshire; King's Park, Edinburgh; Barcaldine, Argyleshire; Killin, Kenmore, Kinnoull Hill, and Craighall, Perthshire; Den of Glammis, Forfarshire; Craig Coinnoch, Braemar, Aberdeenshire; Applecross, Ross-shire. Mallow, co. Cork; Blackwater Bridge, co. Kerry.

d. *Thallus microphylline*, variously lobed.

10. *C. pulposum* Ach. Syn. (1814) p. 311. Thallus thickish, subimbricate-lobed, olive-brown or dark-greenish; lobes nearly entire or repando-crenate, often plicate (1+reddish). Apothecia moderate, concave or plane, reddish or dark-red, the margin thick, entire; spores ovoid, usually 3-septate, or also with longitudinal septules, 0.016–24 mm. long, 0.007–10 mm. thick.—Mudd, Man. p. 38 pro p., t. i. f. 3; Cromb. Lich. Brit. p. 4; Leight. Lich. Fl. p. 18, ed. 3, p. 18.—*Lichen pulposus* Bernh. Schrad. Journ. (1799) i. p. 7, t. 1. f. 1. *Lichen crispus* Eng. Bot. t. 834. *Lichenoides gelatinosum foliis imbricatis et cristatis* Dill. Musc. 140, t. 19. f. 26 c.—*Brit. Exs.*: Cromb. n. 4.

From allied species this is distinguished by its thick, pulpy thallus, the repand, crenate, and often plicate lobes, and by the entire margin of the apothecia. Frequently seen in a rudimentary nostocine condition, and then not conspicuous unless in wet weather, when the thallus swells considerably. The apothecia are chiefly central, numerous, sometimes becoming confluent, and slightly convex, with thin recurved margin.

Hab. On the ground and old walls, chiefly calcareous, in maritime and upland districts.—*Distr.* General in the Channel Islands, and in most parts of Great Britain and Ireland.—B. M.: St. Saviour's Hill, Island of Guernsey. Reigate Hill, Surrey; Shoreham, Kent; Lewes and Hurstpierpoint, Sussex; Undercliff and Shanklin, Isle of Wight; near Plymouth and Torquay, Devonshire; St. Minver, Cornwall; Preston, Wiltshire; Bathampton Downs, Somersetshire; Tetbury and Cirencester, Gloucestershire; Norton, Worcestershire; Barmouth, Merionethshire; Teesdale, Durham; Kendal, Westmoreland; near Whitehaven, Cumberland. Appin, Argyleshire; Killin, Perthshire. Great Island, co. Cork; Killarney, co. Kerry.

Form *compactum* Nyl. Syn. i. (1858) p. 109.—Thalline lobes densely complicated-imbricate, somewhat rugose; apothecia reddish.—Cromb. Journ. Bot. 1874, p. 333; Leight. Lich. Fl. ed. 3, p. 18.—*Collema compactum* Ach. Syn. (1814) p. 313.

The closely imbricate and rougher thallus distinguishes this form, which, however, is connected with the type by intermediate states, depending on the nature of the habitat. When fertile, the apothecia are numerous and become darker with age.

Hab. On the ground in maritime and upland tracts.—*Distr.* Local and scarce in a typical condition, having been observed only in W. England and in the S. and W. Highlands, Scotland.—B. M.: Kemble, Gloucestershire; Malvern, Worcestershire. Island of Lismore, Argyleshire; Killin, Perthshire.

Var. *β. pulposulum* Nyl. *ex* Cromb. Journ. Bot. 1874, p. 147.—Thallus smaller, granuloso-lobulate, scattered or but little developed. Apothecia rather small, numerous: spores oblong or fusiformi-oblong, 3-septate, with 1 or 2 longitudinal septules, 0,020–28 mm. long, 0,007–0,010 mm. thick.—Leight. Lich. Fl. ed. 3, p. 19.—*Collema pulposulum* Nyl. Act. Soc. Linn. Bord. xxv. (1864) p. 7.

A distinct variety well characterized by the granulose, dispersed thallus, and the form of the spores. It is much smaller than the type, though externally similar.

Hab. On old walls in shady upland situations.—*Distr.* Local and scarce in W. England, though no doubt overlooked elsewhere.—B. M.: Near Cirencester, Gloucestershire.

11. *C. tenax* Ach. Syn. (1814) p. 314.—Thallus imbricately lobed, thickish, dark-glaucous or dark-greenish; lobes round, obtuse, inciso-crenate or subpalmate at the margins (I+reddish). Apothecia moderate, innate, concave, reddish, the margin entire, scarcely prominent; spores ovoid or oblong, 3-septate, with a longitudinal septum, 0,018–25 mm. long, 0,009–10 mm. thick.—Sm. Eng. Fl. v. p. 209; Mudd, Man. p. 39; Cromb. Journ. Bot. 1874, p. 333.—*Collema pulposum* var. *tenax* Cromb. Lich. Brit. p. 4; Leight. Lich. Fl. p. 19, ed. 3, p. 19. *Enchylium tenax* Gray, Nat. Arr. i. p. 397. *Lichen tenax* Swartz. N. Act. Ups. iv. (1784) p. 249.—*Brit. Exs.*: Leight. n. 105, 290; Mudd, n. 1; Larb. Lich. Hb. n. 201.

Distinguished from *C. pulposum* by the inciso-dentate or subpalmate thalline lobes, the innate apothecia, the less prominent receptacle, the larger spores, and the reaction with iodine. The apothecia are usually scattered and not numerous.

Hab. Among mosses on rocks, and on the bare ground in upland districts.—*Distr.* Local and rather scarce where it occurs, throughout England, in S. Wales, the S. and W. Highlands, Scotland, and in N.W. Ireland.—B. M.: Runton and Cromer, Norfolk; near Ightham, Kent; Reigate, Surrey; Luccombe, Isle of Wight; the Mendips, Somersetshire; Hathrop Castle, Gloucestershire; near Bewdley, Claines, and Malvern, Worcestershire; Pentregaer, Oswestry, Shropshire; Tenby, Pembrokeshire; near Ayton, Cleveland, Yorkshire; near Brigsteer, Westmoreland; Keswick, Cumberland. Appin and Island of Lismore, Argyleshire; Killin, Perthshire. Kylemore, co. Galway.

Var. *β. coronatum* Koerb. Par. (1865) p. 413.—Thallus rather thinner and more appressed; apothecia sessile, plane or slightly convex, with subentire margin, often large and confluent.—Cromb. Journ. Bot. 1882, p. 272.—*Collema pulposum* var. *cristatum* Mudd, Man. p. 39. *Collema cristatum* Sm. Eng. Fl. v. p. 208; Tayl. in Mack. Fl. Hib. ii. p. 108. *Lichen cristatus* Huds. Fl. Angl. p. 447; Lightf. Fl. Scot. ii. p. 821; With. Arr. ed. 3, iv. p. 75. *Lichenoides gelatinosum foliis imbricatis et cristatis* Dill. Musc. 140, t. 19. f. 26, A, B, D. *Lichenoides foliis pilosis crassioribus, obscure virentibus* Dill. in Ray, Syn. 74. 68.

Hudson's specific name has priority, but as it might be confounded with *C. cristatum* Hoffm., I have not used it. Similarly *C. multiflorum* var. *palmatum* Hepp, is rejected on account of the homonym *Leptogium palmatum* (Huds.).—*Brit. Exs.*: Leight. n. 106.

A well-marked variety, distinguished by the apothecia being sessile. They are generally more numerous than in the type, sometimes becoming large and proliferous, with the subentire or subgranulate margin obliterated.

Hab. On the ground and on walls in maritime and upland districts.—*Distr.* General in S., W., and N. England, N. Wales, the W. Highlands, Scotland, and S.W. Ireland.—B. M.: Amberley, Sussex; near Claverton, Somerset; near Malvern, Worcestershire; near Shrewsbury, Shropshire; Barmouth, Merionethshire; Island of Anglesea; near Aytton, Cleveland, Yorkshire. Campsie Glen, near Stirling; Appin, Argyleshire; Killin, Perthshire; Lochaber, Inverness-shire. Blackstone Bridge, co. Cork; Dunkerron, co. Kerry.

12. *C. glaucescens* Hoffm. *Deutsch. Fl.* ii. (1795) p. 100.—Thallus thin, appressed, lobed, sordid-green or dark-olive; lobes small, round or oblong, approximate or scattered, entire or slightly crenulate. Apothecia moderate, appressed, plane, reddish-brown or red; the thalline margin thin, scarcely prominent, entire or slightly crenate; spores usually 4-næ (6-næ), ovoid, 5-septate, with several longitudinal septules, 0.027–38 mm. long, 0.014–16 mm. thick.—Cromb. *Grevillea*, xv. (1866) p. 11.—*Collema limosum* Ach., *Borr. in Eng. Bot. Suppl.* t. 2704. f. 1; *Sm. Eng. Fl.* v. p. 208; *Tayl. in Mack. Fl. Hib.* ii. p. 108; *Cromb. Lich. Brit.* p. 4; *Leight. Lich. Fl.* p. 21, ed. 3, p. 19. *Collema pulposum* γ. *limosum* Mudd, *Man.* p. 39.

This is readily recognized by the agglutinate and somewhat evanescent thallus, and by the appressed, thinly and often indistinctly margined apothecia. Its chief characteristic, however, is in the spores, which at once distinguish it from states of the allied species. The apothecia are at first slightly concave, and when the lobes are scattered are single in each fertile lobe.

Hab. On moist clayey soil in maritime and upland tracts.—*Distr.* Local and rare in S.W. and N. England, as also in the W. Highlands, Scotland; probably overlooked when the thallus is evanescent.—B. M.: Near Southend, Essex; Croham Quarry, Kent; Hurstpierpoint, Sussex; Wootton-under-Edge, and near Cirencester, Gloucestershire; Bulstrode, Buckinghamshire; Buxton, Derbyshire; Hawford and Norton, Worcestershire; Coatham Marshes, near Aytton, Cleveland, Yorkshire; Milnthorpe, Westmoreland. Fort Augustus, Inverness-shire.

13. *C. crispum* Ach. *Syn.* (1814) p. 311.—Thallus lobato-divided or subradiate, dark-green or brownish-black; lobes somewhat erect, granulate and crowded in the centre, depressed and dilated at the circumference, the larger granulato-crenate at the margins (I+reddish). Apothecia moderate or somewhat large, plane, reddish or dark-red, the margin crenato-granulate; spores ovoid, usually 3-septate, becoming irregularly murali-locular.

0.016–24 mm. long, 0.007–11 mm. thick.—Borr. in Eng. Bot. Suppl. t. 2716. f. 1; Sm. Eng. Fl. v. p. 212; Tayl. in Mack. Fl. Hib. ii. p. 110; Mudd, Man. p. 40; Cromb. Lich. Brit. p. 4; Leight. Lich. Fl. p. 21, ed. 3, p. 19.—*Lichen crispus* Ach. Prodr. (1798) p. 126. *Lichen crispus* of our older authors belongs to *C. cheileum*.—*Brit. Exs.*: Leight. n. 106; Mudd, n. 2.

This is allied to *C. pulposum*, but differs in the form of the granulate lobes, and especially in the crenato-granulate thalline margin of the apothecia. From *C. cheileum*, which in fructification it closely resembles, it is distinguished by the central lobes being more developed, erect and aggregate. The apothecia are usually central, generally crowded, and sometimes large.

Hab. Among mosses on gravelly soil, and the tops of old walls, chiefly in upland districts.—*Distr.* Local and scarce, at least in a fertile condition, in the Channel Islands, Great Britain and Ireland.—B. M.: Shores of the Island of Herm. The Downs, Sussex; St. Lawrence and Sandown, Isle of Wight; near Torquay, S. Devon; St. Minver, Cornwall; Windsor Great Park, Berkshire; Coatham Marshes, Cleveland, Yorkshire. Appin, Argyleshire; Craig Tulloch, Blair Athole, Perthshire. Killarney and Dunkerron, co. Kerry.

Subsp. *C. ceranoides* Nyl. ex Cromb. Grevillea, xv. (1886) p. 12.—Lobes in the centre imbricate, ascending, dilated upwards, somewhat proliferous, fastigiata. Apothecia with subentire or granulate margin: spores 3-septate, 0.017–25 mm. long, 0.008–9 mm. thick.—*Collema pulposum* var. *ceranoides* Cromb. Journ. Bot. 1874, p. 333; Leight. Lich. Fl. ed. 3, p. 18. *Collema ceranoides* Borr. in Eng. Bot. Suppl. (1831) t. 2704. f. 2; Sm. Eng. Fl. v. p. 209; Mudd, Man. p. 41 pro parte; Cromb. Lich. Brit. p. 6; Leight. Lich. Fl. p. 23.

Having regard merely to the imperfect portion of the plant figured in E. B. Suppl., this might be taken for a well-marked species. More perfect specimens, however, in which the lobes at the circumference are depressed and more typical, show that it is to be viewed rather as a subspecies of *C. crispum*, well distinguished by the thallus and apothecia. It is usually seen only in a sterile condition.

Hab. On cretaceous and calcareous soil, sometimes on shell-sand, in maritime and upland tracts.—*Distr.* Rather local and scarce, in the Channel Islands, and S. and W. England.—B. M.: Island of Herm. Henham, Essex; Shiere, Surrey; The Downs, Halmaker, and Rottingdean Cliffs, Sussex; Babbicombe Downs, Devonshire; St. Minver and near Penzance, Cornwall; Bathampton Downs, Somersetshire; near Cirencester, Gloucestershire; Malvern, Worcestershire.

Form *cristatulum* Nyl. ex Cromb. Journ. Bot. 1874, p. 334.—Thallus microphylline, lobes crowdedly granulato-crenate. Apothecia small: spores 0.016–21 mm. long, 0.007–9 mm. thick.—Leight. Lich. Fl. Suppl. p. 468, ed. 3, p. 20.

This is a smaller and less developed state of *C. ceranoides*, from which probably it ought not to be distinguished. As in the type, the apothecia are but sparingly present.

Hab. On sandy soil in maritime tracts.—*Distr.* Local and rare; the Channel Islands and S.W. England.—B. M.: Coast of Herm. St. Minver, Cornwall.

14. *C. concinnum* Flot. Linnæa, 1849, p. 361; 1850, p. 157.—Thallus somewhat small, orbicular, variously inciso-lobed, olive-brown or dark-glaucous; lobes narrow, round, more or less ascending or depressed. Apothecia submoderate, plane, reddish, the margin entire; spores ovoid, 3-septate or submuruli-ocular, 0,014–20 mm. long, 0,006–9 mm. thick.—Cromb. Journ. Bot. 1882, p. 272.

From *C. crispum* this is distinguished by the smaller thallus and spores. The British specimens belong chiefly to *β. deplanatum* Flot., with the lobes depressed, but this is evidently a mere state. The apothecia are numerous, nearly moderate, or smaller, with the margin sometimes incurved.

Hab. On rocks and wall-tops in maritime districts.—*Distr.* Local and rare in S.W. England, N. Wales, and W. Ireland; but no doubt occurring elsewhere.—B. M.: Plymouth, S. Devon; near Penzance, Cornwall; Barmouth, Merionethshire. Achanure Castle, co. Galway.

15. *C. cheileum* Ach. Lich. Univ. (1810) p. 630.—Thallus imbricately-lobed or crenato-granulose, greenish-black or dark-olive; lobes round, or minute and crenate, variously divided. Apothecia moderate, or somewhat large, plane, dark-reddish, the thalline margin granulato-crenate; spores oblongo-ellipsoid, 3-septate or submuruli-divided, 0,025–40 mm. long, 0,010–16 mm. thick.—Sm. Eng. Fl. v. p. 208; Mudd, Man. p. 40, t. i. f. 4; Cromb. Lich. Brit. p. 6; Leight. Lich. Fl. p. 20, ed. 3, p. 20.—*Lichen cheileus* Ach. Prodr. (1798) p. 134. *Enchylium crispum* Gray, Nat. Arr. i. p. 396. *Lichen crispus* Huds. Fl. Angl. p. 447; Lightf. Fl. Scot. ii. p. 820; With. Arr. ed. 3, iv. p. 76. *Lichen marginatus* Bernh., Dicks. Crypt. fasc. iv. p. 25. *Lichenoides gelatinosum atro-virens, crispum et rugosum* Dill. Musc. 139, t. 19, f. 23.—Hudson's name, *Lichen crispus*, has priority, but to set aside the established name of Acharius would lead to great confusion.—*Brit. Exs.*: Mudd, n. 3; Larb. Cæsar. n. 52, Lich. Hb. n. 203.

The thallus is occasionally somewhat effuse, and varies in the character of the lobes, being either determinate and orbicular, lobate, with the lobes very small in the centre and explanate at the circumference, or sometimes little developed and crenato-granulose. The gonimia are usually scattered, though some are occasionally moniliform, and the filaments are but scanty. The apothecia are chiefly central, with the margin persistent.

Hab. On the mortar of old walls, rarely on calcareous rocks, chiefly in upland situations.—*Distr.* General and usually common in the Channel Islands, and most parts of Great Britain and Ireland, but frequently barren.—B. M.: Quenvais, Island of Jersey. Thetford, Norfolk; Walthamstow, Essex; Shanklin, Isle of Wight; near Plymouth, Devonshire; St. Minver, Cornwall; Bathampton Downs, Somersetshire; Milton, Oxfordshire; near Cirencester, Gloucestershire; Cradley, near Malvern, Worcestershire; Oswestry, Shropshire; near Barmouth, Merioneth;

Pinchingthorpe, Cleveland, Yorkshire: Kendal, Westmoreland; near Whitehaven, Cumberland. Near Edinburgh: near Glasgow: Appin, Argyleshire; Killin, Perthshire; near Aberdeen; Fort William, Inverness-shire. Mallow, and near Cork: Tullywhree Bridge, co. Galway.

Form 1. *nudum* Nyl. Syn. i. (1858) p. 111; Lich. Scand. p. 31.—Thallus platyphyllous, lobate, usually naked; otherwise as in the type.—Leight. Lich. Fl. ed. 3, p. 20.—*Collema crispum* var. *nudum* Schær. Enum. (1850) p. 25.

This form is more distinctly and broadly lobed, and but sparingly, if at all, granulose. The colour of the thallus and of the apothecia is usually paler.

Hab. On the mortar of old walls in upland situations.—*Distr.* Local and scarce in S. and W. England, the W. and S. Highlands, Scotland, and S. Ireland.—B. M.: Near Ventnor, Isle of Wight; Torquay, S. Devon; near Cirencester and Burton-on-the-Water, Gloucestershire; near Farlow, Shropshire. Appin, Argyleshire: Ben Lawers, Perthshire. Killarney and Dunkerron, co. Kerry.

Form 2. *monocarpon* Nyl. Syn. i. (1858) p. 111.—Thallus microphylline, or nearly obliterated, visible chiefly about the apothecia.—Cromb. Journ. Bot. 1874, p. 147.—*Collema monocarpon* Duf. ex Nyl. l. c.

The thallus is more or less scattered and microphylline, but often is scarcely visible, except as a granulate margin to the apothecia. In perfect specimens it is occasionally more developed at the circumference.

Hab. On the mortar of old walls, rarely on calcareous rocks in maritime and upland situations.—*Distr.* Local and scarce in S. and S.W. England, no doubt overlooked elsewhere.—B. M.: Shanklin, Isle of Wight; near Hastings, Sussex; near Cirencester, Gloucestershire.

e. Thallus variously lacinate.

16. *C. granuliferum* Nyl. Flora, 1875, p. 103.—Thallus imbricato-lacinate, firm, sprinkled with isidiose globules, dark olive-green or blackish, laciniae usually somewhat erect and crowded in the centre, beneath often longitudinally and crowdedly plicatulo-rugulose when dry. Apothecia moderate, slightly concave or plane, the thalline margin at length suberenate, isidiose; spores ovoid, 3-septate, sometimes with 1-2 longitudinal septules, 0.024-32 mm. long, 0.008-12 mm. thick.—Cromb. Grevillea, iii. p. 191; Leight. Lich. Fl. ed. 3, p. 21.—*Collema pulposum* var. *granulatum* Mudd, Man. p. 38. *Lichen granulatus* pro parte of our older authors.—*Brit. Eas.*: Larb. Lich. Hb. n. 204.

In the thallus and the fructification this species is subsimilar to *C. melenum*, but is at once distinguished by the peculiar isidiose globules with which it is sometimes almost entirely covered. A larger and a smaller condition occurs, to the former of which is to be referred *C. flaccidum*, var. *microlobum* Nyl., ex Carroll, Journ. Bot. 1868, p. 100, Cromb.

Lich. Brit. p. 5, and *C. subplicatile*, var. *meizolobum* Nyl., Cromb. Journ. Bot. 1874, p. 334; but these are connected by intermediate states. The apothecia are rare and scarcely seen in the larger condition.

Hab. On calcareous walls and rocks, rarely among mosses on the ground in upland districts.—*Distr.* Probably general and common in the hilly and mountainous tracts of Great Britain and Ireland.—B. M.: Shanklin, Isle of Wight; Plymouth, Elburton, Paington, Oggwell, and near Kingsbridge, S. Devon; St. Minver, Cornwall; Bathampton Downs, Weston-super-Mare, and Cheddar Cliffs, Somersetshire; Leigh Woods, near Bristol, Gloucestershire; Tenby, Pembrokeshire; Beaumaris, Island of Anglesea; near Buxton, Derbyshire; Pentregaer, Oswestry, Shropshire; Redcar, Cleveland, Yorkshire; near Whitehaven, Cumberland. Appin, Argyleshire; Killin and Ben Lawers, Perthshire; S. of Fort William, Inverness-shire. Killarney, co. Kerry; near Kylemore and Recess, Connemara, co. Galway.

17. *C. melænum* Ach. Lich. Univ. (1810) p. 636.—Thallus depressed, lacero-laciniate, greenish- or olive-black (I wine-red in thin section); laciniae more or less elongate, somewhat broad and imbricate, the margins elevated, undulate, crisp and crenate. Apothecia moderate, sessile or slightly elevated, submarginal, plane, reddish-brown or blackish, the thalline margin somewhat granulate; spores ovoid, 2-3-septate and irregularly divided, 0.021-27 mm. long, 0.009-11 mm. thick.—Mudd, Man. p. 37; Cromb. Lich. Brit. p. 5 pro parte; Journ. Bot. 1874, p. 334; Leight. Lich. Fl. p. 19 pro parte, ed. 3, p. 20.—*Lichen melæneus* Ach. Prodr. (1798) p. 130. *C. auriculatum* var. *pinguescens* Nyl. Flora, 1872, p. 353; Cromb. Journ. Bot. 1873, p. 133; Leight. Lich. Fl. ed. 3, p. 17 (*cf.* Nyl. Flora, 1883, p. 534).

The depressed orbicular thallus, and the form of the laciniae readily distinguish this from the allied species. In favourable situations it is often considerably expanded, and then in old plants becomes centrifugal. The apothecia are not uncommon, generally numerous, situated towards the margins, and at length slightly convex and concolorous with the thallus. On the sterile thallus is rarely seen a parasitic *Obrizum*, which must not be confounded with the spermogones.

Hab. On calcareous rocks and old walls in maritime and upland districts.—*Distr.* Local and scarce in N. England, the W., Central, and N. Highlands of Scotland.—B. M.: Near Buxton, Derbyshire; Teesdale, Durham; Kendal, Westmoreland; near Alston, Cumberland. Island of Lismore and Appin, Argyleshire; Killin, Ben Lawers, and Craig Tulloch, Perthshire; Craig Guie and Morroune, Braemar, Aberdeenshire; Coygach, Sutherlandshire.

Form 1. *marginale* Ach. Lich. Univ. (1810) p. 637.—Thallus elongato-laciniate, laciniae narrow, canaliculate, the margins crisp and crenate. Apothecia marginal, scattered, the thalline margin prominent and entire.—Mudd, Man. p. 37; Cromb. Journ. Bot. 1874, p. 334; Leight. Lich. Fl. ed. 3, p. 21.—*Collema marginale* Hook. Fl. Scot. ii. p. 71; Engl. Fl. v. p. 210; Tayl. in Mack. Fl. Hib. ii. p. 109. *Enchylium marginale* Gray, Nat. Arr. i. p. 397. *Lichen marginalis*

Huds. Fl. Angl. ed. 2 (1778), p. 534; With. Arr. ed. 3, iv. p. 35; Eng. Bot. t. 1924. *Lichenoides gelatinosum fuscum*, *Jacobææ maritimæ divisura* Dill. Musc. 140, t. 19. f. 25.

This differs from the type in the form of the laciniae, the situation of the apothecia, and their entire margin. The thallus also is not so dark when growing, and the apothecia are more scattered, and concave when young.

Hab. On calcareous rocks and walls in maritime and upland tracts.—*Distr.* Probably general, though as yet seen only from W. England, N. Wales, the W. Highlands, Scotland, and S. Ireland.—B.M.: Near Torquay, Devonshire; Pentregaer, near Oswestry, Shropshire; near Wrexham, Denbighshire; near Settle, Yorkshire; Teesdale, Durham; near Kendal, Westmoreland; Lamplugh, Cumberland. Appin, Argyleshire; Gairloch, Ross-shire. Middleton, co. Cork; Dunkerron, co. Kerry; Loughcooter, co. Galway.

Form 2. *jacobæifolium* Ach. Lich. Univ. (1810) p. 637.—Thallus deeply laciniate; laciniae lacero-pinnatifid, radiate, narrow, canaliculate, the margins crisp. Apothecia marginal, the thalline margin subentire.—Mudd. Man. p. 37; Cromb. Journ. Bot. 1874, p. 334; Leight. Lich. Fl. ed. 3, p. 21.—*Lichen jacobæifolius* Schrank, Fl. Bav. (1789) ii. p. 530.—*Brit. Exs.*: Larb. Cæsar. n. 2.

Very closely allied to the preceding, differing in the more deeply divided, radiating, narrower laciniae, and the subentire thalline margin of the apothecia. The fructification is very rarely present in the British specimens.

Hab. On calcareous rocks in maritime districts.—*Distr.* Local and rare, in the Channel Islands and S. England; it no doubt occurs elsewhere.—B.M.: Quenvais, Island of Jersey. Isle of Wight.

Form 3. *gyrosum* Ach. Lich. Univ. (1810) p. 638.—Thallus gyroso-complicate: laciniae approximate, subequal, crisp and crenate at the margins. Apothecia scattered, marginal, the thalline margin entire or slightly granulate.—Cromb. Journ. Bot. 1874, p. 334; Leight. Lich. Fl. ed. 3, p. 21.—*Lichen gyrosus* Ach. Prodr. (1798) p. 135.

This form (identified from a specimen of Acharius in Linn. Soc.) is not unlike *C. cristatum*, and differs from the type in the gyrose laciniae, which are plicate, densely approximate, and nearly even at the margins. The apothecia are scattered, but are very rare in a fully developed condition.

Hab. On the ground among calcareous rocks in upland situations.—*Distr.* Very local and scarce, in Central England and among the Central Grampians, Scotland.—B.M.: Near Buxton, Derbyshire. Craig Tulloch, Blair Athole, Perthshire.

Subsp. *C. hypergenum* Nyl. Flora, 1876, p. 232.—Thallus lacero-laciniate; laciniae somewhat narrow and short, the margins crisp and crenate. Apothecia marginal or submarginal, approximate, the thalline margin entire; spores 0.026–0.36 mm. long, 0.010–0.16 mm. thick.—Cromb. Grevillea, v. p. 25; Leight. Lich. Fl. ed. 3, p. 21.

Approaches *f. marginale*, but distinguished by the larger spores, which, as observed by Nylander *l. c.*, entitle it to rank at least as a subspecies. In the only two specimens seen by me the apothecia are numerous, and almost crowded in the centre.

Hab. On calcareous rocks in upland districts.—*Distr.* Found only in N.W. Ireland.—B. M.: Tullywhree Bridge, co. Galway.

18. *C. cristatum* Hoffm. Deutsch. Fl. ii. (1795) p. 101.—Thallus intricately laciniate, thickish, olive- or blackish-green (I+red); laciniae short, undulato-crisp, inciso-crenate at the margins. Apothecia rather large, somewhat plane, reddish-brown, the thalline margin at length crenulate; spores fusiformi-oblong, somewhat narrower at both apices, 3-septate, irregularly murali-locular, 0.026–34 mm. long, 0.010–12 mm. thick.—Schær. Enum. (1850) p. 225; Cromb. Journ. Bot. 1874, p. 334; Leight. Lich. Fl. ed. 3, p. 22.—To this belongs as an old state *Collema subplicatile* Cromb. Journ. Bot. 1874, p. 147, non Nyl. Flora, 1875, p. 297, which latter belongs to the section of *C. chazanum*. As already observed, *Lichen cristatus* Huds., Linn., &c. is a variety of *Collema tenax*.

From the closely allied *C. melanum* this differs in the imbricato-aggregate laciniae with inciso-dentate margins, in the larger apothecia with crenulate thalline margin, and in the slightly different spores. These distinguish it in its typical condition, though whether they make it specifically distinct is doubtful. The apothecia, when fully developed, are of considerable size, and only sparingly present.

Hab. Among mosses on old walls and on rocks in maritime and upland districts.—*Distr.* Found only in W. England, the W. Highlands, Scotland, and S.W. Ireland.—B. M.: St. Michael's Tor, Devonshire; near Cirencester, Gloucestershire. Island of Lismore, Argyleshire; Killin and Craig Tulloch, Perthshire. Killarney, co. Kerry.

19. *C. polycarpon* Koerb. Par. (1865) p. 417.—Thallus small, radiato-laciniate, appressed, dark-green or reddish-black (I+purplish-red); laciniae narrow, short, complicate, suberect in the centre, more expanded and depressed at the circumference. Apothecia small, numerous, plane, or at length somewhat convex, dark-red or blackish, the thalline margin thin, entire; spores oblong or fusiformi-ellipsoid, more constantly 3- rarely 5-septate, locular, 0.018–27 mm. long, 0.006–7 mm. thick.—Cromb. Journ. Bot. (1873) p. 132, 1874, p. 334; Leight. Lich. Fl. ed. 3, p. 22.—*Collema multifidum* ? *polycarpon* Schær. Spic. (1842) p. 532. *Collema stygium* Schær. Spic. p. 544, Lich. Helv. n. 434; Cromb. Journ. Bot. 1874, p. 334; Leight. Lich. Fl. ed. 3, p. 23. Nylander observes in *litt.* that while *C. stygium* Del., may be the plant of Schærer, it is probably not pure, and is besides only a MSS. name, while that of Schærer and Arnold is *C. polycarpon* (conf. Flora, 1883, p. 105).—*Brit. Exs.*: Cromb. n. 103; Lich. Fl. ed. 3, p. 23.

Might be taken for a smaller state of *C. melanum*, but the characters given separate it. The apothecia are usually abundant over the thallus, and sometimes are so numerous as almost to obliterate the laciniae.

Hab. On calcareous rocks and walls in upland hilly districts.—*Distr.* Local and scarce in W. England, the S.W. Highlands, Scotland, and N.W. Ireland.—B. M.: Cleve Hill, Somersetshire; Shipton and near Cirencester, Gloucestershire; Buxton, Derbyshire; near Kendal, Westmoreland. Appin, Argyleshire. Kylemore, co. Galway.

C. SYNECHOBLASTUS (Trev. Nuov. gen. Collem. 1853).—Thallus variously lobed. Apothecia lecanorine, rarely biatorine: spores narrow or fusiform, usually pluriseptate (not muriform); hymenial gelatine bluish with iodine. Spermogones with jointed sterigmata.

20. *C. Laureri* Nyl. *ex* Cromb. Journ. Bot. 1873, p. 132.—Thallus inciso-lobed, smooth or slightly granular, dull olive-black (I+reddish, when dry); lobes somewhat dilated, rounded, ascending, crowded, imbricate and undulate in the centre, more or less depressed at the circumference, erect and nearly entire at the margins. Apothecia moderate, sessile, plane, reddish-brown or dark-red, the margin entire or slightly crenate; spores linear-oblong, obtuse at both apices, 3-septate, straight, 0.020–24 mm. long, 0.005–6 mm. thick.—Cromb. Journ. Bot. 1874, p. 334; Leight. Lich. Fl. ed. 3, p. 22.—*Synechoblastus complicatus* Mudd, Man. p. 44, t. 1. f. 6. *Synechoblastus Laureri* Flot. in Koerb. Syst. Lich. Germ. (1855) p. 414.

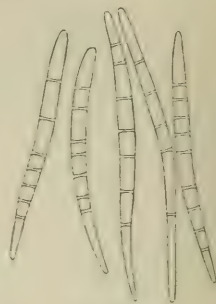


Fig. 13.

Collema nigrescens, Ach.
Five spores. $\times 500$.

Externally sub-similar to *C. polycarpon*, but distinguished by the broader lobes, and especially by the spores being more obtuse. The thallus radiates from the centre, and according to Koerber is white-fibrillose on the underside. The apothecia are scattered and chiefly marginal. We have seen only a small specimen very sparingly fertile.

Hab. On limestone walls in upland districts.—*Distr.* Local in N. England, where according to Mudd it is abundant near the High Force Inn, Teesdale: if really British, should be detected elsewhere.—B. M.: Teesdale, Durham.

21. *C. nigrescens* Ach. Lich. Univ. (1810) p. 646.—Thallus sub-monophyllous, roundly lobed, radiately rugoso-plicate, olive- or blackish-green (I+reddish, when dry): lobes broad, smooth or granulose, depressed at the circumference, more or less ascending in the centre, entire or slightly crenate at the margins. Apothecia small, plane, at length convex, crowded, the margin entire: spores fusiform-cylindrical, pluri-septate, 0.0034–42 mm. long, 0.005 mm. thick.—Hook. Fl. Scot. ii. p. 71; Sm. Eng. Fl. v. p. 211; Tayl. in Mack. Fl. Hib. ii. p. 116; Cromb. Lich. Brit. p. 6; Leight. Lich. Fl. p. 24, ed. 3, p. 24.—*Synechoblastus nigrescens* Mudd, Man. p. 42, t. i. f. 5. *Lathragium nigrescens* Gray, Nat. Arr. i. p. 399. *Lichen nigrescens* Huds. Fl. Angl. (1762) p. 450; With. Arr. ed. 3, iv. p. 74; Eng. Bot.

t. 345. *Lichen vespertilio* Lightf. Fl. Scot. ii. p. 840. *Lichenoides gelatinosum membranaceum tenue nigricans* Dill. Musc. p. 138, t. 19. f. 20. *Lichenoides saxatile membranaceum gelatinosum tenue, nigrescens* Dill. in Ray, Syn. ed. 3, 72. 53.—*Brit. Ecs.*: Leight. n. 109; Cromb. n. 104.

This is readily recognized by the nearly monophyllous, rugose, thinnish thallus, lacunose beneath, and by the small crowded apothecia. The thallus, which is orbicular and appressed at the circumference, is not inaptly likened by Dillenius to a "bat's wing," whence the specific name of Lightfoot; when growing more luxuriantly it sends forth smaller lobes. Sometimes in old age it is nearly obliterated, only the smaller lobes with the apothecia being apparent, when it might be mistaken for the next species. The apothecia are chiefly central, and in otherwise barren specimens the spermatogones are usually abundant.

Hab. On the trunks of old trees, chiefly poplars and willows, in maritime and upland wooded districts.—*Distr.* General and not uncommon in the Channel Islands, Great Britain, and Ireland, but chiefly in the Western tracts.—*B. M.*: Noirmont, Rozel, and St. Ouen's Bay, Island of Jersey; Island of Guernsey. Near Ryde, Carisbrook Castle, and Shanklin, Isle of Wight; Fairlight Glen, Hastings, Henfield, Hurstpierpoint, and Beeding, Sussex; Torquay, Paignton, Sidmouth, Totnes, Bolt Head, and Cornworthy, Devonshire; Boconnoc, near Penzance, and the Lizard, Cornwall; Kemble, near Cirencester, Gloucestershire; Barrow Hill, Malvern, and Broadwas, Worcestershire; Aberdovey, Merionethshire; near Guisboro', Cleveland, Yorkshire. New Galloway, Kirkcudbrightshire; Barcaldine, Argyshire; near Callander, Loch Tay, and in Glen Lochay, Perthshire; Glen Dole, Forfarshire; Gairloch and Applecross, Ross-shire. Castlemartyr, co. Cork; Powerscourt, co. Wicklow; Killarney and Muckross, co. Kerry.

22. *C. aggregatum* Nyl. Mém. Soc. Sc. Nat. Cherb. ii. (1854) p. 318; Syn. i. p. 115, t. ii. f. 9.—Thallus small, lobate and plicate, somewhat rigid, difform, greenish-black or olive-brown (I+ red); lobes rather short, sometimes crenate, and often granuloso-crispate at the margins. Apothecia moderate, crowded, plane or slightly convex, red or dark-red, the thalline margin thin, entire; spores rarely 6næ. fusiformi-cylindrical, straight or curved, pluri-septate, 0.033–65 mm. long, 0.004–5 mm. thick.—Cromb. Lich. Brit. p. 6; Leight. Lich. Fl. p. 26, ed. 3, p. 25.—*Synechoblastus aggregatus* Mudd, Man. p. 43. *Enchylium fasciculare* β. *aggregatum* Gray, Nat. Arr. i. p. 398. *Collema fasciculare* var. *aggregatum* Ach. Lich. Univ. (1810) p. 648. *Lichenoides gelatinosum palmatum, tuberculis conglomeratis* Dill. Musc. 141, t. 19. f. 27 B.—*Brit. Ecs.*: Cromb. n. 105.

From the closely allied *C. nigrescens* this is distinguished by the thallus being much smaller, more rigid, and not radiately rugose, and by the shorter, not rounded nor appressed lobes. It is occasionally leaden-coloured when dry, and often but little developed. The apothecia in fertile specimens are usually numerous and crowded.

Hab. Among mosses on the trunks of old trees in wooded upland tracts.—*Distr.* Found only in S., W., and N. England, N. Wales, the W. Highlands of Scotland, and S.W. Ireland.—*B. M.*: High Rocks,

Tunbridge Wells, Kent: St. Leonard's Forest and Henfield, Sussex; New Forest, Hampshire; Barmouth, Merionethshire; Ingleby, Cleveland, Yorkshire. Barmaldine, Argyleshire; near Killin and Aberfeldy, Perthshire; Loch Linnhe, Inverness-shire. O'Sullivan's Cascade and Derry-cuntry, Killarney, co. Kerry.

23. *C. fasciculare* Ach. Lich. Univ. (1810) p. 639.—Thallus subcrenato-lobulate, brownish-green or dark-green (I + blood-red); lobules rounded, usually in erect, small, subpedicellate tufts, dilated upwards. Apothecia small, very numerous and crowded, hiatiorine, somewhat convex, reddish, the margin thin, undulate; spores fusiform, normally 3- sometimes 1-septate, 0.016–29 mm. long, 0.004–6 mm. thick.—*Collema fasciculare* Hook. Fl. Scot. ii. p. 71; Sm. Eng. Fl. v. p. 210; Cromb. Journ. Bot. 1874, p. 334; Leight. Lich. Fl. ed. 3, p. 24. *Enchylium fasciculare* Gray, Nat. Arr. i. p. 398. *Lichen fascicularis* Linn. Mant. ii. (1771) p. 153; Lightf. Fl. Scot. ii. p. 841; Huds. Fl. Angl. ed. 2, p. 536; With. Arr. ed. 3, iv. p. 76; Eng. Bot. t. 1162. *Syncehoblastus conglomeratus* (Hoffm.) Mudd, Man. p. 43. *Collema conglomeratum* Cromb. Lich. Brit. p. 6; Leight. Lich. Fl. p. 23. *Lichenoides gelatinosum palmatum, tuberculis conglomeratis* Dill. Musc. t. 19, f. 27 A.

Distinguished by the thalline lobules of the thallus being fasciculate, except (in entire specimens) at the immediate circumference, where they are crenate and sterile. The apothecia are so crowded as sometimes to render the thallus invisible except when moistened; so that in dry weather it is very apt to be overlooked.

Hab. On the trunks of old trees in wooded upland districts.—*Distr.* Local, and not common where it occurs, in the mountainous tracts of W. Britain: not detected in Ireland. B. M.: St. Leonard's Forest and Henfield, Sussex; near Barmouth, Merioneth; Nant Glyn, Denbighshire; Ambleside, Westmoreland. Loch Katrine, Kenmore, and Den of Aberfeldy, Perthshire; Clova, Forfarshire.

24. *C. multipartitum* Sm. Eng. Bot. xxxvi. (1814) t. 2582.—Thallus laciniate, radiate, olive-brown or olive-black; laciniae narrow, multifid, somewhat convex, undulate and twisted, lobato-bifid at the apices, the lobes divergent. Apothecia moderate, plane or convex, dark-reddish, the thalline margin thickish, entire; spores cylindrical, often somewhat curved, normally 3-septate and variously oleoso-locular, 0.028–48 mm. long, 0.007 mm. thick; paraphyses thick, pauci-articulate.—Nyl. Syn. i. p. 116, t. ii. f. 8; Sm. Eng. Fl. v. p. 210; Tayl. in Mack. Fl. Hib. ii. p. 108; Cromb. Enum. p. 7; Leight. Lich. Fl. p. 26, ed. 3, p. 24.—*Syncehoblastus multipartitus* Mudd, Man. p. 43.—*Brit. Evs.*: Bohl. n. 70.

From states of *C. melanum*, especially form *jacobaeifolium*, with which it might be confounded, this is distinguished by the radiating thallus which is often centrifugal, and by the convex, undulate, or twisted laciniae. The laciniae are sometimes rather discrete, and radiate continuously from the centre, while at other times they are more or less broken up and dispersed. As observed by Nylander (Syn. p. 117), the internal structure of the thallus is nearly similar to that of *C. cheileum*,

the gonimia being not moniliform but glomeruloso-congested. The apothecia are usually scattered over the whole thallus almost to the apices of the laciniae.

Hab. On shady calcareous rocks and walls in maritime and upland districts.—*Distr.* Sparingly here and there in Great Britain, S. and W. Ireland.—B. M.: Mendip Hills and near Yatton, Somersetshire; Dovedale and Buxton, Derbyshire; Oswestry, Shropshire; Nant Glyn, Denbighshire; Settle, Yorkshire; Teesdale, Durham; Haversham Head and Cunswick Sear, Westmoreland; Lamplugh, Cumberland. Achosragan Hill, Appin, and island of Lismore, Argyleshire; shores of Loch Tay and Ben Lawers, Perthshire. Middleton, near Cork; Kenmare and O'Donoghue's Prison, Killarney, co. Kerry; Kylemore, co. Galway.

25. *C. isidioides* Nyl. ex Arn. Flora, 1870, p. 232.—Thallus granuloso-aggregate (isidioid), blackish, in subpulvinate glomeruli. Apothecia and spermatogones unknown.—Nyl. Flora, 1883, p. 98; Cromb. Journ. Bot. 1885, p. 195.

The place of this species in the genus is uncertain in the absence of fructification. Detected by Arnold in the Bavarian Alps, Nylander observes that the "thallus consists of a congeries of syngonimia (sub-globose or oblongo-diform), with the filaments often indistinct."

Hab. On calcareous rocks in mountainous districts.—*Distr.* Gathered only in N.W. England (Warton Craig, Westmoreland).

15. **COLLEMODIUM** Nyl. ex Lamy, Bull. Soc. Bot. Fr. t. xxv. (1878) p. 341; Nyl. Flora, 1875 (ut subgenus).—Thallus

small or submoderate, variously lobed or subfruticulose; cortical layer somewhat distinct; gonimia more or less scattered, partly moniliform. Apothecia urceolate, lecanorine, rarely bi-atorine; spores 8næ, ovoid or ellipsoid, colourless, variously septate and divided; hymenial gelatine deep blue with iodine. Spermatogones with jointed sterigmata and straight spermatia obsoletely incrassate at either apex.

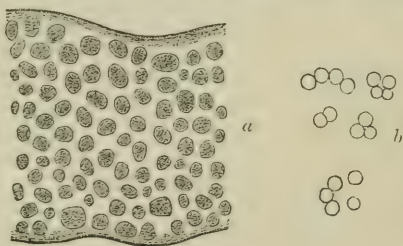


Fig. 14.

Collemodium fluvatile Nyl.—a. Vertical section of thallus, $\times 275$. b. Gonimic granules separated from the cells.

Instituted by Nylander for various plants previously arranged chiefly under *Collema*. From *Collema* it differs in the cortical layer being distinct, though usually but slightly apparent. It thus forms a transition between *Collema* and *Homodium*, a subgenus of *Leptogium* to which it is closely related. The fructification is similar to that of *Leptogium*.

1. *C. biatorinum* Nyl. ex Cromb. Grevillea, xv. (1886) p. 12.—Thallus effuse, minutely granuloso-lobulate, imbricate, brown or

brownish-green. Apothecia biatorine, small, gyalectiform, brown or reddish, the margin thickish, entire; spores ovoid, 3-4-septate and sparingly longitudinally divided, 0.025-30 mm. long, 0.011-12 mm. thick.—*Collema biatorinum* Nyl. Act. Linn. Soc. Bord. sér. 3, i. (1857) p. 268; Carroll. Journ. Bot. 1866, p. 22; Cromb. Lich. Brit. p. 5, Journ. Bot. 1874, p. 335; Leight. Lich. Fl. p. 21, ed. 3, p. 25.—*Brit. Exs.*: Larb. Lich. Hb. n. 282.

Closely resembles *Leptogium pusillum*, from which it differs chiefly in structure and the purely biatorine apothecia. Internally the thallus presents scattered cavities, each containing 1 or 2 gonimic granules, with traces of tubiform canals. The apothecia are scattered, or more or less crowded.

Hab. On cretaceous soil and the mortar of old walls in damp places in maritime and upland tracts.—*Distr.* The Channel Islands, S. and W. England, plentiful where it occurs.—B. M.: Coast of the island of Alderney. Near Maidstone, Kent; near Lewes, Sussex; Reigate hill, Surrey; Wadebridge, Cornwall; near Cirencester, Gloucestershire; Charnwood Forest, Leicestershire.

2. *C. microphyllum* Nyl. ex Lamy. Bull. Soc. Bot. Fr. t. xxx. (1883) p. 337.—Thallus effuse, microphylline, imbricato-lobed, often verrucoso-diffract, dark-green or olive-brown: lobes minute, ascending, granulato-crenate, somewhat dilated at the circumference. Apothecia small, crowded, urecolato-concave, reddish-brown, the thalline margin entire, tumid, subconcolorous; spores ovoido-ellipsoid, usually 3-septate, becoming murali-locular, 0.016-24 mm. long, 0.008-0.010 mm. thick.—Cromb. Grevillea, xv. p. 12.—*Leptogium microphyllum* Nyl., Cromb. Journ. Bot. 1874, p. 330. *Collema microphyllum* Ach. Lich. Univ. (1810) p. 630; Borr. Eng. Bot. Suppl. t. 2721; Sm. Eng. Fl. v. p. 208; Mudd, Man. p. 41; Cromb. Lich. Brit. p. 6; Leight. Lich. Fl. p. 22. *Enchylium microphyllum* Gray, Nat. Arr. i. p. 396. *Leptogium fragrans* Cromb. Lich. Brit. p. 8 pro parte; Leight. Lich. Fl. p. 30 pro parte, ed. 3, p. 30. *Collema fragrans* Sm. Eng. Fl. v. p. 208. *Enchylium fragrans* Gray, Nat. Arr. i. p. 396. *Lichen fragrans* Eng. Bot. t. 1912.—*Brit. Exs.*: Leight. n. 258; Larb. Lich. Hb. n. 2.

According to Nylander in litt. the gonimia are partly moniliform and partly without order, with interwoven filamentose elements. From Sowerby's original specimen it appears that *Lichen fragrans* E. B. is merely a state of this, and the fragrance from which it obtained its trivial name was, as observed by Borrer, accidental. The apothecia are minute, numerous and crowded.

Hab. On the trunks of old trees, chiefly Ash and Elm in shady upland situations.—*Distr.* In the Channel Islands, S.W. and N. England; not yet known from Scotland or Ireland.—B. M.: St. Brelade's Bay, Island of Jersey. Near Bury, Suffolk; Copthall, Essex; Southwick, near Lewes, and Henfield, Sussex; Lyndhurst, New Forest, Hants; Wimpole Park, Cambridgeshire; Claines, Worcestershire; near Oswestry, Shropshire; Garn, Denbighshire; Ingleby Park, Cleveland, Yorkshire; Leven's Park, Kendal, Westmoreland.

3. *C. fragile* Nyl. *ex* Cromb. Grevillea, xv. (1886) p. 12.—Thallus small, rosulate, laciniato-lobed, dark olive-green or olive-brown; lobes convex, granuloso-unequal, radiate and crenate at the circumference. Apothecia minute, urceolate, at length somewhat plane, dark-brown, the thalline margin entire, thickish; spores ovoid, variously divided, about 0,029 mm. long, 0,013 mm. thick.—*Leptogium fragile* Nyl. Mém. Soc. Cherb. v. (1857) p. 333; Cromb. Lich. Brit. p. 7; Leight. Lich. Fl. p. 36, ed. 3, p. 27. *Collema fragile* Tayl. in Mack. Fl. Hib. ii. (1836) p. 109; Mudd, Man. p. 38.

The thallus is almost stellato-laciniate, with the laciniae irregularly arranged and variously divided; the gonimic granules are rarely moniliform. With its radiating laciniae, it somewhat resembles young states of *Collema multipartitum*. In the British specimens the apothecia are only sparingly present.

Hab. On calcareous rocks in maritime and upland districts.—*Distr.* Only sparingly in S. and N. England and in S.W. Ireland.—B. M.: Anstey's Cove, Torquay, S. Devon; Barrowmouth, Cumberland. Dunkerron, co. Kerry.

4. *C. plicatile* Nyl. *ex* Lamy, Bull. Soc. Bot. Fr. t. xxx. (1883) p. 337.—Thallus somewhat small, laciniato-lobed, olive- or leaden-brown; lobes thickish, slightly rugulose, erect or ascending in the centre, plicate towards the circumference, often crisp at the margins, more or less granuloso-furfuraceous. Apothecia small or nearly moderate, somewhat concave or plane, reddish-brown, the thalline margin thick, entire; spores ovoid, 3-septate, and irregularly muralilocular, 0,018–30 mm. long, 0,008–16 mm. thick.—Cromb. Grevillea, xv. p. 12.—*Leptogium plicatile* Nyl., Cromb. Journ. Bot. 1874, p. 336; Leight. Lich. Fl. ed. 3, p. 30. *Collema plicatile* Sm. Eng. Fl. v. p. 209; Mudd, Man. p. 38; Cromb. Lich. Brit. p. 5; Leight. Lich. Fl. p. 22. *Enchylium plicatile* Gray, Nat. Arr. i. p. 397. *Lichen plicatilis* Ach. N. Act. Stock. xvi. (1795) p. 11, t. 1. f. 2. *Lichenoides gelatinosum atro-virens, auriculatum et granosum* Dill. Musc. 140, t. 19. f. 24 B–D.—*Brit. Exs.*: Cromb. n. 106.

This, as observed by Nylander (*Leptogium firmum* Lich. Scand. p. 34), resembles *L. sinuatum*, but the thallus is thicker, very thinly or inconspicuously cellulari-corticate. The apothecia, which are scattered, are not very numerous in our British specimens.

Hab. On calcareous rocks and walls, rarely on trunks of trees, in maritime and upland districts.—*Distr.* Local and scarce in S. and W. England, rare in the W. Highlands of Scotland and in S.W. Ireland.—B. M.: Near Maidstone, Kent; Shoreham, Beeding, and Lewes, Sussex; Babbicombe and Plymouth, S. Devon; Mendip Hills, Somersetshire; near Cirencester, Gloucestershire. Near Appin House, Argyleshire. Ardtully, co. Kerry.

Form *minus* Cromb. Grevillea, xv. (1886) p. 12.—Thallus smaller, laciniae narrower, rather longer, when dry somewhat angulose:

otherwise as in the type.—*Leptogium plicatile* f. *minor* Cromb. Journ. Bot. 1874, p. 336; Leight. Lich. Fl. ed. 3, p. 31.

This form evidently depends upon the nature of the habitat. It is rarely fertile.

Hab. In depressions of dry rocks in maritime and upland tracts.—*Distr.* Local and rare in the S.W. Highlands of Scotland and in S.W. Ireland.—B. M.: Island of Lismore, Argyleshire. Near Killarney, co. Kerry.

Var. β . *hydrocharum* Nyl. ex Cromb. Grevillea, xv. (1886) p. 12.—Thallus thicker, rigid, greyish- or glaucous-greyish; lobes repand, somewhat rugulose, depressed. Apothecia central, scattered, the thalline margin entire.—*Leptogium plicatile* var. *hydrocharum* Nyl. Flora, 1875, p. 302. *Collema pulposum* var. *hydrocharum* Cromb. Journ. Bot. 1874, p. 147; Leight. Lich. Fl. ed. 3, p. 18. *Parmelia hydrocharum* Ach. Meth. (1803) p. 222.

Distinguished by the colour of the thicker thallus and the more depressed lobes, which are somewhat discrete at the circumference. No fructification is visible in our only British specimen.

Hab. On damp calcareous rocks in upland districts.—*Distr.* Only among the Central Grampians, Scotland.—B. M.: Craig Tulloch, Perthshire.

5. *C. fluviatile* Nyl. ex Cromb. Grevillea, xv. (1886) p. 12.—Thallus inciso-lobed, thin, greyish-green or dark greyish-glaucous; lobes somewhat erect, oblong, subrepand, flexuoso-complicate, simple or proliferous. Apothecia small, submarginal, elevated, plane or somewhat concave, dark-red, the thalline margin entire, paler; spores ellipsoid, usually 3-septate, 0.016–23 mm. long, 0.007–9 mm. thick.—*Leptogium fluviatile* Nyl. ex Cromb. Journ. Bot. 1874, p. 336; Leight. Lich. Fl. ed. 3, p. 32. *Collema fluviatile* Sm. Eng. Fl. v. p. 209; Mudd, Man. p. 40; Cromb. Lich. Brit. p. 5; Leight. Lich. Fl. p. 24. *Collema multipartitum* β . *fluviatile* Tayl. in Fl. Hib. ii. p. 109. *Enchylium fluviatile* Gray, Nat. Arr. i. p. 397. *Lichen fluviatilis* Huds. Fl. Angl. ed. 2 (1778), p. 536; With. Arr. ed. 3, iv. p. 77; Eng. Bot. t. 2039. *Lichenoides gelatinosum foliis angustioribus tunæformibus* Dill. Musc. 142, t. 19. f. 28. *Lichenoides gelatinosum opuntiioides* Dill. in Ray, Syn. ed. 3, 72. 58.

This approaches in habit small states of *Leptogium tremelloides*. It is distinguished from the preceding species by the form of the lobes and of the smaller spores. In texture, as observed by Nylander (Syn. i. p. 112), the thallus is entirely cellular, the cortex being composed of spheroid cells, with the gonimia either single or usually 4-agglomerate in each cavity. Only a few of the British specimens seen are sparingly fertile. *Collema rivulare* Ach., according to Nylander *in litt.*, is only a state of this with shorter and simple lobes; this state occurs in this country.

Hab. On moist rocks and boulders of streams in upland mountainous situations.—*Distr.* Found only sparingly in W. and N. England, N. Wales, S.W. and Central Scotland, and S.W. Ireland.—B. M.: St. Minver, Cornwall; River Elwy, Denbighshire; Snowdon, Carnarvon-

shire; Malham Cove, Yorkshire. Bonnington Falls, near Lanark; near Leven, Fifeshire; River Isla, near Ruthven Wood and Lochearn, Perthshire. Ardully, Kenmare, co. Kerry.

6. *C. glebulentum* Nyl. *ex* Cromb. Grevillea, xv. (1886) p. 12.—Thallus effuse, thickly isidiose, glomuloso-diffract, sublobate, and membranaceous at the circumference, olive-brown or blackish; lobes very small, subentire or lacerate at the margins. Apothecia and spermogones unknown.—*Leptogium glebulentum* Nyl. *Cromb. Journ. Bot.* 1882, p. 272.

A peculiar plant externally diverse, but nearly allied to the preceding. The thallus is rather thin, except where it is covered with the granuloso-crustose isidia, by which it is almost obliterated, unless at the circumference. Apothecia and spermogones are absent in the few specimens seen.

Hab. On moist limestone rocks in subalpine and alpine localities.—*Distr.* In S. and N. Grampians, Scotland, rare.—B. M.: Above Loch-na-Gat, Ben Lawers, Perthshire; Craig Guie, Braemar, Aberdeenshire.

7. *C. turgidum* Nyl. *ex* Lamy, *Bull. Soc. Bot. Fr.* t. xxv. (1878) p. 342.—Thallus thickish, roundly lobed, naked or granulate, dark-olive or reddish-black; lobes turgid, rugulose, ascending and somewhat imbricate in the centre, concave and undulato-plicate at the circumference. Apothecia moderate, urceolate or at length somewhat plane, reddish-brown or dark-brown, the thalline margin turgid, more or less granulate; spores oblongo-ovoid, 3-septate and murali-locular, 0.023–32 mm. long, 0.010–12 mm. thick.—*Leptogium turgidum* Nyl. *Cromb. Lich. Brit.* p. 10; *Leight. Lich. Fl.* p. 28, ed. 3, p. 33. *Collema turgidum* Ach. *Lich. Univ.* (1810) p. 634; *Sm. Eng. Fl.* v. p. 209; *Mudd, Man.* p. 38.—*Brit. Exs.*: *Leight. n.* 257; *Larb. Lich. Hb. n.* 42.

From all states of *Collema pulposum* or *Collemodium plicatile* this is distinguished by the peculiar sublobato-fruticulose thallus, which when dry appears as if minutely verrucæformi-lobed. The apothecia, which are sessile and normally urceolate, are usually numerous.

Hab. On limestone and brick walls, also on calcareous and cretaceous soil, in upland tracts.—*Distr.* General, though nowhere common, throughout England, rare in the S.W. Highlands of Scotland, not seen from Ireland.—B. M.: Dunwich, Suffolk; Chelsfield, Kent; Reigate Hill and Shiere, Surrey; near Hastings, Sussex; Shanklin, Isle of Wight; Plymouth, Devonshire; Wadebridge, Cornwall; Chew Magna, near Bristol, Somersetshire; Charfield, Gloucestershire; Sevenhampton, Wiltshire; Barrington Hill and Malvern, Worcestershire; Tetsworth, Oxfordshire; near Shiffnal, Shropshire. Appin, Argyshire.

Var. *β. depressum* Cromb. Grevillea, xv. (1886) p. 12.—Thallus depressed, somewhat rosulate, very small, much scattered. Apothecia minute.

This peculiar variety evidently depends upon the nature of the habitat, and is probably a starved form of the type. Although the thallus is little developed, the apothecia are rather numerous.

Hab. On calcareous stones in upland situations.—*Distr.* Very local in S.W. England.—B. M. : Near Cirencester, Gloucestershire.

8. *C. Schraderi* Nyl. *œ* Cromb. *Grevillea*, xv. (1886) p. 12.—Thallus effuse, caespitose-fruticulose, somewhat erect, dichotomously branched, dull olive-green or dark reddish-brown; branches sub-linear, irregularly sulcate-rugose and somewhat angular, dilated in the middle, constricted at the base and at the apices. Apothecia lateral, small, concave, reddish, the margin entire, paler: spores ellipsoid, 3–5-septate and submurally-divided, 0,023–33 mm. long, 0,011–15 mm. thick.—*Leptogium Schraderi* Mudd, *Man.* p. 49; *Cromb. Lich. Brit.* p. 9; *Leight. Lich. Fl.* p. 36, ed. 3, p. 34. *Polychidium Schraderi* Gray, *Nat. Arr. i.* p. 402. *Collema Schraderi* Eng. Bot. t. 2284; *Sm. Eng. Fl. v.* p. 213. *Lichen Schraderi* Bernh. in *Schrad. Journ. i.* (1799) p. 22, t. 2. f. 5.—*Brit. Exs.* : *Larb. Lich. Hb. n.* 4.

This usually forms small tufts which shrivel up very much in a dry condition. The branches, which are at first appressed, become nearly erect and fastigiate at the apices, being paler at the base. It has moniliform gonimia. It is rarely seen fertile, and the apothecia are few.

Hab. On cretaceous and calcareous soil, rarely on the mortar of old walls in maritime and upland situations.—*Distr.* General, though nowhere very common in England (chiefly in the S.), very rare amongst the S.W. Grampians, Scotland, and rare in the Channel Islands, in N. and S. Ireland.—B. M. : Island of Herm; Moulin Huet, Island of Guernsey. Caistor Church, Norfolk; Martham, Suffolk; Shiere, Surrey; Shanklin, Isle of Wight; The Downs and near Brighton, Sussex; Babicombe and near Plymouth, S. Devon; St. Minver, Cornwall; Cheddar Cliffs and Bathampton Downs, Somersetshire; near Siddington, Gloucestershire; Miller's Dale, Derbyshire; Island of Anglesea, N. Wales; near Milnthorpe, Westmoreland. Appin, Argyleshire; Glen Lyon, Perthshire. Blackrock, near Cork; Muckross, Killarney, and Dunkerron, co. Kerry; Dawros, co. Galway; Sheep Walk, co. Armagh.

16. **LEPTOGIUM** Gray, *Nat. Arr. i.* (1821) p. 395; Nyl. *Mém. Soc. Cherb.* (1855) p. 165, emend.—Thallus microphylline, fruticulose or rarely granulose, sometimes foliaceous and macrophylline, internally cellular or with tubular interwoven cavities; gonimia more or less moniliform; cortical layer more or less distinct, usually formed of a simple series of cells. Apothecia lecanorine or biatoroid; spores 8næ, more or less oblong, variously septate and divided, colourless; hymenial gelatine deep blue with iodine. Spermatogones immersed, with shortly articulate sterigmata and straight spermatia obsoletely incrassate at both apices.

As now limited, this genus, though better defined than formerly, is still closely related to *Collema*. It is distinguished by the thallus in the foliaceous species being thinner and less turgid when moist, by the apothecia being often biatoroid, and more especially by having a distinct cortical layer, though sometimes entirely cellular within. The spermatogones, as in *Collema* and *Collemodium*, have the spermatia identical in size, viz. 0,0035–0,0040 mm. long, scarcely 0,001 mm. thick. According

to the anatomical structure of the thallus and the character of the apothecia, it is divided by Nylander into four subgenera, all of which occur in our Islands.

Subgen. HOMODIUM Nyl. Flora, 1875, p. 297 (*cf.* Cromb. Grevillea, xv. p. 12).—Thallus microphylline, granulose, or variously lobed or fruticulose, entirely cellular within; gonimia rarely in part moniliform. Apothecia urceolate or biatoroid; spores variously septate and divided.

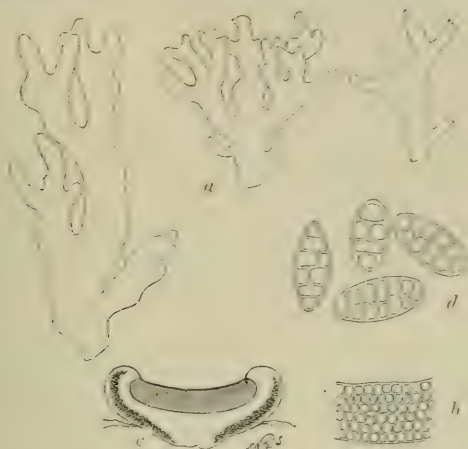


Fig. 15.

Leptogium tenuissimum Koerb.—a. Thalline laciniae, $\times 30$. b. Transverse section of thallus, $\times 200$. c. Section of apothecium (when dry), $\times 30$. d. Spores, $\times 500$.

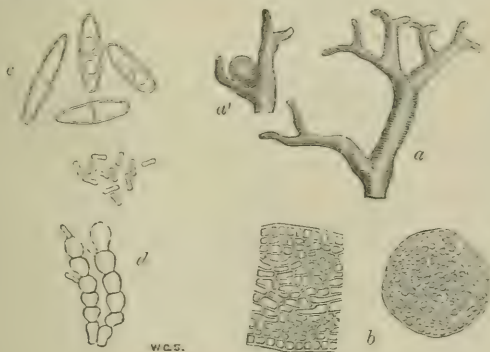


Fig. 16.

Leptogium muscicola Fr.—a. Thalline branch, $\times 30$. a'. Branchlet with a spermatogone, $\times 30$. b. Transverse and longitudinal sections of thallus, $\times 200$. c. Spores, $\times 500$. d. Sterigmata and spermatia, $\times 500$.

1. *L. rhyparodes* Nyl. Flora, 1865, p. 210.—Thallus diffuse, thin, furfuraceous or subgranulato-unequal, diffract, brownish-red or blackish-brown (1 + wine-red). Apothecia small, at first concave, becoming somewhat plane and at length biatorine with excluded margin, concolorous or reddish; spores ovoid or ellipsoid, attenuate at one or the other apex, submurali-divided, 0,020–35 mm. long, 0,011–16 mm. thick.—Carroll, Journ. Bot. 1865, p. 287; Cromb. Lich. Brit. p. 7; Leight. Lich. Fl. p. 35, ed. 3, p. 26.—*Collema psorellum* Nyl. Flora, 1865, p. 602; Cromb. Journ. Bot. 1866, p. 22; Lich. Brit. p. 3; Leight. Lich. Fl. p. 26; *vide* Cromb. Journ. Bot. 1874, p. 335.

The thallus, which has the gonimia more or less scattered, sometimes spreads extensively, and occasionally becomes almost evanescent. The apothecia are at first urceolate and sometimes at length subbiatorine. Occasionally specimens growing on moist shady rocks are more obscure and less developed with nearly biatorine apothecia; this state is *Collema psorellum* Nyl.

Hab. On damp rocks and stones (schistose) in subalpine and alpine localities.—*Distr.* Very local and rare among the S. Grampians, Scotland.—B. M.: Craig Calliach, on the summit and above Loch-na-Gat, Ben Lawers, Perthshire.

2. *L. tenuissimum* Koerb. Syst. Lich. Germ. (1855) p. 419.—Thallus effuse, squamuloso-granulose, olive- or brownish-green; squamules laciniato-dissect or crenato-incised, congested into a dense crust. Apothecia moderate or large, urceolate, reddish-brown, the margin entire, thick, paler; spores ovoid or oblong, narrower at either apex, irregularly murali-ocular, 0,024–34 mm. long, 0,011–13 mm. broad.—Mudd, Man. p. 46; Cromb. Lich. Brit. p. 7; Leight. Lich. Fl. p. 35, ed. 3, p. 26.—*Collema tenuissimum* Sm. Eng. Fl. v. p. 213. *Polychidium tenuissimum* Gray, Nat. Arr. i. p. 401. *Lichen tenuissimus* Dicks. Crypt. fasc. i. (1785) t. 2. f. 8; With. Arr. ed. 3, iv. p. 61; Eng. Bot. t. 1427.—*Brit. Exs.*: Mudd, n. 4.

Well distinguished by the external character of the thallus from the allied species of the subgenus, and by the internal structure from states of *L. lacerum* var. *pulvinatum*, which it resembles. The apothecia, usually sparingly present, have the margin sometimes slightly connivent, and are often comparatively large and deeply urceolate.

Hab. On the ground among mosses and short grass in maritime and upland districts.—*Distr.* Sparingly here and there throughout England, very rare in Scotland and Ireland.—B. M.: Near Norwich, Yarmouth, Norfolk; Reigate Hill, Surrey; Hastings and Twineham, Sussex; Sandown, Isle of Wight; near Penzance, Cornwall; Snowdon, Carnarvon; near Easby, Cleveland, Yorkshire. New Galloway, Kirkcudbrightshire; near Cramond, Edinburgh; Appin, Argyshire; Ben Lawers, Perthshire. Middleton, co. Cork.

3. *L. humosum* Nyl. Mém. Soc. Cherb. v. (1857) p. 90; Syn. i. (1858) p. 119.—Thallus effuse, thinnish, consisting of lobulate granules closely aggregate (with larger lobules here and there intermixed), brown or brownish-black. Apothecia small, somewhat

concave, concolorous ; spores 4-Snæ, plurilocular or variously septate, ovoid or oblongo-ovoid, 0,020-34 mm. long, 0,008-16 mm. thick.—Cromb. Journ. Bot. 1885, p. 195.—To this Nylander (*in litt.*) refers *Leptogium tetrasporum* Fr. fil. Vet. Ak. Förh. 1864, p. 276.

As observed by Nylander, *l. c.*, this has externally the appearance of *Lecidea uliginosa* Ach., from which it is far removed by the structure of the thallus and apothecia. It is near the preceding species, from which it is distinguished by the less-developed thallus and the smaller concolorous apothecia. In the British specimens the apothecia are few, with the spores usually 4næ, ovoid, 0,027-34 mm. long, 0,013-16 mm. thick.

Hab. On mortar of walls in a maritime district.—*Distr.* Rare in the Channel Islands.—B. M. : Port Gorey, Island of Sark.

4. *L. pusillum* Nyl. Mém. Soc. Cherb. v. (1857) p. 90 ; Syn. i. p. 121.—Thallus very minute, lobulato-granulose, thin, adnate, olive- or greenish-brown. Apothecia minute, concave, elevated, reddish, prominent in the thalline exciple, the margin of which is concolorous with the epithecium ; spores ovoid or narrowed at either apex, 3-4-septate, 0,018-26 mm. long, 0,008-10 mm. thick.—Cromb. Lich. Brit. p. 7 ; Leight. Lich. Fl. p. 30, ed. 3, p. 27.—*Brit. Ess.* : Larb. Cæsar. n. 54.

An inconspicuous plant, apt to be overlooked. Scarcely any of the gonimia are moniliform. The British specimens are usually little developed and more or less effuse (form *effusum* Nyl.). The apothecia are very small and somewhat scattered.

Hab. On mortar of old walls in maritime districts.—*Distr.* Local and rare in the Channel Islands and in S. and W. England.—B. M. : St. Brelade's Bay, Island of Jersey ; St. Peter's Port, Island of Guernsey. Shiere, Surrey ; Freshford, near Bath, Somersetshire ; Kemble, Gloucestershire.

5. *L. subtile* Nyl. Mém. Soc. Cherb. v. (1857) p. 90 ; Syn. i. p. 121.—Thallus effuse, very minutely divided, somewhat laciniato-dissect or granuloso-crenate, dark- or brownish-green. Apothecia minute, gyalectoid, pale-brown or reddish, the margin thin, entire, subconcolorous ; spores ovoid, 3-5-septate, with longitudinal septules, 0,020-23 mm. long, 0,008-10 mm. thick.—Mudd, Man. p. 46, t. 1. f. 8 ; Cromb. Lich. Brit. p. 8 ; Leight. Lich. Fl. p. 31, ed. 3, p. 29.—*Collema subtile* Sm. Eng. Fl. v. p. 213 ; Tayl. in Mack. Fl. Hib. ii. p. 111.—*Polychidium subtile* Gray, Nat. Arr. i. p. 401.—*Lichen subtilis* Schrad. Spic. (1794) p. 95 ; Dicks. Crypt. fasc. iv. p. 28 ; Eng. Bot. t. 1008.

The more distinctly lacinate thallus when fully developed, and the much smaller and thinly margined apothecia, distinguish this from *L. tenuissimum*, with which it agrees in its entirely cellular structure. The spores also are smaller, with fewer loculi. The apothecia are generally numerous and somewhat crowded.

Hab. On cretaceous rocks, on the ground, rarely on the roots of old trees, in upland districts.—*Distr.* Pretty general, though not very common, in S. and W. England ; rare in the Channel Islands, N. England,

the S.W. and Central Highlands of Scotland, and S.W. Ireland.—B. M. : The Grove, Island of Jersey. Near Hale End, Epping Forest, Essex; Shiere, Surrey; Folkestone, Kent; West Downs and Henfield, Sussex; Shanklin, Luccombe, and Bonchurch, Isle of Wight; near Withiel, Cornwall; Clevedon, Somersetshire; near Wootton-under-Edge, Gloucestershire; Colwall, Herefordshire; near Ayton, Cleveland, Yorkshire. Island of Lismore, Argyleshire; Clova, Forfarshire. Dunkerron, co. Kerry.

6. *L. amphineum* Nyl. Lich. Scand. (1861) p. 32.—Thallus adnate, very thin, or suberustaceous, unequal, olive or brownish-green. Apothecia small, concave, dark-reddish, the margin thickish; spores ellipsoid or ellipsoideo-ovoid, 3-septate and variously divided, 0,023–0,027 mm. long, 0,009–0,011 mm. thick.—Cromb. Journ. Bot. 1874, p. 133; Leight. Lich. Fl. ed. 3, p. 29.—*Collema amphineum* Ach. ex Nyl. l. c.

Differs from *L. humosum* in the more continuous and equal thallus, and in the structure of the spores, and from *L. subtile*, of which it seems a subspecies (Grevillea, xv. p. 12), in the more crustaceous thallus and larger spores. The plant spreads thinly over the substratum, and with us is sparingly fertile.

Hab. On the ground, rarely on roots of old trees, in shady places in maritime and upland tracts.—*Distr.* Found only sparingly in S. and W. England.—B. M. : Henfield, Sussex; Newlyn Cliff, Penzance, Cornwall; Stroud, Gloucestershire; Newbury, Worcestershire.

7. *L. minutissimum* Fr. Sum. Veg. (1846) p. 122; Kierb. Par. (1865) p. 423.—Thallus thinly membranaceous, minutely lobed, smooth, olive-green or leaden-brown; lobes imbricate, inciso-crenate at the margins. Apothecia minute, concave, reddish-brown, the margin thin, entire, or sometimes at length subcrenulate; spores oblongo-ovoid, irregularly murali-locular, large, 0,024–0,030 mm. long, 0,009–0,015 mm. thick.—*Collema minutissimum* Flörke, Deutsch. Lich. (1815) n. 99. *Leptogium lacerum* var. *crenatum* Nyl., ex Carroll, Journ. Bot. 1866, p. 22. *Leptogium subtile* f. *latiusculum* Nyl. ex Josh. Grevillea, iv. p. 43; Leight. Lich. Fl. ed. 3, p. 29. *Leptogium sinuatum* var. *crenulatum* Cromb. Journ. Bot. 1874, p. 336; Leight. Lich. Fl. ed. 3, p. 40. *Leptogium fragrans* Mudd, Man. p. 46; Leight. Lich. Fl. p. 30, pro parte. *Collema fragrans* Tayl. in Mack. Fl. Hib. ii. p. 107.—*Brit. Ees.*: Cromb. n. 107.

This species, little understood by British authors, looks like a diminutive state of *L. lacerum*, though at once separated by the texture of the thallus. From the closely allied *L. subtile* it is distinguished by the more developed thallus and the larger spores. The apothecia, which are numerous and crowded, are gyalectiform and superficial.

Hab. On the ground, rarely on trunks of old trees, in upland districts.—*Distr.* Local and rather scarce in S., W., and N. England, rare in S. Ireland.—B. M. : Halstead, Kent; Butler's Holt, Buckinghamshire; near Cirencester, Gloucestershire; near Ayton, Cleveland, Yorkshire. Bantry, co. Cork.

8. *L. cretaceum* Nyl. Act. Linn. Soc. Bord. sér. 3, i. (1857) p. 270; Syn. i. p. 120.—Thallus rosulato-lobulate or stellato-laciniate, olive-brown or dark-olive; the lobes unequal, crenate, almost imbricate. Apothecia small, nearly biatorine, concave or gyalectiform, pale reddish-brown, the margin entire, paler; spores ovoid, 3-7-septate, with longitudinal septa, 0.022-40 mm. long, 0.011-17 mm. thick.—Mudd, Man. p. 45; Cromb. Lich. Brit. p. 7; Leight. Lich. Fl. p. 32, ed. 3, p. 27.—*Enchylium cretaceum* Gray, Nat. Arr. i. p. 398. *Collema cretaceum* Sm. Eng. Fl. v. p. 210. *Lichen cretaceus* Eng. Bot. (1800) t. 738.

This plant appears at first as minute, very thin, olive or dark *stella*, somewhat immersed and distinct. These become more prominent, approximate and confluent, till it attains the perfect state. It is occasionally seen in an isidiomorphous condition. The gonimia are rarely moniliform. The apothecia, seen only in the best developed specimens, are small in the scattered, and moderate in the confluent *rosule*.

Hab. On cretaceous and siliceous nodules in moist shady places in upland tracts.—*Distr.* Confined to the Chalk and Oolite districts of S. and W. England; probably in its young state often overlooked.—B. M.: Near Folkestone, Kent; Plumpton and West Dean, Sussex; Reigate Hill, Surrey; Isle of Wight; Brighton Downs, Sussex; near Northleach, Gloucestershire; Stokesay, Shropshire.

9. *L. microscopicum* Nyl. Bull. Soc. Bot. Fr. iv. (1857) p. 920; Syn. i. p. 122, t. 4. f. 17.—Thallus effuse, very minute, fruticulose, erect, branched, olive-brown, dark-brown or blackish; branches slender, elongato-papillate, unequally rounded, somewhat constricted or attenuate at the base. Apothecia very minute, scattered, concave, pale brown or brownish-red, the margin smooth, entire; spores ovoid or oblong, 3-5-septate, and murali-locular, 0.022-27 mm. long, 0.009-14 mm. thick.—Cromb. Journ. Bot. 1874, p. 336; Leight. Lich. Fl. Suppl. p. 468, ed. 3, p. 34.—*Brit. Exs.*: Cromb. n. 7.

In its earlier stages of growth this has the appearance of a *Sirosophon*. The thallus is cellular, and the gonimia are often 3-moniliform. Though resembling a minute state of *L. lophæum*, it is distinguished by its peculiar habit and the form of the spores. It is very rarely fertile. On the thallus is occasionally seen a parasitic *Obrizum* described hereafter.

Hab. On slaty rocks, but chiefly on chalk pebbles and calcareous walls,

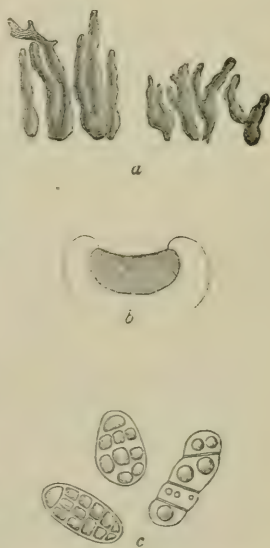


Fig. 17.

Leptogium microscopicum Nyl.
—a. Thallus, $\times 30$. b. Section of apothecium, $\times 30$.
c. Three spores, $\times 500$.

sometimes also on the trunks of old trees (willow and ash) in maritime and upland districts.—*Distr.* Local, though common where it occurs, in the Channel Islands, S. and W. England, and S.W. Highlands, Scotland.—B. M.: Rozel and coast of the Island of Jersey. Shiere, Surrey (in fruit); near Maidstone, Kent: near Lewes, Sussex: Cheddar Cliffs, near Porloch and Yatton, Somersetshire: Weston-super-Mare (in fruit), Brinscomb, and near Cirencester, Gloucestershire: Malvern and Aston, Worcestershire: Blaxton, Yorkshire; Eden, Westmoreland. Barcaldine, Argyleshire.

10. *L. placodiellum* Nyl. Flora, 1865, p. 210.—Thallus small, somewhat firm, adnate, granulate or granulo-areolate, placodioid-radiate at the circumference, olive or dark-olive, the radii and granules convex. Apothecia not seen rightly developed.—Cromb. Journ. Bot. 1882, p. 272.—*Leptogium diffractum* Kremp. Flora, 1861, p. 258, is a prior name, but had previously been given to a species of *Collema*.

This resembles a small condition of *Collemodium fragile*, but it is readily distinguished from this and allied species by its placodioid appearance. In one British specimen young apothecia are sparingly present.

Hab. On calcareous rocks in upland hilly districts.—*Distr.* Extremely local and scarce, in W. England.—B. M.: Cleeve Hill, Somersetshire.

11. *L. muscicola* Fr. Sum. Veg. (1846) p. 122.—Thallus pulvinate, filamentoso-fruticulose, rounded or slightly compressed, dark-brown or olive-black: branches minute, cylindrical, suberect or decumbent, intricate, somewhat obtuse at the apices. Apothecia subterminal, moderate, appressed, brownish-red, the margin thin, entire, pale; spores 1-septate (bilocular), oblongo-fusiform, 0.023–27 mm. long, 0.007 mm. thick.—Nyl. Syn. i. p. 134, t. iv. ff. 11–15: Cromb. Lich. Brit. p. 10: Leight. Lich. Fl. p. 27, ed. 3, p. 34.—*Polychidium muscicola* Gray, Nat. Arr. i. p. 402; Mudd, Man. p. 49, t. i. f. 9. *Collema muscicola* Hook. Fl. Scot. ii. p. 72; Sm. Eng. Fl. v. p. 214; Tayl. in Mack. Fl. Hib. ii. p. 111. *Lichen muscicola* Sw. N. Act. Ups. iv. (1784) p. 248: Dicks. Crypt. fasc. ii. t. 6. f. 9; With. Arr. ed. 3, iv. p. 46; Engl. Bot. t. 2264.—*Brit. Ears.*: Leight. n. 395; Larb. Lich. Hb. n. 122.

This plant is unlike any of the *Collemai*, resembling when dry and sterile some young and paler state of *Parmelia lanata*. The thallus is composed of somewhat large elongate cells, which become smaller and subangular at the surface, the gonimic granules, which are scanty, being here and there aggregate in the cells. The branches, which are rigid when dry, are numerous and intricate, the lower ones sometimes anastomosing. The apothecia are horizontal, very much broader than the branches, while occasionally one is common to two or three of the branches.

Hab. Among mosses on rocks and walls, in maritime, upland, and subalpine districts.—*Distr.* General and not uncommon in mountainous regions, chiefly of W. Britain, rare in the Channel Islands, and in E. and W. Ireland.—B. M.: Quenvais, Island of Jersey. South Brent, Botor Rock, and near Hunter Tor, Devonshire: Cader Idris, Drews-y-nant and Ty Gwyn, near Dolgelly, Merionethshire: Llanberis Pass and Snowden,

Carnarvonshire; Beaumaris, Island of Anglesea; near Oswestry, Shropshire; Teesdale, Durham; Kentmere, Westmoreland. New Galloway, Kirkcudbrightshire; Ben Cruachan and Loch Creran, Argyleshire; Ben Lawers and near St. Fillans, Perthshire; Craig Guie, Braemar, Aberdeenshire. Luggelaw, co. Wicklow; Killarney, co. Kerry; Kylemore, co. Galway.

Subgen. 2. EULEPTOGIUM Croub. Journ. Bot. 1874, p. 133.—Thallus more or less foliaceo-membranaceous, cellulari-corticate on both surfaces; internally with entangled tubular cavities; gonimia moniliform. Apothecia lecanorine; spores variously divided.

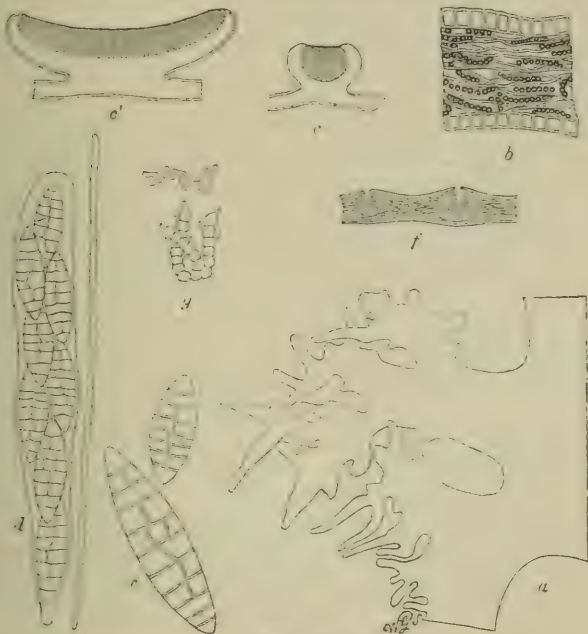


Fig. 18.

Leptogium lacerum Fr.—a. Fragment of a thalline lacinia showing the fimbriature, $\times 30$. b. Texture of section of the thallus, $\times 200$. c. Section of a young apothecium in dry state, $\times 30$, and c', the same of an older apothecium. d. Theca with a paraphysis, $\times 350$. e. Spores, $\times 500$. f. Section of thallus (moistened) with two spermogones, $\times 30$. g. Sterigmata and spermatia, $\times 500$.

12. *L. lacerum* Gray, Nat. Arr. i. (1821) p. 401.—Thallus thin, lacero-laciniate, longitudinally rugulose, olive-brown or leaden; laciniae subimbricate, subascending, crisp and ciliato-dentate at the margins. Apothecia small, scattered, concave, brownish- or pale-red, the thalline margin thickish, entire; spores ovoid, or narrowed at either apex, irregularly murali-locular, 0.034–48 mm. long, 0.010–16 mm. thick.—Nyl. Syn. i. p. 122, t. ii. f. 6; Mudd, Man.

p. 47; Cromb. Lich. Brit. p. 8; Leight. Lich. Fl. p. 32, ed. 3, p. 28.—*Collema acerum* Hook. Fl. Scot. ii. p. 72; Sm. Eng. Fl. v. p. 213; Tayl. in Mack. Fl. Hib. ii. p. 111. *Lichen lacerus* Sw. in Ach. Prodr. (1798) p. 113. *Lichen lacer* Eng. Bot. t. 1982. *Lichen tremella* With. Arr. ed. 3, iv. p. 72. *Lichen tremelloides* Lightf. Fl. Scot. ii. p. 842; Huds. Fl. Angl. ed. 2, p. 537. *Lichenoides pellucidum, endiviæ foliis tenuibus crispis* Dill. Musc. 143, t. 19. f. 31 A, B. *Lichenoides saxatile tenue rufescens* Dill. in Ray, Syn. ed. 3, 77. 89.—*Brit. Exs.*: Mudd, n. 5, pro parte; Larb. Cæsar. n. 4.

Easily recognized by the thallus and laciniae. The thallus is more or less effuse, often interrupted by fresh growths of the living mosses upon which it is developed; in a moist condition it is very delicate and subpellucid. The apothecia, which are rather rare in British specimens, are sparingly and irregularly scattered.

Hab. Among mosses on the ground and old walls in shady places in maritime and upland districts.—*Distr.* Pretty general, but not very common, in the Channel Islands and most parts of Great Britain and Ireland.—B. M.: Quenvais, Island of Jersey. Near Cambridge; Shiere, Surrey; Ventnor, Isle of Wight; Buckfastleigh and Morleigh, Devonshire; Penzance and near Withiel, Cornwall; Cheddar Cliffs, Somersetshire; near Cirencester, Gloucestershire; Seddington, Bedfordshire; Charnwood Forest, Leicestershire; Broadwas and Alrice, Worcestershire; Garn Dingle, Denbighshire; Cotteral Clough, Lancashire; near Kendal, Westmoreland; Mulgrave Castle, Cleveland, Yorkshire; Keswick, Cumberland. Near Moffat, Dumfriesshire; Barcaldine, Argyshire; Killin and the Ochills, Perthshire; Glen Dole, Forfarshire; Corriemulzie, Braemar, Aberdeenshire; Lochaber, Inverness-shire. Blarney and Kilworth, co. Cork; Killarney and Dingle Bay, co. Kerry; Connemara, co. Galway.

Form *fimbriatum* Nyl. Syn. i. (1858) p. 122.—Thallus larger; laciniae broader, densely fimbriate and ciliate at the margins, the ciliae very much branched. Apothecia much scattered.—Cromb. Journ. Bot. 1874, p. 335; Leight. Lich. Fl. Suppl. p. 468, ed. 2, p. 28.—*Collema fimbriatum* Hoffm. Deutsch. Fl. (1795) p. 104. *Lichenoides pellucidum, endiviæ foliis tenuibus crispis* Dill. Musc. 143, t. 19. f. 31 c.—*Brit. Exs.*: Cromb. n. 108; Mudd, n. 5, pro parte.

From the type this differs chiefly in the densely fimbriate-ciliate margins of the laciniae, though both states occasionally occur in the same specimen. With us, as elsewhere, it is rarely seen fertile.

Hab. Among mosses on rocks and old walls, chiefly in upland tracts.—*Distr.* Seen only in S., W., and N. England, in S. Scotland, and the W. Highlands.—B. M.: Luccombe, Isle of Wight; near Totness and Tavistock, Devonshire; Cheddar Cliffs, Somersetshire; Chalford and near Cirencester, Gloucestershire; Broadwas, Worcestershire; Barmouth, Merionethshire; Cleveland, Yorkshire. New Galloway, Kirkcudbrightshire; Barcaldine and Inverary, Argyshire; Killin, Perthshire; S. of Fort William, Inverness-shire.

Subsp. 1. *L. pulvinatum* Nyl. Flora, 1878, p. 345.—Thallus small, pulvinate, dark-brown; lobes minute, much crowded, denticulate-

laciniate. Apothecia small, somewhat rare.—Cromb. Journ. Linn. Soc., Bot. xvii. p. 567.—*Leptogium lacerum* β . *pulvinatum* Mudd, Man. p. 47; Cromb. Lich. Brit. p. 8; Leight. Lich. Fl. p. 33, ed. 3, p. 28. *Collema pulvinatum* Hoffm. Deutsch. Fl. (1795) p. 104. *Lichen tremelloides* γ Lightf. Fl. Scot. ii. p. 842; With. Arr. ed. 3, iv. p. 73. *Lichenoides tenue crispum*, *foliis exiguis surrectis* Dill. Muse. 146, t. 19. f. 34 A, et *Lichenoides tenue crispum et veluti aculeatum* p. 146, t. 19. f. 35.—*Brit. Eas.*: Larb. Cæsar. n. 55; Lich. Hb. n. 241.

This, which might almost be regarded as a distinct species, is distinguished by the minute, crowded, denticulate lacinae; it forms pulvinate tufts which are either determinate or somewhat spreading. The apothecia, which are seldom seen, are chiefly central.

Hab. On rocks and old walls, occasionally on the ground, among mosses in upland and subalpine tracts.—*Distr.* Frequent in the Channel Islands, Great Britain and Ireland, usually plentiful where it occurs.—B. M.: Quenvais, Island of Jersey. Cromer, Norfolk; Epping Forest, Essex; Shere, Surrey; Bonchurch and Luccombe, Isle of Wight; near Plymouth, Devonshire; Bathampton Downs, Somersetshire; Chalford and near Cirencester, Gloucestershire; Malvern Hills, Broadwas, and Alfric, Worcestershire; Twycross, Leicestershire; Aberdovey, Merionethshire; Clee Hills, Shropshire; Kildale, Cleveland, Yorkshire; Stavely, Westmoreland; Alston, Cumberland. Appin, Argyshire; Killin and Ben Lawers, Perthshire; S. of Fort William, Inverness-shire. Inchigargin, co. Cork; near Armagh, co. Antrim.

Subsp. 2. *L. lophæum* Nyl. ex Cromb. Grevillea, xv. (1886) p. 13.—Thallus very small, pulvinate, greenish-black; lobes minute, very much crowded, ciliato-dissect or ramoso-fimbriate, the branchlets cylindrical. Apothecia unknown.—*Leptogium lacerum* var. *lophæum* Cromb. Lich. Brit. p. 8; Leight. Lich. Fl. p. 34, ed. 3, p. 29. *Parmelia scotina* γ . *lophæa* Ach. Meth. (1803) p. 238.

Probably a distinct species, differing from the preceding subspecies in the cylindrical branches and smaller thallus, which is composed of minute, irregularly laciniate and ramulose denticulate lobes. With us, as elsewhere, it is sterile.

Hab. On decaying stumps of old trees in maritime tracts.—*Distr.* Found but sparingly in N. Wales and in the W. Highlands of Scotland.—B. M.: Barmouth, Merionethshire. Barcaldine, Argyshire.

13. *L. scotinum* Fr. Sum. Veg. (1846) p. 122; Nyl. Syn. i. (1858) p. 123.—Thallus laciniato-lobed, plicate, reticulato-rugulose, dark glaucous-green or brownish lead-coloured; lobes rounded, somewhat crowded, suberect and entire at the margins. Apothecia small, concave, brownish-red, the margin smooth, elevated; spores ovoid, irregularly murali-locular, 0.024–41 mm. long. 0.008–0.016 mm. thick.—Cromb. Lich. Brit. p. 8, pro parte.—*Leptogium sinuatum* Mudd, Man. p. 47, pro parte; Leight. Lich. Fl. p. 37, pro parte, ed. 3, p. 39, pro parte. *Lichen scotinus* Ach. Prodr. (1798) p. 128.—*Brit. Eas.*: Mudd, n. 6, pro parte; Cromb. n. 109, pro parte.

In anatomical structure similar to the preceding species. Externally at once distinguished by the rounded lobes of the thallus, with the margins entire, or occasionally obsoletely and sparingly crenate. The apothecia are usually numerous, and must not be confounded in their younger condition with the spermatogones.

Hab. Among mosses on old walls and boulders, chiefly in maritime and upland tracts.—*Distr.* General and common where it occurs in most of the hilly tracts of Great Britain; not seen from Ireland.—B. M.: Hoyle Sands, near Penzance, Cornwall; Chew Magna, Somersetshire; near Cirencester, Gloucestershire; Buxton, Derbyshire; Garn, Denbighshire; Lake Ogwen and Capel Curig, Carnarvonshire; High Force Inn, Teesdale, and near Stanhope, Durham; Whitehaven, Cumberland; by the Kent, Westmoreland. Appin and island of Lismore, Argyshire; Killin, Ben Lawers, and Blair Athole, Perthshire; Morrone, Braemar, Aberdeenshire.

Var. β . *sinuatum* Malbr. Bull. Soc. Nat. Rouen, 1866, p. 365.—Thallus smaller, lobes sinuato-incised, lacinate, crisp, the margins depressed, crenate and denticulate; otherwise as in the type.—*Leptogium sinuatum* Mudd, Man. p. 47, pro parte; Leight. Lich. Fl. p. 37, pro parte, ed. 3, p. 39, pro parte; Cromb. Grevillea, xv. p. 17, pro parte. *Collema sinuatum* Sm. Eng. Fl. v. p. 213; Tayl. in Mack. Fl. Hib. ii. p. 110. *Lathagrium sinuatum* Gray, Nat. Arr. i. p. 400. *Lichen sinuatus* Huds. Fl. Angl. ed. 2 (1778), p. 535; With. Arr. ed. 3, iv. p. 75; Eng. Bot. t. 772. *Lichen tremelloides* γ Lightf. Fl. Scot. ii. p. 842. *Lichenoides tenui crispum, foliis parvis depressis* Dill. Muse. 145, t. 19. f. 33.—*Brit. Ers.*: Mudd, n. 6, pro parte; Cromb. n. 109, pro parte.

This has been confounded with the type, though it presents distinctive characters. The smaller thallus, the form of the lobes, and their denticulate-crenate margins probably entitle it to rank as a subspecies. It is often sterile; the apothecia are numerous when present.

Hab. On earth-covered mossy walls and rocks in maritime and upland districts.—*Distr.* Not very general nor common in Great Britain, chiefly in the W.; rare in S. and W. Ireland.—B. M.: Caistor, Norfolk; Storrington, Sussex; near St. Lawrence, Isle of Wight; Chagford, Devonshire; Garn, Denbighshire; Pentregaer, Oswestry, Shropshire; Wear-dale and near Stanhope, Durham. Appin, Argyshire; Bowling; Dumbartonshire; Killin, Perthshire; near Forbes, Elgin. Blarney, co. Cork; Dunkerron, co. Kerry.

Form *Polinieri* Cromb. Journ. Bot. 1874, p. 336.—Thallus pale greenish. Apothecia somewhat scattered; otherwise as in the type.—Leight. Lich. Fl. ed. 3, p. 30.—*Collema Polinieri* Del. ex Nyl. Syn. i. (1858) p. 123.

Distinguished by the bright green colour of the thallus, which is persistent both in a moist and dry condition. The apothecia also are paler and not very numerous.

Hab. Among mosses on shady walls, rarely on rocks, in upland situations.—*Distr.* Very local and scarce in S. England, N. Wales, the S.W. Highlands of Scotland, and in S. Ireland. B. M.: Henfield, Sussex; Garn, Denbighshire. Appin, Argyshire. Blarney, co. Cork; Blackwater Bridge, co. Kerry.

Var. *γ. crenatum* Nyl. Flora, 1875, p. 106.—Thallus small, smooth or subsmooth; lobes short, crowded, somewhat crenato-incised at the margins. Apothecia small, scattered.—Cromb. Grevillea, xv. p. 13.

A marked variety, at once distinguished by the entirely smooth thallus, only a few lobes here and there being slightly rugulose. Its small crowded lobes suggest *L. pulvinatum*. In the only fertile specimen seen, the apothecia are but few.

Hab. On the ground among schistose rocks in subalpine localities.—*Distr.* Extremely local and scarce among the S. Grampians of Scotland.—B. M.: Craig Vore and Ben Lawers, Perthshire.

14. *L. palmatum* Mont. Pl. Cell. (1840) p. 128, in Webb & Berth. Canar.—Thallus laciniate, thin, greenish- or glaucous-brown; laciniae sublinear, suberect, corniculato-convolute. Apothecia small, sessile, pale-red, the thalline margin elevated, entire, concolorous; spores ellipsoid or attenuate at the apices, variously septate and divided (irregularly murali-ocular), 0.028–40 mm. long, 0.016–18 mm. thick.—Nyl. Syn. i. p. 126; Mudd, Man. p. 48; Cromb. Lich. Brit. p. 9; Leight. Lich. Fl. p. 34, ed. 3, p. 31.—*Collema palmatum* Sm. Eng. Fl. v. p. 210. *Scytinium palmatum* Gray, Nat. Arr. i. p. 398. *Lichen palmatus* Huds. Fl. Angl. ed. 2 (1778), p. 536; With. Arr. ed. 3, iv. p. 74; Eng. Bot. t. 1635. *Lichenoides pellucidum fuscum corniculatum* Dill. Musc. 143, t. 19. f. 30. *Lichenoides gelatinosum tenerius laciniatum ex fusco purpurascens* Dill. in Ray, Syn. ed. 3, 72. 54.

The thallus is caespitose, moderate or small, often tinged purplish, and rather brittle when dry. It somewhat resembles var. *β* of the preceding in the herbarium, but is distinguished by its nearly erect laciniae, revolute at the margins. The apothecia are rare, and are but few when present. On the thallus is sometimes found the parasitic *Obryzum corniculatum*.

Hab. Among mosses and short grass in sandy and gravelly places in maritime and upland tracts.—*Distr.* General in the Channel Islands and England, rare in Scotland and Ireland.—B. M.: St. Brelade's Bay, Island of Jersey; Island of Herm. Yarmouth, Norfolk; Hale End, Epping Forest, Essex; near Stony Cross, New Forest, Hants; Swanage, Dorsetshire; Lustleigh Cleeve, Botorr Rock, and near Okehampton, Devonshire; Hales End, near Malvern, Worcestershire; Coatham, Cleveland, Yorkshire. Sands of Barrie, Forfarshire; Castleton of Braemar, Aberdeenshire. Luggelaw, co. Wicklow.

15. *L. tremelloides* Gray, Nat. Arr. i. (1821) p. 400.—Thallus lobed, thin, somewhat smooth, dull olive-green or glaucous leaden-coloured; lobes oblong, imbricate or crisp, entire at the margins. Apothecia moderate, urceolate or plane, reddish or pale-red, the margin thick, entire; spores ovoid, or often ellipsoid, narrowed at either apex, 3-septate, irregularly murali-ocular, 0.021–27 mm. long, 0.008–9 mm. thick.—Nyl. Syn. i. p. 124, t. ii. f. 7; Mudd, Man. p. 48; Cromb. Lich. Brit. p. 8; Leight. Lich. Fl. p. 28,

ed. 3, p. 31.—*Collema tremelloides* Hook. Fl. Scot. ii. p. 72; Sm. Eng. Fl. v. p. 213; Tayl. in Mack. Fl. Hib. ii. p. 111. *Lichen tremelloides* Linn. fil. Suppl. Pl. (1781) p. 450; Eng. Bot. t. 1981. *Lichen cochleatus*, Dicks. Crypt. fasc. i. (1785) t. 2. f. 9; With. Arr. ed. 3, iv. p. 74.—*Brit. Exs.*: Cromb. n. 110; Larb. Lich. Hb. n. 3.

Differs from *L. lacerum* in the larger smoothish thallus, leaden-coloured when dry, in the more rounded lobes with entire margins, and in the elevated, larger apothecia. The cortical layer is formed of rather large angular cells. Sparingly fertile in S.W. England and W. Ireland.

Hab. Among mosses on moist rocks in maritime and mountainous districts.—*Distr.* General, and usually plentiful in the Channel Islands, S. and W. Britain, and E. and S.W. Ireland.—B. M.: St. Peter's Valley, Island of Jersey. St. Lawrence, Isle of Wight; near Brixham, Saltash, Haberton, Conworthy, Wembury, and Totness, S. Devon; St. Issey and near Penzance, Cornwall; Tenby, Pembrokeshire; Barmouth and Harlech Castle, Merionethshire; Garn, Denbighshire; Llanberis Pass, Carnarvonshire; Island of Anglesea. Dumbarton Castle, Dumbartonshire; Appin and Island of Mull, Argyleshire. Dunkerron Mt., Blackwater, and Killarney, co. Kerry; Kylemore and Doughbraugh Mts., co. Galway.

Form *polyphyllum* Nyl. ex Leight. Lich. Fl. ed. 3 (1879), p. 32. —Thalline lobes smaller, more divided and complicated, naked or isidiiferous.

The thallus of this polyphyllous form when densely covered with isidia, as it usually is, is form *pichneum* (Ach. Syn. p. 343), Cromb. Grevillea, xv. p. 13. Not seen fertile.

Hab. On damp rocks among mosses in maritime districts.—*Distr.* Local and scarce in S. England, the S.W. Highlands of Scotland, and N.W. Ireland.—B. M.: Near Torquay, S. Devon. Island of Mull, Argyleshire. Near Kylemore, Connemara, co. Galway.

Subgen. 3. STEPHANOPHORUS Flot. Linnæa, 1843, p. 16.—Thallus crowdedly plicatulate; apothecia with the thalline receptacle plicato-rugose.

16. *L. ruginosum* Nyl. ex Cromb. Grevillea, xv. (1886) p. 13.—Thallus membranaceous, roundly lobed, plicate, longitudinally and crowdedly rugose, brownish- or greenish-lead-coloured, brownish-black-furfuraceous on the upper surface; lobes complicate, undulate, the margins entire or crenulate. Apothecia somewhat large, slightly concave or plane, red or brownish-red, the thalline margin thick, rugoso-plicate or furfuraceo-granulate; spores ellipsoid or attenuate at both apices, 3-5-septate, and also sometimes longitudinally divided, 0,020-37 mm. long, 0,010-17 mm. thick.—*Collema ruginosum* Duf. in Schær. Enum. (1850) p. 251. *Leptogium chloromelum* Mudd (non Nyl.), Man. p. 48; Carroll, Journ. Bot. 1867, p. 254; Cromb. Lich. Brit. p. 9; Leight. Lich. Fl. p. 32, ed. 3, p. 32.

This can scarcely, even in an infertile state, be mistaken for any other British plant. It has sometimes been confounded with two exotic

species, viz. *L. Brebissonii* Mont., and *L. chloromelum* Nyl.; but it is quite distinct from both. According to Nyl. (*in litt.*), *L. Brebissonii* has the thallus less plicatulo-corrugate, and is moreover whitish- or greyish-downy beneath; while *L. chloromelum* (an American species) has the thallus and receptacle less corrugate, the latter being subsmooth. The specimens found in this country are sterile.

Hab. On the trunks of old trees and on rocks among mosses in maritime and mountainous districts.—*Distr.* Sparingly in N. Wales and S.W. Ireland.—B. M.: Garth, near Dolgelly and Barmouth, Merionethshire. Eagle's Nest and Dinish, Killarney, co. Kerry.

Subgen. 4. MALLOTIUM Ach. Lich. Univ. (1810) p. 644.—Thallus membranaceo-lobed, cellulari-corticate above, tomentose beneath; gonimia moniliform. Apothecia lecanorine; spores subellipsoid, murali-divided.

17. *L. saturninum* Nyl. Syn. i. (1858) p. 127.—Thallus large, sub-monophyllous and lobato-incised, or polyphyllous and sinuato-lobed, rounded and entire at the margins, olive- or leaden-brown, above smooth or slightly furfuraceous, beneath greyish and densely tomentose.

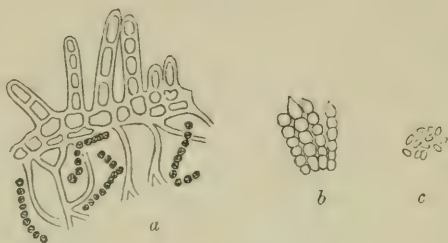


Fig. 19.

Leptogium saturninum Nyl.—a. Vertical section of a superficial portion of the tomentose thallus, $\times 275$. b. Sterigmata, and c. spermatia, $\times 275$.

Apothecia moderate, plane, reddish-brown, thalline receptacle cupular and somewhat prominent, margin thin, entire; spores ellipsoid, 3-septate, becoming irregularly murali-multilocular, 0.020–0.22 mm. long, 0.010–0.11 mm. thick.—Cromb. Lich. Brit. p. 9; Leight. Lich. Fl. p. 29, ed. 3, p. 32.—*Mallotium saturninum* Gray, Nat. Arr. i. p. 399; Mudd, Man. p. 44. *Collema saturninum* Hook. Fl. Scot. ii. p. 71; Sm. Eng. Fl. v. p. 211. *Lichen saturninus* Dicks. Crypt. fasc. ii. (1790) p. 21, t. 6. f. 8; With. Arr. ed. 3, iv. p. 60; Eng. Bot. t. 1980.—*Brit. Eas.*: Cromb. n. 5; Dicks. Hort. Sic. n. 24.

Though elsewhere a large plant, spreading extensively with firm thallus, with us it is smaller, thinner, and less polyphyllous. In damp shady situations it often becomes blackish above when dry, contrasting with the colour of the under surface. When smaller and furfuraceous it resembles *Collema flaccidum*, from which it may always be recognized by the minutely cellular cortical layer, and by the whitish down of the under surface. The apothecia are very rare in Britain.

Hab. On the trunks of old trees, generally ash, by streams in upland mountainous districts.—*Distr.* Local and scarce in the S. and W. High-

lands, Scotland.—B. M.: Inverary and Appin, Argyleshire; Glen Lochay, Glen Lyon, Fortingall, Loch Earn, and Craighall, Perthshire; Clova, Forfarshire; Lochaber, Inverness-shire.

18. *L. Hildenbrandii* Nyl. Syn. i. (1858) p. 127.—Thallus small or moderate, monophyllous, nearly orbicular, somewhat lobed and undulate, opaque, slightly rugulose, brownish-green or leaden-brown, beneath greyish-white, with somewhat long, fasciculate rhizinae. Apothecia moderate, plane or convex, the thalline margin entire: spores ellipsoid, 3-septate, becoming irregularly murali-multilocular, 0.016–24 mm. long, 0.09–11 mm. thick.—Cromb. Journ. Bot. 1874. p. 336.—*Collema Hildenbrandii* Garov. Lich. It. (1837) n. 1. *Lichen saturninus* Sm. Trans. Linn. Soc. i. (1791) p. 84.

Distinguished from *L. saturninum*, to which it is closely allied, by being more monophyllous, usually smaller, and especially by being fibrilloso-rhizinose on the under surface. In the few British specimens the thallus is rather small, and the apothecia are few and scattered.

Hab. On the trunks of old trees by streams, in upland mountainous districts.—*Distr.* Only in N. England and the S. Grampians of Scotland.—B. M.: Teesdale, Durham. Glenample and Craighall, Perthshire; Clova, Forfarshire.

19. *L. Burgessii* Mont. Pl. Cell. (1840) p. 129, in Webb. & Berth. Canar.—Thallus large, laciniato-lobed, complicate, greenish- or leaden-brown, lobes crowded, somewhat imbricate, crenulate, or minutely lacerate and crisp, beneath greyish and more or less minutely tomentose. Apothecia moderate or large, concave or at length somewhat plane, reddish-brown or dark-red, the thalline margin sub-foliateous, crisp and lacinate; spores ellipsoid, frequently attenuate at both apices, 3–5-septate, and irregularly murali-multilocular, 0.030–40 mm. long, 0.013–17 mm. thick.—Cromb. Lich. Brit. p. 9; Leight. Lich. Fl. p. 30, ed. 3. p. 33.—*Mallotium Burgessii* Gray, Nat. Arr. i. p. 399; Mudd, Man. p. 45. *Collema Burgessii* Hook. Fl. Scot. ii. p. 71; Sm. Eng. Fl. v. p. 211; Tayl. in Mack. Fl. Hib. ii. p. 110. *Lichen Burgessii* Lightf. Fl. Scot. ii. (1777) p. 827, t. 26; Huds. Fl. Angl. ed. 2. p. 538; Eng. Bot. t. 300; With. Arr. ed. 3, iv. p. 57.—*Brit. Exs.*: Cromb. n. 6; Dicks. Hort. Sic. n. 24.

This is the largest of the British *Collemai*, and may at once be recognized by the parmelioid thallus and the foliaceous thalline margin of the apothecia. Where the plant is rare, it is orbicular and of moderate size, but where it is plentiful it spreads extensively, and is often somewhat purplish. The apothecia are numerous and crowded, becoming in old plants nearly plane, and blackish, with the thalline margin more or less obliterated.

Hab. On the trunks of old trees near water (lakes and rivers), rarely found on old walls, in wooded upland districts.—*Distr.* General, and usually common, in the mountainous tracts of W. Britain; very abundant in the W. Highlands of Scotland, rarer in W. Ireland.—B. M.: Ivy Bridge and Liddford, S. Devon; Nannau, near Dolgelly, Cwm-Brychan and Barnmouth, Merionethshire; Hafod, Cardiganshire; Mandale, Westmore-

land. New Galloway, Kirkcudbrightshire; Johnstone, Moffat, and Raeburn, Dumfriesshire; Inverary and Appin, Argyleshire; The Trosachs, Glen Lochay, and Glen Falloch, Perthshire; Lochaber, Inverness-shire. Eagle's Nest, Cromaglow, Dinish, and Derryquinty, Killarney, co. Kerry; Connemara, co. Galway.

PSEUDO-GENUS.

17. **DENDRISCOCAULON** Nyl. Flora, 1885, p. 299.—Thallus fruticulose, much branched, the axis solid, branches covered towards the apices with minutely divided furfuraceous laciniae, containing gonimia, which are more or less scattered. Apothecia and spermogones unknown.

This pseudo-genus, as indicated by Nylander (Flora, 1876, p. 578), is only a leprarioid condition of "*Leptogium*," so that we have both gonimic and gonidic leprarioid thalli. In internal structure the furfuraceous laciniae are somewhat like those of the subgenus *Homodium*.

1. **D. bolacinum** Nyl. Flora, 1885, p. 299.—Thallus caespitose, erect, branches compressed, isabelline; laciniae crowded, leproso-pulvinate, dark greenish.—Cromb. Grevillea, xv. p. 13.—*Homodium bolacinum* Cromb. Journ. Linn. Soc., Bot. xvi. p. 228. *Leptogium bolacinum*, Cromb. Journ. Bot. 1876, p. 359. *Collema atrovirens* ϵ . *bolacinum* Schaer. (non Ach.) Enum. 1850, p. 249.

According to Nylander (Stiz. Lich. Hyperb. p. 6) this peculiar plant is identical with *Cornicularia Umhauensis* Auerw., Hedwigia, 1869, p. 113, and constitutes the glomeruli of *Ricasolia glomulifera*. It resembles *Leptogium lophaeum*, and very rarely occurs growing independently.

Hab. Among mosses on old trees, rarely on rocks, in upland tracts.—*Distr.* As an independent plant very local and scarce in the S. Highlands of Scotland.—B. M.: Barcaldine, Argyleshire; near Taymouth, Perthshire.

18. **COLLEMOPSIS** Nyl. Flora, 1873, p. 17 (note), *cfr.* Cromb. Journ. Bot. 1874, p. 332.—Thallus crustaceous, thin, granulato-areolate, more or less loosely affixed to the substratum, glaucous-green within; gonimic granules submoniliform. Apothecia urceolato-innate, small, the margin usually tumid and connivent; spores 8 μ e, ellipsoid, simple, colourless; paraphyses usually simple, slender; hymenial gelatine bluish or wine-red with iodine; spermogones with simplish sterigmata, and oblong minute spermatia.

Nylander separated this genus from *Pyrenopsis* and placed it amongst the *Collemei* because of the texture and colour of the thallus and the submoniliform gonimia. It embraces various genera of authors, as *Pyrenopsis* Nyl. pro parte, *Psorotichia* Mass., *Porocyphus* Körb., &c. "Of these, *Psorotichia*, had it not been informal (for it should evidently have been written *Tichospora*), ought probably to have been preserved" (Nyl. *in litt.*). Some species very much resemble *Pannularia*, but are distinguished by the absence of a hypothallus. *Collempsopsis* evidently holds the same place among the *Collemei* as *Pannularia* among the *Lichenacei*.

1. *C. Schæreri* Nyl. ex Cromb. Journ. Bot. 1874, p. 332.—Thallus subeffuse, thinnish, areolato-granulose, or minutely granuloso-squamulose, brownish-black or blackish. Apothecia small or nearly moderate, plane, lecanorine (with distinct thalline margin), brownish- or reddish-black; spores ellipsoid, 0,014–21 mm. long, 0,007–11 mm. thick; hymenial gelatine pale blue and then tawny with iodine.—Leight. Lich. Fl. ed. 3, p. 25.—*Pyrenopsis Schæreri* Nyl. olim, Cromb. Lich. Brit. p. 2; Leight. Lich. Fl. p. 15. *Pannaria Schæreri* Mass. Ric. Aut. Lich. (1852) p. 114.—*Brit. Evs.*: Cromb. n. 2.

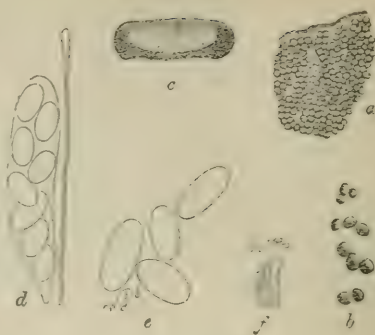


Fig. 20.

Collemaopsis Schæreri, Nyl.—a. Section of a small portion of the thallus, $\times 200$. b. Gonimia, $\times 350$. c. Section of an apothecium, $\times 30$. d. Theca with a paraphysis, $\times 350$. e. Spores, $\times 500$. f. Sterigmata and spermatia, $\times 500$.

This is often less developed, with the thallus granulose and diffract, though when fully developed it is more squamulose and continuous. The apothecia, for the most part, are very numerous and crowded, sometimes nearly obliterating the thallus, smaller, and becoming somewhat convex and immarginate in the less developed, or moderate, plane, with persistent margin in the best developed conditions.

Hab. On cretaceous pebbles and limestone walls and rocks in moist shady upland situations.—*Distr.* Local, though plentiful, in S. W., and Central England, amongst the Central and N. Grampians of Scotland, and in N.W. Ireland.—B. M.: Maidstone, Kent: Box Hill and Shiere, Surrey: Bathampton Downs and Babington, Somersetshire: Chalford and near Cirencester, Gloucestershire: Buxton, Derbyshire: Egremont, Cumberland. Craig Tulloch, Blair Athole, Perthshire: Craig Guie, Braemar, Aberdeenshire. Kylemore, co. Galway.

2. *C. lecanopsoides* Nyl. ex Cromb. Journ. Bot. 1874, p. 332.—Thallus thin, opaque, granuloso-areolate, or nearly continuous, somewhat scabrous, dark-brown or brownish-black. Apothecia small, urceolate, concolorous, the margin prominent, connivent; spores 4–8 μ , ellipsoid, 0,012–20 mm. long, 0,006–11 mm. thick, paraphyses slender, not crowded; hymenial gelatine bluish with iodine.—Leight. Lich. Fl. ed. 3, p. 35.—*Pyrenopsis lecanopsoides* Nyl. Flora, 1866, p. 374; Carroll. Journ. Bot. 1867, p. 254; Cromb. Lich. Brit. p. 3; Leight. Lich. Fl. p. 15. *Collema pyrenopsoides* Nyl. Mém. Soc. Cherb. v. p. 89; Syn. i. p. 203. *Lecanora pyrenopsoides* Nyl. Bot. Not. (1853) p. 163.

This, as Nylander observes (Syn. p. 103), is at first sight not unlike *C. fuliginea* (Wahl.), and also has considerable resemblance to obscure

and less developed conditions of *Lecanora cervina*. In this country it sometimes occurs associated with the preceding species, from which it is distinguished by the thallus and the apothecia; though neither of these are well developed in the British specimens.

Hab. On calcareous rocks in maritime and upland tracts of mountainous regions.—*Distr.* Very local and rare in S.W. Ireland (near Kenmare, co. Kerry) and the Central Highlands of Scotland.—B. M.: Craig Tulloch, Blair Athole, Perthshire.

3. *C. furfurella* Nyl. ex Cromb. Journ. Bot. 1874, p. 332.—Thallus effuse, very thinly furfuraceo-granulose, or scattered in small furfuraceous verrucæ, brownish-black or blackish, with somewhat larger, convex granules intermixed. Apothecia minute, subpyrenodeo-lecanorine, impressed in the larger granules, concolorous; spores shortly ellipsoid, 0,011–17 mm. long, 0,008–11 mm. thick; paraphyses discrete; hymenial gelatine wine-red with iodine.—Nyl. Flora, 1881, p. 453; Leight. Lich. Fl. ed. 3, p. 35.—*Collema furfurellum* Nyl. Sällsk. pro F. et Fl. Fenn. Not. iv. (1859) p. 229; Lich. Scand. p. 28; Carroll, Journ. Bot. 1865, p. 286; Cromb. Lich. Brit. p. 3; Leight. Lich. Fl. p. 17.

The anatomical structure of the thallus shows this plant, at one time regarded by Nylander as a distinct section of *Collema*, to be a *Collemopsis*. The thallus and fructification distinguish it from the allied species. The apothecia are numerous, though the spores are rarely found fully developed. The spermatogones are only sparingly visible, the spermatia being thin, oblongo-cylindrical.

Hab. On moist schistose rocks in alpine places.—*Distr.* Found very sparingly amongst the S. Grampians, Scotland.—B. M.: Above Loch-na-Gat, Ben Lawers, Perthshire.

4. *C. Arnoldiana* Nyl. Flora, 1874, p. 305.—Thallus effuse, thin, maculate, granulose, olive-brown or dark-brown. Apothecia small, biatorine, somewhat prominent, impressed in the centre, reddish or dark-red, the margin paler; spores ellipsoid, oleoso-locular, 0,017–20 mm. long, 0,010–0,0105 mm. thick; paraphyses articulate; hymenial gelatine slightly bluish, then pale wine-red with iodine.—Cromb. Journ. Bot. 1876, p. 359; Leight. Lich. Fl. ed. 3, p. 36.—*Physma Arnoldiana* Hepp, Flora, 1858, p. 94.

This somewhat resembles *Leptogium biatorinum*, but is smaller, thinner, and with different spores. The thallus is minutely cellular, lax, and indistinct in texture. The apothecia, which are nearly gyalectiform, are either somewhat scattered or approximate. *Ferrucaria Flotoviana* Hepp, Flecht. n. 92 pro parte, *Collemopsis Flotoviana* Nyl. ex Cromb. Journ. Bot. 1874, p. 147, scarcely differs from this species.

Hab. On calcareous stones in shady upland situations.—*Distr.* Apparently local and rare in S. and W. England.—B. M.: Near Shiere, Surrey; near Cirencester and Chalford, Gloucestershire.

5. *C. oblongans* Nyl. Flora, 1874, p. 305.—Thallus subeffuse, thin, granuloso-crustaceous, confluent, brownish-olive. Apothecia

minute, somewhat concave, bright- or reddish-testaceous, the margin thickish; spores oblong, simple or spuriously 1-septate, 0,016–30 mm. long, 0,006–7 mm. thick; hymenial gelatine obsoletely bluish, becoming very faintly wine-red with iodine.—Cromb. *Grevillea*, iii. p. 22; Leight. *Lich. Fl.* ed. 3, p. 36.

At first sight this might be taken for a *Lecidea* belonging to the *Gyalectas*, and only a microscopical examination makes its true relations apparent. It differs from the preceding in the colour of the thallus and in the spores. The apothecia are sometimes not very well developed, as is not unfrequently the case with lichens growing in similar situations.

Hab. On the ground in shady crevices of limestone rocks in upland tracts.—*Distr.* Only very sparingly in N.W. England.—B. M.: Haverbrack Hill, Westmoreland.

6. *C. diffundens* Nyl. *ex* Cromb. *Journ. Bot.* 1874, p. 332.—Thallus effuse, thin, areolato-squamulose, black, opaque; squamules subfurfurous, small, variable. Apothecia small, innate, somewhat plane or often gyalectoid, reddish, pale within; spores ellipsoid, 0,011–23 mm. long, 0,007–11 mm. thick; paraphyses slender, discrete; hymenial gelatine bluish, then wine-red with iodine.—Leight. *Lich. Fl.* ed. 3, p. 36.—*Pyrenopsis diffundens* Nyl. *Flora*, 1865, p. 602; Carroll, *Journ. Bot.* 1866, p. 92; Cromb. *Lich. Brit.* p. 3; Leight. *Lich. Fl.* p. 16. *Collema diffractum* Nyl. Carroll, *Journ. Bot.* 1865, p. 287.

The thallus and fructification sufficiently distinguish this from other British species. I have not seen an authentic specimen, and the plant has been vainly searched for at Maidstone, Kent, where it was originally found. Specimens somewhat aberrant have been gathered elsewhere.

Hab. On sandstone and schistose rocks.—*Distr.* Very local and scarce in S.E. England and N. Wales.—B. M.: Near Barmouth, Merionethshire.

7. *C. leptogiella* Nyl. *Flora*, 1877, p. 220.—Thallus effuse, thin, minutely subcoralloideo-furfuraceous, olive-brown. Apothecia leptogoid, minute, lurid-testaceous, slightly margined, the epithecium somewhat impressed or at length subplane; spores ellipsoid or oblongo-ellipsoid, 0,010–17 mm. long, 0,005–7 mm. thick; paraphyses slender, or somewhat slender, thicker at the apices; hymenial gelatine tawny wine-reddish with iodine.—Cromb. *Grevillea*, vi. p. 18; Leight. *Lich. Fl.* ed. 3, p. 36.

This peculiar species departs in various respects from the rest, and belongs almost to a proper genus. The thallus is confusedly cellular, with the gonimia nearly moderate. The branchlets, which resemble those of *Leptogium microscopicum*, though shorter, are subpapilliform. In the only specimen seen by me, the apothecia are fairly numerous, the margin being usually very thin.

Hab. On quartzose rocks in upland districts.—*Distr.* Very local and rare in N.W. Ireland.—B. M.: Kylemore, co. Galway.

Tribe III. **PYRENIDIEI** Nyl. ex Cromb. Journ. Bot. 1874, p. 337; Flora, 1875, p. 103.

Thallus maculate, radiately appressed; cortical layer distinct; gonimic granules moniliformly coherent. Apothecia pyrenoid; spores 4næ, septate, brown; paraphyses scarcely any. Spermatogones unknown.

A singular tribe, holding amongst the *Collema* an analogous place to the *Pyrenodei* amongst the *Lichenacei*. In this respect the family very appropriately closes with it; for the genus *Obryzum*, with its pyrenocarpous apothecia, is now known to be entirely parasitic, and must be removed. The *Pyrenidie* consist of a single genus with a single species; further research may bring others to light.

19. **PYRENIDIUM** Nyl. Flora, 1865, p. 210.—Thallus minute, stellato-divided, fibrillose, the cortical layer cellular, distinct. Apothecia innate, scarcely prominent; spores oblongo-ellipsoid, 3-septate, brownish; paraphyses slender, few or obsolete; hymenial gelatine not tinged with iodine.

Having regard only to the thallus, this genus might be supposed to be allied to *Leptogium*; but the form of the apothecia separates it entirely from all the preceding genera of the *Collema*. There seems no reason to doubt that the apothecia really belong to the thallus and not to a parasitic fungus.

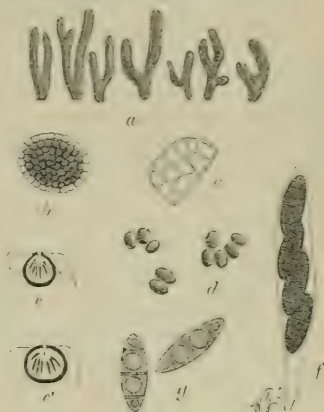


Fig. 21.

Pyrenidium actinellum Nyl.—a. Thal-line filaments, $\times 30$. b. Transverse section of a filament, $\times 200$. c. A frustule of the cortex, $\times 350$. d. Gonimia. e, e'. Vertical sections of two apothecia (viewed under water), $\times 30$, with a small portion of crustose thallus. f. Theca with spores, $\times 350$. g. Two spores, $\times 500$.

1. *P. actinellum* Nyl. Flora, 1865, p. 210.—Thallus adnate, thinly crustæform, thinly stellato-fibrillose at the circumference, the fibrillæ equally cylindrical, sparingly branched, but usually effuse, and entirely covered by or almost entirely composed of somewhat erect fibrillæ, sordid- or dark-olive (I + wine-red). Apothecia minute, scarcely prominent, almost entirely innate, the pyrenium entirely black; spores 0.020–24 mm. long, 0.008–9 mm. thick.—Carroll, in Journ. Bot. 1865, p. 286; Cromb. Lich. Brit. p. 10; Leight. Lich. Fl. p. 36, ed. 3, p. 37.

The thallus of this species (of which I give Nylander's emended diagnosis) forms small maculæ on the substratum, which are more or less scattered, or at length confluent. When sterile it is externally very similar to states of *Leptogium microscopicum*; but under the microscope its fibrillæ are seen to be equally cylindrical, while in

L. microscopicum they are unequal. In the few authentic specimens seen, the apothecia are sparingly present; and the other specimens, referable to this or another species, are sterile.

Hab. On cretaceous and calcareous pebbles in moist maritime and upland districts.—*Distr.* Very sparingly in S. and S.W. England.—B.M. : Box Hill and ? Shere, Surrey; ? near Brighton, Sussex; Anstey's Cove, Torquay, S. Devon.

Family III. **LICHENACEI** Nyl. Mém. Soc. Cherb. ii.
(1854) p. 10; Syn. i. p. 141.

Thallus polymorphous, filamentose, foliaceous, squamose, crustaceous, pulverulent, or obsolete, or none, varying from membranaceous to coriaceous and from filmy to tartareous, extremely variable in colour, white, greyish, yellowish, reddish, brown, blackish, but little or non-gelatinous; gonidial layer usually distinct, formed of true gonidia or rarely of gonimic granules. Apothecia either stipitate or sessile, lecanorine, patellate, lecideine, or pyrenoid, very variable in colour, but rarely concolorous with the thallus. Spermatogones either immersed or prominent, with simple or articulate sterigmata and various spermatia.

The plants belonging to this, by far the largest family of Lichens, are very variable with respect both to the thallus and the fructification. They differ from the preceding families in being only very occasionally gelatinous, and especially in having, except in a comparatively few instances, a distinct stratum of bright green, rarely orange, gonidia. The apothecia in most cases have the thalamium furnished with paraphyses, which are generally distinct. In the lower genera some plants approximate to the Ascomycetous Fungi.

Series I. **Epiconiodei** Nyl. Syn. i. (1860) p. 141.

Thallus either (1) horizontally expanded and crustaceous, sometimes none proper, with the apothecia usually stipitate, capituliform, occasionally sessile, or (2) fruticulososo-erect, with the apothecia in terminal capitula of the thallus, nuclear, at length widely open; spores naked, usually collected into a pulverulent mass on the surface of the mature fructification.

Though in other respects varying considerably, the two tribes which constitute this series agree in having the spores, except in a few species, accumulated as a conglutinate powder or sporal mass (mazædium, Ach.) on the surface of the mature fruit. It is only in the young apothecia that the spores are seen in thecae; when more advanced, they occur only free in the mazædium.

Tribo I. **CALICIEI** Nyl. Syn. i. (1860) p. 141.

Thallus horizontal, crustaceous, granulose, or obsolete, or none proper. Apothecia stipitate, capituliform, or sessile; spores 8næ, in evanescent thecae, spherical or oblong, simple or variously septate,

brownish or blackish, paraphyses usually little developed; hymenial gelatine scanty. Spermogones punctiform, black, the sterigmata somewhat simple.

This tribe consists of rather small plants, some of which are parasitic and readily overlooked, while others are conspicuous from their brightly coloured thalli. The apothecia sometimes have the stipes abnormally branched, and occasionally the capitulum is proliferous.

2). **SPHINCTRINA** Fr. Pl. Hom. (1825) p. 120 (at genus *Fungorum*); De Not. Giorn. Bot. It. 1846, p. 314.—Thallus none proper. Apothecia parasitic, chiefly on the thalli of *Pertusaria*, globoso-turbinate, sessile or substipitate, somewhat shining, black, proper margin thick, connivent; thecae subpersistent, sporal mass black; spores simple (very rarely 1-septate), blackish; hymenial gelatine usually more or less tinged with iodine. Spermogones with acicular arcuate spermatia.

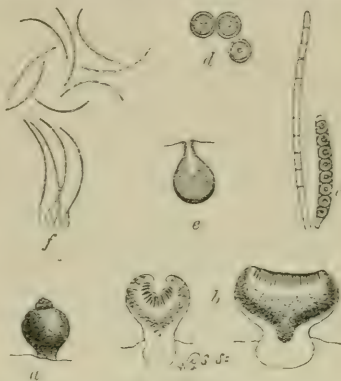


Fig. 22.

The few species belonging to this genus are distinguished by the apothecia being parasitic, sessile or subsessile, and shining. At first sight they look like minute *fungi*; but their anatomical structure places them among the lichens.

Sphinctrina turbinata, Fr. —a. Apothecium (in dry state), $\times 30$. b. Longitudinal section of two apothecia, $\times 30$. c. Theca and paraphyses, $\times 350$. d. Spores, $\times 500$. e. Section of spermogonium, $\times 30$. f. Sterigmata and spermatia, $\times 500$.

1. *S. turbinata* Fr. Sum. Veg. (1846) p. 366.—Thallus none. Apothecia small, globose or globoso-turbinate, shortly stipitate, or often almost sessile, the sporal mass usually protruded; spores simple, globose or subglobose, small, 0.003–8 mm. in diameter; hymenial gelatine pale bluish, then sordid dark-coloured with iodine.—Nyl. Syn. i. p. 142, t. v. f. 1; Mudd, Man. p. 255, t. iv. f. 102; Cromb. Lich. Brit. p. 11; Leight. Lich. Fl. p. 38, ed. 3, p. 38.—*Calicium turbinatum* Pers. Fung. Suppl. (1797) p. 59. *Calicium sessile* Turn. & Borr. Lich. Br. p. 128; Eng. Bot. t. 2520; Sm. Eng. Fl. v. p. 138. *Acolium stigonellum* Gray, Nat. Arr. i. p. 482. *Lichen gelatinatus* With. Arr. ed. 3, iv. p. 8, t. 31.—*Brit. Ecs.*: Leight. n. 132; Mudd, n. 241.

This is readily recognized upon the host by the numerous, sometimes crowded apothecia, which vary somewhat in size. The spermogones, scattered amongst the apothecia, are not unfrequent, with spermatia 0.012–15 mm. long, 0.001 mm. thick.

Hab. On the thallus of *Pertusaria communis*, and sometimes of *P. fallax*, on the trunks of old trees, chiefly oaks, in maritime and upland

wooded tracts.—*Distr.* General and not uncommon in England; rare in S. and Central Scotland and in S. Ireland.—B. M.: Rozel, Island of Jersey; Guernsey. Yarmouth, Suffolk; Epping Forest, Essex; Shiere, Surrey; Sibertswold, Kent; Henfield and St. Leonard's Forest, Sussex; Ventnor, Isle of Wight; New Forest, Hants; near Withiel, Cornwall; Chedworth Woods and Oakley Park, near Cirencester, Gloucestershire; near Worcester; Shrewsbury, Shropshire; Hay Wood, Herefordshire; near Ayton, Cleveland, Yorkshire; Leven's Park, Westmoreland. New Galloway, Kirkcudbrightshire; Roseneath, Dumbartonshire; Craigforth, Stirling; Carse of Gowrie, Perthshire. Blarney and Ardrum, co. Cork; Curraghmore, near Waterford; Glenstale, co. Tipperary.

2. *S. anglica* Nyl. Syn. i. (1860) p. 143, t. v. f. 3.—Thallus (if proper) effuse, thin, granuloso-unequal, greyish-brown or olive-green, or evanescent. Apothecia small, scattered, substipitate, globose or globoso-turbinate; spores simple, globose, sometimes ellipsoid or oblong, 0,008–13 mm. long, 0,006–9 mm. thick; hymenial gelatine bluish with iodine.—Mudd, Man. p. 255; Cromb. Lich. Brit. p. 11; Leight. Lich. Fl. p. 38, ed. 3, p. 38.—*Calicium microcephalum* Turn. & Borr. Lich. Br. p. 130; Sm. Eng. Fl. v. p. 138. *Phacotium* (errore *Phacotrum*) *microcephalum* Gray, Nat. Arr. i. p. 482. *Lichen microcephalus* Eng. Bot. t. 1865.—In giving the specific name of *anglica*, Nylander (*l. c.*) observes that the older name *microcephala* is not suitable to the apothecia.

Differs from *S. turbinata* in the apparently (though very doubtfully) proper thallus, in the more stipitate apothecia, and the larger spores. In the original specimen figured in E. B., the thallus is partly subtartareo-granulose and partly subevanescent; but I have never seen the fertile plant *in situ*, though I have observed a similar sterile thallus in many places. The spermatogones appear to be rare, and sparingly scattered, with spermatia as in *S. turbinata*, or slightly larger.

Hab. On old rails, especially oak, in shady situations in maritime and upland tracts.—*Distr.* Only sparingly in a few localities in S. and Central England.—B. M.: Caistor, near Yarmouth, Norfolk; Ardingley and Albourne, Sussex; Twycross, Leicestershire.

3. *S. microcephala* Nyl. Mém. Soc. Cherb. v. (1857) p. 91.—Thallus none. Apothecia minute, sessile or substipitate, globose or globoso-turbinate; spores simple, fusiformi-ellipsoid, somewhat large, 0,011–16 mm. long, 0,007–8 mm. thick; hymenial gelatine faintly bluish with iodine.—Nyl. Syn. i. p. 144, t. v. f. 2; Cromb. Lich. Brit. p. 11; Leight. Lich. Fl. p. 39, ed. 3, p. 38.—*Sphinctrina turbinata* β . *microcephala* Mudd, Man. p. 256. *Calicium microcephalum* Tul. Mem. Lich. (1852) p. 78, t. 15. f. 20.

Also closely allied to *S. turbinata*, but may readily be distinguished on microscopical examination by the form and size of the spores. In our British specimens the apothecia, which are smaller than in the preceding species, are usually rather scattered, as are also the spermatogones.

Hab. On the thallus of *Pertusaria melaleuca* in shady woods in maritime tracts.—*Distr.* Only in the Channel Islands and the S. coast of

England, though no doubt overlooked elsewhere.—B. M.: Rozel, Island of Jersey. Near Brockenhurst, New Forest, Hampshire.

4. *S. Kylemoriensis* Cromb. Journ. Bot. 1882, p. 274.—Thallus none proper. Apothecia minute, very shortly stipitate or subsessile, the stipes slender, pale; capitulum turbinato-globose, black or blackish, somewhat shining; spores simple, globose, dark-brown, 0.004–6 mm. in diameter; hymenial gelatine pale bluish and then sordid with iodine.—*Calicium Kylemoriense* Larb. ex Leight. Linn. Trans. n. ser. Bot. 1878, p. 242, t. 23. ff. 12–14; Lich. Fl. ed. 3, p. 42.

This "very beautiful new species" (Leight.) is intimately allied to *S. turbinata*, from which it differs merely in the paler (though often concolorous) stipes, the smaller capitulum and spores, as also in the saxicolous habitat. It is probably not a distinct species.

Hab. On rocks in maritime tracts. Parasitic on the thalli of *Lecanora parella* and *L. nitens*.—*Distr.* Local and rare, in the Channel Islands and in N.W. Ireland.—B. M.: Island of Sark. Kylemore, co. Galway.

21. **CALICIUM** Pers. Ust. Ann. Bot. vii. (1794) p. 20; Nyl. Syn. i. p. 145.—Thallus thin, granulose, pulverulent or evanescent, very rarely squamulose, or none proper. Apothecia stipitate, rarely subsessile, black; capitulum globose or turbinate; thecae evanescent; sporal mass umbrine or black; spores spherical, ellipsoid or oblong, simple or septate, brown or blackish; hymenial gelatine rarely tinged with iodine. Spermogones with short, oblong spermatia.

The species of this genus are very rarely parasitic, and by this, as well as by the stipitate apothecia, the genus is distinguished from *Sphinctrina*. For the most part the plants spread extensively over the substratum, though the thallus often becomes evanescent. It is divided into two subgenera, founded on the character of the gonidia.

Subgen. **ALLODIUM** Nyl. Flora, 1880, p. 392.—Thallus with cylindrical gonidimia; spores spherical, simple, brownish, sporal mass umbrine.

1. *C. trichiale* Ach. Lich. Univ. (1810) p. 242.—Thallus thinnish, minutely granuloso-squamulose, greyish-yellow or greyish-glaucous (K—). Apothecia somewhat small, scattered or crowded, stipes usually slender, black; capitulum globoso-lenticular, black, beneath greyish-suffused, at length naked; spores 0.0025–15 mm. in diameter.—Mudd, Man. p. 259; Cromb. Lich. Brit. p. 12; Leight. Lich. Fl. p. 41, ed. 3, p. 40.—*Calicium æruginosum* β. *ærulescens* Turn. & Borr. Lich. Br. p. 156.

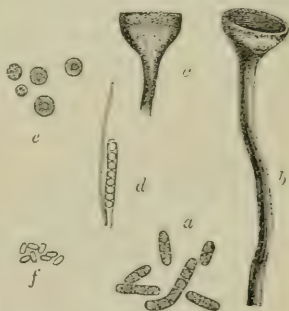


Fig. 23.

Calicium trichiale Ach.—a. Gonidimia, $\times 350$. b. Apothecium, $\times 30$. c. Vertical section of upper portion of an apothecium (moistened), $\times 30$. d. Theca and paraphysis, $\times 350$. e. Spores, $\times 500$. f. Spermatia, $\times 500$.

From other British species of the genus this is distinguished by the oblongo-cylindrical gonidimia, similar to those of *Coniocybe furfuracea*. The thalline squamiform granules are either somewhat scattered and minute, or more crowded and larger. In this more developed state, which is rare in Britain, the apothecia are usually less crowded, with the stipes firmer and shorter.

Hab. On the trunks of old trees and decaying pales (fir) in shady upland tracts.—*Distr.* Only in one or two places in S. and N. England, S. Scotland, and S.W. Ireland.—*B. M.*: Menstrie, New Forest, Hants; Ingleby Park, Cleveland, Yorkshire. Binnie Woods, Haddingtonshire. Tervoe, co. Limerick.

Subsp. 1. *C. cinereum* Nyl. ex Norrl. Medd. Soc. F. et Fl. Fenn. (1876) p. 10.—Thallus granulose, greyish or whitish. Apothecia with the stipes often brownish and partly greyish-suffused, capitulum beneath greyish or white-suffused; spores 0.003–5 mm. in diameter.—Cromb. Grevillea, xv. p. 14.—*Calicium trichiale* var. *cinereum* Nyl. ex Carroll, Journ. Bot. 1866, p. 22; Leight. Lich. Fl. p. 41, ed. 3, p. 40. *Calicium cinereum* Pers. Icon. (1799) p. 38, t. 14.

This subspecies is distinguished by the more granulose thallus and the differently coloured stipes. The apothecia are usually more scattered.

Hab. On the bark of old oaks in wooded upland tracts.—*Distr.* Only in S. Ireland.—*B. M.*: Deer Park, Castlemartyr, co. Cork.

Subsp. 2. *C. stemoneum* Nyl. ex Norrl. Medd. Soc. F. et Fl. Fenn. (1876) p. 10.—Thallus thinnish, leprose, greyish- or greenish-yellow. Apothecia black or brownish-black; stipes short or elongate, dark-brown; capitulum grey-pruinose beneath, or nearly naked; sporal mass umbrine or reddish-brown; spores as in the type.—Cromb. Grevillea, xv. p. 14.—*Calicium trichiale* var. *stemoneum* Ach. Lich. Univ. (1810) p. 243; Nyl. Syn. i. p. 150, t. v. f. 15; Mudd, Man. p. 260; Cromb. Lich. Brit. p. 12; Leight. Lich. Fl. p. 41, ed. 3, p. 40. *Calicium aruginosum* Turn. & Borr. Lich. Br. p. 156; Eng. Bot. t. 2502; Sm. Eng. Fl. v. p. 141. *Phacotium aruginosum* Gray, Nat. Arr. i. p. 484.—*Brit. Exs.*: Leight. n. 227; Mudd, n. 248.

Distinguished chiefly by the thin leprose thallus and the colour of the stipes. The stipes is short and stout, or elongate and slender, according to the habitat. The sterile plant may not be unfrequent in some parts of England, but fertile specimens are rare.

Hab. On the trunks of old trees, stumps and pales in shady lowland and upland situations.—*Distr.* Local and scarce in S. W., and N. England.—*B. M.*: Bury St. Edmunds, Suffolk; Cuckfield, Sussex; Kenwick, Worcestershire; Bousdale Gill, Cleveland, Yorkshire.

Subgen. EUCALICIUM Cromb. Grevillea, xv. (1886) p. 14.—Thallus with globulose gonidia; spores globose or ellipsoid, simple or 1-septate.

a. Spores globose, very rarely oblong, simple, brownish; sporal mass umbrine.

2. *C. chrysocephalum* Ach. Meth. Suppl. (1803) p. 15.—Thallus thickish, granulate, granules usually conglomerate, citrine or bright greenish-yellow. Apothecia scattered; stipes rather short, slender, black or blackish-brown; capitulum turbinate-lentiform, black, beneath and at the margin citrino-suffused; spores 0.003–6 mm. in diameter.—Cromb. Lich. Brit. p. 11; Leight. Lich. Fl. p. 39, ed. 3, p. 39.—*Cyphelium chrysocephalum* Mudd, Man. p. 261. *Phacotium chrysocephalum* Gray, Nat. Arr. i. p. 484. *Lichen chrysocephalus* Turn. Linn. Soc. Trans. vii. (1804) p. 88, t. 8. f. 1; Eng. Bot. t. 2501. *Calicium chrysocephalum* Sm. Eng. Fl. v. p. 140.—*Brit. Ews.*: Leight. n. 134, pro parte; Mudd, n. 251.

Readily distinguished by its bright yellow thallus, which in British specimens is persistent, and by the colour of the margin and of the underside of the capitulum, but the latter disappears in old plants. The apothecia are more or less scattered, rarely here and there aggregate, and as if subsessile.

Hab. On old pales and barn-doors in maritime and upland tracts.—*Distr.* Local and scarce in a few localities throughout England; very rare in S. and Central Scotland.—B. M.: Bury, Suffolk; Walthamstow, Essex; Penshurst, Kent; Bolney, Sussex; Lyndhurst, New Forest, Hants; Downton Castle, Herefordshire; Hatfield, near Worcester; Hay Park, near Ludlow, Shropshire; Rosedale, Cleveland, Yorkshire. Falls of Clyde, Lanarkshire; Aberfeldy, Perthshire.

Form 1. *melanocephalum* Nyl. Syn. i. (1860) p. 147, t. v. f. 19.—Apothecia fasciculately branched; stipes black; capitulum black, citrino-suffused only at the margin; spores globose or ellipsoid, pale-brown, 0.004–16 mm. long, 0.004–8 mm. thick.—Leight. Lich. Fl. p. 40, ed. 3, p. 39; Cromb. Grevillea, xv. p. 14.—*Brit. Ews.*: Leight. n. 134, pro parte.

From the type, with which it grows associated, this is distinguished



Fig. 24.

Calicium quercinum Pers.—*a.* Gonidia, $\times 350$ diameters. *b.* Apothecium, $\times 30$. *c.* Section of apothecium (moistened), $\times 30$. *d.* Theca and paraphyses, $\times 350$. *e.* Spores, $\times 500$. *f.* Vertical section of a spermogonium, $\times 30$. *g.* Stigmata, and *h.* spermatia, $\times 500$.

by the fasciculate apothecia, the colour of the capitulum, and more especially by the rather variable spores.

Hab. On old pales in upland tracts.—*Distr.* Extremely local and scarce in W. England.—B. M.: Downton Castle, Herefordshire.

Form 2. *filare* Ach. Lich. Univ. (1810) p. 239.—Thallus somewhat scattered. Apothecia fasciculate, stipes more elongate, slender, with smaller capitulum.

This form, which seems constant, differs in the thallus not being continuous, and in the longer stipes and the smaller capitulum, characters no doubt resulting from the habitat.

Hab. On the bark of old firs in moist upland situations.—*Distr.* Very local and rare among the S. Grampians, Scotland.—B. M.: Aberfeldy and Ben Lawers, Perthshire.

3. *C. phæocephalum* Turn. & Borr. Lich. Br. (1839) p. 145.—Thallus thickish, granulose, granules small, subsquamiform, plicato-congested, crenate, pale-greyish or dark-yellowish. Apothecia small; stipes rather short, slender, blackish or pale-brown; capitulum turbinato-lentiform, greenish-yellow-pruinose, sporal mass somewhat plane; spores 0.003–5 mm. in diameter.—Sm. Eng. Fl. v. p. 140; Cromb. Lich. Brit. p. 11; Leight. Lich. Fl. p. 40, ed. 3, p. 39.—*Cyphelium phæocephalum* Mudd, Man. p. 261. *Lichen phæocephalus* Turn. Linn. Soc. Trans. viii. (1807) p. 260, t. 6. f. 1. *Phacotium trabinellum* Gray, Nat. Arr. i. p. 484. *Lichen trabinellus* Eng. Bot. t. 1540.

The granuloso-squamulose thallus by which this plant is characterized varies somewhat in thickness and in colour according to the habitat. Although variable in other countries, all the British specimens are typical. The apothecia are usually very numerous, and sessile in thicker thalli.

Hab. On old boarded buildings, rarely on pales, in upland wooded tracts.—*Distr.* Local and scarce in S., E., and W. England.—B. M.: Lakenham, near Norwich, Norfolk; Bruisyard, Suffolk; near Colchester, Essex; Hurstpierpoint and Albourne, Sussex; Hay Park, near Ludlow, Shropshire.

4. *C. aciculare* Fr. Sum. Veg. (1846) p. 119.—Thallus very thin, subleprose, greyish or obsolete. Apothecia minute, crowded; stipes short, very slender, dark-brown; capitulum obeonico-turbinate, more or less citrino-suffused, sporal mass usually much protruded; spores 0.003–4 mm. in diameter.—Leight. Lich. Fl. p. 40, ed. 3, p. 40.—*Calicium phæocephalum* var. *aciculare* Cromb. Lich. Brit. p. 12. *Lichen acicularis* Eng. Bot. (1812) t. 2385. *Calicium chlorellum* Turn. & Borr. Lich. Br. p. 146; Sm. Eng. Fl. v. p. 140; Mudd, Man. p. 262, t. iv. f. 107. *Phacotium hispidulum* Gray, Nat. Arr. i. p. 483.—*Brit. Exs.*: Leight. n. 170; Mudd, n. 252; Larb. Lich. Hb. n. 81; Bohl. n. 98.

Allied to the preceding species, but differing in the thin, subleprose, or nearly evanescent thallus, the minute, numerous, and crowded apothecia, the longer and narrower capitulum, and the protruded sporal mass. The

citrine colour of the capitulum is sometimes confined to the margin, and in the herbarium is frequently obliterated.

Hab. On the trunks of old trees in maritime and upland tracts.—*Distr.* Very local and scarce in S., E., and N.W. England.—B. M.: Bury, Suffolk; Wheatfield Park, Oxfordshire; Esher, Surrey; Bolney, Sussex; New Forest, Hants; Kempsey, Worcestershire; Brantsdale and Bousdale Gill, Cleveland; Levens, Westmoreland.

5. *C. arenarium* Nyl. ex Lamy, Bull. Soc. Bot. Fr. t. xxv. (1876) p. 345.—Thallus none proper. Apothecia parasitic, somewhat small; and scattered, stipes more or less elongate, stout, rusty-brown, yellowish-suffused; capitulum globoso-lentiform; spores oblong, simple or faintly 1-septate, 0,006–11 mm. long, 0,0025–35 mm. thick.—Cromb. Grevillea, xv. p. 14.—*Cyphelium arenarium* Hampe in Mass. Miscell. (1856) p. 20. *Coniocybe citrina* Leight. Ann. & Mag. Nat. Hist. ser. 2, xix. (1857) p. 130, t. 8. ff. 7–9. *Cyphelium citrinum*, Mudd, Man. p. 261. *Calicium citrinum* Cromb. Lich. Brit. p. 12; Leight. Lich. Fl. p. 45, ed. 3, p. 44.—*Brit. Ees.*: Leight. n. 269.

The colour and general aspect of the fructification as well as the sterile thallus of the host give this species the appearance of a state of *Coniocybe furfuracea*. The spores are not fully developed in specimens growing in shady places.

Hab. Parasitic on the thallus of *Lecidea lucida* on stones in shady walls in upland districts.—*Distr.* Rather local and scarce, having been gathered only sparingly in Wales, N. England, and the Central Highlands, Scotland.—B. M.: Croesfaen, Monmouthshire; between Corwen and Bala, Merionethshire; near Dent, Yorkshire. Blair Athole, Perthshire.

6. *C. melanophæum* Ach. Vet. Ak. Handl. (1816) p. 276, t. 8. f. 8.—Thallus thickish, granulose, yellowish-white or cream-coloured (K + red), sometimes nearly obsolete. Apothecia moderate, scattered; stipes moderate or somewhat long, stout, black; capitulum turbinate, black; sporal mass occasionally protruded; spores 0,0025–0,008 mm. in diameter.—Mudd, Man. p. 259; Cromb. Lich. Brit. p. 12; Leight. Lich. Fl. p. 42, ed. 3, p. 41.—*Brit. Ees.*: Leight. n. 315.

In general appearance this seems allied to *C. trichiale*, but the form of the gonidia and the chemical reaction afford definite marks of distinction. The apothecia are irregularly scattered and generally not numerous in British specimens.

Hab. On the trunks of old firs and decorticated oaks, rarely on decaying posts in wooded upland tracts.—*Distr.* Local and scarce in S., E., and N. England; very rare in Central Scotland.—B. M.: Epping Forest, Essex; Leith Hill, Surrey; Ardingley, Sussex; New Forest, Hants; Oakley Park and Hailey Wood, near Cirencester, Gloucestershire; Lonsdale, Cleveland, Yorkshire. New Galloway, Kirkeudbrightshire; Blair-drummond, near Stirling, and Aberfeldy, Perthshire.

Var. *β. ferrugineum* Schaer. Enum. (1850) p. 172.—Thallus granuloso-conglomerate or nearly leprose. Apothecia large, sessile, the stipes immersed in the crust; spores 0,004–11 mm. in diameter.

—Cromb. *Grevillea*, xv. p. 14.—*Calicium trichiale* γ . *ferrugineum* Mudd, Man. p. 260, t. iv. f. 106; Cromb. *Lich. Brit.* p. 12; Leight. *Lich. Fl.* p. 41, ed. 3, p. 41.—*Calicium ferrugineum* Turn. & Borr. *Lich. Br.* (1839) p. 136; Eng. Bot. t. 2473; Sm. Eng. *Fl.* v. p. 139.—*Brit. Ews.*: Mudd, n. 249.

The gonidia separate this from *C. trichiale*, to which it has been referred by recent authors because of the appearance of the thallus. Nylander (*in litt.* 1875) regards it as a variety of *C. melanophæum*, from which it is distinguished by the large sessile apothecia. The thallus is frequently more or less sprinkled with irregular rusty spots. It is often sterile; when fertile the apothecia are numerous, and sometimes 2-3 or more become confluent.

Hab. On old pales, rarely on decorticated oaks, in shady lowland and upland tracts.—*Distr.* Pretty general, and common where it occurs, throughout England, chiefly in the S.—B.M.: Framlingham and Bury St. Edmunds, Suffolk; Walthamstow, Essex; near Mill Hill, Middlesex; Elstree, Herts; near Reigate, Surrey; New Forest, Hants; Oakley Park, Cirencester, Gloucestershire; Ragley Park, Worcestershire; Gopsall Wood, Leicester-shire; Moor Park and Hay Park, near Ludlow, Shropshire; near Ingleby, Yorkshire.

Subsp. *C. brunneolum* Nyl. ex Norrl. Medd. Soc. F. et Fl. Fenn. (1876) p. 10.—Thallus effuse, very thin, macular, greenish- or greyish-white, often evanescent (K + red). Apothecia small, numerous; stipes elongate, very slender, dark-brown or blackish; capitulum small, globoso-lenticular, brown; sporal mass reddish-brown or ferruginous; spores 0.0025-42 mm. in diameter.—Cromb. *Grevillea*, xv. p. 14.—*Calicium trichiale* δ . *brunneolum* Mudd, Man. p. 260; Cromb. *Lich. Brit.* p. 12; Leight. *Lich. Fl.* p. 42, ed. 3, p. 41. *Calicium brunneolum* Ach. Vet. Ak. Handl. 1816, p. 279, t. 8. f. 12.—*Brit. Ews.*: Leight. n. 252; Mudd, n. 250.

As this agrees in the form of the gonidia, the thalline reaction, and in general appearance with *C. melanophæum*, Nylander regards it as being only a subspecies. It is distinguished by the smaller and more numerous apothecia, the elongate slender stipes, the colour of the capitulum and sporal mass.

Hab. On old decorticated trees and stumps in shady upland districts.—*Distr.* Very local and scarce in S. and N. England.—B. M.: Leith Hill, Surrey; New Forest, Hants; Crowle, near Worcester; Ingleby Park and Brantsdale, Cleveland, Yorkshire; Hexham, Northumberland.

7. *C. elassosporum* Nyl. *Flora*, 1875, p. 441.—Thallus effuse, thinnish, glaucous or glaucous-greenish, becoming somewhat obsolete. Apothecia small, numerous; stipes elongate, slender, blackish; capitulum small, globoso-lenticular; sporal mass umbrine; spores 0.0025 mm. in diameter, or even smaller.—Cromb. *Grevillea*, iv. p. 180; Leight. *Lich. Fl.* ed. 3, p. 41.—*Brit. Ews.*: Cromb. n. 111.

Similar to more robust states of the preceding subspecies, but differs in the smaller spores and gonidia. The gonidia are conglomerate in difform syngonia. The thallus, which spreads extensively, becomes more or

less evanescent and visible only around the apothecia, which are either scattered, or more frequently approximate, with the stipes occasionally once-branched.

Hab. On decorticated trunks of alders in mountainous districts.—*Distr.* Very local and scarce, among the S. Grampians, Scotland.—B. M.: Glen Lochay, Perthshire.

b. Spores ellipsoid, 1-septate, rarely simple, black;
sporal mass blackish.

8. *C. hyperellum* Ach. Meth. (1803) p. 93.—Thallus granulose or leprose, greenish-yellow. Apothecia moderate, usually numerous; stipes elongate, firm, black; capitulum globoso-lentiform, black, beneath usually somewhat reddish; spores sometimes narrowed at either apex, 1-septate, 0,009–16 mm. long, 0,004–6 mm. thick.—Turn. & Borr. Lich. Br. p. 140; Sm. Eng. Fl. v. p. 139; Tayl. in Mack. Fl. Hib. ii. p. 77; Mudd, Man. p. 258, t. iv. f. 105; Cromb. Lich. Brit. p. 16; Leight. Lich. Fl. p. 42, ed. 3, p. 42.—*Phacotium hyperellum* Gray, Nat. Arr. i. p. 483. *Lichen hyperellus* Ach. Prodr. (1798) p. 85; Eng. Bot. t. 1832. *Coralloides fungiforme arboreum nigrum vix crustosum* Dill. Musc. 78, t. 14. f. 3 B.—*Brit. Ears.*: Leight. n. 23; Bohl. n. 61; Mudd, n. 245.

In favourable situations this spreads extensively, though more frequently it occurs in small, interrupted patches. Nearly agrees with *C. chrysocephalum* in the colour of the thallus, though the colour of the apothecia and the spores are very diverse. Often infertile; when present the apothecia are generally very numerous.

Hab. On the trunks of old trees, chiefly oaks, in upland wooded districts.—*Distr.* Pretty general and common in England, rare in Wales; very rare in S. and Central Scotland and in N. and W. Ireland.—B. M.: Ickworth and Bury, Suffolk; Epping Forest, Essex; Penhurst Park, Kent; Hurstpierpoint, Sussex; New Forest, Hampshire; Chedworth Woods and Sapperton, Gloucestershire; Hendlip, Worcestershire; Gopsall Park, Leicestershire; Derbyshire; near Ludlow and Almond Park, near Shrewsbury, Shropshire; Builth, Brecknockshire; Welshpool, Montgomeryshire; Ingleby and Brantsdale, Yorkshire; Leven's Park, Westmoreland; Catterlen, Cumberland. New Galloway, Kirkcudbrightshire; Falls of Clyde, Lanarkshire; Aberfeldy, Perthshire. Killarney, co. Kerry.

Form 1. *viride* Nyl. Syn. i. (1860) p. 153.—Thallus thin, leprose or granulato-pulverulent, greenish-yellow, the stipes occasionally very short; capitulum often greenish- or greyish-pulverulent, black beneath.—Cromb. Grevillea, xv. p. 14.—*Calicium viride* Pers. Ust. Ann. vii. (1794) p. 20.

This form is distinguished by the more pulverulent thallus and the colour of the capitulum above, though this latter character is not always present. The stipes is occasionally very short, so that the apothecia are almost sphinctriniform (=form *sessile* Cromb.)—a condition which is referred to by Turner and Borrer in Lich. Br. p. 142.

Hab. On trunks of old trees and on pales in wooded upland situations.

—*Distr.* Local and scarce in E., S., and W. England, and among the S. Grampians, Scotland.—B. M. : New Forest, Hants; Sapperton, Gloucestershire; Malvern, Worcestershire. Ben Lawers, Perthshire.

Form 2. *balium* Nyl. Syn. i. (1860) p. 153.—Apothecia larger, the stipes thicker and compressed at the base.—Cromb. in Grevillea, xv. p. 14.—*Calicium balium* Ach. Lich. Univ. (1810) p. 238.

Differs from the type merely in the stipes. In the only British specimen the apothecia are numerous and some are nearly sessile.

Hab. On old pales in wooded upland districts.—*Distr.* Only in S.W. England.—B. M. : Near Lyndhurst, New Forest, Hants.

9. *C. quercinum* Pers. Tent. (1797) p. 59.—Thallus thin, granulose, or nearly smooth, or leprose, greyish-white or scarcely any. Apothecia moderate, numerous; stipes somewhat long, stout, black; capitulum turbinato-lentiform, white-pruinose, at length naked, beneath grey-pruinose; spores somewhat constricted in the middle, 1-septate, 0.005–9 mm. long, 0.003–5 mm. thick.—Nyl. Syn. i. p. 155, t. v. f. 25; Mudd, Man. p. 257; Cromb. Lich. Brit. p. 13; Leight. Lich. Fl. p. 43, ed. 3, p. 43.—*Calicium clavellum* Turn. & Borr. Lich. Br. p. 138; Sm. Eng. Fl. v. p. 139. *Lichen clavellus* Eng. Bot. t. 1465. *Phacotium claviculare* Gray, Nat. Arr. i. p. 483.—*Brit. Exs.*: Mudd, n. 244; Bohl. n. 95.

When fully developed the thallus is subtartareous, but frequently it is but little visible. In all conditions, however, the species is readily recognized, even when the disk is naked, by the grey pruina of the capitulum beneath, which in a growing state is always persistent. The apothecia are frequent, and the spermogones are usually abundant and crowded.

Hab. On old pales and the decayed trunks of trees in wooded upland tracts.—*Distr.* Local and scarce throughout England: very rare in S. Scotland; not known in Ireland.—B. M. : Lakenham, Norfolk; Henfield, Sussex; Lyndhurst, New Forest, Hants; Birkland, Nottinghamshire; Hay Park, Ludlow, Shropshire; Baysdale, Cleveland, Yorkshire; Hexham, Northumberland. Falls of Clyde, Lanarkshire.

Var. β . *lenticulare* Nyl. Syn. i. (1860) p. 156.—Thallus thin, granuloso-leprose, whitish, or scarcely any, or obsolete. Apothecia moderate, numerous; stipes somewhat robust, black; capitulum tubiformi-dilated, entirely naked, concolorous; spores as in the type or slightly narrower.—Cromb. Lich. Brit. p. 13.—*Calicium lenticulare* Ach. Vet. Ak. Handl. 1816, p. 262, t. 8. f. 4.—*Brit. Exs.*: Cromb. n. 112 pro parte.

This differs chiefly in the form and colour of the capitulum, which is not pruinose. It is a very distinct variety; perhaps it should rank as a subspecies.

Hab. On old oak pales in wooded upland tracts.—*Distr.* Local and scarce in S. and W. England, and in N. Wales.—B. M. : Shire, Surrey; New Forest, Hants; Lewes, Sussex; Bovey Tracey, S. Devon; Barmouth, Merionethshire; Ennerdale, Cumberland.

Form 1. *chlorodes* Nyl. ex Cromb. *Grevillea*, xv. (1886) p. 14.—Thallus effuse, thinnish, granuloso-leprose, greenish-yellow. Apothecia small, scattered; stipes short, black.

The colour of the thallus, if not abnormal, would render this a very distinct variety. The apothecia are smaller and usually more slender than in var. *lenticulare*, but in other respects quite similar.

Hab. On old pales in upland tracts.—*Distr.* Found only sparingly in E. and S. England.—B. M.: Epping Forest, Essex; near Shiere, Surrey; near Bovey Tracey, S. Devon.

Subsp. *C. curtiusculum* Nyl. *Flora*, 1879, p. 360.—Thallus effuse, granulate, whitish. Apothecia black; stipes short; capitulum lentiform, white-pruinose at the extreme margin; spores 0,006–10 mm. long, 0,0035–45 mm. thick.—Cromb. *Grevillea*, viii. p. 114.—*Brit. Exs.*: *Larb. Lich. Hb.* n. 82.

As indicated by Nylander (*l. c.*), most probably a subspecies of *C. quercinum*, differing in the short stipes and in the marginal pruina. The apothecia, sometimes nearly sessile, are numerous and crowded.

Hab. On bark of old firs, and on pales in shady lowland tracts.—*Distr.* Local and scarce in S. and E. England.—B. M.: Near Lewes, Sussex; Oakington, Cambridgeshire.

10. *C. pusillum* Flörke. *Deutsch. Lich.* (1815) n. 188.—Thallus maculate, greyish or whitish, obsolete or none. Apothecia small, entirely black, the stipes slender; spores 1-septate, 0,005–0,010 mm. long, 0,0025–0,005 mm. thick.—Nyl. *Syn. i.* (1860) p. 157; Cromb. *Journ. Bot.* 1882, p. 272.

Looks like a minute variety of *C. quercinum*, but is constant to its own type. Analogous modifications occur in almost all the other species, though usually on the same plant as their types. The very few British specimens have the thallus obsolete and apothecia minute and scattered.

Hab. On decorticated firs in wooded situations.—*Distr.* Extremely local and scarce in S. Ireland.—B. M.: Deer Park, Castlemartyr, co. Cork.

11. *C. curtum* Turn. & Borr. *Lich. Br.* (1839) p. 148.—Thallus very thin, granulose, greyish or obsolete. Apothecia small, black; stipes short, usually somewhat stout; capitulum turbinate-cylindrical, white-pruinose at the margin; sporal mass generally much protruded; spores ellipsoid, 1-septate, 0,007–14 mm. long, 0,004–7 mm. thick; hymenial gelatine frequently bluish with iodine.—Eng. Bot. t. 2503; Sm. Eng. Fl. v. p. 140; Mudd, *Man.* p. 257; Leight. *Lich. Fl.* p. 44, ed. 3, p. 43.—*Calicium quercinum*, subsp. *curtum* Nyl., *Cromb. Lich. Brit.* p. 13. *Phacotium curtum* Gray, *Nat. Arr. i.* p. 485.—*Brit. Exs.*: Leight. n. 133; Mudd, n. 243; *Cromb.* n. 110; *Larb. Lich. Hb.* nn. 83, 321; Bohl. n. 99.

The most common of the British *Calicieï*, and often spreads extensively, though sometimes the thallus is evanescent. From *C. quercinum* it

differs chiefly in having the capitulum slightly pruinose only at the margin, and the spore-mass very much protruded, giving the apothecia "a miniature resemblance to a painter's brush" (Turn. & Borr. *l. c.*). The apothecia are very numerous and crowded, varying considerably in size even in the same specimen. The spermogones are frequent, somewhat prominent, black, and often congregate.

Hab. On old pales and the decayed trunks of trees, chiefly oaks, in wooded upland districts.—*Distr.* General, and plentiful where it occurs, in most parts of Great Britain, but local and scarce in the Channel Islands and Ireland.—B. M.: Island of Guernsey. Bury, Suffolk: Walthamstow and Epping Forest, Essex: Balcombe and Shire, Surrey: near Hythe, Kent: Bolney, Sussex: Lyndhurst, New Forest, Hants: Braydon Forest, Wilts: Tetsworth, Oxfordshire: Gopsall Park and Bradgate Park, Leicestershire: Hay Park, Herefordshire: Hatfield, near Worcester: Oswestry and Stiperstones, Shropshire: Aberdovey, Merionethshire: near Ayton, Cleveland, Yorkshire: Teesdale, Durham: Barcaldine and Glen Falloch, Argyllshire: Killin, Craig Calliach, and Blair Athole, Perthshire: Countesswell's Wood, near Aberdeen. Castle-martyr, co. Cork.

12. *C. trachelinum* Ach. Vet. Ak. Handl. 1816, p. 272, t. 8. f. 7.—Thallus very thin, granulose, greyish-white, or often obsolete. Apothecia moderate, or somewhat large, scattered or crowded: stipes short and stout, or elongate and slender, black; capitulum turbinate-globose, reddish beneath; spores slightly constricted in the middle, 1-septate, 0.008-13 mm. long, 0.004-7 mm. thick.—Mudd, Man. p. 258; Cromb. Lich. Brit. p. 12; Leight. Lich. Fl. p. 43, ed. 3, p. 42.—*Calicium claviculare* γ. *trachelinum* Ach. Meth. (1803) p. 91. *Calicium sphaerocephalum* Turn. & Borr. Lich. Br. p. 152; Hook. Fl. Scot. ii. p. 41; Sm. Engl. Fl. v. p. 141; Tayl. in Mack. Fl. Hib. ii. p. 77. *Phacotium sphaerocephalum* Gray, Nat. Arr. i. p. 483. *Lichen sphaerocephalus* Eng. Bot. t. 414. *Coralloides fungiforme arboreum nigrum vix crustosum* Dill. Musc. 78, t. 14. f. 3 A.—*Brit. Evs.*: Leight. n. 270; Mudd, n. 246; Cromb. n. 112 pro parte.

Readily recognized by the colour of the underside of the capitulum. Occasionally, as in other species, it is more or less suffused with a yellowish *lepraria*, which remains when the proper thallus has disappeared. The apothecia are usually very numerous, and the stipes when elongate is sometimes flexuose. The spermogones are generally present and abundant.

Hab. On the trunks of old trees, occasionally on pales, in maritime and upland districts.—*Distr.* Not very general nor common, throughout England, rare in N. Wales, S. and Central Scotland, and in S.W. Ireland.—B. M.: Earsham, Norfolk: Lea Bridge Road, Essex: Henfield, Sussex: New Forest, Hants: Chedworth Woods, Gloucestershire; near Worcester: Pophills, Warwickshire: Pen-y-law, near Oswestry, Salop: Barmouth, Merionethshire: Kildale, Cleveland, Yorkshire: Eglestone, Durham: Leven's Park, Westmoreland. Ben Lawers and Den of Dupplin, Perthshire: Mar Lodge, Braemar, Aberdeenshire. Castle Bernard Park, co. Bandon.

Form *hemiphæum* Nyl. ex Cromb. Grevillea, xv. p. 14.—Apothecia with the stipes reddish above, or sometimes entirely reddish.—Var. *hemiplodum* (errore) Nyl., Leight. Lich. Fl. ed. 3, p. 43.

This differs from the type in the upper portion or the entire length of the stipes being concolorous with the underside of the capitulum. It is probably an accidental state. Leighton erroneously describes it as having a whitish margin.

Hab. On decaying wood in upland tracts.—*Distr.* Very rare and local in W. England.—B. M.: Cricklade, Wiltshire.

Var. *β. xylonellum* Nyl. Syn. ii. (1860) p. 155.—Capitulum blackish, usually more globose, the margin inflexed, sometimes brownish.—Cromb. Grevillea, xv. p. 14.—*Calicium xylonellum* Ach. Meth. (1803) p. 92, Suppl. p. 14. *Calicium sphaerocephalum β. crustosum* Turn. & Borr. Lich. Br. p. 153.

Though looking distinct, this is only a variety of *C. trachelinum*, differing, amongst other minor and less constant characters, in the colour, form, and coarctate margin of the capitulum.

Hab. On old pales in upland wooded tracts.—*Distr.* Very local and scarce in E. and S. England, and (*vide* Nyl. l.c.) in S.W. Ireland.—B. M.: Bury St. Edmund's, Suffolk; Stoney Cross, New Forest, Hants.

13. *C. parietinum* Ach. Vet. Ak. Handl. 1816, p. 260, t. 8. f. 1 A, B. —Thallus very thin, maculate, greyish-white, or none visible. Apothecia minute, scattered; stipes somewhat short, slender, black; capitulum lenticular or subtruncate, blackish, sporal mass compact; spores fusiformi-ellipsoid, simple, about 0.007–11 mm. long, 0.003–6 mm. thick.—Cromb. Grevillea, xv. p. 14.—*Calicium subtile* Mudd, Man. p. 258; Cromb. Enum. p. 13; Leight. Lich. Fl. p. 44, ed. 3, p. 44. *Calicium debile* Eng. Bot. t. 2462; Turn. & Borr. Lich. Br. p. 151; Sm. Eng. Fl. v. p. 141. *Strongyllum debile* Gray, Nat. Arr. i. p. 484.—As it is extremely doubtful if *Calicium subtile* Pers. is this species, I have employed the name of Acharius.—*Brit. Exs.*: Leight. n. 314; Mudd, n. 247.

The thallus, even when best developed, forms only a very thin, widely spreading film, which often becomes obliterated. The minute, scattered apothecia, the slender stipes, the form of the capitulum, the rather compact mazædium, and the simple spores distinguish it from its British allies.

Hab. On the trunks of decorticated dead trees, and on old timber of outhouses in upland districts.—*Distr.* Local and rare in S. and N. England.—B. M.: Henfield, Sussex; Lyndhurst, New Forest, Hants; Cleveland, Yorkshire.

Form *minutellum* Nyl. Syn. i. (1860) p. 159.—Thallus whitish. Apothecia minute, capitulum often greyish-suffused beneath.—Cromb. Grevillea, xv. p. 14.—*Calicium minutellum* Ach. Vet. Ak. Handl. 1816, p. 118, t. 5. f. 2.

This differs from the type in the colour of the thallus, the constantly minute apothecia, and the colour of the underside of the capitulum. In the only British specimen this last character is scarcely apparent.

Hab. On old pales in upland tracts.—*Distr.* Only sparingly in S. England.—B. M.: Wheatfield Park, Oxfordshire.

14. *C. populneum* De Brond. in Dub. Bot. Gall. (1830) ii. p. 638.—Thallus hypophæodal, macular, subleprose, pale or whitish. Apothecia minute, scattered, entirely black, somewhat shining; stipes very short, slender; capitulum turbinate; spores 1-septate, blackish, 0.010–11 mm. long, 0.005–6 mm. thick.—Mudd, Man. p. 257, t. iv. f. 104; Leight. Lich. Fl. p. 45, ed. 3, p. 44; Cromb. Grevillea, xv. p. 14.—*Calicium curtum* β . *populinum* Turn. & Borr. Lich. Br. p. 149; Sm. Eng. Fl. v. p. 140. *Calicium triste* Cromb. Lich. Brit. p. 13.

The thallus is somewhat smooth and shining, appearing as a very thin film. From *C. parietinum*, which it somewhat resembles, distinguished by its place of growth, the minute, fragile apothecia and the larger spores.

Hab. On the smooth bark of poplars in wooded upland tracts.—*Distr.* Only sparingly from the S.W. Highlands of Scotland and S.W. Ireland.—B. M.: Airds, Appin, Argyleshire. Killarney, co. Kerry.

15. *C. diploellum* Nyl. Flora, 1868, p. 161.—Thallus effuse, very thin, greyish-white, but doubtfully proper. Apothecia minute, scattered, entirely black; stipes very short; capitulum turbinate, open; sporal mass scarcely prominent; spores simple or at length 1-septate 0.006–9 mm. long, 0.003–4 mm. thick.—Carroll, Journ. Bot. 1868, p. 100; Cromb. Lich. Brit. p. 13; Leight. Lich. Fl. p. 39, ed. 3, p. 39.

Apart from other marks of distinction, this may be recognized by its very small size, being the most minute of all *Caliciei*, so that it is very liable to be overlooked. It is closely allied to *C. disseminatum*, a European species, which has not yet been detected in Great Britain.

Hab. On the bark of holly in upland wooded districts.—*Distr.* Extremely local and scarce, in S.W. Ireland.—B. M.: Cromaglow, Killarney, co. Kerry.

16. *C. retinens* Nyl. Flora, 1868, p. 161.—Thallus effuse, thin, subfarinaceous, opaque, whitish. Apothecia minute, sessile, lecideiform, black; sporal mass indistinct; spores oblong or oblongo-cylindrical, conspicuously 1-septate, 0.008–11 mm. long, 0.0025–35 mm. thick; hypothecium brownish-rubricose.—Leight. Ann. Mag. Nat. Hist. ser. 4, i. p. 482; Lich. Fl. p. 45, ed. 3, p. 44; Cromb. Grevillea, xv. p. 14.

It is doubtful if the thallus be really proper. This may be decided by additional specimens. With its lecideiform apothecia and indistinct mazædium and definitely 1-septate spores it seems referable to *Trachylia*; but it rather presents, according to Nylander, *in litt.*, an affinity with species of the present genus, especially in the longer spores. At the same time it shows that there are no decided limits for the two genera.

Hab. On the trunk of an old oak in a maritime district.—*Distr.* Met with only once, and very sparingly, in the Channel Islands, on the coast of Jersey.

22. **STENOCYBE** Nyl. Bot. Not. 1854, p. 84, *ex* Stiz. St. Gall. Nat. Ges. (1876) p. 196.—Thallus macular, thin, usually obsolete, or probably none proper. Apothecia stipitate, scattered, black, the capitulum turbinato-clavate; paraphyses slender, short; sporal mass none; spores oblongo-fusiform, normally 3-septate, dark-brown or blackish; hymenial gelatine pale-bluish with iodine. Spermatogones not rightly known.

Distinguished from *Calicium* by the surface of the capitulum, which is without any accumulated sporal mass, the pluriseptate spores, and the more slender and shorter paraphyses. The absence of a mazædium entitles it to rank as a distinct genus, as originally proposed by Nylander, a position to which he has again restored it. All the plants are minute and inconspicuous.

1. **S. euspora** Nyl. *ex* Cromb. Journ. Bot. 1882, p. 272.—Thallus scarcely any proper, or very diffuse and obsolete. Apothecia distantly scattered, very small, black; stipes slender; capitulum clavate; spores 3-5-7-septate, 0,018-36 mm. long, 0,007-11 mm. thick; paraphyses thin, crowded. — *Calicium eusporum* Nyl. Bull. Soc. Bot. Fr. xv. (1856) p. 549; Carroll, Journ. Bot. 1865, p. 287, *pro parte*. *Stenocybe major* Nyl. Bot. Not. 1854, p. 84 (nomen ineptum).

This has hitherto been confounded by British authors (following Mudd) with *S. trajecta*. From this it is distinguished by the smaller and more scattered apothecia and especially by the smaller spores.

Hab. On old stumps of holly in mountainous situations. — *Distr.* Extremely local and rare in S.W. Ireland.—B. M.: Mangerton, co. Kerry.



Fig. 25.

Stenocybe euspora Nyl.—a. An apothecium, $\times 30$. b. Section of upper portion of an apothecium, $\times 30$. c. Theca and paraphysis, $\times 350$. d. Spores, $\times 500$.

2. **S. trajecta** Nyl. *ex* Cromb. Journ. Bot. 1882, p. 272.—Thallus effuse, very thin, or obsolete, or none proper. Apothecia small, blackish; stipes short and robust, or more elongate and slender; capitulum truncate-clavate, with the margin inflexed; spores 2 (4)-locular, or at length 3-septate, very large, 0,044-70 mm. long, 0,014-20 mm. thick; paraphyses slender, somewhat crowded. — *Calicium trajectum* Nyl. Flora, 1865, p. 211; Carroll, Journ. Bot. 1865, p. 287; Cromb. Lich. Brit. p. 13; Leight. Lich. Fl. p. 46.

Stenocybe eusporum Mudd, Man. p. 256, t. iv. f. 103. *Calicium eusporum* Cromb. Lich. Brit. p. 13. *Calicium septatum* Leight. Lich. Fl. p. 45, ed. 3, p. 45. *Sphinctrina septata* Leight. Ann. & Mag. Nat. Hist. ser. 2, xix. (1857) p. 132, t. 8. ff. 20-24. The specific name of Leighton, though having priority, is quite inapplicable in this genus.—*Brit. Exc.*: Mudd, n. 242; Leight. n. 228; Cromb. n. 9.

There has been considerable difficulty about this plant, owing to the variable character of the spores, which, as already observed, has led to its being confounded with the preceding. The thallus is so thin as to be scarcely distinguishable from the bark upon which it grows, and is usually evanescent or none proper. The apothecia are generally numerous, sometimes 2-3 congregate, with the stipites varying in length from $\frac{1}{8}$ to $\frac{1}{4}$ inch, and occasionally, when more elongate, becoming branched.

Hab. On the bark of holly, and also parasitic on the thallus of *Thelotrema lepadinum* and *Graphis elegans* in upland wooded districts.—*Distr.* Local, though common where it occurs, in S. and N. England and in S. and W. Ireland. B. M.: Near Lyndhurst, New Forest, Hants; Ingleby Park and Bousdale Gill, Cleveland, Yorkshire. Glenbower Wood and near Castlemartyr, co. Cork; Turc Mt., Killarney, co. Kerry; Kylemore, co. Galway.

3. *S. byssacea* Nyl. Bot. Not. 1884, p. 84.—Thallus scarcely any visible, or obscure and obsolete. Apothecia small, much scattered, blackish; stipes very slender, sometimes branched; capitulum clavato-tubiform: spores simple or at length 1-3-septate, 0,015-23 mm. long, 0,005-7 mm. thick; paraphyses few; hymenial gelatine scarcely tinged with iodine.—Cromb. Grevillea, xv. p. 14.—*Calicium byssaceum* Fr. Sched. Crit. i. (1824) p. 6; Cromb. Journ. Bot. 1873, p. 132; Leight. Lich. Fl. ed. 3, p. 45.

Closely allied to the two preceding species, but smaller and more slender, with the apothecia very much scattered and the spores smaller. Unless after a shower of rain, it is scarcely visible, and is consequently overlooked. The apothecia are frequently branched, becoming occasionally somewhat fasciculate.

Hab. On the trunks and branches of old alders in upland wooded districts.—*Distr.* Local and scarce in W. England, N. Wales, and among the Grampians, Scotland.—B. M.: Hay Park, Ludlow, Shropshire; Capel Curig, Carnarvonshire. Glen Lochay and Blair Athole, Perthshire; Glen Cluny, Braemar, Aberdeenshire.

23. **CONIOCYBE** Ach. Vet. Ak. H. 1816, p. 288; Nyl. Mém. Soc. Cherb. iii. (1855) p. 168.—Thallus effuse, leprose, thin, or scarcely any distinct; gonidial layer consisting of gonidimia, various in form. Apothecia stipitate, globoso-pulverulent, yellow or pale, stipes usually elongate; sporal mass copiously accumulated on the capitulum; spores spherical, simple, colourless, or pale-brownish, mixed with the paraphyses; spermogonia with simplish sterigmata, and oblong or ellipsoid spermatia.

In the type of the apothecia this has the same relation to *Calicium* that *Biatorella* has to *Eulecidea*. It differs from *Calicium* in the pulverulent globose capitulum and in the constantly spherical form of the spores, although, as already observed, it closely approaches subgen. *Allodium*.

1. *C. furfuracea* Ach. Vet. Ak. Handl. 1816, p. 288.—Thallus leproso-pulverulent, greenish-yellow or sulphur-coloured. Apothecia small or moderate, concolorous, or rarely greyish-pruinose; stipes elongated, slender, sulphureo-pulverulent; capitulum globose, sporal mass yellow or pale-umbrine; spores 0.0025–30 mm. in diameter; paraphyses at length branched.—Mudd, Man. p. 262, t. iv. f. 108; Cromb. Lich. Brit. p. 14; Leight. Lich. Fl. p. 46, ed. 3, p. 45.—*Calicium furfuraceum* Turn. & Borr. Lich. Br. p. 159; Sm. Eng. Fl. v. p. 142. *Bæomyces furfuraceus* Tayl. in Mack. Fl. Hib. ii. p. 78. *Trichia furfuracea*, With. Arr. ed. 3, iv. p. 398. *Mucor furfuraceus* Linn. Sp. Pl. ed. 3 (1764) p. 1655. *Strongylium capitellatum* Gray, Nat. Arr. i. p. 485. *Lichen capitatus* Sm. Eng. Bot. t. 1539.—Brit. Exs.: Leight. n. 225; Cromb. n. 10; Bohl. n. 62.



Fig. 26.

Coniocybe furfuracea Ach.—a. Apothecium, $\times 30$. b. Vertical section of the capitulum, $\times 30$. c. Theca and paraphysis, $\times 350$. d. Spores, $\times 500$. e. Vertical section of a spermatogone, $\times 30$. f. Sterigmata and g. spermatia, $\times 500$.

The thallus, which is more or less effuse, and internally has oblongo-cylindrical gonidimia, occasionally becomes nearly evanescent. The stipes are very weak, and consequently more or less flexuose; while in old age they are denudate and become brown or blackish. The apothecia when present (for the thallus is very frequently infertile) are numerous, scattered, or crowded. Our fig. (b) shows the brown axis of the stipes ascending into the *cupula*, left white in the figure, and the pale brownish pulvinate subcolumelliform hypothecium. The spermatogones are apt to be overlooked, being nearly concolorous with the thallus.

Hab. On the roots of decayed trees and on dead twigs, occasionally on the ground and decayed mosses, rarely on rocks in shady upland places.—*Distr.* General throughout England, rare in N. Wales, S. and Central Scotland, rare in E. Ireland (near Belfast).—B. M.: Near Bury, Suffolk; Walthamstow, Essex; Esher, Surrey; Lyndhurst, New Forest, and Blackwater, Hants; near Shanklin, Isle of Wight; near Malvern Wells and Alfrick, Worcestershire; Twycross, Leicestershire; South Wingfield, Derbyshire; Oswestry and Church Stretton, Shropshire; near Barmouth, Merionethshire; Peel, Isle of Man; Brantsdale, Yorkshire; Teesdale,

Durham; Bassenthwaite Lake, Cumberland. Calderbank, near Glasgow; Blair Athole and Aberfeldy, Perthshire.

Form *fulva* Fr. Lich. Eur. (1831) p. 382.—Stipes short, somewhat stout, capitulum hemispherical; otherwise as in the type.—Mudd, Man. p. 262; Leight. Lich. Fl. ed. 3, p. 46; Cromb. Grevillea, xv. p. 14.—*Mucor fulvus* Linn. Sp. Pl. ed. 3 (1764) p. 1655.

This form differs only in the shorter, stouter stipes and the form of the capitulum. Where the plant is abundant, transition-states may be seen in the same specimen.

Hab. On dead stems and mosses on walls and on the ground in upland tracts.—*Distr.* Local and scarce in W. England, and amongst the Central Grampians, Scotland.—B. M.: Oswestry, Shropshire. Blair Athole, Perthshire.

2. *C. sulphurea* Nyl. ex Cromb. Grevillea, xv. (1886) p. 14.—Thallus effuse, leprose, very thin, greyish or greyish-white, often obsolete. Apothecia small, sulphureo-pulverulent; stipes short, very slender; capitulum minute, globose; sporal mass yellow; spores 0.0025–0.003 mm. in diameter.—*Lichen sulphureus* Retz. Vet. Ak. Handl. 1769, p. 249. *Coniocybe furfuracea* c. *sulphurella* Fr. Mudd, Man. p. 262; Cromb. Lich. Brit. p. 14; Leight. Lich. Fl. p. 47, ed. 3, p. 46.

Though regarded as a variety of the preceding, differing chiefly in the colour of the thallus and the smaller apothecia, this appears to be specifically distinct. It definitely and constantly preserves its own proper type, and it has smaller gonidimia. In the British specimens the thallus is well developed, with the apothecia somewhat scattered.

Hab. On semiputrid trunks of old oaks in wooded upland tracts.—*Distr.* Extremely local and scarce, in S. and N. England.—B. M.: New Forest, Hants; Teesdale, Durham.

3. *C. pallida* Fr. Sched. Crit. i. (1824) p. 3.—Thallus very thin, leproso-pulverulent, white, often obsolete. Apothecia small; stipes moderate, stout, hyaline or yellow, rarely brownish above; capitulum globose; sporal mass white or pale; spores 0.004–10 mm. in diameter.—Mudd, Man. p. 262; Cromb. Lich. Brit. p. 14; Leight. Lich. Fl. p. 47, ed. 3, p. 46.—*Calicium pallidum* Pers. Ust. Ann. (1794) p. 20, t. 3. ff. 1, 2. *Calicium peronellum* Turn. & Borr. Lich. Br. p. 158; Sm. Eng. Fl. v. p. 141. *Phacotium cantherellum* Gray, Nat. Arr. i. p. 484. *Lichen cantharellus* Eng. Bot. t. 2557.

This may easily be recognized from the preceding, to which in the colour of the thallus it approximates, by the hyaline and stout stipes, and the colour of the sporal mass.

Hab. On stumps and trunks of old decayed trees in shady places in upland tracts.—*Distr.* Only a few localities in Central and N. England, though what appears to be the barren thallus has been met with elsewhere.—B. M.: Teesdale, Durham; near Hexham, Northumberland.

4. *C. hyalinella* Nyl. Mém. Soc. Cherb. v. (1857) p. 93; Syn. i. p. 164, t. v. f. 40.—Thallus obsolete. Apothecia small; stipes slender, hyaline, brownish above; capitulum globose; sporal mass white or pale-reddish: spores minute, 0,0025–0,004 mm. in diameter.—Cromb. Lich. Brit. p. 14; Leight. Lich. Fl. p. 47, ed. 3, p. 46.

Occasionally there are traces of a very thin, whitish, and leprose thallus, but it is doubtful if this be proper. It is closely allied to *C. pallida*, but differs in the more slender stipes, and in the spores being at least half the size.

Hab. On indurated stumps of trees in wooded upland districts.—*Distr.* Found only very sparingly in N. England.—B. M.: Brantsdale, Yorkshire.

24. **TRACHYLIA** Fr. Vet. Ak. Handl. 1821, p. 324, pro parte; Nyl. Mém. Soc. Cherb. iii. (1855) p. 167; Lich. Scand. p. 44 (note).—Thallus granulose, or rarely subleprose, or wanting. Apothecia sessile, cupuliform, open, black, with thin proper margin; sporal mass more or less accumulated, black; spores 1-septate, rarely pluri-septate and irregularly divided, ellipsoid, blackish or brownish-black: hymenial gelatine scanty and scarcely tinged with iodine. Spermatogones with oblong or ellipsoid spermatia.

Distinguished from the allied genera by the apothecia being constantly sessile, almost lecideiform, and the ellipsoid spores. As already noted under *Calicium retinens*, transition forms are not wanting, and *Trachylia* may not be generically distinct. The gonidia are globulose.

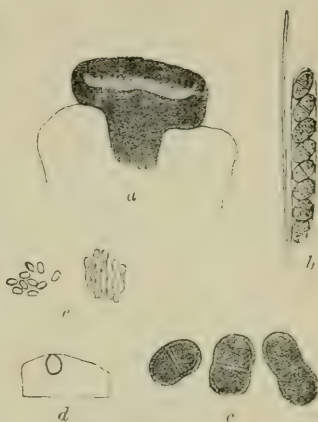


Fig. 27.

Trachylia tympanella Fr.—a. Vertical section of an apothecium, $\times 30$. b. Theca (with young spores) and a paraphysis, $\times 350$. c. Older (free) spores, $\times 500$. d. Vertical section of a spermatogonium, $\times 30$. e. Sterigmata and spermatia, $\times 500$.

1. *T. tigillaris* Fr. Sum. Veg. (1846) p. 282.—Thallus effuse, granulose, or granulo-areolate, or conerescent, usually rimose, yellowish-green or citrine (K—). Apothecia small, plane, innate, black, the margin prominent, at length excluded; spores 1-septate, 0,015–25 mm. long, 0,008–11 mm. thick.—Cromb. Lich. Brit. p. 14; Leight. Lich. Fl. p. 48, ed. 3, p. 47.—*Acolium tigillare* Gray, Nat. Arr. i. p. 482; Mudd, Man. p. 254. *Calicium tigillare* Turn. & Borr. Lich. Br. p. 132; Sm. Eng. Fl. v. p. 139. *Lichen tigillaris* Ach. Prodr. (1798) p. 67; Eng. Bot. t. 1530.

There is a striking contrast between the colour of the thallus and of

the apothecia in this species. In damp shady places it is greener but barren, so that it may be taken for a brightly coloured state of some subconcolorous lichen. Scattered amongst the ordinary granules are larger and more prominent ones bearing the apothecia, which in our specimens are few and small. The spermogones are frequent, punctiform, minute, blackish, the sterigmata very short, the spermatia 0,005-7 mm. long, 0,0025-35 mm. thick.

Hab. On old pales, generally about gardens, very rarely on trees, in lowland and upland districts.—*Distr.* Very local, at least in a well-developed state, having been gathered only sparingly in the Eastern counties of England, and now extinct in several of the recorded localities. B. M.: Near Yarmouth, Suffolk: Walthamstow, Loughton, and Colchester, Essex; Herringfleet, Suffolk.

2. *T. tympanella* Fr. Sum. Veg. (1846) p. 282.—Thallus effuse, granulose or granuloso-conerescens, moderate or thinnish, grey or greyish-white (K+). Apothecia moderate or large, elevato-sessile, plane, black, slightly grey-pruinose or naked, the margin prominent, black, often white-pruinose, at length evanescent; spores 1-septate, 0,010-18 mm. long, 0,007-12 mm. thick.—Cromb. Lich. Brit. p. 14; Leight. Lich. Fl. p. 48, ed. 3, p. 47.—*Acolium tympanellum* Gray, Nat. Arr. i. p. 482; Mudd, Man. p. 254, t. iv. f. 101. *Calicium tympanellum* Ach. Meth. (1803) p. 89; Turn. & Borr. Lich. Br. p. 134; Sm. Eng. Fl. v. p. 139. *Lichen inquinans* Eng. Bot. t. 810.—*Brit. Exs.*: Leight. n. 88; Mudd, n. 240; Cromb. n. 114.

With its sessile apothecia this might readily be taken for some *Lecidea* (such as *L. premea*). The thallus, which is thickish with the granules confluent, or very thin (nearly evanescent), spreads extensively over the substratum, but occasionally, when surrounded by other lichens, it is small. The apothecia are very numerous, at first somewhat protuberant, but at length plane, large—the largest in the tribe. When touched the mazedium, which is sometimes considerably protruded, stains the fingers with an inky colour.

Hab. On old posts and pales, rarely on the bark of trees in upland districts.—*Distr.* General, and usually plentiful, in various parts of England, and rare in E. Ireland.—B. M.: Earsham, Norfolk; Yarmouth and Ickworth, Suffolk; Walthamstow and Colchester, Essex; Totteridge, Middlesex; Elstree, Herts; Penshurst and Lydd, Kent; Albourne, Sussex; New Forest, Hants; near Wootton Bassett, Gloucestershire; near Malvern, Worcestershire; Gopsall Park, Leicestershire; Harboro' Magna, Warwickshire; Derbyshire; Oswestry, Haughmond Hill, and near Shrewsbury, Shropshire; Rosedale, Yorkshire. Carraghmore, co. Waterford.

3. *T. stigonella* Fr. Sum. Veg. (1846) p. 282.—Thallus none proper. Apothecia parasitic, small or moderate, scarcely prominent, plane, black, naked, the margin prominent, concolorous, or sometimes pruinose, at length evanescent; spores 1-septate, obtusely rounded at either apex, 0,009-17 mm. long, 0,007-10 mm. thick.—Cromb. Lich. Brit. p. 15; Leight. Lich. Fl. p. 49, ed. 3, p. 47.—

Acolium stigonellum Mudd, Man. p. 254. *Calicium stigonellum* Ach. Meth. (1803) p. 88, pro parte. *Calicium sessile* β . *marginatum* Turn. & Borr. Lich. Br. p. 128; Sm. Eng. Fl. v. p. 138.—*Brit. Ess.*: Leight. n. 226; Cromb. n. 11.

This species is closely allied to the preceding, but is distinguished by the smaller and constantly naked, somewhat scattered apothecia, and by its being entirely parasitic.

Hab. On the thallus of various *Pertusariæ*, on old oaks, in upland woods.—*Distr.* General, though not common, throughout England.—B. M.: Epping Forest, Essex; Shiere, Surrey; St. Leonard's Forest, Sussex; near Lyndhurst, New Forest, Hants; Oakley Park, near Cirencester, Gloucestershire; Hendlip, near Worcester; Gopsall Wood, Leicestershire; Llanforda, Shropshire; Easby Wood and Ingleby, Cleveland, Yorkshire; Leven's Park, near Kendal, Westmoreland; Teesdale, Durham.

Tribe II. **SPHÆROPHOREI** Nyl. Mém. Soc. Cherb.
iii. (1855) p. 168; Syn. i. p. 169.

Thallus vertical, fruticuloso-divided or ramulose, subgloboso-incrassate at the apices, within entirely filamentose. Apothecia terminal, innate, at first closed, at length with the thalline receptacle irregularly lacero-dehiscent; sporal mass copious, black; spores 8næ, in evanescent thecæ, simple or 1-septate, spherical or ellipsoid, blackish or brown. Spermogones terminal, black or pale.

This is closely allied to the preceding tribe. Their thalli are no doubt very different in form and texture; but the fully developed fructification of the *Sphærophorei* is similar to that of the *Caliciei*.

25. **SPHÆROPHO-**

RUS Pers. in Ust. Ann. vii. (1794) p. 23. (*Sphærophoron* Ach. Meth. (1803) p. 134.)—Thallus cæspitoso - fruticulose, branched, smooth, fragile; medullary layer white, woolly; cortical layer corneous, somewhat shining. Apothecia situated on the dilated apices of the primary axes, paraphyses very scanty; spores covered with a black pigment. Spermogones black with short, jointed sterigmata and oblong spermatia.

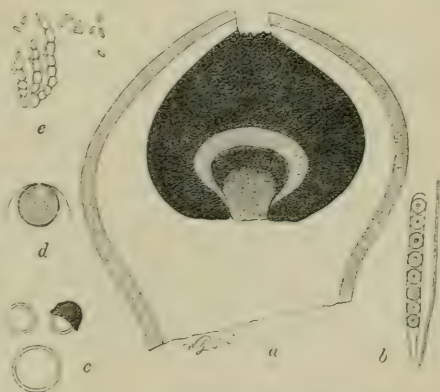


Fig. 28.

Sphærophorus coralloides Ach. — a. Vertical section of an apothecium (in dry state), $\times 30$. b. Theca and paraphyses, $\times 350$. c. Three spores (two of which are naked), $\times 500$. d. Vertical section of a spermogonium, $\times 30$. e. Arthrosterigmata and spermatia, $\times 500$.

This small genus is distinguished from other fruticulose lichens by the thallus and apothecia. The fructification, though at first apparently pyrenocarpoid, is at length entirely as in this series. The black powder of the spores is easily rubbed off, so that it is sometimes not visible in herbaria specimens.

1. *S. compressus* Ach. Meth. (1803) p. 135.—Thallus fruticulose, erect, irregularly branched, whitish (K—, medulla I—); branches short, compressed, much divided, naked or more or less laterally and minutely fibrillose. Apothecia moderate, oblique, globoso-depressed; the receptacle lacero-dehiscent, or at length discoid and open; spores spherical, 0,007–11 mm. in diameter.—Hook. Fl. Scot. ii. p. 67; Sm. Eng. Fl. v. p. 232; Gray, Nat. Arr. i. p. 487; Turn. & Borr. Lich. Br. p. 115; Mudd, Man. p. 264; Cromb. Lich. Brit. p. 15; Leight. Lich. Fl. p. 49, ed. 3, p. 48.—*Lichen fragilis* Huds. Fl. Angl. i. p. 460 pro parte; Lightf. Fl. Scot. ii. p. 888 pro min. parte; Eng. Bot. t. 114. *Coralloides alpinum corallinæ minoris facie* Dill. Musc. 116, t. 17. f. 34 c. *Lichenoides non tubulosum, ramulis nigris scutellis terminatis* Dill. in Ray Syn. ed. 3, 66. 13.—Brit. Exs.: Mudd, n. 254; Larb. Lich. Hb. n. 205; Dicks. Hort. Sic. n. 23.

This, as observed by Turner and Borrer (*l. c.*), “is a singularly elegant and beautiful lichen in point both of shape and of colour, especially in its fertile state, when the striking whiteness of the thallus is relieved by the jetty black of the large open cistulæ.” In moist places the main branches are occasionally of a glaucous colour, and rarely, as stated by Lightfoot *l. c.*, “tinged with a bright-red colour” (becoming, however, darker when dry), “so as to resemble very strongly *Corallina rubens* Linn.” The compressed and normally whitish thallus and the oblique discoid apothecia distinguish it from the following species. The apothecia are but sparingly seen in British specimens, and the spermatogones are seldom present. They are tuberculose and brownish-black, situated on the main branches, or more rarely on the apices of the fibrillæ, with spermatia ellipsoid, 0,003 mm. long, 0,001 mm. thick.

Hab. On rocks and boulders in shady places in upland tracts.—*Distr.* General, though not common, in Great Britain: rarer in W. Ireland and the Channel Islands.—B. M.: Island of Guernsey. Tunbridge Wells, Kent; Ardingly, Sussex; Dartmoor, Devonshire; Cromford Moor, near Matlock, Derbyshire; Craigforda, near Oswestry, Shropshire; Aberdovey and Cwm Brchan, Merionethshire; Farndale, Yorkshire; Teesdale, Durham; Wark, Northumberland. New Galloway, Kirkcudbrightshire; Pentland Hills, near Edinburgh; Barcaldine, Lorne, Argyshire; the Trossachs and Loch Tay, Perthshire; Clova Mts., Forfarshire; Countess-wells Wood, near Aberdeen; Lochaber, Inverness-shire. Turk Mt. and Cromaglow, co. Kerry; Connemara, co. Galway.

2. *S. coralloides* Pers. Ust. Ann. i. (1794) p. 23.—Thallus unequally and somewhat loosely branched, suberect or ascending, greyish-white or reddish-brown (K—, medulla I + bluish); branches rounded, numerous, rather short, with compound lateral fibrillæ. Apothecia globose, moderate, the receptacle persistent, semi-globose and irregularly dehiscent above; spores spherical, 0,009–15 mm. in dia-

meter.—Hook. Fl. Scot. ii. p. 67; Gray, Nat. Arr. i. p. 487; Leight. Br. Angl. Lich. 7, t. i. f. 1; Lich. Fl. p. 47, ed. 3, p. 48; Mudd, Man. p. 264, t. v. f. 109; Cromb. Lich. Brit. p. 15.—*Sphærophoron coralloides* a. *laxum* Sm. Eng. Fl. v. p. 232. *Lichen globiferus* Lightf. Fl. Scot. ii. p. 887; Eng. Bot. t. 115; With. Arr. ed. 3, iv. p. 40. *Lichen globosus* Huds. Fl. Angl. i. p. 460. *Coralloides eupressiforme capitulis globosis* Dill. Musc. p. 117, t. 17. f. 35. *Lichenoides non tubulosum ramosissimum, fruticuli specie cinereo-fuscum* Dill. in Ray, Syn. ed. 3, 65. 9.—*Lichen globiferus* Linn. Mant. (1767) p. 133 is a prior name, but being merely the Latin equivalent of *Sphærophorus* cannot be retained, nor the still older name—*Lichen globosus* Huds.—*Brit. Exs.*: Mudd, n. 253; Leight. n. 316; Bohl. n. 5.

Notwithstanding the specific name, this plant is not nearly so “corallinoid” as the preceding, from which it is distinguished by the rounded and laxly branched thallus, the shorter branches, and the persistent subglobose receptacle of the apothecia. It occurs in extensive patches, varying in colour from glaucous in shady to brownish or even reddish in exposed habitats, the branches being somewhat shining in the upper portion, and the larger ones more or less indistinctly articulate. The apothecia are chiefly on the main branches, and remain closed for a considerable time. Our figure (p. 103) illustrates their structure: *a* is a section of the thalline receptacle with an apothecium. In the receptacle is an external pale stratum—the *cortex*. In the apothecium there is (1) the columellar brown *hypothecium*, which is blackish above; (2) a bluish-white stratum, which is the *hymenium*; and (3) a very thick external black stratum, which is the *mazædium*. The spermogones are terminal either on the sterile branches or on the fibrillæ, and are similar to those of *S. compressus*, though more frequent.

Hab. On rocks and boulders, rarely on the mossy roots of trees, from maritime to alpine regions.—*Distr.* General and common in the hilly and mountainous tracts of Great Britain and Ireland, rarer in the Channel Islands.—*B. M.*: Islands of Jersey and Guernsey. Tunbridge Wells, Kent; Ardingly, Sussex; Vixen Tor, Lustleigh Cleeve, and Hay Tor, Dartmoor, Devonshire; between Arthur’s bed and Wring Cheese, near Penzance, and Helminton, Cornwall: Buckstone, near Monmouth: Charnwood Forest, Leicestershire; Malvern Hills, Worcestershire; Cromford Moor, near Matlock, Derbyshire: Caer Caradoc and Pentregaer, Cswestry, Salop; Llanberis and Conway Falls, Carnarvonshire; Cader Idris, Cwm Bychan, and Aberdovey, Merionethshire: Island of Anglesea; Kildale Moor, Cleveland, Yorkshire: Teesdale and Egglestone, Durham; Kentmere, Westmoreland; the Cheviots, Northumberland. New Galloway, Kirkcudbrightshire: Pentland Hills and Dalmahey Hill, near Edinburgh; Inverary and Loch Crevan, Argyleshire: the Trossachs, Craig Callich, Ben Lawers, Falls of Bruar, and near Loch Ericht, Perthshire; Reeky Linn and Clova, Forfarshire; hills at Nigg, Kincardineshire; Craig Coinnech and Lochnagar, Braemar, Aberdeenshire; Glen Nevis, Inverness-shire; near Forres, Elginshire; near Lairg, Sutherlandshire. Devis Mt., co. Antrim; Killarney, co. Kerry; Connemara, co. Galway.

Form *congestus* Lamy, Bull. Soc. Bot. Fr. xxv. (1878) p. 349.—Thallus small, firm, the branches short, erect, densely aggregate.—Cromb. Grevillea, xv. p. 15.

This singular form occurs in compact tufts, sometimes very closely appressed to the substratum, and is probably only a stunted condition of the type. It resembles the following species, but is distinguished by the fibrillose and subfasciculate branches, and by the reaction of the medulla with iodine. It is never seen fertile.

Hab. On naked boulders in subalpine regions.—*Distr.* Very local and scarce among the Grampians and in the N.W. Highlands of Scotland.—B. M.: Ben Lawers, Perthshire; Morrone, Braemar, Aberdeenshire; hills of Applecross, Ross-shire.

3. *S. fragilis* Ach. Meth. (1803) p. 135.—Thallus densely cæspitose, sparingly and dichotomously branched, nearly erect, greyish-white, brownish or lurid-greyish (K + yellowish, medulla I -); branches rounded, fastigate, naked, not fibrillose. Apothecia terminal, globose, black; receptacle irregularly dehiscient above; spores spherical or globoso-ellipsoid, 0.007–16 mm. in diameter.—Gray, Nat. Arr. i. p. 487; Hook. Fl. Scot. ii. p. 67; Cromb. Lich. Brit. p. 15; Leight. Lich. Fl. p. 51, ed. 3, p. 49.—*Sphærophoron coralloides* β . *fragile* Mudd, Man. p. 264. *Lichen fragilis* Linn. Sp. Pl. (1753) p. 1154; Lightf. Fl. Scot. ii. p. 888 pro parte; Eng. Bot. 2474. *Sphærophoron coralloides* β . *cæspitosum* Turn. & Borr. Lich. Br. p. 111; Sm. Eng. Fl. v. p. 232; Leight. Br. Angl. Lich. p. 8, t. i. f. 2. *Coralloides alpinum*, *Corallinae minoris facie* Dill. Musc. 116, t. 17. f. 34 A, B.

Though regarded as a variety of *S. coralloides*, this is distinguished by the smaller and densely cæspitose thallus, the fastigate efibrillose branches, and the chemical reactions, though that with K is but little visible in darker-coloured thalli. It is usually pulvinate, and even when best developed scarcely an inch in height, frequently glaucous towards the apices and lurid near the base of the branches, occasionally reddish, suffused on the surface with peroxide of iron. The apothecia are less regularly globose than in the preceding species, the fertile branches being more or less protruded. It is most frequently sterile. The spermatogones are common, with spermatia oblongo-cylindrical, very minute, 0.003 mm. long, about 0.001 mm. thick.

Hab. On mossy (also naked) rocks and boulders in upland, subalpine, and alpine situations.—*Distr.* General and common in the hilly and mountainous tracts of Great Britain and Ireland, reaching to the highest summits of the Scottish Grampians.—B. M.: Ardingly Rocks, Sussex; Hay Tor and Lustleigh Cleeve, Dartmoor, S. Devon; near Liskeard, Cornwall; Chamwood Forest, Leicestershire; Craigforda, near Oswestry, Shropshire; Rhewgreidden, Merionethshire; Snowdon, Carnarvonshire; Island of Anglesea; Helsby, Cheshire; Farndale, Yorkshire; Eggleston and Teesdale, Durham; Ennerdale, Cumberland; the Cheviots, Northumberland. New Galloway, Kirkcudbrightshire; Ben Lomond, Dumbartonshire; Craig Calliach, Ben Lawers, near Crieff, and Loch Eriicht, Perthshire; Clova Mts., Forfarshire; Craig Coinnoch, Glen Callater, Loch-na-gar and Ben-naboord, Braemar, Aberdeenshire; Ben Nevis, Inverness-shire; Culbin, Forres, Elginshire; hills of Applecross, Ross-shire; near Laing, Sutherlandshire. Killarney, co. Kerry; Malin Head, co. Antrim; Connemara, co. Galway.

Series II. *Cladodei* Nyl. Syn. i. (1860) p. 174.

Thallus either horizontally expanded and crustaceous, or usually erect and foliaceous. Apothecia terminal on podetia, rarely sessile and without podetia, biatorine, rarely lecanorine (*mazædium* none); spores usually 8næ, oblong, simple, or elongate and septate, very rarely murali-divided.

The genera in this series are very diverse, both in external form and internal structure; but there are various important points of connection which warrant their being thus associated. This arrangement is more natural than one which places some of them far apart from the others.

Tribe III. **BÆOMYCETEI** Nyl. Mém. Soc. Cherb. iii. (1855) p. 168 (ut *Bæomycei*); Bull. Soc. Linn. Norm. sér. 2, vi. (1872) p. 320.

Thallus various, either horizontally expanded and crustaceous, or also vertically ascending and podetiiform. Apothecia either sessile and biatorine, or depressed and difform, or podetiiformi-stipitate, pale or reddish; spores 8næ, oblong, simple or 1-3-septate, colourless. Spermatogones with arthrosterigmata, very rarely with simple sterigmata.

This tribe, as observed by Nylander (Syn. i. p. 174), is composed of genera differing considerably in the thallus and apothecia. The affinity of these genera, however, seems to be with each other in this Series, rather than with the *Lecanorei* or *Lecidei*, in which, for the most part, they have been variously placed by authors.

26. **GOMPHILLUS** Nyl. Mém. Soc. Cherb. iii. (1855) p. 1866; Syn. i. p. 175. —Thallus very thin, consisting of spherical gonidia of moderate size, and of irregularly filamentose elements gelatinously conglutinate. Apothecia stipitate, clavato-capitate, corneous; spores 8næ (the thecæ not distinct), filiform, multiseptate, paraphyses not discrete; hymenial gelatine not tinged with iodine. Spermatogones somewhat prominent; sterigmata simple, minute; spermatia slender, cylindrical, straight.

This peculiar genus differs in many ways from the others belonging to this tribe. Though showing a slight

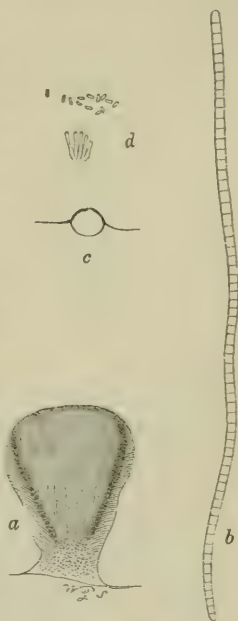


Fig. 29.

Gomphillus calicioides Nyl.
—a. Section of an apothecium, $\times 30$. b. A shorter spore, $\times 500$. c. Section of a spermatogone, $\times 30$. d. Sterigmata and spermatia, $\times 500$.

superficial resemblance to the *Calicieæ*, yet, unless it constitutes a separate and intermediate tribe, it may, from its general habit, be referred as an aberrant genus to the *Bæomycetæ*.

1. *G. calicioides* Nyl. Act. Soc. Linn. Bord. sér. 3, i. (1857) p. 146; Syn. i. p. 175, t. 7. f. 3.—Thallus very thin, somewhat varnished, effuse or obsolete, greyish or greyish-green. Apothecia small, pale; stipes narrowly canaliculate; capitulum subturbinate, dark or blackish; spores very long, cylindrical, fasciculately constipate in vertical canaliculi of the thalamium, 60–100-septate, 0,160–0,200 mm. long, and sometimes of even greater length.—Cromb. Lich. Brit. p. 15; Leight. Lich. Fl. p. 52, ed. 3, p. 50.—*Bæomyces calicioides* Del. in Dub. Bot. Gall. (1830) p. 636.

This plant has a somewhat fungoid aspect, but analysis shows it to be a lichen. The thallus is normally orbicular; but is at length more or less widely spreading. Its varnished appearance and the numerous bæomycetoid apothecia easily distinguish it. The frequent spermogones are brownish-black, the spermatia about 0,001 mm. long, scarcely 0,0005 mm. thick.

Hab. Incrusting decaying mosses on the ground in upland situations.—*Distr.* Only in N. Wales and N.W. Ireland.—B. M.: Barmouth, Merionethshire. Letter Hill, co. Galway.

Form *microcephalus* Nyl. Syn. i. (1860) p. 175.—Apothecia smaller, more shortly stipitate.—Carroll, Journ. Bot. 1867, p. 254; Cromb. Lich. Brit. p. 15; Leight. Lich. Fl. p. 52, ed. 3, p. 50.—*Bæomyces microcephalus* Tayl. in Mack. Fl. Hib. ii. (1836) p. 78.—*Brit. Exs.*: Cromb. n. 115.

In this form, differing from the type only in the smaller apothecia, the stipes is occasionally so short that the apothecia are almost sessile on the thallus.

Hab. Incrusting decaying mosses on trees and boulders in shady places in wooded upland tracts.—*Distr.* Local and scarce in the W. Highlands, Scotland, and in S.W. Ireland.—B. M.: Barcaldine, Argyleshire. Dinish, Turk Mt., Muckruss, Cromaglow and Dunkerron, Killarney, co. Kerry.

27. *BÆOMYCES* Pers. Ust. Ann. 1794, p. 19; Nyl. Syn. i. p. 175.—Thallus crustaceous, granuloso-pulverulent or squamose. Apothecia sessile or stipitate, opaque, biatorine, the stipes formed of the constricted extended hypothecium and of longitudinal filamentose elements; hypothecium pale; spores usually 8næ (in clongato-cylindrical thecæ), ellipsoid or fusiform, simple or septate, colourless; paraphyses slender, not very discrete; hymenial gelatine either not tinged, or pale bluish with iodine. Spermogones tubercular, with jointed sterigmata and straight, cylindrical spermatia.

Although the apothecia are more or less stipitate, this genus, were it not for the spermogones, might be included amongst the *Lecideæ*. No doubt the spermogones equally differ from those of this series, so that

the general habit, looking towards the Cladonias, must determine its place. The differences in the thallus and apothecia in some species are not sufficient to separate them generically, though they place them in different sections of the same genus.

A. EUBÆOMYCES Cromb. Grevillea, xv. p. 15.—Apothecia stipitate, solid or subarachnoid within, veiled or naked, immarginate.

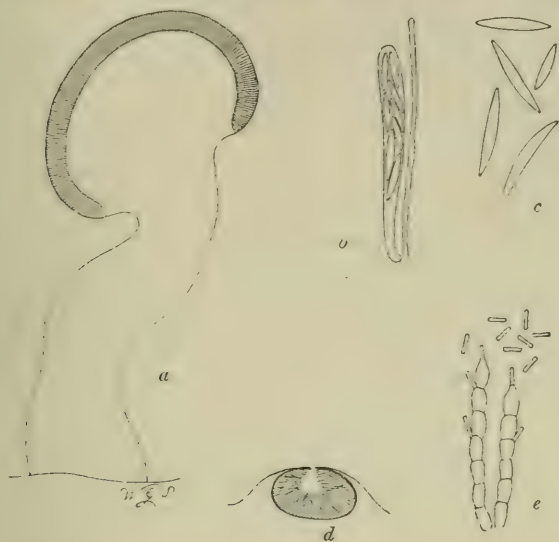


Fig. 30.

Bæomyces roseus Pers.—a. Vertical section of an apothecium (in dry state), $\times 30$. b. Theca and paraphysis, $\times 350$. c. Spores, $\times 500$. d. Section of a spermogone, $\times 30$. e. Arthrosterigmata and spermatia, $\times 500$.

a. Apothecia solid within, naked.

1. *B. rufus* DC. Fl. Fr. ii. (1805) p. 342.—Thallus effuse, thin-nish, leproso-granulose, greenish-white or glaucescent, the granules sometimes depressed (K+ yellow). Apothecia small or moderate, plane or convex, reddish- or brownish-flesh-coloured (K-); stipes moderate or short, subcompressed, whitish; spores 6-8 μ , oblongo-ellipsoid, simple, 0.006-12 μ long, 0.003-4 μ thick; paraphyses often slightly branched; hymenial gelatine not tinged with iodine.—Gray, Nat. Arr. i. p. 413; Hook. Fl. Scot. ii. p. 65; Sm. Eng. Fl. v. p. 137; Cromb. Lich. Brit. p. 16; Leight. Lich. Fl. p. 52, ed. 3, p. 50.—*Lichen rufus* Huds. Fl. Angl. (1762) p. 443; With. Arr. ed. 3, iv. p. 14. *Bæomyces rupestris* Pers., Tayl. in Mack. Fl. Hib. ii. p. 78. *Bæomyces lignorum* Pers. Gray, Nat. Arr. i. p. 413, pro parte. *Lichen byssoides*, Linn. Mant. (1767) p. 133; Lightf. Fl. Scot. ii. p. 808; Huds. Fl. Angl. ed. 2, p. 527; Eng. Bot.

t. 373. *Bæomyces byssoides* Mudd, Man. p. 63. *Lichen fungiformis* With. Arr. ed. 3, iv. p. 14, pro parte. *Coralloides fungiforme sacatile, pallide fuscum* Dill. Muse. 78, t. 14. f. 4. *Lichenoides fungiforme terrestre, capitulis fuscis* Dill. in Ray Syn. ed. 3, 70. 39.—*Brit. Eas.*: Leight. n. 178; Mudd, n. 30; Larb. Cæsar. n. 6; Cromb. n. 12; Larb. Lich. Hb. n. 43.

Usually spreads very extensively, though often subdeterminate. It varies somewhat in thickness, being either moderate and granulose, or thinnish and almost leprose, and also in colour from greenish-white to dark-greyish, according to substratum and exposure. These minor and accidental differences gave rise to the enumeration of supposed species, none of which, however, can rank even as forms. The apothecia are usually very numerous, simple, or conglomerate, with the stipes occasionally branched, and when dry sulcato-corrugate.

Hab. On sandy and gravelly soil, occasionally on rocks and stones, rarely on rotten wood, in shady upland situations.—*Distr.* General and common in most parts of Great Britain, Ireland, and the Channel Islands, but chiefly in hilly and mountainous tracts.—*B. M.*: Rozel, Island of Jersey; Island of Sark. Epping Forest, Essex; Hornsey Wood, Middlesex; Leith Hill, Surrey; Ightham Common, Kent; Lyndhurst, New Forest, Hants; Isle of Wight; near South Brent, Devonshire; Penzance, Withiel and near Bocconoc, Cornwall; Amptill, Bedfordshire; Malvern, Worcestershire; Charnwood Forest, Leicestershire; Bishop's Castle, Shropshire; Welshpool, Montgomeryshire; Barmouth and Dolgelly, Merionethshire; Island of Anglesea; Ayton, Cleveland, Yorkshire; Eglestone, Durham; Keswick, Cumberland; Grayrigg Forest, Westmoreland; Hexham, Northumberland; Ashby, Cumberland. New Gal-loway, Kirkcudbrightshire; Leadhills, Lanarkshire; Pentland Hills, near Edinburgh; Ashburn, Gourrock, Renfrewshire; Craig Calliach, Ben Lawers, and Blair Athole, Perthshire; Sidlaw Hills, Forfarshire; near Portlethen, Kincardineshire; Glen Callater, Braemar, Aberdeenshire. Mangerton and Killarney, co. Kerry; Connemara, co. Galway.

Var. *β. subsquamulosus* Nyl. Flora, 1877, p. 463.—Thallus determinate, granuloso-squamulose in the centre, squamulose at the circumference. Apothecia sessile, minute, simple or conglomerate, dark-brown.—Cromb. Grevillea, xv. p. 15.—*Bæomyces rufus* ff. *sessilis et carneus* Cromb. Lich. Brit. p. 16. Var. *carneus* Leight. Lich. Fl. p. 53, et f. *sessilis*, ed. 3, p. 51. *Bæomyces lignorum* Gray, Nat. Arr. i. p. 413 pro parte.—*Brit. Eas.*: Larb. Cæsar. n. 7; Cromb. n. 116.

Distinguished by the more squamulose thallus and smaller apothecia. It is subsimilar to *B. carneus* Flork., which does not occur in our Islands, and which, though generally regarded as a var. of *B. rufus*, is a distinct species. In *B. carneus* the thallus is squamulose, with the squamules contiguous, inciso-crenate, the podetia distinctly, though shortly stipitate, and the thalline reaction K+yellow, and then immediately saffron-red (*vide* Nyl. Flora, 1877, p. 462). In this variety the thallus is usually orbicular and moderate in size, with the apothecia minute and scattered, though two or three often become conglomerate, and in a dry state entirely sessile.

Hab. On sandy and peaty soil, rarely on putrid wood, in exposed mari-

time and upland situations.—*Distr.* Local and scarce in the Channel Islands, S. and S.W. England; more plentiful among the Grampians.—B. M.: Rozel, Island of Jersey. Dartmoor, Devonshire; near Bodmin, Cornwall. Menstrie Glen, near Stirling; Glen Lochay, Schiehallion, and Rannoch, Perthshire; Glen Girnac, Braemar, Aberdeenshire.

2. *B. placophyllus* Ach. Meth. (1803) p. 323, t. 7. f. 4.—Thallus orbicular, crustaceo-imbricate and corrugato-plicate in the centre, squamoso-lobed and crenate at the circumference, glaucescent or whitish (K + yellow). Apothecia moderate or small, slightly convex, reddish- or brownish-flesh-coloured (K —); stipes short, compressed, white, often divided at the apex; spores 8 μ æ (or 6 μ æ), oblongo-ellipsoid, simple, 0,010–15 mm. long, 0,002–4 mm. thick; hymenial gelatine not tinged with iodine.—Sm. Eng. Fl. v. p. 137; Mudd, Man. p. 63; Cromb. Lich. Brit. p. 16; Leight. Lich. Fl. p. 53, ed. 3, p. 51.

In general aspect the sterile plant resembles *Physcia pityrea*, but the thallus is opaque and more entire, glaucous when moist, and the habitat is entirely different. The apothecia, which are very rare and seldom fully developed in Great Britain, are central, several being aggregate and almost confluent on the divided apex of the stipes.

Hab. On gravelly soil among heaths in upland moorland districts.—*Distr.* Local and scarce in the mountainous tracts of N. Wales, N. England, and S. and N. Scotland, more frequent among the Grampians.—B. M.: Corwen, Cader Idris, and Barmouth, Merionethshire; Egglestone, Durham; Mardale, Westmoreland. New Galloway, Kirkeudbrightshire; Ben Lawers and Falls of Bruar, Perthshire; Morrone, Braemar, Aberdeenshire; Glen Nevis, Inverness-shire; Ach-na-druim, Ross-shire; near Lairg, Sutherlandshire.

b. Apothecia subarachnoid within, veiled.

3. *B. roseus* Pers. Ust. N. Ann. i. (1794) p. 19.—Thallus granuloso-crustaceous, effuse or determinate, white (Kf + yellow). Apothecia nearly globose, moderate, rose- or pale flesh-coloured (K + orange); stipes short, rounded, white; spores 8 μ æ (or 6 μ æ), fusiformi-oblong or fusiform, simple or sometimes obsoletely 1-septate, 0,011–26 mm. long, 0,0025–0,003 mm. thick; paraphyses slender; hymenial gelatine scarcely tinged, but the apices of the thecae pale bluish with iodine.—Gray, Nat. Arr. i. p. 412; Hook. Fl. Scot. ii. p. 65; Sm. Eng. Fl. v. p. 137; Mudd, Man. p. 63, t. i. f. 12; Cromb. Lich. Brit. p. 16; Leight. Lich. Fl. p. 53, ed. 3, p. 51. *Lichen Bæomyces* Eng. Bot. t. 374. *Lichen ericetorum* Linn. Huds. Fl. Angl. p. 443 pro parte; Lightf. Fl. Scot. ii. p. 809 pro parte; With. Arr. ed. 3, iv. p. 14. *Coralloides fungiforme carneum, basi leprosa* Dill. Musc. 76, t. 14. f. 1. *Lichenoides fungiforme, crusta leprosa candida capitulis et pediculis incarnatis* Dill. in Ray, Syn. ed. 3, 70. *Lichen ericetorum* Linn. Suec. (1755) would have priority, but it refers chiefly to *B. æruginosus*.—Brit. Ess.: Leight. n. 355; Mudd, n. 31; Cromb. n. 117.

This is at once distinguished by the colour and form of the apothecia and by their internal structure. The thallus, when sterile, often spreads extensively, and is then more continuous and aspersed with large rosy-white or white cephalodine granules, when it is *Variolaria terricola* Tayl. in Mack. Fl. Hib. ii. p. 115. The apothecia are not common in this country; but the spermogones are frequent on otherwise barren thalli. They are somewhat large, tuberculiform, at first covered by the cortical layer, the conceptacle blackish above, with elongate jointed sterigmata and straight spermatia 0,005 mm. long, scarcely 0,001 mm. thick.

Hab. On sterile gravelly or turfy soil on upland moorlands.—*Distr.* General, though not common in a fertile state, in most of the mountainous and more hilly tracts of Great Britain and Ireland.—*B. M.*: Suffolk; Epping Forest, Essex; Toy Hill, Kent; Lyndhurst Moor, Hants; St. Breock Down and Tregawn, Cornwall; Montgomeryshire; Cader Idris, near Barmouth, and Aberdovey, Merionethshire; Wapley Hill, Herefordshire; Cleveland, Yorkshire; the Cheviots, Northumberland. New Galloway, Kirkcudbrightshire; Leadhills, Lanarkshire; Achosragan Hill, Appin, Argyleshire; Sheriffmoor, Stirling; Glen Lochay, Ben More, Craig Tulloch, and Ben Lawers, Perthshire; Baldoan Woods and Sidlaw Hills, Forfarshire; Glen Dee, Braemar, Aberdeenshire; Glen Nevis, Inverness-shire. Near Clonmel, Co. Tipperary.

B. ICMADOPHILA (Trevis. in Mass. Rich. (1852) p. 26).—Apothecia sessile, lecanoroid, at length biatorine, solid within.

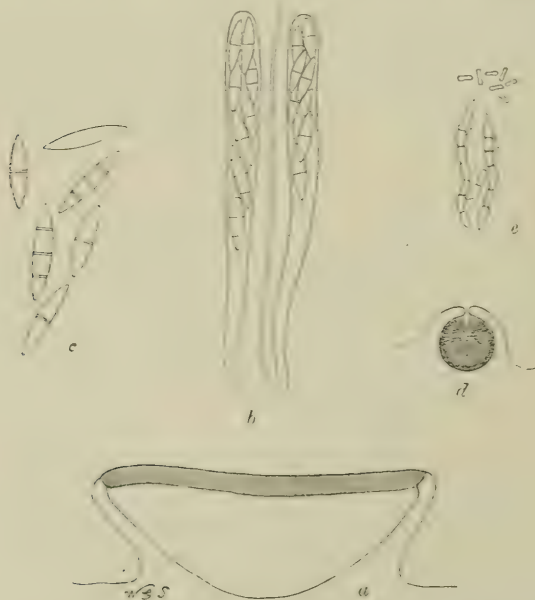


Fig. 31.

Baeomyces aruginosus DC.—*a.* Section of an apothecium (in dry state), $\times 20$. *b.* Two thecae and a paraphysis, $\times 350$. *c.* Spores, $\times 500$. *d.* Section of a spermogone, $\times 30$. *e.* Sterigmata and spermatia, $\times 500$.

4. *B. æruginosus* DC. Fl. Fr. ii. (1805) p. 343.—Thallus effuse, granulato-rugose or subdeprose, glaucescent or whitish (K + yellow). Apothecia elevato-superficial, moderate, or somewhat large, obsoletely rugulose, sublecanorine with evanescent thalline margin, or at length biatorine, flesh-coloured, soft (K + orange); spores 6µe or 8µe, fusiform, 1-3-septate, 0.013-0.027 mm. long, 0.004-0.006 mm. thick; hymenial gelatine faintly bluish with iodine.—*Lichen æruginosus* Scop. Fl. Carn. i. (1760) p. 78. *Icmadophila æruginosa* Mudd, Man. p. 64, t. i. f. 13. *Bæomyces icmadophilus* Cromb. Lich. Brit. p. 16; Leight. Lich. Fl. p. 54, ed. 3, p. 52. *Lecidea icmadophila* Gray, Nat. Arr. i. p. 473; Hook. Fl. Scot. ii. p. 39; Sm. Eng. Fl. v. p. 184. *Lichen icmadophila* Erhr., With. Arr. ed. 3, iv. p. 15. *Lichen ericetorum* Huds. Fl. Angl. p. 443 pro parte; Eng. Bot. t. 372.—*Brit. Exs.*: Leight. n. 209; Mudd, n. 32; Cromb. n. 118; Larb. Lich. Hb. n. 44.

This plant in moist shady localities is of a beautiful green colour, becoming yellowish when long preserved in herbaria. The apothecia are generally numerous, often much crowded and almost confluent, undulate when dry, rarely substipitate, occasionally entirely lecanorine, with depressed thalline margin. The spermogones are inclosed in the thalline granules in colourless conceptacles; the spermatia slender, somewhat thickened at either apex, 0.004 mm. long, scarcely 0.001 mm. thick. Though much difference exists as to the place of this species, it is anatomically and chemically a *Bæomyces*, as observed by Nylander, Lapp. Or. p. 108.

Hab. On moist turfy soil, on decayed *Sphagnum* in bogs, and on putrid trunks of trees, in upland and subalpine districts.—*Distr.* Somewhat local, but plentiful where it occurs, in the hilly tracts of England and North Wales, more frequent in those of Scotland, especially among the Grampians; rare in S. and W. Ireland.—*B. M.*: Near Tunbridge Wells, Kent; Ardingly, Sussex; Amptill, Bedfordshire; Charnwood Forest, Leicestershire; Matlock, Derbyshire; Cwm Bychan, Merionethshire; Island of Anglesea; Guisboro' Moor and Houghton Moor, Cleveland, Yorkshire; Teesdale, Durham; Alston Moors, Cumberland. New Galloway, Kirkcudbrightshire; Pentland Hills and Swanston Hill, near Edinburgh; Appin, Argyleshire; Blairdrummond, near Stirling; Glen Falloch, Ben Lawers, and Killin, Perthshire; Sidlaw Hills and Clova, Forfarshire; Glen Callater and Morrone, Braemar, Aberdeenshire; Rothiemurchus and Glen Nevis, Inverness-shire; near Lairg, Sutherlandshire. Pass of Keimian Eigh-Wist and Gongaumbarra, co. Cork; Dunkerron, co. Kerry; Connemara, co. Galway.

Tribe IV. **PILOPHOREI** Nyl. ex Cromb. Grevillea, v. (1876) p. 77.

Thallus formed of rigid, cylindrical, fistulose or internally arachnoid and externally granulose podetia, usually also granulose or pulveraceous at the base. Apothecia terminal, capituliform, black; paraphyses prolonged directly into the hypothecium; spores 8µe, ellipsoid, simple, colourless. Spermogones with nearly simple sterigmata.

The single genus of which this tribe consists has been arranged by

authors among the *Stereocauli* or the *Cladonie*. On account of the peculiar texture of the apothecia Nylander has established for it a separate tribe, distinguished by the character of the paraphyses.

28. PILOPHORUS

Fr. fil. Comm. Ster. (1857) p. 40; Tuck. Syn. Lich. New Eng. (1848) p. 46 (ut sectio *Stereocauli*). *Pilophoron* Nyl. Syn. i. p. 228.—Thallus at the base (when present) granulose or

somewhat pulverulent, bearing cephalodia; podetia rigid, cylindrical, simple or sparingly branched; usually fistulose, internally filamentoso-arachnoid, externally covered with a granulose cortex; gonidia moderate, greenish-yellow. Apothecia capituliform or often subglobose, solid within, corneous; paraphyses thickish or moderate, blackish at the apices, forming a thick subhymenial layer: spores in clavate thecae, which

have the wall thickened at the apices, ellipsoid or oblongo-ellipsoid; hymenial gelatine scarcely (except at the apices of the thecae) tinged bluish with iodine. Spermeogones affixed to the apices of the podetia, black; spermatia bacillar, straight or slightly curved.

This genus is well characterized by the paraphyses being prolonged into the hypothecium, and forming a subhymenial stratum nearly thrice as thick as the hymenium. The rest of the hypothecium is formed of confused obliterated cells. The cephalodia, which are adnate and in the form of testaceous tubercles, are internally densely and minutely cellular, with "the gonimia bluish-green, shortly ellipsoid or subglobose, glomerulose arranged or moniliformly joined" (Nyl. l. c.).

1. *P. cereolus* Nyl. ex Stiz. St. Gall. Nat. Ges. (1875) p. 198; Fr. fil. Lich. Scand. (1871) p. 55 pro parte.—Thallus effuse at the base, forming a verrucoso-granulose or pulverescent crust, greyish-

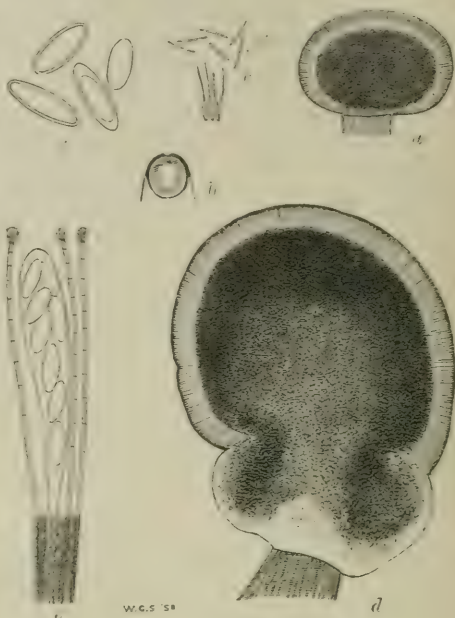


Fig. 32.

Pilophorus cereolus Nyl.—*a*. Vertical section of an apothecium. $\times 30$. *b*. Vertical section of a spermeogone, $\times 30$. *c*. Sterigmata and spermatia, $\times 500$. *Pilophorus strumatus* Nyl.—*d*. Vertical section of an apothecium, $\times 30$. *e*. Theca and paraphyses, $\times 350$. *f*. Spores, $\times 500$.

white; podetia short, erect, simple, verrucoso-granulate or subpulverulent (K+yellowish). Apothecia small, subglobose, paraphyses thickish; spores ellipsoideo-fusiform, 0,016-0,022 mm. long, 0,004-0,005 mm. thick.—Cromb. Grevillea, xv. p. 15.—*Stereocaulon cereolus* Ach. Meth. p. 316; Borr. in Engl. Bot., Suppl. t. 2667. *S. cereolinum* Sm. Eng. Fl. v. p. 233 pro parte; Tayl. in Mack. Fl. Hib. ii. p. 83. *Lichen (Isidium) cereolus* Ach. Prodr. (1798) p. 89. *Stereocaulon condensatum* var. *cereolinum* Ach. pro parte, Cromb. Lich. Brit. p. 17 pro parte. To this also belongs *P. fibula* (non Tuck.) Leight. Ann. Mag. Nat. Hist. 1869, vol. iv. p. 201; Lich. Fl. p. 76, ed. 3, p. 69 pro parte.—*Brit. Exs.*: Leight. n. 383; Larbal. Lich. Hb. n. 5.

When sterile, this closely resembles *Stereocaulon pileatum*, from which, when fertile, it is easily distinguished by the simple spores. The basal thallus is normally granuloso-diffract, sometimes becoming more or less pulveraceo-delitescens. The podetia vary somewhat in length and thickness, and at times become more or less glabrous. The apothecia are typically solitary, and in old plants, as observed by Acharius (Lich. Univ. p. 583), become compound and conglomerate. On the basal thallus there occur frequent cephalodia, which are tuberculose, brownish, with the gonimia glomerulose arranged. It is intimately allied to *P. fibula* Tuck. (Nyl. ex Cromb. Grevillea, xv. p. 15), a similar American plant which (ex Nyl. in litt.) differs in the thicker spores (0,018-0,025 mm. long, 0,007-0,008 mm. thick).

Hab. On moist shady rocks in upland and subalpine situations.—*Distr.* Local and scarce in the mountainous tracts of N. England, N. Wales, S.W. Scotland, the S.W. Highlands, among the Grampians, and in W. Ireland.—B. M.: Cader Idris and Dolgelly, Merionethshire; Teesdale and Egglestone, Durham; Borrowdale, Cumberland. New Gallo-way, Kirkcudbrightshire; Achrosagan Hill, Appin, Argyshire; Ben Lawers, Perthshire; Ben Nevis, Inverness-shire; hills of Applecross, Ross-shire. Dunkerron, co. Kerry; Kylemore and Salrock Road, Conne-mara, co. Galway.

2. *P. strumaticus* Nyl. ex Cromb. Journ. Bot. 1875. p. 140 (nomen).—Thallus determinate or subeffuse at the base, verrucoso-granulate, greyish-white; podetia short, stoutish, verrucoso-granulate (K+yellowish). Apothecia moderate or submoderate, subglobose, beneath as if strumosely appendiculate, paraphyses moderate; spores oblongo-ellipsoid, 0,018-0,024 mm. long, 0,006-0,009 mm. thick.

Differs from the preceding in the thallus being firmer, not pulverescent, and especially in the peculiar form of the apothecia, resulting from the turgescens perithecium. The podetia are simple, somewhat crowded, occasionally very short, so that the apothecia appear sessile. The cephalodia are similar to those of *P. cereolus*.

Hab. On shady ledges of schistose rocks in subalpine districts.—*Distr.* Local and scarce in N. Wales, among the Grampians, and in the N.W. Highlands, Scotland.—B. M.: Cader Idris, Merioneth. Glen Lyon, Perthshire; Morrone, Braemar, Aberdeenshire.

Tribe V. **STEREOCAULEI** Nyl. Mém. Soc. Cherb. iii.
(1855) p. 170.

Thallus caespitose, erect or decumbent, with solid fruticulose podetia, to which are affixed fragile, more or less evanescent granules, usually bearing cephalodia, internally with chondroid axis. Apothecia lecideine, rarely lecanorine, terminal and lateral, paraphyses discrete: spores 8næ, sometimes 6næ, variously septate, very rarely solitary and murali-divided, subfusiform, cylindrical or oblong, colourless. Spermatogones immersed, with simple sterigmata.

Though resembling the *Sphærophorei* in the fruticulose habit, this tribe is far separated by the granulose thallus and by the structure of the apothecia. From the preceding, to which it is closely allied, it differs in the absence of the thick subhymenial stratum. As observed by Nylander (Lapp. Or. p. 177), it precedes, like the *Pilophorei*, the *Cladoniæ*, since the granulose thallus expresses a lower type in the series.

29. **STEREOCAULON** Schreb. Gen. Pl. (1791) p. 768; Nyl. Syn. i. (1860) p. 230.—Podetia branched, somewhat rounded, covered or

sprinkled with granules of various forms, internally with a cartilaginous axis formed of longitudinal confluent chondrohyphæ, to which are affixed the external portions of the thallus, viz. a corticali-gonidial and an arachnoid medullary layer. Apothecia biatorine, blackish-brown or pale brownish, rarely lecanorine, black: hypothecium colourless; spores 8næ or 6næ (in subclavate thecæ), fusiformi-cylindrical, 3- or pluri-septate; paraphyses distinct, slender or moderate; hymenial gelatine bluish with iodine. Spermatogones lateral or subterminal in pale conceptacles, blackish at the apices, with spermatia aciculari-bacillar, straight, or longer and slightly curved.

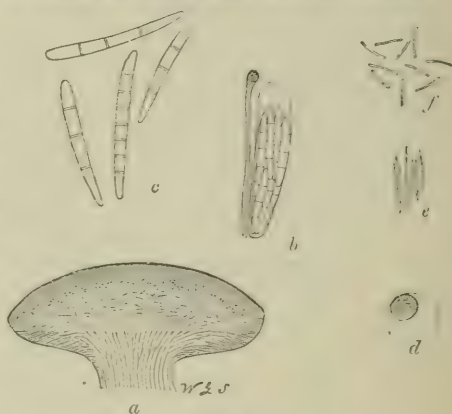


Fig. 33.

Stereocaulon coralloides Fr.—a. Vertical section of an apothecium, $\times 30$. b. Theca and paraphysis, $\times 350$. c. Spores, $\times 500$. d. Vertical section of a young spermatogone, $\times 30$. e. Sterigmata, and f, spermatia, $\times 500$.

Many plants belonging to this genus have an elegant appearance with their fruticulose granulate podetia and numerous brown or dark apothecia. The podetia, especially in barren specimens, are sometimes whitish sorediato-capitate. The apothecia, which arise from the granules, are at first punctiformi-impressed, and then lecanoroid, becoming immediately lecideine (biatorine). Our British species, which belong to the subgenus *Eustereocaulon*, have the thalline reactions $K +$ yellow, $CaCl =$, except in *S. coralloides*, where the chondroid axis is $K +$ yellow.

a. Thallus evanescent at the base; podetia branched; cephalodia sessile, glomeruliform or verrucose.

1. *S. coralloides* Fr. L. Succ. Exs. (1817) n. 118; Sched. Crit. iv. p. 24.—Thallus somewhat small or usually moderate; podetia cæspitously united at the base, erect or ascending, branched, the axis glabrous; podetial granules digitately branched or subfibrillose, greyish. Apothecia moderate, terminal and lateral, at length globose and immarginate, brown or dark-reddish; spores 3- (rarely 5-7-) septate, fusiformi-cylindrical, 0,0022-40 mm. long, 0,0025-40 mm. thick.—Cromb. Lich. Brit. p. 16; Leight. Lich. Fl. p. 77, ed. 3, p. 69.—*Stereocaulon paschale* β . *corallinum* Mudd, Man. p. 65, t. i. f. 14. *Stereocaulon paschale* Gray, Nat. Arr. i. p. 411; Hook. Fl. Scot. ii. p. 66; Sm. Eng. Fl. v. p. 333; Tayl. in Mack. Fl. Hib. ii. p. 83; Mudd, Man. p. 65; Cromb. Lich. Brit. p. 17 pro parte; Leight. Lich. Fl. p. 77 pro parte. *Lichen paschalis* Huds. Fl. Angl. p. 460 pro parte; Lightf. Fl. Scot. ii. p. 886 pro parte; With. Arr. ed. 3, iv. p. 44 pro parte; Eng. Bot. t. 282. The above synonyms show that this has been confounded with *S. paschale*.—Brit. Exs.: Leight. n. 148; Cromb. n. 119; Bohl. n. 14.

Readily distinguished by the mode of growth and the form of the elegantly divided granules. The podetia are very closely adnate to the substratum, and the apothecia are numerous. The cephalodia are greyish, sometimes cæcio-greyish, opaque, verrucose, minutely granulate on the surface, with the gonimia in gelatinous nodules. The spermatogones are at first simple, afterwards compound, with the spermatia 0,005-6 mm. long, 0,001 mm. thick.

Hab. On rocks, boulders, and old walls in upland and subalpine districts.—*Distr.* General and common in the hilly and mountainous tracts of Great Britain, rare in Ireland.—B. M.: Dartmoor, Devonshire; between Arthur's bed and Wring Cheese, and near Helmington, Cornwall; Black Edge, Buxton, Derbyshire; Abdon Burf and near Oswestry, Shropshire; Cader Idris and Dolgelly, Merionethshire; Teesdale, Durham; near Staveley, Kendal, and Ambleside, Westmoreland; Wastdale, Cumberland. New Galloway, Kirkcudbrightshire; Leadhills, Lanarkshire; Inverary and Appin, Argyshire; Ben Lawers, Blair Athole, and Loch Rannoch, Perthshire; Sidlaw Hills, Balray Wood, and Glen Isla, Forfarshire; Craig Nich, Glen Callater, Glen Derrie, and Glen Dee, Braemar, Aberdeenshire; near Forres, Elginshire; Ben Nevis and Lochaber, Inverness-shire; hills of Applecross, Ross-shire. Killarney, co. Kerry; Connemara, co. Galway.

2. *S. Delisei* Bory in Dub. Bot. Gall. ii. (1830) p. 619.—Thallus small, podetia loosely cæspitose, branched, the axis thinly arachnoid or often naked; podetial granules situated chiefly towards the apices, crenate or digitately divided, whitish, pulverulent-dissolved, sorediato-conglomerate on the apices. Apothecia unknown.—Cromb. Journ. Bot. 1885, p. 195.—*S. coralloides* subsp. *S. Delisei* Nyl. Syn. i. p. 242, t. 7. f. 17.

The granules at first resemble those of *S. coralloides*, but at length become pulverulent and sorediate at the apices. Our British specimens, which are without cephalodia, have the podetia scarcely $\frac{1}{2}$ in. high, with

the axis naked and the granules almost entirely pulverulent. They are quite sterile as in W. France, the only other region in which the plant has hitherto been detected.

Hab. Among mosses on granitic boulders in upland districts.—*Distr.* Sparingly among the Central Grampians, Scotland.—B. M.: Near Loch Eagh, Rannoch Moor, Perthshire.

3. *S. paschale* Fr. Stirp. Femsj. (1825) p. 35.—Thallus moderate or somewhat large; podetia stipate or subdispersed, erect or subdecumbent, very much branched, the axis somewhat compressed, at first arachnoid, speedily becoming nearly glabrous; podetial granules squamulose, crenate, greyish-white or whitish. Apothecia moderate, terminal or subterminal, plane or convex, brown or dark-brown; spores usually 3-, sometimes 5-9-septate, fusiformi-cylindrical, 0.018-40 mm. long, 0.0035-45 mm. thick.—Nyl. Syn. i. p. 242, t. 7. ff. 18-28; Cromb. Grevillea, xv. p. 15; Lich. Brit. p. 17 pro parte; Leight. Lich. Fl. p. 77, ed. 3, p. 70 pro parte.—*Lichen paschalis* Linn. Sp. Pl. (1753) p. 1153 pro parte.

As already stated, *S. coralloides* has for the most part been confounded with this by British authors. The podetia are but loosely adherent to the substratum, and often become nearly free. From *S. coralloides* it differs also in the podetia being stipate (not cæspitose) and in the granules being smaller and less distinctly dactyloid-divided. It is essentially a plant of cold climates, where it frequently spreads extensively; but in this country it is one of our rarest lichens. The apothecia are not very numerous, and are usually situated at or near the apices of the podetia. The cephalodia are verrucose, greyish, with the gonimia glomerulose, often moniliform. The spermogones are not uncommon, with spermatia 0.0045-55 mm. long, about 0.001 mm. thick.

Hab. Among mosses on rocks and the ground in alpine tracts.—*Distr.* Very sparingly among the N. Grampians, Scotland.—B. M.: Upper Glen Dee, Braemar, Aberdeenshire.

4. *S. evolutum* Graewe ex Fr. fl. Bot. Not. 1865, p. 181.—Thallus somewhat small or moderate; podetia cæspitose, very much and divaricately branched, especially towards the apices, glabrous; podetial granules ramuloso-divided, stipate and very much crowded at the apices, greyish-glaucous or whitish. Apothecia terminal, moderate or somewhat large, at first somewhat plane and thinly margined, pale- or dark-brown; spores firm, oblong or oblongo-fusiform, obtuse, 3-septate, 0.018-28 mm. long, 0.005-7 mm. thick.—Cromb. Journ. Bot. 1876, p. 359; Leight. Lich. Fl. ed. 3, p. 72. This also has been confounded with *S. paschale*.—*Brit. Exs.*: Cromb. n. 120.

Intermediate between *S. coralloides* and *S. paschale*, but sufficiently distinguished from both by the constantly 3-septate spores. The podetia are usually suberect, pretty closely adherent to the substratum, and in large plants less aggregate. The apothecia in old plants become tuberculate-diform, and often burst asunder. The cephalodia (which are not very frequent) and the spermogones are as in *S. coralloides*.

Hab. On rocks and walls in maritime and mountainous districts.—

Distr. General and common in W. and N. England, N. Wales, among the Grampians, Scotland, and in W. Ireland.—B. M.: Hay Tor, Widdicombe, and Wistmain's Wood, Devonshire; Plynlimmon, Cardiganshire; Cader Idris, Llyn Bodlyn, Dolgelly, and Garth, Merionethshire; Teesdale, Durham. New Galloway, Kirkcudbrightshire; Appin, Argyshire; Crianlarich, Ben Lawers, and near Loch Earh, Rannoch, Perthshire; Glen Callater, Braemar, Aberdeenshire; Loch Linnhe, Invernessshire; near Forres, Elginshire; Applecross, Ross-shire. Cahir and Blackwater Bridge, co. Kerry; Connemara, co. Galway.

5. *S. tomentosum* Fr. Sched. Crit. iii. (1824) p. 20 pro parte; Fr. fil. Comm. Ster. (1857) p. 29.—Thallus moderate or somewhat large; podetia solitary or loosely caespitose, depressed or ascending, rounded, the axis densely tomentoso-arachnoid, divaricately branched, the branches often subdistichous; podetial granules scarcely any below, crowded above, inciso-crenate, rounded, greenish-white or caesio-greenish. Apothecia small, terminal and lateral, concave, becoming subglobose, brown or dark-brown; spores 3-, rarely 5-7-septate, fusiformi-bacillar, 0,022-37 mm. long, 0,002-3 mm. thick.—Mudd, Man. p. 65; Cromb. Lich. Brit. p. 17; Leight. Lich. Fl. p. 87, ed. 3, p. 70.—*Brit. Exs.*: Dicks. Hort. Sic. n. 24.

The podetia, usually somewhat robust, are loosely affixed to the substratum or subfree. The tomentum, by which the plant may generally at once be recognized, becomes more or less evanescent in age. The cephalodia are minute, verrucoso-glomerulose, greyish, sometimes ærugineose, with the gonimia minute, conglomerate, and for the most part moniliform. The apothecia are rather rare in this country, but the spermatogones are more common, with spermatia 0,005-6 mm. long, 0,001 mm. thick.

Hab. Amongst gravel in stony places in maritime and subalpine districts.—*Distr.* Local and scarce in S., W., and N. England, the E. coast of Scotland, and here and there among the Grampians.—B. M.: Dartmoor, Devonshire; Helvellyn, Cumberland. Ben Lawers, Perthshire; Sands of Barrie and Clova Mts., Forfarshire; Glen Lui Beg, Braemar, Aberdeenshire; Ben Nevis, Inverness-shire.

6. *S. alpinum* Laur. in Fries, Lich. Eur. (1831) p. 204.—Thallus somewhat small; podetia congested, adherent at the base, erect, the axis thinly tomentose; podetial granules whitish, verruciform and conglomerate, or the lower ones squamulose and inciso-crenate. Apothecia few, usually terminal and dilated, somewhat plane or at length convex, dark-red or brownish-black; spores as in the preceding.—Cromb. Grevillea, xv. p. 15.—*Stereocaulon tomentosum* var. *alpinum* Cromb. Lich. Brit. p. 17; Leight. Lich. Fl. p. 78, ed. 3, p. 71. *Stereocaulon paschale* γ. *alpinum* Mudd, Man. p. 66.—*Brit. Exs.*: Larb. Lich. Hb. n. 7.

Though regarded as a variety of *S. tomentosum*, this seems to be a distinct species. The generally small podetia are more erect and congested, with their branches less divaricate; the granules are whitish, more turgid and verrucoso-conglomerate; the tomentum, which is whitish and more sparingly present, is at length entirely evanescent; and the

apothecia are more scattered, usually larger and terminal. In this country it is rarely and very sparingly fertile.

Hab. On the ground and on boulders in subalpine districts.—*Distr.* Local and scarce among the Scottish Grampians and in W. Ireland.—B. M. : Ben Lawers and Ben Vrackie, Perthshire; Morrone and Benna-boord, Braemar, Aberdeenshire. Kylesmore and Connemara, co. Galway.

7. *S. denudatum* Flörke, Deutsch. Lich. Lief. iv. (1819) p. 13.—Thallus somewhat small or moderate; podetia nearly erect, slender, smooth, loosely aggregate, somewhat simple or branched above, attenuate at the apices, the axis naked; podetial granules subpel-tate, at first subrounded, then appanate and depressed in the middle, whitish or greyish-white, darker in the centre, the margin usually crenulate, white. Apothecia small, lateral, plane or somewhat convex, brownish; spores elongato-fusiform, 3- (rarely 5-) 7-septate, 0,026-46 mm. long, 0,003-4 mm. thick.—Mudd, Man. p. 66; Cromb. Lich. Brit. p. 17; Leight. Lich. Fl. p. 79, ed. 3, p. 71.—*Coralloides crispum et botryforme alpinum* Dill. Musc. 114, t. 17. f. 33. *Lichenoides non tubulosum, cinereum ramosum totum crustaceum* Dill. in Ray, Syn. ed. 3, 66. 11. *S. paschalis* pro parte of some authors.—*Brit. Exs.*: Larb. Lich. Hb. n. 244.

Easily distinguished from other British species by the subpeltate granules with whitish margin, and by their paucity or absence towards the apices of the podetia. The cephalodia are olive-brown, somewhat shining, glomerulose or verrucose, with the gonimia sordid glaucous-green. In this country the apothecia are rare, nor are the spermogones very frequent, the spermatia being 0,008-9 mm. long, 0,005 mm. thick. On the podetia are commonly seen the pulvinuli of *Sirospion saxicola* Naeg.

Hab. On rocks and boulders from upland to alpine situations.—*Distr.* General and frequent in the more mountainous districts of Great Britain and Ireland; very abundant among the Grampians in Braemar.—B. M. : Cawsand Beacon and Sharpitor Rock, Dartmoor, Devonshire; Plynllynnon, Cardiganshire; Cader Idris, Merionethshire; Snowdon, Carnarvonshire; Island of Anglesea; Mynydd-y-Myffe, Shropshire; Teesdale, Durham; Stavely Head, Westmoreland; Emmerdale, Cumberland. Ben Lawers and Rannoch Moor, Perthshire; Sidlaw Hills and Clova, Forfarshire; Glen Candlic, Cairn Drochit and Ben-naboord, Braemar, Ben Nevis, Inverness-shire; Island of Skye; Applecross, Ross-shire; Lairg, Sutherlandshire. Killarney, co. Kerry; Kylesmore, Connemara, co. Galway.

Form 1. *validum* Laur. in Fr. Lich. Eur. (1831) p. 205.—Thallus larger, caespitose; podetia thicker, divided towards the base into elongate branches; granules aggregate and sometimes discoid.

This is larger, with more robust and caespitose podetia, and crowded and often somewhat large granules. It occurs only sterile.

Hab. On schistose rocks in alpine situations.—*Distr.* Very local and scarce, among the S. Grampians.—B. M. : Ben Lawers, Perthshire.

Form 2. *capitatum* Flot. in Koerb. Syst. (1856) p. 13.—Podetia sorediate and somewhat turgid at the apices. Apothecia arising from the soredia.

The soredate apices of the podetia and their branches distinguish this form from the type. In the only fertile British specimen seen the apothecia are small and very sparingly present.

Hab. On rocks and boulders in subalpine regions.—*Distr.* Local and scarce, having as yet been found only in N. Wales, among the Grampians, and in the N.W. Highlands of Scotland, though probably to be detected elsewhere.—B. M.: Cader Idris, Merionethshire. Ben Lawers, Perthshire; Braemar, Aberdeenshire; hills of Applecross, Ross-shire.

β. pulvinatum Flot. Lich. Sil. (1842) n. 16 *γ*.—Thallus densely pulvinato-caespitose; podetia short, fastigiately and intricately branched; podetial granules turgid, nodulose, crowded. Apothecia small, extremely rare.—Cromb. Journ. Bot. 1882, p. 272.—*Stereocaulon paschale* *ε. pulvinatum* Schaer. Spic. (1883) p. 274. *Stereocaulon tomentosum* var. *botryosum* Cromb. Lich. Brit. p. 17; Leight. Lich. Fl. p. 78, ed. 3, p. 71. *Stereocaulon paschale* *γ. alpinum* var. *botryosum* Mudd, Man. p. 66. *Stereocaulon botryosum* Sm. Eng. Fl. v. p. 233.—*Brit. Exs.*: Leight. n. 387.

In Herbaria frequently confounded with other species, more especially *S. alpinum* form *botryosum*, which apparently does not occur in Britain. It is loosely affixed to the substratum, and the granules are sometimes almost crustaceo-confluent. In this country, as elsewhere, it is very rarely seen fertile.

Hab. On rocks and boulders in subalpine situations.—*Distr.* Rather local in N. Wales, N. England, among the Grampians, Scotland, and in S.W. Ireland.—B. M.: Cader Idris, Merionethshire; Llyn Howel and Snowdon, Carnarvonshire; Teesdale, Durham. Ben Lawers, Craig Cal-liach, Ben Vrackie, and near Loch Eagh, Rannoch, Perthshire; Morrone and Ben Macdhui, Braemar, Aberdeenshire; Ben Nevis, Inverness-shire. Connor Cliffs, co. Kerry.

b. Thallus persistent at the base; podetia subsimple; cephalodia sessile, glomeruliform or verrucose.

S. S. condensatum Hoffm. Deutsch. Fl. ii. (1795) p. 130.—Thallus rather small; podetia very short, or almost none, simple or subsimple, somewhat robust, the axis at first slightly arachnoid and then more or less glabrous; granules squamulose, caespitosely congested at the base, scattered on the podetia, crenulate, glaucous or greyish-white. Apothecia moderate, terminal, at length convex, often confluent, brownish or dark reddish-brown; spores 3-7-septate, fusiformi-cylindrical, 0.020-36 mm. long, 0.0015-25 mm. thick.—Mudd, Man. p. 66; Cromb. Lich. Brit. p. 17; Leight. Lich. Fl. p. 79, ed. 3, p. 71.—*Brit. Exs.*: Mudd, n. 33; Leight. n. 295.

The thallus often spreads extensively, forming an effuse, granulose crust, and the podetia are often almost entirely wanting. The cephalodia are verrucose, dark-greyish, adnate towards the base of the podetia, the gonimia glomerulosely arranged. The apothecia sometimes occur also on the basal granules, and the spermatogones are frequent, with spermatia about 0.005 mm. long, scarcely 0.001 mm. thick.

Hab. On the ground and on turf-covered walls in maritime, upland,

and subalpine tracts.—*Distr.* General and common in all the mountainous regions of Great Britain and Ireland, rare in the Channel Islands.—B. M.: La Moye, Island of Jersey. Near Mildenhall, Suffolk; near Buxton, Derbyshire: Battersby Moor, Cleveland, Yorkshire: Teesdale, Durham: Housesteads, Northumberland. Doune, near Stirling: Auchterhouse, Forfarshire: Aberfeldy and Glen Fender, Perthshire: Portlethen, Kincardineshire; Craig Guie, Braemar, Aberdeenshire. Mangerton, co. Kerry.

Form *condyloideum* Nyl. Lich. Scand. (1861) p. 66.—Thallus submoderate: podetia rather longer, more or less branched, branches shortly ramuloso-divided at the apices.—Cromb. Lich. Brit. p. 17: Leight. Lich. Fl. p. 80, ed. 3, p. 72.—*Stereocaulon condyloideum* Ach. Meth. Suppl. (1803) p. 51; Sm. Eng. Fl. v. p. 237.

This differs in being somewhat larger, with the podetia more frequently and distinctly branched. The apothecia, which are usually aggregate and terminal, are sometimes also infixed on the subterminal branchlets.

Hab. On turf-covered walls in upland districts.—*Distr.* Local and scarce in N. England and among the Grampians, Scotland.—B. M.: Housesteads, Northumberland. Ben Lawers and Glen Fender, Perthshire.

9. *S. pileatum* Ach. Lich. Univ. (1810) p. 582: Fr. fl. Lich. Scand. p. 51.—Thallus small; podetia very short, erect, slender, simple or sometimes sparingly branched, the axis glabrous; granules squamulose or corallino-verrucæform, usually conglomerate at the base, scattered on the podetia, greyish. Apothecia terminal, pileate, somewhat plane, at length slightly convex, brown or reddish-brown; spores 3-septate, fusiform, obtuse at either apex, 0.018–30 mm. long, 0.0040–45 mm. thick.—Cromb. Grevillea, xv. p. 15.—*Stereocaulon condensatum* var. *cereolinum* Cromb. Lich. Brit. p. 17 pro parte; Leight. Lich. Fl. p. 79, ed. 3, p. 72. *Stereocaulon cereolinum* Sm. Eng. Fl. v. p. 233 pro parte: Mudd. Man. p. 67. *Stereocaulon cereolus* Borr. Eng. Bot., Suppl. t. 2667 descr. pro parte.—*Brit. Exs.*: Larb. Lich. Hb. n. 6.

From *S. condensatum*, of which it has been regarded as a variety, this is distinguished by the short and often nearly naked podetia, and by the structure of the apothecia. It still more closely resembles *Pilophorus cereolus* (Ach.), from which, however, it differs in the spores. The podetia are closely affixed to the substratum, and are often in barren plants sordiato-capitate at the apices. The cephalodia, which are situated towards the base of the podetia, are verrucose, olive-brown or dark-greyish, with the gonimia somewhat large or moderate, glomerulose. In the British specimens the spermogones are sparingly present.

Hab. On mountainous rocks in subalpine districts.—*Distr.* Rare and local in N. Wales, N. England, in S.W. Scotland, the W. Highlands, and in N.W. Ireland.—B. M.: Cader Idris and Dolgelly, Merionethshire; Teesdale, Durham; Wastdale, Cumberland. New Galloway, Kirkcudbrightshire; Ben Cruachan, Argyleshire; Glen Ample and Glen Lochay, Perthshire. Connemara, co. Galway.

30. **LEPROCAULON** Nyl. ex Lamy, Bull. Soc. Bot. Fr. t. xxv. (1878) p. 352.—Thallus minute, subpodetiform, subleproso-granulose, not bearing cephalodia, the pseudo-podetia caespitosely congested, simplish. Apothecia and spermogones unknown.

This pseudo-genus, containing a single species, separated by Nylander from *Stereocaulon*, is but a fruticulescent *Lepraria*. It may be placed here on account of its superficial resemblance to *Stereocaulon*, to which, however, it is not even allied (*vide* Flora, 1876, p. 578).

1. **L. nanum** Nyl. ex Lamy, *l. c.*—Thallus minute, leproso-granulose at the base; granules very small, glaucous-white or subæruginose; pseudo-podetia very short, slender, filiform, caespitoso-congested, somewhat simple or sparingly divided towards the apices, the branches often subfastigate, obsoletely arachnoid, often glabrous (K—).—Cromb. Grevillea, xv. p. 15.—*Stereocaulon nanum* Ach. Meth. (1803) p. 315; Gray, Nat. Arr. i. p. 411; Sm. Eng. Fl. v. p. 233; Mudd, Man. p. 67; Cromb. Lich. Brit. p. 17; Leight. Lich. Fl. p. 80, ed. 3, p. 73.—*Brit. Ess.*: Larb. Lich. Hb. n. 284.

"*Stereocaulon nanum* is not a *Stereocaulon*, but, so far as I have seen in nature, only a *Lepraria* (*Leprocaulon*). The thallus is imperfect, and it has no right to be referred to *Stereocaulon*" (Nylander *in litt.*). This view is confirmed by the absence of the yellow reaction with K, characteristic of that genus.

Hab. In crevices of rocks and walls in maritime and mountainous districts.—*Distr.* Local, though plentiful where it occurs, in the Channel Islands, N. Wales, W. and N. England, amongst the Grampians, Scotland, and rare in N.W. Ireland.—B. M.: Boulay Bay, Island of Jersey; Island of Guernsey. Near Kingsbridge and Totness, Devonshire; Lammorna and Helmin-ton, Cornwall; near Alfrick, Worcestershire; Oswestry, Shropshire; Bettws-y-Coed, Carnarvonshire; Aberdovey, Merionethshire; Teesdale, Durham. Barcaldine, Argyleshire; Balmerino, Fifeshire; Glen Lochay, Perthshire; Den of Balthayock and Reeky Linn, Forfarshire; Falls of Lui, Braemar, Aberdeenshire. Learmont, co. Derry.

Tribe VI. **CLADONIEI** Nyl. Mém. Soc. Cherb. ii. (1854) p. 11; Syn. i. (1860) p. 186.

Thallus foliose, fruticulose or caespitose, erect or ascending, consisting of fistulose or subfistulose podetia, with usually a gonidial-cortical layer, and generally also of horizontal leaflets or squamules at the base, sometimes also on the podetia, containing gonidia and corticate only above, or very rarely of crustaceous basal granules; medullary layer formed principally of filamentose agglutinate longitudinal elements. Apothecia cephalodine or biatorine, typically terminal on the podetia, rarely affixed to the leaflets, often aggregate ("symplicarpous"), variously coloured (not black); spores Snae, simple, oblong, small, colourless; paraphyses somewhat short, occasionally bifurcate. Spermogones generally protuberant on the podetia; sterigmata slender, simple or sparingly branched.

As limited, this is a very natural tribe, readily known by the form of the thallus and the character of the variously coloured, but never normally black, apothecia. The five genera of which it is composed, as constituted by Nylander (two of which, viz. *Heterodea* and *Cladia*, are exotic), while closely related to each other, are separated by the basal thallus and the podetia. The species are for the most part very social in habit.

31. PYCNOTHELIA

Duf. Bory Ann. Sc. Phys. (1821) viii. p. 45; Ach. Lich. (1810) p. 571 (ut sectio *Cenomyces*). — Thallus crustaceous at the base, persistent; podetia papillæform, simple or branched, corticate, glabrous. Apothecia small, terminal on the podetia; spores 8næ, oblong, simple, colourless; thecæ, especially the apices, bluish with iodine. Spermatogones normally terminal on the podetia, conical; spermatia cylindrical, and somewhat acute at either apex, or slightly arcuate.

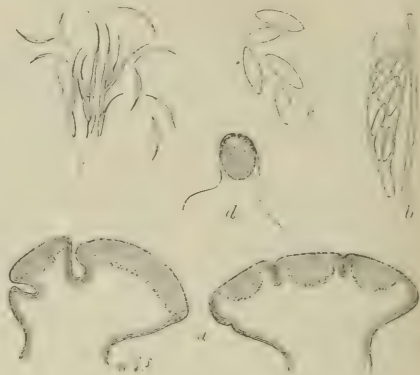


Fig. 34.

Pycnothelia papillaria Duf.—a. Sections of apothecia, $\times 30$. b. A theca and paraphysis, $\times 350$. c. Spores, $\times 500$. d. Section of a spermatogone, $\times 30$. e. Sterigmata and spermatia, $\times 500$.

Though usually regarded as a section, or at most a subgenus of *Cladonia*, this seems a distinct genus characterized by the crustaceous thallus and papillate podetia. The texture of the thallus is entirely that of *Cladonia* (vide Nyl. Syn. i. pp. 183, 189).

1. *P. papillaria* Duf. Bory Ann. Sc. Phys. (1821) viii. p. 46.—Thallus granulose at the base, forming a more or less effuse crust, whitish or pale yellow-greyish; podetia short, clavato-cylindrical or cylindrical, very fragile, egranulose, simple or subsimple, white or glaucous (K + yellowish, CaCl—). Apothecia at first somewhat plane and marginal, at length convex, solitary or aggregate, brown or reddish-brown; spores 0.009–0.014 mm. long, 0.0045 mm. thick.—Sm. Eng. Fl. v. p. 241; Gray, Nat. Arr. i. p. 424; Cromb. Lich. Brit. p. 18; Leight. Lich. Fl. p. 55, ed. 3, p. 52.—*Cladonia papillaria* Mudd, Man. p. 52; Brit. Clad. p. 34. *Cenomyce papillaria* Tayl. in Mack, Fl. Hib. ii. p. 82. *Lichen papillaria* Ehrh. Phyt. (1780) n. 100; Dicks. Crypt. fasc. i. p. 13; With. Arr. ed. 3, iv. p. 45; Eng. Bot. t. 907. *Coralloides minimum fragile*, *Madrepore instar nascens* Dill. Muse. 107, t. 16. f. 28.—Brit. Exs.: Leight. n. 203; Mudd, n. 22, Clad. n. 80; Cromb. n. 121.

The thallus in more barren habitats is somewhat determinate, and the podetia are often subverruca-form, usually somewhat scattered, though

occasionally numerous and crowded. The apothecia in this country are extremely rare, at least in a rightly developed condition. The spermogones, however, are frequent, with spermatia 0,010-13 mm. long, 0,0005 mm. thick.

Hab. On the ground in dry exposed places of upland and subalpine moorland districts.—*Distr.* General, but nowhere common, in the hilly and mountainous tracts of Great Britain and Ireland.—B. M.: Mousehold Heath, Norwich, Norfolk; Bournemouth, Hants; Dartmoor, Devonshire; St. Breock, Cornwall; Llandrindod Hill, Radnorshire; Ayton, Cleveland, Yorkshire; Eglestone, Durham. New Galloway, Kirkcudbrightshire; Appin, Argyleshire; Ben Lawers and Rannoch, Perthshire; Bennaboord, Morrong (frt.), and above Loch Callater, Braemar, Aberdeenshire; Ben Nevis, Inverness-shire; Applecross, Ross-shire; near Lairg, Sutherlandshire. Doneraile Mts., co. Cork; Kilkee, co. Clare; Killarney, co. Kerry.

Form *molariformis*, Cromb. Grevillea, xi. p. 111.—Podetia longer, thicker, divided towards the apices, the branches short, subpapillate, subfastigate.—Var. *molariformis* Nyl. in Cromb. Lich. Brit. (1870) p. 18.—*Cladonia molariformis* Hoffm. Deutsch. Fl. (1795) p. 117.

A luxuriant and robust form, with the podetia crowded and branched, and the basal crust but little visible. Nylander observes (Lich. Scand. p. 50) that it occurs more frequently in Central than in Northern Europe; and this corresponds with its distribution in Great Britain. With us the apothecia do not occur, and the spermogones are less frequent than in the type.

Hab. On the ground among rocks in upland situations.—*Distr.* Very local, though common where it occurs, in S. England.—B. M.: Ardingly Rocks, Sussex.

2. *P. apoda* Nyl. Flora, 1865, p. 211 (note), 1878, p. 241.—Thallus thin, thinly granuloso-crustaceous, white or whitish; podetia small, erect, ellipsoideo-vesiculose or subgranuliform (K + yellow. CaCl—). Apothecia sessile, small, often aggregate, plane, immarginate or somewhat convex, rusty-red or red-ochraceous; spores fusiformi-oblong, 0,007-0,010 mm. long, 0,004 mm. thick; epithecium reddish-brown.—Cromb. Grevillea, vii. p. 97; Leight. Lich. Fl. ed. 3, p. 544.

From the preceding well distinguished by the apothecia being sessile on the basal thallus. The podetia, which are few, are seen only in an abortive condition. A singular character of the plant is that the spermogones usually occur inclosed in the hymenium, without any distinct conceptacle. The spermatia are slightly arcuate, 0,008-0,012 mm. long, 0,0005 mm. thick.

Hab. On the ground in a maritime district.—*Distr.* Very local and rare, in N.W. Ireland (near Kylemore, co. Galway).

32. CLADONIA Hill.

Hist. Pl. (1751) p. 91 pro parte; Hoffm. D. Fl. ii. (1795) p. 114; Nyl. Not. Sällsk. pro F. et Fl. Fenn. Förh. n. s. v. (1866) p. 110. — Thallus laciniato-foliaceous or squamoso-foliolose at the base; podetia branched or scyphiferous, more or less pulveraceous or squamose, entire or with the axils and scyphi perforate. Apothecia terminal, at first somewhat perianth-like, but immediately becoming convex and immarginate; spores 8næ, oblong, simple, colourless. Spermatogones usually situated on the apices of the podetia, conical; spermata equally cylindrical, somewhat curved or straight.

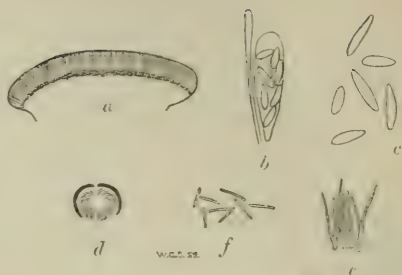


Fig. 35.

Cladonia pyxidata Fr.—a. Vertical section of an apothecium, $\times 30$. b. Theca and paraphysis, $\times 350$. c. Spores, $\times 500$. d. Vertical section of a spermatogonium, $\times 30$. e. Sterigmata, and f, spermata, $\times 500$.

The species of this genus are for the most part very variable. They are consequently so connected by intermediate states and forms (the result to a certain extent, perhaps, of hybridism) that it is sometimes difficult to separate them. Unfortunately, also, the chemical thalline reactions, apart from the characters of the basal thallus and the podetia, are not of decided value here*.

Sometimes there is seen a thin extended hypothalline-filamentose patch, in which originate the basal squamules. The thallus is loosely affixed by these filaments to the substratum, and in some instances, where they decay, it becomes free. The spores and the spermata of the different species do not vary much in size, the former being 0.003–0.015 mm. long, 0.003–0.004 mm. thick, and the latter 0.008–0.012 mm. long, scarcely 0.001 mm. thick. The genus may, for convenience, be divided into the following sections from the colour of the apothecia. Some plants of this and the following genus, when growing in dry exposed places, become more or less cervine or brownish, whence vars. *spadicea*, *fuscescens*, &c., of authors.

Our islands are peculiarly rich in Cladonias; further research will no doubt bring additions to light, as well as extend the distribution of some already detected.

* Nylander says:—"The genus *Cladonia* is not well adapted to show the excellence of reactions, on account of the tinctorial particles being often but sparingly present, by reason of the tenuity commonly of the cortex."—'Flora,' 1886, p. 101.

A. PHÆOCARPÆ.—Apothecia brown or pale.

a. *Macrophyllineæ*.—Thallus foliaceo-laciniose; podetia usually little developed.

1. *C. endiviæfolia* Fr. Lich. Eur. (1831) p. 212.—Thallus large and rigid at the base; laciniae multifid, long, flexuose, generally crenulate at the rounded apices, yellowish or glaucous-green, beneath pale straw-coloured or whitish; podetia small, cylindrical, simple, rarely irregularly scyphiferous, arising from the upper surface of the laciniae (Kf + yellowish, K(CaCl) + deeper yellow). Apothecia more or less confluent, pale or brown; spores oblong, 0.011–13 mm. long, 0.0035–0.004 mm. thick.—Mudd, Man. p. 52; Brit. Clad. p. 2; Cromb. Lich. Brit. p. 18; Leight. Lich. Fl. p. 55, ed. 3, p. 53.—*Scyphophorus endivifolius* Sm. Eng. Fl. v. p. 242; Gray, Nat. Arr. i. p. 418. *Cenomyce endivifolia* Hook. Fl. Scot. ii. p. 62. *Lichen endivifolius* Dicks. Crypt. fasc. iii. (1793) p. 17; With. Arr. iv. p. 60; Eng. Bot. t. 2361.—*Brit. Evs.*: Dicks. Hort. Sic. n. 24.

The basal thallus is larger than in the other species, the laciniae being often 1–2 inches long and $\frac{1}{4}$ inch broad. The yellowish-green colour of the upper and the paler yellow of the under surface, turned up in dry weather, render this a beautiful plant. It varies in size, and the smaller and more divided states are with difficulty distinguished from other species. The apothecia are extremely rare and little developed in this country.

Hab. On dry sandy (usually calcareous) soil among mosses and short grasses, chiefly in maritime districts.—*Distr.* Local and scarce, in a few localities in E. and S. England.—B. M.: Hemsby, near Yarmouth, Suffolk; Banstead Downs, Surrey; Newhaven, Sussex (fruit).

2. *C. alaicornis* Floerke, Clad. (1828) p. 23.—Thallus somewhat large and rigid at the base; laciniae multifid, often almost palmately divided, more or less blackish-fibrillose at the margins, glaucous-green or yellowish, beneath whitish straw-coloured or nearly white; podetia arising from the upper surface of the laciniae, small or moderate, usually narrowly scyphiferous, scyphi cristate at the margins (K—, K(CaCl) + deep yellow). Apothecia often confluent, brown; spores as in the preceding species.—Cromb. Lich. Brit. p. 18; Leight. Lich. Fl. p. 59, ed. 3, p. 56.—*Cladonia endiviæfolia* β . *alaicornis* Mudd, Man. p. 52; Brit. Clad. p. 3. *Scyphophorus alaicornis* Sm. Eng. Fl. v. p. 242; Gray, Nat. Arr. i. p. 418. *Cenomyce alaicornis* Hook. Fl. Scot. ii. p. 62. *Lichen alaicornis* Lightf. Fl. Scot. ii. (1777) p. 872 pro parte; Eng. Bot. t. 1392. *Lichen foliaceus* Huds. Fl. Angl. p. 457 pro parte; With. Arr. ed. 3, iv. p. 35. *Coralloides scyphiforme*, *foliis alaicorniformibus cartilaginosis* Dill. Musc. 87, t. 14. f. 12 A. *Lichenoides cartilaginosa*, *tubulis et pyxidulis exiguis* Dill. in Ray, Syn. ed. 3, 70. 38.—*Brit. Evs.*: Leight. n. 15; Mudd, Clad. n. 1; Larb. Cæsar. n. 56.

In its typical condition this may be distinguished from the preceding by the more divided, narrower, and congested thallus, which is sometimes pale rose-coloured beneath, and by the blackish fibrillose margins of the

laciniae. States, however, occur, as if intermediate between them, in which these characters are not so evident. With us it is rare in a fertile condition. The podetia are occasionally wanting, and then the apothecia and the spermogones are sessile on the laciniae.

Hab. In dry sandy places amongst mosses and heaths in maritime and upland districts.—*Distr.* Here and there throughout Great Britain, chiefly in S. England and the Channel Islands; rare in S.W. Ireland.—B. M.: Quenvais, Island of Jersey; Island of Sark; Jerbourg, Icart Point, and L'Ancresse Bay, Island of Guernsey. Hunstanton, Norfolk; Aldgrave, Suffolk; Epping Forest, Essex; the Downs, near Brighton, Sussex; Isle of Wight; near Torquay, S. Devon; Withiel and the Scilly Islands, Cornwall; Malvern Hills, Worcestershire; Charnwood Forest, Leicestershire; Haughmond Hill, Shropshire; Barmouth and Anglesea, N. Wales; near Great Ayton, Cleveland, Yorkshire. Pentland Hills, Edinburgh; Island of Lismore; Bay of Nigg, Kincardineshire; the Links, Old Aberdeen. Glengariff, co. Cork.

3. *C. firma* Nyl. Bull. Soc. Bot. Fr. viii. (1861) p. 755.—Thallus laciniato-squamose at the base; laciniae constipate, suberect, very minutely subareolato-insculpt, firm, crenate, naked, or at times fibrillose at the margins, and crenato-incised, yellowish or glaucous-greenish above, beneath pale yellowish or whitish or obsoletely rose-coloured and white-suffused; podetia small, narrowly scyphiferous (K—, K(CaCl) + yellow, often ferruginous). Apothecia more or less confluent, brown.—Cromb. Grevillea, xi. p. 111.—*Cladonia alcicornis* var. *firma* Nyl. Syn. i. (1860) p. 191.—*Brit. Exs.*: Larb. Cæsar. n. 57; Cromb. n. 122.

Though originally regarded by Nylander as a variety of *C. alcicornis*, yet "it constitutes a proper species more certainly than many others in this genus" (Bull. Soc. Bot. l. c.). It differs from *C. alcicornis* in the laciniae being constipate, thicker, simpler, and more ascending, firmer when growing, but rather brittle when dry. The podetia and apothecia, which are very like those of the preceding, are not uncommon. The spermogones also are frequent, and are often sessile on the leaflets.

Hab. On sandy soil and on the ground amongst rocks in maritime districts.—*Distr.* Very local and scarce in the Channel Islands and in S. England.—B. M.: Noirmont, Warren, and Quenvais, Island of Jersey; Jerbourg, Island of Guernsey; Chateau Point, Island of Sark. Lydd, Kent; Brighton Downs, Sussex; Start Point, S. Devon.

Form *gracilescens* Cromb.—Thallus small; laciniae very narrow, much divided, more or less crenate at the apices; podetia narrow and narrowly scyphiferous. Apothecia not seen.—*Cladonia alcicornis* f. *gracilescens* Cromb. Grevillea, xi. (1883) p. 111.

A well-marked form, perhaps a variety, of this rather than of the preceding species, characterized by the smaller thallus and the much more slender and divided laciniae. It closely approaches to var. *gentilis* Ach. of *C. alcicornis*, but differs in the marginal fibrillae being not "long and simple" but shortly fasciculate. In the only entire specimen seen the podetia, which are but sparingly present, are substerile and only spermogoniiferous.

Hab. On the ground among rocks in a maritime district.—*Distr.* Very sparingly in S. Wales.—B. M.: Lydstep, Pembrokeshire.

b. Microphyllina.—Thallus typically small, variously squamulose.

a'. Scyphophora.—Podetia normally scyphiferous.

4. *C. pyxidata* Fr. Lich. Eur. (1831) p. 216.—Thallus foliaceo-squamulose at the base; squamules small, firm, glaucous-green or greyish, whitish beneath; podetia short or somewhat elongate, continuously corticate or verrucose, scyphiferous; scyphi large, cyathiform, often proliferous (K —, CaCl —). Apothecia moderate, brown or reddish-brown, sometimes symphicarpous; spores oblong, variable in size, 0,008–14 mm. long, 0,003–0,0045 mm. thick.—Mudd, Man. p. 53 pro parte; Brit. Clad. p. 7 pro parte; Cromb. Enum. p. 18 pro parte; Grevillea, xi. p. 111; Leight. Lich. Fl. p. 60, ed. 3, p. 56.—*Scyphophorus pyxidatus* Sm. Eng. Fl. v. p. 238; Gray, Nat. Arr. i. p. 456. *Cenomyce pyxidata* Hook. Fl. Scot. ii. p. 62. *Lichen pyxidatus* Linn. Sp. Pl. (1753) p. 1151; Huds. Fl. Angl. p. 456; Lightf. Fl. Scot. ii. p. 869 pro parte; With. Arr. ed. 3, iv. p. 36; Eng. Bot. t. 1393. *Cladonia coccifera* Tayl. in Mack. Fl. Hib. ii. p. 81 pro parte. *Coralloides scyphiforme, tuberculis fuscis* Dill. Musc. 79, t. 14. f. 6 c, 1–m. *Lichenoides tubulosum pyxidatum cinereum* Dill. in Ray, Syn. ed. 3, 68. 28 pro parte.—*Brit. Eas.*: Mudd, Clad. n. 6; Bohl. n. 32.

This is with us, as elsewhere, a very variable species, giving rise to many marked forms and varieties, besides others enumerated by authors which are simply states and do not deserve distinctive names. Among these latter are:—*simplex* Roth., with “the scyphi larger and spermogoniiferous at the margin;” *staphylea* Ach., with “the apothecia pedicellate on the margin of the scyphi;” *syntheta* Ach., with “the margin of the scyphi proliferous;” *costata* Flörke, with “the podetia denudate and longitudinally furrowed.” Where the plant spreads extensively, one or other of these may be met with on the same specimen. In the type the basal squamules occasionally become nearly obsolete, and the apothecia are comparatively rare.

Hab. On the ground, old walls, rocks, and about the roots of trees in maritime, lowland, and upland districts.—*Distr.* General and common throughout Great Britain, and no doubt also in Ireland, though specimens have not been seen; rare in the Channel Islands.—*B. M.*: Island of Guernsey. Epping Forest, Essex; Hampstead Heath, Middlesex; New Forest, Hants; Dartmoor, Devonshire; St. Breward and near Bodmin, Cornwall; Charnwood Forest, Leicestershire; Buxton, Derbyshire; Aberdovey and Dolgelly, Merionethshire; Ayton, Cleveland, Yorkshire; Alston and Bassenthwaite Lake, Cumberland. Appin, Argyleshire; Killin and Blair Athole, Perthshire; Den of Mains, Forfarshire; Durris, Kincardineshire; Countesswells and Castleton of Braemar, Aberdeenshire; south of Fort William, Inverness-shire; Lairg, Sutherlandshire.

Form 1. *lophyra* Coem. Clad. Belg. (1863) n. 29.—Podetia short, turbinate; scyphi crisp, squamuloso-foliaceous at the margins. Apothecia large, sessile or pedicellate among the squamules.—Mudd, Brit. Clad. p. 8; Cromb. Grevillea, xi. p. 111.—*Cenomyce pyxidata* δ . *lophyra* Ach. Lich. Univ. (1810) p. 535.

The squamulose margins of the scyphi and the position of the apothecia

distinguish this form. In the British specimens the apothecia are very sparingly present, though the spermogones are not uncommon.

Hab. On the ground in maritime and upland districts.—*Distr.* Local and scarce in S.W. England and the Highlands of Scotland; probably overlooked.—B. M.: St. Breock, Cornwall. Barcalaine, Argyleshire; Rannoch, Perthshire.

Form 2. *epiphylla* Nyl. Lich. Scand. (1861) p. 50.—Podetia extremely short or wanting. Apothecia subsessile on the basal squamules, conglomerate.—Cromb. Lich. Brit. p. 18; Grevillea, xi. p. 111.—*Cladonia pyxidata* β . *chlorophæa* g. *epiphylla* Mudd, Brit. Clad. p. 9. *Lichen epiphyllus* Ach. Prodr. (1798) p. 185.

This distinct form, or probably variety, is characterized by the podetia being abortive or nearly so, and by the apothecia being consequently more or less sessile on the basal thallus. A single British specimen has been seen; it has a few very minute, scattered podetia.

Hab. On the ground in upland tracts.—*Distr.* Extremely local and scarce in E. England; not recently found.—B. M.: Epping Forest, Essex.

Var. β . *pocillum* Fr. Sum. Veg. (1845) p. 110.—Squamules at the base somewhat large, firm, usually appressed, subimbricate, pale-greyish; podetia short, turbinato-scyphiferous, corticate, granulato-verrucose. Apothecia small, dark-brown.—Mudd, Man. p. 53; Brit. Clad. p. 7; Cromb. Lich. Brit. p. 18; Grevillea, xi. p. 111.—*Bewomyces Pocillum* Ach. Meth. (1803) p. 336, t. 8. f. 6.

In this variety the basal thallus, which is occasionally orbicular, is as if crustaceo-appressed to the substratum, and is sometimes of a cervine or lurid-cervine colour (form *cervina* Nyl. Syn. p. 193). The podetia are more or less scattered, and the apothecia, rare in our specimens, are marginal on the scyphi.

Hab. On sterile soil on banks and heaths in maritime and upland tracts.—*Distr.* Probably general and common, though seen only from comparatively few localities in England, Scotland, and the Channel Islands.—B. M.: The Vale, Island of Guernsey. Near Bodmin, Cornwall; Bathampton Downs, Somersetshire; Charnwood Forest, Leicestershire; Barmouth, N. Wales; Redcar, Cleveland, Yorkshire. Tongland, Kirkcudbrightshire; Killin and Rannoch, Perthshire; Durris, Kincardineshire; Countesswells and Castleton of Braemar, Aberdeenshire; Glen Nevis, Inverness-shire.

Var. γ . *chlorophæa* Flörke, Clad. (1828) p. 70.—Squamules at the base somewhat small; podetia elongato-turbinate, greenish or sulphur-coloured, granulato-pulverulent, scyphiferous; scyphi usually narrow, simple or variously proliferous.—Mudd, Clad. p. 8; Leight. Lich. Fl. p. 60, ed. 3, p. 57; Cromb. Grevillea, xi. p. 111.—*Cenomyce chlorophæa* Flörke in Somm. Suppl. Lapp. (1826) p. 130.—*Brit. Ess.*: Mudd, Clad. nos. 7-11; Leight. n. 399; Larb. Lich. Hb. n. 206.

Characterized by the granulato-pulverulent podetia, in which it approaches *C. fimbriata*. When less developed the basal squamules are

often also pulverulent at the margins. It is not uncommon in a fertile condition, the apothecia being often confluent.

Hab. Among mosses on the ground and old walls in maritime and upland districts.—*Distr.* General and common in Great Britain, and probably also in Ireland, though no specimens have been seen: rare in the Channel Islands.—B. M.: Island of Guernsey. Wootton Common, Norfolk; Epping Forest, Essex; Chislehurst, Kent; Leith Hill, Surrey; Lustleigh Cleeve, Dartmoor, Devonshire; near Penzance and Helminston, Cornwall; Adderbury Church, Oxfordshire; Hale End, Malvern, Worcestershire; Shrewsbury, Shropshire; Aberdovey and Dolgelly, Merionethshire; Ayton, Newton, and Kildale Moors, Cleveland, Yorkshire; Morpeth, Northumberland. New Galloway, Kirkcudbrightshire; Pentland Hills, Edinburgh; Appin, Argyleshire; Rannoch and Blair Athole, Perthshire; Durrus, Kincardineshire; Countesswells, near Aberdeen, and Castleton of Braemar, Aberdeenshire; Loch Linnhe, Inverness-shire; Lairg, Sutherlandshire.

Form 1. *lepidophora* Flörke, Clad. (1828) p. 70.—Podetia densely covered with minute, crowded, inciso-crenate, glaucous-grey squamules.—Cromb. Grevillea, xi. p. 111.—*Cladonia pyxidata* β . *chlorophæa* c. *phyllophora* (Wallr.) Mudd, Brit. Clad. p. 9.

This form seems quite distinct from the type, but the younger podetia are as in it granulato-pulverulent. Its distinctive character no doubt depends upon age and the nature of the habitat; in the type itself podetia sometimes occur bearing a few scattered squamules. In the few specimens seen the apothecia are not numerous.

Hab. On old brick walls and thatched roofs in lowland districts.—*Distr.* Probably general, though seen only from Central and W. England, N. Wales, and N.E. Scotland.—B. M.: Lechlade, Oxfordshire; near Cirencester, Gloucestershire; Conway, Carnarvonshire. Kinnordy, Forfarshire; Cults, near Aberdeen.

Form 2. *myriocarpa* Cromb. Grevillea, xi. (1883) p. 111.—Podetia somewhat short, subturbinate; scyphi subdiluted, proli-ferous from the margins, the proliferations narrow, multifid. Apothecia sessile, small, aggregato-confluent.—*Cladonia pyxidata* var. *fimbriata* f. *myriocarpa* Coem. Clad. Belg. (1863) n. 53; Mudd, Brit. Clad. p. 10.—*Brit. Exs.*: Larb. Cæsar. n. 58.

A well-marked form, referred to *C. fimbriata* by Coemans, but belonging to this variety of *C. pyxidata*, from which it is distinguished by the proliferations of the scyphi. The apothecia in well-fruited specimens are very numerous and crowded, from pale-brown becoming reddish-brown.

Hab. On the ground and on wall-tops in maritime and upland situations.—*Distr.* Local and scarce in the Channel Islands, W. England S. Scotland, and the S. and N. Grampians.—B. M.: St. Ouen's Bay, Island of Jersey. Ozleworth Park, Gloucestershire; Malvern and Bewdley, Worcestershire. Castle Douglas, Kirkcudbrightshire; Achmore, Killin, Perthshire; Glen Cluny, Braemar, Aberdeenshire.

5. *C. leptophylla* Flörke, Comm. Clad. (1828) p. 19.—Thallus squamulose at the base, pale-greenish; squamules small, scattered,

rounded, entire or slightly crenate; podetia rarely present, short, slender, glabrous, simple, sometimes bifid at the apices, ascyphous (K—, CaCl—). Apothecia solitary, turgid, capitate, brown; spores 0,010–12 mm. long, 0,003–35 mm. thick.—Cromb. Grevillea, xi. p. 111.—*Cladonia pyxidata* subsp. *leptophylla* Cromb. Lich. Brit. p. 18; var. *leptophylla* Leight. Lich. Fl. p. 61, ed. 3, p. 57. *Cladonia cariosa* β. *leptophylla* Mudd, Brit. Clad. p. 6. *Cladonia squamosa* f. *leptophylla* Mudd, Man. p. 57. *Helopodium leptophyllum* Gray, Nat. Arr. i. p. 416. *Cenomyce leptophylla* Ach. Lich. Univ. (1810) p. 568. *Scyphophorus microphyllus* Sm. Eng. Fl. v. p. 237. *Lichen microphyllus* Eng. Bot. t. 1782.

This anomalous plant resembles *C. cariosa*, but beside other characters differs in the absence of any thalline reaction. It is near *C. pyxidata*; but the form of the thallus and of the podetia (which when dry become shrunken and somewhat costate) entitle it to rank as a species; it was so regarded by the older authors, and more recently by Nylander ('Flora,' 1874, p. 70). The apothecia are nearly hemispherical, and much broader than the podetia.

Hab. In moist places amongst heaths in wooded upland tracts.—*Distr.* Very sparingly in S. England and S.W. Scotland; probably overlooked elsewhere.—B. M.: Tilgate Forest, Sussex. New Galloway, Kirkcudbrightshire.

6. *C. pityrea* Flörke Clad. (1828) p. 79.—Thallus squamulose at the base; squamules minute, often evanescent, greyish-green above, white beneath; podetia somewhat short, slender, entirely furfuraceo-granulate, obsoletely and irregularly scyphiferous, greyish-white; scyphi narrow, little evolute or divided, fimbriato-radiate and often proliferous at the margins (K—, CaCl—). Apothecia moderate or small, subpedicellate or sessile, pale- or dark-brown.—Cromb. Grevillea, xi. p. 112.—*Cladonia pyxidata* subsp. *pityrea* Cromb. Lich. Brit. p. 18. *Cladonia pyxidata* μ. *pityrea* Mudd, Brit. Clad. p. 15; Leight. Lich. Fl. p. 60, ed. 3, p. 57. *Capitularia pityrea* Flörke in Web. et Mohr, Beitr. ii. (1810) p. 182. *Coralloides parum ramosum, tuberculis fuscis* Dill. Musc. 97, t. 15. f. 20.—*Cladonia pyxidata* var. *symphicarpa* Cromb. (non Ach.) Lich. Brit. p. 18; Grevillea, xi. p. 111, is an obscure state of this.—*Brit. Ess.*: Mudd, Clad. nos. 27–29, 16 pro parte, and 38; Larb. Cæsar. n. 8.

Resembling generally *C. fimbriata* and var. *chlorophæa* of *C. pyxidata*, yet so constant as to deserve to rank as a proper species. It is distinguished by the furfuraceo-pulverulent podetia and the minutely fimbriate narrow scyphi, which are pervious or non-pervious. The apothecia are small and marginal on the scyphi, or large and subpedicellate, becoming dark in old age.

Hab. On the ground among mosses and on dead stumps of trees in upland situations.—*Distr.* Local and scarce in S. and N. England, and among the Grampians, Scotland; rare in N.W. Ireland and the Channel Islands.—B. M.: Noirmont, Island of Jersey. New Forest, Hants; Dartmoor, Devonshire; Helminston, near Bodmin, Cornwall; Loundsdale, Guisboro' Moor, near Roseberry, Ayton Moor, and Black

Banks, Cleveland, Yorkshire. New Galloway, Kirkcudbrightshire; Appin, Argyleshire; Rannoch, Perthshire; near Ballater, Aberdeenshire; Loch Linnhe, Inverness-shire. Kylemore, co. Galway.

Form *hololepis* Flörke Clad. (1828) p. 83.—Podetia somewhat short, densely squamuloso-furfuraceous; squamules fragile, more or less pulverulent; scyphi irregularly fimbriate or divided.—Cromb. Grevillea, xi. p. 112.—*Cladonia pyxidata* μ . *pityrea* j. *hololepis* Mudd, Brit. Clad. p. 16 (non Exs. n. 33).

This differs in the minutely squamuloso-furfuraceous podetia somewhat elongate when sterile. Though distinct, it is only a form, as in the type a few minute squamules are occasionally present. In the only British specimen the apothecia are somewhat numerous.

Hab. On the ground amongst decayed heaths in upland districts.—*Distr.* Very local and scarce in the S. Highlands, Scotland, though no doubt occurring elsewhere.—B. M.: Glen Lochay, Killin, Perthshire.

7. *C. acuminata* Norrl. Medd. Soc. pro F. et Fl. Fenn. (1876) p. 12.—Thallus minutely squamulose at the base; squamules greenish-grey above, white beneath; podetia slender, somewhat elongate, cylindrico-subuliform, simple or branched, acuminate at the apices, granulato-furfuraceous, greyish-white (K + yellowish, CaCl—). Apothecia terminal, small, brown.—Cromb. Grevillea, xi. p. 112.—*Cladonia pyxidata* μ . *pityrea* e. *acuminata* Mudd, Brit. Clad. p. 15 (non Exs. n. 20). *Cenomyce pityrea* b. *acuminata* Ach. Syn. (1814) p. 254. *Coralloides corniculis brevioribus et crebrioribus* Dill. Musc. 104, t. 16, f. 27 E.

Till recently this was regarded by authors as a variety of *C. pityrea*. In addition, however, to the more elongate, subulate, apically acute podetia, with their terminal apothecia, it is at once separated by the thalline reaction with K. Of the two specimens gathered in this country, one is fertile.

Hab. On the ground among mosses in subalpine districts.—*Distr.* Very local and scarce among the N. Grampians, Scotland, and in N.W. Ireland (Connemara, Galway).—B. M.: Head of Glen Callater, Braemar, Aberdeenshire.

8. *C. Lamarkii* Nyl. Flora, 1875, p. 447.—Thallus squamulose at the base; squamules small, crenate, greyish-green above, whitish beneath; podetia moderate, granulato-furfuraceous, scyphifero-proliferous, the scyphi not pervious, digitately divided at the margins, furcato-radiate at the apices (Kf + yellowish, then ochraceous, CaCl—). Apothecia small, conglomerate, brown.—Cromb. Journ. Bot. 1876, p. 360; Grevillea, xi. p. 112; Leight. Lich. Fl. ed. 3, p. 54.—*Cladonia Lamarkii* Del. fide Nyl. l. c. *Cladonia pyxidata* μ . *pityrea* c. *fascicularis* Mudd, Brit. Clad. p. 15.

From the two preceding species this is distinguished by the scyphi and by the reaction with K. In the few British specimens the podetia are rather short (about $\frac{1}{2}$ in. long), occasionally somewhat fasciculate, with

the scyphi proliferous from the margins. The apothecia do not usually occur.

Hab. On the ground in upland situations.—*Distr.* Local and scarce in S.W. England, S.W. Scotland, and the S.W. Highlands.—B. M.: Near Widdicombe, Devonshire; Bodmin, Cornwall. New Galloway, Kirkcudbrightshire; Barcaldine, Argyleshire.

Form *Isignyi* Nyl. Flora, 1875, p. 447.—Podetia densely squamuloso-foliaceous. Apothecia moderate, dark-brown.—Cromb. Grevillea, xv. p. 44.—*Cladonia pyxidata* μ . *pityrea* k. *d'Isignyi* Mudd, Brit. Clad. p. 16. *Cladonia Isignyi* Del. fide Nyl. l. c.

The podetia are usually covered with folioles except towards the apices, where they are more or less squamulose. In perfect specimens the basal thallus is more developed than in the type. With us it is rarely well-fertile.

Hab. Among mosses on the ground and about the roots of trees in maritime and upland districts.—*Distr.* Local and rare in the Channel Islands and the Central Grampians, Scotland.—B. M.: Grosnez Common, Island of Jersey. Near Falls of Tummel, Perthshire.

9. *C. cariosa* Spreng. Syst. Veg. iv. (1827) p. 272.—Thallus squamulose at the base; squamules minute, crenato-incised, greyish-glaucous above, white beneath; podetia rather short, somewhat stout, simple or branched, at first smooth, becoming granulate-verrucose, partly denudate, and then almost white carioso-cancellate, greyish-glaucous or glaucous; scyphi digitately divided into subfastigiate branches (K + yellow, CaCl—). Apothecia turgid, somewhat large, subconfluent, brown; spores 0,009–13 mm. long, 0,004–5 mm. thick.—Mudd, Brit. Clad. p. 6; Cromb. Lich. Brit. p. 19; Leight. Lich. Fl. p. 57, ed. 3, p. 55.—*Cladonia gracilis* E. *cariosa* Mudd, Man. p. 55. *Cenomyce cariosa* Borr. Eng. Bot. Suppl. t. 2761; Tayl. in Mack. Fl. Hib. ii. p. 80. *Lichen cariosus* Ach. Prodr. (1798) p. 198. *Coralloides fungiforme fuscum, basi foliacea* Dill. Musc. 77, t. 14, f. 2.—*Brit. Exs.*: Mudd, Clad. n. 5.

Easily known by the carioso-cancellate podetia, which, with the other characters, show it to be a very distinct species. The basal squamules are sometimes very small or evanescent, and minute squamules are rare on the podetia. These latter are crowdedly and longitudinally sulcate or subfissured, and usually corymbosely divided at the apices. The apothecia are occasionally entirely sessile and subconfluent on the podetia.

Hab. On clayey and sandy soil in maritime and upland wooded districts.—*Distr.* Apparently local and scarce in S.W. and N. England, the W. Highlands of Scotland, and S.W. Ireland.—B. M.: Horsemunden, Kent; Wyre Forest and Bewdley, Worcestershire; Ayton, Cleveland, Yorkshire. Barcaldine, Argyleshire; Loch Katrine, Perthshire; Lochaber, Inverness-shire.

10. *C. fimbriata* Fr. Lich. Eur. (1831) p. 222.—Thallus squamulose at the base; squamules minute, greyish-green above, white beneath, occasionally evanescent; podetia usually somewhat elon-

gate, cylindrico-subulate or tubæform, scyphiferous, very thinly pulverulent, white or glaucous-white; scyphi with the margin usually erect and crenate, regular or variously proliferous (K—, CaCl—). Apothecia brown, simple or confluent.—Cromb. Lich. Brit. p. 19; Grevillea, xi. p. 112.—*Cladonia pyxidata* β . *fimbriata* Mudd, Man. p. 53, Brit. Clad. p. 9; Leight. Lich. Fl. p. 61, ed. 3, p. 57. *Scyphophorus fimbriatus* Sm. Eng. Fl. v. p. 243; Gray, Nat. Arr. i. p. 419. *Cenomyce fimbriata* Hook. Fl. Scot. ii. p. 62; Tayl. in Mack. Fl. Hib. ii. p. 81. *Lichen fimbriatus* Linn. Sp. Pl. (1753) p. 1152; Huds. Fl. Angl. p. 456; Lightf. Fl. Scot. ii. p. 870; With. Arr. ed. 3, iv. p. 37; Eng. Bot. t. 2438. *Coralloides scyphiforme gracile, marginibus serratis* Dill. Musc. 84, t. 14. f. 8, et *Coralloides scyphiforme, tuberculis fuscis*, p. 79, t. 14. f. 6 A, B. *Lichenoides tubulosum proliferum, marginibus serratis* Dill. in Ray, Syn. ed. 3, 69. 30.—*Brit. Ecs.*: Leight. nos. 325, 376, 377; Mudd, n. 1, Clad. nos. 14, 15, 17, 18; Bohl. n. 24.

From *C. pyxidata*, to which it is allied, this differs in the podetia being whitish-pulverulent, often more extended, with narrower scyphi. In these respects it is constant, and may with propriety be regarded as specifically distinct. It is a very variable plant in the characters of the podetia. Sometimes they become denudate, and in this case are often longitudinally ribbed (form *costata* Flörke, Mudd, Brit. Clad. p. 11; Leight. Lich. Fl. ed. 3, p. 58); and at other times they are once or twice proliferous (form *prolifera* Ach., Mudd, *l. c.*). The scyphi also are occasionally unequally denticulate at the margins (form *denticulata* Flörke, Mudd, Man. p. 54, Brit. Clad. p. 10), and more rarely are cyathiform, with the margin squamulose (*pterygota* Flörke, Mudd, Brit. Clad. p. 11). These, however, are mere states of the type resulting from the nature of the habitat, and more than one of them may at times be seen on the same specimen. In this country the apothecia are rarely well developed.

Hab. On the ground, roots of trees, and among mosses on old walls in maritime, lowland, and upland districts.—*Distr.* General and common in Great Britain and Ireland, though seen but from comparatively few localities, the more typical condition being rarer.—B. M.: Epping Forest, Essex; Dorking, Surrey; New Forest, Hants; Truro, Cornwall; Newmarket Heath, Cambridgeshire; near Chipping Norton, Oxfordshire; Barmouth, Merionethshire; Aber, Carnarvonshire; Over, Cheshire; Ayton and Bilsdale, Cleveland, Yorkshire; Windermere, Westmoreland. New Galloway, Kirkcudbrightshire; Royal Botanic Gardens and Braid Hills, Edinburgh; Barcaldine and Appin, Argyleshire; Killin and Blair Athole, Perthshire; Countesswells Wood, near Aberdeen; Castleton of Braemar, Aberdeenshire; Rothiemurchus, Inverness-shire; Lairg, Sutherlandshire. Kylesmore, co. Galway.

Var. β . *conista* Nyl. Lich. Scand. (1861) p. 51.—Podetia short, subturbinate, pulverulent, greenish-grey; scyphi simple, the margin subentire.—Cromb. Grevillea, xi. p. 112.—*Cladonia pyxidata* γ . *fimbriata* b. *conista* Mudd, Brit. Clad. p. 10. *Scyphophora conista* Gray, Nat. Arr. i. p. 421. *Cenomyce fimbriata* β . *conista* Ach. Syn. (1814) p. 257.—*Brit. Ecs.*: Mudd, Clad. n. 13.

Differs in the size and form of the podetia, and in their simple (never

proliferous) scyphi. As these characters seem to be constant, it may be regarded as constituting a distinct variety rather than a less developed form. The apothecia, which are "marginal and minute" (Ach.), do not occur in our British specimens.

Hab. On the ground and tops of walls in upland districts.—*Distr.* Probably not unfrequent, though seen only from a few localities in S. and N. England, N. Wales, S. and N.E. Scotland, and the S. Grampians.—B. M.: Lanivet, Cornwall; Aberdovey, Merioneth; Easby, Cleveland, Yorkshire. New Galloway, Kirkcudbrightshire; Killin, Perthshire; Countesswells, near Aberdeen.

Form *exigua* Cromb. Grevillea, xi. (1883) p. 112.—Podetia very short, whitish- or greyish-pulverulent; scyphi narrow, simple, brown within, the margin entire.—*Lichen pyxidatus* η . *exiguus* Huds. Fl. Angl. ed. 2 (1778), p. 552. *Scyphophora conista* β . *exilis* (Ach.), Gray, Nat. Arr. i. p. 421. *Lichen filiformis* var. 2, With. Arr. ed. 3, iv. p. 39. *Coralloides scyphis humilibus, intus fuscis* Dill. Musc. 86, t. 14, f. 11.

Probably only an accidental state, differing in the entire margin of the scyphi and their bright-brown colour in the interior, though, as indicated by Acharius (Lich. Univ. p. 535, *cfr.* Meth. p. 338), this may become blackish in age. In the British specimens seen, which are sterile, the podetia are numerous and crowded.

Hab. On the ground upon upland heaths.—*Distr.* Apparently very local and scarce in E. England.—B. M.: Epping Forest, Essex.

Var. γ . *tubæformis* Fr. Lich. Eur. (1831) p. 22.—Podetia somewhat elongate, cylindrical, pulverulent, white, scyphiferous; scyphi narrow, regular, entire or slightly crenulate at the margins.—Cromb. Lich. Brit. p. 19.—*Cladonia pyxidata* var. *fimbriata* f. *tubæformis* Leight. Lich. Fl. p. 62, ed. 3, p. 58. *Cladonia pyxidata* E. *tubæformis* Mudd, Man. p. 54, Brit. Clad. p. 10. *Cladonia pyxidata* var. *tubæformis* Hoffm. Deutsch. Fl. ii. (1791) p. 122.—*Brit. Eas.*: Leight. n. 377; Mudd, n. 7.

The cylindrical and usually more elongate podetia, with their narrower scyphi, distinguish this variety, which is most frequently seen only in a juvenile condition. In this country, as elsewhere, the apothecia are apparently very rare, though the spermogones are occasionally visible.

Hab. On the ground and rotten stumps in wooded upland tracts.—*Distr.* Not very general nor frequent, occurring only here and there in England, N. Wales, and Scotland; not seen from Ireland.—*Distr.* Walthamstow, Essex; New Forest, Hants; near Bovey Tracey, S. Devon; St. Breward, Cornwall; Charlton Camp, Oxfordshire; Shrewsbury, Shropshire; near Worcester; Barmouth, Merionethshire; Ayton, Cleveland, Yorkshire. Barcaldine, Argyleshire; Craigforth, Stirling; Glen Lochay and Rannoch, Perthshire; Countesswells, near Aberdeen.

Form *macra* Cromb. Grevillea, xi. (1883) p. 112.—Podetia short, cylindrical, slender, whitish-pulverulent; scyphi narrow, the margin entire.—*Cladonia pyxidata* β . *fimbriata* f. *macra* Mudd, Man.

p. 54, Brit. Clad. p. 9. *Cupitularia pyxidata* c. *macra* Flörke in Web. et Mohr, Beitr. ii. (1810) p. 290.—*Brit. Ecs.*: Mudd, Clad. n. 12.

The much shorter and slender podetia and the narrow scyphi characterize this form, which is entirely referable to the above variety. With us it is scarcely, if ever, seen fertile.

Hab. On putrid trunks in upland localities.—*Distr.* Found only in E., S.W., Central, and N. England, the W. Highlands, Scotland, and S. Ireland.—B. M.: Epping Forest, Essex; near Bodmin, Cornwall; Charnwood Forest, Leicestershire; Cleveland, Yorkshire. Barcaldine, Argyleshire. Castlemartyr, co. Cork.

Var. δ . *carneopallida* Nyl. Syn. i. (1860) p. 195.—Podetia moderate, narrow, scyphiferous, whitish or greenish-white-pulverulent; scyphi narrow, crenate and sometimes proliferous at the margins. Apothecia small, pale flesh-coloured.—Cromb. Grevillea, xi. p. 112.—*Cladonia pyxidata* δ . *carneopallida* Mudd, Brit. Clad. p. 11. *Cupitularia pyxidata* γ . *carneopallida* Flörke in Web. et Mohr, Beitr. ii. (1810) p. 304. *Cladonia carneola* Mudd, Man. p. 56 (excl. syn.).

Somewhat similar to the preceding variety, from all states of which it differs in the colour of the apothecia. In this respect it approaches to *C. carneola* Fr., with which it has occasionally been confounded. The two British specimens seen are only sparingly fertile.

Hab. On putrid trunks of trees in upland woods.—*Distr.* Seen only from E. England; no doubt to be detected elsewhere.—B. M.: Epping Forest and Snarresbrook, Essex.

Subsp. *C. fibula* Nyl. ex Norrl. Medd. Soc. pro F. et Fl. Fenn. (1876) p. 12.—Podetia elongate, slender, simple, subcylindrical, white-pulverulent; scyphi narrow or none (K—, CaCl—). Apothecia small, brown, usually aggregate.—Cromb. Grevillea, xi. p. 112.—*Cladonia pyxidata* ϵ . *cornuta* k. *fibula* Mudd, Brit. Clad. p. 13. *Lichen fibula* Ach. Prodr. (1798) p. 194. *Scyphophora fimbriata* δ . *fibularia* Gray, Nat. Arr. i. p. 420.

The form of the podetia, which are 1-2 in. long, warrant this being regarded as a subspecies. In the British specimens the podetia are usually ascyphous and well-fertile. From it apparently descend the varieties and forms that follow, all of which are connected by intermediate states.

Hab. On decaying stumps and on the ground among mosses in wooded upland districts.—*Distr.* Gathered only very sparingly in S.W. England, S. Scotland, the S.W. Highlands, and among the S. Grampians.—B. M.: Dartmoor, Devonshire. New Galloway, Kirkcudbrightshire; Barcaldine, Argyleshire; Glen Lochay, Killin, Perthshire.

Form *abortiva* Cromb. Grevillea, xi. (1883) p. 112.—Podetia elongate, rather thicker, white-pulverulent, obtuse or obscurely scyphiferous at the apices; scyphi subcrenate and somewhat dila-

cerate. Apothecia not seen.—*Cladonia pyxidata* γ. *fimbriata* k. *abortiva* Mudd, Brit. Clad. p. 11. *Scyphophora fimbriata* γ. *abortiva* Gray, Nat. Arr. i. p. 420. *Capitularia pyxidata* β. *longipes* B. *abortiva* Flörke in Web. et Mohr, Beitr. ii. (1810) p. 294.

Seems to be only a form of this subspecies, next to which it was placed by Acharius, Syn. p. 255. It is distinguished chiefly by the apices of the podetia and by being always sterile. In the British specimens the scyphi are not well developed, and only a few spermogones are visible.

Hab. On semiputrid stumps in upland districts.—*Distr.* Local and scarce in N. England and the S.W. Highlands, Scotland.—B. M.: Near Ayton, Cleveland, Yorkshire. Barcaldine, Argyleshire.

Var. β. *subcornuta* Nyl. ex Cromb. Grevillea, xi. (1883) p. 112.—Podetia elongate, simple or sparingly branched above, white-pulverulent, subulate and more or less cornute at the apices.—*Cladonia fimbriata* subsp. *subcornuta* Nyl. in Flora, 1874, p. 318. *Cladonia pyxidata* β. *fimbriata* A. *cornuta* Mudd, Man. p. 53; Brit. Clad. p. 12. *Scyphophora fimbriata* η. *cornuta* Gray, Nat. Arr. i. p. 420. *Lichen cornutus* Lightf. Fl. Scot. ii. p. 876 δ; Eng. Bot. t. 1836. *Coralloides vix ramosum*, *scyphis obscuris* Dill. Musc. 90, t. 15. f. 14 D, E.—*Brit. Exs.*: Mudd, Clad. nos. 19, 20, 21; Bohl. n. 48.

Distinguished from *C. fibula* by the form of the apices of the ascyphous podetia. In this it closely resembles states of *C. cornuta*, with which it has often been confounded, but is distinguished by the podetia being pulverulent throughout. Only spermogones are present in our specimens.

Hab. On the ground among mosses in upland districts.—*Distr.* Apparently not very common in Great Britain and Ireland.—B. M.: Epping Forest, Essex; Ayton and Baysdale, Cleveland, Yorkshire; Teesdale, Durham. Leadhills, Lanarkshire; Killin, Perthshire; Countesswells, near Aberdeen; Kinnordy Moss, Forfarshire; Morrone, Braemar, Aberdeenshire. Near Cork; Blaris Bridge, Belfast, co. Antrim; Kylesmore, co. Galway.

Form 1. *nemoxyna* Nyl. ex Cromb. Grevillea, xi. p. 112.—Podetia slender, branched; branches divided, subuliform. Apothecia not seen.—*Cladonia pyxidata* ε. *cornuta* l. *nemoxyna* Mudd, Brit. Clad. p. 13. *Scyphophora fimbriata* ξ. *nemoxyna* Gray, Nat. Arr. i. p. 420. *Boromyces radiatus* β. *nemoxynus* Ach. Meth. (1803) p. 342. *Coralloides scyphiforme cornutum* Dill. Musc. 92, t. 15. f. 16 B, D, E.

Differs in the subuliformi-branched podetia, with the branches usually of unequal length. It occurs only spermogoniiferous.

Hab. On the ground among heaths in upland tracts.—*Distr.* Local and scarce in E. and N. England and among the S. Grampians, Scotland; probably to be detected elsewhere.—B. M.: Epping Forest, Essex; Ayton Moor, Cleveland, Yorkshire. Killin, Perthshire.

Form 2. *tortuosa* Nyl. ex Cromb. Grevillea, xi. (1883) p. 112.—Podetia somewhat stout, flexuose, divaricately branched; branches short, subulate, or thickened and obtuse at the apices.—*Cladonia*

pyxidata *c. cornuta* *c. tortuosa* Mudd, Brit. Clad. p. 12. *Cenomyce tortuosa* Del. in Dub. Bot. Gall. ii. (1830) p. 622.

The contorted podetia and the often incrassate apices of their branches distinguish this form. The podetia are frequently also more or less squamulose and furfuraceous in the lower portion. In our specimens a few young apothecia only are present.

Hab. On the ground among mosses in upland districts.—*Distr.* Seen only from Central England and N.E. Scotland.—B. M.: Charnwood Forest, Leicestershire. Countesswells, near Aberdeen.

Var. *γ. radiata* Nyl. *ex* Cromb. Grevillea, xi. (1883) p. 112.—Podetia elongate, subulate or scyphiferous; scyphi narrow, radiate or radiato-fimbriate at the margins.—*Cladonia fimbriata* var. *radiata* Cromb. Lich. Brit. p. 19. *C. pyxidata* var. *fimbriata* f. *radiata* Mudd, Man. p. 53, Brit. Clad. p. 13. *Scyphophora fimbriata* β. *radiata* Gray, Nat. Arr. i. p. 420. *Cenomyce radiata* Tayl. in Mack. Fl. Hib. ii. p. 81. *Lichen radiatus* Schreb. Spic. Fl. Lips. (1771) p. 122; With. Arr. ed. 3, iv. p. 38; Eng. Bot. t. 1835. *Cladonia pyxidata* var. *fimbriata* f. *cornuto-radiata* Schær., Leight. Lich. Fl. p. 62, ed. 3, p. 58. *Lichen pyxidatus* ρ Huds. Fl. Angl. ed. 2, p. 555. *Coralloides scyphiforme cornutum* Dill. Musc. 92, t. 15. f. 16 c, f, g.—*Brit. Exs.*: Mudd, Clad. n. 23; Leight. n. 376; Bohl. n. 47.

This is distinguished by the radiate margins of the scyphi; but the ascyphous podetia are very similar to those of the preceding variety, with which it seems to be confluent. In luxuriant specimens the scyphi are expanded, with the subulate fimbriæ more elongate. The apothecia are not present in our specimens, but the spermatogones are frequent.

Hab. On the ground in upland districts.—*Distr.* Probably general in hilly tracts of Great Britain and Ireland, though as yet seen only from comparatively few localities.—B. M.: Near Norwich, Norfolk; St. Breock, Cornwall; Malvern, Worcestershire; Barmouth and Aberdovey, Merionethshire; Westerdale, Cleveland, Yorkshire. Tongland, Kirkcudbrightshire; Glen Lochay, Killin, Perthshire; Kinnordy Moss, Forfarshire; Durris, Kincardineshire; Countesswells, near Aberdeen. Aghalee bog, N.W. of Lough Neagh, co. Londonderry; Killarney, co. Kerry.

11. *C. gracilis* Hoffm. Deutsch. Fl. ii. (1795) p. 119.—Thallus sparingly squamuloso-foliolose at the base; squamules olive-green or brownish above, whitish beneath, often evanescent; podetia elongate, slender, corticate, glabrous, simple or branched, subulate or scyphiferous at the apices; scyphi narrow, denticulate at the margins, pale-greyish or pale-greenish, occasionally subspadiceous (K—, CaCl—). Apothecia either pedicellate or sessile, moderate, brown or reddish; spores oblong, 0,009–0,012 mm. long, 0,0035–0,004 mm. thick.—Cromb. Grevillea, xi. p. 112; Leight. Lich. Fl. p. 62, ed. 3, p. 58. *Cladonia gracilis* d. *chordalis* Mudd, Brit. Clad. p. 17; Cromb. Lich. Brit. p. 19. *C. gracilis* γ. *hybrida* *c. chordalis* Mudd, Mann. p. 55. *Scyphophorus gracilis* Sm. Eng. Fl. v. p. 239.

Cenomyce gracilis Hook. Fl. Scot. ii. p. 63; Tayl. in Mack. Fl. Hib. ii. p. 82. *Scyphophora cenocyna* β . *gracilis* Gray, Nat. Arr. i. p. 421. *Lichen gracilis* Linn. Sp. Pl. (1753) p. 1152; Huds. Fl. Angl. p. 457; Leight. Fl. Scot. ii. p. 874; With. Arr. ed. 3, iv. p. 37; Eng. Bot. t. 1264. *Coralloides scyphiforme serratum elatius, caulibus gracilibus glabris* Dill. Musc. 88, t. 14. f. 13 c, d. *Lichenoides pyxidatum cinereum elatius, ramulis pyxidatum desinentibus* Dill. in Ray, Syn. ed. 3, 69. 32.—*Brit. Exs.*: Leight. n. 296; Mudd, nos. 10, 11, & 16 (pro parte), Clad. nos. 34, 37; Larb. Lich. Hb. n. 207.

A very variable plant. The form here described is *Cladonia chordalis* Flörke, Clad. p. 34. The basal thallus is rarely visible except in young plants, becoming for the most part speedily obsolete. It is a social plant, often spreading extensively, with the podetia 2-4 in. long, simple or more or less branched, and frequently blackish at the base. The apothecia are rare; when present they are numerous and occasionally conglomerate.

Hab. Among mosses on the ground and on rocks in maritime and upland districts.—*Distr.* General and common in most parts of Great Britain and probably also Ireland; rare in the Channel Islands.—B. M.: Islands of Guernsey and Sark. Wootton Common, Norfolk; Epping Forest, Essex; Lydd, Kent; Dartmoor, Devonshire; near Penzance, Cornwall; Wokingham Heath, Berkshire; Worcester Beacon, Worcestershire; Charnwood Forest, Leicestershire; Barmouth and Dolgelly, Merionethshire; Island of Anglesea; Cleveland and Farndale, Yorkshire; Eglestone, Durham; The Cheviots, Northumberland; Lamplugh, Cumberland. New Galloway, Kirkcudbrightshire; Manor Head, Peebleshire; Largs, Ayrshire; Barcaldine, Argyleshire; Glen Lochay, Glen Ample, Blair Athole, and Rannoch, Perthshire; Kinnordy and Kirriemuir, Forfarshire; Durris, Kincardineshire; Glen Dee, Braemar, Aberdeenshire; Glen Nevis and Rothiemurchus, Inverness-shire; Forres, Elginshire; Applecross, Ross-shire. Near Cork; Ballynascreen Mt., co. Tyrone; Turk Mt., Killarney, co. Kerry.

Form 1. *abortiva* Schaer. Spic. (1823) p. 33.—Podetia subuliform, recurved or hooked at the apices, and there verrucose, infusate: substerile.—Mudd, Brit. Clad. p. 17; Leight. Lich. Fl. p. 63, ed. 3, p. 59; Cromb. Grevillea, xi. p. 112.—*Brit. Exs.*: Mudd, Clad. n. 36.

Probably an accidental state, resulting from the abortive apothecia deforming the podetia.

Hab. On the ground in upland situations.—*Distr.* Seen only from N. England and the Central Grampians, Scotland; no doubt occurring elsewhere.—B. M.: Highcliffe, Cleveland, Yorkshire. Rannoch, Perthshire.

Form 2. *spinulifera* Cromb.—Podetia slender, dark spadiceous, somewhat rugulose, with frequent short spinules; scyphi with the margins spinulose.

A peculiar and probably accidental form, analogous to var. *spinosa* of *C. furcata*. The only specimen yet gathered is sterile.

Hab. On moors in upland situations.—*Distr.* Found only in S.W. England.—B. M.: Near Newton Abbot, S. Devon.

Form 3. *aspera* Flörke, Clad. (1828) p. 30.—Podetia more or less clothed with foliolose squamules; squamules crenate or crenato-incised at the margins.—Cromb. Grevillea, xi. p. 112.—*Capitularia gracilis* var. *aspera* Flörke in Web. et Mohr, Beitr. ii. (1810) p. 333.—*Brit. Ecs.*: Light. n. 402.

Differs in the more or less squamulose podetia, which are usually ascyphous. The British specimens are in a stunted condition, with podetia short (scarcely more than 1 in. high), subulate and sterile.

Hab. On the ground in upland situations.—*Distr.* Local and scarce in Central and N. England.—B. M.: Charnwood Forest, Leicestershire; Ingleby Park, Cleveland, Yorkshire; Windermere, Westmoreland.

Var. β . *hybrida* Schaer. Spic. (1823) p. 32.—Podetia more or less elongate, robust, sparingly branched, usually scyphiferous; scyphi subdiluted or proliferous at the margins. Apothecia moderate.—Mudd, Man. p. 55, Brit. Clad. p. 17; Cromb. Grevillea, xi. p. 112.—*Cladonia hybrida* Hoffm. Deutsch. Fl. ii. (1795) p. 119 pro parte. *Cladonia gracilis* Cromb. Lich. Brit. p. 19. *Coralloides scyphiforme serratum elatius, caulibus gracilibus glabris* Dill. Musc. 88. t. 14. f. 13 A, B.

A robust plant, with the podetia for the most part scyphiferous. As noticed by Nylander (Syn. p. 196), it approaches vars. of *pyxidata*, of which at first sight it looks to be a more extended form. In the few British specimens the apothecia are sparingly present.

Hab. On mossy rocks and among mosses on the ground in mountainous districts.—*Distr.* Local; the Grampians, Scotland, probably not uncommon.—B. M.: By Loch Tay, Killin, Perthshire; Sidlaw Hills, Forfarshire; Glen Callater, Braemar, Aberdeenshire.

Subsp. *C. gracillima* Norrl. Hb. Lich. Fenn. ix. (1882) n. 424.—Podetia elongate, very slender, crowded, subulate or scyphiferous, much branched above; branches divided, shortly subfurcate at the apices; scyphi very narrow, denticulate at the margins (K—, CaCl—). Apothecia not seen.—Cromb. Grevillea, xi. p. 112.

Distinguished by the slender podetia being densely caespitose, much and intricately branched, especially in the upper portion, and by their apices being somewhat furcate, resembling *C. furcata*. Found only in a substerile condition.

Hab. On mossy boulders in upland fir woods.—*Distr.* Very local and scarce in N. England and N.E. Scotland.—B. M.: The Cheviots, Northumberland. Countesswells Wood, near Aberdeen.

12. *C. cornuta* Fr. Lich. Eur. (1831) p. 225.—Thallus sparingly foliolose at the base; leaflets lobato-crenate or none; podetia elongate, corticate and glabrous in the lower portion, pulverulent towards the apices, subuliformi-cornute or a few sometimes narrowly scyphiferous (K—, CaCl—). Apothecia small, brown; spores as in the preceding species.—Cromb. Lich. Brit. p. 13; Grevillea, xi. p. 112.—

Cladonia gracilis var. *cornuta* Leight. Lich. Fl. p. 62, ed. 3, p. 58. *Lichen cornutus* Linn. Sp. Pl. (1753) p. 1152.—This is not *Lichen cornutus* of British authors: vide *C. fibula* var. *subcornuta* and *C. macilenta*.

Though by some regarded as a variety or subspecies of *C. gracilis*, yet from the podetia being corticate only to beyond the middle and then more or less pulverulent upwards, it may rank as a distinct species. The basal leaflets are not unfrequently present; and the podetia, which are 2–4 in. high, are quite naked. In British specimens the apothecia and spermogones are extremely rare.

Hab. Among mosses on the ground on heaths and in woods in upland tracts.—*Distr.* Seen only from N. England and the Grampians, Scotland.—B. M.: Ayton Moor, Cleveland, Yorkshire. Sherrifmuir, near Stirling; Rannoch and Killiecrankie, Perthshire; Ballochbuie Forest, Braemar, Aberdeenshire; Rothiemurchus, Inverness-shire.

Form *clavulus* Fr. Lich. Eur. (1831) p. 225.—Podetia short, somewhat turgid, corticate from below the middle; scyphi none.

A stunted, stouter form, with the podetia sometimes pulverulent throughout, except towards the base. It apparently never occurs scyphiferous or fertile.

Hab. On turf-walls in upland districts.—*Distr.* Extremely local and scarce among the Central and N. Grampians, Scotland.—B. M.: Rannoch, Perthshire; Glen Quoich, Braemar.

13. *C. ochrochlora* Flörke, Clad. (1821) p. 75.—Thallus foliaceo-squamulose at the base; squamules laciniato-crenate, greenish above, white beneath; podetia somewhat short, cylindrical, glabrous in the lower portion and pale greenish-grey, pulverulent above and whitish or ochroleucous, obtuse and truncate at the apices or narrowly scyphiferous, with the margins dentato-radiate (K—, CaCl—). Apothecia small, pale brown.—Cromb. Grevillea, xi. p. 112.—*Cladonia gracilis* var. *ochrochlora* Leight. Lich. Fl. p. 63, ed. 3, p. 59. *C. pyxidata* & *ochrochlora* Mudd, Brit. Clad. p. 14.—*Brit. Exs.*: Mudd, Clad. 24–26.

This approaches in some respects subsp. *C. fibula*, and in others *C. cornuta*; but as it constantly preserves its own type, it may be regarded as distinct. The podetia are occasionally sparingly squamulose (var. *phyllostrota* Flörke), and the scyphi are rarely proliferous. In this country it seldom occurs fertile, though the spermogones are not uncommon.

Hab. On putrid trunks and turfy soil in wooded upland districts.—*Distr.* Somewhat local and rare in S.W. and N. England, in S. Scotland, and in the W. Highlands.—B. M.: Near Beckey Falls, S. Devon; near Bodmin, Cornwall; Malvern, Worcestershire; Dolgelly, Merionethshire; Cleveland, Yorkshire; Windermere, Westmoreland. New Galloway, Kirkeudbrightshire; Barcaldine, Argyleshire; Loch Katrine, Perthshire; S. of Fort William, Inverness-shire.

Form *ceratodes* Flörke, Clad. (1821) p. 77.—Podetia slender, cylindrical or somewhat ventricose, simple, subulate at the apices.—

Cromb. Grevillea, xi. p. 112.—*Cladonia pyxidata* ξ . *ochrochlora* a. *ceratodes* Mudd, Brit. Clad. p. 14.—*Brit. Ees.*: Mudd, Clad. n. 23.

This differs chiefly in the form of the apices of the podetia, and apparently never occurs with apothecia.

Hab. On putrid trunks and turf-walls in shady upland districts.—*Distr.* Apparently local and scarce in S.W. and N. England and among the Central Scottish Grampians.—B. M.: Beckey Falls, S. Devon; near Bodmin, Cornwall; Loundsdale, Cleveland, Yorkshire; Ennerdale, Cumberland. Rannoch, Perthshire; Loch Linnhe, Inverness-shire.

14. *C. verticillata* Flörke, Clad. (1828) p. 26.—Thallus foliaceo-squamulose at the base; leaflets few, small, laciniiform, crenato-incised, dark-olive or greyish-green; podetia corticate, glabrous, elongato-turbinate, scyphiferous, glaucous- or brownish-green; scyphi regular, plane, denticulate at the margin, at length repeatedly proliferous (2-4 times) from the somewhat elevated centre (K—, CaCl—). Apothecia moderate, brown or reddish.—Leight. Lich. Fl. p. 63, ed. 3, p. 59.—*Cladonia gracilis* subsp. *verticillata* Cromb. Lich. Brit. p. 19. *Cladonia cervicornis* β . *verticillata* Mudd, Brit. Clad. p. 5. *C. gracilis* β . *verticillata* Mudd, Man. p. 54. *Scyphophora verticillata* Gray, Nat. Arr. i. p. 418. *Cladonia pyxidata* var. *verticillata* Hoffm. Deutsch. Fl. (1795) p. 122. *Lichen pyxidatus* β . pro parte, Huds. Fl. Angl. p. 552; With. Arr. ed. 3, iv. p. 36. *Lichenoides tubulosum pyxidatum proliferum* Dill. Muse. 80. t. 14. f. 6 D-II; in Ray, Syn. ed. 3, 69. 29.—*Brit. Ees.*: Mudd, Clad. n. 3.

From *C. gracilis*, of which some make it a variety or subspecies, this is distinguished by the scyphi being at length 2-4 times proliferous from the centre, the uppermost scyphus being shorter and narrower. It approaches also *C. verticillaris* Mont., but is well separated by the basal thallus. In this country it is rarely fertile.

Hab. On mossy rocks and boulders in maritime and upland districts.—*Distr.* Local and scarce in S., W., and N. England, very rare in Scotland and in N.W. Ireland (Connemara, Galway), as also in the Channel Islands; though it is no doubt more generally distributed.—B. M.: Noirmont, Island of Jersey. Broadwater Forest, Sussex; St. Breock, Cornwall; Delamere Forest, Cheshire; Ayton Moor and Baysdale, Cleveland, Yorkshire; Swinhope Fell, Northumberland. Glen Lochay, Killin, Perthshire; Moor of Morrone, Braemar, Aberdeenshire.

Form *laciniolata* Nyl. ex Cromb. Grevillea, xi. (1883) p. 112.—Laciniae elongate and narrow at the base; podetia with the scyphi laciniolose at the margins.

This may be a distinct variety. It is a luxuriant plant, with the apothecia numerous and dark brown.

Hab. On exposed rocks in moist places in upland districts.—*Distr.* Found only sparingly in S.W. England and the S.W. Highlands, Scotland.—B. M.: Carn Galva, near Penzance, Cornwall. Barcaldine, Argyleshire.

15. *C. cervicornis* Schær. Enum. (1850) p. 195.—Thallus foliaceo-squamulose at the base; leaflets large, laciniiform, crenate or inciso-crenate, or variously multifid, ascending, firm, dark olive-green or glaucous-green above, whitish or brownish-black beneath; podetia short, smooth or subverrucose, scyphiferous; scyphi simple or irregularly proliferous, more or less squamulose (K + yellowish, CaCl—). Apothecia small, sessile, brownish-black.—Mudd, Brit. Clad. p. 4; Leight. Lich. Fl. p. 57, ed. 3, p. 54.—*Cladonia gracilis* subsp. *cervicornis* Mudd, Man. p. 54; Cromb. Lich. Brit. p. 19. *Scyphophorus cervicornis* Sm. Eng. Fl. v. p. 242; Tayl. in Mack. Fl. Hib. ii. p. 81. *Lichen cervicornis* Ach. Prodr. (1798) p. 184, Eng. Bot. t. 2574. *Coralloides scyphiforme, foliis alcicorniformibus cartiluginosis* Dill. Musc. 87, t. 14. f. 12 B.

Though generally resembling less proliferous states of the preceding species, this differs in the more developed laciniae, the shorter podetia, and in the chemical reaction with K. The thallus at the base is densely caespitose, with the leaflets nearly erect, somewhat thickened, in old plants rimoso-reticulate above and the podetia are often but little developed, or entirely wanting (form *basima* Cromb.). The apothecia are sessile on the margins of the scyphi, and are either simple or conglomerate, becoming blackish in age.

Hab. On the ground among rocks and on heaths in maritime and upland regions.—*Distr.* General and usually plentiful in hilly and mountainous tracts of Great Britain and probably also of Ireland; rare in the Channel Islands.—B. M.: Quenvais, Island of Jersey; Pleinmont, Guernsey. Rusthall Common, Kent; Hay Tor, Dartmoor, and Bolt Head, Devonshire; Withiel and Penzance, Cornwall; Bathampton, Somersetshire; Worcester Beacon, Worcestershire; Buxton, Derbyshire; Rhewegidden, Merionethshire; Llanberis, Cardiganshire; Island of Anglesea; Teesdale, Durham. New Galloway, Kirkcudbrightshire; Moffat, Dumfriesshire; Pentland Hills, near Edinburgh; Appin, Argyleshire; The Trossachs, Rannoch, and Craig Calliach, Perthshire; Lion's Face and Ben-na-board, Braemar, Aberdeenshire; Glen Nevis, Inverness-shire; near Lairg, Sutherlandshire; hills of Applecross, Ross-shire. Carig Mt. and Killarney, co. Kerry; Kylemore, co. Galway.

Form *stipata* Nyl. Flora, 1876, p. 239.—Squamules at the base elongate, sublinear, crenato-incised and deeply divided, erect, stipate; podetia and apothecia as in the type.—Cromb. Journ. Bot. 1876, p. 360; Leight. Lich. Fl. ed. 3, p. 55.

Differs only in the basal thallus. The podetia and apothecia very rarely occur.

Hab. On the ground among rocks in upland districts.—*Distr.* Rare and local in N. Wales, the Central Grampians and the N.W. Highlands, Scotland, and in N.W. Ireland (Kylemore, co. Galway).—B. M.: Aberdovey, Merionethshire. Loch Eagh, Rannoch, Perthshire; hills of Applecross, Ross-shire.

16. *C. sobolifera* Nyl. Flora, 1873, p. 66; Not. Sällsk. pro F. et Fl. Fenn. Forh. n. s. v. (1866) p. 176 (note).—Thallus foliaceous at the base; leaflets somewhat narrow, inciso-crenate, caespitose,

glaucous-green above, whitish beneath; podetia short, cylindrical, glabrous, subverrucose or somewhat foliaceous, scyphiferous, greyish-green or glaucous-white; scyphi dilated, proliferous from the centre and from the denticulate margins (K—, CaCl—). Apothecia small, simple or conglomerate, brown.—Cromb. Grevillea, xi. p. 113.—*Cladonia verticillata* var. *sobolifera* Leight. Ann. Mag. Nat. Hist. ser. 3, xviii. p. 411, Lich. Fl. p. 64, ed. 3, p. 59; Cromb. Lich. Brit. p. 19. *Cenomyce cladomorpha* var. *sobolifera* Del. in Dub. Bot. Gall. (1830) p. 631. *Coralloides scyphiforme, marginibus radiatis et foliatis* Dill. Musc. 85, t. 14. f. 9 A, B. *Lichenoides pyxidatum, marginibus eleganter foliatis* Dill. in Ray, Syn. ed. 3, 69. 33.—*Brit. Exs.*: Leight. n. 14; Mudd, n. 9 pro parte, Clad. n. 2; Lich. Hb. n. 322.

Very closely allied to *C. cericornis*, from which it is at once separated by the reaction with K. In other respects it is distinguished chiefly by the somewhat smaller (rarely nearly as large) and less cæspitose thallus, by the margins of the scyphi and the proliferations, which are often 2, rarely 3, in which respect it more resembles *C. verticillata*. From this also it seems distinct, and preserves its own type. The podetia are occasionally sparingly foliaceous, and the apothecia are usually numerous.

Hab. On mossy boulders, rocks, and the ground in upland districts.—*Distr.* Somewhat local in S., W., and N. England, the Highlands of Scotland, S. Ireland, and the Channel Islands; no doubt often overlooked.—B. M.: Grosnez Common, Island of Jersey. Near Dawlish and Hunter Tor, S. Devon; St. Breock and Helminston, Cornwall; Malvern, Worcestershire; Rhewgreidden and Dolgelly, Merionethshire; Ayton and Ingleby Moor, Cleveland, Yorkshire; Windermere, Westmoreland. New Galloway, Kirkcudbrightshire; Barcaldine, Argyshire; Glen Lochay and Rannoch, Perthshire; Countesswells, near Aberdeen; Glen Nevis, Inverness-shire; Applecross, Ross-shire. Ballyedmond, co. Cork.

17. *C. macrophylla* Nyl. Flora, 1873, p. 299.—Thallus squamuloso-foliaceous at the base; squamules large, glaucous above, whitish beneath, crenate at the margins; podetia moderate or somewhat elongate, cylindrical, ascyphous or often with narrow scyphi, rough with smaller glaucous squamules, becoming at length carious (K+yellowish, CaCl—). Apothecia brown, generally confluent; spores 0,008–0,011 mm. long, 0,0035 mm. thick.—Cromb. Grevillea, xi. p. 113.—*Cladonia ventricosa* β . *macrophylla* Schaer. Spic. (1833) p. 316.

In old age the podetia (which are then often blackish at the base, as are also the basal squamules at their base) become more or less carious, and thus somewhat resemble those of *C. cariosa*. From *C. decorticata* Flörke, with which it has sometimes been confounded, and which probably also occurs in this country, it differs in the larger squamules and the chemical reaction. In the only fertile British specimen the apothecia are aggregate and deformed.

Hab. On earth-covered boulders and ledges of rocks in wooded mountainous regions.—*Distr.* Apparently very local and scarce among the S. and N. Grampians, Scotland.—B. M.: Craig Calliach, Perthshire; Head of Glen Quoich, Braemar, Aberdeenshire.

18. *C. degenerans* Flörke, Clad. (1828) p. 41.—Thallus squamulose at the base: squamules few, small, crenato-incised, glaucous-green above, white beneath; podetia moderate, glabrous, often subverrucoso-unequal, scyphiferous, whitish or pale-greenish, black and whitish-punctate at the base; scyphi often radiato-pedicellate or proliferous at the margins (K—, CaCl—). Apothecia somewhat large, brown, or pale reddish-brown; spores 0.010–11 mm. long, 0.0035 mm. thick.—Cromb. Lich. Brit. p. 19; Leight. Lich. Fl. p. 64, ed. 3, p. 59.—*Cladonia degenerans* b. *euphorea* Mudd, Brit. Clad. p. 17. *Cladonia gracilis* δ . *degenerans* Mudd, Man. p. 55. *Capitularia degenerans* Flörke in Web. et Mohr, Beitr. ii. (1810) p. 308.

A very variable plant, which approaches in its varieties and forms several other species. In general it may readily be distinguished from all of these, with which it might be confounded, by having the podetia, which in age become blackish in their lower portion, whitish corticallipunctate at the base. Its most typical state, as observed by Nylander (Lich. Scand. p. 54), is form *euphorea* Ach. (Syn. p. 259), which has almost the habit of *C. gracilis* and presents the above characters. The only British specimen as yet seen is sterile.

Hab. On the ground in moorlands in subalpine mountainous regions.—*Distr.* Found only very sparingly among the N. Grampians, Scotland.—B. M.: Head of Glen Gairn, Braemar, Aberdeenshire.

Form 1. *haplotea* Flörke, Clad. (1828) p. 42.—Podetia moderate, usually proliferously divided above, scyphiferous, scarcely or rarely squamulose; scyphi cristato-divided at the margins.—Mudd, Brit. Clad. p. 18; Cromb. Lich. Brit. p. 19.—*Cladonia gracilis* δ . *degenerans* a. *haplotea* Mudd, Man. p. 55. *Cenomyce gonorega* a. *aplotea* Ach. Syn. (1814) p. 258.

The podetia in this form are from 1 to 2 in. high, naked, or occasionally, especially at the margins of the scyphi, sparingly squamulose. In the few British specimens, the apothecia, which are minute, reddish-brown, are only sparingly present.

Hab. On the ground in subalpine and alpine regions.—*Distr.* Apparently local and scarce among the Scottish Grampians.—B. M.: Pass of Leny, Perthshire; Ben-naboord and Upper Glen Dee, Braemar, Aberdeenshire.

Form 2. *granulifera* Cromb. Grevillea, xi. (1883) p. 113.—Podetia moderate, densely verrucoso-granulose, simple, or shortly branched above, obscurely scyphiferous.

Seems to be intermediate between the type and the following variety, and is well characterized by the minute crowded granules with which the blackish podetia are clothed throughout. The apothecia in the only specimen seen are somewhat large and dark-brown, but are visible only on a single podetium.

Hab. On the ground in alpine situations.—*Distr.* Met with only once and very sparingly among the N. Scottish Grampians.—B. M.: Cairngorm, Braemar, Aberdeenshire.

Form 3. *pleolepidea* Nyl. Lich. Scand. (1861) p. 54.—Podetia simple or sparingly branched above, usually somewhat curved, asecyphous, densely covered with rigid squamules. Apothecia numerous, dark-brown.—Cromb. Grevillea, xii. p. 91.

The podetia, which Nylander (*l. c.*) describes as being 2-3 in. long, are with us much smaller, from $\frac{1}{2}$ to 1 in. Occasionally, where less squamulose, they are white-punctate. In the two specimens gathered the apothecia are more or less aggregate.

Hab. Among short mosses on the ground in alpine places.—*Distr.* Very local and scarce among the N. Grampians, Scotland.—B. M.: Near the summit of Morrone, Braemar, Aberdeenshire.

Var. β . *anomæa* Flörke, Clad. (1828) p. 43.—Podetia short, slender, rugose and more or less squamulose; scyphi usually radiately divided. Apothecia either sessile or pedicellate, dark brown.—Mudd, Brit. Clad. p. 18; Cromb. Lich. Brit. p. 20; Leight. Lich. Fl. p. 64, ed. 3, p. 60.—*Cladonia gracilis* δ . *degenerans* ϵ . *anomæa* Mudd, Man. p. 55. *Scyphophorus anomæus* Sm. Eng. Fl. v. p. 238. *Cenomyce anomæa* Hook. Fl. Scot. ii. p. 63. *Lichen anomæus* Eng. Bot. t. 1867. *Becomyces anomæus* Ach. Meth. (1803) p. 349.—*Brit. Evs.*: Mudd, Clad. n. 32 (atypical).

This variety is distinguished by the podetia, which are from $\frac{1}{2}$ to 1 in. high, being either densely or partially covered with squamules, and by the form of their scyphi. As observed, however, by Nylander (*Syn.* p. 200), the podetia are scarcely scyphiferous, but rather radiato-partite (*cf.* Ach. Lich. Univ. p. 552). The apothecia are either simple or conglomerate, becoming in age somewhat large.

Hab. On the ground on heaths and on rotten wood in upland situations.—*Distr.* Apparently local and scarce in S.W. and N. England, in S. Scotland, and among the Grampians: no doubt overlooked elsewhere.—B. M.: Lakenham, Norfolk; near Hurstpierpoint, Sussex; Dartmoor, S. Devon; Malvern, Worcestershire; Burton Head, Cleveland, Yorkshire. Pentland Hills, near Edinburgh; Craig Calliach, Perthshire; Glen Cal-later and Glen Quoich, Braemar, Aberdeenshire.

Subsp. 1. *C. trachyna* Nyl. *ex* Norrl. Not. Sällsk. pro F. et Fl. Fenn. Förh. n. s. x. (1873) p. 319.—Podetia elongate, or moderate, cylindrical, squamulose, scyphiferous, sordid-whitish; scyphi denticulato-proliferous and radiato-cristate at the margins. Apothecia minute, brown.—Cromb. Grevillea, xi. p. 113.—*Cladonia degenerans* f. *trachyna* Mudd, Brit. Clad. p. 18. *Becomyces trachynus* Ach. Meth. (1803) p. 348.

From the preceding varieties and forms this differs in the form of the scyphi, which give it somewhat the appearance of *C. crispata*. This and its general habit seem to entitle it to rank as a subspecies. The podetia are normally from 3 to 5 in. long; but they sometimes occur less developed. The apothecia are at length dark brown, but our more elongate states are only spermogoniiferous.

Hab. On heathy ground amongst mosses in upland and subalpine regions.—*Distr.* Local and scarce among the Scottish Grampians.—B. M.: Rannoch, Perthshire; Ben-naboord, Braemar, Aberdeenshire.

Form *subfurcata* Nyl. *ex* Norrl. Not. Sällsk. pro F. et Fl. Fenn. Förh. n. s. x. (1873) p. 320.—Podetia elongate, subulate, sub-stipitate, fastigiate, branched upwards, granulato-unequal on the surface, brownish. Apothecia not seen.—Cromb. *Grevillea*, xi. p. 113.

This very peculiar form is as if an hybrid between *C. degenerans* and *C. furcata*, to which latter, but for the granulate podetia, it might be referred as a variety. The absence of any reaction with K keeps it distinct from *Cladonia stricta*. In this country, as elsewhere, it is always sterile.

Hab. On moist peaty ground in subalpine tracts.—*Distr.* Found only very sparingly among the N. Scottish Grampians.—B. M.: Upper Glen Dee, Braemar, Aberdeenshire.

Subsp. 2. *C. coralloidea* Nyl. Lich. Scand. (1861) p. 54.—Thallus small, somewhat pulvinate; podetia short, branched above, sub-flexuose, verrucose or granulate on the surface, ascyphous. Apothecia small, crowded, brown.—Cromb. *Grevillea*, xv. p. 45.—*Cladonia furcata* subsp. *coralloidea* Cromb. *Grevillea*, xi. p. 113. *Cladonia coralloidea* Mudd, Brit. Clad. p. 5. *Cenomyce coralloidea* Ach. Lich. Univ. (1810) p. 528.—*Brit. Ears.*: Mudd, Clad. n. 4.

Though receding in various respects from the type, this, according to the specimen from Acharius in Herb. Linn. Soc., is most probably to be regarded as a subspecies of *C. degenerans*. It is not unlike *C. furcata* var. *palamea* (Ach.), but at once differs from this by having a distinct basal thallus. The only British specimens seen agree with the plant of Acharius, except that the podetia are partly subsquamulose. The apothecia seem to be not unfrequent.

Hab. On the ground on wet heaths in mountainous districts.—*Distr.* Very local and scarce in N. England and among the S. Grampians, Scotland.—B. M.: Baysdale Moor, Cleveland, Yorkshire. Ben Lawers, Perthshire.

19. *C. lepidota* Nyl. Not. Sällsk. pro F. et Fl. Fenn. Förh. n. s. v. (1866) p. 176.—Thallus squamulose at the base; squamules somewhat large, crenato-incised, pale glaucous above, white beneath; podetia robust, pale, foliolose or squamuloso-foliolose; sepyhi usually narrow, irregular, difform or cristato-divided (K+yellow, CaCl—). Apothecia small, brown, conglomerate.—*Cenomyce gonorega* f. *lepidota* Ach. Syn. (1814) p. 259.

From *C. degenerans*, of which it has usually been regarded as a variety, this differs in being more robust and paler, in having the podetia squamulose with the squamules larger (as also at the base), and in the reaction with K. The type, however, does not occur in our Islands, but only the following form.

Form *hypophylla* Cromb. *Grevillea*, xi. (1883) p. 113.—Thallus foliaceo-squamulose, subcaespitose, greyish-white or greenish-grey, white beneath; podetia obsolete (K+yellow, CaCl—). Apothecia small, sessile, dark-brown.—*Cladonia degenerans* f. *hypophylla*

Nyl. Lich. Scand. (1861) p. 54; Mudd, Brit. Clad. p. 18 pro parte.—*Brit. Exs.*: Mudd, n. 9 pro parte, Clad. n. 18.

A rather anomalous plant, which, if it does not descend from *C. cervicornis*, with which it somewhat agrees in the character of the basal squamules, is most probably referable to this species. The apothecia, which in the absence of rightly developed podetia are sessile on the leaflets, are numerous.

Hab. On the ground among rocks in upland districts.—*Distr.* Somewhat local, though not uncommon where it occurs in N. Wales, N. England, S. Scotland, and among the Grampians.—B. M.: Plinlimmon, Cardiganshire; Dolgelly and Rhewgreidden, Merionethshire; Bettws-y-Coed, Denbighshire; Battersby and Ayton Moors, Cleveland, Yorkshire; Ennerdale, Cumberland. New Galloway, Kirkcudbrightshire; Danyat, near Stirling; Craig Calliach and Loch Eagh, Perthshire; Lion's Face and Glen Quoich, Braemar, Aberdeenshire.

v. Ascyphae.—Podetia not scyphiferous.

20. *C. turgida* Hoffm. Deutsch. Fl. ii. (1795) p. 124.—Thallus foliaceous at the base: leaflets large, laciniiform, variously divided and crenate, sometimes few or evanescent, glaucous-green or whitish, white beneath; podetia lavigato-corticate, turgid, elongato-turbinate or cylindrical, subscyphiferous or perforate at the apices, the margin dentato-radiate, glaucous or pale-green (Kf + yellowish, CaCl—). Apothecia brownish-red or pale; spores oblong or oblongo-fusiform, 0,010–15 mm. long, 0,0035–40 mm. thick.—Cromb. Lich. Brit. p. 20; Leight. Lich. Fl. p. 56, ed. 3, p. 54.—*Lichen turgidus* Ehrh. Crypt. (1793) n. 297.

When rightly developed (for the podetia are occasionally absent), this is a very distinct species, which at first sight might be referred to the macrophylline section. As stated, however, by Nylander (Syn. p. 205), its true affinity is with *C. furcata* in the present section. In the only two British specimens the podetia are here and there sprinkled with smaller leaflets. There are no apothecia present, but the spermogones are abundant.

Hab. On the ground among heather in subalpine regions.—*Distr.* Extremely local and scarce among the N. Grampians, Scotland.—B. M.: Head of Glen Quoich, Braemar, Aberdeenshire.

21. *C. furcata* Hoffm. Deutsch. Fl. ii. (1793) p. 115.—Thallus squamulose at the base or evanescent; podetia slender, elongate, glabrous, sparingly branched, glaucous-white or brownish-green, not perforate or subpervious at the axils, the branches somewhat erect, attenuato-subulate and divergenti-furcate at the apices (K—, CaCl—). Apothecia small, subglobose, brown or reddish-brown; spores 0,010–13 mm. long, 0,0034–40 mm. thick.—Nyl. Syn. i. p. 205, t. 1. f. 3; Cromb. Lich. Brit. p. 20; Leight. Lich. Fl. p. 65, ed. 3, p. 60.—*Cladonia furcata* β . *subulata* Sm. Eng. Fl. v. p. 236; Mudd, Man. p. 58, Brit. Clad. p. 23. *Cenomyce furcata* β . *subulata* Hook. Fl. Scot. ii. p. 64; Tayl. in Mack. Fl. Hib. ii. p. 80. *Cladonia subulata* Gray, Nat. Arr. i. p. 414. *Lichen subulatus* Linn.,

Huds. Fl. Angl. p. 459; Lightf. Fl. Scot. ii. p. 881; With. Arr. iv. p. 42. *Coralloides corniculis longioribus et varioribus* Dill. Musc. 102, t. 16. f. 26. *Lichenoides tubulosum cinereum minus crustaceum, minusque ramosum* Dill. in Ray, Syn. ed. 3, p. 67, n. 17.—*Brit. Exs.*: Mudd, n. 16 pro parte, Clad. nos. 50, 51.

This, even its more limited Nylanderian conception, is a very variable species as to the podetia, the differences in which give rise to the following subspecies, varieties, and forms. As observed by Nylander (*l. c.*), it approaches on the one hand *C. gracilis* and on the other *Cladina rangiferina*. The type, as above described, is *Lichen subulatus* of Linneus and other authors, which in general appearance is somewhat similar to *C. gracilis (chordalis)*, from which it is at once distinguished by the apically furcate podetia. These are at times dark-brown (form *spadicea* Pers., Ach.) and at other times white (form *epermenia* Ach.), according to nature of habitat, the latter state occurring chiefly on cretaceous and calcareous soil. When fertile, as it rarely is with us, the branches are usually subfastigiate at the apices, with the apothecia either solitary or cymoso-aggregate. For the anatomical texture of the thallus, *vide* Nyl. *l. c.*

Hab. On the ground on moorlands and in woods in upland tracts.—*Distr.* Probably general and common in Great Britain and Ireland, though seen from only a comparatively few localities.—B. M.: Epping Forest, Essex; near Widdicombe and Bovey Tracey, S. Devon; Temple Moor, Cornwall; Charnwood Forest, Leicestershire; Barnmouth, Merionethshire; Island of Anglesea; near Ayton and Newton, Cleveland, Yorkshire. Appin, Argyleshire; Killin, Perthshire; Sidlaw Hills and Clova, Forfarshire; Glen Callater, Braemar, Aberdeenshire; Rothiemurchus, Inverness-shire. Killarney, co. Kerry.

Form *exilis* Mudd, Brit. Clad. (1865) p. 23.—Podetia very slender, short, simple or sparingly branched, once or twice furcate at the apices. Apothecia small, aggregate, dark-brown.—Cromb. Grevillea, xi. p. 113.—*Cladonia furcata* var. *tenuissima* Cromb. Lich. Brit. p. 20 pro parte.—*Brit. Exs.*: Mudd, Clad. n. 53.

This apparently descends from var. *tenuissima* Flörke, of which probably it is only a more stunted state, being from $\frac{1}{2}$ to 1 in. high. In fertile specimens the podetia are somewhat thicker and but sparingly branched, with very rarely a few minute scattered squamules. The apothecia are usually somewhat numerous.

Hab. On sterile ground in upland moorlands.—*Distr.* Local and scarce in N. England, S. Scotland, and among the Grampians; no doubt to be detected elsewhere.—B. M.: Guisboro' Moor, Cleveland, Yorkshire. New Galloway, Kirkcudbrightshire; Glen Lochay, Killin, Perthshire; Hill of Fare, Aberdeenshire.

Var. β . *corymbosa* Nyl. Syn. (1860) p. 207.—Podetia thickish, usually cefoliolose, here and there longitudinally fissured, as also at one or the other side of the apices, which are radiato-ramose or subcorymbose. Apothecia as in the type.—Cromb. Lich. Brit. p. 20. Grevillea, xi. p. 113.—*Cenomyce allotropa* var. *corymbosa* Ach. Lich. Univ. (1810) p. 556.—To this also seems referable the following:—*Cenomyce furcata* Hook. Fl. Scot. ii. p. 64; *Cladonia furcata* Gray.

Nat. Arr. i. p. 414; while it is also *Cladonia furcata* pro parte of more recent authors.—*Brit. Exs.*: Mudd, Clad. nos. 46, 47: Leight. n. 401; Bohl, n. 23.

The more or less (sometimes sparingly) fissured podetia and the form of their apices characterize this variety. The podetia, which are frequently sub-padiceous, vary in length from 1 to 5 in., and in our British specimens are usually somewhat slender and rarely sparingly foliiferous. With K the reaction, at least in paler specimens, is often slightly yellow, quickly turning to brownish. It is usually well fertile, the apothecia being numerous on the subcorymbose apices.

Hab. On the ground and on turf-walls in wooded upland districts.—*Distr.* Somewhat local and scarce in England, N. Wales, S. Scotland, and S. Ireland; more frequent, however, among the Scottish Grampians.—B. M.: Epping Forest, Essex; Winchfield, Hants; Dartmoor, Devonshire; Withiel and near Penzance, Cornwall; Charnwood Forest, Leicestershire; Malvern, Worcestershire; Aberdovey, Merionethshire; Ayton Moor, Cleveland, Yorkshire; the Cheviots, Northumberland; New Galloway, Kirkcudbrightshire; Appin, Argyleshire; Glen Loshay and Rannoch, Perthshire; Countesswells near Aberdeen; Glen Dee, Braemar, Aberdeenshire; Loch Linnhe and Rothiemurchus Woods, Inverness-shire. Near Cork; Killarney, co. Kerry.

Var. *γ. spinosa* Hook. in Sm. Eng. Fl. v. (1833) p. 236.—Podetia moderate, rigid, glabrous, decumbent; branches lax, curved and flexuose, here and there spinulose. Apothecia small, dark-brown.—Tayl. in Mack. Fl. Hib. ii. p. 80; Leight. Ann. Mag. Nat. Hist. ser. 3, xxiii. p. 413, Lich. Fl. p. 65, ed. 3, p. 60; Cromb. Grevillea, xi. p. 113.—*Lichen spinosus* Huds. Fl. Angl. (1762) p. 459; Lightf. Fl. Scot. ii. p. 882; With. Arr. ed. 3, iv. p. 45. *Cladonia furcata* *δ. subulata* *δ. spadicca* Mudd, Brit. Clad. p. 23. *Coralloides sparsum, caulibus tortuosis et spinosis* Dill. Musc. 101, t. 16. f. 25.—*Brit. Exs.*: Mudd, Clad. n. 52.

This differs in the rather lax, irregularly branched and curved podetia, bearing scattered, short, erect or recurved spinules. The podetia, which, though rigid, are brittle, are often subspadiceous, but when paler in colour they usually give with K a distinct yellow reaction. It is rather rare in fruit, the apothecia being either simple or sparingly aggregate.

Hab. On the ground in moorlands and upon turf-walls in upland districts.—*Distr.* Probably general and common throughout Great Britain and Ireland.—B. M.: Epping Forest, Essex; Dartmoor, Devonshire; Newmarket Heath, Cambridgeshire; Brandon Hill, Leicestershire; Aberdovey, Merionethshire; Island of Anglesea; Ingleby Park, Cleveland, Yorkshire; the Cheviots, Northumberland; Harris Moor, Cumberland. Craig Calliach and Rannoch, Perthshire; Baldovan, Forfarshire; Durris, Kincardineshire; Countesswells, near Aberdeen; near Inverey, Braemar, Aberdeenshire; Glen Nevis, Inverness-shire. Seymourhill Bog, near Belfast, co. Antrim.

Subsp. *C. racemosa* Nyl. ex Norrl. Not. Sällsk. pro F. et Fl. Fenn. Förh. n. s. x. (1873) p. 320.—Podetia elongate, stoutish, irregularly branched, more or less squamulose, the branches short, erect, furcate at the apices (K—, CaCl—). Apothecia small, aggregate, brown.

—Cromb. Grevillea, xi. p. 113.—*Cladonia furcata* β . *racemosa* Mudd, Man. p. 37, Brit. Clad. p. 22; Cromb. Lich. Brit. p. 20; Leight. Lich. Fl. p. 65, ed. 3, p. 60. *Cladonia racemosa* Hoffm. Deutsch. Fl. ii. (1795) p. 114; Gray, Nat. Arr. i. p. 414. *Cenomyce racemosa* Hook. Fl. Scot. ii. p. 64. *Cladonia furcata* Sm. Eng. Fl. v. p. 236. *Lichen furcatus* Huds. Fl. Angl. p. 458; Lightf. Fl. Scot. ii. p. 881; With. Arr. ed. 3, iv. p. 45. *Coralloides corniculis brevioribus et crebrioribus* Dill. Musc. 104, t. 16. f. 27 B, C.—*Lichenoides tubulosum cinereum, ramosius et crustaceum* Dill. in Ray, Syn. ed. 3, 67. 18.—*Brit. Exs.*: Mudd, Clad. n. 48.

Well distinguished by its general habit and the squamulose podetia, which are occasionally, however, somewhat slender (form *tenuior* Cromb.). By Acharius and others it was regarded as a distinct species; but it is scarcely entitled to rank otherwise than as a subspecies or probably only as a variety of *C. furcata*. In this country the apothecia seem to be rare.

Hab. On the ground in moorlands, usually on damp peaty soil in upland districts.—*Distr.* Local and scarce in Great Britain and in S.W. Ireland.—B. M.: Malvern, Worcestershire: Rhewgreidden and Dolgelly, Merionethshire; Guisboro' Moor, Cleveland, Yorkshire. New Galloway, Kirkeudbrightshire; Glen Lochay and Rannoch, Perthshire; Glen Cal-later, Braemar, Aberdeenshire; Glen Nevis, Inverness-shire. Killarney, co. Kerry.

Form 1. *recurva* Flörke, Clad. (1828) p. 147.—Podetia usually more folioso-squamulose, the branches short, recurved, subfurcate and subulate.—Cromb. Grevillea, xi. p. 113.—*Cladonia furcata* β . *racemosa* B. *recurva* Mudd, Man. p. 58; Brit. Clad. p. 22. *Cladonia furcata* var. *recurva* Leight. Lich. Fl. p. 65, ed. 3, p. 60. *Cladonia recurva* Hoffm. Deutsch. Fl. ii. (1795) p. 115. *Lichen furcatus* β . Lightf. Fl. Scot. ii. p. 882; var. 2, With. Arr. ed. 3, iv. p. 45. *Coralloides corniculis brevioribus et crebrioribus* Dill. Musc. 104, t. 16. f. 27 D. *Lichenoides tubulosum virescens, ramosius et foliosum, summitatibus arcuatis* Dill. in Ray, Syn. ed. 3, 67. 19.—*Brit. Exs.*: Mudd, Clad. n. 49.

The more or less densely squamulose podetia and their recurved apices are the characteristics of this form. In a very young state it sometimes occurs with the basal thallus well-developed and the podetia very short. In our specimens the apothecia are seldom seen.

Hab. On the ground in moorlands and on turf-walls in maritime and upland situations.—*Distr.* Occurs only here and there sparingly in Great Britain; not seen from Ireland.—B. M.: Bolt Head and near Torquay, S. Devon; Charnwood Forest, Leicestershire; Aberdovey, Merionethshire; Farndale Moor, Cleveland, Yorkshire. Appin, Argyleshire; Craig Cal-liach and Rannoch, Perthshire; Hills of Nigg, Kincardineshire; Glen Muick, Braemar, Aberdeenshire.

Form 2. *palamæa* Nyl. ex Cromb. Grevillea, xii. (1884) p. 91.—Podetia somewhat turgid and curved, noduloso-rugose, usually somewhat dilated and subdigitately divided at the apices.—*Beaomyces spinosus* β . *palamæus* Ach. Meth. (1803) p. 359.

A very anomalous form, distinguished by the podetia being rougher and here and there nodulose, as also by the form of their apices. In our British specimens the apothecia are small and but sparingly present.

Hab. On the ground in upland localities.—*Distr.* Very local and scarce in S. and W. England.—B. M.: Near Shiere, Surrey; Brighton Downs, Sussex; Bathampton Downs, Somersetshire.

22. *C. pungens* Flörke, Clad. (1828) p. 156.—Thallus squamulose, evanescent at the base; podetia slender, erect or ascending, much and divaricately branched, glabrous or subverruculose, greyish or sometimes brownish-white; branches attenuato-subulate and divergenti-furcate at the apices, which are often reddish-brown (K+yellow, CaCl—). Apothecia small, brownish; spores 0.010–13 mm. long, 0.0035–40 mm. thick.—Gray, Nat. Arr. i. p. 415; Sm. Eng. Fl. v. p. 235; Leight. in Ann. Mag. Nat. Hist. ser. 3, xviii. p. 406, Lich. Fl. p. 56, ed. 3, p. 53; Cromb. Grevillea, xi. p. 113.—*Cladonia furcata* δ . *pungens* Mudd, Man. p. 58, Brit. Clad. p. 23; Cromb. Lich. Brit. p. 20. *Lichen pungens* Ach. Prodr. (1798) p. 202, Eng. Bot. t. 2444. *Lichen rangiferinus* β . *sylvaticus* Huds. Fl. Angl. p. 458; Lightf. Fl. Scot. ii. p. 879. *Lichen rangiferinus* var. 2, With. Arr. ed. 3, iv. p. 42. *Coralloides fruticuli specie candicans, corniculis rufescentibus* Dill. Musc. 110, t. 16. f. 30 A. *Lichenoides tubulosum ramosissimum, fruticuli specie candicans, corniculis rufescentibus* Dill. in Ray, Syn. ed. 3, p. 67, n. 15.—Brit. Ers.: Leight. n. 16; Mudd, n. 16 pro parte, Clad. nos. 54, 55; Cromb. n. 123.

In general appearance this resembles smaller states of *Cladina sylvatica*, with which it was frequently confounded by the older authors. Its affinities, however, are entirely with *C. furcata*, though, apart from the reaction, there are sufficient diversities in habit and the character of the podetia to entitle it to rank as a distinct species. It forms densely congested and intricate tufts, which sometimes spread extensively. The podetia, which are often of a brownish colour, are rather fragile, small, and attenuate at the subpungent apices. It is comparatively rare in fruit, though in some situations the apothecia are abundant and more or less conglomerate.

Hab. On the ground among mosses and short grass in maritime and upland situations.—*Distr.* General and common in most parts of England; apparently much rarer in Scotland, Ireland, and the Channel Islands.—B. M.: Island of Sark. Near Hemsby, Norfolk; Epping Forest, Essex; Esher, Surrey; Shoreham, Sussex; Lydd, Kent; Isle of Wight; Dartmoor, Devonshire; near Penzance and St. Merryn, Cornwall; Breth, Oxfordshire; Charnwood Forest, Leicestershire; Dovedale, Derbyshire; Haughmond Hill, Shropshire; Delamere Forest, Cheshire; Aberdovey, Merionethshire; near Ayton and Cliffrigg, Cleveland, Yorkshire; Windermere, Westmoreland; St. Bees, Cumberland. New Galloway, Kirkcudbrightshire; Pentland Hills, near Edinburgh; Barcaldine, Argyleshire; Countesswells Wood, near Aberdeen. Warrenscourt and Macroon, co. Cork.

Form 1. *nivea* Koerb. Syst. Lich. (1855) p. 55.—Podetia erect, crowded, very white.—Cromb. Grevillea, xv. p. 45.—*Beomyces pungens* β . *niveus* Ach. Meth. (1803) p. 354.

Differs merely in the snow-white colour of the podetia, which become brownish at the apices. The only British specimens seen are sterile.

Hab. On mossy rocks in maritime and upland tracts.—*Distr.* Very local and scarce in N. England and the S.W. Highlands of Scotland.—B. M.: Windermere, Westmoreland. Head of Loch Creran, Barcaldine, Argyleshire.

Form 2. *foliosa* Flörke. Clad. (1828) p. 156.—Podetia erect or decumbent, more or less sprinkled with minute leaflets.—Leight. Lich. Fl. p. 56, ed. 3, p. 54; Croub. Grevillea, xi. p. 113.—*Cladonia furcata* E. *pungens* c. *foliosa* Mudd, Brit. Clad. p. 24. *Coralloides fenticuli specie candidans, corniculis rufescentibus* Dill. Musc. 110, t. 16. f. 30 c, d.—*Brit. Exs.*: Mudd, Clad. n. 56; Leight. n. 374.

Except in the foliaceous podetia this form is also entirely similar to the type. It appears to be very rarely fertile, the apothecia when present being usually simple and dark-brown.

Hab. On the ground in upland situations.—*Distr.* Somewhat local, though plentiful where it occurs, in England: not yet seen from Scotland or Ireland.—B. M.: Shiere, Surrey; Lydd, Kent; Basingstoke, Hants; near Cheltenham, Gloucestershire; Malvern, Worcestershire; Pentregaer, Oswestry, Shropshire; near Redcar, Yorkshire; near Hartlepool, Durham; Windermere, Westmoreland.

Subsp. *C. muricata* Croub. Grevillea, xi. p. 113.—Podetia somewhat turgid, rugose, sparingly branched, glabrous or squamulose, simple and obtuse or shortly furcate at the apices. Apothecia small, dark-brown.—*Cladonia furcata* var. *muricata* Nyl. Syn. i. p. 207. *Cenomyce muricata* Del. in Dub. Bot. Gall. ii. (1830) p. 622. *Lichen deformis* Huds. Fl. Angl. p. 458 pro parte. *Coralloides crassius subincanum, calicibus dentatis* Dill. Musc. 95, t. 15. f. 18 B (deformed state). *Lichenoides tubulosum magis ramosum, maxime difforme* Dill. in Ray, Syn. ed. 3, p. 68, n. *23.—*Brit. Exs.*: Leight. n. 369.

This is a more robust and less-branched plant, having the podetia either erect or prostrate, with the cortex rugoso-unequal, usually more or less squamulose (form *lepidota* Del.), and occasionally variously difform. It somewhat resembles states of subsp. *C. racemosa*, but it has with K the reaction of *C. pungens*, of which it forms a well-marked subspecies. The apothecia are extremely rare in our British specimens.

Hab. On the ground in upland situations.—*Distr.* Local, though somewhat plentiful where it occurs, in S., Central, and W. England.—B. M.: Shiere, Surrey; Basingstoke, Hants; near Amberley, Sussex; Thetford Road, Gloucestershire; Bathampton Downs, Somersetshire; Charnwood Forest, Leicestershire.

23. *C. crispata* Nyl. Not. Sällsk. pro F. et Fl. Fenn. Förh. n. s. v. (1866) p. 110.—Thallus foliaceous at the base; leaflets small, incised and crenate, greyish- or greenish-white, sometimes evanescent; podetia somewhat turgid, glabrous, sometimes 3-4-, usually repeatedly branched, concolorous or pale-greyish or subspadiceous,

the apices and the axils infundibuliform, pervious, the apertures cristate at the margins (K—, CaCl—). Apothecia small, brown or reddish.—Cromb. Lich. Brit. p. 20; Leight. Lich. Fl. p. 65, ed. 3, p. 61.—*Cladonia furcata* u. *crispata* Mudd, Man. p. 57, Brit. Clad. p. 22. *Bæomyces turbinatus* ξ . *crispatus* Ach. Meth. (1803) p. 341. *Coralloides perforatum minus, molle et tenue* Dill. Musc. 99, t. 16. f. 22 b.—*Brit. Ees.*: Mudd, Clad. n. 45.

Though regarded by some authors as the type of *C. furcata*, the glabrous proliferous podetia, the characters of their apices and axils, and the cristate margins of the apertures at once separate it from all the varieties and forms of that species and render it specifically distinct. In this country the apothecia are rare, though the spermogones are not unfrequent.

Hab. On the ground among mosses in upland and subalpine moorland districts.—*Distr.* Local and rare in N. England and among the Grampians, Scotland.—B. M.: Kildale Moor and Lonsdale, Cleveland, Yorkshire. Ben-y-gloe Mountains, Perthshire: Ben-naboord and Upper Glen Dee, Braemar, Aberdeenshire.

Subsp. *C. furcatiformis* Nyl. Flora, 1874, p. 318.—Podetia slender, very much branched, caespitose-fruticulose, the scyphi cristato-ciliate at the margins.—Cromb. Grevillea, xi. p. 113.—*Brit. Ees.*: Mudd, n. 12.

Distinguished as a subspecies by the characters of the podetia and their scyphi. The only British specimen seen is not very typical, and is quite sterile.

Hab. On the ground among mosses in upland districts.—*Distr.* Apparently extremely local and scarce in N. England, though it no doubt occurs also in the Highlands of Scotland.—B. M.: Ingleby Park, Cleveland, Yorkshire.

24. *C. cenotea* Schær. Spic. (1823) p. 35.—Thallus nearly efoliolose or with small lobato-crenate squamules at the base: podetia cylindrical, whitish or greyish-pulverulent, repeatedly proliferous, the axils and apices often dilated, scyphoid and pervious, the apertures (usually brownish within) denticulate (K—, CaCl—). Apothecia small, brown or pale; spores moderate.—Cromb. Grevillea, xi. p. 113.—*Bæomyces cenoteus* Ach. Meth. (1803) p. 345.

The pulverulent podetia, with their pervious axils and apices, readily distinguish this from *C. crispata*. They are glabrous and corticate at the base, and from being repeatedly proliferous have a branched appearance. In the few British specimens seen the apothecia are very rare.

Hab. On putrid stumps of trees in wooded upland situations.—*Distr.* Very local and scarce among the Grampians, Scotland, where it is confined apparently to some of the remnants of the old Caledonian Forest.—B. M.: Black Wood of Rannoch, Perthshire: Bullochbuie Forest, Braemar, Aberdeenshire.

β . *glauca* Nyl. in Zw. Lich. Heidelb. (1883) p. 12.—Podetia moderate, glaucous, furfuraceous or here and there sprinkled with

minute glaucous squamules, slightly pervious at the axils and lacero-radiate, the apices subulato-furcate.—Cromb. Grevillea, xv. p. 45, xi. p. 113 (ut subsp.).—*Cladonia glauca* Flörke, Clad. (1828) p. 140.

Differs perhaps as a subspecies in the colour of the podetia and the form of their apices. In our only two British specimens the podetia are almost entirely furfuraceous, with a few scattered squamules towards the base. The apothecia, which are small, dark-brown, are very rarely present.

Hab. Among mosses on putrid stumps in mountainous districts.—*Distr.* Extremely local and scarce in N. Wales and the S.W. Highlands of Scotland.—B. M.: Rhewgreidden, Merionethshire. Glen Creran, Argyleshire.

25. *C. scabriuscula* Nyl. Flora, 1876. p. 447.—Thallus squamulose at the base, the squamules small, often evanescent; podetia caespitose, slender, erect or curved, scabrid, more or less minutely squamulose, divaricately branched, greyish-white, the branches subalternate, recurved and furcate at the apices (K + yellowish, CaCl—). Apothecia moderate, terminal, brown.—Cromb. Journ. Bot. 1876, p. 360; Leight. Lich. Fl. ed. 3, p. 61.—*Cenomyce scabriuscula* Del. in Dub. Bot. Gall. ii. (1830) p. 623.

This approaches on the one hand subsp. *C. racemosa* f. *recurva* (*tenuior*) and on the other subsp. *C. adspersa* of the following species. From both, however, it is separated by the podetia and the reaction with K, so that it may with propriety be regarded as holding an intermediate specific place. In our British specimens there are only a few young apothecia.

Hab. On mossy rocks and old walls in maritime and upland districts.—*Distr.* Found only in the Channel Islands, S.W. England, S. Scotland, and the W. Highlands.—B. M.: Noirmont, Island of Jersey. Near Beckey Falls, Devonshire; near Penzance, Cornwall. New Galloway, Kirkcudbrightshire; Barcaldine, Argyleshire; Loch Linne, Lochaber, Inverness-shire.

26. *C. squamosa* Hoffm. Deutsch. Fl. (1795) p. 125.—Thallus foliaceo-squamulose at the base; squamules crenate or incisor-crenate, greyish-white or pale above, white beneath; podetia cylindrical, branched, more or less covered with minute leaflets or furfuraceous squamules, the axils pervious, dentate and proliferous at the apertures; apices somewhat furcate or, when fertile, radiato-cristate, subcorymböse (K—, CaCl—). Apothecia small, pale or reddish-brown: spores 0.010–13 mm. long, 0.0035 mm. thick.—Mudd, Man. p. 56, Brit. Clad. p. 19; Cromb. Lich. Brit. p. 20; Leight. Lich. Fl. p. 66, ed. 3, p. 61.—*Scyphophorus sparassus* Sm. Eng. Fl. v. p. 237. *Cenomyce sparassa* Hook. Fl. Scot. ii. p. 64; Tayl. in Mack. Fl. Hib. ii. p. 80. *Schasmaria sparassa* Gray, Nat. Arr. i. p. 416. *Lichen sparassus* Eng. Bot. t. 2362.—*Brit. Ess.*: Mudd, n. 13; Cromb. n. 124; Lerb. Caesar. n. 10 pro parte.

Well distinguished by the minutely foliaceo-squamulose podetia (which in old age become subdenudate) and by their perforate axils with dentate or sublacerate margins. The podetia vary in height from 1 to 3 inches, and are slender or somewhat turgid, simple or repeatedly branched. It is not very common in fruit, but when present the apothecia are cymoso-aggregate, at first plane and margined, at length convex and immarginate.

Hab. Among mosses on the ground and on rocks in wooded, maritime, and upland tracts.—*Distr.* General, and usually plentiful where it occurs, chiefly in the hilly and mountainous regions of Great Britain and Ireland; rare in the Channel Islands.—B. M.: Noirmont Bay, Island of Jersey. Epping Forest, Essex; near Beckey Falls, Devonshire; St. Breock, Cornwall; Charnwood Forest, Leicestershire; Dolgelly, Merionethshire; Conway Falls, Carnarvonshire; Hafod, Cardiganshire; Ingleby Park, Cleveland, Yorkshire; Windermere, Westmoreland; West Allen Cams, Northumberland. New Galloway, Kirkcudbrightshire; Barcaldine, Argyllshire; Bracklin Bridge, Rannoch, and Loch Tay, Perthshire; Durris, Kincardineshire; Craig Cluny, Braemar, Aberdeenshire; Rothiemurchus Woods and Loch Linnhe, Inverness-shire. Black Mountain, near Belfast, co. Antrim; Doneraile Mts., co. Cork; Killarney, co. Kerry; Kylemore, co. Galway.

Form 1. *ventricosa* Fr. Lich. Eur. (1831) p. 231.—Podetia stout, subventricose, the axils and apices dilated, open, infundibuliform.—Mudd, Man. p. 56. Brit. Clad. p. 19; Cromb. Grevillea, xi. p. 114.—*Beomyces sparassus* β . *ventricosus* Ach. Meth. (1803) p. 347.—*Lichen ventricosus* Huds., as will subsequently be seen, is not, as supposed by authors, referable to this form.—Brit. Ess.: Mudd, Clad. n. 40.

Probably this is to be regarded as but a more robust state of the type (with which it is sometimes confluent) depending upon the nature of the habitat. The podetia are much branched, with the branches often as if scyphiform. It is but sparingly seen fertile.

Hab. Among mosses on moist rocks in wooded upland districts.—*Distr.* Local and scarce in N. Wales, N. England, and the S.W. Highlands of Scotland.—B. M.: Conway Falls, Carnarvonshire; Aberdovey, Merionethshire; Westerdale, Cleveland, Yorkshire. New Galloway, Kirkcudbrightshire; Barcaldine, Argyllshire.

Form 2. *cucullata* Nyl. ex Cromb. Journ. Bot. 1876, p. 360.—Thallus with the squamules at the base and on the podetia minute, narrowly lacinate, crenulate and cucullato-revolute.—Cromb. Journ. Linn. Soc., Bot. xvii. p. 558; Leight. Lich. Fl. ed. 3, p. 21.—*Cenomyce cucullata* Del. in Dub. Bot. Gall. ii. (1830) p. 626. *Cladonia squamosa* β . *microphylla* Mudd, Man. p. 56. *Coralloides scyphi-forme foliis alicorniformibus cartilaginosis* Dill. Musc. 87, t. 14. f. 12 d.—Brit. Ess.: Mudd, n. 14, Clad. nos. 33, 50.

Differs in the form of the smaller squamules, which give it a rather fine appearance. In the British specimens the podetia are usually short and sterile, rarely more elongate and fertile.

Hab. On mossy boulders and putrid trunks in wooded upland districts.—*Distr.* Local and rare in W. and N. England, N. Wales, S. Scotland, the W. Highlands, and N.W. Ireland.—B. M.: Near Withiel, Cornwall;

Aberdovey and Dolgelly, Merionethshire; Cleveland, Yorkshire. Tongland, Kirkcudbrightshire; Appin, Argyleshire; Loch Linnhe, Inverness-shire. Leenane, near Kylemore, co. Galway.

Subsp. *C. adpersa* Nyl. ex Cromb. Grevillea, xi. (1883) p. 114.—Podetia moderate, somewhat slender, squamuloso-furfuraceous, sparingly branched; branches subsimple, usually recurved, subulate or furcately divided at the apices (K—, CaCl—). Apothecia small, dark-brown.—*Cladonia adpersa* Cromb. Journ. Bot. 1876, p. 360. *Cladonia furcata* var. *adpersa* Flörke, Deutsch. Lich. (1821) n. 198; Leight. Lich. Fl. ed. 3, p. 61.

Though regarded by authors as belonging to *C. furcata*, var. *recurva* of which it closely approaches, Nylander now refers this to *C. squamosa* as a subspecies well characterized by the podetia. With us, as elsewhere, the apothecia are very rare, but the spermogones are frequent.

Hab. Among mosses in woods and on shady rocks in upland districts.—*Distr.* Local in England and Ireland; more general in the Highlands of Scotland.—B. M.: Shanklin Downs, Isle of Wight; Epping Forest, Essex; near Oxford; Charnwood Forest, Leicestershire. New Galloway, Kirkcudbrightshire; Barcaldine, Argyleshire; Rannoch, Perthshire; Inglismaldie Woods, Kincardineshire; Countesswells, near Aberdeen, and Glen Callater, Braemar, Aberdeenshire; Loch Linnhe, Inverness-shire. Connemara, co. Galway.

27. *C. subsquamosa* Nyl. ex Cromb. Journ. Linn. Soc., Bot. xvii. (1880) p. 560.—Thallus foliaceo-squamulose at the base; squamules small, inciso-crenate, pale or greyish-green above, white beneath; podetia somewhat short or more elongate, branched, minutely squamulose in the lower portion, granulate above, furcate, or radiatocristate and subcorymbose at the apices (K + yellow and then crimson, CaCl—). Apothecia small, reddish-brown.—*Cladonia delicata* var. *subsquamosa* Nyl. ex Leight. Ann. Mag. Nat. Hist. ser. 3, xviii. (1866) p. 407; Cromb. Lich. Brit. p. 20; Leight. Lich. Fl. p. 59, ed. 3, p. 55.—*Brit. Ess.*: Mudd, n. 14; Lerb. Cæsar. n. 10 pro parte; Leight. n. 405; Bohl. n. 16.

A somewhat variable plant, approaching in some of its smaller states *C. delicata*, with which it agrees in the thalline reaction. In its larger states again it is subsimilar to *C. squamosa*, from which it can rightly be distinguished only on the application of K. The apothecia in our specimens are rarely present.

Hab. On rotten stumps of trees and among mosses in maritime and upland districts.—*Distr.* Rather local in the Channel Islands, S.W. and N. England, N. Wales, S. Scotland, among the Grampians, and in E. and W. Ireland.—B. M.: Noirmont Bay, Island of Jersey. Ightham Common, Kent; Shanklin, I. of Wight; near Penzance, Cornwall; Hay Coppice, Herefordshire; Barmouth, Merionethshire; Kildale and Ingleby, Cleveland, Yorkshire; Alston, Cumberland; Bellingham Woods, Northumberland. New Galloway, Kirkcudbrightshire; Appin, Argyleshire; Rannoch, Perthshire; Sidlaw Hills, Forfarshire; Loch Linnhe, Inverness-shire. Kelly's Glen, near Dublin; Killarney, co. Kerry; Leenane, Connemara, co. Galway.

Form **tumida** Cromb. Grevillea, xi. (1883) p. 114.—Podetia turgid, ventricose, the axils and apices dilated, infundibuliform.

This is analogous to form *ventricosa* of *C. squamosa*, with which but for the reaction it might readily be confounded. It is apparently but rarely fertile.

Hab. On moist shady rocks among mosses in upland tracts.—*Distr.* Local and scarce in S. England, N. Wales, S. Scotland, and in the S.W. Highlands.—B. M.: High Rocks, near Tunbridge Wells, Kent; Dolgelly, Merionethshire. New Galloway, Kirkcudbrightshire; Barcaldine, Argyleshire.

28. **C. asperella** Cromb. Grevillea, xi. (1883) p. 114.—Thallus squamulose at the base, the squamules minute, inciso-crenate, subevanescent; podetia elongate, slender, erect, whitish or greyish-white, glabrous, squamulose or furfuraceo-pulverulent, proliferously and variously branched, the axils and apices pervious, denticulate (K—, CaCl—). Apothecia small, conglomerate, brown.—*Cladonia squamosa* β . *asperella* Flörke, Clad. (1828) p. 132; Mudd, Brit. Clad. p. 20.—To this *fide* Nyl. is referable also *Cenomyce speciosa* Del. in Dub. Bot. Gall. ii. p. 626.—*Brit. Exs.*: Mudd, Clad. n. 41.

From subspecies *C. adspersa*, which it closely resembles, this differs in the erect podetia and their fasciculate branches, which are subulate or truncate at the apices. It may thus with propriety be regarded as a distinct species rather than as a subspecies of *C. squamosa*. In the very few British specimens the podetia, which are 2–3½ in. long, are sparingly foliiferous throughout, with the apothecia rarely present.

Hab. Among mosses on rocks and heaths in upland districts.—*Distr.* Apparently very local and scarce in N. England.—B. M.: Stogdale, Cleveland, Yorkshire.

Form **polychonia** Cromb. Grevillea, xi. (1883) p. 114.—Podetia glabrous and furfuraceo-pulverulent, the axils dilated and radiato-proliferous.—*Cladonia squamosa* f. *polychonia* Flörke, Clad. (1828) p. 136; Mudd, Brit. Clad. p. 20.—*Brit. Exs.*: Mudd, Clad. n. 42.

Differs in the absence of any folioles on the podetia (except occasionally towards their base) and in the form of the axils. The apothecia are very rare.

Hab. On the ground in upland heaths.—*Distr.* Rare and local in N. England; probably to be detected elsewhere.—B. M.: Baysdale, Cleveland, Yorkshire.

29. **C. cæspititia** Flörke, Clad. (1828) p. 8.—Thallus squamulose-foliaceous at the base: leaflets small, ascending, laciniato-lobed, crenate or eroso-lacerate at the margin, densely cæspitose-congested, pale-green above, white beneath; podetia very short, naked, cylindrical, simple or divided, pale (K—, CaCl—). Apothecia conglomerate either on the podetia or on the leaflets, flesh-coloured or reddish; spores 0,009–16 mm. long, 0,004–5 mm. thick.—Cromb. Grevillea, xi. p. 114.—*Cladonia squamosa* subsp. *cæspititia* Cromb. Lich. Brit. p. 20. *Cladonia squamosa* ϵ . *cæspititia* Mudd, Man. p. 57,

Brit. Clad. p. 21. *Cladonia pyxidata* var. *cæspititia* Leight. Lich. Fl. p. 60, ed. 3, p. 57. *Scyphophorus cæspititius* Sm. Eng. Fl. v. p. 236; Gray, Nat. Arr. i. p. 417. *Lichen cæspititius* Eng. Bot. t. 1796. *Bæomyces cæspititius* Pers. in Ust. Ann. i. (1794) p. 155. —Brit. Exs.: Mudd, Clad. n. 44; Larb. Cæsar. n. 2; Bohl. n. 72; Leight. n. 368.

Though appearing as if descending from *C. squamosa*, yet preserving as it constantly does its own type, this may rightly be regarded as a distinct species. At first sight, as observed by Nylander (Syn. p. 210), it looks almost as if it were a foliolose species of *Bæomyces*, or, when the apothecia are sessile, as if it were a squamulose *Lecidea* with reddish apothecia. When more developed, it forms erect imbricate tufts of moderate size, and when less developed and with the squamules more scattered (terricole) it is rather widely expanded. The podetia, which arise from the upper surface of the laciniae, are naked or occasionally subverrucose, and often so short that the apothecia and the spermatogones are apparently sessile on the leaflets.

Hab. Among mosses on the trunks of trees and on rocks, on thatched roofs, and also on the bare ground in maritime and upland tracts.—*Distr.* General and common throughout Great Britain; rare in S. and W. Ireland and the Channel Islands.—B. M.: Belcroute Bay, Island of Jersey; Island of Guernsey. Epping Forest, Essex; Hornsey Wood, Middlesex; St. Leonard's Forest, Sussex; New Forest, Hants; near Beckey Falls, S. Devon; St. Breward, Cornwall; Oaksey, Wiltshire; Malvern, Worcestershire; near Matlock, Derbyshire; Stableford, Shropshire; Barmouth, Merionethshire; Beaumaris, Island of Anglesea; Cliff-rigg, Cleveland, Yorkshire. New Galloway, Kirkcudbrightshire; Appin, Argyleshire; Rannoch, Perthshire; Countesswells Wood, near Aberdeen; Loch Linnhe, Inverness-shire. Dunscombe Wood, co. Cork; Killarney, co. Kerry.

30. *C. delicata* Flörke, Comm. Clad. (1828) p. 7.—Thallus cæspitosely foliaceous at the base; leaflets minute, narrowly eroso-laciniate, granulate-leprose at the margin, greenish-white or brownish-grey; podetia short, slender, somewhat thickened upwards, simple or shortly divided at the apices, granulate-furfuraceous or minutely squamulose (K + yellowish, CaCl—). Apothecia generally conglomerate, brown or pale; spores oblongo-fusiform, 0.010–15 mm. long, 0.0035–40 mm. thick.—Cromb. Lich. Brit. p. 20; Leight. Lich. Fl. p. 58, ed. 3, p. 55.—*Cladonia squamosa* δ . *delicata* Mudd, Man. p. 56. *Helopodium delicatum* Gray, Nat. Arr. i. p. 416. *Lichen delicatus* Ehrh. Crypt. Exs. (1793) n. 247; Eng. Bot. t. 2052. *Scyphophorus parasiticus* (Hoffm.) Sm. Eng. Fl. v. p. 237. *Cenomyce parasitica* Tayl. in Mack. Fl. Hib. ii. p. 80.—Brit. Exs.: Mudd, n. 15, Clad. n. 43; Leight. n. 382.

From the preceding species, to states of which it bears considerable resemblance, this is distinguished by the microphyllous thallus, the sub-leprose margins of the leaflets, and the granulate or squamulose podetia. More especially, however, and at once, it may with certainty be recognized by the reaction with K. In suitable habitats it spreads somewhat extensively, and is generally fertile. The apothecia are small, but are seldom seen simple.

Hab. On rotten rails and stumps of trees in upland districts.—*Distr.* Somewhat scarce, occurring here and there throughout England, rare in S. Scotland and in the S. and W. Highlands; not yet seen from Ireland.—B. M.: Edgefield, Norfolk; Chelsfield, Kent; St. Leonard's Forest, Sussex; Lyndhurst, New Forest, Hants; Crown East Wood, near Worcester; Aymestry, Herefordshire; Bagot's Park, Staffordshire; Llandrindod, Radnorshire; Easby Wood and Kildale, Cleveland, Yorkshire; Wastdale, Cumberland. New Galloway, Kirkcudbrightshire; Barcaldine, Argyleshire; Craig Calliach, Killin, Perthshire.

B. ERYTHROCARPÆ.—Apothecia scarlet.

31. *C. coccifera* Schær. Spic. (1823) p. 24.—Thallus squamulose or subfoliaceous at the base; squamules somewhat firm, crenate or incised, greyish-green; podetia somewhat short, glabrous, unequally granuloso-corticate, subsimple, scyphiferous, greenish- or whitish-yellow; scyphi subregular, dilated (Kf + yellow, K(CaCl) + yellow). Apothecia sessile or pedicellate, often confluent; spores oblong or oblongo-ellipsoid, 0.009–11 mm. long, 0.0035 mm. thick.—Cromb. Grevillea, xi. p. 114; Mudd, Man. p. 60, t. i. f. 11 pro parte; Brit. Clad. p. 28 pro parte. *Scyphophora coccifera* Gray, Nat. Arr. i. p. 423. *Cenomyce coccifera* Hook. Fl. Scot. ii. p. 63; Tayl. in Mack. Fl. Hib. ii. p. 81 pro parte. *Lichen cocciferus* Linn. Sp. Pl. (1753) p. 1151; Lightf. Fl. Scot. ii. p. 866; With. Arr. ed. 3, iv. p. 39; Eng. Bot. t. 2051. *Cladonia cornucopioides* Cromb. Lich. Brit. p. 21; Leight. Lich. Fl. p. 66, ed. 3, p. 62. *Coralloides scyphiforme, tuberculis coccineis* Dill. Muse. 82, t. 14. f. 7 A–F, G–I. *Lichenoides tubulosum pyxidatum, tuberculis ancone coccineis* Dill. in Ray, Syn. cd. 3, p. 69, n. 35.—*Lichen cornucopioides* Linn. Sp. Pl. p. 1151 (post *cocciferum*), according to the specimen in his own Herb., is not referable to this plant.—Brit. Exs.: Mudd, n. 23, Clad. nos. 65, 66; Leight. n. 404 & 375 pro parte; Bohl. n. 40.

In various respects this resembles *C. pyxidata* of the preceding section, but is at once distinguished by the scarlet apothecia, which, however, in old age (and also in herbaria) frequently become denigrate. When sterile, the colour of the podetia, the less dilated margins of the scyphi, and the chemical reactions prevent it from being confounded with *pyxidata*. It is a somewhat variable species with respect to the podetia, which are either regular and simple (*stemmatina* Ach.), or proliferous from the margins (*extensa* Ach.), occasionally becoming in old plants costate. The basal squamules are sometimes small or rarely subevanescent. When fertile the apothecia are occasionally expanded and nearly cover the whole interior of the scyphi.

Hab. On sterile soil and turf-walls, chiefly upon moorlands from maritime to subalpine tracts.—*Distr.* General and not uncommon in most parts of Great Britain and Ireland; rare in the Channel Islands.—B. M.: Le Gouffre, Island of Guernsey. Epping Forest, Essex; Shanklin, Isle of Wight; St. Breward and near Wadebridge, Cornwall; Shotover Hill, Berks; Charnwood Forest, Leicestershire; Wrekin Hill, Shropshire; Cwm Bychan, Dolgelly, and Aberdovey, Merionethshire; Battersby Moor, Ayton Moor, and Baysdale, Cleveland, Yorkshire; Teesdale, Durham; the Cheviots, Northumberland. New Galloway, Kirkcud-

brightshire; Ben Lomond, Dumbartonshire; Appin, Argyleshire; Glen Lechay, near Tummel Bridge, and Rannoch Moor, Perthshire; Clova Mts., Forfarshire; Countesswells, and Scotston Moor, near Aberdeen, Glen Clunie and Ben-naboord, Braemar, Aberdeenshire; Ben Nevis, Inverness-shire; Lairg, Sutherlandshire; Applecross, Ross-shire. Doneraile Mts., co. Cork; Side Devis, near Belfast, co. Antrim; Kylemore, co. Galway.

Form 1. *asotea* Mudd, Brit. Clad. (1865) p. 29.—Podetia obconico-scyphiiform; scyphi proliferous (or aggregato-proliferous) from the centre.—Cromb. Grevillea, xi. p. 114.—*Scyphophora asotea* Gray, Nat. Arr. i. p. 423. *Baeomyces cocciferus* γ. *asoteus* Ach. Meth. (1803) p. 332. *Coralloides scyphiforme, tuberculis coccineis* Dill. Musc. 82, t. 14. f. 7 K-M.

This differs in the form of the podetia, which are often phyllophorous, and in the proliferations of the scyphi, which are sometimes 2-3 repeated, and thus present an analogy to those of *C. sobolifera*. As observed, however, by Acharius, Syn. p. 269, it grows along with the type and probably occurs on the same thallus, so that it can be considered only as a form. In our British specimens the apothecia are generally expanded.

Hab. On peaty soil among mosses in mountainous districts.—*Distr.* Apparently very local and scarce in N. England, and among the Central and N. Grampians, Scotland.—B. M.: Alston Moors, Cumberland. Rannoch, Perthshire; Head of Glen Callater, Braemar, Aberdeenshire.

Form 2. *cornucopioides* Fr. fil. Lich. Scand. (1871) p. 71.—Podetia somewhat short, more or less squamoso-foliaceous; scyphi proliferous both from the centre and the margins, foliiferous. Apothecia conglomerate.—Cromb. Grevillea, xi. p. 114.—*Scyphophorus asotea* β. *cornucopioides* Gray, Nat. Arr. i. p. 423. *Cenomyce coccifera* β. *cornucopioides* Hook. Fl. Scot. ii. p. 63. *Lichen cornucopioides* Huds. Fl. Angl. p. 456 pro parte; Lightf. Fl. Scot. ii. p. 860 pro parte; With. Arr. ed. 3, iv. p. 40 pro parte. *Baeomyces cornucopioides* Ach. Meth. (1803) p. 333. *Cladonia coccifera e phyllocoma* Flörke, Mudd, Brit. Clad. p. 29; Leight. Lich. Fl. p. 67, ed. 3, p. 62.—*Brit. Ess.*: Mudd, n. 23 pro parte, Clad. n. 67; Leight. n. 375 pro parte.

In the proliferations of the scyphi this unites in itself the position of those of the type (*extensa*) and of form *asotea*. Its most characteristic mark is the development of the podetial squamules into folioles on the margins of the scyphi, crowning as it were the usually crowded apothecia.

Hab. Among mosses on boulders and walls in upland mountainous situations.—*Distr.* Rather local and scarce in N. England, S. Scotland, and among the Grampians.—B. M.: Wrekin Hill, Shropshire; Battersby Moor and Baysdale, Cleveland, Yorkshire; Alston, Cumberland. New Galloway, Kirkcudbrightshire; Rannoch, Perthshire; Countesswells, near Aberdeen; Glen Callater, Braemar, Aberdeenshire.

Var. β. *incrassata* Fr. fil. Lich. Scand. (1871) p. 71.—Thallus minutely squamulose and verrucose at the base; podetia short, verrucoso-granulate, simple and subcylindrical or sparingly divided at

the incrassate apices; scyphi not (or scarcely) developed. Apothecia small, crowded.—Cromb. Grevillea, xii. p. 92.—*Cladonia incrassata* Flörke, Comm. Clad. (1828) p. 21. *Cladonia macilentata* form *diminuta* Cromb. Grevillea, xi. p. 115.

This apparently descends from *C. coccifera*, of which it is probably only a peculiar and diminutive condition. The podetia are usually about 2 lines, rarely $\frac{1}{2}$ in. high, with the scyphi either not at all developed or very narrow. The apothecia are numerous, becoming at length more or less confluent.

Hab. On peaty soil and putrid stumps of trees in mountainous districts.—*Distr.* Found only sparingly in the S.W. and Central Highlands of Scotland.—B. M.: Barcaldine, Argyleshire; Rannoch, Perthshire.

Subsp. *C. pleurota* Cromb. Grevillea, xi. (1853) p. 114.—Podetia turbinate-scyphiferous, pulverulent, yellowish-white or pale-greenish; scyphi dilated, subentire or rarely proliferous at the margins. Apothecia solitary, subpedicellate.—*Cladonia cornucopioides* subsp. *pleurota* Cromb. Lich. Brit. p. 21. *Cladonia cornucopioides* form *pleurota* Leight. Lich. Fl. p. 67, ed. 3, p. 62. *Cladonia coccifera* β . *pleurota* Mudd, Man. p. 60; γ . *deformis* b. *pleurota* Brit. Clad. p. 30. *Scyphophora pleurota* Gray, Nat. Arr. i. p. 424. *Capitularia pleurota* Flörke in Berl. Mag. 1808, p. 218. *Scyphophorus cocciferus* Hook. Eng. Fl. v. p. 240.

Though sometimes regarded as a variety of *C. deformis*, its affinity is undoubtedly with *C. coccifera*, to which it holds a somewhat analogous relation as *C. fimbriata* to *C. pyxidata*. Since, however, as pointed out by Nylander, Lich. Scand. p. 59, it occurs also with the podetia ciliate at the base, it can scarcely be regarded as a distinct species. The podetia in states with larger scyphi have the margin at length sinuate and radiate. With us it is only smaller and less typical states that are usually seen, and the apothecia are rarely present.

Hab. On the ground among mosses in shady places, on moorlands, and in woods in upland districts.—*Distr.* Apparently local and scarce in S.W. and N. England, the W. and N. Grampians, Scotland, and S.W. Ireland.—B. M.: Dartmoor, Devonshire; St. Breward, Cornwall; Ayton, Cleveland, Yorkshire. Barcaldine, Argyleshire; Rannoch, Perthshire; Glen Callater, Braemar, Aberdeenshire. Killarney, co. Kerry.

32. *C. bellidiflora* Flörke, Clad. (1828) p. 95.—Thallus foliaceo-squamose at the base; leaflets somewhat firm, variously divided or crenato-incised, straw-coloured above, white beneath; podetia ciliate, subsimple, squamoso-foliaceous, cylindrical, or scyphiferous, often somewhat ventricose in the middle, straw-coloured or greyish-green; scyphi narrow, sometimes divided when not rightly developed (K—, CaCl—). Apothecia somewhat large, often conglomerate; spores 0,009–11 mm. long, about 0,0035 mm. thick.—Cromb. Lich. Brit. p. 21; Leight. Lich. Fl. p. 72, ed. 3, p. 65. *Cladonia coccifera* β . *bellidiflora* Mudd, Man. p. 60, Brit. Clad. p. 29. *Scyphophorus bellidiflorus* Sm. Eng. Fl. v. p. 240; Gray, Nat. Arr. i. p. 424. *Cenomyce bellidiflora* Hook. Fl. Scot. ii. p. 64; Tayl. in Mack. Fl. Hib. ii. p. 82. *Lichen bellidiflorus* Ach. Prodr.

(1798) p. 194; Eng. Bot. t. 1894. *Lichen cornutus* ϵ . Lightf. Fl. Scot. ii. p. 876. *Coralloides viv ramosum, scyphis obscuris* Dill. Musc. 90, t. 15. f. 14 F. *Coralloides scyphiforme, ossis femoris facie* Dill. Musc. 91, t. 15. f. 15.—To this also is referable *Cladonia vestita* Leight. Ann. Mag. Nat. Hist. ser. 3, xix. (1867) p. 117, Lich. Fl. p. 67, ed. 3, p. 62.

From *C. coccifera* this differs in the longer (2–3 in.), slender, and more squamulose podetia, as also in the absence of any chemical reactions. As observed, however, by Fries fil. (Lich. Scand. p. 65), specimens from more arctic regions are with K (CaCl) distinctly yellowish. This is also occasionally the case with specimens growing at high altitudes on the Scottish mountains, whence *C. vestita* Leight., which is nothing typical, and differs in the diagnosis from var. *vestita* Ach. Lich. Univ. p. 541. The basal squamules or leaflets are often glaucous and occasionally somewhat large, while the podetia are frequently brownish at the base and sometimes proliferous. The apothecia are usually numerous, of a fine scarlet colour, though occasionally, as in the other species of this section, becoming denigrate.

Hab. On peaty soil among mosses in upland, but chiefly in subalpine and alpine districts of mountainous regions.—*Distr.* Local and scarce in W. and N. England and N. Wales; more frequent among the Scottish Grampians; doubtful in E. Ireland.—B. M.: Hustyn Down, Cornwall; Dillwys, near Barnmouth, Merionethshire; the Cheviots, Northumberland. Ben Cruachan, Argyleshire; Ben Lawers and Rannoch, Perthshire; near Loch Phadrig in Glen Callater, and Cairngorm, Braemar, Aberdeenshire; Ben Nevis, Inverness-shire.

Form 1. *gracilentia* Flörke, Clad. (1828) p. 99.—Podetia elongate, slender, branched; scyphi dilated, dentato-radiate at the margins, substerile.—Cromb. Lich. Brit. p. 21.—*Cladonia coccifera* β . *bellidiflora* b. *gracilentia* Mudd, Brit. Clad. p. 29. *Cenomyce cocccephala* δ . *gracilentia* Ach. Lich. Univ. (1810) p. 542.

Differs only in having the podetia more slender, branched (2–4 divided), and in being substerile, with the apothecia seldom rightly developed.

Hab. On the ground in subalpine moorlands.—*Distr.* Apparently local and scarce in N. England, and among the Central and N. Scottish Grampians.—B. M.: Killhope Law, Northumberland. Rannoch, Perthshire; near Loch Phadrig, Glen Callater, and on Ben-na-boord, Braemar, Aberdeenshire.

β . *Hookeri* Nyl. Syn. i. (1860) p. 221.—Podetia glabrous, unequally corticate, squamulose, or occasionally here and there with a few small squamules. Apothecia large.—Cromb. Grevillea, xi. p. 114.—*Cladonia Hookeri* Tuck. Syn. (1845) p. 55.

Characterized by the naked or almost entirely naked podetia. In the only British specimen seen these are about 1 in. high, robust, entirely squamulose, with the apothecia somewhat large, conglomerate, and having a few minute squamules intermixed.

Hab. On the ground in subalpine moorlands.—*Distr.* Very local and rare, having been seen only from one locality among the N. Grampians, Scotland.—B. M.: Glen Candlic, Braemar, Aberdeenshire.

33. *C. deformis* Hoffm. Deutsch. Fl. ii. (1795) p. 120.—Thallus foliaceo-squamulose at the base; leaflets moderate or somewhat large, pale-green above, whitish beneath; podetia elongate, turgid, simple, efoliolose, tubæformi-seyphiferous, sulphureo-pulverulent; seyphi regular or difform, crenato-dentate or irregularly proliferous at the margins (Kf + yellowish, K(CaCl) + yellow). Apothecia discrete or conglomerate; spores 0,008–10 mm. long, 0,003–4 mm. thick.—Cromb. Lich. Brit. p. 21; Leight. Lich. Fl. p. 68, ed. 3, p. 63.—*Cladonia coccifera* *δ. deformis* Mudd, Man. p. 61, Brit. Clad. p. 30. *Seyphophorus deformis* Sm. Eng. Fl. v. p. 244; Gray, Nat. Arr. i. p. 442. *Cenomyce deformis* Hook. Fl. Scot. ii. p. 63. *Lichen deformis* Linn. Sp. Pl. (1753) p. 1152; Eng. Bot. t. 1394.—*Lichen deformis* of Hudson and our older authors is referable to the next species.—Brit. Ears.: Mudd, n. 25, Clad. n. 68; Bohl. n. 39.

From var. *pleurota* of *C. cornucopioides*, with which it is comparable, this is distinguished by the elongate, more turgid, and differently coloured podetia. These are sometimes nearly fissured throughout, more or less corticate, and when sterile are cornute. The apothecia, which are at length conglomerate, are very rare in Great Britain, and are seldom seen rightly developed.

Hab. On the ground among heaths in wooded upland tracts.—*Distr.* Not very general nor common in W. and N. England, more frequent among the Scottish Grampians, especially in Braemar; not seen from Ireland.—B. M.: Hay Coppice, Herefordshire; Guisboro' Moor and Loundsdale, Cleveland, Yorkshire; Windermere, Westmoreland; Alston, Cumberland. Appin, Argyleshire; Craig Calliach and Rannoch, Perthshire; Linn of Dee, Ben-naboord, and Loch Phadrig, Braemar, Aberdeenshire; Rothiemurchus Woods, Inverness-shire; near Forbes, Elginshire.

Form 1. *gonecha* Nyl. Syn. i. (1860) p. 222.—Podetia longer, gradually incrassate upwards from the base; the seyphi dilated, irregular, lacero-radiate. Apothecia somewhat large, confluent.—Cromb. Grevillea, xi. p. 114.—*Bromyces deformis* *γ. gonechus* Ach. Meth. (1803) p. 335.

This form is characterized by the larger, turgid podetia, and by the irregular form of the seyphi. The only British specimens gathered are sterile.

Hab. On peaty soil amongst stunted heaths on subalpine moorlands.—*Distr.* Very local and rare among the N. Grampians and in the N.W. Highlands, Scotland.—B. M.: Billochbuie Forest, Braemar, Aberdeenshire; Ben Ferrog, Inverness-shire.

Form 2. *pulvinata* Nyl. Lich. Scand. (1861) p. 60.—Thallus pulvinato-congested at the base, the podetia short, narrow, curvato-flexuose and lacero-fissured, substerile.—Cromb. Grevillea, xv. p. 46.—*Cenomyce pulvinata* Ach. Lich. Univ. (1810) p. 544.

The small pulvinate basal thallus, consisting of minute imbricate leaflets, and the less developed, curved, and fissured podetia are the distinctive marks of this form, which, however, is connected with the type by intermediate states. It is never seen with the apothecia rightly developed.

Hab. On peaty soil and decayed trunks of trees in upland situations.—*Distr.* Found only in N. England and among the Scottish Grampians.—B. M.: Egglestone, Durham. Rannoch and Craig-y-barns, Dunkeld, Perthshire; Ballochbuie Forest, Braemar, Aberdeenshire; Rothiemurchus Woods, Inverness-shire.

34. *C. digitata* Hoffm. Deutsch. Fl. ii. (1795) p. 124.—Thallus foliaceous at the base, the leaflets roundly lobed or crenato-incised, pale-green above, beneath whitish and usually pulverulent: podetia subcylindrical, simplish, rarely divided, scyphiferous, white- or yellow-pulverulent in the upper portion, corticate and subrugulose at the base; scyphi usually narrow, the margin incurved, entire or irregularly divided and shortly proliferous (K+yellow, CaCl—). Apothecia small and discrete, or large and confluent; spores 0,009–11 mm. long, 0,0035–40 mm. thick.—Cromb. Lich. Brit. p. 21; Leight. Lich. Fl. p. 69, ed. 3, p. 63.—*Cladonia coccifera* *ε. digitata* et *ε. digitato-radiata* Mudd, Man. p. 61. *δ. digitata* Brit. Clad. p. 31. *Scyphophora digitata* Gray, Nat. Arr. i. p. 422. *Lichen digitatus* Linn. Sp. Pl. (1753) p. 1152. *Lichen deformis* Huds. Fl. Angl. p. 458 pro parte; Lightf. Fl. Scot. ii. p. 876; With. Arr. ed. 3, iv. p. 38. *Coralloides crassius subincanum, calicibus dentatis* Dill. Musc. 95, t. 15. f. 18 A (atypica).—*Lichen digitatus* of our older authors is not this, but a variety of the following species.—*Brit. Ews.*: Mudd, Clad. n. 76 (juvenilis).

From the preceding this is distinguished by its different habit, the colour of the more corticate podetia, and the incurved margin of the scyphi. It is often somewhat macrophyllous at the base. The podetia, which are 1–2 in. long, not unfrequently arise from the margins or the surface of the leaflets, and are either naked or with a few smaller and scattered leaflets chiefly towards the base or at the apices. In sterile specimens they are often cornute or subulate. With us the apothecia are rare.

Hab. On putrid trunks of trees among mosses in wooded upland districts.—*Distr.* Local and rather scarce in W. and N. England, N. Wales, and among the W. and N. Scottish Grampians; not seen from Ireland.—B. M.: Malvern, Worcestershire; Rhewgreiddan, Merionethshire; Kildale Moor, Cleveland, Yorkshire; Windermere, Westmoreland; near Whitehaven, Cumberland. Craig Calliach, Perthshire; Barcaldine, Argyleshire; Glen Muick and Craig Cluny, Braemar, Aberdeenshire; Rothiemurchus Woods, and by Loch Linnhe, Inverness-shire.

Form 1. *brachytes* Nyl. Lich. Scand. (1861) p. 61.—Thallus large at the base; podetia short, simple, somewhat slender; scyphi regular, narrow. Apothecia small.—Cromb. Grevillea, xv. p. 46.—*Bæomyces bacillaris* f. *brachytes* Ach. Meth. (1803) p. 329.

Differs in the more developed basal thallus and in the slender, narrow, usually substerile podetia. Our British specimens are only sparingly spermogoniiferous.

Hab. On old fir-trunks in upland wooded districts.—*Distr.* Found only among the N. Grampians, Scotland.—B. M.: Mar Forest, Braemar, Aberdeenshire.

Form 2. *cerucha* Nyl. Lich. Scand. (1861) p. 61.—Podetia simple, subventricose, slightly attenuate at the apices; scyphi minute, narrow.—Cromb. Grevillea, xv. p. 46.—*Cenomyce digitata* c. *cerucha* Ach. Syn. (1814) p. 268.

The more turgid and almost cornute podetia and the very small narrow-scyphi distinguish this form from the type. It is very rarely seen with the apothecia well developed, but occurs for the most part in a spermogoniiferous or substerile condition.

Hab. Among mosses on putrid stumps in upland wooded districts.—*Distr.* Very local and scarce in N. England, S. Scotland, and the N. Grampians.—B. M.: Windermere, Westmoreland. New Galloway, Kirkcudbrightshire; Ballochbuie Forest, Braemar, Aberdeenshire.

Form 3. *monstrosa* Nyl. Lich. Scand. (1861) p. 61.—Podetia large, thickened, the scyphi difform and divided, shortly branched or subproliferous. Apothecia moderate.—Cromb. Grevillea, xi. p. 114.—*Scyphophora digitata* β . *monstrosa* Gray, Nat. Arr. i. p. 422. *Cenomyce digitata* c. *monstrosa* Ach. Syn. (1814) p. 268.

Evidently but an accidental monstrosity, characterized by the more turgid podetia and the abnormal form of the scyphi. In the few British specimens the apothecia are but sparingly present.

Hab. On decaying trunks of trees in wooded mountainous districts.—*Distr.* Very local and scarce among the N. Grampians, Scotland.—B. M.: Craig Cluny, Braemar, Aberdeenshire; Rothiemurchus Woods, Invernesshire.

35. *C. macilenta* Hoffm. Deutsch. Fl. ii. (1795) p. 126.—Thallus squamuloso-foliaceous at the base, the squamules small, incised or crenato-lobed, glaucous-greenish or glaucous-greyish above, white beneath; podetia cylindrical, slender, simple or sometimes shortly divided at the apices, ascyphous or rarely narrowly and minutely scyphiferous, whitish-pulverulent (K + yellow, CaCl—). Apothecia small, terminal, solitary or tuberculoso-confluent.—Cromb. Lich. Brit. p. 21, Grevillea, xi. p. 114.—*Cladonia digitata* subsp. *macilenta* Leight. Lich. Fl. p. 69, ed. 3, p. 63. *Lichen macilentus* Ehrh. Pl. Crypt. (1793) n. 237. *Cladonia coccifera* η . *macilenta* c. *filiformis* Mudd, Man. p. 62, Brit. Clad. p. 32. *Cenomyce filiformis* Sm. Eng. Fl. v. p. 239; Tayl. in Mack. Fl. Hib. ii. p. 82. *Lichen filiformis* Relh. in Eng. Bot. t. 2028; With. Arr. ed. 3, iv. p. 38. *Scyphophora bacillaris* Gray, Nat. Arr. i. p. 422 pro parte. *Lichen tubiformis* Lightf. Fl. Scot. ii. p. 871 pro parte. *Coralloides vic ramosum*, *scyphis obscuris* Dill. Musc. 90, t. 15. f. 14 A.—*Coralloides scyphis gracilibus tubiformibus*, *Pedicularis folio* Dill. Musc. 85, t. 14. f. 10 B.—*Brit. Ees.*: Mudd, nos. 26 pro parte, 29, Clad. n. 75; Larb. Lich. Hb. n. 283.

In its typical state this is distinguished from the preceding by the smaller basal squamules, which are esorediate beneath, and by the slender ascyphous or minutely scyphiferous podetia, which are pulverulent throughout. It is very variable as to the basal thallus and the podetia, the differences in which give rise to the following varieties and

forms. The apothecia are not very common in a rightly developed condition.

Hab. Among mosses on old trunks of trees and on the ground in wooded upland districts.—*Distr.* General and not uncommon in most parts of Great Britain, rare in the Channel Islands; not seen from Ireland.—B. M.: Island of Jersey. New Forest, Hants; Lustleigh, Devonshire; near Withiel, Cornwall; Bradgate Park, Leicestershire; Cromford Moor, near Matlock, Derbyshire; Cwm Bychan, Merionethshire; Ayton and Ingleby, Cleveland, Yorkshire; Windermere, Westmoreland. Barcaldine, Argyshire; Craig Calliach, Craig-y-Barns near Dunkeld, and Falls of Bruar, Perthshire; Sheriffmuir, near Stirling; Craig Cluny, Braemar, Aberdeenshire; Rothiemurchus Woods, Inverness-shire.

Form 1. *styracella* Nyl. Lich. Scand. (1861) p. 62.—Thallus foliolose at the base, the leaflets minute, thin, lobed, subimbricate or somewhat scattered; podetia simple, slender, subuliform, white-pulverulent, the scyphi very minute with entire margin. Apothecia not seen rightly developed.—Cromb. Grevillea, xi. p. 114.—*Bæomyces bacillaris* γ. *styracellus* Ach. Meth. (1803) p. 330. *Cladonia coccifera* ε. *macilenta* f. *subulata* Mudd, Brit. Clad. p. 32.—*Brit. Ees.*: Mudd, Clad. n. 74; Leight. n. 297.

Differs chiefly in the thinly lobed basal folioles and in the simple podetia, which are attenuate upwards. The minute scyphi are rarely present, and the apothecia occur only in a young state.

Hab. On mossy trunks of old trees in mountainous districts.—*Distr.* Local and rare in S., W., and N. England, more frequent among the Scottish Grampians; rare in the Channel Islands and in S.W. Ireland.—B. M.: Island of Jersey. Withiel, Cornwall; Lonsdale, Cleveland, Yorkshire; Nesscliff, Shropshire. Barcaldine, Argyshire; Loch Tummel, Perthshire; Rothiemurchus Woods, Inverness-shire. Turk Mt., Killarney, co. Kerry.

Form 2. *clavata* Fr. Lich. Eur. (1831) p. 334.—Podetia thickish, simple, subventricose, cornute at the apices, white-pulverulent. Apothecia few, minute.—Cromb. Grevillea, xi. p. 114.—Subsp. *Cladonia macilenta* f. *clavata* Leight. Lich. Fl. p. 70, ed. 3, p. 64. *Bæomyces deformis* β. *clavatus* Ach. Meth. (1803) p. 334. *Cladonia coccifera* ε. *macilenta* l. *monstrosa* Mudd, Brit. Clad. p. 33. *Lichen cornutus* β. Lightf. Fl. Scot. ii. p. 876. *Coralloides via ramosum scyphis obscuris* Dill. Musc. 90, t. 15. f. 14 B, c.—*Brit. Ees.*: Mudd, Clad. n. 79; Leight. n. 403.

This form is as it were only a more turgid state of the preceding, with which also it agrees in the length of the clavato-ventricose podetia (though these are sometimes thick and stunted), which render it easily distinguished. It is apparently everywhere extremely rare with rightly developed apothecia.

Hab. On the ground among mosses on heaths and on the dead stumps of trees in wooded upland districts.—*Distr.* Found only in S., W., and N. England, N. Wales, and among the Grampians, Scotland.—B. M.: New Forest, Hants; Long Mynd, Shropshire; Aberdovey, Merionethshire; Westerdale, Cleveland, Yorkshire; near Whitehaven, Cumberland. Craig Calliach and Rannoch, Perthshire; Mar Forest, Braemar, Aberdeenshire; Rothiemurchus, Inverness-shire.

Form 3. *scolecina* Nyl. Lich. Scand. (1861) p. 62.—Thallus with the basal squamules minute, greyish, partly granulose or granuloso-dissolved; podetia very short, somewhat ventricos-subulate, greyish-granulose. Apothecia minute, solitary or 2-3-aggregate.—Cromb. Lich. Brit. p. 21, Grevillea, xi. p. 114.—*Boeromyces scolecinus* Ach. Meth. (1803) p. 324, t. 7. f. 2.

A well-marked form distinguished by the short podetia (2-3 lines in height) and by the granulose squamules. The apothecia, which Acharius (Lich. Univ. p. 543) erroneously describes as "brown," are apparently extremely rare; so that the plant is generally spoken of as sterile.

Hab. On old decaying pales and dead wood of trees in lowland and upland tracts.—*Distr.* Local and scarce in S. and Central England.—B. M.: Walthamstow, Essex; Chichester, Sussex; New Forest, Hants; Gopsall Park, Leicestershire.

Var. β . *scabrosa* Nyl. ex Lamy, Bull. Soc. Bot. Fr. t. xxv. (1878) p. 357.—Thallus granuloso-squamulose at the base; squamules greyish or glaucous, beneath white; podetia short, cylindrical, simple or short and variously divided above, ascyphous, greyish-white or glaucous, entirely granuloso-rugose. Apothecia small, discrete or confluent.—Cromb. Grevillea, xi. p. 115.—*Cladonia coccifera* ϵ . *macilenta* ϵ . *scabrosa* Mudd, Brit. Clad. (1865) p. 32.—*Brit. Evs.*: Mudd, Clad. n. 73.

Well characterized by the crowdedly rugose basal and podetial squamules, which give it a peculiarly scabrid appearance. The podetia are from $\frac{1}{4}$ to $\frac{1}{2}$ in. long, of moderate thickness, and often divided towards the apices. In the simple podetia the apothecia are rarely present; but in those more divided they are frequent and numerous.

Hab. On putrid stumps and on turf-walls in wooded upland tracts.—*Distr.* Local and scarce in S., W., and N. England and N. Wales, but more frequent among the Scottish Grampians; not seen from Ireland.—B. M.: Epping Forest, Essex; Ardingly, Sussex; near Bodmin, Cornwall; Malvern, Worcestershire; Dolgelly, Meri nethshire; Bridel Gill, Cleveland, Yorkshire. New Galloway, Kirkcudbrightshire; Barcaldine, Argyleshire; Glen Lochay and Rannoch, Perthshire; Morrone, Braemar, Aberdeenshire; Rothiemurchus, Inverness-shire.

Form *intumescens* Cromb. Grevillea, xv. (1886) p. 46.—Podetia more elongate, turgid, densely and coarsely granulato-squamulose, simple and rarely obscurely scyphiferous at the apices.—*Cladonia macilenta* form *incrassata* Cromb. Grevillea, xii. p. 92.

Differs in the much thicker podetia, which are from $\frac{1}{2}$ to 1 in. in length. They are also occasionally obscurely scyphoid at the apices, the scyphi being coarsely granular within. When present the apothecia are minute and discrete.

Hab. On turf-walls in shady upland situations.—*Distr.* Found only among the Central and N. Grampians, Scotland.—B. M.: Rannoch, Perthshire; near Inverey, Braemar, Aberdeenshire.

Var. γ . *coronata* Nyl. Lich. Scand. (1861) p. 62.—Thallus folioloso-squamulose at the base, the leaflets pale-greenish above,

multifid and crenate; podetia somewhat thickish, pulverulent and squamulose, either digitately branched or with narrow proliferous scyphi at the apices. Apothecia moderate, or smaller and conglomerate.—Cromb. Grevillea, xv. p. 46.—*Bæomyces digitatus* β . *coronatus* Ach. Meth. (1803) p. 333. *Cladonia digitata* var. *macilentula* f. *polydactyla* (Flörke) Leight. Lich. Fl. p. 70, ed. 3, p. 64, et forma *coronata* p. 65.—*Cladonia coccifera* η . *maritima* A. *polydactyla* Mudd. Man. p. 62, Brit. Clad. p. 32. *Scyphophorus digitatus* Sm. Eng. Fl. v. p. 240. *Cenomyce digitata* Hook. Fl. Scot. ii. p. 63. *Lichen digitatus* Lightf. Fl. Scot. ii. p. 874; With. Arr. ed. 3, iv. p. 39; Eng. Bot. 2439. *Lichen pyxidatus* ϵ . *digitatus* Huds. Fl. Angl. p. 457. *Coralloides cornucopioides incanum, scyphis cristatis* Dill. Musc. 94, t. 15. f. 17 A.—*Brit. Ess.*: Leight. n. 274; Mudd, nos. 27, 28, Clad. nos. 77, 78, 72 pro parte; Bohl. nos. 7, 8.

Often confused with *C. digitata*, from which it is well distinguished by the podetia. It differs from the other varieties and forms of this species in the more developed basal leaflets, and in the more or less squamuloso-foliateous podetia, which are either asepiphous and digitately branched, or apically narrowly scyphiferous and proliferous. It usually occurs well-fruited.

Hab. Among mosses on the ground, on boulders, and about the roots of old trees in wooded upland districts.—*Distr.* General and usually plentiful where it occurs in the hilly and mountainous tracts of Great Britain, and probably also of Ireland.—B. M.: Epping Forest, Essex; St. Leonard's Forest, Sussex; New Forest, Hants; Ivy Bridge and near Totness, Devonshire; near Bodmin, Cornwall; Charnwood Forest, Leicestershire; Malvern, Worcestershire; Barmouth, Dolgelly, and Aberdovey, Merionethshire; Baysdale, Ingleby, Lonsdale, and Kildale, Yorkshire; Windermere, Westmoreland; Ashgill, Cumberland. New Galloway, Kirkcudbrightshire; Barcaldine, Argyleshire; Glen Lochay, Falls of Bruar, and Loch Rannoch, Perthshire; Clova, Forfarshire; Countesswells Woods, near Aberdeen; Craig Cluny, Braemar, Aberdeenshire; Rothiemurchus Woods, Inverness-shire. Killarney, co. Kerry; Connemara, co. Galway; Devis Mt., co. Antrim.

Form 1. *ventricosa* Cromb. Grevillea, xv. (1886) p. 46.—Podetia thick, somewhat turgid above, narrowly scyphiferous, variously branched at the margins. Apothecia not seen rightly developed.—*Lichen ventricosus* Huds. Fl. Angl. (1762) p. 457; Lightf. Fl. Scot. ii. p. 875; With. Arr. ed. 3, iv. p. 38. *Coralloides cornucopioides incanum, scyphis cristatis* Dill. Musc. 94, t. 15. f. 17 B, c.—Though there is no specimen of *Lichen ventricosus* in any of the old herbaria, yet from their references to the figure of Dillenius there is little doubt that this was the plant intended by the above authors.

This seems to be only a larger and thicker form of var. *coronata*, somewhat analogous to form *monstrosa* of the preceding species. As Lightfoot l. c. remarks, "it resembles in miniature a pollard tree with its lop on." In the only recent British specimen seen referable to this form, as in that in Herb. Dill., there are no apothecia visible, but only decolorate spermatogones.

Hab. On peaty soil in upland moorlands.—*Distr.* Local and scarce in

N. England, but no doubt to be detected elsewhere.—B. M.: Kildale Moor, Cleveland, Yorkshire.

Form 2. *carcata* Nyl. Lich. Scand. (1861) p. 62.—Podetia moderate, granulato-pulverulent and partly squamulose, simple or subdivided at the apices; apothecia solitary or conglomerate.—Cromb. Lich. Brit. p. 21; Leight. Lich. Fl. p. 70 pro parte, ed. 3, p. 64 pro parte (*cfr.* Cromb. Grevillea, xi. p. 115).—? *Cenomyce carcata* Ach. Lich. Univ. (1810) p. 568.

The original specimen gathered in England by Turner having disappeared from Herb. Ach., at Helsingfors, it is very doubtful what Acharius really meant by his *carcata*, which in Syn. p. 266 he refers to *Cenomyce bacillaris* as a variety. If really referable to this latter, Nylander suggests *in litt.* that it may be the same as his var. *subcoronata*. Probably, however, it is nothing very typical, and if belonging to the present variety, is only a simpler condition, and such as sometimes occurs in this country.

Hab. On mossy boulders in wooded mountainous districts.—*Distr.* Very local and scarce (at least in its more characteristic state) in S.W. and N. England and the Highlands, Scotland.—B. M.: Dartmoor, S. Devon; Wark, Northumberland. Balcaldine, Argyshire; Falls of Bruar, Blair Athole, Perthshire; Craig Cluny, Braemar, Aberdeenshire.

Var. δ . *ostreata* Nyl. Lich. Par. (1855) n. 108, Syn. i. p. 225.—Thallus with the basal squamules ascending, subimbricate, usually subrotundate, white-pulverulent at the margin and on the under surface; podetia small, white-pulverulent, the scyphi narrow. Apothecia minute, very rare.—Cromb. Grevillea, xi. p. 115.—*Cladonia digitata* var. *macilenta* f. *ostreatiformis* Leight. Lich. Fl. p. 70, ed. 3, p. 64.—*Brit. Exs.*: Mudd, Clad. n. 69; Leight. n. 371.

Readily recognized by the basal squamules bearing a very considerable resemblance to those of *Lecidea ostreata*, from which when sterile it is distinguished by the different reaction with K. In our British specimens the podetia are usually short, somewhat cornute at the apices, or when better developed narrowly scyphiferous. The apothecia are extremely rare, though the spermogones are not unfrequent.

Hab. On old mossy stumps of trees in upland wooded districts.—*Distr.* Found sparingly only here and there throughout England.—B. M.: Epping Forest, Essex; New Forest, Hants; Charnwood Forest, Leicestershire; Wrekin Hill, Shropshire; Battersby, Cleveland, Yorkshire.

36. *C. bacillaris* Nyl. ex Cromb. Linn. Soc. Journ., Bot. xvii. (1880) p. 559.—Thallus minutely squamulose at the base; squamules incised and crenate, greyish-white above, white beneath; podetia slender, cylindrical, simple or shortly branched at the apices, very rarely narrowly scyphiferous, greyish-white, granuloso-pulverulent (K—, CaCl—). Apothecia small, discrete or confluent.—Cromb. Grevillea, xi. p. 115.—*Cladonia Floerkiana* var. *bacillaris* Leight. Ann. Mag. Nat. Hist. ser. 3, xviii. p. 417 pro parte; Lich. Fl. p. 71, ed. 3, p. 65 pro parte. *Cladonia Floerkiana* var. *bacillaris* Cromb. Lich. Brit. p. 21. *Scyphophora bacillaris* Gray, Arr. i. p. 422 pro parte. *Cenomyces bacillaris* Ach. Meth. (1803) p. 329.

Cladonia coccifera *ε. macilenta* *a. clavata* Mudd, Brit. Clad. p. 31. *Coralloides ramulosum, tuberculis coccineis* Dill. Muse. 96, t. 15. f. 19 c.—*Brit. Exs.*: Mudd, Clad. n. 70; Bohl, n. 80.

From *C. macilenta* (typical), to which it is similar and with which it has usually been confounded, this species is at once separated by the absence of any reaction with K. In other respects it differs in the podetia being more slender and granuloso-pulverulent. Our British specimens are but rarely well fertile.

Hab. On the bare ground and turf-walls in upland situations.—*Distr.* Seen only from a few localities in S. England, the Scottish Grampians, and N.W. Ireland.—B. M.: Bournemouth, Hampshire; Wadebridge, Cornwall. Appin, Argyleshire; Glen Lochay and Rannoch, Perthshire; Hills at Nigg, Kincardineshire; Castleton of Braemar, Aberdeenshire. Near Kylemore, co. Galway.

Form **pityropoda** Nyl. *ex* Cromb. Grevillea, xi. (1883) p. 115.—Podetia somewhat thick, granuloso-rugose, simple or shortly divided at the apices.

This form, which is distinguished by the thicker and coarsely granulose podetia, is analogous to var. *scabrosa* of *Cl. macilenta*. Our British specimens are for the most part well-fruited.

Hab. On the ground and turf-walls in upland tracts.—*Distr.* Local and scarce in N. England, among the Grampians, Scotland, and in N. Ireland.—B. M.: Kildale Moor, Cleveland, Yorkshire. Appin, Argyleshire; Rannoch, Perthshire. Colin Glen, near Belfast, co. Antrim; Connemara, co. Galway.

Var. **β. subcoronata** Nyl. *ex* Cromb. Grevillea, xii. (1884) p. 92.—Podetia thickish, granulato-squamulose, somewhat simple or digitately branched towards the apices.—*Coralloides ramulosum, tuberculis coccineis* Dill. Muse. 96, t. 15. f. 19 a, b.—*Lichen digitatus* pro parte as it appears of our older authors.—*Brit. Exs.*: Mudd, Clad. n. 72 pro parte.

Differs in the podetia being more or less squamulose and often digitately divided, so that it has a considerable resemblance to states of var. *coronata* of the preceding species. The British specimens seen are well fertile.

Hab. On the ground in upland moorlands.—*Distr.* Local and rare in S.W. and N. England, among the S. Grampians, Scotland, and in N.W. Ireland; no doubt overlooked elsewhere.—B. M.: Near Hunter Tor, Dartmoor, Devonshire; St. Breward, Cornwall; Ingleby Park, Cleveland, Yorkshire. Glen Lochay, Killin, Perthshire. Letter Hill, Connemara, co. Galway.

37. **C. Floerkeana** Fr. Sched. Crit. iii. (1824) p. 18.—Thallus squamulose at the base; squamules small, inciso-lobed or crenate, greenish-white above, white beneath, often evanescent; podetia cylindrical, slender, corticate, glabrous, simple or shortly divided at the apices, greyish-white, greyish-green or brownish (K—, CaCl—). Apothecia moderate, usually conglomerate; spores 0.008–10 mm. long, 0.003 mm. thick.—Cromb. Grevillea, xi. p. 115, Lich. Brit.

p. 21 pro parte; Leight. Lich. Fl. p. 71 pro parte, ed. 3, p. 65 pro parte.—*Cladonia coccifera* γ . *Floerkeana* Mudd, Man. p. 61 pro parte, Brit. Clad. p. 33 pro parte.

Closely allied to *C. bacillaris*, from which it is distinguished by the glabrous corticate podetia, which are often blackish at the base. It is almost always abundantly fertile, and the fine scarlet, often confluent apothecia render it one of our most beautiful species.

Hab. On peaty ground in subalpine mountainous moorlands.—*Distr.* Local and rare in its typical state, having been found only in a few places in the Scottish Highlands and S.W. Ireland.—B. M.: Achrosagan Hill, Appin, Argyleshire; Craig Calliach, Perthshire; Head of Glen Callater, Braemar, Aberdeenshire. Killarney, co. Kerry.

Form *trachypoda* Nyl. ex Cromb. Journ. Bot. 1876, p. 360.—Podetia rather shorter, more or less verrucoso-squamulose.—Cromb. Grevillea, xi. p. 115.—*Cladonia coccifera* ϵ . *macilenta* b. *carcata* Mudd, Brit. Clad. p. 32.—To this is also referable *Cladonia Floerkeana* var. *bacillaris* Leight. pro parte.—*Brit. Ecs.*: Mudd, Clad. n. 71; Larb. Lich. Hb. n. 84.

Usually not rightly distinguished from the type, this differs in the podetia being either partly verrucose or entirely squamulose. Intermediate states, however, in which the squamules are but sparingly present (though probably from abrasion), are frequent in herbaria.

Hab. On the ground, generally on peaty soil in upland and subalpine mountainous regions.—*Distr.* Not unfrequent in Great Britain and Ireland; very abundant among the Scottish Grampians.—B. M.: Epping Forest, Essex; Leith Hill, Surrey; Dartmoor, Devonshire; Bardon Hill, Leicestershire; Rhewgreidden, Merionethshire; Baysdale, Cleveland, Yorkshire; West Allen Carrs, Northumberland. New Galloway, Kirkcudbrightshire; Achrosagan Hill, Appin, Argyleshire; Sheriffmuir, near Stirling; Craig Tulloch and Rannoch, Perthshire; Canlochan Glen, Clova, Forfarshire; Cairnma Earn, Kincardineshire; Hill of Fare and Morrone, Braemar, Aberdeenshire; Lairg, Sutherlandshire; Applecross, Ross-shire. Doneraile Mts., co. Cork; Killarney, co. Kerry; near Kylemore, co. Galway.

33. CLADINA Nyl.

Not. Sällsk. pro F. et Fl. Fenn. Förh. n. s. v. (1866) p. 110.—Thallus wanting at the base; podetia fruticulose, very much branched, more or less smooth, glabrous; scyphi none or narrow. Apothecia terminal on the apices of the branches, biatorine, small, pale or brown; spores 8næ, oblong, simple, colourless; thecæ, especially the apices, bluish with iodine.



Fig. 36.

Cladina rangiferina Nyl.—a, a'. Vertical sections of two apothecia (the lower juvenile), $\times 30$. b. Theca and paraphysis, $\times 350$. c. Spores, $\times 500$. d. Vertical section of a spermogone, $\times 30$. e. Sterigmata, and f, spermatia, $\times 500$.

Spermogones terminal, conical; spermatia cylindrical, somewhat curved or straight.

Distinguished from *Cladonia* by the absence of a basal thallus*, and by the podetia being naked, usually asecyphous, with the cortex not pulveraceo-fatiscent. The species are extremely social, some of them in Arctic and Antarctic regions forming the most characteristic feature of the vegetation, as also on the higher moorlands and mountains of more temperate climes.

1. *C. rangiferina* Nyl. Not. Sällsk. pro F. et Fl. Fenn. Förh. n. s. v. (1866) p. 110.—Podetia very much branched, cylindrical, somewhat slender, opaque, subperforate at the axils, more or less verruculoso-scabrous, subtomentose, greyish or greyish-white: branches short, divaricate or subdeflexed, subsecund, the apices nodding when sterile, erect and subcorymbose when fertile (K + yellow, CaCl—). Apothecia small; spores oblongo-fusiform, 0.010–15 mm. long, 0.0035 mm. thick.—Leight. Ann. Mag. Nat. Hist. ser. 3, xviii. p. 418; Cromb. Lich. Brit. p. 22.—*Cladina rangiferina* Leight. Lich. Fl. p. 74, ed. 3, p. 67. *Cladonia rangiferina* Gray, Nat. Arr. i. p. 415; Sm. Eng. Fl. v. p. 235; Mudd, Man. p. 58; Brit. Clad. p. 24. *Cenomyce rangiferina* Hook. Fl. Scot. ii. p. 65; Tayl. in Mack. Fl. Hib. ii. p. 78. *Lichen rangiferinus* Linn. Sp. Pl. (1753) p. 1153; Huds. Fl. Angl. p. 458; Lightf. Fl. Scot. ii. p. 877; With. Arr. ed. 3, iv. p. 41; Eng. Bot. t. 173. *Coralloides montanum fruticuli specie ubique candicans* Dill. Musc. 107, t. 16. f. 29 A–D. *Lichenoides tubulosum ramosissimum, fruticuli specie ubique candicans* Dill. in Ray, Syn. p. 66, n. 14.—Under this our earlier, and some more recent, authors include also the following species.

This, with *C. sylvatica*, is the familiar “Reindeer Moss.” By the separation of that species it is not so variable as it was formerly regarded. The podetia are elongate, 3–5 in. and sometimes more in length, densely stipate, subsmooth or granuloso-unequal, more or less tomentose, trichotomously branched, with the branches closer at the apices. In dry and more exposed situations they occasionally become greyish-brown. With us the apothecia are comparatively rare, but the spermogones are more frequent.

Hab. On the ground, usually in boggy places, on moorlands and mountains from upland to subalpine regions.—*Distr.* Not general nor common in Great Britain, and not yet seen from Ireland.—B. M.: Trevello Carne, near Penzance, Cornwall; Charnwood Forest, Leicestershire; Delamere Forest, Cheshire; Snowdon, Carnarvonshire; the Cheviots, Northumberland. Glen Lochay, Ben Lawers, and Rannoch Moor, Perthshire; Clova, Forfarshire; Craig Coinnoch and Glen Callater, Braemar, Aberdeenshire; Rothiemurchus Forest, and Glen Nevis, Inverness-shire.

Form *gigantea* Nyl. & Lamy. Bull. Soc. Bot. Fr. t. xxv. (1878) p. 358.—Podetia more elongate, thickish, granuloso-unequal, whitish

* In Medd. Soc. pro F. et Fl. Fenn. xiv. p. 32, Dr. Wainio affirms that both *C. sylvatica* and *C. uncialis* do very rarely occur with a basal thallus; but this certainly requires further proof.

and partly greyish-brown, the branches erect at the apices.—Cromb. Grevillea, xi. p. 115.—*Lichen giganteus* Bory, Voy. iii. (1803) p. 83.

Distinguished by the longer (4-8 in.) and thicker podetia, and is connected with the type by intermediate states. Of the few British specimens only one is sparingly fertile.

Hab. Among mosses on subalpine heaths.—*Distr.* Found only once and sparingly among the N. Grampians.—B. M.: Glen Derrie, Braemar, Aberdeenshire.

2. *C. sylvatica* Nyl. Not. Sällsk. pro F. et Fl. Fenn. Förh. n. s. v. (1866) p. 176.—Podetia much branched, cylindrical, slender, opaque, subperforate at the axils, glabrous, at length verruculoso-scabrous, pale straw-coloured or whitish; branches short, divaricate or subdeflexed, the apices subsecund, nodding when sterile, erect and subcorymbose when fertile (K—, K(CaCl)+yellow). Apothecia and spores as in the preceding species.—Leight. Ann. Mag. Nat. Hist. ser. 3, xviii. p. 418; Cromb. Lich. Brit. p. 22.—*Cladina sylvatica* Leight. Lich. Fl. p. 72, ed. 3, p. 66. *Cladonia rangiferina* β . *sylvatica* Mudd, Man. p. 59, Brit. Clad. p. 25. *C. sylvatica* Hoffm. Deutsch. Fl. ii. (1795) p. 114. *Coralloides fruticuli specie candicans, corniculis rufescentibus* Dill. Musc. 110, t. 19. f. 30 B.—As already noticed, *Lichen sylvaticus* of Hudson and Lightfoot is referable to *Cladonia pungens*.—Brit. Ecs.: Leight. n. 57; Mudd, nos. 19, 20, Clad. nos. 57, 58; Larb. Lich. Hb. nos. 242, 243; Bohl. n. 6.

Apart from the etomentose podetia this differs but little in external form and appearance from *C. rangiferina*, of which it has generally been regarded only as a variety with somewhat uncertain characters. By the aid of the chemical reactions, however, we are now able to distinguish it in all its different states, and to assign to it its proper specific value. In this country it is comparatively rare in a fertile condition.

Hab. On the ground in forests, on moorlands and mountains from lowland to alpine regions.—*Distr.* General and frequent throughout Great Britain and no doubt also Ireland; rare in the Channel Islands; often constituting in otherwise sterile tracts the greater part of the vegetation.—B. M.: Quenvais, Island of Jersey. North Wootton Common, Norfolk; Epping Forest, Essex; Shanklin Downs, Isle of Wight; New Forest, Hants; Dartmoor, Devonshire; Tregawn, Cornwall; Farnham Royal Common, Bucks; Nettiehead Wood, Oxfordshire; Charnwood Forest, Leicestershire; Wyre Forest, Worcestershire; Haughmond Hill, Shropshire; Barmouth and Rhewgreiddan, Merionethshire; Ayton and Kildale Moors, Cleveland, Yorkshire; Windermere, Westmoreland; the Cheviots and West Allen Carrs, Northumberland. New Galloway, Kirkcudbrightshire; Pentland Hills near Edinburgh; Ben Cruachan, Argyshire; Ben Lawers, Kinross Hill and Moncrieffe Hill, near Perth, and Rannoch Moor, Perthshire; Sidlaw Hills, Forfarshire; Countesswells Wood, near Aberdeen, Mar Forest and Ben-naboord, Braemar, Aberdeenshire; Rothiemurchus and Ben Nevis, Inverness-shire; Lairg, Sutherlandshire; Applecross, Ross-shire. Connemara, co. Galway; Arklow, co. Wicklow.

Form 1. **tenuis** Lamy, Bull. Soc. Bot. Fr. t. xxv. (1878) p. 358.—Podetia somewhat short, very slender, much and intricately branched.—Cromb. Grevillea, xii. p. 92.—*Brit. Ees.*: Mudd, Clad. n. 58 (vix).

Has very much the aspect of *Cladonia pungens*, from which, as well as from an analogous form (*tenuis* Floerke) of *C. rangiferina*, not yet detected in Britain, it differs in the absence of any reaction with K. It is from 1 to $1\frac{1}{3}$ in. high, and with us occurs only sterile.

Hab. On the ground in upland situations.—*Distr.* Seen only from a few localities in S. and N. England, and S. and Central Scotland.—B. M.: Epping Forest, Essex; New Forest, Hants; Kildale Moor, Cleveland, Yorkshire (atypical). Near Castle Douglas, Kirkcudbrightshire; Rannoch, Perthshire; Sidlaw Hills, Forfarshire; Glen Nevis, Invernessshire.

Form 2. **lacerata** Nyl. ex Nörrl. Medd. Soc. pro F. et Fl. Fenn. (1876) p. 14.—Podetia moderate, very shortly branched, perforate or lacerate at the axils.—Cromb. Grevillea, xi. p. 115.—*Cenomyce sylvatica* δ . *lacerata* Del. in Dub. Bot. Gall. ii. (1830) p. 621.

The lacerate axils of the rather stouter and shortly branched podetia distinguish this form. The apothecia are rare.

Hab. In moist sandy places and on moorlands in maritime and upland districts.—*Distr.* Local and scarce in the Channel Islands, S.W. England, S. Scotland, and the Central and N.E. Grampians.—B. M.: Quenvais, Island of Jersey. Near Bodmin, Cornwall. New Galloway, Kirkcudbrightshire; Moor of Rannoch, Perthshire; Hills at Nigg, Kincardineshire.

Var. β . **grandis** Cromb. Grevillea, xii. (1884) p. 92.—Podetia robust, inflato-cylindrical, flexuose, much branched, pale straw-coloured, the branches short, somewhat drooping and brownish at the apices.—*Cladonia rangiferina* var. *grandis* Flörke, Clad. (1828) p. 169; Mudd, Brit. Clad. p. 25.—*Brit. Ees.*: Mudd, Clad. n. 60.

Well distinguished by the much stouter podetia with their shorter branches. Although regarded by some authors as a distinct species s. n. *Cladonia arbuscula* Wallr., it holds only a somewhat analogous relation to the type as *forma gigantea* does to the preceding species. It varies in length from 3 to 5 in., and occasionally has the podetia very robust and less branched. The few British specimens are only sparingly fertile.

Hab. On the ground in elevated moorlands in mountainous regions.—*Distr.* Sparingly in N. England, S. Scotland, and among the Grampians.—B. M.: Ayton Moor, Cleveland, Yorkshire. Barend Moss, New Galloway, Kirkcudbrightshire; Sidlaw Hills, Forfarshire; Rannoch Moor, Perthshire; Glen Dee, Braemar, Aberdeenshire.

Form **portentosa** Leight. Ann. Mag. Nat. Hist. ser. 3, xviii. (1866) p. 419.—Podetia very thick, difform, lacerate, verruculoso-scabrid, very shortly branched, the branches turgid and denticulato-cristate at the apices.—Cromb. Lich. Brit. p. 22, Grevillea, xi. p. 115.—*Cladina sylvatica* form *portentosa* Leight. Lich. Fl. p. 73,

ed. 3, p. 67. *Cenomyce portentosa* Duf. Ann. Sc. Physiq. t. viii. (1821) p. 69.

The turgid deformed podetia and the form of their apices distinguish this. Apparently, however, it is only an abnormal and stunted condition of the preceding variety. It is very rarely fertile.

Hab. In moist places on moorlands in upland districts.—*Distr.* Local and scarce in S.W. and Central England, in S. Scotland, and among the Grampians.—B. M.: Near Penzance, Cornwall; Charnwood Forest, Leicestershire. New Galloway, Kirkcudbrightshire; Moor of Rannoch, Perthshire; Mar Forest, Braemar, Aberdeenshire.

Var. γ . *alpestris* Nyl. Not. Sällsk. pro F. et Fl. Fenn. Förh. n. s. v. (1866) p. 176.—Podetia slender, somewhat soft, intricately and divaricately branched, the branches and branchlets very densely thyrsoïd.—Leight. Ann. Mag. Nat. Hist. ser. 3, xviii. p. 119; Cromb. Lich. Brit. p. 22.—*Cladina sylvatica* f. *alpestris* Leight. Lich. Fl. p. 73, ed. 3, p. 67. *Cladonia rangiferina* β . *alpestris* Mudd, Man. p. 59, Brit. Clad. p. 25. *Lichen rangiferinus alpestris* Linn. Sp. Pl. (1753) p. 1153; Huds. Fl. Angl. p. 458; Lightf. Fl. Scot. ii. p. 877. *Coralloides montanum*, *fruticuli specie ubique candicans* Dill. Muse. 107, t. 16. f. 29 E, F.—*Brit. Exc.*: Larb. Lich. Hb. n. 85.

A well-marked variety, which alike in a young and mature state appears to be constant to its characters. It is easily recognized by the densely thyrsoïd apices of the podetia, which are usually shorter than in the type. With us it is very seldom fertile.

Hab. In moist places of woods and moorlands in upland and subalpine regions.—*Distr.* Local and scarce in England and Ireland; more frequent among the Grampians, Scotland.—B. M.: Charnwood Forest, Leicestershire; Rhewgreiddan, N. Wales; Windermere, Westmoreland. Glen Lochay, Perthshire; Hill of Ardo, near Aberdeen, and Ben-naboord, Braemar, Aberdeenshire; Glen Nevis, Inverness-shire. Ballytore, co. Kildare; Kylemore, co. Galway.

Form *pumila* Leight. Ann. Mag. Nat. Hist. ser. 3, xviii. (1866) p. 419.—Podetia short, slender, very much branched, rather fragile, densely caespitose-pulvinulate.—Cromb. Lich. Brit. p. 22; Grevillea, xi. p. 115.—*Cladina sylvatica* f. *pumila* Leight. Lich. Fl. p. 73, ed. 3, p. 67. *Cenomyce rangiferina* ξ . *pumila* Ach. Lich. Univ. (1810) p. 566.—*Brit. Exc.*: Mudd, Clad. n. 52.

The much smaller size (1-2 in. high) and the caespitose pulvinate habit distinguish this form. It approaches states of *Cladonia pungens*, from which the absence of any reaction with K keeps it distinct. It rarely occurs in a fertile condition.

Hab. In dry bare places on heaths and on turf-walls in upland districts.—*Distr.* Rather local and scarce in Great Britain, and not seen from Ireland; probably often overlooked.—B. M.: Broadwater Forest, Sussex; Charnwood Forest, Leicestershire; Rhewgreiddan, Merionethshire; Burton Head, Cleveland, Yorkshire. Appin, Argyleshire; Rannoch, Perthshire; Glen Dee, Braemar, Aberdeenshire; Rothiemurchus, Inverness-shire.

3. *C. uncialis* Nyl. Not. Sällsk. pro F. et Fl. Fenn. Förh. n. s. v. (1866) p. 111.—Podetia cylindrical, somewhat close, glabrous or verruculose, shining or subopaque, shortly and dichotomously branched, more or less perforate at the axils, straw-coloured or greenish-straw-coloured, the apices erect, subulate or (2–5) denticulate when sterile, digitato-radiate when fertile; scyphi none (K—, K(CaCl)+yellowish). Apothecia small, pale or brown; spores oblongo-fusiform, 0.008–12 mm. long, 0.0035 mm. thick.—Cromb. Lich. Brit. p. 22.—*Cladina uncialis* Leight. Lich. Fl. p. 74, ed. 3, p. 67. *Cladonia uncialis* Gray, Nat. Arr. i. p. 415; Sm. Eng. Fl. v. p. 238; Mudd, Man. p. 59. *Cenomyce uncialis* Hook. Fl. Scot. ii. p. 64; Tayl. in Mack. Fl. Hib. ii. p. 78. *Lichen uncialis* Linn. Sp. Pl. (1753) p. 1153; Huds. Fl. Angl. p. 459; Lightf. Fl. Scot. ii. p. 880; With. Arr. ed. 3, iv. p. 44; Eng. Bot. t. 174. *Cladonia stellata* Schær., Mudd. Brit. Clad. p. 26. *Coralloides perforatum minus molle et tenue* Dill. Musc. 99, t. 16. f. 22 A, c, d. *Lichenoides tubulosum cauliculis mollioribus et crassioribus, minus* Dill. in Ray, Syn. ed. 3, p. 67, n. 21.—*Brit. Exs.*: Bohl. nos. 15, 31.

Though the podetia are usually glabrous, yet when the plant grows at high altitudes and in exposed situations they often become subgranulato-unequal, as also in the following forms. In the type the podetia are of nearly equal thickness throughout, and vary in height from 1–3 inches. The apothecia are very rare with us, nor are the spermogones frequent.

Hab. On the ground among mosses on moorlands and mountains from upland to alpine regions.—*Distr.* General and common throughout Great Britain, and probably in Ireland; usually associated with the two preceding species.—B. M.: Yarmouth, Suffolk; Reigate Heath, Surrey; near Tunbridge Wells, Kent; Hay Tor, Dartmoor, Devonshire; near Respring, Cornwall; Charnwood Forest, Leicestershire; Hartlebury Common, Worcestershire; Barmouth and Rhewgreidden, Merionethshire; Ingleby Moor, Cleveland, Yorkshire; The Cheviots, Northumberland. New Galloway, Kirkcudbrightshire; Ben Lomond, Dumbartonshire; Craig Calliach and Rannoch Moor, Perthshire; Clova, Forfarshire; Hill of Ardo, near Aberdeen, Glen Callater and Ben Macdhui, Braemar, Aberdeenshire; near Rothiemurehus and Ben Nevis, Inverness-shire; Lairg, Sutherlandshire; Hills of Applecross, Ross-shire. Coachford, near Cork; Erris, co. Mayo; Kylemore, co. Galway.

Form 1. *bolacina* Cromb. Lich. Brit. (1870) p. 22.—Podetia short, slender, usually very much and somewhat intricately branched, imperforate at the axils.—Cromb. Grevillea, xi. p. 115.—*Cenomyce uncialis* γ. *bolacina* Ach. Lich. Univ. (1810) p. 559.—*Brit. Exs.*: Leight. n. 58; Mudd, n. 17, Clad. n. 61.

Cespitosely pulvinate in habit, and distinguished by the smaller and much more branched podetia, which are scarcely 1 in. long. They are occasionally “adpersed with a verrucæform lepra” Del.—“rugoso-verrucose with brown points” Schær., var. *leprosa* (Del.), which appears to be caused by a fungus. It is rarely fertile.

Hab. In dry places among mosses on moorlands in upland districts.—*Distr.* Apparently local and scarce in N. England, N. Wales, and among the Grampians, Scotland.—B. M.: Hay Tor, Dartmoor, Devonshire; Haughmond Hill, Shropshire; Rhewgreidden, Merionethshire; Cleve-

land, Yorkshire. Rannoch, Perthshire; Morrone, Braemar, Aberdeenshire (in both localities also *leprosa* (Del.)).

Form 2. **adunca** Cromb. Journ. Linn. Soc. Bot. xvii. (1880) p. 560, Grevillea, xi. p. 115.—Podetia elongate, thickened upwards, sparingly branched, perforate at the axils; branches subfastigiate, subulate, furcate, or stellato-dentate at the apices.—*Cladina uncialis* f. *adunca* Leight. Lich. Fl. p. 75, ed. 3, p. 68. *Cladonia uncialis* β. *adunca* Gray, Nat. Arr. i. p. 415; Hook. Fl. Scot. ii. p. 64. *Cladonia stellata* β. *adunca* Mudd, Brit. Clad. p. 26. *Bæomyces aduncus* Ach. Meth. (1803) p. 353. *Cladonia uncialis* β. *elutior* Fr., Mudd, Man. p. 59. *Lichen uncialis* var. β, Huds. Fl. Angl. ed. 2, p. 555; Lightf. Fl. Scot. ii. p. 880; With. Arr. ed. 3, iv. p. 44. *Coralloides perforatum majus, molle et crassum* Dill. Musc. 98, t. 16. f. 21. *Lichenoides tubulosum, cauliculis mollioribus et crassioribus, majus* Dill. in Ray Syn. ed. 3, p. 67, n. 20.—*Brit. Exs.*: Mudd, n. 21, Clad. n. 62.

Larger than the type, usually 3–4 in. in length, with the podetia softer, thicker, more open at the axils, and subfastigiate at the apices, which are somewhat variable in form. The apothecia are very rare in our specimens.

Hab. On the ground in damp places on moorlands and mountains in upland and subalpine districts.—*Distr.* Probably general in Great Britain; apparently rare in S. Ireland.—B. M.: Esher, Surrey; Dartmoor, Devonshire; near Penzance and Withiel, Cornwall; Cwm Bychan, Merionethshire; Battersby Moor and Ayton Moor, Cleveland, Yorkshire; The Cheviots, Northumberland. Ben Lomond, Dumbartonshire; Ben Cruachan, Argyleshire; Craig Calliach and Rannoch Moor, Perthshire; Clova Mts. and Sidlaw Hills, Forfarshire; Lochnagar, Braemar, Aberdeenshire; Ben Nevis, Inverness-shire. Doneraile Mts., co. Cork.

Form 3. **turgescens** Cromb. Lich. Brit. (1870) p. 22.—Podetia thick, turgid, sparingly branched, perforate at the axils; branches subtruncate, fastigiate, stellato-denticulate at the apices.—*Cladina uncialis* f. *turgescens* Leight. Lich. Fl. p. 75, ed. 3, p. 68. *Cladonia uncialis* c. *turgescens* Fr. Lich. Eur. (1831) p. 244; Mudd, Man. p. 59. *Cladonia stellata* β. *adunca* b. *turgescens* Mudd, Brit. Clad. p. 27. *Cladonia uncialis* β. *turgida* Schær., Sm. Eng. Fl. v. p. 235.

Perhaps a more turgid state of the preceding, with which it seems to be confluent, though differing also in the subtruncate apices. The podetia, which are 2–3 in. in height and often more than 3 mm. in thickness, are sometimes much deformed. In our British specimens the apothecia are rare.

Hab. On the ground among mosses and on turf-walls in upland moorlands.—*Distr.* Local and scarce in S. and W. England, S. Scotland, and among the Grampians.—B. M.: Aldershot, Hants; Cwm Bychan, Merionethshire. New Galloway, Kirkcudbrightshire; Ben Lawers and Rannoch, Perthshire; Sidlaw Hills, Forfarshire; Hill of Ardo, near Aberdeen; Moor of Morrone, Braemar; Rothiemurchus, Inverness-shire.

Form 4. **obtusata** Nyl. Not. Sällsk. pro F. et Fl. Fenn. Förh. n. s. v. (1866) p. 111.—Podetia decumbent, short, turgid, simplish

or very shortly branched; the branches obtuse, usually imperforate and shortly denticulate at the apices. Spores 0.008–9 mm. long.—Cromb. Journ. Linn. Soc. Bot. xvii. p. 561.—*Cladina uncialis* f. *obtusata* Leight. Lich. Fl. ed. 3, p. 68. *Cenomyce uncialis* δ. *obtusata* Ach. Lich. Univ. (1810) p. 559. *Coralloides imperforatum corniculis brevissimis crispis* Dill. Musc. 100, t. 16. f. 12.

The short ($\frac{1}{3}$ in. to 1 in. long), inflated, decumbent podetia, with their thickened and frequently dark brown apices, characterize this form. In more branched specimens the podetia are somewhat aggregated, but when simpler they are often somewhat discrete, owing to the nature of the habitat. The apothecia are extremely rare, and even the spermogones are seldom visible.

Hab. In peat bogs on upland and subalpine moorlands.—*Distr.* Apparently local and scarce in N. Wales, S. Scotland, among the Grampians, and in S.E. and N.W. Ireland.—B. M.: Snowdon, Carnarvonshire. New Galloway, Kirkcudbrightshire; Craig Calliach and Moor of Rannoch, Perthshire; Glen Caudlie and Ben Macdhui, Braemar, Aberdeenshire. Kylemore, co. Galway; Achavanagh, co. Wicklow.

4. *C. amaurocraea* Nyl. Not. Sällsk. pro F. et Fl. Fenn. Förh. n. s. v. (1866) p. 111.—Podetia slender, close, erect, glabrous, subulate, more or less branched, sparingly and narrowly scyphiferous, straw-coloured or whitish straw-coloured; scyphi dentato-cristate, or subulato-spinulose at the margins, often proliferous, rarely perforate at the axils (K—, K (CaCl) + yellow). Apothecia somewhat small or moderate, brown or pale-testaceous; spores oblong, 0.009–12 mm. long, 0.0035 mm. thick.—Cromb. Lich. Brit. p. 22.—*Cladina amaurocraea* Leight. Lich. Fl. p. 74, ed. 3, p. 67. *Cladonia amaurocraea* Mudd, Brit. Clad. p. 27. *Capitularia amaurocraea* Flörke in Web. et Mohr, Beitr. ii. (1810) p. 334.—As observed in Grevillea, xi. p. 115, var. *myriocraea* (? Flörke) Mudd, Brit. Clad. p. 27, Exs. n. 18, is referable to some condition of *Cladonia furcata* rather than to this species; but the specimens seen are imperfect.

From the closely allied *C. uncialis* this, when well developed, is easily known by the podetia being scyphiferous, more slender, and close. When ascyphous, as it often occurs, it is apt to be confounded with that species, though even then it must be regarded as distinct. With us the apothecia are very rare, and the spermogones only occasionally present.

Hab. On the ground in moist places amongst heaths in upland and subalpine regions.—*Distr.* Found sparingly among the Grampians, Scotland, and in N.W. Ireland.—B. M.: Rannoch Moor, Perthshire; Benaboard and Glen Dee (frt.), Braemar, Aberdeenshire. Near Kylemore, co. Galway.

Subsp. *C. destrieta* Nyl. ex Norrl. Sällsk. pro F. et Fl. Fenn. Förh. xiii. (1873) p. 321.—Podetia short, more or less verrucose, not close, but vaguely directed, much branched, ascyphous, straw-coloured or greenish-grey; branches short, subulate or furcate at the apices. Apothecia not seen.—Cromb. Journ. Bot. 1876, p. 360, Grevillea, xi. p. 115.—*Cladonia amaurocraea* f. *destrieta* Nyl. Scand. (1861) p. 59.

Cladonia amaurocraea c. *depressa* Mudd, Brit. Clad. p. 28.—*Brit. Ees.*: Mudd, n. 18, Clad. n. 64. To this is probably referable Mudd, Clad. n. 63, as an atypical state.

Well distinguished as a subspecies by the vaguely directed ascyphous podetia. It appears on the summits of the higher Grampians in the form of rotundate tufts of moderate size, and along with a small form of *Lycopodium Selago* L. often constitutes the scanty vegetation of the granitic and schistose detritus. The débris of the podetia, broken by the tread of sheep or the red deer, may be found extensively scattered over the ground (*cfr.* Lamy, Lich. Mt. Dôr. p. 23). It is never fertile.

Hab. On sterile moorlands and mountains from upland to alpine regions.—*Distr.* Local in N. Wales, N. England, and S. Scotland; but usually abundant among the Grampians, Scotland, especially in Braemar.—B. M.: Snowdon, Carnarvonshire; Baysdale and Guisboro' Moors, Cleveland, Yorkshire. New Galloway, Kirkeudbrightshire; Ben Lawers, Perthshire; Morrone and Cairngorm, Braemar, Aberdeenshire; Ben Nevis, Inverness-shire.

Series III. *Ramalodei* Nyl. Mém. Soc. Cherb. iii. (1855) p. 170.

Thallus fruticulose or filamentose, erect or pendulous, rounded, compressed, or angulose, corticate on both sides, destitute of leaflets, granules or basal crust, internally hollow or solid. Apothecia usually lecanorine, rarely lecideine or difform: spores ellipsoid and simple, or oblong and 1-3-septate; paraphyses either not discrete or sometimes discrete. Spermatogones with sterigmata either simple or pauci-articulate, and straight, rarely curved spermatia.

This series is distinguished from the preceding by the naked thallus and the absence of a basal crust. Though more compact and better limited than *Cladodei*, the tribes and genera of which it is composed differ considerably from each other. There are, however, close and important links which render the series a very natural one.

Tribe VII. *ROCCELLEI* Nyl. Mém. Soc. Cherb. iii. (1855) p. 170.

Thallus subsimple or branched, rounded or compressed, subcartilaginous, erect, or at length somewhat pendulous, internally entirely filled with a filamentose medulla. Apothecia lecanorine, lecideine, or irregular, lateral or terminal, adnate or innate; spores 8næ (or 6næ), oblongo-fusiform, 3-septate, colourless; paraphyses discrete. Spermatogones immersed: sterigmata simple or subsimple.

A distinct tribe, comprising two small genera, one of which, *Combea*, is exotic. The species are maritime, occurring on rocks, occasionally on trees, chiefly in warm regions, where they occupy the place of the maritime *Ramalinas* of colder climates, towards which in habit and various characters they approach. They yield a valuable purple dye—the well-known "Orchill" of commerce.

34. **ROCCELLA** DC. Fl. Fr. ii. (1805) p. 334.—Thallus subfruticulose, usually opaque and smoothish, somewhat tough, attenuate at the apices, concolorous on both sides, medullary layer dense. Apothecia lateral, lecideine or irregular, naked or pruinose; hypothecium thick, black; spores oblong or fusiform, straight or curved; hymenial gelatine wine-red or wine-yellow, or sometimes slightly bluish with iodine. Spermatogones lateral, with acicular, curved spermatia.

The thallus is more or less fruticulose from a common base, and in some species is of considerable size. It is whitish, rarely brownish, in colour, and firm, though sometimes from tenuity becoming flaccid. The cortical and gonidial systems, as observed by Nylander, Syn. i. p. 256 (*cfr.* Flora, 1866, p. 198), form a confluent layer, the cortex, which is destitute of an epithallus, consisting of medullary filaments thickened towards the surface and there densely parallel, external to which are seen granular elements, while internally and immediately beneath the cortex are the gonidia. The apothecia are lecideine or variously deformed, often as in *Dirina*, sometimes as in *Chiodecton*, with the paraphyses slender or nearly moderate, and not unfrequently bifurcate.

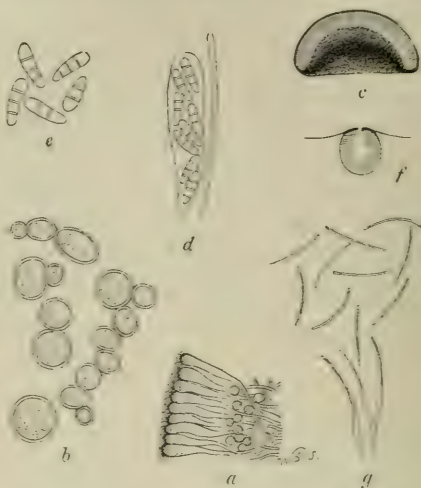


Fig. 37.

Rocella phycopsis Ach.—a. Section of external portion of the thallus, showing the cortical and gonidial layers and a small exterior portion of the medulla, $\times 200$. b. Gonidia, $\times 350$. c. Vertical section of an apothecium, $\times 30$. d. Theca and paraphysis, $\times 350$. e. Spores, $\times 500$. f. Vertical section of a spermatogone, $\times 30$. g. Sterigmata and spermatia, $\times 500$.

1. **R. phycopsis** Ach. Lich. Univ. (1810) p. 440.—Thallus rounded or slightly compressed, very much branched and densely caespitose, whitish or glaucous-brown, more or less sorediiferous; branches subsimple or dichotomously divided (Ca Cl + reddish, soredia —, medulla l + bluish). Apothecia small, lecideine, black, naked or slightly pruinose, somewhat prominent or appressed; spores fusiform-oblong, 0.012–16 mm. long, 0.003–4 mm. thick.—Nyl. Syn. i. p. 259, t. 8. f. 3; Gray, Nat. Arr. i. p. 426; Cromb. Lich. Brit. p. 22; Leight. Lich. Fl. p. 81, ed. 3, p. 74.—*Rocella tinctoria* β . *phycopsis* Mudd. Man. p. 75. *Lichen fucoides* Dicks. Crypt. fasc. ii. p. 22. *Lichen Rocella* With. Arr. ed. 3, iv. p. 42. *Rocella tinctoria* Sm. Eng. Fl. v. p. 221; Mudd, Man. p. 75; Leight. Lich. Fl.

p. 81, ed. 3, p. 74. *Lichen Roccella* Eng. Bot. t. 211, is true *Roccella tinctoria* DC. (*minor*), but the figure is drawn from an exotic specimen.—*Brit. Exs.*: Mudd, n. 48; Larb. Cæsar. n. 11; Lich. Hb. n. 122; Cromb. n. 14.

States with the branches more elongate and scarcely sorediiferous have been confounded with *R. tinctoria*, whose range, however, does not extend so far north as our islands. It differs in its smaller size (1–3 inches in height), the less opaque thallus, which is more thinly branched and sorediiferous (not farinaceous) on the surface, as also in the smaller lecideine apothecia. It is very rarely fertile in Great Britain. The spermogones, which are occasionally present in our specimens, have the sterigmata slender and the spermatia arcuate, 0,013–16 mm. long, scarcely 0,001 mm. thick. Our fig. 37 shows that the globulose or ellipsoid gonidia are simple, or two or more concatenate. The papillæform cells of the cortex are sprinkled with the powder (granulations) of the pigmentary matter.

Hab. On rocks, rarely on walls in maritime localities.—*Distr.* Not uncommon in the Channel Islands and in S. England; extremely rare in S.W. Scotland.—B. M.: St. Brelade's Bay, La Moye and Noirmont, Island of Jersey; Petit-Bot Bay, Island of Guernsey. Godshill Church and Bembridge, Isle of Wight; Portland Island, Dorsetshire; Bolt Head, Lynmouth, and Valley of Rocks, Lynton, Devonshire; Tintagel Castle, Lamorna Cove, Pentire and St. Minver, Cornwall; St. Mary's, Scilly Islands. Millport, Cumbrae Island, Frith of Clyde.

Form *tenuior* Nyl. *ex* Leight. Lich. Fl. ed. 3 (1879) p. 74.—Thallus somewhat elongate, very slender, much branched towards the apices. Apothecia not seen.—*Roccella fuciformis* (errore) f. *tenuior* Cromb. Grevillea, xv. p. 47.

Differs from the type in the more slender, elongate, and apically branched thallus. It is plentifully sorediate, but apparently never fertile.

Hab. On rocks in maritime situations.—*Distr.* Local and scarce in the Channel Islands.—B. M.: La Moye, Island of Jersey.

2. *R. fuciformis* DC. Fl. Fr. ii. (1805) p. 335.—Thallus compressed, much branched, glaucous-white or glaucous-brown, often sorediiferous; branches dichotomously laciniate (Ca Cl—, soredia + reddish, medulla I + bluish). Apothecia moderate, superficial, lecanorine, black, pruinose, the thalline margin at length nearly excluded; spores fusiform or oblongo-fusiform, 0,020–30 mm. long, 0,004–6 mm. thick.—Gray, Nat. Arr. i. p. 426; Sm. Eng. Fl. v. p. 222; Tayl. in Mack. Fl. Hib. ii. p. 83; Mudd, Man. p. 76, t. 1. f. 18; Cromb. Lich. Brit. p. 23; Leight. Lich. Fl. p. 82, ed. 3, p. 74. *Lichen fuciformis* Linn. Sp. Pl. (1753) p. 1614; Dicks. Crypt. fasc. iii. p. 17; With. Arr. ed. 3, iv. p. 51; Eng. Bot. t. 728. *Lichenoides fuciforme tinctorium, corniculis longioribus et acutioribus* Dill. Musc. 168, t. 23. f. 61.—*Brit. Exs.*: Leight. n. 171; Larb. Cæsar. n. 12; Lich. Hb. n. 123; Cromb. nos. 15, 125.

From *R. phycopsis*, with which in this country it is usually found associated, this differs in its compressed, broader, generally longer thallus, and in the fructification. It varies considerably in size, occasionally

attaining a length of 6 inches or more. The apothecia are rare in Britain, though numerous when present. They are dirinean in appearance, superficial, somewhat prominent, chiefly marginal, with the pruina at length evanescent. The spermogones have the spermatia 0,012–15 mm. long, scarcely 0,001 mm. thick.

Hab. On rocks in maritime districts.—*Distr.* Local though plentiful where it occurs in the Channel Islands and in S. England; very rare in the islands of S.W. Ireland.—B. M.: St. Ouen's Bay, Beauport Bay, and St. Brelade's Bay, Island of Jersey; Jerbourg and Petit-Bot Bay, Island of Guernsey. Bolt Head, Devonshire; Logan Rocks, near Land's End, Tintagel, the Lizard and Lamorna Cove, Cornwall; St. Mary's, Scilly Islands.

Tribe VIII. **SIPHULEI** Nyl. Mém. Soc. Cherb. v. (1857)
p. 97; Syn. i. p. 261.

Thallus podetiiform, simple or fruticuloso-divided, somewhat tough, usually opaque, often affixed to the substratum by radical branchlets, internally either with a dense filamentose medulla or fistulose. Apothecia not rightly known. Spermogones (in so far as detected) innate.

This small tribe is composed of three genera, *Siphula*, *Endocena*, and *Thamnolia*. The last only is found in Britain. As the apothecia are unknown, the systematic place and even the value of the tribe are somewhat uncertain. *Siphula* is near to *Rocella* and *Thamnolia* to *Cladonia*.

35. **THAMNOLIA**

Ach. in litt. 1819, ex Schær. Enum. (1850) p. 243. — Thallus formed of stipites or podetia which are cylindrical or somewhat compressed, subulate or cornute, imperforate, simple or somewhat branched, acute at the apices, internally fistulose; cortical layer composed of small cells laxly united. Apothecia not rightly known. Spermogones innate, pale, with long jointed sterigmata; spermatia cylindrical, obsoletely thickened at either apex.

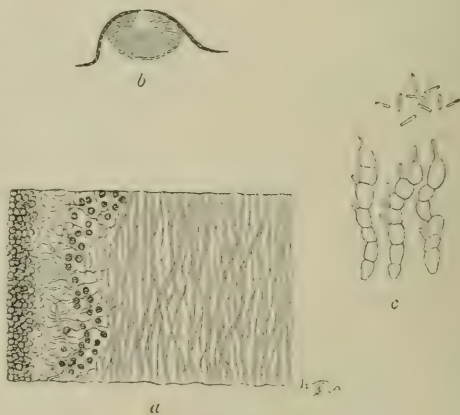


Fig. 38.

Thamnolia vermicularis Schær.—a. Longitudinal section of thallus, $\times 200$. b. Vertical section of a spermogone, $\times 30$. c. Sterigmata and spermatia, $\times 500$.

The fistulose podetia and the gonidia ally this to *Cladonia*; the spermogones are similar to those of *Bæomyces*, while the continuity of the

cortical layer separates it from the former. The apothecia have been described by some authors as similar to those of *Roccella*, and by others to those of *Cladonia*, but both are apparently erroneous.

1. *T. vermicularis* Schær. Enum. (1850) p. 243, t. ix. f. 7.—Thallus prostrate, ascending or erect, simple or bifurcate, smooth or longitudinally rugulose, somewhat dispersed or stipitate, chalky-white or whitish (K + yellow): apothecia unknown.—Mudd, Man. p. 68; Cromb. Lich. Brit. p. 23; Leight. Lich. Fl. p. 83, ed. 3, p. 75.—*Cladonia vermicularis* Sm. Eng. Fl. v. p. 234; Mudd, Brit. Clad. p. 34. *Cenomyce? vermicularis* Hook. Fl. Scot. ii. p. 65. *Cerania vermicularis* Gray, Nat. Arr. i. p. 413. *Lichen vermicularis* Sw. in Linn. fil. Meth. Musc. (1781) p. 119; Dicks. Crypt. fasc. ii. t. 6. f. 10; With. Arr. ed. 3, iv. p. 41; Eng. Bot. t. 2024.—*Brit. Ews.*: Cromb. n. 13.

Easily recognized by the form and habit of the thallus, somewhat resembling small white worms, whence its trivial name. The stipites are simple, but sometimes more or less shortly branched. The apothecia have not yet been certainly detected; for in the absence of any fertile specimen it is very doubtful whether the "tubercules" figured by Dickson, *l. c.*, corresponding to those described by Swartz, be really the fructification. Massalongo, Flora, 1856, p. 234, and Fries fil. Lich. Arct. p. 161, represent the apothecia as being *Cladonieine*, but this is still very doubtful. The spermogones are also very rare. They are somewhat large, lateral, margined by the thallus, entirely white or colourless, with spermatia 0.004–5 mm. long, scarcely 0.001 mm. thick. On the thallus occasionally are found two parasites, *Microthelia vermicularia* Linds., and *Endocarpon Crombiei* Mudd, both of which are evidently fungi.

Hab. On the ground among mosses and heaths in subalpine and alpine regions.—*Distr.* Very local and rare on the mountains of N. Wales and N. England; general and plentiful on all the higher Grampians and the N. Highlands of Scotland; not seen in Ireland.—B. M.: Cader Idris, Merionethshire; Skiddaw, Cumberland. Ben Lawers, Craig Calliach, and Ben Vrackie, Perthshire; Clova Mts. and Canlochan, Forfarshire; Lochnagar, Morrong, Glen Candlic, Ben-naboord, and Cairntoul, Braemar, Aberdeenshire; Ben Nevis, Inverness-shire; Ben Luighal, Sutherlandshire; Hills of Applecross, Ross-shire.

Var. *β. taurica* Schær. Enum. (1850) p. 244.—Thallus ventricoso-subulate, suberect, recurved, and cornute at the apices, often divergently branched, the branches cornute and subulate.—Cromb. Journ. Bot. 1885, p. 195.—*Lichen tauricus* Wulf. in Jacq. Coll. ii. (1788) p. 177, t. 12. f. 2.

Differs in the more turgid and erect stipites, and in the form of their apices. Like the type it is never found with apothecia, though, as observed by Nylander, Lich. Scand. p. 68, it occurs spermogoniiferous.

Hab. On the ground in alpine places.—*Distr.* Extremely local and rare, having been found only on one of the N. Grampians, Scotland.—B. M.: Near the summit of Cairngorm, Braemar, Aberdeenshire.

Tribe IX. **RAMALINEI** Nyl. Bull. Soc. Linn. Normand.
sér. 2, iv. (1870) p. 103.

Thallus fruticulose, laciniose, or filamentose, rounded or compressed, erect or pendulous, internally with woolly arachnoid medulla. Apothecia lecanorine, scutellate, terminal or lateral; spores 8næ, 1-septate, suboblong, straight or slightly curved, colourless; paraphyses discrete. Spermogones immersed or slightly prominent; sterigmata subsimple or pauci-articulate, with long anastomosing filaments intermixed.

This tribe, under which Nylander in his former arrangement included *Alectoria* and *Evernia*, is now, in its more limited acceptance, regarded by him as quite distinct, on account of marked analytical differences, more especially of the thalamium, while the structure of the spermogones is entirely peculiar (*vide* Ramal. Monogr. l. c.). The exotic genus *Ramalea* Nyl. externally resembling *Ramalina*, ought, from the type of the spermatia, to be relegated to the *Cladonie*; while *Dactylina* and *Dufourea*, neither of which occur in Britain, are also excluded from this tribe.

36. RAMALINA

Ach. Lich. Univ. (1810)

p. 122.—Thallus cæspitoso-fruticulose, foliaceo-complanate or rounded, somewhat shining or subopaque, soft or rigid, solid or fistulose, ramoso-laciniate, concolorous on both sides; medullary layer arachnoid, becoming sometimes very lax, cortical layer composed either of indistinct cells or of longitudinal conglutinate filaments. Apothecia scattered, opaque, subconcolorous with thallus; hypothecium colourless; spores small; paraphyses thin or moderate, thicker or clavate at the apices; hymenial gelatine bluish, then violet with iodine. Spermogones scattered; spermatia straight, cylindrical, or oblongo-cylindrical.

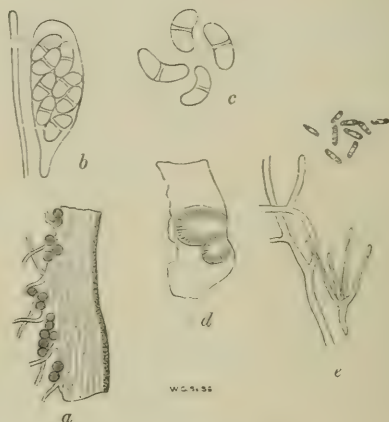


Fig. 39.

Ramalina fraxinea Ach.—a. Longitudinal section of (one side of) thallus, $\times 200$. b. Theca and paraphysis, $\times 350$. c. Spores, $\times 500$. d. Sections of two spermogones, $\times 50$. e. Sterigmata and spermatia, $\times 500$. (Also on the left a fragment of the anastomosing spermogonic filaments.)

The species of this genus, formerly little understood, have recently had new light thrown upon them by the minute researches of Nylander. He

has shown that the chemical reactions of the medulla with K, the differences in the receptacle of the apothecia, the form and size of the spores and spermatia, afford invaluable aid in the discrimination of species. The number of species have been consequently largely increased, and varieties more definitely referred to their species. As compared with other European countries, the genus has a very fair number of species and varieties in Great Britain, all belonging to Nylander's Section C, which is characterized by the spermiogones having pale or colourless conceptacles.

a. Thallus attenuate, fruticulose, subrounded or subcompressed; cortical layer filamentose.

1. *R. thrausta* Nyl. Bull. Soc. Linn. Normand. sér. 2, iv. (1870) p. 116.—Thallus elongate, pendulous or prostrate, filiform, subrounded, here and there compressed, very much branched, smooth, somewhat shining, pale straw-coloured; laciniae very slender, densely interwoven, the apices unequally capillari-attenuate (medulla K—). "Apothecia superficial, sessile, minute, plane, pale, the margin very thin; spores straight."—Cromb. Journ. Bot. 1872, p. 71; Leight. Lich. Fl. ed. 2, p. 470, ed. 3, p. 83.—*Ramalina calicaris*, var. *thrausta* Cromb. Lich. Brit. p. 25 pro parte; Leight. Lich. Fl. p. 94 pro parte. *Alectoria thrausta* Ach. Lich. Univ. (1810) p. 596.

The thallus, which is somewhat Alectorioid, is very fragile when dry, and in the few British specimens gathered is destitute of the soredia, with which it is elsewhere sometimes sprinkled. The apothecia, which are not well known, are absent from our specimens, which are also without spermiogones.

Hab. On sandy soil among short heath in maritime tracts.—*Distr.* Very sparingly in one spot on the N.E. coast of Scotland.—B. M.: Bay of Nigg, Kincardineshire (now extinct).

b. Thallus compressed, longitudinally striato-nerved or subcostato-unequal; cortical layer filamentose.

2. *R. calicaris* Nyl. Bull. Soc. Linn. Normand. sér. 2, iv. (1870) p. 131.—Thallus subrigid, compressed, linear or lineari-laciniate, pale glaucous or greyish green, laciniae sublacunosely longitudinally nervoso-rugose, usually canaliculate (medulla K—). Apothecia pedicellate, marginal and terminal, small or moderate, pale flesh-coloured or glaucescent, the receptacle rugose beneath; spores straight, ellipsoid, 0.010–16 mm. long, 0.005–7 mm. thick.—Cromb. Grevillea, xv. p. 47; Lich. Brit. p. 25 pro parte; Leight. Lich. Fl. ed. 3, p. 83.—*Ramalina calicaris* γ . *canaliculata* Fr. Mudd, Man. p. 73, t. 1. f. 17; Leight. Lich. Fl. p. 92. *Ramalina fastigiata* β . *calicaris* Hook. Fl. Scot. ii. p. 68 pro parte; Tayl. in Mack. Fl. Hib. ii. p. 85. *Loharia calicaris* Hoffm. Deutsch. Fl. ii. (1795) p. 139 pro parte. *Lichen calicaris* Huds. Fl. Angl. p. 451 pro parte; Lightf. Fl. Scot. ii. p. 834 pro parte; With. Arr. ed. 3, iv. p. 51 pro parte. *Lichen fastigiatus* Eng. Bot. t. 890 (upper fig.). *Ramalina fastigiata* Sm. Eng. Fl. v. p. 225 pro parte. *Lichenoides coralliforme rostratum et canaliculatum* Dill. Muse. 170, t. 23. f. 62 a.—*Lichenoides arboreum*

ramosum, angustioribus cinereo-virentibus ramulis Dill. in Ray Syn. ed. 3, p. 75, n. 81.—*Brit. Exs.*: Mudd, n. 44; Cromb. n. 21.

Length of the thallus rather variable. The laciniae generally attenuate, sometimes considerably so, often give forth transverse laciniole from one or both margins. The apothecia are frequent on the reflexed apices of the laciniae. The spermogones are also common, with spermatia oblongo-cylindrical, 0,003–4 mm. long, 0,001 mm. thick.

Hab. On the trunks and branches of trees in lowland and upland districts.—*Distr.* General and common in Great Britain; rare in the Channel Islands and in Ireland.—*B. M.*: St. Aubin's, Island of Jersey. Lydd, Kent; New Forest, Hants; near Totnes, S. Devon; near Respring and Penzance, Cornwall; Dynevor Castle, Carmarthenshire; Pyle, Glamorganshire; Old Windsor, Berkshire; Gopsall Park, Leicestershire; Oswestry, Shropshire; Llandrindod, Radnorshire; Island of Anglesea; Airyholme Woods, Cleveland, Yorkshire; near Stavelay, Westmoreland; The Cheviots, Northumberland; Wasdale, Cumberland. Pentland Hills, near Edinburgh; Barcaldine and Appin, Argyleshire; Killin, Kenmore, and Abernethy, Perthshire; De-rhill Wood and near Arbroath, Forfarshire; Countesswells Woods and Abergeldie, Aberdeenshire; S. of Fort William, Inverness-shire; Loch Shin, Sutherlandshire. Co. Antrim.

Var. *β. subampliata* Nyl. Bull. Soc. Linn. Normand. sér. 2, iv. (1870) p. 132.—Laciniae broader, longitudinally sublaevosely nervoso-rugose, canaliculate. Apothecia marginal and terminal, the receptacle rugose; spores as in the type.—Leight. Ann. Mag. Nat. Hist. ser. 4, ix. p. 129; Lich. Fl. ed. 2, p. 471, ed. 3, p. 84.—*Lichenoides coralliforme rostratum et canaliculatum* Dill. Musc. 170, t. 23, f. 62 B.—*Brit. Exs.*: Mudd, n. 42 pro parte.

Externally like a narrow state of *R. fraxinea*, but distinguished by the form of the spores.

Hab. On the trunks of trees in maritime and upland tracts.—*Distr.* Local and scarce in S., W., and N. England, N. Wales, and in S.W. Scotland.—*B. M.*: Beeding Priory, Sussex; New Forest, Hants; Penzance, Cornwall; Malvern, Worcestershire; Aberdovey, Merionethshire; Ayton, Cleveland, Yorkshire. Barcaldine, Argyleshire.

Var. *γ. subfastigiata* Nyl. Bull. Soc. Linn. Normand. sér. 2, iv. (1870) p. 132.—Laciniae broader, longitudinally nervoso-rugose. Apothecia terminal, the receptacle rugose; spores as in the type.—Leight. Ann. Mag. Nat. Hist. ser. 4, ix. p. 129; Lich. Fl. ed. 2, p. 471, ed. 3, p. 84.

In the character of the thallus and the situation of the apothecia this resembles larger states of *R. fastigiata*, but is distinguished by the form of the spores.

Hab. On trees and rocks in maritime and upland districts.—*Distr.* S.W. England, S. Wales, the S.W. Highlands of Scotland, and S. Ireland.—*B. M.*: Near Penzance, Cornwall; Llandrindod, Radnorshire. Appin, Argyleshire. Coachford, co. Cork.

3. *R. farinacea* Ach. Lich. Univ. (1810) p. 606.—Thallus subrigid, roundly or planely compressed, sublacunose or obsoletely nervoso-plicate, white straw-coloured or pale-glaucous; laciniae linear, attenuate, sorediiferous (medulla and soredia K—). Apothecia pedicellate, small, terminal and lateral, plane or convex, glaucescent or pale-testaceous, the receptacle smooth beneath; spores straight, ellipsoideo-oblong or fusiformi-ellipsoid, 0.008–16 mm. long, 0.004–7 mm. thick.—Gray, Nat. Arr. i. p. 407; Hook. Fl. Scot. ii. p. 68; Sm. Eng. Fl. v. p. 225; Tayl. in Mack. Fl. Hib. ii. p. 85; Leight. Lich. Fl. ed. 2, p. 472, ed. 3, p. 84.—*Ramalina calicaris* ϵ . *farinacea* Mudd, Man. p. 73; Cromb. Lich. Brit. p. 25; Leight. Lich. Fl. p. 93. *Lichen farinaceus* Linn. Sp. Pl. (1753) p. 1146; Huds. Fl. Angl. p. 451; Lightf. Fl. Scot. ii. p. 833; With. Arr. ed. 3, iv. p. 50; Eng. Bot. t. 889. *Lichenoides segmentis angustioribus, ad margines verrucosis et pulverulentis* Dill. Musc. 172, t. 23. f. 63 B, c.—*Brit. Ess.*: Leight. n. 40; Mudd, n. 45; Cromb. n. 22.

The thallus, which varies somewhat in the length and breadth of the laciniae, is more or less sprinkled with white-pulverulent, round or oblong marginal soredia. Occasionally these are almost absent, when it seems to merge into the preceding. The apothecia, which are small, are rare in this country, as well as the spermogones, which are similar to those of *R. calicaris*.

Hab. On the trunks and branches of trees in wooded lowland and upland districts.—*Distr.* General and usually plentiful throughout Great Britain; apparently rare in Ireland and the Channel Islands.—B. M.: Boulay Bay, Island of Jersey. Near Loughton, Epping Forest, Essex: Shiere, Surrey: Glynde, Sussex: Lydd, Kent; Lyndhurst, New Forest, Hants; Carrisbrook, Isle of Wight; Penzance and Withiel, Cornwall; Madingley, Cambridgeshire: Gopsall, Leicestershire: Malvern and Broadwas, Worcestershire; Causeway, Warwickshire; Dynevor Castle, Carmarthenshire: Island of Anglesea: Bettws-y-Coed, Denbighshire; near Oswestry and Shrewsbury, Shropshire; Newton, Cleveland, Yorkshire; Teesdale and Eglestone, Durham: Stavely, near Kendal, Westmoreland; Alston, Cumberland. New Galloway, Kirkcudbrightshire: near Edinburgh: Appin, Argyshire: Loch Katrine, Finlarig, Craig Calliach, Blaeberry Hill, Balthayock Woods, Perthshire: Baldovan Wood, Forfarshire; Countesswells Woods, near Aberdeen and Invercauld, Braemar, Aberdeenshire; Glen Nevis, Inverness-shire; Lairg, Sutherlandshire; Applecross, Ross-shire. Near Cork; Dunkerron, co. Kerry.

Form 1. *pendulina* Ach. Lich. Univ. (1810) p. 607.—Thallus more lax, longer and pendulous, the laciniae rather broader.—Cromb. Grevillea, 1886, p. 47.—*Parmelia farinacea* γ . *pendulina* Ach. Meth. (1803) p. 264.

A more luxuriant form, which is but sparingly fertile.

Hab. On trunks of old trees in wooded districts.—*Distr.* Local and rare in S.W. England; no doubt to be detected elsewhere.—B. M.: New Forest, Hampshire.

Form 2. *phalerata* Ach. Lich. Univ. (1810) p. 607.—Thallus small; laciniae short, somewhat broad, usually proliferous at the

apices and margins; soredia large. Apothecia not seen.—Cromb. Grevillea, vii. p. 141.—*Parmelia farinacea* δ . *phalerata* Ach. Meth. (1803) p. 264. *Lichen farinaceus* var. 2, With. Arr. ed. 3, iv. p. 50. *Lichenoides segmentis angustioribus, ad margines verrucosis et pulverulentis* Dill. l. c. D, E.

Probably a stunted state; in size and general aspect like small conditions of *R. fastigiata*, but separated by the soredia. It is apparently always sterile.

Hab. On the trunks of trees.—*Distr.* Only one locality in S. England; no doubt to be detected elsewhere.—B. M.: Stowe Park, Buckinghamshire.

Subsp. *R. intermedia* Nyl. ex Lamy, Bull. Soc. Bot. Fr. t. xxv. (1878) p. 380 (obs.).—Thallus smaller, smooth, not nervose; otherwise as in the type.—Cromb. Grevillea, xv. p. 47.—*Ramalina intermedia* Del. ex Nyl. Bull. Soc. Linn. Normand. sér. 2, t. iv. (1870) p. 166; Cromb. Journ. Bot. 1873, p. 132; Leight. Lich. Fl. ed. 3, p. 90.—*Brit. Ess.*: Larb. Lich. Hb. n. 248.

Distinguished by the generally smaller size and especially by the smooth thallus. From *R. subfarinacea*, which it closely resembles, it at once differs in the absence of any reaction with K on the medulla or the soredia. The apothecia are very rare, and in our specimens the spermatogones are absent.

Hab. On the branches of shrubs in maritime districts.—*Distr.* Local and scarce in the Channel Islands. S.W. England, the W. Highlands of Scotland, and N.W. Ireland.—B. M.: Near Moulin Bay, Island of Sark. Near Penzance, Cornwall; Annet Island, Scilly (frt.). Black Island, Appin, Argyleshire. Killery Bay, Connemara, co. Galway.

4. *R. fraxinea* Ach. Lich. Univ. (1810) p. 602.—Thallus subrigid, compressed, sublineari-laciniate, greenish-grey; laciniae longitudinally rugose or nerved, or partly also transversely rugulose, somewhat attenuate towards the extremities (medulla K—). Apothecia pedicellate, moderate or large, carneo-testaceous or glaucous, concave or plane, marginal and superficial, the receptacle unequally rugose; spores oblong or oblongo-ellipsoid, curved, 0,011–16 mm. long, 0,005–7 mm. thick.—Hook. Fl. Scot. ii. p. 68; Sm. Eng. Fl. v. p. 225; Tayl. in Mack. Fl. Hib. ii. p. 84; Leight. Lich. Fl. ed. 2, p. 472, ed. 3, p. 85.—*Ramalina calicaris* a. *fraxinea* Mudd, Man. p. 73; Cromb. Lich. Brit. p. 25; Leight. Lich. Fl. p. 94. *Lichen fraxineus* Linn. Sp. Pl. (1753) p. 1146; Huds. Fl. Angl. p. 541 pro parte; With. Arr. ed. 3, iv. p. 56 pro parte; Eng. Bot. t. 1781. *Lichenoides longifolium rugosum rigidum* Dill. Musc. 165, t. 22. f. 59 A, B. *Lichenoides arboreum ramosum scutellatum, majus et rigidius, colore virescente* Dill. in Ray, Syn. ed. 3, p. 75, n. 79 pro parte.—*Brit. Ess.*: Bohl. n. 21 pro parte; Leight. n. 38 pro parte; Mudd, n. 42 pro parte.

The varied length and breadth of the laciniae give rise to several varieties and forms. The common and typical condition is that described (var. *teniaformis* Ach. Lich. Univ. p. 603). From *R. calicaris* it may be recognized by the always broader rugose laciniae, by the rugose receptacle

of the larger apothecia, and especially by the form of the spores. The apothecia are usually very abundant, and are often scattered on both sides of the thallus. The spermogones are also frequent, with spermatia 0,004 mm. long, 0,001 mm. thick.

Hab. On the trunks of old trees in open places, and in forests in lowland and upland districts.—*Distr.* General and common where it occurs throughout Great Britain; apparently rare in Ireland.—B. M.: Epping Forest, Essex; near Glynde, Sussex; Brading Downs, Isle of Wight; New Forest, Hants; near Penzance, Cornwall; Cirencester, Gloucestershire; Harboro' Magna, Warwickshire; Clungunford and near Shrewsbury, Shropshire; Cleveland, Yorkshire; Teesdale, Durham; Windermere, Westmoreland; Alston, Cumberland. New Galloway, Kirkcudbrightshire; near Moffat, Dumfriesshire; Roslin and near Edinburgh, Midlothian; Barcaldine, Argyleshire; Blair Athole, Perthshire; Reeky Linn, Forfarshire; Countesswells Wood, near Aberdeen; Invercauld, Craig Coinnoch, and Glen Clunie, Braemar; Glen Nevis, Inverness-shire. Killarney, co. Kerry.

Var. β . *ampliata* Ach. Lich. Univ. (1810) p. 603.—Thallus dilated, lanceolato-diform, or broadly lobed, obtuse at the apices, longitudinally costato-rugose, transversely subreticulato-rugose. Apothecia and spores as in the type.—Cromb. Journ. Bot. 1872, p. 72; Leight. Lich. Fl. ed. 2, p. 473, ed. 3, p. 86.—*Parmelia fraxinea* γ . *ampliata* Ach. Meth. (1803) p. 259. *Lichenoides longifolium rugosum rigidum* Dill. Musc. l. c. c.—*Brit. Exs.*: Leight. n. 38 pro parte; Larb. Lich. Hb. n. 286; Bohl. n. 21 pro parte.

The laciniae are more dilated and coarsely rugose, though when younger they more resemble the type. Occasionally the thallus is stunted and deformed. The apothecia are usually abundant, often superficial, large, and when young rather concave. The spermogones are very frequent on deformed states.

Hab. On the trunks of old trees, chiefly oak and ash, in wooded upland districts.—*Distr.* Local and scarce in Great Britain; not observed in Ireland.—B. M.: Brandon, Suffolk; Epping Forest, Essex; New Forest, Hants; Dartmoor, Devonshire; Bartonbury, Gloucestershire; Darnley, Derbyshire; Alfric, Worcestershire; Oswestry, Shropshire; Barmouth and Aberdovey, Merionethshire; Island of Anglesea; Teesdale, Durham; East Allendale, Cumberland. New Galloway, Kirkcudbrightshire; Blair Athole, Perthshire; Abergeldie, Aberdeenshire.

Form *monophylla* Cromb. Grevillea, vii. (1879) p. 141.—Thallus simple, very broad, oblongo-rotundate, subreticulately costato-rugose. Apothecia as in the preceding.

Its simple thallus gives this a leaf-like appearance, but probably it is not constant. The apothecia are numerous and chiefly superficial.

Hab. On an aged oak in a wooded upland district.—*Distr.* Observed only in S. England.—B. M.: New Forest, Hants.

Var. γ . *calicariformis* Nyl. Bull. Soc. Linn. Normand. sér. 2, iv. (1870) p. 136.—Thallus attenuate; laciniae longitudinally rugose or nerved and sparingly transversely rugulose. Apothecia marginal and subterminal, the receptacle rugose; spores curved, 0,010–17 mm. long, 0,004–6 mm. thick.—Cromb. Journ. Bot. 1882, p. 272.

Externally like *R. calicaris*, but distinguished by its curved spores. The apothecia are small and numerous; the spermatia are 0,0035–45 mm. long, 0,001 mm. thick.

Hab. On the branches of trees in upland situations.—*Distr.* Gathered only very sparingly in W. England and N. Wales.—B. M.: Near Barmouth, Merionethshire; Kendal, Westmoreland; Lamplugh, Cumberland.

5. *R. fastigiata* Ach. Lich. Univ. (1810) p. 603 pro parte.—Thallus subrigid, subcompressed or inflato-hollow, smoothish or longitudinally unequal and nervoso-rugose, pale straw-coloured or greenish-white; laciniæ short, subfastigate, crowded (medulla K—). Apothecia terminal, peltato-sessile, plane or convex, small or moderate, pale-testaceous or glaucous, the receptacle somewhat rugose beneath; spores oblongo-ellipsoid, curved, 0,009–17 mm. long, 0,005–7 mm. thick.—Gray, Nat. Arr. i. p. 406; Hook. Fl. Scot. ii. p. 68; Sm. Eng. Fl. v. p. 225; Tayl. in Mack. Fl. Hib. ii. p. 85; Leight. Lich. Fl. ed. 2, p. 473, ed. 3, p. 86.—*Ramalina calicaris* β. *fastigiata* Mudd, Man. p. 73; Cromb. Lich. Brit. p. 25; Leight. Lich. Fl. p. 94. *Lichen fastigiatus* Pers. in Ust. N. Ann. i. (1794) p. 256; Eng. Bot. t. 890 (lower figs.). *Lichen calicaris* Huds. Fl. Angl. p. 451 pro parte; Lightf. Fl. Scot. ii. p. 834 pro parte. *Lichenoides cornutum bronchiale molle, subtus incanum* Dill. Musc. 160, t. 21. f. 55 b. *Lichencides coralliforme, rostratum et canaliculatum* Dill. Musc. 170, t. 23. f. 62 c.—*Brit. Exs.*: Leight. n. 32; Mudd, n. 43; Larbal. Cæsar. n. 60; Lich. Hb. n. 287; Bohl. n. 22.

Although Nylander (Mon. Ram. p. 39) considers this to be scarcely more than a variety or subspecies of the preceding, yet its constant characters induce me to treat it as a species. From young states of *R. fraxinea* it is distinguished by the thallus being cæspitose, erect, more contracted and subfastigately divided. Externally it approaches *R. calicaris* var. *subfastigiata*, but the spores are more typically curved. The apothecia are usually very numerous and the spermogones rare, with spermatia 0,0035 mm. long, about 0,001 mm. thick.

Hab. On the trunks, and more especially on the branches, of trees in wooded maritime and upland districts.—*Distr.* General and common in Great Britain, seldom seen in the fir woods of the Highlands; rare in Ireland and the Channel Islands.—B. M.: Islands of Jersey and Guernsey. Epping Forest and Copthall Green, Essex; Penshurst, Kent; Beeding Priory, Sussex; New Forest, Hampshire; near Ryde, Isle of Wight; near Penzance and Withiel, Cornwall; Cirencester, Gloucestershire; Eversden Wood, Cambridgeshire; Charnwood Forest, Leicestershire; Malvern and Broadwas, Worcestershire; near Oswestry and Shrewsbury, Shropshire; Causeway, Warwickshire; Aberdovey, Merioneth, and Anglesea; near Over, Cheshire; Cleveland, Yorkshire; Teesdale, Durham; Kendal, Westmoreland; Lamplugh, Cumberland. New Galloway, Kirkcudbrightshire; Yester House, Haddington; Roslin and Bonally, Mid-Lothian; Bowling Bay, Dumbarton; Barcaldine, Argyleshire; Loch Tay, Blaeberry Hill, and Blair Athole, Perthshire; Abergeldie and Craig Coimnoch, Braemar, Aberdeenshire; Glen Nevis, Inverness-shire; near Strathpeffer, Ross-shire; Lairg, Sutherlandshire. Derriquin, co. Kerry.

Form *minutula* Fr. fil. Lich. Scand. i. (1871) p. 37.—Thallus very small, caespitoso-erect, very much branched, non-sorediiferous, somewhat shining. Apothecia never seen.—Cromb. Grevillea, vii. p. 141.—*Ramalina farinacea* a. *minutula* Ach. Lich. Univ. (1810) p. 606. *Lichenoides segmentis angustioribus, ad margines verrucosis et pulverulentis* Dill. Musc. 172, t. 23. f. 63 A.

Referred by Acharius and most authors to *R. farinacea*, this is rightly placed by Fries fil. (*l. c.*) under the present species. Probably a young and barren state.

Hab. On pales, chiefly larch, in wooded upland districts.—*Distr.* Local in S. England, S., N.E., and N. Scotland; no doubt often overlooked.—B. M.: New Forest, Hants. Swanston, near Edinburgh; Park, near Aberdeen; Lairg, Sutherlandshire.

6. *R. polymorpha* Ach. Lich. Univ. (1810) p. 600.—Thallus rigid, compressed, nervoso-unequal or longitudinally sublacunose, moderate, subopaque, granuloso-sorediate, sublineari-laciniate, glaucous or greenish-white; laciniae plane, subsimple, often somewhat broad (medulla K—). Apothecia marginal, concave, small, pale-yellow or glaucescent, the receptacle rugoso-unequal or smoothish; spores oblong, straight or substraight, 0.011–16 mm. long, 0.004–5 mm. thick.—Cromb. Grevillea, xv. p. 47; Lich. Brit. p. 25 pro parte; Leight. Lich. Fl. ed. 3, p. 474 pro parte, et var. *ligulata*, ed. 3, p. 87 pro parte.—*Lichen polymorphus* Ach. Prodr. (1798) p. 178.

A variable species, of which *ligulata* Ach. (Meth. p. 265), Lich. Univ. p. 600, is the type. From all states of *R. cuspidata*, with which it agrees in the reaction of the medulla, it is distinguished by the concolorous globuloso-granulose soredia, more or less scattered over the thallus. It has not occurred with us fertile.

Hab. On exposed rocks in maritime tracts.—*Distr.* Local and scarce on the N.E. coast of Scotland.—B. M.: Near Portlethen, Kincardineshire.

Var. β . *emplecta* Ach. Lich. Univ. (1810) p. 601.—Laciniae attenuate, very much branched, acuminate, granulate. Apothecia not seen.—Cromb. Grevillea, xv. p. 47; Leight. Lich. Fl. ed. 2, p. 475 pro parte, ed. 3, p. 87 pro parte.—*Parmelia polymorpha* e. *emplecta* Ach. Meth. (1803) p. 267.

Distinguished by the narrower and much branched laciniae, which are also more erect, and somewhat rounded and acuminate at the apices. The soredia are not crowded in our specimens, which are always sterile.

Hab. On rocks and boulders in mountainous regions.—*Distr.* Local and scarce in the N. Grampians, Scotland.—B. M.: Near Loch Callater, Braemar, Aberdeenshire.

Subsp. *R. capitata* Nyl. ex Cromb. Grevillea, vii. (1879) p. 141.—Thallus small, with the laciniae lineari-divided, branched, obtuse and capitato-sorediate at the apices. Apothecia terminal or subterminal, the receptacle beneath at length nervoso-rugose or costato-nervose; spores oblong, slightly curved or substraight.—*Ramalina poly-*

morphæ *ε. capitata* Ach. Lich. Univ. (1810) p. 601; Nyl. Bull. Soc. Linn. Normand. sér. 2, iv. (1870) p. 149. *Ramalina polymorpha* Sm. Eng. Fl. v. p. 229.

Distinguished by the laciniae, which are esorediate at the sides, and by the situation of the apothecia. The apices of the laciniae are subfastigiate, with the soredia globuloso-granulose, or partly pulverulent, whitish and convex. It should perhaps, as Nylander suggests (*l. c.*), rank as a distinct species, intermediate between *R. polymorpha* and *R. pollinaria*. In this country it is always sterile.

Hab. On weathered granitic boulders in mountainous regions.—*Distr.* Local and scarce in N. England and in the N. Grampians, Scotland.—B. M.: Teesdale, Durham. Ben-naboord, Aberdeenshire.

7. *R. pollinaria* Ach. Lich. Univ. (1810) p. 608.—Thallus suberect, somewhat elongate, subflaccid, subcompressed, sublacunosounequal, and longitudinally rugose towards the base, lacero-laciniate, slightly shining, pale straw-coloured or glaucouscent; laciniae plane, sublinear, variously divided, with white farinose, scattered soredia (medulla K—). Apothecia subterminal, moderate, concave, pale or glaucous, the receptacle unequal beneath; spores oblong, straight or slightly curved, 0.010–15 mm. long, 0.004–6 mm. thick.—Gray, Nat. Arr. i. p. 407; Sm. Eng. Fl. v. p. 225; Tayl. in Mack. Fl. Hib. ii. p. 85 pro parte; Mudd, Man. p. 74; Cromb. Lich. Brit. p. 25; Leight. Lich. Fl. p. 95, ed. 2, p. 475, ed. 3, p. 87.—*Lichen pollinarius* Westr. Vet. Ak. Handl. (1795) p. 56; Eng. Bot. t. 1607 (descr. pro parte). *Lichen farinaceus* var. 3, With. Arr. ed. 3, iv. p. 50. *Lichenoides lacunosum lacerum, angustius* Dill. Musc. 163, t. 21. f. 57 D, E.—*Brit. Ess.*: Mudd, n. 46 pro parte; Cromb. n. 130.

Related to *R. farinacea* as well as to the preceding species, but distinguished from both by the laciniae and the soredia. The laciniae are variable, the typical form being that described (*elatior* Ach. Lich. Univ. p. 608). The soredia are numerous, though occasionally they occur only towards the apices, sometimes rendering the thallus inflated on the opposite surface. In this country the apothecia are rarely met with. The spermogones, which are also rare, have the spermatia cylindrical, about 0.004 mm. long, and 0.001 mm. thick.

Hab. On the trunks and branches of old trees, rarely on rocks, in wooded maritime and upland tracts.—*Distr.* General and common in S. and W. England, local in N. Wales and the Channel Islands; very rare in S. Scotland; not seen from Ireland.—B. M.: La Roche, Jersey; Island of Sark. Waltham Abbey, Essex; near Maidstone, Kent; Henfield and near Lewes, Sussex; New Forest, Hants; near Ryde, Isle of Wight; Plymouth and Streat, Devonshire; Pentire, The Lizard, and near Penzance, Cornwall; Fresco Island, Scilly; Stowe Park, Buckingham; Twycross, Leicestershire; Island of Anglesey; Ingleby, Cleveland, Yorkshire; Teesdale, Durham; near Hexham, Northumberland; near Skelton, Cumberland. New Galloway, Kirkcudbrightshire; Salisbury Crags, Edinburgh.

Form *humilis* Ach. Lich. Univ. (1810) p. 608.—Laciniae short, aggregate, complicate, often flexuose; soredia large, usually confluent. Apothecia very rare.—Cromb. Journ. Bot. 1872, p. 73

Leight. Lich. Fl. ed. 2, p. 475, ed. 3, p. 88.—*Lichenoides cornutum bronchiale molle, subtus incanum* Dill. Muse. 160, t. 21. f. 55 E.—*Brit. Ess.*: Leight. n. 41 pro parte; Larb. Lich. Hb. n. 208.

Distinguished by the subpulvinate thallus, which in its smaller states is often almost covered by the confluent soredia. With us it is never seen fertile.

Hab. On trees, pales, barn-doors, occasionally on rocks and stones, in maritime and upland tracts.—*Distr.* Local, though plentiful where it occurs, throughout England; very rare in S. Scotland.—*B. M.*: Near King's Lynn, Norfolk; Lakenham, Suffolk; Penshurst, Kent; near Lyndhurst, New Forest, Hants; near Penzance, Cornwall; Gopsall, Leicestershire. Salisbury Crags, Edinburgh.

c. Thallus usually transversely or subreticulately unequal; cortical layer amorphous or subamorphous.

8. *R. evernioides* Nyl. Mém. Soc. Cherb. v. (1857) p. 100, Bull. Soc. Linn. Normand. sér. 2, iv. p. 153.—Thallus suberect, crowdedly reticulato-rugose, or reticulato-scröbiculo-se, or thinly rugulose and partly plane, compressed, subopaque, variously lacinate, whitish or greenish straw-coloured; laciniae difform and variously divided, more or less soredioso-lacerate (medulla K—). Apothecia moderate, concave or somewhat plane, pale-testaceous or pale-glaucous, the receptacle rugose beneath; spores oblong, slightly curved, 0.010–15 mm. long, 0.0035–45 mm. thick.—Cromb. Journ. Bot. 1872, p. 73; Leight. Lich. Fl. ed. 2, p. 475, ed. 3, p. 88.—*Lichen pollinarius* Eng. Bot. t. 1607 (fig. et descr. pro parte). *Lichenoides lucunosum lacerum, latius* Dill. Muse. 163, t. 21. f. 57 A, B, C.—*Brit. Ess.*: Leight. n. 41 pro parte; Mudd, n. 46 pro parte; Cromb. n. 131.

The thallus is somewhat soft and often pliciform from rugosity. It varies considerably in size as well as in the breadth and divisions of the laciniae. The apothecia occur sparingly in this country, and the spermatogones, which are not frequent, are somewhat scattered, with spermatia 0.003–4 mm. long, scarcely 0.001 mm. thick.

Hab. On the trunks of old trees, chiefly oaks, in wooded upland districts.—*Distr.* General and common in S. and W. England and S. and E. Ireland; rare in the Channel Islands; not seen from Scotland.—*B. M.*: Dixcart, Island of Sark. Near Walthamstow, Essex; near Reigate, Surrey; Eridge, near Tunbridge Wells and Worthing, Sussex; Lydd, Kent; Testwood Park (frt.) and near Lyndhurst (frt.), New Forest, Hants; Bembridge, Isle of Wight; Ilington, S. Devon; Endellion and Tintagel, Cornwall; Bourton-on-Water, Gloucestershire; Stowe Park, Buckinghamshire; Gopsall, Leicestershire; Ingleby, Cleveland, Yorkshire. Near Belfast, co. Antrim.

Form *monophylla* Cromb. Journ. Bot. 1872, p. 73.—Thallus pendulous, simple, broad, oblongo-rounded, very rugose, the margin entire. Apothecia not seen.—Leight. Lich. Fl. ed. 3, p. 88.

Apparently distinct, with a simple, leaf-like thallus. It has the same relation to the type as the analogous form of var. *ampliata* has to *R. farinosa*. The soredia are rather large, and the thalline reticulations

distinct and prominent. In the specimens gathered, which were old and sterile, the thallus is of a sordid-brown colour.

Hab. On the trunks of old oaks in open places in a wooded tract.—

Distr. Local and scarce in S. England.—B. M.: New Forest, Hants.

- d. Thallus firm, solidly corticate, subroundly compressed or superficially unequal; cortical layer externally amorphous, internally filamentose.

9. *R. scopulorum* Ach. Lich. Univ. (1810) p. 604.—Thallus rigid, more or less compressed and shining, smoothish or longitudinally unequal, linear-laciniate, pale-greyish or pale straw-coloured; laciniae sublinear, attenuate (medulla K + yellowish, then rusty-red). Apothecia subpedicellate, marginal and subterminal, moderate, pale-testaceous or pale-glaucous, the receptacle somewhat smooth; spores oblong, straight, 0.012–19 mm. long, 0.0045–65 mm. thick.—Gray, Nat. Arr. i. p. 407; Hook. Fl. Scot. ii. p. 68; Sm. Eng. Fl. v. p. 225; Tayl. in Mack. Fl. Hib. ii. p. 85; Mudd, Man. p. 74; Cromb. Lich. Brit. p. 25; Leight. Lich. Fl. p. 91, ed. 2, p. 476, ed. 3, p. 88.—*Lichen scopulorum* Retz. Obs. Bot. fasc. iv. (1791) p. 30; Dicks. Crypt. fasc. iii. p. 18; With. Arr. ed. 3, iv. p. 57; Eng. Bot. t. 688.—Most of these references belong only in part to this species, from which until recently *R. cuspidata* was not clearly distinguished. It is also the *Lichen calicaris* pro parte of the older British authors.—*Brit. Ecs.*: Larb. Lich. Hb. n. 247; Bohl. n. 112.

Recognized by the shining, rigid, cartilaginous thallus and the chemical reaction of the medulla. It varies in length, and is often little branched. The apothecia are common and usually abundant, though in shady places it is generally sterile. The spermatogones are frequent, with spermatia oblongo-cylindrical, 0.0035–45 mm. long, 0.0010–15 mm. thick.

Hab. On rocks in maritime districts.—*Distr.* General and common on most of the rocky coasts of Great Britain and the Channel Islands, probably also of Ireland.—B. M.: Grosnez Common, Island of Jersey; Islands of Guernsey and Sark. Bolt Head, S. Devon: St. Michael's Mount, Land's End, and Lamorna Cliff, Cornwall: St. Mary's, Scilly Islands; Harlech Castle, Merionethshire; Port Soderick, Isle of Man; Holy Island, Northumberland. Solway Frith, Kirkcudbrightshire; Isle of May, Frith of Forth; Ailsa Craig, Frith of Clyde; Island of Mull and Airds, Appin, Argyleshire; Portlethen, Kincardineshire; Applecross, Ross-shire; Orkney Islands.

Var. *β. incrassata* Nyl. Bull. Soc. Linn. Normand. sér. 2, iv. (1870) p. 15.—Thallus smaller, thickish, rigid, subopaque, tuberculoso-diform, shortly laciniate, sparingly divided (medulla K + yellow and then rusty-red).—Cromb. Journ. Bot. 1874, p. 147; Leight. Lich. Fl. ed. 3, p. 89.—*Brit. Ecs.*: Larb. Lich. Hb. n. 324.

A small, thick, stunted, and deformed plant, with the thallus scarcely shining and less divided, and with broad, short laciniae. It is often tuberculoso-rugose from the numerous prominent spermatogones. The apothecia in British specimens are sparingly present.

Hab. On rocks in maritime tracts.—*Distr.* Local and rare in the

Channel Islands, S.W. England, and N.W. Ireland.—B. M.: La Moye, Island of Jersey. Near Penzance, Cornwall. Near Renvyle, Connemara, co. Galway.

10. *R. subfarinacea* Nyl. Flora, 1873, p. 66.—Thallus caespitose, suberect, shining, smoothish, rigid and fragile when dry, pale-greenish or greenish-grey; laciniae lineari-attenuate, short, roundly compressed, usually much divided towards the apices, pulverulentosorediiferous (medulla and soredia K+ yellowish and then rusty-red). Apothecia small, marginal and subterminal, at length convex, the receptacle subsmooth; spores oblong, straight, 0,012–15 mm. long, 0,004–6 mm. thick.—Cromb. Grevillea, xv. p. 47.—*Ramalina scopulorum* var. *subfarinacea* Nyl. ex Cromb. Journ. Bot. 1872, p. 74; Leight. Lich. Fl. ed. 2, p. 476, ed. 3, p. 89. *Ramalina calicaris* δ. *thrausta* Mudd, Man. p. 73; Leight. Lich. Fl. p. 94 pro parte; Cromb. Lich. Brit. p. 25.—*Brit. Exs.*: Cromb. n. 23; Lich. Hb. n. 323.

This looks as if related to *R. farinacea*, but the structure of the cortex and the chemical reaction, as well as the general habit and place of growth, show its affinity to be rather with *R. scopulorum*, to which it holds the same relation as *R. farinacea* has to *R. calicaris*. Sometimes it spreads extensively over the substratum, while at other times it occurs only in small tufts. It is very rarely fertile in Great Britain, the spermatogones having the spermatia as in the preceding species.

Hab. On rocks and old walls in maritime and upland districts.—*Distr.* General, and common where it occurs, on the rocky sea-coasts of the Channel Islands and Great Britain, also in the mountainous tracts of England and Scotland; no doubt also in Ireland.—B. M.: La Coupe, Island of Jersey; Islands of Sark and Alderney. Near Plymouth, Ivy Bridge, and Dartmoor, Devonshire; near Penzance, Cornwall (frt.); Annet Island, Scilly (frt.); Malvern Hills, Worcestershire; near Dolegelly and Harlech Castle, Merionethshire; Moel-y-golfa, Montgomeryshire; Beddgelert and Snowdon, Carnarvonshire; Long Mynd, Shropshire; Langbrough, Cleveland, Yorkshire; near Staveley, Westmoreland; near Hexham, Northumberland; St. Bees, Cumberland. Black Island (frt.) and Airds, Appin, Argyleshire; Killin, Perthshire; Banchorry Devenick, near Aberdeen; Portlethen, Kincardineshire; Applecross, Ross-shire.

11. *R. cuspidata* Nyl. Bull. Soc. Linn. Normand. sér. 2, iv. (1870) p. 158.—Thallus rigid, subcompressed and slightly shining, smoothish or longitudinally unequal, lacunose and tuberculate, lineari-laciniate, pale-greyish or pale straw-coloured; laciniae simple or dichotomously branched (medulla K—). Apothecia with the receptacle sometimes striatulate; spores substraight or slightly subcurved, 0,010–18 mm. long, 0,004–6 mm. thick.—Cromb. Journ. Bot. 1872, p. 74; Leight. Lich. Fl. ed. 2, p. 477, ed. 3, p. 89.—*Ramalina scopulorum* β. *cuspidata* Ach. Lich. Univ. (1810) p. 305. *Ramalina scopulorum* β. *cornuata* Ach., Gray, Nat. Arr. i. p. 407. *Lichen siliquosus* Huds. Fl. Angl. p. 460; With. Arr. ed. 3, iv. p. 40. *Coralloides fasciculare verrucosum et veluti siliquosum* Dill. Muse. 119, t. 17. f. 38.—*Lichen siliquosus*, from specimens in herbaria,

is merely an accidental state of this species.—*Brit. Exs.*: Leight. n. 2.

This differs from *R. scopulorum* chiefly in the absence of any chemical reaction of the medulla. The thallus is variable in size and in the character of the laciniae, and is often roughish with spermogoniiferous pustules. The apothecia, except in the occasionally striatulate receptacle and the size of the spores, are, as well as the spermogones, similar to those of *R. scopulorum*, though often congested and difform.

Hab. On rocks and boulders in maritime districts, rarely on hills at a distance from the sea.—*Distr.* General and abundant on all the rocky coasts of Great Britain, the Channel Islands, and probably also of Ireland.—*B. M.*: Island of Guernsey. Leigh Tor, Dartmoor, near Plymouth, Wembridge, and Torquay, Devonshire; Land's End, Tintagel, the Lizard, Lamorna, St. Breck, and Pentire, Cornwall; Tenby, Pembrokeshire; Aberdovey and Dolgelly, Merionethshire; South Stacks, Island of Anglesea; Pwllheli, Carnarvonshire; Holy Island, Northumberland; St. Bees, Cumberland. Solway Firth, Kirkcudbrightshire; Rivelston and Cramond Island, near Edinburgh; Innerkip, Renfrewshire; Banks of the Tay and Turin Hill, Forfarshire; Kinnoul Hill, Perthshire; Portlethen, Kincardineshire; near Peterhead, Aberdeenshire. Great Island, Cork; Ardglass, co. Down.

Form *minor* Nyl. Bull. Soc. Linn. Normand. sér. 2, iv. (1870) p. 159.—Thallus small, erect; laciniae simplish, slender, subulate. Apothecia small, terminal or subterminal.—Cromb. Grevillea, vii. p. 141.

A much dwarfed condition, being only $\frac{1}{2}$ in. to 1 in. in height, with the laciniae often black at the apices. The apothecia are small and usually numerous.

Hab. On dry exposed rocks in maritime tracts.—*Distr.* Local, though plentiful where it occurs in the Channel Islands, S. and W. England, and in N.E. Scotland; probably to be detected elsewhere.—*B. M.*: The Vale, Island of Guernsey. Wembury, Devonshire; Fowey and near Penzance, Cornwall; Tenby, Pembrokeshire; Aberystwith, Cardiganshire; St. Bees, Cumberland. Portlethen, Kincardineshire.

Var. *β. crassa* Del. ex Nyl. Bull. Soc. Linn. Normand. sér. 2, iv. (1870) p. 159.—Thallus somewhat small, thick, subopaque, tuberculoso-difform, rigid, shortly laciniate; laciniae dilated, sparingly divided (medulla K—). Apothecia chiefly terminal.—Cromb. Journ. Bot. 1874, p. 147; Leight. Lich. Fl. ed. 3, p. 90.

Analogous to var. *incrassata* of *R. scopulorum*, from which it differs in the absence of any chemical reaction of the medulla. The thallus is sometimes terebrate in old plants. Our British specimens are rarely fertile.

Hab. On rocks and boulders in maritime tracts.—*Distr.* Local and scarce in the Channel Islands, S. and N. England, and in N.E. Scotland.—*B. M.*: La Moye, Island of Jersey. Near Penzance, Cornwall; St. Bees, Cumberland. Portlethen, Kincardineshire.

Subsp. *R. breviuscula* Nyl. Flora. 1873, p. 66.—Thallus small, depressed, firm, often subpulvinato-stipate; laciniae short, congested,

turgid, variously difform (medulla K—). Apothecia small or nearly moderate, the margin of the receptacle suberenate.—Cromb. Grevillea, vii. p. 141.—*Ramalina cuspidata* f. *breviuscula* Nyl. Bull. Soc. Linn. Normand. sér. 2, iv. (1870) p. 159. *Ramalina polymorpha* f. *depressa* Cromb. Journ. Bot. 1872, p. 72; Leight. Lich. Fl. ed. 2, p. 475, ed. 3, p. 87. *Ramalina scopulorum*, β . *polymorpha* Mudd, Man. p. 74. *R. polymorpha* pro max. parte. Leight. Lich. Fl. and Cromb. Lich. Brit.; ? Tayl. in Mack. Fl. Hib. ii. p. 84.—*Brit. Exs.*: Leight. n. 73; Mudd, n. 47.

This subspecies is somewhat variable in size, and in some of its smaller states is closely appressed to the substratum. The broader laciniae, which are occasionally convex, are often covered with spermogoniiferous verrucae and young apothecia; the former have been mistaken by British authors for the granulose soredia of *R. polymorpha*. It is usually infertile.

Hab. On rocks in maritime tracts and on mountains.—*Distr.* Not general nor common in the Channel Islands, S., W., and N. England, on the N.E. coast of Scotland, and probably also among the Grampians.—B. M.: Coast of Guernsey and Island of Sark. Lustleigh Cleeve, Dartmoor, Devonshire; Tintagel and Polperro, Cornwall; Gower Peninsula, Glamorganshire; Moel-y-golfa, Montgomeryshire; near Thirsk and on top of Roseberry, Yorkshire. Portlethen, Kincardineshire.

Form *gracilescens* Cromb. Grevillea, vii. (1879) p. 141.—Thallus very small, pulvinato-congested, laciniae short, slender, shortly divided at the apices, which are finely incurved or revolute. Apothecia not seen.

The characters given separate this form, which otherwise agrees with the type. No apothecia have been seen, but spermogones are sparingly present.

Hab. On boulders and walls in maritime tracts.—*Distr.* Local and rare in the Channel Islands and S. England, but may occur elsewhere.—B. M.: Island of Sark. Near Brighton, Sussex.

12. *R. Curnowii* Cromb. ex Nyl. Flora, 1875, p. 441.—Thallus fruticulose, subrigid, slender, rounded or somewhat compressed, shining, sparingly branched and but slightly interwoven, pale glaucous (medulla K—). Apothecia terminal and lateral, small or nearly moderate, convex, pale, geniculato-adnate, the receptacle smooth; spores ellipsoid, straight, 0,011–15 mm. long, 0,004–6 mm. thick.—Cromb. Grevillea, iv. p. 180; Leight. Lich. Fl. ed. 3, p. 90.—*Brit. Exs.*: Cromb. n. 129; Larb. Cæsar. n. 13.

Allied to *R. cuspidata*, though, as stated by Nylander *l. c.*, the colour of the spermogones might lead us to place it in the section of *R. carpae-thica*. The thallus, which is moderate or more or less elongate (from 2 to 6 inches in length), is blackish towards the base, and the laciniae, for the most part simplish (rarely branched towards the apices), are usually narrow, though varying somewhat in breadth. When fertile the apothecia are numerous. The blackish spermogones are frequent, with spermatia 0,003 mm. long, 0,001 mm. thick.

Hab. On rocks in maritime districts.—*Distr.* Very local though plentiful where it occurs, in the Channel Islands and S.W. England.—B. M.: Mont Orgueil, Island of Jersey. Near Land's End and Penzance, Cornwall; St. Mary's, Scilly.

13. *R. geniculata* Hook. & Tayl. Lond. Journ. Bot. 1844, p. 655.—Thallus moderate or somewhat small, subrounded or subcompressed, smooth, or obsoletely longitudinally subnervose, cæspitosely and subfastigiately branched, pale or pale straw-coloured, often terebrate with scattered perforations, fistulose within; branches usually attenuate (medulla K—). Apothecia small, terminal or subterminal, pale-testaceous or glaucous-white, the receptacle smooth or rugulose; spores oblong or fusiformi-oblong, straight (or obsoletely slightly curved), 0,009–0,015 mm. long, 0,004–7 mm. thick.—Nyl. Bull. Soc. Linn. Normand. sér. 2, iv. p. 163; Cromb. Journ. Bot. 1876, p. 360; Leight. Lich. Fl. ed. 3, p. 90.

Resembles *R. pusilla* Le Prév., a plant found in Portugal but not reaching our Islands: it is distinguished by the cortical texture and the shining, smooth, and more freely divided thallus. To the following species also it presents several points of alliance. It is interesting as one of the exotic plants which extend to W. Ireland. In the British specimens the apothecia, which are appendiculate, are very sparingly present.

Hab. On stems of shrubs (thorns) in maritime districts.—*Distr.* Extremely local and scarce in N.W. Ireland, though we may expect to find it in the S.W. also.—B. M.: Killery Bay, Connemara, co. Galway.

14. *R. minuscula* Nyl. Bull. Soc. Linn. Normand. sér. 2, iv. (1870) p. 164.—Thallus small, subrounded, shining, soft, subpelucid, very finely longitudinally striatulate, cæspitosely branched, straw-coloured or pale straw-coloured, branches attenuato-ramulose (medulla K—). Apothecia small, terminal, plane or convex, yellowish flesh-coloured or glaucous, the receptacle smoothish beneath; spores oblong or fusiformi-oblong, straight, 0,009–0,015 mm. long, 0,004–6 mm. thick.—Cromb. Grevillea, vii. p. 142.—*Ramalina calcaris* f. *minuscula* Nyl. Sällsk. pro F. et Fl. Fenn. Forh. n. s. v. (1866) p. 114.

This might be taken for a small, narrow state of *R. fastigiata*, or for a young condition of *R. calcaris*. It is, however, a very distinct species, differing from the preceding in the smaller and softer thallus, which is scarcely more than $\frac{1}{4}$ inch in height; it occasionally presents small scattered oblong perforations. In British specimens the apothecia are very rare.

Hab. On the branches of stunted larches, and erratic on rocks in a wooded mountainous district.—*Distr.* Very local and scarce, found only among the N. Grampians, Scotland.—B. M.: Craig Cluny, Braemar, Aberdeenshire.

Tribe X. **USNEEI** Nyl. Mém. Soc. Cherb. iii. (1855) p. 170.

Thallus fruticulose, somewhat rounded, rarely angulose, erect or pendulous, internally with a firm chondroid axis. Apothecia lecanorine, peltate, terminal or lateral: spores 8nae, small, simple, colourless; paraphyses not discrete. Spermatogones immersed; sterigmata simple or subsimple.

A natural tribe, distinguished from its allies by having internally a solid axis (as in *Stereocaulon*), which readily separates from the cortical layer. Comprising only three small genera, two of which, *Neuropogon* and *Chlorea*, do not occur in Great Britain, it is with us, as in most other countries, marked by the abundance of the species of *Usnea*.

37. **USNEA** Dill. Musc. (1741) p. 56 pro parte; Ach. Meth. (1803) p. 306.—Thallus filamentoso-clongate, or fibrilloso-ramulose with patent branches, concolorous on both sides; chondroid axis composed of densely conglutinate filaments, cortical layer fragile and often diffract. Apothecia concolorous or subconcolorous with

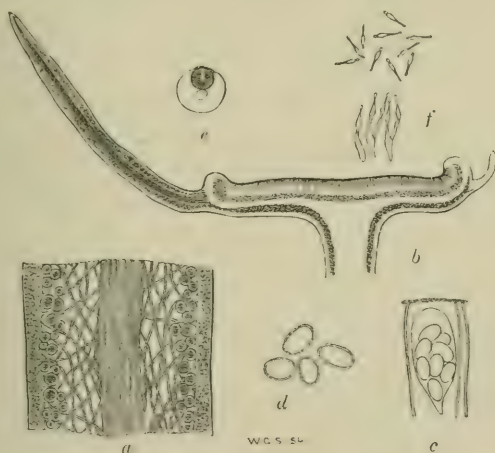


Fig. 40.

Usnea florida Ach.—a. Longitudinal section of the thallus, $\times 200$. b. Vertical section of a young apothecium (with thalline receptacle), $\times 30$. c. Theca and paraphysis, $\times 350$. d. Spores, $\times 500$. e. Transverse section of the thallus, showing above a spermatogone (beneath which is a section of the medulla), $\times 30$. f. Sterigmata and spermatia, $\times 500$.

the thallus, often with ramuloso-ciliate margin; hypothecium colourless; spores small, ellipsoid; paraphyses stipate in the dense hymenial gelatine, which is bluish with iodine. Spermatogones lateral, slightly protuberant, in colourless conceptacles; spermatia straight, cylindrico-acicular, slightly incrassate towards the base.

The species are more or less social, occurring in wooded regions, chiefly in old woods (though sometimes saxicole and lignicole), where, with their pale-greenish or yellowish thalli often very considerably elongate, they form, especially when fertile, a fine ornament to the trunks and branches of the trees, covering them as if with a "shaggy fleece." The limits of many species have been little understood by recent authors, the earlier writers having in this respect a more accurate judgment. Accordingly, modern lichenologists, following Fries, have usually included several distinct species as varieties under *Usnea barbata* Fr., supposing that they were connected by intermediate states. Nylander has, however, again separated these, and pointed out that there are sufficient external and anatomical differences to entitle them to rank as distinct species—one of the more important characters being the size of the spores. Nearly all the species are often sorediiferous, especially in barren specimens; while on the thalli of several "cephalodia" are not unfrequent. These are lateral, pale, or at length brown, tuberculoso-pulvinate, solid, internally dense (with no distinct gonimic layer), and composed of thin, interwoven filamentose elements (*vide* Nyl. Syn. i. p. 296j). The spermogones are rare and covered by the thallus, on which they appear as slight protuberances, with spermatia 0.009 mm. long, about 0.001 mm. thick. In the British species the cortical layer usually gives a more or less yellowish reaction with K, but is untinged by CaCl. Frequently, however, the positive reaction is very faint or even wanting in portions of the same specimen, so that it cannot be employed for the discrimination of species, as Dr. Stirton has done (*Scottish Naturalist*, vi. p. 101 *et seq.*).

1. *U. florida* Ach. Meth. (1803) p. 307 pro parte.—Thallus erect, rounded, scabrous, very much branched, pale-greyish or greyish-green; branches patent, nearly simple, with crowded horizontal fibrils. Apothecia plane, moderate or large, pale or somewhat glaucous, ciliate at the margins, the cilia long, fibrillose, radiating; spores shortly ellipsoid, 0.007–11 mm. long, 0.006–7 mm. thick.—Gray, Nat. Arr. i. p. 403; Hook. Fl. Scot. ii. p. 70; Sm. Eng. Fl. v. p. 226; Cromb. Journ. Linn. Soc. Bot. xvii. p. 555. *Usnea barbata* a. *florida* Müdl. Man. p. 69, t. i. f. 15; Cromb. Lich. Brit. p. 23; Leight. Lich. Fl. p. 83, ed. 3, p. 75; Tayl. in Mack. Fl. Hib. ii. p. 86. *Lichen floridus* Linn. Sp. Pl. (1753) p. 1154; Huds. Fl. Angl. p. 463; With. Arr. ed. 3, iv. p. 50; Eng. Bot. t. 872. *Usnea vulgatissima tenuior et brevior, cum orbiculis* Dill. Musc. 69, t. 13, f. 13. *Lichenoides quod Muscus arboræus cum orbiculis* Dill. in Ray Syn. ed. 3, p. 65, n. 6.—*Brit. Eas.*: Cromb. n. 16.

Easily recognized by its constantly erect habit, and the horizontal fibrils with which the branches are covered. The thallus is usually rigid and more or less scabrid. When several plants grow in proximity they form, with their large and numerous apothecia, a striking object on the forest trees, and present the appearance of a small parasitic shrub. The apothecia are terminal and smooth, though in age they become rugulose and shortly fibrillose on the underside.

Hab. On the branches of trees, rarely erratic on rocks, in upland woods and forests.—*Distr.* General and not uncommon in Great Britain, but more frequent and fruiting more freely in the Southern tracts: rare in the Channel Islands: not seen from Ireland, though said by Dr. Taylor

(*l. c.*) to be common.—B. M.: Island of Guernsey. Near Lydd, Kent; New Forest, Hants; Lydford and near Totnes, Devonshire; Boveconoe and near Penzance, Cornwall; Hay Coppice and Whittfield, Herefordshire; near Porthogo, Breconshire; Dynevor Castle, Carmarthenshire; Hafod, Cardiganshire; Island of Anglesea; Gib-side Woods, Durham; Ambleside, Westmoreland. New Galloway, Kirkcudbrightshire; Pentland Hills, near Edinburgh; near Inverary, Argyleshire; Stronaclachan Woods, Killin, Perthshire; Durris Woods, Kincardineshire; Countesswells Woods, near Aberdeen, and Ballochbuie Forest, Braemar; Lochaber, Inverness-shire.

2. *U. hirta* Hoffm. Deutsch. Fl. ii. (1795) p. 133.—Thallus somewhat small, nearly erect, caespitose, crowdedly branched, densely and minutely fibrillose, greenish- or yellowish-white; branches often covered with verrucoso-pulverulent soredia. Apothecia small, pale, the margin with short radiating fibrils; spores shortly ellipsoid, 0.006–8 mm. long, 0.004–6 mm. thick.—Cromb. Linn. Soc. Journ. Bot. xvii. p. 555.—*Usnea barbata* β . *hirta* Mudd, Man. p. 69; Cromb. Lich. Brit. p. 23; Leight. Lich. Fl. p. 84, ed. 3, p. 76. *Usnea plicata* γ . *hirta* Gray, Nat. Arr. i. p. 404; Hook. Fl. Scot. ii. p. 70; Sm. Eng. Fl. v. p. 226; Tayl. in Mack. Fl. Hib. ii. p. 86. *Lichen hirtus* Linn. Sp. Pl. (1753) p. 1155; Huds. Fl. Angl. p. 462; Lightf. Fl. Scot. ii. p. 895; With. Arr. ed. 3, iv. p. 46. *Usnea vulgatissima tenuior et brevior, sine orbiculis* Dill. Muse. 67, t. 13. f. 12.—*Brit. Ecs.*: Leight. n. 1 pro parte; Mudd, n. 35.

Distinguished from the preceding, which it resembles in habit, by being much smaller (usually about 1–2 inches in height), more caespitose, branched and fibrillose. Occasionally it is very small and pulvinate, and is sometimes only sparingly sorediiferous. The apothecia are very rare in Great Britain, and are found only on the smaller conditions. Minute cephalodia, however, are not unfrequent on the main branches.

Hab. On old pales (oak and larch), and occasionally on the branches of trees in wooded tracts.—*Distr.* General in maritime and upland districts, sometimes abundant, especially in the Central Highlands of Scotland; apparently rare in Ireland and in the Channel Islands.—B. M.: Island of Guernsey. Walthamstow, Essex; Lydd, Kent; near Lewes, Sussex; near Ryde, Isle of Wight; Lyndhurst, New Forest, Hampshire; Coryton, S. Devon; near Penzance, Cornwall; Cirencester, Gloucestershire; Gopsall, Leicestershire; Rowter Rocks, Derbyshire; near Oswestry and Haughmond Hill, Shropshire; Conway Falls, Carnarvonshire; Bettws-y-Coed, Denbighshire; Island of Anglesea; Ingleby, Cleveland, Yorkshire; near Hexham, Northumberland; Ashgill, Cumberland. New Galloway, Kirkcudbrightshire; near Moffat, Dumfriesshire; Pentland Hills, near Edinburgh; Inverary and Appin, Argyleshire; Killin, Perthshire; Muchalls, Kincardineshire; Park, near Aberdeen; Mar Forest, Braemar, Aberdeenshire; Rothiemurchus Wood, Inverness-shire; Lairg, Sutherlandshire. Near Belfast, co. Antrim.

3. *U. dasypoga* Nyl. & Stiz. St. Gall. Nat. Ges. (1876) p. 202.—Thallus elongate, pendulous, scabrous, sparingly branched, greyish-white or pale-greyish; the branches long, divergent, simplish, with short, patent, crowded fibrillae. Apothecia small or nearly mode-

rate, concave, pale or flesh-coloured, fibrillose-ciliate at the margins; spores shortly ellipsoid, 0.009–11 mm. long, 0.006–7 mm. thick.—Cromb. Journ. Linn. Soc. Bot. xvii. p. 555.—*Usnea barbata* δ . *dasypoga* Mudd, Man. p. 69; Cromb. Lich. Brit. p. 23; Leight. Lich. Fl. p. 84, ed. 3, p. 76. *Usnea plicata* γ . *dasypoga* Ach. Meth. (1803) p. 312. *Usnea barbata* Hook. Fl. Scot. ii. p. 70 pro parte; Sm. Eng. Fl. v. p. 231 pro parte. *Lichen barbatus* Huds. Fl. Angl. p. 462; Lightf. Fl. Scot. ii. p. 890; Eng. Bot. t. 258. f. 2. *Usnea barbata loris tenuibus fibrosis* Dill. Musc. 63, t. 12. f. 6.—The specific name of *barbatus* Linn. having been applied to the aggregate species of recent authors, it is better to adopt the later name in order to prevent confusion.

Distinguished from *U. florida* by the elongate, pendulous thallus with its long divergent branches, and by the smaller and fewer apothecia. The thallus, as is the case in other species, is in old plants sometimes very sparingly articulate towards the base, and occasionally also consists merely of one or two elongate branches, which at first sight are not unlike those of *U. longissima* Ach., which does not occur in this country. It is often widely spreading and cephalodiferous, and from its appearance is best entitled to the name of “bearded.” With us it is very rarely seen in fruit; when present the apothecia are scattered and chiefly subterminal.

Hab. On the trunks of trees, chiefly firs, in wooded upland tracts.—*Distr.* Somewhat local in S. and N. England, N. Wales; more common among the Grampians, Scotland; not seen from Ireland.—B. M.: Dartmoor, Lydford, and near Totnes, S. Devon; near Dolgelly and Rhewgreidden, Merionethshire; Hafod, Cardiganshire; Teesdale Forest, Durham; Ingleby, Cleveland, Yorkshire; Lamplugh, Cumberland. New Galloway, Kirkcudbrightshire; Loch Ard, Killin, and Ben Lawers, Perthshire; Deerhill Wood, Forfarshire; Mar Forest, Aberdeenshire; Rothiemurchus Woods, Inverness-shire.

Var. β . *plicata* Nyl. Flora, 1885, p. 299.—Thallus smooth, subdichotomously branched; branches lax, entangled, subarticulate, very sparingly or non-fibrillose, the ultimate ones capillary. Apothecia somewhat small, concave or at length plane.—Cromb. Grevillea, xv. p. 48.—*Usnea barbata* γ . *plicata* Mudd, Man. p. 69 pro parte; Cromb. Lich. Brit. p. 23 pro parte; Leight. Lich. Fl. p. 85 pro parte, ed. 3, p. 76 pro parte. *Usnea plicata* Gray, Nat. Arr. i. p. 403 (excl. vars.); Hook. Fl. Scot. ii. p. 70; Sm. Eng. Fl. p. 226. *Lichen plicatus* Ach. Prodr. (1798) p. 225; Eng. Bot. t. 257 (atypical, and referable rather to *dasypoga*).—As there is no specimen of *Lichen plicatus* in Herb. Linn., it is very doubtful if this be the plant he intended by that name.

This, regarded by Nylander as a variety of *U. dasypoga*, has been little understood by lichenologists. It is distinguished by the thallus being quite smooth, very sparingly fibrillose (in its more typical state efibrillose), and the branches more lax and entangled. The older branches are somewhat articulo-diffract, and the ultimate ones attenuate, filiform. Only one of our British specimens is quite typical and well fertile.

Hab. On the branches of trees, chiefly larch, in wooded mountainous

regions.—*Distr.* Local and scarce among the Grampians, Scotland.—B. M.: Stronachlachan Woods, Killin, Perthshire; near Corriemulzie, Braemar, Aberdeenshire (typical); Rothiemurchus Woods, Invernessshire; Dulcie, by the Findhorn, Morayshire.

Var. *γ. scabrata* Nyl. Flora, 1885, p. 299.—Thallus rough with more or less crowded, slightly elevated papillae; branches somewhat strict, nearly cfrillose. Apothecia small.—Cromb. Grevillea, xv. p. 48.—*Usnea scabrata* Nyl. Flora, 1875, p. 103; Cromb. Journ. Bot. 1882, p. 27.

Differs from the preceding variety in having the branches scabrid and not subarticulate. From *U. ceratina*, which it also resembles, it is distinguished by the absence of patent branches. The British specimens are short, about 6 inches long, often verrucoso-sorediiferous, and are for the most part sterile.

Hab. On the trunks and branches of larches in mountainous woods.—*Distr.* Probably general in the fir forests of the Scottish Highlands, though seen only from a few localities in S. Scotland and among the Grampians.—B. M.: New Galloway, Kirkeudbrightshire; Stronachlachan Woods, Killin, and Ben Lawers, Perthshire; near Corriemulzie, Braemar, Aberdeenshire.

4. *U. ceratina* Ach. Lich. Univ. (1810) p. 610.—Thallus elongate, subpendulous, rigid, papilloso-scabrous, at length verrucoso-sorediate, much and variously branched, pale-greyish or yellowish; the branches patent, diffuse, more or less fibrillose. Apothecia moderate or somewhat large, slightly concave, concolorous, sometimes pruinose, the margin with long, stout, recurved cilia, the receptacle beneath papilliferous; spores 0.007–9 mm. long, 0.005–7 mm. thick.—Cromb. Journ. Linn. Soc. Bot. xvii. p. 554.—*Usnea barbata* var. *ceratina* Cromb. Journ. Bot. 1872, p. 232; Leight. Lich. Fl. p. 85, ed. 3, p. 77. *Lichen plicatus* Huds. Fl. Angl. p. 461; Lightf. Fl. Scot. ii. p. 889; With. Arr. ed. 3, iv. p. 50. *Usnea vulgaris loris longis implexis* Dill. Musc. 56, t. 11. f. 1. *Muscus arboreus*, *Usnea officinarum* Dill. in Ray, Syn. ed. 3, p. 64, n. 1.—*Brit. Evs.*: Mudd, n. 36.

Generally confounded by British authors with var. *plicata* of the preceding species, from which it is readily distinguished by the numerous papillae or short fibrils, which give it so very rough an appearance. It is very variable in size, mode of branching, and degree of fibrilosity, while in old plants it is sometimes sparingly articulate at the base. The apothecia in this country are seldom present.

Hab. On the trunks and branches of old trees in upland woods.—*Distr.* General and common in S., W., and N. England, in N. Wales, and the Grampians, Scotland; not seen from Ireland or the Channel Islands.—B. M.: Lydd, Kent; Bexhill, Sussex; Isle of Wight; Lyndhurst, New Forest, and Woodcote Wood, Hampshire; Beckey Falls, S. Devon; Roughton and Bocconoc, Cornwall; Annet Island, Scilly; near Malvern, Worcestershire; Nannau, near Dolgelly, and Harlech, Merionethshire; Hafod, Cardiganshire; Island of Anglesea; Ingleby Park, Cleveland,

Yorkshire; Ashgill Woods and Lamplugh, Cumberland. Stronaclachan Woods and Ben Lawers, Perthshire; Countesswells Woods, near Aberdeen; Ballochbuie Forest, Braemar, Aberdeenshire; Rothiemurchus Woods, Inverness-shire; Cawdor Woods, Nairn, Morayshire.

Var. *β. scabrosa* Ach. Lich. Univ. (1810) p. 620.—Thallus smaller, erect or suberect, subcaespitose, more or less fibrillose, papiloso-scabrid, verrucoso-sorediate: otherwise as in the type.—Cromb. Journ. Bot. 1882, p. 272.—*Brit. Evs.*: Mudd, n. 34; Leight. n. 1 pro parte; Larb. Lich. Hb. n. 285.

When erect and fibrillose this is not unlike *U. florida*, from which it differs in the papillæ and prominent verrucose soredia, with which it is more or less covered. It is 3–5 inches in length, and is rarely fertile, though cephalodia are often present.

Hab. On trunks and branches of trees, also on stunted shrubs and rocks in maritime and upland districts.—*Distr.* Rather local, though plentiful where it occurs in S., W., and N. England, N. Wales, S. Scotland, and the S.W. Highlands; not seen from Ireland.—B. M.: Boulay Bay, Island of Jersey. High Rocks, near Tunbridge Wells, and Lydd, Kent; St. Leonard's Forest, Sussex; Lyndhurst, New Forest, Hampshire; near Lydford, S. Devon; Gopsall, Leicestershire; Haughmond, Hill, Shropshire; near Dolgelly, Merionethshire; Ayton Moor, Cleveland, Yorkshire; Calder Abbey, Cumberland. New Galloway, Kirkcudbrightshire; Appin, Argyleshire.

Form *ferruginascens* Cromb. Trans. Essex Field Club, iv. (1885) p. 60.—Thallus erect, small, deep rusty-red. Apothecia not seen.—*Usnea florida* f. *rubiginæa* (non Mich.); Gray, Nat. Arr. i. p. 403; Cromb. Journ. Bot. 1870, p. 96; Leight. Lich. Fl. p. 86, ed. 3, p. 77.

Evidently an accidental condition, abnormally coloured by some kind of maceration. The main branches are occasionally sparingly articulate towards the base. It is always sterile.

Hab. On trees and shrubs in maritime and upland tracts.—*Distr.* Hainault Forest, Essex; Lydd, Kent; St. Leonard's Forest and Maplehurst, Sussex; New Forest, Hampshire; Falls of Beckey, S. Devon; Withiel, Cornwall. Near Belfast, co. Antrim.

5. *U. articulata* Hoffm. Deutsch. Fl. ii. (1795) p. 135.—Thallus pendulous, nearly smooth, flaccid, very much and dichotomously branched, pale-greyish or pale-yellowish; branches elongate, articulo-constricted, the articulations ventricose, discrete; branchlets slender, fibrillose and entangled. Apothecia small, pale, somewhat sparingly fibriloso-ciliate.—Cromb. Journ. Linn. Soc. Bot. xvii. p. 554.—*Usnea barbata* *β. articulata* Gray, Nat. Arr. i. p. 404; Hook. Fl. Scot. ii. p. 70 (ε); Mudd, Man. p. 69; Cromb. Lich. Brit. p. 23; Leight. Lich. Fl. p. 85, ed. 3, p. 77. *Lichen articulatus* Linn. Sp. Pl. (1753) p. 1156; Huds. Fl. Angl. p. 462; With. Arr. ed. 3, iv. p. 48, et var. 2 *barbatus*; Eng. Bot. t. 258. f. 1. *Usnea barbata* Sm. Eng. Fl. v. p. 231. *Usnea capillacea nodosa* Dill.

Musc. 60, t. 11. f. 4. *Lichenoides quod Muscus arboreus nodosus* Dill. in Ray, Syn. p. 65, n. 4.—*Brit. Exs.*: Cromb. n. 17; Dicks. Hort. Sic. n. 24.

Apparently a distinct species, easily recognized by the articulate thallus and the long capillary fibrils of the lateral branches. The rest of the thallus is sometimes nearly efibrillose, and the articulations, few or many, are caused by the transverse rupture of the cortical layer. In this country the apothecia have never been met with, the supposed fruit of the older writers being merely the "cephalodia," which are sometimes very frequent and occasionally conglomerate.

Hab. On the trunks of aged trees in old shady woods and forests in upland districts.—*Distr.* Local and scarce at the present day in Great Britain, though before our old woods and forests were so extensively felled it seems to have been much more frequent.—B. M.: Charlton Forest, Sussex; near Appuldurecomb and Ventnor, Isle of Wight; New Forest, Hants; near Exeter, Arton, Beckey Falls, Devonshire; Liskeard, Cornwall; Entfield Chase, Hertfordshire; near Stockenchurch, Oxford; Cwm Bychan, near Barmouth, Merionethshire; Burnley, Lancashire. Stronachlachan Woods, Killin, Perthshire; Deerhill Woods, Forfarshire; Rothiemurchus Woods, Inverness-shire.

Form *intestiniformis* Cromb. Grevillea, xv. (1886) p. 48.—Thallus prostrate, thick, and inflated, here and there coarctate and ventricose; branchlets short, attenuate, flexuoso-interwoven.—*Usnea barbata* d. *intestiniformis* Ach. Lich. Univ. (1810) p. 625. *Usnea barbata* β . *articulata* Sm. Eng. Fl. v. p. 231. *Usnea articulata* Tayl. in Mack. Fl. Hib. ii. p. 86.

This singular state, evidently depending on the habitat, differs in the articulations being very much swollen and the branchlets much shorter. It is always infertile.

Hab. On the ground in sandy tracts in maritime districts.—*Distr.* Local and scarce in S.W. England and S.E. Ireland; not recently gathered.—B. M.: Exmouth Warren, Devonshire. Malahide, near Dublin.

Tribe XI. ALECTORIEI Nyl. Flora 1869, p. 444.

Thallus fruticulose, rounded or compressed, erect or pendulous, decumbent or prostrate, internally with lax, arachnoid medulla, or entirely hollow. Apothecia lecanorine, scutelliform, lateral or pseudo-terminal; spores usually 8næ, small or moderate, simple, colourless; paraphyses not discrete. Spermogones immersed or superficial; sterigmata pauci-articulate.

As instituted by Nylander this is a well-defined and natural tribe. It is allied to the preceding and following tribes. Of its three genera, *Dufourea* and *Dactylina* do not occur in our Islands.

38. **ALECTORIA** Ach. Lich. Univ. (1810) p. 592 pro parte; Nyl. Syn. p. 277.—Thallus filamentose, often intricately branched, concolorous on both sides, somewhat shining; medullary layer loosely arachnoid or lacunose, not readily separating from the cortical layer, which is corneous, formed of subparallel filaments closely conglutinate. Apothecia discolorous, or rarely subconcolorous with the thallus, rarely with ciliate margin; hypothecium colourless; spores 8 μ and small, or 2–4 μ and larger, very rarely murali-divided, ellipsoid, sometimes at length becoming brown; hymenial gelatine bluish with iodine. Spermatogones lateral, inclosed in thalline tubercles, the conceptacles externally blackish; spermatia acicular, fusiformi-incrassate towards either apex.

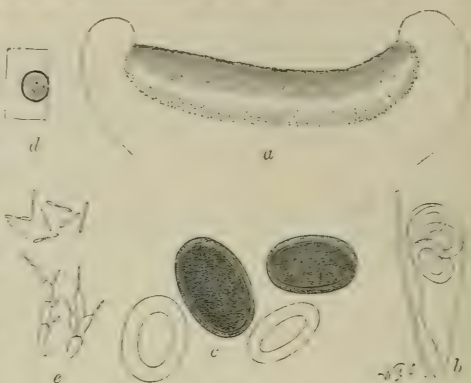


Fig. 41.

Alectoria ochroleuca Nyl.—a. Vertical section of a young apothecium, $\times 30$. b. Theca and paraphysis, $\times 350$. c. Spores, $\times 500$. d. Longitudinal section of thallus with a spermatogone, $\times 30$. e. Sterigmata and spermatia, $\times 500$.

The species of this genus are characteristic of mountainous regions, and several occur in great abundance in suitable localities. In some the thallus becomes at length free from the substratum, because of the decay and death of the lower portion, which does not, however, prevent them from freely vegetating.

a. Apothecia lateral or pseudo-terminal; spores 2–4 μ , somewhat large, colourless or at length brown. (*Eualectoria* Fr. fil. Gen. Heterol. (1861) p. 48.)

1. **A. ochroleuca** Nyl. Mém. Soc. Cherb. v. (1837) p. 98.—Thallus caespitose-fruticulose, rigid, erect, rounded or somewhat compressed, smooth, or here and there lacunoso-impressed, much and divaricately branched, ochroleucous or whitish straw-coloured; branches attenuate, the apices recurved and usually blackish (Kf^{+} yellowish, $CaCl^{-}$). Apothecia large, innato-sessile, at length repand, bright brownish-red or brownish-black, the margin inflexed or excluded; spores 0.023–42 μ long, 0.014–24 μ thick.—Mudd, Man. p. 73; Cromb. Lich. Brit. p. 24; Leight. Lich. Fl. p. 87, ed. 3, p. 79.—*Cornicularia ochroleuca* Hook. Fl. Scot. ii. p. 69; Sm. Eng. Fl. v. p. 229. *Lichen ochroleucus* Ehrh. Beytr. iii. (1789) p. 82; Dicks. Crypt. fasc. iii. p. 19; With. Arr. ed. 3, iv. p. 46 pro parte; Eng. Bot. t. 2374.—*Brit. Fl.*: Cromb. n. 126.

Grows in large tufts with the thallus at length free, is often sprinkled with small whitish soredia, and has the fertile branches thicker. It varies somewhat in the degree of blackness with which its normally pale yellow colour is diversified, this being confined to the apices of the branchlets, as is usually the case with us, or extending over the greater portion of the thallus, as in Arctic regions. In Great Britain the apothecia are extremely rare, having been seen in only a single specimen. The spermogones, which are seldom present with us, are minute, punctate, colourless within, with spermatia 0,007-8 mm. long, scarcely 0,001 mm. thick.

Hab. Among mosses on gravelly soil in alpine places. *Distr.* Confined to some of the higher Grampians, Scotland, on or near their summits.—B. M.: Cairngorm and Cairntoul, Braemar, Aberdeenshire; ? Clova Mts., Forfarshire.

Form *tenuior* Cromb. Journ. Bot. 1872, p. 232.—Thallus smaller, decumbent, the branches more slender, somewhat entangled and concolorous at the apices. Apothecia small, pale reddish-brown.—Leight. Lich. Fl. ed. 3, p. 79.—*Lichen sarmentosus* Eng. Bot. t. 2040 (smaller fig.).

This form depends no doubt upon the habitat. It bears a general resemblance except in colour to the terminal branchlets of var. *cinnamomea* of *A. sarmentosa*, to which belongs the specimen from Morrone cited in Journ. Bot. l. c. and quoted in Leight. Lich. Fl. p. 88 as var. *crinalis*. In the only specimen seen there is but a single young apothecium visible, which is rather lateral than pseudo-terminal.

Hab. On sterile ground in alpine places.—*Distr.* Seen only from one of the loftier mountains of the N. Highlands of Scotland.—B. M.: Ben Luighal, Sutherlandshire.

2. *A. sarmentosa* Ach. Lich. Univ. (1810) p. 595.—Thallus pendulous or prostrate, elongate, complicate, very much and remotely branched, compressed at the axils, whitish-straw-coloured, the apices attenuate, long, concolorous (K^- , $K (CaCl)_f^-$ reddish). Apothecia small, lateral, badio-reddish or brown; spores 3-4 μ , 0,015-36 mm. long, 0,014-30 mm. thick.—Cromb. Journ. Bot. 1875, p. 140; Leight. Lich. Fl. ed. 3, p. 79.—*Lichen sarmentosus* Ach. Vet. Ak. Handl. 1795, p. 212, t. 8. f. 2. ? *Usnea loris longis dichotomis, extremitatibus tenuioribus* Dill. Musc. 59, t. 11. f. 2.

Distinguished by the form of the thallus and the situation of the apothecia. The thallus, which varies in thickness, is rounded or here and there somewhat compressed, smooth or more or less lacunoso-foveolate, with the branches divaricate or dichotomous. Our only known British specimen belongs to the usual alpine and thicker condition. It has only a few apothecia and no spermogones.

Hab. Among mosses on the ground in alpine situations.—*Distr.* Known only from one of the N. Grampians, Scotland.—B. M.: Cairngorm, Banffshire.

Var. β . *cinnamomea* Nyl. Syn. i. (1860) p. 282; Flora, 1869, p. 244.—Thallus prostrate, sarmentose, intricate, unequally compressed, thickened, impresso-lacunose, remotely branched, pale greenish

sulphur-coloured; branches very much divaricate, long, attenuate, concolorous or sparingly blackish at the apices (K^- , $CaCl_+^-$ reddish). Apothecia lateral, becoming brownish-black, the margin entire.—Cromb. Grevillea, xv. p. 79.—*Alectoria ochroleuca* var. *cinnamata* Leight. Lich. Fl. p. 88, ed. 3, p. 79. *Evernia ochroleuca* b. *cinnamata* Fr. L. E. (1830) p. 22. *Alectoria ochroleuca* var. *sarmentosa* Cromb. Lich. Brit. p. 24. *Alectoria sarmentosa* Gray, Nat. Arr. i. p. 408; Hook. Fl. Scot. ii. p. 68; Sm. Eng. Fl. v. p. 227; Mudd, Man. p. 70. *Lichen ochroleucus* With. Arr. ed. 3, iv. p. 46 pro parte.—As specimens in herbaria show, this was mistaken by our earlier and some later writers for *A. sarmentosa* (cfr. Cromb. Journ. Bot. 1872, p. 232).—*Brit. Eas.*: Cromb. n. 18.

The thallus often bears large foveolate and serbiculate concolorous excrescences, and usually is here and there tinged of a bluish-black colour. The apothecia do not occur in this country, and the spermogones are very rarely seen.

Hab. On the ground in alpine places, creeping loosely over mosses and the stems of *Azalea procumbens*.—*Distr.* Very local, though somewhat plentiful on a few of the higher N. Grampians, Scotland.—B. M.: Ben-naboord, Morrone, Ben Macdhuì, Cairngorm, Braemar, Aberdeenshire.

b. Apothecia lateral; spores 8 μ , small, colourless (*Bryopogon* Link. Handb. (1833) p. 164 pro parte).

3. *A. divergens* Nyl. Lich. Scand. (1861) p. 71.—Thallus cæspitose, erect or prostrate, robust, rigid, and fragile, somewhat rounded or subangular, shining, often much branched, brownish-chestnut-coloured; branches dichotomously diverging (K^- , $CaCl_+^-$ deep red). Apothecia bright-brown, the margin usually crenulate or rough; spores 0.008–10 mm. long, 0.0045–55 mm. thick.—Cromb. Journ. Bot. 1873, p. 133; Leight. Lich. Fl. ed. 3, p. 78.—*Cornicularia divergens* Ach. Meth. (1803) p. 303.

This is like larger states of *Cetraria aculeata*, from which, however, it is well distinguished by being more robust, not spinulose, by the medullary reaction with $CaCl$, and the nature of the spermogones. In the few specimens gathered in Britain the thallus is less developed than in those from Arctic regions, and is destitute of the white points which elsewhere are sometimes present, arising from the rupture of the cortical layer. The apothecia have as yet been detected only in N.E. Asia.

Hab. On the ground among mosses in alpine places.—*Distr.* Found only on one of the higher N. Grampians, Scotland.—B. M.: Cairngorm, Braemar, Aberdeenshire.

4. *A. nigricans* Nyl. Lich. Scand. (1861) p. 71.—Thallus cæspitoso-fruticulose, erect or ascending, rigid, somewhat rounded, dichotomously and intricately branched, livid- or chestnut-black, paler towards the base, opaque, branches more or less deflexed at the apices, the axils somewhat lacunoso-impressed (K_+^- yellow at base' $CaCl_+^-$ reddish). Apothecia lateral, moderate, badio-brownish, the

margin thin, at length excluded; spores 0,021–35 mm. long, 0,015–20 mm. thick.—Carroll, Journ. Bot. 1865, p. 287; Cromb. Lich. Brit. p. 24; Leight. Lich. Fl. p. 87, ed. 3, p. 78.—*Cornicularia ochroleuca* β . *nigricans* Ach. Lich. Univ. (1819) p. 615.—Brit. Ess.: Cromb. n. 19.

The thallus, which is at length free, and, except in colour, like that of *A. ochroleuca*, is often blackish almost throughout, though sometimes only towards the apices. When long preserved in herbaria it becomes reddish, and tinges the paper of the same colour. The apothecia have been found only in Labrador and Arctic N. America. With us the spermogones are not uncommon. They are somewhat protuberant, most frequent towards the apices, with spermatia 0,007 mm. long, about 0,001 mm. thick.

Hab. Among mosses on the ground and on rocks, in alpine and sub-alpine situations.—*Distr.* Somewhat local, but usually plentiful on several of the higher Grampians, Scotland; very sparingly on mts. in N. Wales; doubtfully on those of N. England.—B. M.: Cwm Bychan, Merionethshire; The Glyders and Carnedd Llewelyn, Carnarvonshire; ? Teesdale, Durham. Ben Lawers and Mael Girdy, Perthshire; Ben-y-Gloe and Cairn Gowar, Blair Athole; Ben-naboord, Morrone, and Ben Macdhuil, Braemar, Aberdeenshire; Ben Nevis, Inverness-shire.

5. *A. jubata* Nyl. ex Cromb. Journ. Bot. 1872, p. 233.—Thallus elongate, pendulous, filiform, subrounded, somewhat rigid, much branched, sorediiferous, olive-brown or brownish black, rarely paler; branches entangled, smooth, subconcolorous at the apices (K^- , $CaCl^-$). Apothecia innato-sessile, affixed to geniculations of the thallus, small, plane or convex, the margin entire, at length excluded: spores 0,006–9 mm. long, 0,004–5 mm. thick.—Gray, Nat. Arr. i. p. 408; Hook. Fl. Scot. ii. p. 67; Sm. Eng. Fl. v. p. 227; Tayl. in Mack. Fl. Hib. ii. p. 86; Mudd, Man. p. 70 pro parte; Cromb. Lich. Brit. p. 24 pro parte; Leight. Lich. Fl. p. 88 pro parte, ed. 3, p. 80.—*Lichen jubatus* Linn. Sp. Pl. (1753) p. 1155 pro parte; Huds. Fl. Angl. p. 461 pro parte; Lightf. Fl. Scot. ii. p. 891 pro parte; With. Arr. ed. 3, iv. p. 46; Eng. Bot. t. 1880 pro parte. *Usnea jubata nigricans* Dill. Musc. 64, t. 12. f. 7. *Lichenoides quod Muscus corallinus saxatilis feniculaceus* Dill. in Ray Syn. p. 65, n. 7.—Brit. Ess.: Leight. n. 72; Mudd, n. 37; Cromb. n. 128 (pallidior); Bohl. n. 83.

The thallus of this well-known plant, of which the type is *A. proluxa* Ach. Lich. Univ. p. 592, is in its young state suberect, as it frequently appears on old fir pales. Usually it is more or less sprinkled with whitish or greyish soredia, which are especially abundant in the less elongate or suberect states. It is one of our most social lichens, frequently along with *Usneas* completely covering the trunks and branches of firs in Highland woods and forests. The apothecia are extremely rare in Great Britain, owing, no doubt, to so many old forests having been felled. The spermogones, which are also very rare, are inclosed in scattered thalline tubercles, with spermatia 0,006–7 mm. long, about 0,005 mm. thick.

Hab. On the trunks and branches of old trees, chiefly pine and larch, as also on boulders among mosses, in wooded upland and subalpine regions.

—*Distr.* General in the hilly and mountainous tracts of Great Britain—very abundant amongst the Grampians, Scotland; rare in Ireland.—B. M.: St. Leonards, Sussex; New Forest, Hants; Hay Tor, Dartmoor, Devonshire; Helminton and Roughton, Cornwall; Charnwood Forest, Leicestershire; Gamlingay Park, Cambridgeshire; near Kingley, Warwickshire; near Oswestry, Shropshire; Dolgelly, Aberdovey, and near Barmouth, Merionethshire; Baysdale and near Great Ayton, Cleveland, Yorkshire; Teesdale, Durham; Keswick and Alston, Cumberland; The Cheviots, Northumberland. New Galloway, Kirkcudbrightshire; Beld Craig, Moffat, Dumfriesshire; Pentland Hills, near Edinburgh; Appin, Argyleshire; Glen Falloch, Killin (frt.), Ben Lawers, and Knock of Crieff, Perthshire; Deerhill Wood, Forfarshire (frt.); Countesswells Wood, near Aberdeen; Ballochbuie Forest, Craig Cluny, and Mar Forest, Braemar; Rothiemurchus Woods, Glen Nevis, and Glen Morriston, Inverness-shire; Lairg, Sutherlandshire. Killiney Hills, near Dublin; Luggelaw, co. Wicklow; near Innishowen, co. Donegal.

Var. *β. lanestris* Ach. Lich. Univ. (1810) p. 593.—Thallus somewhat small, prostrate, rather soft, very sparingly sorediferous, brownish-black or blackish; branches short, slender, densely entangled. Apothecia not seen.—Cromb. Journ. Bot. 1872, p. 233.—*Lichen jubatus* Eng. Bot. t. 1880 (upper fig.).

This variety, which superficially resembles *Parmelia lanata*, is well distinguished by the smaller, denser, more tender thallus, and by the almost entire absence of soredia. The fructification has apparently never been observed, even in countries where the plant is more common.

Hab. On old fir pales in mountainous districts.—*Distr.* Local and rare, in W. England and among the Grampians, Scotland; no doubt to be detected elsewhere.—B. M.: Helsby Hill, Cheshire. Killin, Perthshire; Braemar, Aberdeenshire; Rothiemurchus, Inverness-shire.

Form *tenerrima* Cromb. Grevillea, xv. (1886) p. 48.—Thallus smaller, very much branched; branches short, very slender, fragile, soft and much interwoven.

At first sight might readily be mistaken for an *Ephebe*. It is always sterile.

Hab. On the trunks of old birch trees in upland situations.—*Distr.* Very local and rare among the N. Grampians, Scotland.—B. M.: Morrone, Braemar, Aberdeenshire.

Subsp. 1. *A. chalybeiformis* Nyl. ex Cromb. Grevillea, xv. p. 48.—Thallus subfiliform, prostrate, flexuose, rigid, divaricately branched, sparingly sorediate, olive- or brownish-black (or dark leaden-coloured), often a little paler at the apices; branches short, remote (K^- , $CaCl^-$). Apothecia not seen.—*Alectoria jubata* var. *chalybeiformis* Ach. Lich. Univ. (1810) p. 592; Hook. Fl. Scot. ii. p. 67; Sm. Eng. Fl. v. p. 227; Mudd, Man. p. 70; Cromb. Lich. Brit. p. 24; Leight. Lich. Fl. p. 89, ed. 3, p. 80.—*Alectoria chalybeiformis* Gray, Nat. Arr. i. p. 408. *Lichen chalybeiformis* Linn. Sp. Pl. (1753) p. 1155; With. Arr. ed. 3, iv. p. 47. *Usnea rigida* horsum vorsum eatensi Dill. Musc. 66, t. 13. f. 10. *Lichenoides caule rigido, instar fili chalybei* Dill in Ray Syn. ed. 3, p. 65, n. 2.—Brit. Ess.: Larb. Lich. Hb. n. 245.

The simpler, less intricate thallus, which is usually more compressed at the axils, more shortly and remotely branched, thicker, flexuose and less sorediate than in *A. jubata*, entitles this to be viewed as a subspecies. The apothecia have never been detected, and the spermogones are absent in our specimens.

Hab. Among mosses on rocks and boulders in upland and mountainous districts.—*Distr.* General and not uncommon in England and N. Wales; plentiful among the Grampians, Scotland; not seen from Ireland.—B. M.: Thetford Warren, Norfolk; Eridge Rocks, near Tunbridge Wells, Sussex; Templemore and Dartmoor, Devonshire; near Malvern and Herefordshire Beacon, Worcestershire; Cader Idris, Merionethshire; Snowdon, Carnarvonshire; Island of Anglesea; Battersby, Cleveland, Yorkshire; Gateshead Fell, Durham; Suddale, Westmoreland. Ben Cruachan, Argyleshire; Ben More and Ben Lawers, Perthshire; Clova Mts., Forfarshire; Craig Coinnoch, Glen Cluny, Lochnagar, and Ben-naboord, Braemar, Aberdeenshire; Ben Nevis and Loch Ennich, Inverness-shire.

Subsp. 2. *A. subcana* Nyl. ex Cromb. Journ. Bot. 1876, p. 360.—Thallus pendulous, filiform, subelongate, much branched, greyish-white (K_- , $CaCl_-$); soredia small, somewhat prominent, whitish. Apothecia not seen.

Very similar in colour to *A. implexa* f. *cana*, for which but for the absence of any reaction it might readily be mistaken. The thallus is less elongate, more slender, with the branches less entangled than in *A. jubata*, while the soredia also are different. It has not been found fertile.

Hab. On the branches of old firs in wooded mountainous tracts.—*Distr.* Very local among the Grampians, Scotland.—B. M.: Ben Lawers, Perthshire; Glen Derrie, Braemar, Aberdeenshire.

6. *A. implexa* Nyl. ex Norrl. Med. Soc. pro F. et Fl. Fenn. i. (1876) p. 14.—Thallus pendulous, elongate, filiform, subrounded, very much branched and entangled, slender and flaccid, greyish-yellow or greyish-white, with whitish or greyish scattered soredia ($K^{+yellowish}$, $CaCl_-$). Apothecia as in the preceding species.—

Usnea implexa Hoffm. Deutsch. Fl. ii. (1795) p. 134. *Alectoria cana* Leight. Lich. Fl. p. 88. *Alectoria capillaris* Cromb. Journ. Bot. 1872, p. 233; Leight. Lich. Fl. ed. 3, p. 79.—This is the *Lichen jubatus* pro parte of Linnæus and of some of the older British authors.

Similar in habit to *A. jubata*, of which it has usually been considered a variety, but from which it is separated by the more slender and differently-coloured thallus, and especially by the reaction. It has a still closer resemblance to *A. sarmentosa* f. *crinalis* Ach., with which, in countries where both are frequent, it is apt to be confounded. It is often almost entirely esorediate. It is very rarely fertile, and the few British specimens are sterile.

Hab. On the trunks of old firs in mountainous districts.—*Distr.* Very local and rare in N. England and the Grampians, Scotland.—B. M.: Yorkshire. Killn, Perthshire; Deerhill Wood, Forfarshire; Mar Forest, Braemar, Aberdeenshire; Rothiemurchus Woods, Inverness-shire.

7. *A. bicolor* Nyl. Mém. Soc. Cherb. v. (1857) p. 98.—Thallus filiform, erect, very much and divaricately branched, densely intricate, black or brownish-black; branches short, slender, rounded, patent, subfibrillose, the apices usually somewhat curved and pale-brown (K^- , $CaCl^-$). Apothecia lateral, small, blackish; spores shortly ellipsoid, 0.007–8 mm. long, 0.005–6 mm. thick.—Mudd, Man. p. 70; Cromb. Lich. Brit. p. 23; Leight. Lich. Fl. p. 86, ed. 3, p. 78.—*Cornicularia bicolor* Gray, Nat. Arr. i. p. 405; Hook. Fl. Scot. ii. p. 69; Sm. Eng. Fl. v. p. 229. *Lichen bicolor* Ehrh. Beytr. iii. (1789) p. 82; Eng. Bot. t. 1853. *Lichen lanatus* Huds. Fl. Angl. p. 461; Lightf. Fl. Scot. ii. p. 892; With. Arr. ed. 3, iv. p. 57. *Usnea lance nigra instar saxis adherens* Dill. Musc. 66, t. 13. f. 8. *Muscus coralloides lance nigra instar, saxis adherens* Dill. in Ray, Syn. ed. 3, p. 65, n. 3.—*Brit. Exs.*: Mudd, n. 39; Cromb. n. 127.

Though allied to *A. jubata*, of which it has been regarded as a variety, yet, in the absence of any intermediate states, this is a very distinct species. The apices of the thallus, which is at length free, are frequently concolorous with the branches (var. *melaneira* Ach. Lich. Univ. p. 614); but this evidently results from exposure. The apothecia have been gathered only in the Himalaya Mts. The spermogones are very minute, more frequent towards the apices, with spermatia 0.008 mm. long, about 0.0005 mm. thick.

Hab. On rocks and boulders among mosses in upland and subalpine tracts.—*Distr.* Frequent and sometimes abundant in mountainous tracts of W. and N. England, N. Wales, and the Highlands of Scotland, but apparently very rare in N.E. Ireland.—B. M.: Hay Tor and Lustleigh Cleeve, Dartmoor, Walkington, Devonshire; Helminston, Cornwall; Capel Arthog, Llyn Bodlyn, and Cader Idris, Merionethshire; Island of Anglesea; Farndale, Yorkshire; Teesdale, Durham; Kentmere, Westmoreland. New Galloway, Kirkcudbrightshire; Ben-A'an, near Taymouth, Ben Lawers, Ben More, Glen Lyon, Corrie Uachlar, Rannoch, and Ben-y-Gloe, Perthshire; Canlochan, Forfarshire; Lochnagar, Aberdeenshire; Ben Luigihal, Sutherlandshire. Co. Antrim.

Tribe XII. **CETRARIEI** Nyl. Mém. Soc. Cherb. iii.
(1855) p. 172; Syn. i. p. 297.

Thallus subfruticulose or foliaceous, compressed or rarely rounded, erect, ascending, or appressed, occasionally sparingly rhizinose beneath, internally filled with a white woolly medulla. Apothecia lecanorine, marginal, obliquely affixed to the laciniae; spores $Sn\alpha$, small, simple, colourless; paraphyses not discrete. Spermogones enclosed in setuliform apiculi or black papillae; sterigmata subsimple or pauci-articulate.

In habit and general appearance this tribe approaches some of the *Alectoriei*, though in more important respects it is allied to the *Parmeliei*. Having regard, however, to the usually fruticulose thallus, the situation of the apothecia, and the character of the spermogones, it is entitled to be separated from both. Most of the European species are found in Britain.

39. **CETRARIA** Ach. Meth. (1803) p. 292 pro parte; Nyl. Syn. i. p. 298.—Thallus fruticulose, erect or ascending, more or less rigid, laciniose, rarely fistulose, concolorous on both sides; epithallus somewhat shining; medullary layer with the filaments loosely interwoven, or in the fistulose species arachnoid, scanty, intricate within; cortical layer internally formed of longitudinal tubes, externally cellular. Apothecia subconcolorous with the thallus, marginal, adnate on the front of the apices of the laciniae, usually with entire, sometimes with crenulate margin; hypothecium colourless; spores subellipsoid; hymenial gelatine bluish with iodine. Spermatogones marginal, spinuliform; sterigmata simple; spermatia cylindrical, moderate or somewhat short.

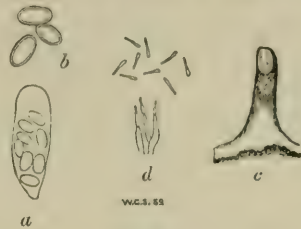


Fig. 42.

Cetraria Islandica Ach.—a. A theca, $\times 350$. b. Spores, $\times 500$. c. Vertical section of a spermatogone, $\times 30$. d. Sterigmata and spermatia, $\times 500$.

This genus is especially characteristic of sub-arctic or alt-alpine regions. The thallus, which is of a lighter or darker spadiceous colour, becomes at length free from the substratum. In most species the apothecia are very rare or unknown in this country, and even the spermatogones, which are more frequent than the apothecia, are seldom seen in herbaria specimens, in consequence of the spinules in which they are enclosed being abraded.

1. **C. Islandica** Ach. Meth. (1803) p. 293.—Thallus subfoliaceous, caespitose, variously laciniate, subcanaliculate, more or less ciliato-spinulose at the margins, shining, pale-chestnut-coloured or dark-chestnut-brown, usually with impressed white soredia at the back, often stained of a blood-red colour at the base (K^- , $CaCl^-$). Apothecia adnate on the upper surface of the apices of the laciniae, large or moderate; the margin thin, entire or crenulate, at length excluded; spores 0,007–11 mm. long, 0,004–6 mm. thick.—Gray, Nat. Arr. i. p. 433; Hook. Fl. Scot. ii. p. 51; Sm. Eng. Fl. v. p. 221; Tayl. in Mack. Fl. Hib. ii. p. 155; Cromb. Lich. Brit. p. 25; Leight. Lich. Fl. p. 96, ed. 3, p. 91.—*Cornicularia Islandica*, Mudd, Man. p. 77, t. 1. f. 19. *Lichen Islandicus* Linn. Sp. Pl. (1753) p. 1145 a; Huds. Fl. Angl. p. 448; Lightf. Fl. Scot. ii. p. 829; Eng. Bot. t. 1330; With. Arr. ed. 3, iv. p. 54. *Lichenoides rigidum eryngii foliis referens* Dill. Musc. 209, t. 28. f. 111 a, in Ray, Syn. ed. 3, p. 77, n. 90.—*Brit. Exs.*: Mudd, n. 51; Leight. n. 42 pro parte.

The thallus of the "Iceland Moss" varies considerably in colour, being sometimes almost entirely greyish-white, and in the character of the laciniae. The fertile laciniae are broader at the apices than the barren. The apothecia, which are seldom met with in this country, are usually of moderate size, and become at length somewhat deformed. The spermo-

gonies are situated at the apices of the marginal cilia, with spermatia 0.005–6 mm. long, 0.001 mm. thick. A parasitic fungus, *Sphæria cetrariicola* Nyl., is occasionally seen on the thallus; in Lapland it has been seen also on *C. hiascens*.

Hab. On the ground among heath, and in stony places in upland, sub-alpine, and especially in alpine situations.—*Distr.* Not general nor common on the mts. of N. Wales, N. England, S.W. Ireland, and S. and N. Scotland, but very plentiful amongst the Grampians, especially in Braemar, where it occurs in fruit on some of the loftier summits; occasionally descending to low altitudes on more exposed upland heaths.—B. M.: Wootton Common, Norfolk; Stockton Forest, Langwith Moor, and Stenshall Common, Yorkshire; Snowdon, Carnarvonshire; Cwm Bychan, Merionethshire; Teesdale, Durham. Cheviot Hills, Roxburghshire; Pentland Hills, near Edinburgh; Mael Graedha and Ben Lawers, Perthshire; Clova Mts. and Sidlaw Hills, Forfarshire; Hills of Nigg, near Aberdeen; Morroae, Lochnagar and Ben Macdhuì, Braemar; Ben Nevis, Inverness-shire. Slieve Donard, co. Down; Mangerton, co. Kerry.

Form *platyna* Fr. Lich. Europ. (1831) p. 37.—Laciniae rather broad, subsimple and sparingly denticulate at the margins. Apothecia large.—Cromb. Grevillea, xv. p. 48; Leight. Lich. Fl. p. 96, ed. 3, p. 91 pro parte. *Cetraria platyna* Ach. Syn. (1814) p. 229. *Cetraria Islandica* f. *dilatata* Norrl., Cromb. Linn. Soc. Journ. Bot. 1880, p. 575. *Lichenoides rigidum eryngii foliis referens* Dill. Musc. 209, t. 28. f. 111 b.

Varies in colour like the type, with the laciniae occasionally 1 inch in breadth. The apothecia are usually rather large and few, with the margin generally excluded. From the paucity of the marginal cilia, the spermogones are rarely seen.

Hab. On the ground among heaths in alpine places.—*Distr.* Local on the loftier Grampians, chiefly in Braemar, at high altitudes, where it is not uncommon.—B. M.: Lochnagar, Ben-naboord, Ben Macdhuì, Cairngorm, Cairntoul, Braemar, Aberdeenshire; Ben Nevis, Inverness-shire.

2. *C. crispa* Nyl. ex Lamy, Bull. Soc. Bot. Fr. xxv. (1878) p. 362.—Thallus somewhat small, caespitose, erect or depressed, pale-chestnut or chestnut-brown; laciniae crowded, rather narrow, canaliculate, densely ciliate and connivent at the margins, often reddish at the base (K^- , $CaCl^-$). Apothecia small, submarginal, the margin persistently denticulate; spores as in the preceding species, or slightly smaller.—Cromb. Grevillea, xv. p. 48.—Subsp. *Cetraria crispa*, Cromb. Grevillea, xii. p. 73. *Cetraria Islandica* β . *crispa* Ach. Lich. Univ. (1810) p. 513; Cromb. Lich. Brit. p. 26; Leight. Lich. Fl. p. 97, ed. 3, p. 92. *Cornicularia Islandica* β . *crispa*, Mudd, Man. p. 77. *Lichen Islandicus* β Lightf. Fl. Scot. ii. p. 830; Huds. Fl. Angl. ed. 2, p. 539; With. Arr. ed. 3, iv. p. 54. *Lichenoides eryngii folia referens, tenuioribus et crispioribus foliis* Dill. Musc. 212, t. 28. f. 112.—*Brit. Exs.*: Mudd, n. 52; Leight. n. 42 pro parte.

Smaller, and somewhat pulvinate, with narrower and more ciliate laciniae than *C. Islandica*, of which it was considered a variety, but is now separated as a species by Nylander. The apothecia are very rare in Britain.

Hab. On the ground among mosses in subalpine and alpine districts.—*Distr.* Local in N. Wales, N. England, and S. Scotland, more frequent among the Grampians, especially in Braemar.—B. M.: Snowdon and Carnedd Llewellyn, Carnarvonshire; Teesdale, Durham. Pentland Hills, near Edinburgh; Mael Graedha, Ben Lawers, and Rannoch, Perthshire; Katelaw, Forfarshire; Morrone and Ben-naboord, Braemar, Aberdeenshire; Ben Nevis, Inverness-shire.

Form *subtubulosa* Cromb. Grevillea, xv. (1886) p. 48.—Laciniae interruptedly tubulose, with the suture ciliato-spinulose. Apothecia not seen.—*Cetraria Islandica* f. *subtubulosa* Fr. Lich. Eur. (1831) p. 37.

A modification of the preceding, which scarcely deserves to rank as a separate form. The thallus is only sparingly branched, and is never seen fertile.

Hab. On mossy ground among boulders in alpine places.—*Distr.* Local and uncommon on a few of the higher Grampians, Scotland.—B. M.: Katelaw, Forfarshire; Ben-naboord and Cairntoul, Braemar, Aberdeenshire.

3. *C. hiascens* Fr. fil. Lich. Scand. (1871) p. 98.—Thallus densely caespitose, subfoliaceous, canaliculate or somewhat plane, opaque, pale- or dark-brown, with white impressed soredia at the back, often stained yellowish-brown at the base; laciniae narrow, sparingly ciliato-spinulose, much and repeatedly dichotomously branched at the apices (K^- , $CaCl^+_{f+}$ reddish). Apothecia adnate to the upper surface of the apices of the laciniae, elevated, moderate, subconcolorous, the margin sometimes denticulate; spores as in the preceding species.—Cromb. Grevillea, xv. p. 48.—*Cetraria aculeata* b. *hiascens* Fr. Lich. Europ. (1831) p. 36. *Cetraria Delisei* (Bory), Cromb. Lich. Brit. p. 26; Leight. Lich. Fl. p. 97, ed. 3, p. 92.

Differs from *C. crispa* in the laciniae and the chemical reaction of the medulla. The thallus, which is rather brittle when dry, varies considerably in colour and in the length of the laciniae, being dark and short in Britain. Neither the apothecia nor the spermatogones occur in this country.

Hab. Among mosses on the ground in alpine places.—*Distr.* Extremely local and rare on the summits of two of the loftier N. Grampians, Scotland.—B. M.: Lochnagar and Ben Macdhuì, Braemar, Aberdeenshire.

4. *C. aculeata* Fr. Syst. Orb. Veg. (1825) p. 239.—Thallus caespitoso-fruticulose, rigid and somewhat fragile, fistulose, erect, somewhat rounded or anguloso-unequal, or somewhat compressed, sublacunose, very much and irregularly branched, bright- or dark-brown; branches divaricate, more or less blackish-spinulose (K^- , $CaCl^-$). Apothecia subterminal, concolorous, small or moderate, the margin spinuloso-denticulate; spores 0.005–9 mm. long, 0.003–4 mm. thick.—Cromb. Lich. Brit. p. 26; Leight. Lich. Fl. p. 97, ed. 3, p. 92.—*Cornicularia aculeata* Gray, Nat. Arr. i. p. 405; Hook. Fl. Scot. ii. p. 69; Sm. Eng. Fl. v. p. 228; Tayl. in Mack. Fl. Hib. ii. p. 86; Mudd, Man. p. 77 (incl. β . *cælocaula* Flott.). *Lichen acu-*

leatus Schreb. Fl. Lips. (1771) p. 125. *Lichen Islandicus* γ Huds. Fl. Angl. ed. 2, p. 539. *Coralloides fruticuli specie fuscum, spinosum* Dill. Musc. p. 112 pro parte. *Lichenoides non tubulosum ramossissimum fruticuli specie, rufo-nigrescens* Dill. in Ray, Syn. ed. 3, p. 66, n. 10 pro parte.—*Brit. Exs.*: Mudd, n. 50; Leight. n. 3; Larb. Lich. Hb. n. 163.

A very distinct species, variable in size and degree of spinulosity, and so giving rise to several forms. The apothecia are not common in Britain, and the spermogones are but occasionally seen. They are very minute, blackish, situated on the apices of the marginal cilia, with spermatia 0,004 mm. long, 0,001 mm. thick.

Hab. On the ground in sandy and gravelly places among grasses and heath of moorlands in upland and subalpine tracts.—*Distr.* Not very general nor common, though occurring here and there in most parts of Great Britain; rare in the Channel Islands; not seen from Ireland.—B. M.: Quenvais, Island of Jersey. North Wootton, Norfolk; Reigate Heath, Surrey; Lyndhurst Common, Hampshire; Dartmoor, Devonshire; Malvern Hills and Hartlebury Common, Worcestershire; Charnwood Forest, Leicestershire; Island of Anglesea; near Over, Cheshire; Farn-dale, Yorkshire; Haughmond Hill, Shropshire; Gateshead, Durham; Kilhope Law, Northumberland. New Galloway, Kirkcudbrightshire; Pentland Hills, near Edinburgh; Glen Lochay, Ben Lawers, and Birnam Hill, Perthshire; Baldovan Woods and Clova, Forfarshire; Lochnagar, Braemar, Aberdeenshire; Glen Nevis, Inverness-shire; Culbin, Elgin-shire.

Form 1. *hispida* Cromb. Linn. Soc. Journ. Bot. xvii. (1880) p. 561.—Thallus smaller, more slender and intricate, densely caespitose. Apothecia numerous.—*Lichen hispidus* Lightf. Fl. Scot. ii. (1777) p. 883; With. Arr. ed. 3, iv. p. 43; Eng. Bot. t. 452. *Cetraria aculeata* var. *muricata* Ach., Cromb. Lich. Brit. p. 26; Leight. Lich. Fl. p. 98, ed. 3, p. 93. *Coralloides fruticuli specie fuscum, spinosum* Dill. Musc. 112, t. 17. f. 31 A.—*Brit. Exs.*: Leight. n. 4; Mudd, n. 49.

Grows in low dense tufts, about $\frac{1}{2}$ to 1 inch high, and occasionally spreads very extensively. The thallus is densely branched, more or less spinulose, and is often darker in colour than in the type. Usually well fertile with crowded apothecia, which are sometimes comparatively large. The spermogones in otherwise barren specimens are numerous.

Hab. On the ground of moorlands in upland and subalpine districts.—*Distr.* Frequent in the hilly and mountainous tracts of Great Britain—more especially in the Central Highlands of Scotland; very rare in S.W. Ireland.—B. M.: Hainault Forest, Essex; Wokingham Heath, Buckinghamshire; Lydd, Kent; Dartmoor, Devonshire; Scilly Islands, Cornwall; Black Edge, near Buxton, Derbyshire; Charnwood Forest, Leicestershire; Longmynd, Shropshire; Cwm Bychan, Merionethshire; Breidden, Montgomeryshire; near Beverley and Cleveland, Yorkshire; Kentmere, near Kendal, Westmoreland; Asby, Cumberland. New Galloway, Kirkcudbrightshire; Dalnahoy Hill and Pentland Hills, near Edinburgh; Ben Lawers, Craig Tulloch, Rannoch Moor, Perthshire; Sidlaw Hills, Montrose links, and near Cortachy, Forfarshire; Glen Dee and Glen Muick, Braemar, Aberdeenshire; Hills of Applecross, Ross-shire. Killarney, co. Kerry.

Form 2. *acanthella* Nyl. Mém. Soc. Cherb. v. (1857) p. 100.—Thallus as in the type, but very much spinuloso-denticulate throughout. Apothecia few.—Cromb. Journ. Bot. 1870, p. 96; Leight. Lich. Fl. p. 98, ed. 3, p. 93.—*Cornicularia spadicæ* γ. *acanthella* Ach. Lich. Univ. (1810) p. 612. *Coralloides fruticuli specie fuscum, spinosum* Dill. Musc. 112, t. 17. f. 31 B.

Distinguished by the entirely hispid-spinulose or setulose thallus. In this country the apothecia are very rare. The spermogones are frequently present in herbaria specimens.

Hab. On the ground among mosses in upland districts.—*Distr.* Local and scarce in W. and N. England, N. Wales, and among the N. Grampians, Scotland.—B. M.: Clifton, near Bristol; Dolgelly, Merionethshire; Farndale, Yorkshire; Prestwick Carr, Northumberland. Clova Mts., Forfarshire; Hill of Ardo near Aberdeen, S. of Lochnagar, Braemar, Aberdeenshire; Glen Nevis, Inverness-shire.

5. *C. odontella* Ach. Syn. (1814) p. 230.—Thallus densely fruticuloso-cæspitose, depressed, narrowly laciniate; laciniae plane, linear, thin, palmately ramoso-divided, spinulose at the margins, spadicæous, chestnut-brown or pale spadiceous, paler at the base, or sometimes blood-coloured (K_- , $CaCl_-$). Apothecia terminal, concolorous, the margin denticulate; spores 0,007–010 mm. long, about 0,0045 mm. thick.—Cromb. Journ. Bot. 1882, p. 272.—*Lichen odontellus* Ach. Prodr. (1798) p. 213.

This usually forms minute depressed tufts, and somewhat resembles form *hispidæ* of the preceding species, but is distinguished by the plane thin laciniae. The thallus closely allies it to *C. crispa*, from which it is, however, separated by the characters given. In the only specimen found in this country, apothecia and spermogones are absent.

Hab. Among mosses on rocks in alpine tracts.—*Distr.* A single specimen from the N. Grampians, Scotland.—B. M.: Cairntoul, Braemar, Aberdeenshire.

40. **PLATYSMA** Nyl. Mém. Soc. Cherb. v. (1857) p. 100; Syn. i. p. 301.—*Platysma*, Hoffm. Deutsch. Fl. ii. (1795) p. 138 pro minima parte (ut sectio *Lobariæ*).—Thallus fruticulose or membranaceo-dilated, erect, ascending or appressed, more or less rigid, lobed or laciniate, concolorous on both sides or discolorous; medullary layer with the filaments loosely interwoven; cortical layer more or less cellular, very rarely with tubulose cavities. Apothecia discolorous from thallus, marginal or submarginal, rarely adnate on the back of the apices of the laciniae, the margin entire or crenulate; hypothecium colourless; spores sub-ellipsoid; hymenial gelatine bluish with iodine. Spermogones marginal, globose; sterigmata somewhat simple or pauci-articulate; spermatia various (not cylindrical).



Fig. 43.

Platysma commixtum Nyl.—a. Section of upper portion of the thallus, $\times 200$. b. Vertical section of a spermogone, $\times 30$. c. Sterigmata and spermatia, $\times 500$.

Well distinguished from *Cetraria* by the form of the spermatogones, though in one section the form of the spermatia indicates some affinity. The thallus is at length free, or affixed to the substratum by a few rhizinae, and is more variable in colour than in *Cetraria*. When it is membranaceous-dilated, as it sometimes is, it resembles *Parmelia*, but is separated by the spermatogones.

A. Spermatia slightly incrassate or clavate at the obtuse apices.

a. Thallus erect, becoming free, concolorous on both sides, the laciniae elongate.

1. **P. nivale** Nyl. Act. Soc. Linn. Bord. sér. 3, i. (1867) p. 295.—Thallus fruticuloso-erect, foliaceo-expanded, sinuato-laciniate, pale straw-coloured or ochroleucous, usually tinged brown-ochraceous at the base; laciniae canaliculato-patulous, reticulato-lacunose, dentate at the apices (K^- , $CaCl^-$). Apothecia adnate on the front of the laciniae, subterminal, moderate, yellowish flesh-coloured, the margin crenulate; spores small, 0,007–9 mm. long, 0,004–5 mm. thick.—Nyl. Syn. i. p. 302, t. 8. f. 33; Cromb. Lich. Brit. p. 26; Leight. Lich. Fl. p. 99, ed. 3, p. 93.—*Cetraria nivalis* Gray, Nat. Arr. i. p. 433; Hook. Fl. Scot. ii. p. 57; Sm. Eng. Fl. v. p. 221; Mudd, Man. p. 78. *Lichen nivalis* Linn. Sp. Pl. (1753) p. 1145; Dicks. Crypt. fasc. iii. p. 17; With. Arr. ed. 3, iv. p. 60; Eng. Bot. t. 1994. *Lichenoides lacunosum candidum glabrum, endiviæ crispæ facie* Dill. Musc. 162, t. 21. f. 56 A.—*Brit. Exs.*: Leight. n. 43; Mudd, n. 53; Cromb. n. 24.

This beautiful species, so characteristic of Arctic and Alpine regions, often forms dense tufts, occasionally of considerable size. The apothecia do not occur in this country, but the spermatogones are occasionally seen. They appear as black marginal papillae, with sterigmata subsimple, or 2-3-articulate, and spermatia 0,006–7 mm. long, 0,001 mm. thick.

Hab. On the ground among mosses and on bare detritus in alpine places.—*Distr.* Rather local, though plentiful among the Grampians, Scotland, chiefly in Braemar.—B. M.: Ben Lawers, Perthshire; Bassies, Clava, Forfarshire; Lochnagar, Ben-naboord, Morrone, Ben Avon, Ben Macdhuil, Cairngorm, Cairntoul, sources of the Dee, Braemar, Aberdeenshire; Ben Nevis, Inverness-shire.

2. **P. cucullatum** Nyl. Act. Soc. Linn. Bord. sér. 3, i. (1867) p. 295.—Thallus fruticuloso-erect, foliaceo-complanate, smooth, canaliculato-laciniate, pale ochroleucous, usually tinged purplish at the base; laciniae sinuato-divided, the margins connivent, undulate, naked, somewhat recurved at the apices (K^- , $CaCl^-$). Apothecia adnate on the back of the lobes, subterminal, often dilated, pale flesh-coloured, the margin thin, or at length excluded; spores 0,007–10 mm. long, 0,004 mm. thick.—Cromb. Journ. Bot. 1870, p. 96; Leight. Lich. Fl. p. 99, ed. 3, p. 94.—*Cetraria cucullata* Mudd, Man. p. 87. *Lichen cucullatus* Bellard, Obs. Bot. (1788) p. 54. *Lichenoides marginibus coruntibus et velut tubulosum* Dill. Musc. 162, t. 21. f. 56 B.—*Brit. Exs.*: Cromb. n. 132.

In Great Britain this occurs only in small, scattered tufts. It differs

from the preceding in the narrower laciniae, connivent at the margins, and when fertile in the position of the apothecia. With us it is sterile.

Hab. On the ground among mosses in alpine places.—*Distr.* Known only from the summits of some of the higher N. Grampians, Scotland.—*B. M.*: Cairntoul and Cairngorm, Braemar, Aberdeenshire.

b. Thallus subascending or appressed, more or less closely adherent, subdiscolorous; laciniae somewhat narrow.

3. *P. sæpincola* Nyl. Act. Soc. Linn. Bord. sér. 3, i. (1856) p. 295.—Thallus small, smooth, laciniato-lobed, olive- or chestnut-brown, beneath paler; laciniae decumbent or ascending, somewhat plane, the margins undulato-sinuate or crenate (K^- , $CaCl^-$). Apothecia submarginal, adnate, small or moderate, dark-brown or subconcolorous, shining, the margin thin, crenate; spores ellipsoid 0.006–10 mm. long, 0.005–6 mm. thick.—Cromb. Lich. Brit. p. 26 pro parte; Leight. Lich. Fl. p. 100 pro parte, ed. 3, p. 94 pro parte.—*Lichen sæpincola* Ehrh. Phyt. (1780) n. 90; Eng. Bot. t. 2386. f. 2.—To this, from specimens in herbaria, is not referable the *Lichen* or *Cetraria sæpincola* of other British authors, which refers to the following species.

A small plant, with the thallus rosulate, pulvinate, or sometimes effuse, and generally smaller when fertile than when barren. The small and crowded apothecia are rare in this country, as also the spermogones, which have the spermatia 0.006 mm. long, scarcely 0.001 mm. thick.

Hab. On old pales and branches of trees, mostly firs, in mountainous districts.—*Distr.* Very local and scarce, in the N. Grampians, Scotland; very doubtfully in N. England.—*B. M.*: ? Teesdale, Durham. Glen Quoich and Glen Dee, Braemar, Aberdeenshire.

4. *P. ulophyllum* Nyl. Flora, 1869, p. 442.—Thallus moderate, smooth or isidio-furfuraceous, lacero-laciniate, greyish- or pale chestnut-brown, beneath paler; laciniae subappressed or ascending, somewhat narrow, variously divided, the margins undulato-crisp and white sorediato-pulverulent (K^- , $CaCl^-$). Apothecia submarginal, small, the margin subcrenulate or entire; spores as in the preceding species.—Cromb. Grevillea, xii. p. 75.—*Platysma sæpincola* var. *ulophyllum* Leight. Lich. Fl. p. 100, ed. 3, p. 95. *Cetraria sæpincola* β. *ulophylla* Ach. Meth. (1803) p. 297. *Cetraria sæpincola* Gray, Nat. Arr. i. p. 432; Hook. Fl. Scot. ii. p. 57; Sm. Eng. Fl. v. p. 220; Mudd. Man. p. 80. *Lichen sæpincola* Dicks. Crypt. fasc. iii. p. 18; With. Arr. ed. 3, i. v. p. 73; Eng. Bot. t. 2386. f. 1.—*Brit. Exs.*: Leight. n. 45; Mudd, nos. 55, 56.

From *P. sæpincola*, of which it has generally been regarded a variety, this is distinguished by the longer and broader, sometimes isidio-furfuraceous laciniae, which when fully developed are somewhat flaccid, and by their crisp sorediate margins. The states by which it has been supposed to be connected with the preceding are merely young and non-isidiferous conditions of this plant. The small apothecia have only once been met with in this country rightly developed.

Hab. On old pales and firs, very rarely on boulders, in hilly and mountainous districts.—*Distr.* General and not uncommon in S., W., and N. England and the Highlands of Scotland; not seen from Ireland.—B. M.: Between Yarmouth and Caistor, Suffolk; near St. Leonards and Ifeld, Sussex; Hay Tor, Devon; Bardon Hill and Gopsall, Leicestershire; Oteley Park, Ellesmere, Shropshire; Cwm Bychan, Merionethshire; Island of Anglesea; Ingleby Park, Cleveland, Yorkshire; Teesdale, Durham; Ashgill, Cumberland. New Galloway, Kirkcudbrightshire; Glen Falloch, Killin, Ben Lawers, Glen Lyon, and Falls of Bruar, Perthshire; Deerhill Wood and Kinnoul Wood, Forfarshire; Morrone and Linn of Quoich (frt.), Braemar, Aberdeenshire; Glen Nevis, Loch Ennich, and Rothiemurchus Woods, Inverness-shire; Laing, Sutherlandshire.

5. *P. diffusum* Nyl. Flora, 1872, p. 247.—Thallus orbicular, appressed, closely adherent, isidioso-rugose in the centre, naked and sinuato-lobed at the circumference, greyish- or brownish-white, beneath pale brown, with a few long rhizinae; laciniae narrow, applanate, multifid, rounded and crenate at the apices (K + deep yellow, CaCl₂). Apothecia small, subopaque, reddish-brown, the margin crenulate and sorediate: spores ellipsoid, 0,006–9 mm. long, 0,005–6 mm. thick.—Cromb. Journ. Bot. 1872, p. 234; Leight. Lich. Fl. ed. 3, p. 95.—*Parmelia diffusa* Gray, Nat. Arr. i. p. 442. *Lichen diffusus* Web. Spic. Fl. Gott. (1778) p. 250; Dicks. Crypt. fasc. iii. 17, t. 9. f. 6; With. Arr. ed. 3, iv. p. 32. *Parmeliopsis aleurites* (Ach.), Cromb. Lich. Brit. p. 37. *Parmelia aleurites* Hook. Fl. Scot. ii. p. 54; Sm. Eng. Fl. v. p. 203; Mudd, Man. p. 98; Leight. Lich. Fl. p. 130. *Lichen aleurites* Eng. Bot. t. 858.—To this is referable *Parmelia horrescens* Tayl. in Mack. Fl. Hib. ii. p. 144 pro parte (cfr. Cromb. Grevillea, vii. p. 98).—*Brit. Exs.*: Leight. n. 47; Mudd, n. 71; Dicks. Hort. Sic. n. 23.

Not unlike *Parmeliopsis aleurites* Nyl., but the spermogones place it in this genus. The thallus is often densely isidiiferous almost throughout, only the apices of the laciniae being naked. It usually occurs sterile; when present the apothecia are elevated and numerous. The spermogones are large, black, marginal and tubercular, with spermatia 0,004 mm. long, about 0,001 mm. thick.

Hab. On old pales, rarely on stumps of felled trees in wooded lowland and upland districts.—*Distr.* Somewhat local in England, N. Wales, and the Highlands of Scotland; rare in S. W. Ireland.—B. M.: Henham, Suffolk; Penshurst, Kent; Wakehurst, Sussex; Croft Castle and near Hereford, Herefordshire; near Windsor, Berkshire; Stoke Park and Sotterly Park, Buckinghamshire; Gopsall, Leicestershire; near Oswestry and Ellesmere, Shropshire; Cwm Bychan, Merionethshire; Baysdale, Cleveland, Yorkshire. Barcaldine, Lorne, Argyleshire; Inverarnan and Criannarich, Perthshire; Glee Dee, Braemar, Aberdeenshire; Rothiemurchus, Inverness-shire. Askew Wood and Dunkerron, co. Kerry.

6. *P. fahlunense* Nyl. Syn. i. (1860) p. 309.—Thallus suborbicular, appresso-imbricate, smooth, laciniate, spadiceo-brownish or brownish-black, beneath blackish, with a few rhizinae at the circumference; laciniae narrow, multifid, sinuate, subcanaliculate

(K^- + yellowish, $CaCl^-$). Apothecia moderate, brownish-red, the receptacle externally plicato-rugose, the margin granulate; spores ellipsoid, 0.005–11 mm. long, 0.004–6 mm. thick.—Cromb. Lich. Brit. p. 27; Leight. Lich. Fl. p. 101, ed. 3, p. 95.—*Parmelia Fahlunensis* Ach., Gray, Nat. Arr. i. p. 441; Hook. Fl. Scot. ii. p. 53; Sm. Eng. Fl. v. p. 206; Mudd. Man. p. 100 pro parte. *Lichen Fahlunensis* Ach. Prodr. (1798) p. 110; Huds. Fl. Angl. ed. 2, p. 532 pro parte; Eng. Bot. t. 653 (descript. non fig.); With. Arr. ed. 3, iv. p. 30 pro parte. *Lichenoides tinctorum atrum, foliis minimis crispis* Dill. Musc. 188, t. 24. f. 81.—The specimens in Herb. Linn. named *Lichen Fahlunensis* belong to the next species, as do specimens in the Herbaria of our older authors. To prevent the greatest confusion I have used the name applied by Acharius to this plant, and by which it has been usually designated.

The thallus is parmelioid, occasionally somewhat expanded, with the laciniae more or less subascending. The apothecia are elevated, at first urceolate, at length becoming somewhat plane. The spermogones are frequent, brownish-black, in protuberant marginal papillae, with spermatia slender, elongate, 0.005 mm. long, 0.001 mm. thick.

Hab. On rocks and boulders in subalpine and alpine places.—*Distr.* Local and scarce in S., W., and N. England, and N. Wales; more frequent among the Grampians, Scotland, especially in Braemar; not seen in Ireland.—B. M.: Hay Tor, Dartmoor, Devonshire; Cader Idris, Merionethshire; The Cheviots, Northumberland. Ben More and Ben Lawers, Perthshire; Clova Mts., Forfarshire; Lochnagar, Ben Macdhu, Aberdeenshire; Ben Nevis, Inverness-shire.

7. *P. polyschizum* Nyl. Flora, 1862, p. 82 (not.), 1869, p. 442.—Thallus orbicular, appressed, thickish, smooth, laciniato-divided, greyish- or dark-olive-brown, beneath paler or dark; laciniae short, narrow, imbricately crowded, subcanaliculate, slightly elevated at the margins, and rotundato-crenate at the apices (K^- , $CaCl^-$). Apothecia and spores as in the preceding species.—Cromb. Journ. Bot. 1882, p. 272.

This might be taken for a panniform condition of *P. Fahlunense*, with which it agrees in the form of the spermatia, but it is at once separated by the absence of any reaction of the medulla. The thallus when moistened is of a greenish colour, and varies beneath from osseous-white to dark-spadiceous. In perfect specimens the laciniae are broader, planer, and less divided at the extreme circumference. When fertile the apothecia and spermogones are occasionally numerous and crowded.

Hab. On rocks and boulders in alpine places.—*Distr.* Extremely local and scarce on one of the higher N. Grampians, Scotland.—B. M.: Ben-na-board, Braemar, Aberdeenshire.

B. Spermatia ellipsoid. Thallus subascending, closely affixed, subconcolorous; laciniae rather narrow.

8. *P. commixtum* Nyl. Syn. i. (1860) p. 310, t. 8. f. 33.—Thallus suborbicular, adpresso-imbricate, smooth, laciniate, spadiceous or spadiceo-brownish, beneath nearly concolorous, with a few rhizine

towards the circumference; laciniae somewhat ascending, much entangled, subplane or plane, crisp (K^- , $CaCl^-$). Apothecia moderate, brownish-red, the receptacle smoothish, margin nearly entire; spores ellipsoid, 0,005–11 mm. long, 0,004–6 mm. thick.—Carroll, Journ. Bot. 1866, p. 22; Cromb. Lich. Brit. p. 27; Leight. Lich. Fl. p. 101, ed. 3, p. 96.—*Lichen Fahlunensis* Linn. Sp. Pl. (1753) p. 1143; Eng. Bot. t. 653 (fig. only).—*Vide sub P. Fahlunensis*.—*Brit. Evs.*: Cromb. n. 25; Dicks. Hort. Sic. n. 23.

Often confounded with the preceding, from which, apart from the characters of the thallus and the receptacle of the apothecia, it is distinguished by the absence of any chemical reaction and by the form of the spermatia. The apothecia are numerous, chiefly central, sometimes becoming large in old age. The spermatogones usually very numerous, have short, simple sterigmata, and spermatia oblongo- or fusiformi-ellipsoid, 0,003–4 mm. long, 0,0015–20 mm. thick.

Hab. On rocks and boulders chiefly in alpine situations.—*Distr.* Rather local, being confined to N. Wales, S. Scotland, and the Grampians, especially those of Braemar, where it is plentiful.—B. M.: Carnedd Llewelyn and the Glyders, Carnarvonshire. New Galloway, Kirkcudbrightshire; Ben Lawers and Hills near Amulree, Perthshire; Katelaw, Forfarshire; Ben-ni-boord, Morrong, and Lochnagar, Braemar, Aberdeenshire; Ben Nevis, Inverness-shire.

Form *tenuisectum* Cromb. (Grevillea, xv. (1886) p. 49.—Laciniae narrower and more intricately crowded.—*Cetraria commixta* f. *tenuisecta* Fr. fil. Lich. Scand. (1871) p. 109.

Connected with the type by intermediate states, and probably not constant; always sterile.

Hab. On rocks in alpine situations.—*Distr.* Local and scarce on the Grampians, Scotland.—B. M.: Ben Lawers, Perthshire; Morrong, Braemar, Aberdeenshire.

C. Spermatia acicular, cylindrical, slightly incrassate at one apex.

a. Thallus suberect or appressed, somewhat loosely affixed, concolorous; laciniae narrow or dilated.

9. *P. juniperinum* Nyl. Act. Soc. Linn. Bord. sér. 3, i. (1857) p. 295.—Thallus ascending, lobato-laciniate, citrine or greenish-yellow on both sides, or somewhat paler beneath; medulla intensely citrine; laciniae crowded, eroso-crenate, crisp, concave (K^- , $CaCl^-$). Apothecia adnate to the front of the laciniae, moderate, badiorreddish or badio-brownish, the margin corrugate or denticulate; spores ellipsoid, 0,006–9 mm. long, 0,004–6 mm. thick.—Nyl. Syn. i. p. 312, t. 8. f. 34; Cromb. Lich. Brit. p. 27; Leight. Lich. Fl. p. 102, ed. 3, p. 96.—*Cetraria juniperina* Gray, Nat. Arr. i. p. 432; Sm. Eng. Fl. v. p. 220; Mudd, Man. p. 79. *Lichen juniperinus* Linn. Sp. Pl. (1753) p. 1147. *Lichen juniperinus* Huds. Fl. Angl. p. 452; Lightf. Fl. Scot. ii. p. 836, apparently refers to some state of *Physcia parietina*, as observed in Eng. Bot. 194, and With. Arr. ed. 3, iv. p. 34 (*cfr.* Cromb. Journ. Bot. 1872, p. 234).

Our few authentic specimens are typical, though smaller than in countries where it is more plentiful. The apothecia do not occur in these, and the spermogones are rarely seen. They are minute, marginal, with spermatia 0,007 mm. long, 0,001 mm. thick.

Hab. On the trunks of aged pines in mountainous woods.—*Distr.* Extremely local and rare in the N. Grampians, Scotland; very doubtfully in N. England.—B. M.: ? Near High Force Inn, Teesdale, Durham (frt.). Clova, Forfarshire; Rothiemurchus Woods, Inverness-shire.

10. *P. pinastri* Nyl. Flora, 1869, p. 442.—Thallus depressed, roundly lobed, greenish-yellow; laciniae plane, somewhat broad, sometimes imbricate, the margins intensely citrino-sorediate; medulla deep citrine (K^- , $CaCl^-$). Apothecia as in the preceding species, but very rare.—*Platysma juniperinum*, subsp. *pinastri* Cromb. Journ. Bot. 1872, p. 234. *Platysma juniperinum* var. *pinastri* Cromb. Lich. Brit. p. 27; Leight. Lich. Fl. p. 102, ed. 3, p. 97. *Cetraria pinastri* Gray, Nat. Arr. i. p. 432. *Cetraria juniperina* β . *pinastri* Hook. Fl. Scot. ii. p. 57 pro parte; Sm. Eng. Fl. v. p. 220; Mudd, Man. p. 79. *Lichen pinastri* Scop. Fl. Carn. ii. (1772) p. 382; Dicks. Crypt. fasc. iii. p. 18; With. Arr. ed. 3, iv. p. 51; Eng. Bot. t. 2111.

This holds the same relation to *P. juniperinum*, of which it has usually been considered a variety, as *P. alophyllum* does to *P. scopulicola*, except with respect to size. It is distinguished from the preceding by being smaller, with broader and more appressed lobes, and by the bright citrine-coloured marginal soredia. The colour of the medulla in both species, as observed by Nylander, *l. c.*, depends upon the presence of vulpine. Neither apothecia nor spermogones are seen in our British specimens.

Hab. On the trunks of old firs and on larch pales in upland wooded districts.—*Distr.* Very local and rare in E. and N. England, and in the Grampians, Scotland.—B. M.: Framlingham, near Norwich, Norfolk; Holwick, Yorkshire; Teesdale, Durham; near Kendal, Westmoreland. Ben Lawers, Perthshire; Woods of Rothiemurchus, Inverness-shire.

b. Thallus subascending, somewhat loosely affixed, discolorous; laciniae dilated.

11. *P. glaucum* Nyl. Act. Soc. Linn. Bord. sér. 3, i. (1857) p. 295.—Thallus foliaceo-expanded, ascending, smooth or lacunosorugulose, lacinate or laciniato-lobed, glaucous-grey or pallescent, beneath brownish or blackish, paler at the circumference; laciniae more or less ascending, sinuate, crenate, or lacerate, often sorediate at the margins ($K^{+yellowish}$, $CaCl^-$). Apothecia marginal, adnate, moderate or somewhat large, reddish-brown, the margin thin, evanescent; spores ellipsoid, 0,006–9 mm. long, 0,035–50 mm. thick.—Nyl. Syn. i. p. 314, t. 8. f. 35; Cromb. Lich. Brit. p. 27; Leight. Lich. Fl. p. 102, ed. 3, p. 97.—*Cetraria glauca* Gray, Nat. Arr. i. p. 433; Hook. Fl. Scot. ii. p. 57; Sm. Eng. Fl. v. p. 220; Tayl. in Mack. Fl. Hib. ii. p. 154; Mudd, Man. p. 79, t. 1. f. 20. *Lichen glaucus* Linn. Sp. Pl. (1753) p. 1148; Huds. Fl. Angl. p. 453; Lightf. Fl. Scot. ii. p. 838; With. Arr. ed. 3, iv. p. 53; Eng. Bot.

t. 1606. *Lichenoides endiviæ foliis crispis splendidibus, subtus nigricantibus* Dill. Musc. 192, t. 25. f. 96.—*Brit. Ews.*: Mudd, n. 54; Leight. n. 44; Bohl. n. 79.

The thallus often spreads extensively over the substratum to the exclusion of all other lichens. It varies in colour from ivory-white above to pitch-black beneath, and also in the length and breadth of the laciniae; when more depressed it is often somewhat parmelioid. The apothecia, which in old plants become large and deformed, are rare in this country; nor are the spermogones very common, at least in dried specimens. They are papilloso-tuberculose, with sterigmata 2-4-articulate, and spermatia about 0.007 mm. long, 0.001 mm. thick.

Hab. On trunks of trees, walls, rocks, and on the ground, in upland and subalpine localities.—*Distr.* General and usually plentiful in the mountainous tracts of Great Britain; very abundant and luxuriant in the Central Highlands of Scotland; not very frequent in Ireland; rare in the Channel Islands.—*B. M.*: Boulay Bay, Island of Jersey. Near Sprouston and at Sall, Norfolk; High Beech, Epping Forest, Essex; New Forest, Hants; Hay Tor and Lustleigh Cleeve, Dartmoor, Devonshire; Lamorna and Helminston, Cornwall; Charnwood Forest and Gopsall Park, Leicestershire; near Matlock, Derbyshire; Craigforda near Oswestry, Shropshire; near Barmouth, and Dolgelly, Merioneth; Island of Anglesea; Kildale Moor, Cleveland, Yorkshire; Teesdale and Cronkley Fell, Durham; Stavely Head, Westmoreland; Ashgill, Cumberland. New Galloway, Kirkcudbrightshire; near Loch Skene, Moffat, Dumfriesshire; Pentland Hills and Swanston Wood, near Edinburgh; near Inverary and Loch Creran, Argyleshire; Killin, Ben Lawers, Loch Earn, and Birnam Hill, Dunkeld, Perthshire; Deerhill Wood, Forfarshire; Countesswells Wood, near Aberdeen; Glen Callater and Lion's Face, Braemar; near Forbes, Elginshire; Glen Nevis and Loch Ennich, Inverness-shire; Hills of Applecross, Ross-shire. Killarney, Lough Bruil and Finnechey Bridge, co. Kerry.

Form 1. *fallax* Nyl. Syn. i. (1860) p. 314.—Thallus either whitish maculate or almost entirely whitish beneath, the laciniae often more or less dissecto-fimbriate at the margins. Apothecia as in the type.—Cromb. Lich. Brit. p. 27; Leight. Lich. Fl. p. 103, ed. 3, p. 98.—*Cetraria glauca* β . *fallax* Hook. Fl. Scot. ii. p. 57; Sm. Eng. Fl. v. p. 220; Mudd, Man. p. 80. *Lichen fallax* Web. Spicil. Fl. Germ. (1778) p. 244; Dicks. Crypt. fasc. i. p. 13; With. Arr. ed. 3, iv. p. 53; Eng. Bot. t. 2373. *Lichenoides membranaceum, tubæ Fallopianæ crinulum* Dill. Musc. 165, t. 22. f. 58.—*Brit. Ews.*: Mudd, n. 55.

Distinguished by the colour of the under surface of the thallus, which is sometimes variegated with black and white, and at other times is almost entirely whitish. With us it is very rarely fertile, the state in which the laciniae are dissecto-fimbriate (*coralloidea* Wallr., Leight. Lich. Fl. II. c.) being here as elsewhere always sterile.

Hab. On the trunks of old trees in shady woods, rarely on moist rocks, in upland districts.—*Distr.* Rather local and scarce in S. W., and N. England, in Central Scotland, and in S.W. Ireland.—*B. M.*: Dartmoor, Devonshire; Helminston, Cornwall; Garth, Dolgelly, Merionethshire; Ingleby Park, Cleveland, Yorkshire. Near Inverary, Argyleshire; Glen Falloch, Finlarig, Killin, Perthshire; Sidlaw Hills, Forfarshire; Glen Nevis, Lochaber, Inverness-shire.

Form 2. *ampullaceum* Cromb. Linn. Soc. Journ. Bot. xvii. (1880) p. 572.—Thallus vesiculososo-inflated either towards the apices of the laciniae, or here and there throughout. Apothecia never seen.—*Lichen ampullaceus* Linn. Sp. Pl. (1753) p. 1146; Huds. Fl. Angl. p. 450; With. Arr. ed. 3, iv. p. 61. *Lichenoides tinctorium glabrum vesiculosum* Dill. Musc. 188, t. 24. f. 82. *Lichenoides saxatile tinctorium foliis latioribus non pilosis, vesiculas proferens* Dill. in Ray, Syn. ed. 3, p. 74, n. 71.

A monstrosity, caused by the presence of the parasite *Abrothallus Smithii*. The portions of the laciniae which are the host become more or less bullato-inflated (var. *bullata* Schær. Enum. p. 13). These "inflated vesicles" were mistaken by Dillenius and older authors for apothecia.

Hab. On shady rocks in upland situations.—*Distr.* Local and scarce in N. England (where it was originally detected near Coln, in Lancashire), and among the N. Grampians.—B. M.: Craig Cluny, Braemar, Aberdeenshire.

Var. β . *tenuisectam* Cromb. Grevillea xv. (1886) p. 49.—Thallus dark-glaucous or brownish-black above, blackish beneath: laciniae short, narrow, much divided and crowded.

A distinct variety, presenting a panniform aspect. The darker colour of the thallus is probably owing to the habitat. It is seen only in a sterile condition.

Hab. On exposed boulders in mountainous regions.—*Distr.* Rather local, though not uncommon in W. England, N. Wales, among the Grampians, and the N.W. Highlands of Scotland.—B. M.: Stiperstones, Shropshire; Clougha, Lancashire; Rhewgreidden, Merionethshire. Crianlarich and Ben Lawers, Perthshire; Morrone, Braemar, Aberdeenshire; Glen Nevis, Inverness-shire; Hills of Applecross, Ross-shire.

12. *P. lacunosum* Nyl. Mém. Soc. Cherb. v. (1857) p. 100; Syn. i. p. 314.—Thallus foliaceo-expanded, reticulato-lacunose, broadly laciniate, or laciniato-lobed, glaucescent or greyish-white, beneath blackish or pale-brown towards the circumference: laciniae crenato-undulate and incised, rotundate at the apices (K^{+} yellowish, $CaCl^{-}$). Apothecia elevated, moderate or large, reddish-brown, the margin entire; spores ellipsoid, 0.006–8 mm. long, 0.004–5 mm. thick.—Carrolli, Journ. Bot. 1865, p. 288; Cromb. Lich. Brit. p. 27; Leight. Lich. Fl. p. 103, ed. 3, p. 98.—*Cetraria lacunosa* Ach. Meth. (1803) p. 295.

Distinguished from the preceding, some states of which it closely resembles, by the much broader and rounded laciniae, with their reticulato-rugose upper surface. The thallus is frequently more or less isidiiferous, sometimes densely so, when growing in moist places. On dry exposed rocks it is of a dark-chestnut colour, as if it had been scorched. The apothecia have not been found in this country, but the spermogones, which are similar to those of *Pl. glaucum*, occasionally occur.

Hab. On shady rocks in subalpine districts.—*Distr.* Local in the S.W. and Central Highlands of Scotland, chiefly among the Grampians.—B. M.: Glen Falloch, Ben Lawers, and Craig Calliach, Perthshire; Craig Cluny and Morrone, Braemar, Aberdeenshire; near Fort William, Inverness-shire.

Series IV. **Phyllodei** Nyl. Mém. Soc. Cherb. ii. (1854)
p. 12; Syn. i. p. 315.

Thallus foliaceous, depressed, lobed or variously laciniate or stellate, rarely fruticulose cespitose, corticate on both sides, or sometimes only on the upper surface; beneath discolorous, very rarely subconcolorous, affixed to the substratum by rhizinae, internally woolly, very rarely solid. Apothecia either peltiform or lecanorine, or lecideine and gyrose: spores usually 8næ, ellipsoid or fusiform, simple or variously divided; paraphyses either discrete or conglomerate. Spermatogones innate, with jointed sterigmata; spermatia acicular or cylindrical, straight.

A well-marked Series comprising the best developed of all lichens, many of which from their large size are conspicuous objects in their various habitats. Though the tribes are as to thallus and fructification rather diverse, yet there are mutual links by which in both of these respects they are closely connected. The foliaceous and usually horizontal appressed thallus at once distinguishes it from the preceding and the following Series.

Tribe XIII. **PARMELIEI** Nyl. Flora, 1869, p. 445
(cfr. Cromb. Grevillea, v. p. 77).

Thallus horizontally expanded, or occasionally erect or ascending, laciniate or laciniato-lobed, beneath discolorous; gonidial layer consisting of true gonidia. Apothecia parmeleine, sessile or subpedicellate; spores usually 8næ, ellipsoid or rarely oblong, simple, colourless; paraphyses not discrete. Spermatogones innate; sterigmata pauci-articulate; spermatia acicular, fusiformi-incrassate at either apex, or very rarely cylindrical, long and arcuate.

According to Nylander's recent arrangement, this tribe includes four genera, of which *Everniopsis* occurs only in subtropical America. Most of the European species of the other genera are met with in Great Britain.

41. **EVERNIA** Ach. Lich. Univ. (1810) p. 84; Nyl. Syn. i. (1860) p. 283, Flora, 1869, p. 445.—Thallus erect or ascending, or prostrate or pendulous, applanate or somewhat rounded, laciniately divided or very much branched, opaque or subopaque, somewhat soft or flaccid, rhizinae none or very few; medullary layer without any cavities, arachnoid or partly chondroid, cortical layer thin, formed of obliterated cells. Apothecia lateral, with entire thalline margin; hypothecium colourless, thecae small, clavate; spores 8næ, small, simple, colourless; hymenial gelatine bluish with iodine. Spermatogones immersed or somewhat superficial; spermatia acicular, straight, somewhat acute at the apices, and towards either apex very thinly fusiformi-incrassulate.

Nylander with most authors placed *Evernia* near *Alectoria*, on account

of the typically fruticulose thallus, but he now more correctly refers it to the *Parmelici*. The structure of the apothecia, the presence of rhizine sparingly in one of the species, and other characters ally it to *Parmelia*, from which, as Nylander observes (*Flora l. c.*), it scarcely differs generically. Indeed in *Parmelia* we have sometimes the same fruticulose habit, as in *P. Kamtschadalis*; while in the section of *P. physodes* (and the species of *Evernia* approach very near to *P. vittata*) the thallus is similarly glabrous beneath.

1. *E. prunastri* Ach. Lich. Univ. (1810) p. 442.—Thallus at first ascending, then more or less pendulous, sublacunoso-rugose, laciniate, greenish-white above, beneath white, subcanaliculate; laciniae much and dichotomously divided, linear-attenuate, usually involute and frequently sorediiferous at the margins (K^+ yellow, $CaCl^-$). Apothecia subpedicellate, moderate, chiefly lateral, reddish-brown, the margin inflexed; spores 0.007–10 mm. long, 0.0045–60 mm. thick.—Gray, Nat. Arr. i. p. 425; Hook. Fl. Scot. ii. p. 61; Sm. Eng. Fl. v. p. 224; Tayl. in Mack. Fl. Hib. ii. p. 84; Mudd, Man. p. 72; Cromb. Lich. Brit. p. 24; Leight. Lich. Fl. p. 90, ed. 3, p. 82.—*Lichen prunastri* Linn. Sp. Pl. (1753) p. 1147; Huds. Fl. Angl. p. 452; Lightf. Fl. Scot. ii. p. 835; With. Arr. ed. 3, iv. p. 52; Eng. Bot. t. 859. *Lichenoides cornutum bronchiale molle, subtus incanum* Dill. Musc. 160, t. 21. f. 55 A. *Lichenoides arboreum ramosum majus et mollius, colore candicante* Dill. in Ray, Syn. p. 75, n. 80.—*Brit. Exs.*: Leight. n. 36; Mudd, n. 41; Lerb. Cæsar. n. 59; Lich. Hb. n. 246; Bohl. n. 64.

Varies considerably according to age and habitat, but always easily recognized. The thallus in old plants is covered with white confluent soredia on the margins, which are sometimes also sparingly scattered over the surface of the laciniae (form *sorediata* Ach.). The apothecia are rare in this country, and the spermogones are also seldom seen. They are externally black, colourless within, with spermatia 0.006–7 mm. long, about 0.005 mm. thick.

Hab. On the trunks and branches of trees, chiefly firs, and on hedge bushes, in wooded upland tracts.—*Distr.* General and usually plentiful in most parts of Great Britain and Ireland; rarer in the Channel Islands; abundant in old fir woods in the Grampians, Scotland, where also it is frequently fertile.—*B. M.*: Islands of Jersey and Guernsey. Epping Forest and near Walthamstow, Essex; Shiere, Surrey; Lydd, Kent; St. Leonard's Forest, Sussex; New Forest, Hants; Ullacombe, near Bovey Tracey, S. Devon; near Penzance and Withiel, Cornwall; Cirencester, Gloucestershire; Madingley, Cambridgeshire; near Milton, Oxfordshire; Twycross, Leicestershire; near Bank House, Derbyshire; Malvern, Worcestershire; Oswestry, and near Shrewsbury, Shropshire; Cwm Bychan, Merionethshire; Island of Anglesea; near Kendal, Westmoreland; Gipside Woods, Durham; Lounsedale, Cleveland, Yorkshire; Hall Mil', Cumberland. New Galloway, Kirkcudbrightshire; Currie, near Edinburgh; Falls of Clyde, Lanark; near Glasgow; Appin, Argyleshire; Killin, Aberfeldy, and Blaeberry hill, Perthshire; Deerhill Wood, Forfarshire; Countesswells Woods, near Aberdeen, and Ballochbuie Forest, Braemar, Aberdeenshire; Rothiemurchus Woods, Inverness-shire; Cawdor woods, Nairnshire; Lairg, Sutherlandshire. Near Belfast, co. Antrim; near Cork; Killarney, co. Kerry; Connemara, co. Galway.

Form *retusa* Ach. Lich. Univ. (1810) p. 443.—Thallus caespitoso-erect, shortly laciniate; laciniae crowded and retuso-emarginate at the apices. Apothecia not seen.—Cromb. Linn. Soc. Journ. Bot. xvii. p. 569.—*Parmelia prunastri* β . *retusa* Ach. Meth. (1803) p. 257. *Lichenoides cornutum bronchiale molle, subtus incanum* Dill. Musc. 160, t. 21. f. 55.

Grows in dense tufts $\frac{1}{2}$ to 1 in. in height, and often spreads extensively. It occurs only sterile, and is more or less sorediiferous.

Hab. On old pales, chiefly larch, in upland and sometimes in lowland districts.—*Distr.* Seen from only a few localities in S. England, E. and N. Scot. and.—B. M.: Near Millhill, Middlesex. Park, near Aberdeen; Lairg, Sutherlandshire.

Var. β . *stictocera* Hook. in Sm. Eng. Fl. v. (1833) p. 224.—Thallus decumbent, subpendulous or prostrate, subcompressed, greenish sulphur-coloured, concolorous on both surfaces; laciniae somewhat narrow, attenuate at the apices, often with minute brown or blackish tubercles. Apothecia very rare.—Cromb. Grevillea, xv. p. 74; Mudd, Man. p. 62; Cromb. Lich. Br. p. 25; Leight. Lich. Fl. p. 91, ed. 3, p. 83.—*Lichen stictoceros* Sm. Eng. Bot. (1802) t. 1353. *Evernia prunastri* var. *gracilis* Cromb. Journ. Bot. 1872, p. 233; Leight. Lich. Fl. ed. 3, p. 83. *Lichen prunastri* β Huds. Fl. Angl. ed. 2, p. 541; With. Arr. ed. 3, iv. p. 53 pro parte. *Lichenoides corniculatum candidum molle, segmentis angustis* Dill. Musc. 159, t. 21. f. 54.

Distinguished by the narrower (in corticole plants rather broader), more cylindrical laciniae, and especially by being concolorous on both surfaces. It approaches *E. divaricata*, which does not occur in our Islands. The laciniae occasionally put forth transverse laciniole, are but sparingly sorediate, and sprinkled, chiefly at the apices, with peculiar foreign (algoid?) tubercles (not true cephalodia). The apothecia are extremely rare, and are seen only on corticole specimens.

Hab. On bare sandy soil, and on heather in sandy soil in maritime tracts, rarely on the trunks of aged firs in mountainous districts.—*Distr.* Local and scarce in the Channel Islands, S. England, and on the Grampians, Scotland.—B. M.: Quenvais, Island of Jersey. Lydd Beach, Kent; Exmouth Downs, S. Devon. Stronaclachan and Fialarig Woods, Killin, Ben Lawers, Perthshire; Deerhill Wood, Forfarshire.

2. *E. furfuracea* Fr. Lich. Eur. (1831) p. 26.—Thallus ascending, pendulous, or prostrate, laciniöse, furfuraceous, greyish or greyish-green; beneath subcanaliculate, black or caesio-black, with a few rhizinae at the base; laciniae much and dichotomously branched, lineari-attenuate, incurved at the margins (K_{-}^{+} yellowish, $CaCl_{-}$). Apothecia subpedicellate, moderate or large, concave, badio-reddish, the margin thin, inflexed; spores 0.007–10 mm. long, 0.004–5 mm. thick.—Mudd, Man. p. 71; Cromb. Lich. Brit. p. 24; Leight. Lich. Fl. p. 90, ed. 3, p. 82.—*Borreria furfuracea* Gray, Nat. Arr. i. p. 435; Hook. Fl. Scot. ii. p. 54; Sm. Eng. Fl. v. p. 223. *Parmelia furfuracea*, Tayl. in Mack. Fl. Hib. ii. p. 144. *Lichen furfuraceus* Linn.

Sp. Pl. (1753) p. 1146; Huds. Fl. Angl. p. 450; Lightf. Fl. Scot. ii. p. 832; With. Arr. ed. 3, iv. p. 56. *Lichenoides cornutum amarum, superne cinereum, inferne nigrum* Dill. Musc. 157, t. 21. f. 52.—*Brit. Ess.*: Light. n. 37; Mudd, n. 40.

The furfur with which the thallus is usually covered above, and the different colours of the upper and the lower surfaces, readily prevent this being confounded with *E. prunastri*. Occasionally, when growing on the tops of stone walls, it is somewhat orbicular, depressed, and loosely adnate, with a very few obscure rhizinae towards the point of attachment. The variations in the lacinia give rise to the several forms described below. The apothecia, which at length become plane and large, are rarely seen in Britain. The spermogones and spermatia are as in the preceding species.

Hab. On the trunks of trees, old pales, walls, and sometimes rocks, in upland districts.—*Distr.* General and not uncommon in the mountainous tracts of Great Britain; most frequent in the Central Highlands of Scotland; apparently very local in Ireland.—B. M.: New Forest, Hants; Dartmoor and South Brent, Devonshire; Helmlinton, Cornwall; Chesterfield, Darley, and near Buxton, Derbyshire; near Oswestry, Caer Caradoc, and Wrekin Hill, Shropshire; Cwm Bychan, Merionethshire; Island of Anglesea; Arkendale and Farndale, Yorkshire; Eglestone, Durham; Kentmere, near Kendal, Westmoreland; Chillingham Park, Northumberland. New Galloway, Kirkcudbrightshire; Swanston Wood, near Edinburgh; Glenfallach, Argyleshire; Blaeberry Hill, Glen Lochay, Killin, and Glen Lyon, Perthshire; Deerhill Wood and Johnston Hill, Forfarshire; Invercauld, Auchindryne, and Castleton, Braemar; Glen Nevis, Inverness-shire. Lough Bray, near Dublin.

Form 1. *nuda* Cromb. Grevillea, xv. (1887) p. 74.—Thallus smaller; lacinia shorter, broader, somewhat plane, pale or here and there subviolet, naked.—*Borrera furfuracea* β . *nuda* Ach. Lich. Univ. (1810) p. 500.

A smaller plant, with the thallus entirely glabrous and the lacinia broader. The apothecia are not present in our specimens.

Hab. On old pales and the trunks of birches in upland situations.—*Distr.* Found only sparingly in the S.W. Highlands and the N. Grampians, Scotland.—B.M.: Crianlarich, Perthshire; Morrone, Braemar, Aberdeenshire.

Form 2. *scobicina* Nyl. Lich. Scand. (1861) p. 73.—Lacinia broader, densely isidioso-furfuraceous or isidioso-fibrillose; otherwise as in the type.—Cromb. Lich. Brit. p. 24; Leight. Lich. Fl. p. 90.—*Parmelia furfuracea* γ . *scobicina* Ach. Meth. (1803) p. 255.

Differs chiefly in being crowdedly isidiiferous; the thallus is usually dark greyish, and the lacinia less branched, broader and lacero-laciniate towards the apices. It is rarely fertile; the apothecia occasionally have both the margin and the back of the receptacle minutely isidiose.

Hab. On the trunks of trees, old pales, and stone walls in upland districts.—*Distr.* Rather local, though plentiful in W. and Central England; but chiefly in the Grampians, Scotland.—B. M.: Gopsall, Park, Leicestershire; Malvern, Worcestershire. Killin and Ben Lawers, Perthshire; Castleton of Braemar, Aberdeenshire; Rothiemurchus, Inverness-shire.

Form 3. *ceratea* Nyl. Lich. Scand. (1861) p. 73.—Thallus decumbent; laciniae narrow, convex and subcylindrical, acuminate, subglabrous.—Cromb. Grevillea, vi. p. 21.—*Parmelia furfuracea* β . *ceratea*, Ach. Meth. (1803) p. 255.—*Brit. Ess.*: Cromb. n. 139.

Distinguished by the form of the more naked laciniae: but intermediate states occur, in which these characters are less marked. With us it is always barren, though Acharius (Lich. Univ. p. 501) says the apothecia chiefly occur in this form.

Hab. On rocks and old walls in upland districts.—*Distr.* Seen only from a few localities in S.W., Central, and N. England, S. and N.E. Scotland, and the S.W. Highlands.—B. M.: Hunter Tor, Dartmoor, Devonshire; Helminton, Cornwall; near Buxton, Derbyshire; Windermere, Westmoreland; Alston, Cumberland. Pentland Hills, near Edinburgh; Glen Falloch, Perthshire; Deerhill Wood, Forfarshire; near Countesswells, Aberdeen.

42. **PARMELIA** Ach. Meth. (1803) p. 153 pro parte; Nyl. Syn. i. (1860) p. 375.—Thallus foliaceous, horizontally expanded or rarely ascending, variously lobed and lacinate; epithallus somewhat shining, beneath usually fibrilloso-rhizinoë; medullary layer woolly, composed of filaments loosely interwoven; cortical layer thin, formed of minute cells with thickened walls. Apothecia scattered, scutelliform, with thalline margin; hypothecium colourless, thecae short, the wall thickened above; spores usually 8næ, ellipsoid, simple, colourless; hymenial gelatine bluish with iodine. Spermogones generally scattered, at length slightly prominent, blackish; sterigmata 2-5-articulate; spermatia acicular, fusiform-incrassate at either apex.

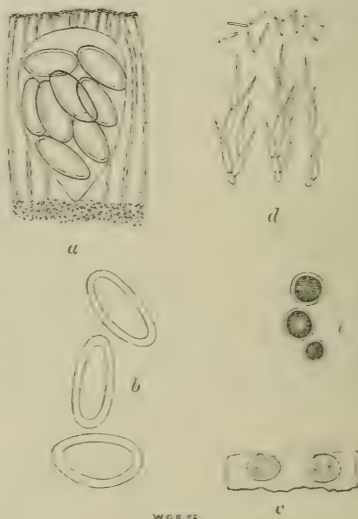


Fig. 44.

Parmelia perlata Ach.—a. Fragment of the thalamium and a theca, $\times 350$. b. Three spores, $\times 500$. c. Vertical section of the thallus, with two spermogones, $\times 30$. d. Sterigmata and spermatia, $\times 500$. e. Three gonidia, $\times 350$.

The species vary in habit, but are for the most part horizontally expanded, and rarely fruticulose. In no other genus are the reactions of more value in discriminating species, which were often not distinguished from each other, or were regarded merely as varieties, forms, and states.

It may be divided into the following sections (or subgenera) and subsections, according to the presence or absence of rhizine and the colour of the thallus.

A. RHIZINOS.E.—Thallus more or less distinctly fibrillose-rhizinose beneath (subgenus *Hyporhizia* Cromb. Grevillea, xv. (1887) p. 74).

a. *Glaucescentes*.—Thallus normally grey, greyish-white or glaucous.

1. *P. perlata* Ach. Meth. (1803) p. 216.—Thallus orbicular or expanded, imbricato-lobed, smooth, glaucous- or greyish-white; beneath somewhat shining, brownish-black or blackish, paler at the circumference, with short scattered rhizine; lobes rounded, often white-soresdiate towards the margins (K^{+} orange-yellow, $CaCl^{+}$ yellow). Apothecia moderate or large, scattered, badio-reddish, the margin thin, entire; spores 0,011–17 mm. long, 0,007–12 mm. thick.—Gray, Nat. Arr. i. p. 437; Hook. Fl. Scot. ii. p. 52; Sm. Eng. Fl. v. p. 200; Tayl. in Mack. Fl. Hib. ii. p. 148; Mudd, Man. p. 92; Cromb. Lich. Brit. p. 33; Leight. Lich. Fl. p. 128, ed. 3, p. 119.—*Lichen perlatus* Linn. Syst. Nat. ed. 12 (1767) p. 712; Huds. Fl. Angl. p. 448; Lightf. Fl. Scot. ii. p. 839; With. Arr. ed. 3, iv. p. 68. *Lichenoides glaucum perlatum, subtus nigrum et cirrhosum* Dill. Musc. 147, t. 20. f. 39, A, B, D, E.—*Brit. Exs.*: Leight. n. 76, 392; Larb. Lich. Hb. n. 291.

Several species were included under this which have been definitely separated by the chemical reactions of the medulla. *P. perlata* is now seen to be a much less variable plant than was supposed, though the thallus varies in the presence or absence of soredia. The apothecia are very rare in this country, nor are the spermatogones often seen. When present, they are scattered, minute, blackish, with spermatia about 0,005–6 mm. long, scarcely 0,001 mm. thick.

Hab. On the trunks of old trees and on rocks in maritime and upland tracts.—*Distr.* General and often plentiful in most parts of Great Britain and in the Channel Islands; apparently rare in Ireland.—B. M.: Islands of Jersey, Sark, and Guernsey. St. Leonard's Forest, near Brighton, Hienfield, and Arundel, Sussex; Lyndhurst, New Forest, Hants; Isle of Wight; Torquay, South Brent, Hay Tor, Dartmoor, and Ilfracombe, Devonshire; Bocconoc, near Penzance, and Withiel, Cornwall; near Cheltenham, Gloucestershire; Twycross, Leicestershire; Harboro' Magna, Warwickshire; Wrighton Park, Herefordshire; Haughmond Hill, Shropshire; Llanbedr, Barmouth, and Dolgelly, Merionethshire; Bousdale Gill, Cleveland, Yorkshire; Stavely, Kendal, and Windermere, Westmoreland. New Galloway, Kirkcudbrightshire; near Inverary and Barmaldine, Argyshire; Loch Katrine and Killin, Perthshire; S. of Fort William, Lochaber, Invernessshire; Applecross, Ross-shire. Near Cork; Dunkerron, co. Kerry.

Subsp. *P. ciliata* Nyl. Flora, 1878, p. 247.—Thallus moderate or large, imbricato-lobed, smoothish, often isidiiferous, white or

glaucous-white, beneath black, glabrous, rugulose, the lobes crenate and ciliate at the margins ($K^{+}_{\text{orange-yellow}}$, $\text{CaCl}^{-}_{\text{yellow}}$). Apothecia moderate or large, scattered, elevated, urceolato-subpedicellate, badio-reddish, the margin frequently crenate and sometimes ciliate; spores as in the preceding.—Cromb. Grevillea, xv. p. 74.—*Parmelia perlata* β . *ciliata* Mudd, Man. p. 92 pro parte; Cromb. Lich. Brit. p. 32; Leight. Lich. Fl. p. 129, ed. 3, p. 120. *Lobaria perlata* var. *ciliata* DC. Fl. Fr. ii. (1805) p. 403. *Parmelia proboscidea* Tayl. in Mack. Fl. Hib. ii. p. 143. *Parmelia perforata* Sm. Eng. Fl. v. p. 200 pro parte. *Lichen perforatus* Eng. Bot. t. 2423 pro parte.—As Nylander observes (Flora, 1869, p. 91), this should perhaps be referred to *P. crinita* Ach.—Brit. Ess.: Lich. Cæsar. n. 17; Lich. Hb. n. 86; Leight. n. 112; Cromb. n. 30.

Differs from the type in being frequently more or less coralloideo-isidiiferous (form *excrecens* Arn.) and in having the lobes, which are occasionally dissected at the margins (form *dissectula* Nyl. in Leight. Br. Fl. iii. p. 120), fringed with elongated cilia, which are sometimes shorter or almost wanting. These differences, and the character of the margins of the apothecia, entitle it to rank at least as a subspecies, if not as a distinct species. In this country, as in most other parts of Europe, the apothecia are rare. They are usually scattered, though sometimes two or three are congregate and smaller.

Hab. On the trunks of old trees, as also on rocks and boulders in shady places in maritime and upland districts.—*Distr.* General in S. and W. England and N. Wales; rarer in the W. Highlands of Scotland, W. Ireland, and the Channel Islands.—B. M.: E. coast of Jersey; Island of Guernsey. High Rocks, Tunbridge Wells, Kent: St. Leonard's Forest, Sussex: Isle of Wight: Lustleigh Cleeve, Hay Tor, Lydford, and Bolt Head, Devonshire: near Penzance and Helminton, Cornwall; St. Mary's, Scilly Islands; Malvern, Worcestershire; Dolgelly, Nannau, and Barmouth, Merionethshire; River Elwy, Carnarvonshire; Keswick and Eskdale, Cumberland; near Kendal, Westmoreland. New Galloway, Kirkcudbrightshire; near Helensburgh, Dumbartonshire; Barcaldine, Argyllshire; shores of Loch Tay, Perthshire; Lochaber, Inverness-shire; Applecross, Ross-shire. Dunkerron Mts., Killarney, and Dinis, co. Kerry; Connemara, co. Galway.

2. *P. olivetorum* Nyl. Not. Sällsk. pro F. et Fl. Fenn. Förh. n. s. v. (1866) p. 180.—Thallus expanded, roundly lobed, smooth, greyish-green; beneath blackish, very sparingly and shortly rhizine, lobes elevated, crisp, incurved, thickened and white-sorediate at the margins (K^{+}_{yellow} , $\text{CaCl}^{-}_{\text{red}}$). Apothecia moderate, reddish-brown, the thalline margin entire; spores 0.014–18 mm. long, 0.007–12 mm. thick.—Leight. Lich. Fl. p. 130, ed. 3, p. 121.—*Parmelia perlata* β . *olivetorum* Ach. Lich. Univ. (1810) p. 458.

From the sorediate states of *P. perlata* this is at once distinguished by the different reaction of the medulla with CaCl . The soredia are minute, confined to and bordering the margins of the lobes. When growing, and in wet weather, it is of a greenish colour, resulting from the cortical layer being subhyaline (Nylander, Prr. Or. p. 16). Neither apothecia nor spermogones are present in our British specimens.

Hab. On the trunks of trees and on rocks in wooded maritime and mountainous districts.—*Distr.* Apparently very local and rare in S. England (Danny, Sussex, *vide* Nyl.), in N. Wales, and the S.W. Highlands, Scotland.—B. M.: Drews-y-mant, Merionethshire. Barcaldine, Argyleshire.

3. *P. cetrarioides* Nyl. Flora, 1869, p. 290.—Thallus large, orbicular or expanded, subcoriaceous, smoothish, roundly lobed, glaucous-white; beneath brownish-black or blackish, paler at the circumference, with few and short rhizine; lobes broad, crenate, elevated, crisp and sorediate at the margins (K^{+} orange-yellow, $CaCl^{-}$, medulla $K(CaCl)f^{+}$ reddish). Apothecia moderate or large, badio-reddish, the margin entire; spores 0.012–14 mm. long, 0.006–7 mm. thick.—Cromb. Lich. Brit. p. 34; Leight. Lich. Fl. p. 128, ed. 3, p. 119.—*Parmelia perlata* var. *cetrarioides* Del. in Dub. Bot. Gall. (1829) p. 601.

Near to *P. olivetorum*, but usually (at least with us) a larger plant, and with a different medullary reaction with $CaCl$. It also resembles states of *Platysma glaucum*, from which the sparingly rhizinose under surface separates it. In some habitats, as also in herbaria, the thallus becomes brownish and the soredia form a fine narrow border on the margins of the lobes. The apothecia in this country are extremely rare, and only once seen fully developed. The spermogones also are seldom present.

Hab. On the trunks of old trees, rarely on rocks, in wooded maritime and upland districts.—*Distr.* Rather local and scarce in N. Wales, S. Scotland, and the W. Highlands; rare in the Channel Islands.—B. M.: Rozel, Island of Jersey. New Forest, Hampshire; Isle of Wight: Dartmoor and Bickleigh Vale, Devonshire; Helmington, Cornwall: Dolgelly, Aberdovey, and near Barmouth (fruit), Merionethshire; Island of Anglesea. New Galloway, Kirkcudbrightshire: Appin, Argyleshire; Loch Katrine, Perthshire; Loch Linnhe, Invernessshire.

4. *P. perforata*, Ach. Meth. (1803) p. 217.—Thallus suborbicular, membranaceous, imbricato-lobed or lobato-laciniate, smooth, minutely reticulato-rimulose, whitish or glaucous-white, beneath brownish-black or black, with black dense rhizine; lobes crenato-sinuate or sinuato-divided, often white-sorediate and occasionally ciliate at the margins (K^{+} yellowish, $^{+}$ yellow, then rusty red, $CaCl^{-}$). Apothecia moderate, perforate in the centre, badio-reddish or brownish-red, the margin entire; spores 0.011–18 mm. long, 0.007–11 mm. thick.—Sm. Eng. Fl. v. p. 204 pro parte; Cromb. Lich. Brit. p. 32; Leight. Lich. Fl. p. 134, ed. 3, p. 123.—*Lichen perforatus*, Wulf. in Jacq. Coll. i. (1786) p. 116, t. 3; Eng. Bot. t. 2423 (mid. fig.). *Parmelia reticulata*, Tayl. in Mack. Fl. Hib. ii. p. 148. *Parmelia perlata*, β . *ciliata*, Mudd, Man. p. 92 pro parte. *Lichenoides glaucum, foliorum laciniis crinitis*, Dill. Musc. 149, t. 20. f. 42 A.—*Brit. Ecs.*: Cromb. n. 29; Larb. Lich. Hb. n. 250.

Closely allied to *P. perlata*, but with the appearance of *P. ciliata*, which, as already intimated, has been frequently confounded with it by

British authors. From both, it may at once be distinguished by the perforate apothecia, and, when infertile, by the minutely reticulate rimulose thallus. The apothecia are extremely rare in our islands, nor are the spermogones present on our specimens.

Hab. On mossy rocks and the trunks of old trees in maritime districts.—*Distr.* Rather local, though plentiful, in S. and W. England, N. Wales, the W. Highlands of Scotland, the Channel Islands, and W. Ireland, where it has once been gathered sparingly fertile.—B. M.: Near Fort Essex, Island of Alderney; Island of Guernsey. St. Leonard's Forest, Sussex; Lyme Regis, Dorsetshire; Carisbrook and near Ryde, Isle of Wight; South Brent, Devonshire; Penzance and Withiel, Cornwall; Dolgelly, Nannau, and Tan-y-Croes, Merionethshire; Island of Anglesea. Barcaldine, Argyleshire. Dunkerron, co. Kerry (fruit); near Kylemore, Connemara, co. Galway.

5. *P. lævigata* Ach. Syn. (1814) p. 212.—Thallus suborbicular, membranaceous, laciniato-lobed, glaucous-white or whitish; beneath blackish and black-fibrillose-rhizino-se; laciniae divaricately sinuato-multifid or sinuato-incised, often subimbricate and whitish tuberculato-sorediate at the apices, smooth or smoothish (K_{+} yellow, $CaCl_{-}$, medulla K ($CaCl$) $f +$ red). Apothecia moderate or large, badio-reddish, the margin entire or obsoletely crenulate or sorediate; spores 6–8 μ , 0.012–13 mm. long, 0.007–8 mm. thick.—Gray, Nat. Arr. i. p. 442; Hook. Fl. Scot. ii. p. 55; Sm. Eng. Fl. v. p. 200; Tayl. in Mack. Fl. Hib. ii. p. 148; Cromb. Lich. Brit. p. 33; Leight. Lich. Fl. p. 139, ed. 3, p. 128.—*Parmelia sinuosa* β . *lævigata*, Mudd, Man. p. 92. *Lichen lævigatus*, Sm. in Eng. Bot. xxvi. (1808) t. 1852.—*Brit. Eas.*: Mudd, n. 69; Larb. Cæsar. n. 64, Lich. Hb. n. 124; Cromb. n. 141.

The thallus is loosely attached to the substratum, often much expanded and generally divided into narrow approximate laciniae. The soredia occur at the apices, but are occasionally scattered over the surface of the laciniae. From the allied species it is well separated by the thalline reactions. The apothecia are very rare, occurring chiefly in the smaller corticole states, but the spermogones are not uncommon. They are minute, dark-brown or blackish, irregularly scattered, with spermatia about 0.005–7 mm. long, 0.001 mm. thick.

Hab. On rocks, boulders, and trunks of trees, chiefly in maritime and mountainous districts.—*Distr.* Somewhat local, though usually plentiful in S. and W. England, N. Wales, W. Highlands, Scotland, W. Ireland, and in the Channel Islands.—B. M.: Islands of Jersey and Guernsey. New Forest and Bournemouth, Hampshire; Lustleigh Cleeve, Dartmoor. Lynton, and Bolt Head, Devonshire; near Penzance and Withiel, Cornwall; near Dolgelly, Aberdovey, and Barmouth, Merionethshire; Llanbeis and Beddgelert, Carnarvonshire; Beaumaris, Island of Anglesea; Asby, Cumberland. Inverary and Barcaldine, Argyleshire; Ben Nevis, Invernessshire; Glen Ach-na-Shilloch, Ross-shire. Killarney, co. Kerry; Gougambara, co. Cork; Connemara, co. Galway.

6. *P. xanthomyela* Nyl. Flora. 1874, p. 306.—Thallus externally similar to that of *P. lævigata* ($K +$ yellow), medulla sulphureous ($K +$ yellowish). Apothecia moderate or large, badio-reddish, the

receptacle reticulato-verrucose, the margin incurved, verrucose: spores 6-8 μ , 0.016-19 mm. long, 0.008-11 mm. thick.—Cromb. Journ. Bot. 1876, p. 360.—*Parmelia endochlora*, Leight. Lich. Fl. (1871) p. 140, ed. 3, p. 133. *Parmelia McMillana*, Stirt. Grevillea, iii. p. 79.—Indicated by Nylander (Flora, 1869, p. 290) as a variety of *P. comparata*, to which it is closely related. I have therefore retained his specific name in preference to that of Leighton, whose diagnosis of the plant is misleading.

Distinguished from the preceding by the colour of the medulla. The thallus is smooth and unequal, thin or moderate, often whitish-sorediate at the apices of the lobes, the soredia becoming dark-greyish in age. The reaction of the medulla with K, which is pale yellowish (not "yellowish-brown," Leight.), is especially seen under the microscope. It is very rarely fertile in this country, the apothecia becoming very large, with the thalline margin obliterated.

Hab. On rocks and boulders in shady wooded upland districts.—*Distr.* Local and scarce in N. Wales, the S.W. Highlands, Scotland, and W. Ireland.—B. M.: Nannau, Dolgelly, Merionethshire; Glen Croe and Barcaldine, Argyshire. Askew Wood, Dunkerron, co. Kerry (frt.); near Kylemore, co. Galway.

7. *P. revoluta* Nyl. Bull. Soc. Linn. Normand. sér. 2, iii. (1868) p. 264.—Thallus orbicular, moderate, smoothish, narrowly sinuato-lobed, glaucous-white or whitish: beneath blackish-fibrillose, at length nearly glabrous, the lobes cucullato-revolute and usually tuberculato-sorediate at the apices (K^+ yellowish, $CaCl^+$ reddish). Apothecia nearly moderate, badio-reddish, the margin entire or obsoletely crenate; spores 6-8 μ , 0.011-19 mm. long, 0.007-12 mm. thick.—Cromb. Grevillea, xv. p. 75.—*Parmelia tiliacea* var. *revoluta*, Leight. Lich. Fl. p. 132, ed. 3, p. 129. *Imbricaria revoluta*, Flörke, D. Lich. (1815) p. 15.—To this also are referable *Parmelia lavigata* var. *subsINUOSA*, Leight. Lich. Fl. ed. 3, p. 129, and *P. tiliacea* var. *sublevigata* Leight. Lich. Fl. p. 132, ed. 3, p. 122.—*P. sublevigata* Nyl. is an exotic species, which does not occur in Europe.—*Brit. Exs.*: Leight. n. 202 (s. n. *P. Forsteri* Borr.), n. 357; Mudd, n. 68; Larb. Lich. Hb. n. 293.

Distinguished from *P. lavigata* by the cucullato-revolute apices of the narrower and more approximate lobes, by the chemical reaction of the medulla with $CaCl$ alone, and by the larger spores. These characters warrant us in regarding it as a species, and not as a variety of *P. lavigata*. The tuberculose soredia, with which the apices of the lobes are frequently covered, are whitish, becoming in age dark-greyish. In this country it is but very seldom seen in fruit. The spermogones are as in the former species.

Hab. On rocks and trees among mosses in maritime and mountainous districts.—*Distr.* General, but not common in S., W., and N. England; rarer in S. Scotland and the W. Highlands, as also in W. Ireland; rare in the Channel Islands.—B. M.: La Coupe, Island of Jersey. St. Leonards Forest, Sussex; Isle of Wight; near Lyndhurst and Bournemouth, Hampshire; Ilsham, Torquay, Ullacombe, near Bovey Tracey, and Lynton, Devonshire; Withiel and Penzance, Cornwall; Aberdovey, Bar-

mouth, Dolgelly, and near Harlech, Merionethshire : Island of Anglesea : Oswestry, Shropshire : near Kendal, Westmoreland. New Galloway, Kirkcudbrightshire : Barcaldine, Argyleshire : Loch Linnhe, Inverness-shire. Castlebernard Park, Bandon, co. Cork : Killarny, co. Kerry : Letterfrack, Connemara, co. Galway.

Var. *β. rugosa* Cromb. Grevillea, xv. (1887) p. 75.—Thallus somewhat expanded, the lobes broadly linear at the circumference, more or less rugose. Apothecia with the thalline margin at length rugose ; spores 0.013–15 mm. long, about 0.008 mm. thick.—*Parmelia tiliacea* var. *rugosa* Leight. Lich. Fl. p. 133. *P. levigata* var. *rugosa* Leight. Lich. Fl. ed. 3, p. 128. *Parmelia rugosa* Tayl. in Mack. Fl. Hib. ii. (1836) p. 145.

A well-marked variety, agreeing with the type in the reaction of the medulla, but differing in the rugose thallus and margin of the apothecia, and in the broader (less revolute) lobes, which are rarely and sparingly sorediiferous at the apices. The apothecia are very rare.

Hab. On rocks in maritime districts.—*Distr.* Local in S.W. England, N. Wales, the W. Highlands, Scotland, and S.W. Ireland.—B. M. : Cornworthy, Devonshire : The Lizard, Cornwall : Barmouth (fruit), Dolgelly, and Aberdovey, Merionethshire : Llanberis, Carnarvonshire. Barcaldine, Argyleshire. Dunkerron (fruit), co. Kerry.

Form *panniformis* Cromb. Grevillea, xv. (1887) p. 75.—Thallus more or less rugose ; laciniae short, narrowly dissected and congested. Apothecia not seen.

Forms a somewhat densely imbricate crust, from the short laciniae being much divided and aggregate. It occurs only sterile.

Hab. On the trunks of old trees, near the base, in maritime and upland tracts.—*Distr.* Local and scarce, in S.W. England and the W. Highlands, Scotland.—B. M. : Pentire, Cornwall. By Loch Linnhe, Inverness-shire.

Var. *γ. concentrica* Cromb. Grevillea, xv. (1887) p. 75.—Thallus panniform, free, spherical, growing in involved concentric layers. Apothecia not seen.—*Parmelia tiliacea* var. *concentrica* Leight. Lich. Fl. p. 133, ed. 3, p. 122. *Parmelia levigata* var. *concentrica* Cromb. Lich. Brit. p. 33. *Parmelia sinuosa* *γ. concentrica* Mudd, Man. p. 96. *Parmelia saxatilis* var. *concentrica* Leight. in Garden. Chron. 1856, pp. 84, 172. *Parmelia sinuosa* var. *erratica* Linds. Mem. Sperm. p. 218.—*Brit. Ees.* : Leight. n. 232.

This curious variety occurs on the ground in a free condition as small globular balls. There is no reason to suppose that it is free *ab initio*, but that, after being detached, it assumes this form from accidental circumstances (*cf.* Cromb. Journ. Bot. 1872, p. 307). Though it has been referred to different species, the thalline reactions, in conjunction with the general aspect of the plant, show that it belongs to *P. revoluta*, produced no doubt by a panniform condition of this species.

Hab. On the ground in maritime and upland tracts.—*Distr.* Extremely local and rare in S.W. England.—B. M. : Melbury Hill, near Shaftesbury, Dorsetshire.

S. *P. tiliacea* Ach. Meth. (1803) p. 215.—Thallus orbicular, membranaceous, appressed, smoothish or partly rugulose, laciniato-lobed, pale greyish-glaucous, subpruinose; beneath brownish black and black-fibrillose; lobes short, subimbricate, rounded and sinuate-crenate at the margins (K_{-}^{+} yellowish, $CaCl_{+}^{-}$ red). Apothecia moderate, crowded, concave or nearly plane, badio-reddish, the margin subentire; spores 0,007–11 mm. long, 0,005–7 mm. thick.—Gray, Nat. Arr. i. p. 438; Sm. Eng. Fl. v. p. 204 pro parte; Mudd, Man. p. 93, t. ii. f. 28; Cromb. Lich. Brit. p. 33 pro parte; Leight. Lich. Fl. p. 131 pro parte, ed. 3, p. 121 pro parte.—*Lichen tiliaceus* Hoffm. Enum. (1784) p. 26 pro parte, t. xvi. f. 2; Dicks. Crypt. fasc. iii. p. 16; With. Arr. ed. 3, iv. p. 31.—*Brit. Ears.*: Larb. Lich. Hb. n. 292.

Well distinguished from both the preceding species by having the thallus more closely appressed and somewhat pruinose, with the laciniæ more contiguous, narrowly sinuate and crenate at the margins. As mentioned by Acharius *l. c.*, the lobes towards the centre of the thallus are more rugose (var. *rugosula* Leight. Lich. Fl. p. 131, ed. 3, p. 121), especially seen in old plants. The apothecia are chiefly central, and the spermogones are not uncommon. They are rather prominent, brownish-black, with spermatia 0,007 mm. long, 0,001 mm. thick.

Hab. On the trunks of trees, rarely on rocks, in maritime and upland districts.—*Distr.* Local and scarce in the Channel Islands, S. and N. England, N. Wales; not yet seen in Scotland, nor with certainty in Ireland.—B. M.: Petit Port, Island of Jersey. Esher, Surrey; Glynde, Sussex; near Ryde, Isle of Wight; Lymington, Hampshire; near Exeter and Ilsham, Torquay, Devonshire; near Barmouth and Harlech, Merionethshire; Clapdale, Yorkshire; near Kendal, Westmoreland.

Subsp. ***P. carporhizans*** Cromb. Grevillea, xv. (1887) p. 75.—Thallus similar to that of *P. tiliacea* (K_{-}^{+} yellowish, $CaCl_{+}^{-}$ red). Apothecia moderate, often excentrically perforate, badio-reddish, the receptacle beneath black-setulose, the margin subentire or slightly crenulate; spores ellipsoid, 0,009–11 mm. long, 0,004–6 mm. thick.—*Parmelia carporhizans* Tayl. in Hook. Journ. Bot. vi. (1847) p. 163; Cromb. Journ. Bot. 1882, p. 272. *Parmelia tiliacea* Cromb. Lich. Brit. p. 33 pro parte; Leight. Lich. Fl. p. 131 pro parte, ed. 3, p. 121 pro parte. *Lichen tiliaceus* Eng. Bot. t. 700.

When sterile, scarcely to be distinguished from *P. tiliacea*, but at least a good subspecies, characterized by the short, blackish, setulose fibrils with which the thalline receptacle of the fruit is densely clothed beneath. In this respect, as pointed out by Taylor *l. c.*, it is analogous to *Physcia ulothrix*. The apothecia are plentiful when they occur, and frequently become perforate, though the perforations are not exactly in the centre, as in *P. perforata*.

Hab. On the trunks of trees in wooded maritime and upland districts.—*Distr.* Local but not uncommon in S. England and the Channel Islands.—B. M.: Near Jerbourg, Island of Guernsey. Lymington, Hampshire; Chagford, Ashburton, and Cornworthy, S. Devon; Dunster Tower, Somersetshire.

9. *P. scortea* Ach. Lich. Univ. (1810) p. 461.—Thallus orbicular, subcoriaceous, smooth, somewhat shining, very thinly isidiose in the centre, sinuato-lobed, greyish-white or whitish: beneath rugose, brownish, densely black-fibrillose: lobes short, rounded, undulate, inciso-crenate at the margins ($K_{-}^{+yellowish}$, $CaCl_{+}^{+reddish}$). Apothecia moderate, scattered, reddish-brown, the margin subentire; spores 0,007–11 mm. long, 0,005–7 mm. thick.—Sm. Eng. Fl. v. p. 203.—*Parmelia tiliacea* var. *scortea* Mudd, Man. p. 93; Cromb. Lich. Brit. p. 33; Leight. Lich. Fl. p. 131, ed. 3, p. 122. *Lichen scorteus* Ach. Prodr. (1798) p. 119; Eng. Bot. t. 2065.—*Brit. Exs.*: Leight. n. 87; Larb. Cæsar. n. 18.

Closely allied to *P. tiliacea*: but its thicker and less appressed thallus, its normally whiter colour, the central isidia, the form of the lobes, and the more scattered apothecia warrant us in regarding it, with the older authors, as a distinct species, in which light also it is now viewed by Nylander (Pyr. Or. p. 5). The isidia, which are greyish, becoming blackish in age, though chiefly central, are sometimes sprinkled over the thallus nearly to its circumference. In this country, as elsewhere, the apothecia are very rare, and even when present are but few. The spermogones, which are more common, are similar to those of *P. tiliacea*.

Hab. On trees and old pales, rarely on rocks, in maritime and upland districts.—*Distr.* Local and scarce in England (chiefly in the South), the Channel Islands, and Wales; very rare in S.W. Scotland and in S. Ireland.—B. M.: L'Etacq, Island of Jersey; Island of Sark. Near Bury St. Edmunds, Suffolk; near Lewes and Henfield, Sussex; Shanklin, Isle of Wight; New Forest, Hants; Bolt Head, Devonshire; Stonehenge, Wilts; Harboro' Magna and Newbold-on-Avon, Warwickshire; Twycross, Leicestershire; Little Stretton, Shropshire; Holyland, Pembrokeshire; Dolgelly and near Barmouth, Merionethshire; Island of Anglesea; Stokesley, Cleveland, Yorkshire; near Eglestone, Durham; near Staveley, Kendal, Westmoreland. Near Dumfries: Castle Douglas, Kirkcudbrightshire. Askew Wood and Dunkerron, co. Kerry.

Form *concrescens* Cromb.—Thallus orbicular, small, isidiose: lobes very short, narrowly dissected and crowded. Apothecia unknown.

A panniform condition, referred to in Leight. Lich. Fl. ed. 1, p. 133, as approaching var. *concentrica* of *P. revoluta*. It is, however, neither spherical (but only somewhat convex) nor free; while the isidia and other characters show that it belongs to *P. scortea*. The specimens seen are sterile.

Hab. In crevices of stone walls in a maritime district.—*Distr.* Extremely local and rare in S.W. England.—B. M.: Bolt Head, S. Devon.

10. *P. saxatilis* Ach. Meth. (1803) p. 204.—Thallus orbiculari-expanded, membranaceous, subimbricate, reticulato-rugulose, often somewhat isidiosio-scabrid, greyish-white or glaucous-grey, beneath black, rhizineo-fibrillose: laciniae sinuato-incised or sinuato-lobed, retuse at the apices; ($K_{+}^{+yellowish}$, $CaCl_{+}^{+yellow\ then\ blood-red}$). Apothecia moderate or somewhat large, badius or brownish, the margin thin,

entire or crenulate; spores 0.014-19 mm. long, 0.009-12 mm. thick.—Gray, Nat. Arr. i. p. 440; Hook. Fl. Scot. ii. p. 53; Sm. Eng. Fl. v. p. 199; Tayl. in Mack. Fl. Hib. ii. p. 144; Mudd, Man. p. 94; Cromb. Lich. Brit. p. 34; Leight. Lich. Fl. p. 137, ed. 3, p. 126.—*Lichen saxatilis* Linn. Sp. Pl. (1753) p. 1142; Huds. Fl. Angl. p. 531; Lightf. Fl. Scot. ii. p. 816; With. Arr. ed. 3, iv. p. 33; Eng. Bot. t. 603. *Lichenoides vulgatissimum cinereo-glaucum laciniosum et cirrhosum* Dill. Musc. 118, t. 24. f. 83 A. *Lichenoides crusta foliosa, superne cinereo-glaucæ, inferne nigra et cirrhosa, scutellis nigricantibus* Dill. in Ray, Syn. ed. 3, p. 72. n. 16.—Under the type was included also the following form by most of our earlier authors.—*Brit. Exs.*: Leight. n. 203 pro parte; Cromb. n. 27.

This well-known species is readily recognized by the reticulato-rugulose thallus. Often very widely spreading, it is one of the largest plants of the genus, and though sometimes sub-smooth is usually isidioso-scabrid on the rugæ. It is seldom fertile, the apothecia, which are at first urceolate and moderate, becoming at length large and flexuose. The spermatogones, which are not uncommon, are very minute, black, with spermatia 0.007 mm. long, about 0.001 mm. thick. The parasites *Dothidea homostegia* Nyl. and *Abrothallus parasiticus* Nyl. (*Lichen parasiticus* Sm. Eng. Bot. t. 1866) are often met with on the thallus of this species and of the form here described.

Hab. On trees, walls, rocks, and boulders in upland and subalpine, sometimes in lowland districts.—*Distr.* Local throughout Great Britain; rare in the Channel Islands; not seen from Ireland.—B. M.: Island of Guernsey. Near Brighton, Sussex: Basingstoke, Hampshire: near Penzance, Cornwall: Malvern Hills, Worcestershire: Wrekin Hill, Shropshire: Lambeth, S. Wales; Island of Anglesea; Staveley, Westmoreland. Appin, Argyleshire; Killin, Ben Lawers, Abernethy, Black Wood of Rannoch, and Ben Vrackie, Perthshire: Cortachy, Forfarshire; Portlethen, Kincardineshire; Corriemulzie, Braemar, Aberdeenshire; Ben Nevis, Inverness-shire.

Form *furfuracea* Schær. Spic. (1840) p. 455.—Thallus much expanded, greyish-white, densely covered with greyish-brown isidia: otherwise as in the type.—Mudd, Man. p. 95; Leight. Lich. Fl. p. 138, ed. 3, p. 127; Cromb. Linn. Soc. Journ. Bot. xvii. p. 573.—*Parmelia horrescens* Tayl. in Mack. Fl. Hib. ii. p. 144 pro parte.—*Lichenoides vulgatissimum cinereo-glaucum lacunosum et cirrhosum* Dill. Musc. 188, t. 24. f. 83 c, d.—*Brit. Exs.*: Leight. n. 46 pro parte; Larb. Lich. Hb. n. 211; Bohl. n. 11.

Remarkable on account of the isidiöse furfur with which it is frequently covered and which obliterates the lobes except at the circumference, giving it a panniform appearance. Smaller and sterile states in this condition, and some very sparingly isidiferous, are the form *panniformis* (Cromb. Grevillea, xv. p. 75). The thallus is often dark-grey, and occasionally becomes centrifugal from the decay of the central portions, when it may present merely a narrow circumferential border. The apothecia, which are frequent, have the thalline margin sometimes exasperate with the isidia.

Hab. On rocks, walls, and trees, chiefly in upland districts.—*Distr.*

General and common in the mountainous tracts of Great Britain, especially in the Scottish Highlands; apparently rare in S. and W. Ireland and in the Channel Islands.—B. M.: Island of Alderney. Eridge Rocks and Ardingley, Sussex; New Forest, Hampshire; near South Brent, Devon; near Penzance and Helminston, Cornwall; Savernake Forest, Wiltshire; Charnwood Forest, Leicestershire; Malvern, Worcestershire; Black Edge, Buxton, Derbyshire; Wrekin Hill, Shropshire; Lambeth, S. Wales; Barmouth and near Dolgelly, Merionethshire; Cleveland, Yorkshire; Kentmere, Westmoreland; Keswick, Cumberland. Dalma-hoy Crag, near Edinburgh; near Helensburgh, Dumbartonshire; Appin, Argyleshire; Ben Lawers and near Dunkeld, Perthshire; Clova and Cortachy, Forfarshire; Crathes, Aberdeenshire; Glen Callater, Mor-rone, and Ben Avon, Braemar, Aberdeenshire; Glen Nevis, Inverness-shire. Lambay Island, near Dublin; near Cork; Dunkerron, co. Kerry; Kylemore, co. Galway.

11. *P. sulcata* Tayl. in Mack. Fl. Hib. ii. (1836) p. 145.—Thallus orbiculari-expanded, membranaceous, smoothish, not isidiferous, irregularly imbricate, reticulato-sorediate, greyish or glaucous-white, the soredia sulciform, rotundato-oblong or linear, margined, whitish (K^{+yellowish}, CaCl⁻). Apothecia and spores as in the preceding species.—Cromb. Grevillea, xv. p. 75.—*Parmelia saxatilis* var. *sulcata* Cromb. Lich. Brit. p. 34; Leight. Lich. Fl. p. 138, ed. 3, p. 126. *Parmelia saxatilis* β. *leucochroa* (Wallr.) Mudd, Man. p. 94. *Lichenoides vulgatissimum cinereo-glaucum, lacunosum et cirrhosum* Dill. Musc. 188, t. 24. f. 83 B.—*Brit. Exs.*: Leight. n. 203; Mudd, n. 66; Cromb. n. 28.

Distinguished from *P. saxatilis* by the soredia and the absence of isidia. The thallus often spreads extensively and varies in the breadth of the laciniae; short and broad states are form *rosæformis* Ach. (Lich. Univ. p. 470). The apothecia are moderate, and sometimes have rather smaller spores than in the preceding species. They are comparatively rare in Britain as elsewhere, nor are the spermogones frequent in our specimens.

Hab. On trees and old walls, chiefly in maritime and upland districts.—*Distr.* General and usually plentiful in Great Britain and Ireland; rare in the Channel Islands; fertile chiefly in the Highlands of Scotland.—B. M.: Island of Guernsey. Epping and Hainault Forests, Essex; New Forest, Hants; Penzance and Withiel, Cornwall; near Cirencester and Sapperton, Gloucestershire; Darley, Derbyshire; Grimsbury Green, Northamptonshire; Ludlow, Shropshire; Harboro' Magna, Warwickshire; near Hopton, Cheshire; Cleveland, Yorkshire; Kendal, Westmoreland; near Hexham, Northumberland. Dalry, Kirkcudbrightshire; Preghorn and Craig Lochart, near Edinburgh; Barcaldine, Argyleshire; Loch Katrine and Killin, Perthshire; Den of Murtle, near Aberdeen; S. of Fort William, Inverness-shire; Applecross, Ross-shire. Rostellan, co. Cork; Dunkerron, co. Kerry.

Var. β. *lævis* Nyl. Syn. i. (1860) p. 389.—Thallus smooth, esorediate, glaucous- or greyish-white; beneath black, densely rhizineo-fibrillose; laciniae narrow, more divided and discrete, greyish or brownish at the apices. Apothecia not seen.—Cromb. Journ. Bot. 1875, p. 140.

A peculiar variety, which, notwithstanding the smooth thallus, is from its general aspect referable to *P. sulcata* rather than to *P. saxatilis*. At the same time it is well distinguished by the esorediate thallus which is but loosely affixed to the substratum, and by the form of the laciniae. The under surface is occasionally covered to the very extremities of the laciniae with numerous densely crowded black rhizine (form *hirsuta* Cromb. l. c.). In the British specimens neither apothecia nor spermatogones are present.

Hab. On the trunks of old firs and on granite walls in upland localities.—*Distr.* Found only in two localities amongst the Grampians, Scotland.—B. M. : Ben Lawers, Perthshire; Durris, Kincardineshire.

12. *P. omphalodes* Ach. Meth. (1803) p. 204.—Thallus orbicular, expanded, submembranaceous, somewhat shining, smoothish, dark-brown, brownish-black or purplish-black; beneath black, densely rhizineo-fibrillose; laciniae subtruncate at the apices (K⁺ yellowish, CaCl⁻). Apothecia dark-badious, moderate or large; otherwise as in *P. saxatilis*.—Gray, Nat. Arr. i. p. 440; Hook. Fl. Scot. ii. p. 53; Sm. Eng. Fl. v. p. 199; Tayl. in Mack. Fl. Hib. ii. p. 145.—*Parmelia saxatilis* δ . *omphalodes* Mudd, Man. p. 95; Cromb. Lich. Brit. p. 34; Leight. Lich. Fl. p. 138, ed. 3, p. 127. *Lichen omphalodes* Linn. Sp. Pl. (1753) p. 1143; Huds. Fl. Angl. p. 446; Lightf. Fl. Scot. ii. p. 818; With. Arr. ed. 3, iv. p. 34; Eng. Bot. t. 604. *Lichenoides saxatile tinctorium, foliis pilosis purpureis* Dill. Musc. 185, t. 24. f. 80, in Ray, Syn. ed. 3, p. 74, n. 70.—*Brit. Exs.* : Leight. n. 7; Mudd, n. 67; Lerb. Cæsar. n. 19; Bohl. n. 18.

Though by some recent authors regarded as a variety of *P. saxatilis*, it is entitled to rank as specifically distinct. It varies in colour from brown or greyish-brown to nearly black, and is often, as observed by Hooker, Eng. Fl. l. c., marked with pale zigzag cracks. In the darker thalli the reaction of the cortical layer with K is less distinct. It often spreads extensively, almost covering the larger and otherwise naked boulders, and is somewhat variable. The apothecia are not unfrequent, sometimes numerous and very large, becoming in old age angulose and flexuose, often with slightly smaller spores as in *P. sulcata*. The spermatogones, which are also common, are usually more prominent than in *P. saxatilis*, giving the thallus a black-punctate appearance.

Hab. On rocks and boulders in maritime, upland, and alpine tracts.—*Distr.* General and common throughout Great Britain; very abundant in the Highlands, Scotland, to the summits of the higher mountains; apparently rare in Ireland and the Channel Islands.—B. M. : Beauport Bay, Jersey; Island of Guernsey. Dartmoor, Hay Tor, and Lustleigh Cleeve, Devonshire; Temple Moor, near Penzance, and Helmington, Cornwall; Malvern Hills, Worcestershire; near Oswestry, Shropshire; Barmouth and Cader Idris, Merionethshire; Conway Mt., and Cwm Idwal, Carnarvon; Anglesea; Cleveland, Yorkshire; near Egglestone and Teesdale, Durham; Kentmere, Westmoreland; Cheviots, Northumberland. Moffat, Dumfriesshire; Dalnaboy Crag, near Edinburgh; Barcaldine and Appin, Argyleshire; Killin, Ben Lawers, Rannoch, near Dunkeld and Abernethy, Perthshire; Canlochan, Forfarshire; near Invercauld, Craig

Coinnoch, Morrone, Glen Dee, Braemar; near Aviemore, and Ben Nevis, Inverness-shire; Applecross, Ross-shire. Dunkerron and Caher, co. Kerry.

Form *cæsio-pruinosa* Nyl. ex Stiz. St. Gall. Nat. Ges. (1876) p. 206.—Thallus and the thalline margin of the apothecia *cæsio-pruinose*.—Cromb. Journ. Bot. 1882, p. 272.—subsp. *Parmelia omphalodes* f. *cæsiopruiosa* Nyl. ex Norrl. Not. Sällsk. pro F. et Fl. Fenn. Förh. xiii. (1873) p. 324.

This differs merely in the presence of the *cæsious* pruina, which, however, at length becomes more or less obsolete, and the thallus is sometimes of a bluish tint. The few British specimens yet seen are sterile.

Hab. On rocks in alpine situations.—*Distr.* Found only on two of the S. Grampians, Scotland.—B. M.: Summits of Craig Calliach and Ben Lawers, Perthshire.

Var. β . *panniformis* Ach. Meth. (1803) p. 204 pro parte.—Thallus more or less effuse, the laciniae much narrower, shortly dissected and imbricate. Apothecia small or submoderate.—Nyl. ex Stiz. St. Gall. Nat. Ges. (1876) p. 206; Cromb. Grevillea, xv. p. 73.—*Parmelia saxatilis* var. *panniformis* Cromb. Lich. Brit. p. 34; Leight. Lich. Fl. p. 139, ed. 3, p. 128.

Forms a densely imbricate and congested crust which is somewhat effuse. It is usually less shining than the type. The apothecia are occasionally present, but are not numerous.

Hab. On rocks and boulders in upland and subalpine regions.—*Distr.* Not general, though plentiful in S.W. and W. England, N. Wales, S. Scotland, and on the Grampians.—B. M.: Hay Tor, Dartmoor, and Didworthy, Devonshire; near Penzance and Helminton, Cornwall; Llyn Gwriorydd, Merionethshire. Stiperstones Hill, Shropshire. New Galloway, Kirkcudbrightshire; Ben Cruachan, Argyshire; Ben More, Ben Lawers, and Rannoch, Perthshire; Canlochan, Forfarshire; Morrone and Ben-naboord, Braemar, Aberdeenshire; Ben Nevis, Inverness-shire.

Form 1. *glomulifera* Cromb. Journ. Bot. 1872, p. 307.—Thallus with scattered, isidioid, nodulose, dark-brown or blackish glomeruli.—Leight. Lich. Fl. ed. 3, p. 126.

Only var. *panniformis* with a few glomeruli, subsimilar in appearance, though differing in structure, to those of *Ricasolia amplissima*. These abnormal growths are probably peculiar to sterile states of the plant.

Hab. On boulders in subalpine tracts.—*Distr.* Rare and local on the mts. of N. Wales and the Scottish Grampians.—B. M.: Cym Idwal, Carnarvon. Morrone, Braemar, Aberdeenshire.

Form 2. *subconcentrica* Cromb. Journ. Bot. 1872, p. 306.—Thallus *panniform*, subspherical, growing involved in concentric layers.—Leight. Lich. Fl. ed. p. 128.

A peculiar state analogous to *P. revoluta* var. *concentrica*, though the few specimens gathered were not so globular. As observed in Journ.

Bot. *l.c.* it evidently originates from the nodular excrescences on the thallus of the preceding form becoming detached.

Hab. On the ground in alpine situations.—*Distr.* Found only on one of the N. Grampians, Scotland.—B. M. : Morrone, Braemar, Aberdeenshire.

13. **P. Borreri** Turn. Trans. Linn. Soc. ix. (1808) p. 148, t. 13. p. 2.—Thallus suborbicular, cartilagineo-membranaceous, appressed, imbricato-lobed, rugoso-sorediate, glaucous-grey or pale whitish-grey; beneath brownish or pale, subfibrillose, glabrous at the circumference; lobes broad, rounded, sinuate, the soredia white-punctiform ($K + \text{yellow}$, $CaCl + \text{red}$, soredia $CaCl + \text{red}$). Apothecia large, badio-reddish, the margin elevated, inflexed; spores 0,011–15 mm. long, 0,008–11 mm. thick.—Sm. Eng. Fl. v. p. 199; Tayl. in Mack. Fl. Hib. ii. p. 147; Mudd, Man. p. 94, t. ii. f. 29; Cromb. Lich. Brit. p. 34; Leight. Lich. Fl. p. 133, ed. 3, p. 122.—*Lichen Borreri* Eng. Bot. t. 1780. *Lichenoides glaucum perlatum, subtus nigrum et cirrosum* Dill. Musc. 147, t. 20. f. 39 c. *Parmelia red-denda* Stirt. in Scottish Naturalist, 1878, p. 298; Leight. Lich. Fl. ed. 3, p. 199, is an accidental state, in which the medulla (not the soredia) gives no reaction with $CaCl$ (*cfr.* Cromb. Grevillea, 1881, p. 26).—*Brit. Exs.* : Leight. n. 231; Larb. Cæsar. n. 20.

Similar to *P. sulcata*, from which it is distinguished by the thicker, more rigid, smoother, less imbricate, appressed, differently coloured thallus, and by the form of the soredia. These appear as numerous, irregularly scattered, often impressed and pseudo-cyphelloid, whitish punctate verrucæ, giving it a rough aspect. The thalline reactions, the smaller spores, and the spermogones render it very distinct. In this country the apothecia are rare and chiefly central, becoming irregularly perforate in old age. The spermogones have the spermatia lageniform, 0,0045 mm. long, 0,0010 mm. thick.

Hab. On trunks of old trees, rarely on rocks, in maritime and upland wooded districts.—*Distr.* General in S. and W. England; rare in S. Scotland, S. and S.W. Ireland, and the Channel Islands.—B. M. : Rozel, Island of Jersey; near Jerbourg, Guernsey. Near Bury, Suffolk; Walthamstow, Essex; Maidstone, Kent; near Brighton and Hentfield, Sussex; Ryde and Shanklin, Isle of Wight; Basingstoke and Lyndhurst, Hampshire; near Penzance and Withiel, Cornwall; Kemble, Gloucestershire; near Oxford and Charlton Camp, Oxfordshire; Hindlip and Malvern, Worcestershire; Twycross, Leicestershire; Harboro' Magna, Warwickshire; Barmouth and Dolgelly, Merionethshire; Dynevor Castle, Carmarthenshire; near Kendal, Westmoreland. Near Dumfries; New Galloway, Kirkcudbrightshire. Riverston, co. Cork; near Limerick; Dunkerron, co. Kerry.

b. Ochroleuca.—Thallus normally yellowish green, or pale straw-coloured.

14. **P. caperata** Ach. Meth. (1803) p. 216.—Thallus expanded, imbricato-lobed, rugulose, pale yellowish-green or ochroleucous;

beneath black, paler and glabrous at the circumference, with few rhizineæ; lobes sinuato-laciniate, rounded, subcrenulate at the margins (K $^{+}$ yellowish, CaCl $^{-}$). Apothecia moderate, badio-reddish, the margin crenulate and often pulverulent; spores 0.017–20 mm. long, 0.007–10 mm. thick.—Gray, Nat. Arr. i. p. 437; Hook. Fl. Scot. ii. p. 52; Sm. Eng. Fl. v. p. 198; Tayl. in Mack. Fl. Hib. ii. p. 146; Mudd, Man. p. 101, t. ii. f. 30; Cromb. Lich. Brit. p. 32; Leight. Lich. Fl. p. 122, ed. 3, p. 114.—*Lichen caperatus* Linn. Sp. Pl. (1753) p. 1147; Huds. Fl. Angl. ed. 2, p. 543; With. Arr. ed. 3, iv. p. 58; Eng. Bot. t. 654. *Lichenoides caperatum, rosaceæ capansum, e sulphureo virens* Dill. Muse. 193, t. 25. f. 97. *Lichenoides crusta foliosa, ex cinereo et luteo virescente, inferne nigra et lævi* Dill. in Ray, Syn. ed. 3, p. 73, n. 62.—*Brit. Exs.*: Leight. n. 77; Mudd, n. 73; Cromb. n. 140; Larb. Cæsar. n. 63; Lich. Hb. n. 251; Bohl. n. 123.

The thallus, which is normally orbicular, frequently spreads extensively. It is usually undulato-plicate, and often more or less granuloso-pulverulent, except at the circumference. The apothecia, which are comparatively rare, are usually scattered, but occur chiefly towards the centre of the thallus. The spermogones are minute, infusate, with spermatia 0.006–7 mm. long, 0.001 mm. thick.

Hab. On the trunks of old trees, on boulders, and on old pales, in lowland and upland tracts.—*Distr.* General and abundant in most parts of England; rarer in Ireland, the Channel Islands, and in Scotland, where apparently it rarely extends beyond the S. Grampians.—B. M.: St. Brelade's and Boulay Bay, Jersey; Island of Guernsey. Walthamstow and Hainault Forest, Essex; near Tunbridge Wells, Kent; Lewes, Hastings, and near Brighton, Sussex; Lyndhurst and near Lymington, Hampshire; Carisbrook and Ryde, Isle of Wight; Ivy Bridge, Torquay, Newton Bushell, and Totnes, S. Devon; Boccenoe, Penzance, and Withiel, Cornwall; St. Mary's, Scilly; Elstree, Herts; near Malvern, Worcestershire; Gamlingay, Cambridgeshire; Charnwood Forest, Leicestershire; Haughmond Hill, Shropshire; Cleveland, Yorkshire; Cwm Bychan and near Barmouth, Merionethshire; Hafod, Cardiganshire; Island of Anglesea; Llanberis, Carnarvonshire; Keswick and Asby, Cumberland; Teesdale, Durham; Stavely, Westmoreland; near Hexham, Northumberland. New Galloway, Kirkcudbrightshire; King's Park, Swanston Wood, Rivelstone and Pentland Hills, near Edinburgh; Airds, Appin, Argyleshire; Blairdrummond, Aberfoyle, Kemmore, and Ben Lawers, Perthshire; Ben Nevis, Inverness-shire. Rostellan, co. Cork; Dunkerron, co. Kerry.

15. *P. sinuosa* Ach. Syn. (1814) p. 207.—Thallus suborbicular, membranaceous, divaricato-lobed, smooth, yellowish; beneath blackish and black-fibrillose, paler towards the circumference; laciniae narrow, sinuato-pinnatifid, dilated and often sorediate at the apices; the sinuses wide, circular (Kf $^{+}$ yellow, CaCl $^{-}$). Apothecia moderate, subplane, dark-brown, the margin thin, smooth, entire; spores 0.011–20 mm. long, 0.008–12 mm. thick.—Gray, Nat. Arr. i. p. 442; Hook. Fl. Scot. ii. p. 54; Sm. Eng. Fl. v. p. 203; Tayl. in Mack. Fl. Hib. ii. p. 149; Mudd, Man. p. 95; Cromb. Lich. Brit. p. 33; Leight. Lich. Fl. p. 136, ed. p. 125.—*Lichen sinuosus*

Sm. Eng. Bot. xxix. (1809) t. 2050.—*Brit. Exs.*: Larb. Lich. Hb. n. 8.

Often confounded with smaller states of *P. lavigata*, to which it is closely allied, but is distinguished not only by the reaction with K, and the larger spores, but also, and at first sight, by the yellow thallus, which is usually smaller, more divided, and somewhat closely affixed to the substratum. The apothecia are extremely rare in our Islands, and when present are but few and central.

Hab. On trunks of trees and boulders in maritime upland districts.—*Distr.* Rather local and very sparingly in S. and W. England, N. Wales, S. and W. Scotland, W. Ireland, and the Channel Islands.—B. M.: Island of Guernsey. Bournemouth, Hampshire; Ullacombe, Devonshire; Barmouth, Ty Gwn, near Dolgelly, Merionethshire; Island of Anglesea. Brodrick Castle, Island of Arran; Appin, Argyleshire; Glen Nevis, Inverness-shire; Applecross, Ross-shire. Near Macroone, co. Cork; Cromaglow and Dunkerron (fruit), co. Kerry; Connemara, co. Galway.

16. *P. dissecta* Nyl. Flora 1882, p. 451.—Subsimilar to *P. lavigata*, but the thallus yellowish, much smaller and thinly-dissected, isidiferous, with short rhizine on the under surface (medulla K(CaCl) + red). Apothecia unknown.—Cromb. Grevillea, xv. p. 74.

This also is closely allied to *P. lavigata*, to which Nylander (Syn. i. p. 384) originally referred it as a variety. It has been raised by him to specific rank because it constantly preserves its own type. I have not seen a British specimen; according to Nylander it is not unfrequent in France.

Hab. On rocks in (?) upland situations.—*Distr.* Extremely local and rare in Ireland (*vide* Nyl.).

17. *P. conspersa* Ach. Meth. (1803) p. 205.—Thallus orbicular, expanded, appressed, laciniato-divided, shining, somewhat smooth, greenish-straw coloured; beneath brown, with short black rhizine; laciniae plane sinuato-incised and crenate at the margins (K⁺ yellow, CaCl⁻). Apothecia moderate, spadiceous or brownish, the margin entire and inflexed; spores 0.008–12 mm. long, 0.005–8 mm. thick.—Gray, Nat. Arr. i. p. 442; Hook. Fl. Scot. ii. p. 55; Sm. Eng. Fl. v. p. 199; Tayl. in Mack. Fl. Hib. ii. p. 143; Mudd, Man. p. 102; Cromb. Lich. Brit. p. 34; Leight. Lich. Fl. p. 134, ed. 3, p. 124.—*Lichen conspersus* Ehrh. in Ach. Prodr. (1798) p. 118; Eng. Bot. t. 2097. *Lichen centrifugus* Huds. Fl. Angl. p. 445; Lightf. Fl. Scot. ii. p. 814; With. Arr. ed. 3, iv. p. 32 pro parte. *Lichenoides imbricatum viridans, scutellis badiis* Dill. Musc. 180, t. 24. f. 75 A.—*Brit. Exs.*: Leight. n. 78; Larb. Caesar. n. 65; Cromb. n. 26.

Often spreads rather extensively, though always preserving an orbicular outline. It is occasionally somewhat glaucous, and specimens rarely occur in which the medulla is partly tawny-yellow, the result evidently

of maceration. In the centre the laciniae are convex and subrugose. The apothecia are numerous, chiefly central, becoming somewhat large and flexuose. The spermatogones are abundant, black, irregularly scattered over the surface of the thallus, with spermatia 0.005–6 mm. long, about 0.001 mm. thick.

Hab. On old walls, rocks, and boulders in maritime and upland regions.—*Distr.* General and common in Great Britain, especially in mountainous tracts; rarer in the Channel Islands; apparently rare in Ireland.—B. M.: Islands of Jersey and Sark. Dartmoor, Ivy Bridge, and Temple Moor, Devonshire; near Penzance and Helmlinton, Cornwall; Malvern Hills, Worcestershire; Charnwood Forest, Leicestershire; near Oswestry, Shropshire; Llanbedr, Barmouth, Cader Idris, and Dolgelly, Merionethshire; Llandyssil, Cardiganshire; Bangor, Carnarvonshire; Beaumaris, Island of Anglesea; Teesdale, Durham; near Kendal, Westmoreland; Ennerdale, Cumberland. New Galloway, Kirkcudbrightshire; near Moffat, Dumfriesshire; Ayrshire; Inverary, Crinan Canal, and Appin, Argyleshire; Loch Ard, Ben Lawers, and Aberfeldy, Perthshire; Durris, Kincardineshire; Craig Guie, Braemar, Aberdeenshire. Dunkerron, co. Kerry.

Form *isidiata* Leight. Lich. Fl. i. (1871) p. 135.—Thallus covered with densely crowded isidia, except at the circumference; otherwise as in the type.—Leight. Lich. Fl. ed. 3, p. 125.—*Imbricaria conspersa* f. *isidiata* Anzi Cat. Lich. Sondr. (1860) p. 28. *Lichenoides imbricatum viridans, scutellis badiis* Dill. Musc. 180, t. 24, f. 75 B.—*Brit. Exs.*: Leight. n. 79 pro parte; Bohl. n. 110.

Easily recognized by the densely isidioid thallus, in which the laciniae are often scarcely visible. It is usually infertile, and when present the apothecia are not numerous.

Hab. On rocks and boulders in upland districts.—*Distr.* Rather local in S.W., W., and N. England, in Wales and S. Scotland, more frequent in the S. and W. Highlands; apparently rare in N.W. Ireland.—B. M.: Dartmoor, Devonshire; Withiel and near Penzance, Cornwall; Herefordshire Beacon, Malvern, Worcestershire; Pont-nedd-Vechan, Brecknockshire; near Dolgelly, Merionethshire; Snowdon, Carnarvonshire; near Kendal, Westmoreland; Ennerdale, Cumberland. New Galloway, Kirkcudbrightshire; Appin, Argyleshire; King's Park, Stirling; Ben Lawers and Rannoch, Perthshire; near Cortachy, Forfarshire; Crathes, Aberdeenshire.

Var. *β. stenophylla* Ach. Meth. (1803) p. 206.—Thallus somewhat effuse; laciniae longer, narrower, more divided and imbricate. Apothecia smaller, rare.—Mudd, Man. p. 102; Cromb. Lich. Brit. p. 34; Leight. Lich. Fl. p. 135, ed. 3, p. 124.—*Brit. Exs.*: Leight. n. 79 pro parte.

Well distinguished by the form of the laciniae. It occasionally presents an almost panniform aspect, and is normally glabrous, though sometimes sparingly isidiiferous. The apothecia are very rare in British specimens.

Hab. On boulders and old walls in upland districts.—*Distr.* Local and scarce in S., Central, and W. England, in N. Wales, in the S.W. Highlands and S. Grampians, Scotland; rare in S.W. Ireland.—B. M.: Near Penzance, Cornwall; Barden Hill, Leicestershire; near Oswestry, Shrop-

shire; Llanelyd, near Dolgelly, Merionethshire; Coe Coch, Snowdon, Carnarvonshire; near Kendal, Westmoreland. Inverary and Appin, Argyleshire; Ben Lawers, Perthshire. Dunkerron, co. Kerry.

18. *P. Mougeotii* Schaer. Enum. (1850) p. 46.—Thallus small, orbicular, appressed and closely adnate, shining, greenish or greyish-yellow, usually with yellowish-white tuberculose soredia; beneath rugose, brownish-black; rhizine not visible; laciniae narrow, linearimultifid, slightly convex, sub-diffract in the centre, explanate at the apices, transversely rimose (K^+ yellowish, $CaCl^-$). Apothecia minute, reddish-brown, the margin sulphureo-pulverulent; spores 0,008–10 mm. long, 0,005–6 mm. thick.—Mudd, Man. p. 102; Cromb. Lich. Brit. p. 34.—*Parmelia conspersa* f. *Mougeotii* Leight. Lich. Fl. p. 136, ed. 3, p. 125. *Lichen incurvus* Eng. Bot. t. 1375 (et descr. pro parte).—*Brit. Eas.*: Leight. n. 143; Mudd, n. 74; Cromb. n. 143; Larb. Lich. Herb. nos. 87, 251.

Closely allied to *P. conspersa*, but distinguished by the frequent presence of scattered soredia and by being much smaller in all its parts, though the individual plants sometimes become confluent. The thallus is frequently greyish or dark in the suberustaceous centre, and the laciniae are occasionally more discrete at the circumference. The apothecia, which are rare in this country, as elsewhere, are few and scattered. The spermatogones, which are not frequent, are very minute, brownish-black, with straight, short, subcylindrical spermatia, 0,005–6 mm. long, about 0,001 mm. thick.

Hab. On rocks and boulders, chiefly granite and gneiss, in maritime and upland districts.—*Distr.* Local and scarce in Great Britain and Ireland; most frequent, perhaps, on the Grampians, Scotland.—B. M.: Thetford Warren, Norfolk; Withiel and Penzance, Cornwall; Charnwood Forest, Leicestershire; near Barmouth and Capel Arthor, Merionethshire; Ingleby, Cleveland, Yorkshire; Teesdale, Durham; Near Kendal, Westmoreland. New Galloway, Kirkcudbrightshire; Achosragan Hill, Appin, Argyleshire; Ben Lawers and Craig Tulloch, Perthshire; Durris, Kincardineshire; Crathes, Aberdeenshire (irt.); and Glen Dee, Braemar. Curraghmore, co. Waterford; Dunkerron, co. Kerry; Connemara, co. Galway.

Form *dispersa* Cromb. Grevillea, xv. (1887) p. 75.—Thallus indeterminate, diffract; the laciniae very narrow, short, discrete, and more or less scattered. Apothecia not seen.

This form no doubt is due to the normal evolution of the thallus being arrested, so that it grows in an interrupted manner. It is but sparingly sorediate, and is always sterile.

Hab. On schist rocks in shady situations in subalpine tracts.—*Distr.* Local and scarce in the W. Highlands, Scotland.—B. M.: Achosragan Hill, Appin, Argyleshire.

19. *P. incurva* Fr. Nov. Sched. Crit. (1826) p. 82.—Thallus orbicular or expanded, appressed, stellato-laciniose, subopaque, greenish straw-coloured or ochroleucous, with somewhat large,

subglobose, sulphureous soredia; beneath dark, with blackish rhizine: laciniae narrow, multiseid, somewhat convexo-compressed, incurved at the apices (K^- , $CaCl^-$). Apothecia small, reddish-brown, the margin subentire; spores 0,008–12 mm. long, 0,005–6 mm. thick.—Sm. Eng. Fl. v. p. 202; Tayl. in Mack. Fl. Hib. ii. p. 149; Mudd, Man. p. 102; Cromb. Lich. Brit. p. 34; Leight. Lich. Fl. p. 140 pro parte, ed. 3, p. 129 pro parte.—*Lichen incurvus* Pers. in Ust. Ann. vii. (1794) p. 24. *Parmelia recurva* Ach., Gray, Nat. Arr. i. p. 442; Hock. Fl. Scot. ii. p. 54. *Lichen multifidus*, Dicks. Crypt. fasc. iii. p. 16, t. 9. f. 7; With. Arr. ed. 3, iv. p. 28.

Easily recognizable from the allied species by the incurved apices of the laciniae. The thallus, which is usually widely expanded, often becomes suberustaceous and dark in the centre, where also, in very old plants, it sometimes decays like *P. centrifuga*, a plant not found in Great Britain. The apothecia are very rare in this country, and when present are not rightly developed. The spermogones, however, are frequent, giving the thallus a black punctate appearance, with spermatia 0,005–7 mm. long, about 0,001 mm. thick.

Hab. On granitic rocks and boulders in subalpine and alpine places.—*Distr.* Local in S.W. Ireland and S. Scotland; more frequent among the N. Grampians, Scotland.—B. M.: New Galloway, Kirkcudbrightshire; Craig Coinnoch, Glen Candlic, Ben-naboard, Morrone, and Upper Glen Dee (fruit), Braemar, Aberdeenshire. Dunkerron Mt., co. Kerry.

c. *Olivaceo-nigricantes*.—Thallus normally olive-brown or brownish-black.

20. *P. acetabulum* Dub. Bot. Gall. ii. (1830) p. 601.—Thallus orbicular, coriaceous-membranaceous, unequal or rugulose, subopaque, imbricato-lobed, glaucous- or lurid-olivaceous; beneath paler and sparingly black-fibrillose; lobes rounded, appressed at the circumference, ascending and undulate in the centre (K^- + yellowish, then red, $CaCl^-$). Apothecia moderate or large, rugose, badio-reddish, the margin crenulate, inflexed; spores 0,012–16 mm. long, 0,008–10 mm. thick.—Mudd, Man. p. 99; Cromb. Lich. Brit. p. 35; Leight. Lich. Fl. p. 136, ed. 3, p. 125.—*Lichen acetabulum* Neck. Delic. (1768) p. 506. *Parmelia corrugata* Gray, Nat. Arr. i. p. 438; Hook. Eng. Fl. v. p. 201. *Lichen corrugatus* Eng. Bot. t. 1652. *Lichenoides acetabulis cutaneis et rugosis* Dill. Musc. 185, t. 24. f. 79.—*Brit. Eas.*: Cromb. n. 142; Leight. n. 362.

The thicker thallus, the larger lobes, and rugose apothecia readily distinguish this from our other species of this subsection. Elsewhere it grows widely expanded, though this state is rare in Britain. The apothecia, which are not frequent in this country, become rather large in very old plants. The spermogones, generally very abundant, are at length confluent, and form rugosities on the thallus, with the sterigmata often branched and jointed, and the spermatia about 0,007 mm. long, 0,001 mm. thick.

Hab. On the trunks of old trees in woods and parks in lowland districts.—*Distr.* Not general nor common throughout England, chiefly

in the S.; very local in Central Scotland; not seen from Ireland.—B. M.: Saham Wood, Norfolk; near Bury, Suffolk; Epping Forest, Essex; Broome Park, Kent; St. Leonard's Forest, Poyning's Hill, and Beeding Priory, Sussex; near Netley Abbey, Hampshire; Somerford Keynes, Wiltshire; near Cirencester and Fairford, Gloucestershire; near the Ketch, Worcestershire; Harboro' Magna, Warwickshire; Stokesley, Cleveland, Yorkshire. Auldbar, Forfarshire.

21. *P. olivacea* Ach. Meth. (1803) p. 213.—Thallus orbicular, membranaceous, appressed, rugulose or minutely corrugate, laciniato-lobed, subopaque, olive-brown or badious-umbrine; beneath nearly concolorous, paler at the circumference, obsoletely fibrillose; lobes radiating, plane, rounded, crenate (K^- , $CaCl^-$). Apothecia moderate, dark chestnut-coloured, the margin entire or nearly entire; spores 0,011–19 mm. long, 0,007–10 mm. thick.—Nyl. Syn. i. (1860) p. 395; Cromb. Grevillea, x. p. 24; Lich. Brit. p. 35 pro parte; Leight. Lich. Fl. p. 122 pro parte. ed. 3, p. 115 pro parte.—*Lichenoides olivaceum, scutellis lavibus* Dill. Musc. 182, t. 24. f. 77 A. —*Lichen olivaceus* and *Parmelia olivacea* of our older authors belong to one or other of the following allied plants.

Several species, now rightly separated, have been included here by authors. As limited, it is readily recognized by the rugulose thallus and the entire margin of the apothecia. It is a plant of a more boreal type than any of its immediate allies. The apothecia are chiefly central and crowded, the margin of the receptacle becoming less smooth and entire in age. The spermogones are minute, black, immersed or prominent, with spermatia 0,007 mm. long, about 0,001 mm. thick.

Hab. On the trunks of trees, birch and alder, in wooded upland districts.—*Distr.* Very local and rare in the N. Grampians, Scotland.—B. M.: Abergeldie and Glen Clunie, Braemar, Aberdeenshire.

22. *P. exasperata* Nyl. Not. Sällsk. pro F. et Fl. F. Förh. n. s. v. (1866) p. 120 (note).—Thallus orbicular, membranaceous, minutely and densely rugoso-papillose, olive-brown; beneath paler, sparingly fibrillose; lobes more or less obliterated in the centre, appressed, rounded and inciso-crenate at the circumference (K^- , $CaCl^-$). Apothecia small, or at length somewhat large, chestnut-coloured, the margin elevated, verrucose and papillose; spores shortly ellipsoid, 0,009–12 mm. long, 0,007–10 mm. thick.—Cromb. Journ. Linn. Soc. Bot. xvii. p. 572.—*Parmelia olivacea* subsp. *exasperata* Cromb. Lich. Brit. p. 35; var. *exasperata* Leight. Lich. Fl. p. 123, ed. 3, p. 115. *Collena exasperatum* Ach. Lich. Univ. (1810) p. 645. *Parmelia olivacea* Gray, Nat. Arr. i. p. 438; Hook. Fl. Scot. ii. p. 52; Eng. Fl. ii. p. 200; Tayl. in Mack. Fl. Hib. ii. p. 143; Mudd, Man. p. 99 pro parte. *Lichen olivaceus* Huds. Fl. Angl. p. 446; Lightf. Fl. Scot. ii. p. 819 pro parte; With. Arr. ed. 3, iv. p. 35; Eng. Bot. t. 2180. *Lichenoides olivaceum, scutellis amplioribus verrucosis* Dill. Musc. 184, t. 24. f. 78. *Lichenoides crusta foliosa scutellata, pullum* Dill. in Ray, Syn. ed. 3, p. 72, n. 60.—

Brit. Ees.: Mudd, n. 72; Leight. nos. 263, 356; *Larb. Lich. Hb.* n. 327; Bohl. n. 86.

Readily distinguished from *P. olivacea*, of which it is generally regarded as a variety, by the papillato-exasperate thallus and the verrucoso-papillose margin of the apothecia. With us the apothecia are comparatively rare, though plentiful when present. The spermogones are very abundant on the papillæ, when these are not abraded, with spermatia 0,008–11 mm. long, scarcely 0,001 mm. thick.

Hab. On the trunks of old trees in maritime and upland districts.—*Distr.* General and usually common in the W. tracts of Great Britain and Ireland.—B. M.: Bury, Suffolk; New Forest, Hants; Withiel, Cornwall; Pembroke, Herefordshire; Cricklade, Wiltshire; Crowle, Worcestershire; near Dolgelly, Merionethshire; Island of Anglesea; Axton, Cleveland, Yorkshire; Egglestone, Durham, near Stavely, Westmoreland. New Galloway, Kirkcudbrightshire; Largs, Ayrshire; Pentland Hills, near Edinburgh; Appin, Argyshire; Glen Lochay, Perthshire; Castleton of Braemar, Aberdeenshire; S. of Fort William, Inverness-shire; Kilravock, Nairnshire; Applecross, Ross-shire. Glencar and Mangerton, co. Kerry; Killerey Bay, Connemara, co. Galway.

23. *P. subaurifera* Nyl. *Flora*, 1873, p. 22.—Thallus orbicular, thinly membranaceous, closely appressed, glabrous or thinly furfuraceous in the centre, laciniato-lobed, olive-brown or umbrine, yellow-sorediate, medulla yellow; beneath blackish, shortly fibrillose; lobes plane, crenate (K^{+} yellowish, $CaCl^{+}$ reddish). Apothecia small, dark chestnut-coloured, the margin subentire, often yellow-sorediate; spores 0,011–13 mm. long, 0,007–8 mm. thick.—Cromb. *Journ. Linn. Soc. Bot.* xvii. p. 572; Grevillea, x. p. 25.—*Lichen olivaceus*, var. 3, With. *Arr.* ed. 3, iv. p. 35. *Lichenoides olivaceum, scutellis lævibus* Dill. *Musc.* 182, t. 23. f. 77 c.—*Brit. Ees.*: *Larb. Lich. Hb.* n. 210.

From the allied species this differs at once in the yellow medulla and the small yellow soredia with which the thallus is everywhere efflorescent. Our British specimens are, with one or two exceptions, less well developed than those from Scandinavia—the thallus being smaller, the medulla less distinctly yellow, and having only in one instance a few young apothecia. The spermogones, which also seem to be very rare with us, have the spermatia 0,005 mm. long, scarcely 0,001 mm. thick.

Hab. On the trunks of trees and branches of shrubs, chiefly oak and firs, in maritime and upland districts.—*Distr.* Local and scarce in England, N. Wales, the Highlands, Scotland, and N.W. Ireland; no doubt often overlooked.—B. M.: Epping Forest, Essex; near Tooting, Surrey; Lydd, Kent; Henfield, Sussex; near Penzance, Cornwall (frt.); Whimpole Park, Cambridgeshire; Grimsbury Green, Northampton; Gopsall Park, Leicestershire; Kempsey, Worcestershire; Aberdovey, Merionethshire; Axton, Cleveland, Yorkshire; Windermere, Westmoreland. Glen Lochay, Perthshire; Wills Braes, Forfarshire; Durris, Kincardineshire; Applecross, Ross-shire. Kylemore, co. Galway.

24. *P. prolixa* Nyl. in *Cromb. Lich. Brit.* (1870) p. 35.—Thallus suborbicular, appressed, somewhat shining, lacinate, dark-olive or blackish-umbrine; beneath blackish or black, moderately fibrillose; laciniae narrow, subimbricate, much and variously divided, somewhat

convex, crenato-incised and but slightly dilated at the apices (K^- , $CaCl^-$). Apothecia small or moderate, scattered, subconcolorous, the margin entire or subentire; spores 0,009–12 mm. long, 0,005–6 mm. thick.—Cromb. Grevillea, x. p. 25.—*Parmelia olivacea* vars. *prolixa* et *dendritica* (Pers.) Leight. Lich. Fl. p. 112, ed 3, p. 115. *Parmelia olivacea* γ. *prolixa* Ach. Meth. (1803) p. 214.—*Brit. Ess.*: Leight. n. 365.

Generally regarded as a variety of *P. olivacea*, but separated by the form of the laciniae and by the smaller spores. The thallus is usually smooth, but sometimes rugulose, as is also the margin of the apothecia. The apothecia are rare in Britain, but the spermogones are not unfrequent. They are at length somewhat prominent, with spermatia scarcely 0,007 mm. long, and about 0,001 mm. thick.

Hab. On rocks in maritime and upland districts.—*Distr.* Local and scarce in W. England and Wales; here and there in Scotland and in N.W. Ireland.—B. M.: Malvern Hills, Worcestershire; Caer Caradoc, Shropshire; Llandegley Rocks, Radnorshire; Mool-y-Golfa, Montgomeryshire; Douglas Head, Isle of Man. New Galloway, Kirkcudbrightshire; Island of Lismore, Argyleshire; Portlethen, Kincardineshire; Craig Guie, Braemar, Aberdeenshire. Connemara, co. Galway.

Subsp. 1. *P. sorediata* Cromb. Journ. Bot. 1882, p. 273.—Thallus smaller, adnate, sprinkled towards the centre with whitish or brownish-white, verrucoso-prominent soredia; laciniae somewhat plane (K^- , $CaCl^-$). Apothecia small; spores 0,010–12 mm. long, 0,005–6 mm. thick.—*Parmelia stygia* b. *sorediata* Ach. Lich. Univ. (1810) p. 471.

Distinguished by the pulvinate soredia with which the thallus is more or less sprinkled towards the centre or occasionally almost throughout. It is of small size (scarcely more than 1 in.), frequently opaque, with the laciniae contiguous. The apothecia, which are small and scattered, are very rare in Britain as in other countries.

Hab. On rocks in upland mountainous districts.—*Distr.* Very local and rare in W. England and among the Central and N. Grampians, Scotland.—B. M.: North Hill, Malvern, Worcestershire. Craig Tulloch, Blair Athole, Perthshire; Craig Guie, Braemar, Aberdeenshire.

Subsp. 2. *P. Delisei* Nyl. Flora, 1873, p. 67.—Thallus larger, pale-olive, the laciniae broader at the circumference ($K(CaCl)_{+f}^-$ reddish). Apothecia and spores as in *P. prolixa*.—Cromb. Journ. Bot. 1873, p. 133; Grevillea, x. p. 25.—*Parmelia Delisei* Leight. Lich. Fl. ed. 3, p. 129. *Parmelia olivacea* var. *Delisei* Dub. Bot. Gall. (1829) p. 602. *Parmelia olivacea* var. *aquiloides* Linds., Mudd, Man. p. 99.—*Lichen olivaceus* pro parte and *Parmelia olivacea* pro parte of the older and some more recent British authors.—*Brit. Ess.*: Leight. n. 291 pro parte; Larb. Lich. Hb. n. 328; Bohl. n. 109 pro parte.

The characters of the thallus and the chemical reaction make this a distinct subspecies. In old plants the apothecia become large, crowded, and somewhat flexuose.

Hab. On rocks and boulders in maritime and upland districts.—*Distr.* Local in S. and W. England, N. Wales, Central Scotland, S. Ireland, and the Channel Islands.—B. M.: La Moye, Island of Jersey. Near Shanklin, Isle of Wight; Wembury, Devonshire; near Penzance, Cornwall; Barmouth, Merionethshire; Island of Anglesea; Isle of Man; Stavelly, Westmorland. Loch Creran, Argyshire; King's Park, Stirling. Mizen Head, co. Cork.

β. isidiascens Nyl. Flora, 1875, p. 8.—Thallus more or less sprinkled with olive-brown verruciform isidia, which become whitish-sorediate at the apices; otherwise as in the type.—Cromb. Grevillea, x. p. 25.—*Brit. Ess.*: Leight. n. 291 pro parte; Bohl. n. 109 pro parte.

Well characterized by the often crowded and at length thickish isidia, which sometimes nearly cover the thallus, and give it an almost panniform appearance. It is rarely seen fertile, the apothecia being but few, with the margin sometimes rugose with isidia.

Hab. On rocks and boulders in maritime and upland districts.—*Distr.* Local and scarce in the Channel Islands, S. England, N. Wales, and Central Scotland.—B. M.: Chateau Point, Island of Sark. Near Penzance and Helmington, Cornwall; Barmouth, Merionethshire; Island of Anglesea; Isle of Man. King's Park, Stirling.

25. *P. fuliginosa* Nyl. Flora, 1868, p. 346.—Thallus orbicular or suborbicular, membranaceous, appressed, laciniato-lobed, umbrine-badious or olive-black, fuliginoso-furfuraceous or black-isidiöse, beneath blackish, sparingly fibrillose; lobes plane, crenate (K^- , $CaCl^+_{red}$). Apothecia small or moderate, scattered, pale- or dark-brown, the margin thickish, slightly crenulate; spores 0.009–12 mm. long, 0.005–6 mm. thick.—Cromb. Lich. Brit. p. 36; Leight. Lich. Fl. p. 134, ed. 3, p. 123.—*Parmelia olivacea* var. *fuliginosa* Fr. in Dub. Bot. Gall. (1830) p. 602. *Parmelia olivacea* γ. *furfuracea* Schær., Mudd. Man. p. 100. *Lichenoides olivaceum*, *scutellis laribus* Dill. Musc. 182, f. 77 B.

Readily recognized by the peculiar black, setuloso-papillose isidia, which are sometimes so dense as to cover the whole thallus and obliterate the lobes, except at the immediate circumference; otherwise sufficiently separated from the preceding species by the chemical reaction of the medulla with $CaCl$. The apothecia are rare in this country, especially on saxicole specimens, and the spermogones are very rarely visible.

Hab. On rocks and walls, also on old pales, rarely on trees, in maritime and upland districts.—*Distr.* Probably general, though not common, in the mountainous regions of Great Britain and Ireland.—B. M.: Penzance and near St. Breock, Cornwall; Herefordshire Beacon, Malvern, Worcestershire; Borthwynog, near Dolgelly and Rhewgreidden, Merionethshire; Bettws-y-Coed, Denbighshire; Haughmond Hill and Stiperstones, Shropshire; near Ayton, Yorkshire; Stavelly, Kendal, Westmorland. New Galloway, Kirkcudbrightshire; Glen Lochay and Blair Athole, Perthshire; Glen Shee, Forfarshire; Portlathen and Durris, Kincardineshire; Hill of Ardo, near Aberdeen, and Castleton of Braemar, Aberdeenshire; near Abernethy, Elgin. Near Cork; Dawros River, Connemara, co. Galway.

Var. β . *lætevirens* Nyl. Bull. Soc. Linn. Normand. vi. 1872, p. 272.—Thallus orbicular or effuse, greenish-olive or greenish-brown, more or less covered with concolorous isidia (medulla $\text{CaCl} + \text{red}$). Apothecia and spores as in the type.—Cromb. Grevillea, x. p. 26.—*Imbricaria olivacea* γ . *lætevirens* Flot. Lich. Sil. (1829) n. 90. *Parmelia fuliginosa* f. *olivacea* Leight. Lich. Fl. ed. 3, p. 123. *Parmelia Borreri* f. *olivacea* Leight. Lich. Fl. ed. 2, p. 479.

Though differing in the colour of the thallus and of the isidia, the reaction of the medulla shows that this is only a variety of *P. fuliginosa*. States occur in which there is scarcely any trace of isidia (form *denudata* Cromb., probably referable to sub-sp. *glabrata* Lamy, as in Grevillea, xv. p. 75). In herbaria specimens the isidia often become abraded, rendering the thallus white-punctate. The apothecia are not uncommon, but the spermogones are rarely seen.

Hab. On old trees and pales, rarely on walls, in maritime and upland districts.—*Distr.* Local and scarce in E. and N. England, N. Wales, the Highlands, Scotland, and N.W. Ireland.—B. M.: Hopton, Suffolk; Bettws-y-Coed, Denbighshire; near Dolgelly and Rhewgredden, Merionethshire; Devil's Bridge, Cardiganshire; Kendal and Levens Park, Westmoreland; Keswick, Cumberland. Appin and head of Loch Awea, Argyshire; Loch Ard and Glen Lochay, Perthshire; Durris, Kincardineshire; Morone, Braemar, Aberdeenshire. Derryclare and near Kylemore, co. Galway.

26. *P. stygia* Ach. Meth. (1803) p. 203.—Thallus orbicular, appressed, somewhat shining, smooth, imbricate, olive-brown or blackish; beneath pitch-black, paler at the margins, with but few rhizine; laciniae sublinear, palmato-multifid, convex, incurved at the apices (K^- , CaCl^-). Apothecia moderate or somewhat large, subconcolorous, the margin granulato-crenate; spores 0.008–10 mm. long, 0.006–7 mm. thick.—Gray, Nat. Arr. i. p. 441; Hook. Fl. Scot. ii. p. 54; Sm. Eng. Fl. v. p. 202; Mudd, Man. p. 100; Cromb. Lich. Brit. p. 35; Leight. Lich. Fl. p. 124, ed. 3, p. 116.—*Lichen stygius* Linn. Sp. Pl. (1753) p. 1143; Dicks. Crypt. fasc. iii. p. 16; With. Arr. ed. 3, iv. p. 30; Eng. Bot. t. 2048.—*Brit. Eas.*: Dicks. Hort. Sic. n. 25 pro parte.

Somewhat resembles *Platysma Fahlunense*, but distinguished by the form of the laciniae, the character of the spermogones, and the absence of medullary reaction with K. It is generally fertile, though the apothecia are rather scattered and not numerous. The spermogones, which are frequent, are immersed, with spermatia 0.005 mm. long, 0.001 mm. thick, constricted in the middle and somewhat obtuse at the apices.

Hab. On rocks and boulders, granitic and quartz-se, in subalpine and alpine regions.—*Distr.* Local and rare, being confined to a few of the higher Grampians, Scotland.—B. M.: Ben More, Perthshire; Lechnagar, Ben-naboard and Ben Macdhuil, Braemar, Aberdeenshire; Ben Nevis, Inverness-shire.

27. *P. alpicola* Fr. fil. Nov. Ac. Reg. Soc. Sc. Upsal. (1861) p. 157.—Thallus orbicular or expanded, somewhat appressed and adnate, subopaque, blackish-olive or dark-grey; beneath very black,

with few rhizine; laciniae narrow, convex, rugoso-plicate, imbricate and complicate, incurved at the apices ($K f_{-}^{+yellowish}$, $CaCl_{-}$). Apothecia small, concave, or at length slightly convex, blackish, the margin entire; spores subglobose or ellipsoid, 0,007–12 mm. long, 0,005–9 mm. thick.—Cromb. Journ. Bot. 1872, p. 357; Leight. Lich. Fl. ed. 3, p. 118.—*Parmelia discreta* Nyl., Cromb. Lich. Brit. p. 36. *Parmelia physodes* var. *discreta* Leight. Lich. Fl. p. 127. *Parmelia stygia* var. *minor* Nyl. ex Carroll, Journ. Bot. 1865, p. 288; Cromb. Lich. Brit. p. 35. *Parmelia encausta* var. *stygioides* Linds. Trans. Roy. Soc. Edin. xxii. p. 224; Mudd, Man. p. 99. *Lichen encaustus* Eng. Bot. t. 2049.—As pointed out in Grevillea, vii. p. 98, this ought rather to be called *P. atrofusca* (Schaer.).—*Brit. Exs.*: Cromb. n. 32; Dicks. Hort. Sic. n. 25 pro parte.

Looks intermediate between *P. stygia* and *P. encausta*, being sometimes confounded with the latter. The presence of rhizine very rarely on the under surface in very young plants shows that it belongs to this Subsection. The thallus varies in colour from nearly pitch-black to dark-grey, the laciniae being often torulose. It is generally fertile, the apothecia being scattered and at length somewhat large. The spermogones are black, minute, with spermatia 0,007 mm. long, about 0,001 mm. thick.

Hab. On granitic and quartzose boulders in alpine places.—*Distr.* Local and scarce on the Grampians, Scotland; very rare in N.W. Ireland.—B. M.: Ben More and Cairn Gowar, Perthshire; Clova Mts., Forfarshire; Cairn Drochit, Morrone and Ben-naboord, Braemar, Aberdeenshire; Ben Nevis, Inverness-shire. Co. Mayo.

28. *P. lanata* Wallr. Fl. Germ. iii. (1831) p. 529.—Thallus expanded, decumbent, loosely appressed, setaceo-filiform, dichotomously and intricately branched, olive-brown or brownish-black, somewhat shining; beneath paler, with minute rhizine; branches unequal, rounded, slender, flexuose, furcate at the apices (K_{-} , $CaCl_{-}$). Apothecia lateral or subterminal, nearly moderate, plane or convex, concolorous, the margin subentire or granulato-unequal; spores 0,007–11 mm. long, 0,006–8 mm. thick.—Mudd, Man. p. 101; Cromb. Lich. Brit. p. 35; Leight. Lich. Fl. p. 124.—*Alectoria lanata* Leight. Lich. Fl. ed. 3, p. 80. *Cornicularia lanata* Gray, Nat. Arr. i. p. 405; Hook. Fl. Scot. ii. p. 69; Sm. Eng. Fl. v. p. 233; Tayl. in Mack. Fl. Hib. ii. p. 87. *Lichen lanatus*, Linn. Sp. Pl. (1753) p. 1153; Eng. Bot. t. 846 (middle fig.). *Usnea caespitosa cecilis*, *capillacea atra* Dill. Musc. 66, t. 13. f. 9.—As already observed the *Lichen lanatus* of our older writers is *Alectoria bicolor*.

A species entirely Alectorioid in habit, so that it might be referred to *Alectoria*. The presence, however, of rhizine on the under surface of the thallus, the crenulato-undulate margin of the apothecia, and the distinctly Parmelioid character of var. β show that it belongs to this genus. The thallus is often suberect, and in favourable situations spreads extensively. The apothecia are rare, but the spermogones are frequent and sometimes so abundant as to render the thalline filaments torulose or noduloso-unequal. They are immersed, with sterigmata

usually almost simple and spermatia 0.006-7 mm. long, 0.001 mm. thick, slightly subacuate at the apices.

Hab. On rocks and boulders, very rarely on gravelly soil, in subalpine and alpine localities.—*Distr.* Local and scarce in S.W. and N. England and in N. Wales; more frequent on the Grampians, Scotland; rarer in W. Ireland.—B. M.: Dartmoor Tors, Devonshire; Cader Idris, Merionethshire; Snowdon, N. Wales; Teesdale, Durham. New Galloway, Kirkcudbrightshire; Ben More, Mael Girdy, and Ben Lawers, Perthshire; Clova Mts. and Katelaw, Forfarshire; Loch Phadrig, Lochmagar, Morronone, Cairngorm, and Ben-naboord (frt.), Braemar; Ben Nevis, Inverness-shire; Hills of Applecross, Ross-shire. Mangerton, Killarney, and MacGillicuddy's Reeks, co. Kerry; Doughbruagh Mts., Connemara, co. Galway.

Var. β . *reticulata* Cromb. Grevillea, xii. (1884) p. 72.—Thallus orbicular or suborbicular, closely appressed, black or blackish, opaque; branches short, slender, very much entangled, subimbricate, dichotomously reticulate, shortly furcate at the apices. Apothecia concolorous, with the margin often ciliate.—*Lichen reticulatus* Wulf. in Jacq. Coll. ii. (1788) t. 9. ff. 6, 7. *Alectoria lanata* var. *parmelioides* Cromb. Journ. Bot. 1872, p. 233; Leight. Lich. Fl. ed. 3, p. 81 (incl. var. *subciliata*). *Parmelia lanata* var. *subciliata* Nyl., Cromb. Lich. Brit. p. 35; Leight. Lich. Fl. p. 125. *Lichen pubescens* Huds. Fl. Angl. ed. 2, p. 132; Lightf. Fl. Scot. ii. p. 893; With. Arr. ed. 3, iv. p. 48. *Coralloides tenuissimum nigrescens, mundi muliebris instar textum* Dill. Musc. 113, t. 17. f. 32.—*Brit. Exs.*: Cromb. n. 20.

A well-marked variety, which in its normal condition with its parmelioïd habit looks like a distinct species. Transition states, however, exist, and old plants gradually assume more of the characters of the type. The thallus, which is aptly compared by Dillenius to "black lace," occasionally becomes centrifugal. It is not uncommon in a fertile condition, the apothecia being usually numerous, with the margin often ciliate with spinuliform papillæ.

Hab. On quartzose rocks and boulders in alpine localities.—*Distr.* Confined to some of the higher Grampians, Scotland, where it is plentiful.—B. M.: Ben Lawers, Perthshire; Clova Mts., Forfarshire; Morronone, Glen Callater, Cairngorm, and Glen Candlic, Braemar, Aberdeenshire.

29. **P. tristis** Nyl. Act. Soc. Linn. Bord. sér. 3, i. (1856) p. 304; Flora, 1872, p. 548.—Thallus cæspitose-fruticulose, cartilaginous, erect, rigid, somewhat roundly compressed, sparingly distichously branched, pitch- or brownish-black; branches subfastigiate, attenuate (K^- , $CaCl^-$). Apothecia plano-convex, moderate, subconcolorous, the margin entire or fimbriate; spores 0.008-11 mm. long, 0.004-6 mm. thick.—Cromb. Grevillea, xii. p. 71.—*Platysma triste* Cromb. Lich. Brit. p. 26; Leight. Lich. Fl. p. 99, ed. 3, p. 94. *Cornicularia tristis* Gray, Nat. Arr. i. p. 404; Hook. Fl. Scot. ii. p. 69; Sm. Eng. Fl. v. p. 228; Tayl. in Mack. Fl. Hib. ii. p. 86; Mudd, Man. p. 76. *Lichen tristis* Web. Spicil. (1788) p. 209; With. Arr. ed. 3, iv. p. 43; Eng. Bot. t. 720. *Lichen radiatus* Huds. Fl. Angl. ed. 2, p. 559. *Lichen corniculatus* Lightf. Fl. Scot.

ii. p. 383. *Coralloides corniculatum, fuci tenuioris facie* Dill. Musc. p. 118, t. 17. f. 37.

Somewhat resembles a small *Fucus*, and has been placed by authors in different genera, though by some regarded as a proper genus. The typically depressed or subdepressed thallus, as observed by Nylander *l. c.*, and the nature of the spermatogones, induce us to refer it to *Parmelia*, near *P. lanata*, to which in various respects it has a marked affinity. The thallus is closely and umbilicately affixed to the substratum, over which it occasionally spreads in large patches, though usually it occurs in small and scattered tufts. The apothecia, which are common, are subterminal on short deflexed ramules; the spermatogones are numerous, prominent, with spermatia 0,005 mm. long, 0,001 mm. thick.

Hab. On rocks and boulders in mountainous districts.—*Distr.* Local in W. and N. England and in Wales; more frequent in the Highlands, Scotland, especially on the N. Gramians; rare in S.W. Ireland.—B. M.: Dartmoor, Devonshire: Malvern Hills, Worcestershire; Sugar Loaf Mt., Monmouthshire: The Glydrys, Snowdon, and Moel Siabod, Carnarvonshire; Cader Idris, Merionethshire: Eglestone, Durham; Crickley Scar, Yorkshire: Mardale, Westmoreland: The Cheviots, Northumberland: Ennerdale, Cumberland. New Galloway, Kirkcudbrightshire: Ben More. Ben Lawers, and Ben Vrackie, Perthshire: Clova Mts., head of the White Water, and Katelaw, Forfarshire: Hill of Ardo, near Aberdeen: near Invercauld, Craig Coinnoch, Morrone, Glen Callater, Glen Dee, and Ben-naboord, Braemar; Ben Nevis, Inverness-shire. Dunkerron, co. Kerry.

B. ERHIZINOSÆ.—Thallus glabrous beneath (subgenus
Hypogymnia Nyl. Flora, 1881, p. 537).

30. *P. physodes* Ach. Meth. (1803) p. 250.—Thallus moderate or somewhat large, substellate, loosely adnate, smooth, imbricatolaciniate, glaucous-white; beneath brownish-black, paler at the circumference, rugose, naked: laciniae multifid, linear, sinuate, somewhat plane, the apices subinflated, imperforate (K^{+} yellow, $CaCl^{-}$ medulla K ($CaCl$) + red). Apothecia subpedicellate, moderate, badiorreddish, the margin entire; spores 0,006–8 mm. long, 0,005–6 mm. thick.—Hook. Fl. Scot. ii. p. 56; Sm. Eng. Fl. v. p. 204; Mudd, Man. p. 96; Cromb. Lich. Brit. p. 36; Leight. Lich. Fl. p. 125, ed. 3, p. 116.—*Physcia physodes* Gray, Nat. Arr. i. p. 436. *Lichen physodes* Linn. Sp. Pl. (1753) p. 1144; Huds. Fl. Angl. p. 447; Lightf. Fl. Scot. ii. p. 882; With. Arr. ed. 3, iv. p. 32; Eng. Bot. t. 126 (middle fig. pro parte). *Lichenoides ceratophyllum obtusius et minus ramosum* Dill. Musc. p. 154, t. 20. f. 49 A, B; in Ray, Syn. ed. 3, p. 76, n. 85.—*Brit. Ecs.*: Leight. n. 48 pro parte; Cromb. n. 31.

Readily recognized by the naked under surface and the more or less inflated apices of the laciniae. The thallus is normally orbicular, but at length becomes expanded, varying considerably in the character of the laciniae, and thus presenting several forms and varieties. The apothecia are not frequent in Britain; they are urceolate, and small when young, at length large, plane and flexuose. The spermatogones are very

abundant and crowded in otherwise sterile specimens, and are minute, black, punctiform, with spermatia 0,006-7 mm. long, about 0,001 mm. thick.

Hab. On trees and old walls in maritime and upland districts.—*Distr.* Not general nor common throughout Great Britain; probably occurs in Ireland; fertile chiefly in the Grampians, Scotland.—B. M.: Hay Tor, Dartmoor, Devonshire; Gopsall Park, Leicestershire; Black Edge, Buxton, and Cromford Moor, near Matlock, Derbyshire; Lickey Hills, Worcestershire; Wrekin Hill, Shropshire; Stormy Down, Glamorganshire; Nannau, near Dolgelly, Cwm Bychan, Garth, near Barnmouth, Merionethshire; Island of Anglesea; Gateshead Fell, Durham; near Kendal, Westmoreland. Near Inverary, Argyleshire; Crianlarich, Killin, Ben Lawers, and Moncrieffe Hill, Perthshire; Hill of Ardo, near Aberdeen; Castleton, Morrone, and Glen Derry, Braemar; Rothiemurchus Woods, Invernessshire; Unst, Shetland.

Form 1. *labrosa* Ach. Lich. Univ. (1810) p. 493.—Laciniae with the apices ascending, somewhat dilated, recurved and sorediate.—Cromb. Lich. Brit. p. 36 pro parte.—*Parmelia physodes* f. *recurva* Leight. Lich. Fl. p. 126, ed. 3, p. 117. *Parmelia physodes* Tayl. in Mack. Fl. Hib. ii. p. 149. *Lichen physodes* Eng. Bot. t. 126 (upper fig.). *Lichenoides ceratophyllum obtusius et minus ramosum* Dill. Musc. p. 154, t. 20, f. 49 c.—*Brit. Ess.*: Leight. n. 48 pro parte, n. 389; Mudd, n. 70; Cromb. n. 144; Lerb. Lich. Hb. n. 290; Bohl. n. 13.

Differs only in the recurved and sorediate apices of the laciniae. As noticed by Acharius *l. c.* these, in consequence of being ruptured beneath, dilated and inflated, present a pulverulent and verrucose small lip. It is a mere condition, depending on age or nature of habitat, and not a variety; indeed it is difficult to find old specimens of the normal type of the species in which some of the laciniae have not these characters, so that Acharius subsequently (Syn. p. 218) with propriety regarded it as a mere state. The apothecia are for the most part plentiful, becoming large in old age.

Hab. On trees, old pales, rocks and walls, in maritime and upland districts.—*Distr.* General and common in most parts of Great Britain, probably also of Ireland; rare in the Channel Islands; fruiting freely in the Highlands, Scotland.—B. M.: Quenvais, Island of Jersey; Island of Guernsey. Walthamstow and Epping Forest, Essex; Millhill, Middlesex; Ardingley Rocks, Sussex; New Forest, Hampshire; Withiel and Penzance, Cornwall; Sandy, Bedfordshire; near Cambridge: Charnwood Forest and Gopsall, Leicestershire; Church Stretton, Wrekin Hill, and Stiperstones, Shropshire; Cwm Bychan, Cader Idris, and near Dolgelly, Merionethshire; Lonsdale, Cleveland, Yorkshire; Windermere, Westmoreland; Ennerdale, Cumberland. Dalry, Kirkcudbrightshire; near Glasgow; Swanston Wood, Edinburgh; Killin and Ben Lawers, Perthshire; Deerhill Wood, Forfarshire; Portlethen, Kincardineshire; Countesswells Woods, near Aberdeen; Invercauld, Morrone, and Glen Candlic, Braemar, Aberdeenshire; Rothiemurchus Woods and Glen Morriston, Invernessshire; Forres, Elgin; Lairg, Sutherlandshire. Near Cork; Dunkerron, co. Kerry.

Form 2. *tubulosa* Mudd, Man. (1861) p. 97.—Laciniae lax, ascending, tubulose, turgid and sorediate at the apices. Apothecia very rare.—*Parmelia ceratophylla* *c. tubulosa* Schær. Enum. (1850)

p. 42. *Parmelia physodes* var. *labrosa* Cromb. Lich. Brit. p. 36 pro parte; Leight. Lich. Fl. p. 126, ed. 3, p. 117. *Lichen physodes* Eng. Bot. t. 126 (lower fig.).—*Brit. Ess.*: Mudd, n. 70 pro parte; Leight. n. 48 pro parte.

A more distinct form than the preceding, with which it has sometimes been confounded. It is readily recognized by the thallus, and by the soredia being protuberant on the apices of the laciniae. In this country, as elsewhere, it seems to occur chiefly in a sterile condition.

Hab. On trees and stone walls in maritime and upland situations.—*Distr.* Not very general nor common in Great Britain; not seen from Ireland.—B. M.: Lustleigh Cleeve, Devonshire; near Penzance and Withiel, Cornwall; Malvern Hills, Worcestershire; Sweeny, Shropshire; near Monmouth: Rhewgreidden, Merionethshire; Bettws-y-Coed, Denbighshire; Beddgelert, Carnarvonshire; Cleveland, Yorkshire; near Kendal, Westmoreland; Asby, Cumberland (fruit). New Galloway, Kirkcudbrightshire; Ben Lawers, Killin (fruit), and Abernethy, Perthshire; Duris, Kincardineshire; Park, near Aberdeen; Rothiemurchus Woods, Inverness-shire.

Var. β . *platyphylla* Ach. Meth. (1803) p. 251.—Laciniae rather broad, subconcrete, rugoso-plicate, roundly lobed and inciso-crenate at the circumference. Apothecia very rare.—Leight. Lich. Fl. p. 126, ed. 3, p. 117.—*Brit. Ess.*: Larb. Lich. Hb. n. 329.

Usually smaller, though thicker than in the type. In the centre it is rugose plicate and scarcely laciniate, the laciniae being more distinct and depressed at the circumference. Occasionally it is more or less sorediate at the apices of the laciniae. As observed by Acharius *l. c.*, the whole thallus has a monophyllous appearance; but transition forms are not wanting. It is very rarely fertile, the spermogones, however, being not infrequent.

Hab. On old pales and stone walls in maritime and upland districts.—*Distr.* Seen from several localities in Great Britain, Ireland, and the Channel Islands.—B. M.: Boulay Bay, Island of Jersey. Lydd, Kent; New Forest, Hampshire; Brading, Isle of Wight; near Cirencester, Gloucestershire; Gopsall Park, Leicestershire; Harboro' Magna, Warwickshire; Aberdovey and near Barmouth, Merionethshire. Killin, Craig Tulloch, Ben Lawers (fruit), and Aberfeldy, Perthshire; Guthrie, Forfarshire; near Nigg, Kincardineshire; Park, near Aberdeen; Rothiemurchus, Inverness-shire. Near Cork.

Form *fuscescens* Cromb. Grevillea, xv. (1887) p. 75.—Thallus rather smaller, opaque, esorediate, brownish; otherwise as above.—*Parmelia physodes* var. *obscurata* Cromb. Journ. Bot. 1876, p. 360; Leight. Lich. Fl. ed. 3, p. 118.—According to Nylander, Flora, 1881, p. 537, var. *obscurata* Ach. is *P. austerodes* Nyl., a subspecies of *P. vittata*.

Evidently referable as a form to var. *platyphylla*, with which, except in being somewhat smaller, constantly esorediate, and especially in the colour of the thallus (owing probably to being suffused with salt-water), it in other respects agrees. In the few specimens gathered neither apothecia nor spermogones are visible.

Hab. On old pales in maritime districts.—*Distr.* Local in S.E. England and N.E. Scotland.—B. M.: Lydd, Kent. Near Cove, Kincardineshire.

31. *P. vittata* Nyl. Flora, 1875, p. 106.—Thallus somewhat expanded, linear-laciniate, loosely adnate, smooth, greyish-glaucous; beneath naked, black; laciniae elongate, divaricately divided, somewhat plane, dark-brown or blackish at the margins (K_{+}^{yellow} , $CaCl_{-}$). Apothecia pedicellate, large, badio-reddish, the margin thin, entire or inflexed; spores 0,004–6 mm. long, 0,0035–45 mm. thick.—Cromb. Grevillea, xv. p. 76.—*Parmelia physodes* β . *vittata* Ach. Meth. (1803) p. 251; Mudd, Man. p. 96 pro parte; Cromb. Lich. Brit. p. 36 pro parte; Leight. Lich. Fl. p. 126 pro parte, ed. 3, p. 117 pro parte.

Formerly regarded by authors as a variety of *P. physodes*, but now separated by Nylander on account of the smaller spores and shorter spermatia. The thallus does not apparently become sorediiferous at the apices of the laciniae, and in our specimens is of a glaucous-brown colour. Neither apothecia nor spermogones occur in Britain. These latter organs have the spermatia 0,0045 mm. long, 0,0006 mm. thick.

Hab. On the ground in alpine places.—*Distr.* Found only on one of the higher N. Grampians, Scotland.—B. M.: Cairntoul, Braemar, Aberdeenshire.

32. *P. encausta* Ach. Meth. (1803) p. 202.—Thallus suborbicular, appressed, corrugate, narrowly laciniate, unequal, greyish-white or greyish-glaucous; beneath black, naked; laciniae crowded, multifid, complicate, convex or somewhat rounded, only slightly inflated at the apices (K_{+}^{yellow} , $CaCl_{-}$). Apothecia adnate, moderate or small, badio-reddish, the margin crenulate or subentire; spores 0,007–10 mm. long, 0,005–7 mm. thick.—Gray, Nat. Arr. i. p. 441; Hook. Fl. Scot. ii. p. 54; Sm. Eng. Fl. v. p. 203; Mudd, Man. p. 97; Cromb. Lich. Brit. p. 36.—*Parmelia physodes* var. *encausta* Leight. Lich. Fl. p. 127, ed. 3, p. 117. *Lichen encaustus* Sm. Trans. Linn. Soc. i. (1791) p. 83.

Sometimes regarded as an alpine var. of *P. physodes*; but in the absence of any well-marked intermediate states it may be considered distinct. In regions where the plant is common, the thallus varies considerably in colour and in the character of the laciniae, but the very few British specimens are sufficiently typical. The apothecia are more or less scattered, at first concave, then plane, and in old plants flexuose. The spermogones are frequent, minute, black, with spermatia 0,007 mm. long, about 0,001 mm. thick.

Hab. On granitic boulders in alpine places.—*Distr.* Found on one of the higher N. Grampians, Scotland.—B. M.: Cairntoul, Braemar, Aberdeenshire.

33. *P. pertusa* Schaer. Spic. (1840) p. 457.—Thallus orbicular, plano-appressed, glabrous, sinuato-laciniate, glaucous-white; beneath black, rugose, naked; laciniae multifid, convex, minutely perforate, dilated and crenato-incised at the apices (K_{+}^{yellow} , $CaCl_{-}$). Apothecia central, small, reddish-brown, the margin entire, inflexed; spores 2–4 μ , 0,0045–60 mm. long, 0,022–28 mm. thick.—Cromb. Lich. Brit. p. 36; Leight. Lich. Fl. p. 129, ed. 3, p. 120.—*Lichen pertusus* Schrank, Fl. Bavar. ii. (1789)

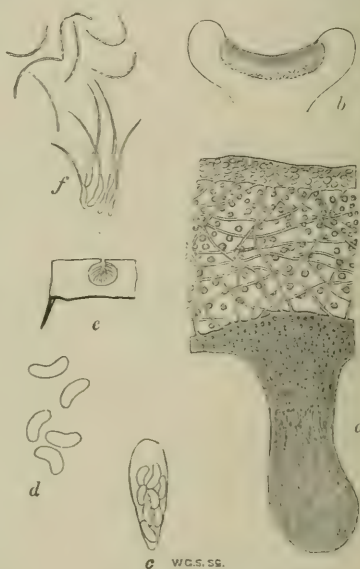
n. 1513. *Parmelia terebrata* (Hoffm.), Mudd, Man. p. 97. *Parmelia diatrypa* Hook. Fl. Scot. ii. p. 56; Sm. Eng. Fl. v. p. 204; Tayl. in Mack. Fl. Hib. ii. p. 150. *Physcia diatrypa* Gray, Nat. Arr. i. p. 436. *Lichen diatrypus* Sm. Eng. Bot. t. 1248.—*Brit. Exs.*: Leight. n. 264; Larb. Cæsar. n. 66; Crompt. n. 145.

In general appearance like small states of *P. physodes*, from which, apart from the chemical reaction of the medulla and the number of the spores, the peculiar perforations in the laciniae at once distinguish it. The thallus is usually sprinkled with round whitish soredia (form *sorediobola* Nyl.). In this country it has not occurred fertile. The spermatogones, which are very seldom present in our specimens, are as in *P. physodes*.

Hab. On rocks among mosses and on the trunks of trees in maritime and upland districts.—*Distr.* Local in the Channel Islands, S.W. England, N. Wales, S. Scotland and the W. Highlands, in S.W. and N. Ireland.—B. M.: Bonne Nuit, Island of Jersey. New Forest, Hants; Bolt Head and Valley of Rocks, Lynton, Devonshire; near Penzance and Tregawn, Cornwall; Barmouth and Dolgelly, Merionethshire; foot of Snowden, Carnarvonshire. New Galloway, Kirkcudbrightshire; Bal-lachulish, Argyshire. Pass of Keim-an-Eigh, co. Cork; Glenmore Lake and Dunkerron, co. Kerry; Connemara, co. Galway; Cushendun, co. Antrim.

43. PARMELIOPSIS Nyl. Lich. Scand. (1861) p. 105 (ut sectio *Parmeliæ*); Not. Sällsk. pro F. et Fl. Fenn. Förh. n. ser. v. (1866) p. 121.—Thallus small, thin, appressed, stellate; beneath sparingly fibrillose-rhizomose. Apothecia small, parmeloid; paraphyses not discrete; spores 8næ, simple, more or less ellipsoid, colourless; hymenial gelatine bluish with iodine. Spermatogones scattered, at length slightly prominent; sterigmata short, simple; spermatia long, acicular, arcuate.

A small genus separated from *Parmelia* on account of its spermatia, which are like those of *Squamaria* in the *Lecanorei*, but the thallus shows that it belongs to this tribe. Two of its three European species occur sparingly in Great Britain.



c. W.C.S. 55.

Fig. 45.

Parmeliopsis ambigua Nyl.—a. Vertical section of a young portion of thallus, with a rhizina beneath, $\times 200$. b. Vertical section of an apothecium, $\times 30$. c. A theca, $\times 350$. d. Spores, $\times 500$. e. Vertical section of thallus with a spermatogone (on the left beneath, a rhizina), $\times 30$. f. Sterigmata and spermatia, $\times 500$.

1. *P. ambigua* Nyl. Not. Sällsk. pro F. et Fl. F. Förh. n. ser. v. (1866) p. 121.—Thallus stellato-orbicular, appressed, closely adnate, imbricato-laciniate, opaque, straw-coloured, sulphureo-sorediate; beneath brownish-black; laciniae somewhat narrow, plane, multifid (K_- , $CaCl_-$). Apothecia small, plane or slightly convex, the margin entire or obsoletely crenulate; spores oblong or ovoid-oblong, often somewhat curved, 0.007–11 mm. long, 0.0025–35 mm. thick.—Cromb. Lich. Brit. p. 37.—*Parmelia ambigua* Borr. Eng. Bot. Suppl. t. 2796 (two lower figs.); Hook. Fl. Scot. ii. p. 55; Sm. Eng. Fl. v. p. 37; Leight. Lich. Fl. p. 127, ed. 3, p. 118. *Lichen ambiguus* Wulf. in Jacq. Coll. iv. (1790) p. 239. *Parmelia diffusa* Mudd, Man. p. 103.—*Brit. Eas.*: Leight. n. 373; Mudd, n. 75; Cromb. n. 146.

The thallus is not unlike that of *Parmelia Mougeotii*, and is more or less sprinkled with soredia, which are normally convex and often confluent. In this country the apothecia are rare. The spermatogones, which are more frequent, are very minute, blackish, sparingly scattered, with spermatia 0.018–25 mm. long, 0.005 mm. thick.

Hab. About the roots of fir trees, and occasionally on old fir pales, in wooded, upland, and mountainous districts.—*Distr.* Local, though common where it occurs, in S., Central, W., and N. England, N. Wales, the Central Highlands, Scotland; not seen from Ireland.—B. M.: Ightham, Kent; Twycross and Gopsall Park, Leicestershire; near Oswestry, Shropshire; Cwm Bychan, Merionethshire; Ingleby Greenhow, Yorkshire. Killin, Perthshire; Kinnordy, Forfarshire; Mar Forest, Braemar, Aberdeenshire; Larig Grue, Banffshire; Rothiemurchus, Inverness-shire.

2. *P. aleurites* Nyl. Flora, 1872, p. 248.—Thallus stellato-orbicular, closely appressed and adherent, laciniato-lobed, greyish-white, whitish pulverulento-sorediate; beneath brownish-black, sparingly fibrillose; laciniae somewhat convex and rugoso-plicate in the centre, plane and linear at the circumference (K_+^{yellow} , $CaCl_-$). Apothecia small or nearly moderate, concave or somewhat plane, brownish- or reddish-spadiceous, shining, the margin slightly crenulate; spores oblong or fusiformi-oblong, usually somewhat curved, 0.011–12 mm. long, 0.003–4 mm. thick.—Cromb. Journ. Bot. 1872, p. 234.—*Lichen aleurites* Ach. Prodr. (1798) p. 117. *Parmelia ambigua* Borr. Eng. Bot. Suppl. t. 2796 (two upper figs.). *Parmelia hyperopta* Mudd, Man. p. 91; Leight. Lich. Fl. ed. 2, p. 478, ed. 3, p. 119.

Externally little different, except in colour, from the preceding. The thallus, which is sometimes dark-greyish, is sprinkled towards the centre with white, scattered, roundish soredia. In the very few British specimens there are only one or two small apothecia with subentire margin. The spermatogones, also rarely present, have the spermatia 0.0023–30 mm. long, 0.0005 mm. thick.

Hab. On the trunks of old firs near the roots and on old fir pales in mountainous districts.—*Distr.* Very local and scarce in the N. Grampians, Scotland.—B. M.: Glen Derry and Glen Dee, Braemar, Aberdeenshire; Larig Grue, Banffshire.

Tribe XIV. **STICTEI** Nyl. Syn. i. (1860) p. 332, ut subtribus *Parmelieorum*; Bull. Soc. Linn. Normand. sér. 2, ii. (1867) p. 498.

Thallus frondosely dilated, lobate or lobato-laciniate, loosely affixed to the substratum; the under surface usually with tomentose rhizinae, and also pulverulent or sorediiform cyphellæ (pseudo-cyphellæ), or true urecolate or thelotremoid cyphellæ; gonidial layer consisting either of gonimic granules or of true gonidia. Apothecia lecanoroid or parmeleine; spores 8næ, fusiform, usually 1- or 3-septate, generally colourless or sometimes pale-brownish; paraphyses discrete, usually more or less articulate, moderate, or thickish; hymenial gelatine (especially the apices of the thecæ) blue with iodine. Spermogones with jointed sterigmata.

The plants of this tribe are for the most part the largest and best developed of all lichens. With these "patricians of lichens," as they were termed by Drs. Taylor and Hooker (Hook. Journ. Bot. 1844, p. 635), the ascending series in Nylander's classification culminates. The thallus, which in its earlier stages of growth is orbicular, is usually widely expanded, of a coriaceo-membranaceous texture, and frequently, when wet, emits an odour as of hemp. In a few species peculiar cephalodia occur either on the upper surface, on the margins, or on the lower surface of the thallus (*vide* Nyl. Syn. l. c. p. 333). The great majority of species are found in warm climates or in the Southern hemisphere; most of the European

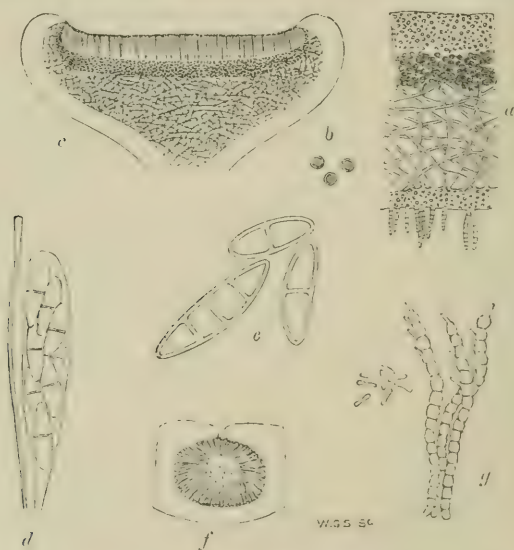


Fig. 46.

Lobaria pulmonaria Hoffm.—*a*. Vertical section of thallus, $\times 200$. *b*. Gonidia, $\times 350$. *c*. Vertical section of a small apothecium, $\times 30$. *d*. A theca and paraphysis, $\times 350$. *e*. Three spores, $\times 500$. *f*. Vertical section of a spermogone, $\times 30$. *g*. Jointed sterigmata and spermatia, $\times 500$.



Fig. 47.

Ricassolia amplissima Leight.—*a.* Vertical section of a young apothecium, $\times 30$. *b.* A theca and paraphysis, $\times 350$. *c.* Spores, $\times 500$. *d.* Vertical section of a spermatogone, $\times 30$. *e.* Jointed sterigmata and spermatia, $\times 500$.

species occur in the more humid tracts of our islands. The tribe has been divided by Nylander into the following 2 subtribes, comprising 5 genera, founded upon differences in the structure and character of the thallus, the presence or absence of cyphellæ, and the nature of the apothecia.

Subtribe I. *STICTINEI* Nyl. Flora, 1879, p. 360.

Thallus either cyphellate or eocyphellate beneath: gonidial layer consisting of gonimia arranged in pluri-locular nodules. Apothecia lecanoroid, rarely parmeleine.

Distinguished by the nature of the gonidial layer, which separates it as a very distinct subtribe. The plants are easily recognized by this layer presenting under the lens, or even to the naked eye, a bluish or leaden-bluish appearance.

44. *STICTINA* Nyl. Flora, 1860, p. 66, Syn. i. p. 333.—Thallus variously lobate or lacinate, often sorediiferous; beneath cyphellate or pseudocyphellate, with simple rhizinae (*rhizohyphæ* Nyl.); gonimia often 2-3 moniliform. Apothecia usually with septate spores. Spermatogones innate, not prominent, with spermatia somewhat short, obtusely and slightly thickened at either apex.

This has been divided into two subgenera, viz. *Eustictina* and *Parmostictina*, the former characterized by lecanorine and the latter by parmeleine apothecia. These characters would justify their being regarded as genera; but gonidia are protruded into the thalline margin of some species of *Sticta*, though their apothecia can scarcely be regarded as truly parmeleine (Nylander, Flora, 1875, p. 363). Of *Parmostictina*, represented by the exotic *Stictina hirsuta*, we have no species in our islands.

Subgenus EUSTICTINA Cromb. Grevillea, xv. (1887) p. 76.—Thallus beneath cyphellate or pseudo-cyphellate. Apothecia lecanoroid.

a. *Pseudocyphellatæ*.—Thallus with white or yellow pseudocyphellæ.

1. *S. intricata* Nyl. Var. β . *Thouarsii* Nyl. Syn. i. (1860) p. 335.—Thallus somewhat expanded, rigid, glabrous, sinuato-lobed, lurid-brown or pale-brown; beneath tomentose, blackish-brown, paler at the circumference, with white pseudocyphellæ; lobes short and broad, sprinkled on the surface, and especially on the margins, with simple, or verrucose, or coralloid cæcio-white soredia. Apothecia not seen rightly developed.—Leight. Lich. Fl. p. 114, ed. 3, p. 108.—*Sticta intricata* var. *Thouarsii* Mudd, Man. p. 90. *Stictina Thouarsii* Cromb. Lich. Brit. p. 31. *Sticta Thouarsii* Del. Stict. (1822) p. 90, t. 8. f. 29. *Sticta crocata* β . Tayl. in Mack. Fl. Hib. ii. p. 151.—*Brit. Exs.*: Cromb. n. 33.

Though appearing distinct, the relation of this plant to *S. intricata* (Del.) is so intimate as scarcely to warrant its separation. It is, however, distinguished from the type by its short and broader lobes, as also by the soredia with which it is often copiously sprinkled. With us young apothecia were once very sparingly met with, but no mature spores have occurred.

Hab. On mossy rocks and boulders, and the trunks of old trees in maritime and mountainous districts.—*Distr.* Local and rare in S.W. England, N. Wales, the S. and W. Grampians, Scotland, and S., W., and N. Ireland.—B. M.: Near Hay Tor, Dartmoor, Devonshire; near Dolgelly and Barmouth, Merionethshire. New Galloway, Kirkcudbrightshire; Inverary, head of Loch Awe, and Barcaldine, Argyreshire; Loch Tay, Perthshire; S. of Fort William, Inverness-shire. Cromaglow and Killarney Woods, co. Kerry; Glenarm, co. Antrim; Fenagh, co. Carlow; Maam, Turk Mts., co. Galway.

2. *S. crocata* Nyl. Syn. i. (1860) p. 338.—Thallus moderate, somewhat shining or nearly opaque, often reticulato-lacunose, broadly lobed, dark olive-green or lurid-brown; beneath brown or blackish tomentose, with moderate rhizinae and yellow pseudocyphellæ; lobes variously divided and crenate, serobiculato-unequal, citrino-sorediate. Apothecia scattered or nearly marginal, moderate, blackish, the margin crenate, at length nearly excluded; spores 1-septate, oblongo-fusiform, brown, 0.020–0.32 mm. long, 0.009–0.10 mm. thick.—Cromb. Lich. Brit. p. 31; Leight. Lich. Fl. p. 114, ed. 3, p. 108.—*Sticta crocata* Gray, Nat. Arr. i. p. 430; Hook. Fl. Scot. ii. p. 58; Sm. Eng. Fl. v. p. 205; Tayl. in Mack.

Fl. Hib. ii. p. 151; Mudd, Man. p. 89. *Lichen crocatus* Linn. Mant. (1771) p. 310; Dicks. Crypt. fasc. ii. p. 22; With. Arr. ed. 3, iv. p. 52; Eng. Bot. t. 2110.—*Brit. Exs.*: Cromb. n. 34; Dicks. Hort. Sic. n. 24.

The plant is sprinkled with scattered, citrine soredia, situated on the reticulations and on the margins, which contrast with its otherwise darkish colour. The medullary layer is either white or white-citrine. In this country neither apothecia nor spermogones occur.

Hab. Among mosses on trees and rocks in moist shady places, generally ravines, in subalpine tracts.—*Distr.* Extremely local in S.W. England and S. Scotland, more frequent in the W. Highlands; scarce in S.W. and N. Ireland.—B. M.: Walkham River and near Vixen Tor, Dartmoor, Devonshire; Carn Galva, near Penzance, Cornwall. Dalmahoy hill, near Edinburgh; Inverary, Glen Falloch, and head of Loch Awe, Argyleshire; ravine at foot of Ben More, and Aberfeldy, Perthshire; Glen Morriston, Inverness-shire. Pigeon Island in the river Kenmare, co. Kerry; Cushendall, co. Antrim.

b. Cyphellatæ.—Thallus with thelotremoid or urceolate cyphellæ.

3. *S. fuliginosa* Nyl. Syn. i. (1860) p. 347.—Thallus moderate or small, monophyllous, somewhat rigid, smoothish or unequal, nearly opaque, roundly lobed, cervine or greyish-brown; beneath tomentose, pale-brown, with whitish or pale cyphellæ; lobes generally broad and rounded, sprinkled with small brownish-black or black, coralloid isidia. Apothecia small, scattered, plane or slightly convex, reddish-brown, the margin at first piloso-ciliate; spores 1-3-septate, fusiform, colourless, 0.027-40 mm. long, 0.007-8 mm. thick.—Cromb. Lich. Brit. p. 30; Leight. Lich. Fl. p. 116, ed. 3, p. 109.—*Stictia fuliginosa* Gray, Nat. Arr. i. p. 430; Hook. Fl. Scot. ii. p. 59; Sm. Eng. Fl. v. p. 206; Tayl. in Mack. Fl. Hib. ii. p. 152; Mudd, Man. p. 88. *Lichen fuliginosus* Dicks. Crypt. fasc. i. (1785) p. 13; With. Arr. ed. 3, iv. p. 70; Eng. Bot. t. 1103. *Lichenoides fuliginosum et pulverulentum, scutellis rubiginosis* Dill. Musc. 198, t. 26. f. 100 A.—*Brit. Exs.*: Leight. n. 142; Larb. Cæsar. n. 61; Cromb. n. 133.

The thallus, which in the larger states expands from a centre, is with us generally smoothish, seldom rugose. It is often covered with the blackish efflorescent isidia, by which at once it may be distinguished from the allied species. The apothecia, which are rare in Great Britain, are at length somewhat biatorine.

Hab. On mossy trunks of old trees and on rocks in moist shady places, especially by waterfalls, in upland districts.—*Distr.* General and not uncommon, though almost confined to the Western part of Great Britain; apparently rare in W. Ireland and the Channel Islands.—B. M.: La Coupe, Island of Jersey; Jerbourg, Island of Guernsey. Lydd, Kent; Isle of Wight; Walkhampton and Ivy Bridge, near Lustleigh and Moreton, between Chudleigh and Ashburton, and at Beckey Falls, S. Devon; Bocoennoc, Launceston, Camelford, Withiel, and near Penzance, Cornwall; Annet Island, Scilly; Malvern, Worcestershire: Whitecliffe Rocks, near Ludlow, Shropshire; Hafod, Cardiganshire: Dolgelly and Aberdovey,

Merionethshire; Bettws-y-Coed and Trefriw, Denbighshire; near Bangor, Carnarvonshire; Island of Anglesea; Ambleside and near Rydal, Westmoreland; Keswick and Ennerdale, Cumberland. New Galloway, Kirkcudbrightshire; Falls of Clyde, Lanarkshire; Inverary, Appin, and head of Loch Awe, Argyleshire; Leny Falls near Caillander, Glen Lochay, and Glen Lyon, Perthshire; Craig Cluny, Braemar, Aberdeenshire; Applecross, Ross-shire. Killarney, co. Kerry; near Kylemore, co. Galway.

4. *S. limbata* Nyl. Syn. i. (1860) p. 346.—Thallus moderate or small, monophyllous, scarcely rigid, smooth or very slightly scrobiculato-unequal, somewhat or but little shining, roundly lobed, glaucous-lurid or pale cervine-brown; beneath pale, more or less tomentose with whitish cyphellæ; lobes broad and rounded, sprinkled on the surface with scattered cæcio-greyish soredia, and densely similarly sorediate towards the margins. Apothecia unknown.—Leight. Lich. Fl. p. 115, ed. 3, p. 108.—*Stictina fuliginosa* subsp. *limbata* Cromb. Lich. Brit. p. 30. *Sticta limbata* Gray, Nat. Arr. i. p. 431; Hook. Fl. Scot. ii. p. 59; Sm. Eng. Fl. v. p. 206; Tayl. in Mack. Fl. Hib. ii. p. 152; Mudd, Man. p. 88. *Lichen limbatus* Sm. in Eng. Bot. xvi. (1803) t. 1104. *Lichenoides fuliginosum et pulverulentum, scutellis rubiginosis* Dill. Musc. t. 26. f. 100 b, c.—*Brit. Eas.*: Larb. Cæsar. n. 15; Cromb. n. 35.

Distinguished from the preceding by the paler thallus, the absence of isidia, and the presence of greyish or sordidly cæsius soredia. The thallus is usually small, and is either strictly monophyllous or sublobate at the circumference. The fructification is not known; the parasite *Abrothallus Welwitschii*, sometimes found on the thallus, might be mistaken for apothecia.

Hab. On the mossy trunks of trees, and on shady rocks among mosses in wooded upland regions.—*Distr.* General and not uncommon, though chiefly in the Western portions of Great Britain and Ireland; rare in the Channel Islands.—B. M.: Rozel, Island of Jersey; Jerbourg, Island of Guernsey. Near Ryde, Isle of Wight; Lydd, Kent; Lyndhurst, New Forest, Hants; Shaugh, Ilsham Walk, Torquay, Dartmoor, and near Exeter, Devonshire; Boconnoc, Withiel, near the Tavy, and near Penzance, Cornwall; Hay Coppice, Herefordshire; Malvern, Worcestershire; Hafod, Cardiganshire; Dolgelly and Barmouth, Merionethshire; Bettws-y-Coed, Denbighshire; Capel Curig and near Bangor, Carnarvonshire; Island of Anglesea; near Stavelv, Kendal, Westmoreland; Teesdale, Durham; The Cheviots, Northumberland; Thornthwaite, Cumberland. New Galloway, Kirkcudbrightshire; Beld Craig, Moffat, Dumfriesshire; Falls of the Clyde, Lanarkshire; Turfin Hill, near Edinburgh; Inverary and Appin, Argyleshire; Loch Katrine, Pass of Leny, and Glen Lochay, Killin, Perthshire; Clova, Forfarshire; Craig Cluny, Braemar, Aberdeenshire; Glen Nevis, Inverness-shire; Island of Skye. Near Belfast, co. Antrim; Aghada, Cork Harbour, and Castlebernard Park, Bandon, co. Cork; Cromaglow, Killarney, and Old Dromore, co. Kerry.

5. *S. sylvatica* Nyl. Syn. i. (1860) p. 348.—Thallus large, rather rigid, subopaque, scrobiculato-unequal, laciniato-lobed, cervine or greyish-brown; beneath tomentose, brown or brownish, paler at the circumference, with pale cyphellæ; lobes variously divided, rounded, crenulate, above slightly furfuraceous, the divisions

obtuse at the apices. Apothecia small or moderate, scattered, plane or slightly convex, the margin naked; spores as in *S. fuliginosa*.—Cromb. Lich. Brit. p. 30; Leight. Lich. Fl. p. 116, ed. 3, p. 109. —*Sticta sylvatica* Gray, Nat. Arr. i. p. 432; Hook. Fl. Scot. ii. p. 59; Sm. Eng. Fl. v. p. 207; Tayl. in Mack. Fl. Hib. ii. p. 152; Mudd, Man. p. 87. *Lichen sylvaticus*, Huds. Fl. Angl. (1762) p. 453; Lightf. Fl. Scot. ii. p. 848; With. Nat. Arr. ed. 3, iv. p. 71; Eng. Bot. t. 2298. *Lichenoides polyschides villosus et scabrum, peltis parvis* Dill. Musc. 199, t. 27. f. 101.—*Brit. Exs.*: Leight. n. 109; Cromb. n. 134.

Also intimately allied to *S. fuliginosa*, from which it may be recognized by the more deeply divided thallus, the narrower lobes which are bifid or trifid towards the extremities, and the generally more naked or slightly furfuraceous upper surface. It is usually a larger plant, and spreads more extensively over the substratum. With us it is always sterile.

Hab. On mossy rocks, old walls, and about the roots of trees in shady places by lakes and rivers in upland districts.—*Distr.* Not very general, though usually plentiful, in the West of Great Britain and Ireland; abundant in the S.W. Highlands of Scotland.—*B. M.*: Lydford, Widdicombe, Meavy, Lustleigh Cleeve, and Bigbury, Devonshire; Bocomnoc and near Penzance, Cornwall; near Oswestry, Shropshire; Hafod, Cardiganshire, Dolgelly, Barmouth, and Rhewgreiddan, Merionethshire; Conway Falls, Carnarvonshire; Island of Anglesea; Eglestone, Durham; Mardale, Westmoreland; Keswick, Cumberland; The Cheviots, Northumberland. New Galloway, Kirkcudbrightshire; Beld Craig, Moffat, Dumfriesshire; Falls of the Clyde, Lanarkshire; Callender rock, near Stirling; Inverary, Appin, and Barcaldine, Argyshire; Falls of Leny, of Moness, and in Glen Lochay, Perthshire; Recky Linn, Forfarshire; Craig Cluny and Craig Coinnoch, Braemar, Aberdeenshire; S. of Fort William, and Rothiemurchus, Inverness-shire; Cawdor Woods, Nairn. Blackwater Bridge, co. Kerry; near Kylemore and Derryclare, Conmemara, co. Galway; near Carrickfergus, co. Antrim.

6. *S. Dufourei* Nyl. Bull. Soc. Linn. Normand. 2 sér. ii. (1867) p. 590.—Thallus small, thin, smooth, laciniato-lobed, glaucous or glaucous-brown; beneath slightly tomentose or nearly naked, pale-brown, often reticulately rugose, with whitish or pale cyphellæ; laciniæ minutely dissecto-fimbriate at the margins. Apothecia unknown.—Leight. Lich. Fl. p. 117, ed. 3, p. 110.—*Stictina sylvatica* subsp. *Dufourei* Cromb. Lich. Brit. p. 30. *Sticta Dufourei* Del. Stict. (1826) p. 78, t. 6. f. 22. *Sticta elegans* Deak. Mudd, Man. p. 89. *Sticta ciliata* Tayl. in Mack. Fl. Hib. ii. p. 152. *S. fimbriata* Tayl. Jour. Bot. 1847, p. 180.—*Brit. Exs.*: Leight. n. 173; Cromb. n. 135.

Looks intermediate between *S. fuliginosa* and *S. sylvatica*, and possesses some characters in common, but is distinguished from both by the characters given in the diagnosis. It is easily recognized by its fimbriate margins. It is met with in a less typical condition, with darker thallus and more entire margins. It has not been seen fertile.

Hab. On mossy rocks and trees in maritime and upland wooded tracts.—*Distr.* Local and rare in S.W. England, N. Wales, the W. Highlands of Scotland (less typical), and S.W. Ireland.—*B. M.*: Near Torquay, and at East Llyn, Devonshire; Pentire, near the Lizard, and Liskeard, Corn-

wall; Ty Gwyn, Dolgelly, Merionethshire. Tongland, Kirkcudbrightshire; Barcaldine, Lorne, Argyshire. Askew Wood and Hyde's Cottage, Killarney, co. Kerry.

45. **LOBARINA** Nyl. Flora 1877, p. 233.—Thallus broadly lobed, scrobiculose: beneath partly tomentose, gibbous, ecyphellate: gonidial layer consisting of gonimia. Apothecia lecanoroid, with 3-septate spores. Spermogones as in the preceding genus.

Formerly included under *Stictina*, but separated because the thallus is scrobiculose above, and destitute of ecyphellæ beneath. It consists of a single species common with us, as it is in most parts of Northern Europe.

1. **L. scrobiculata** Nyl. Flora 1877, p. 233.—Thallus dilated, rigid, subopaque or opaque, more or less reticulately scrobiculose, usually sprinkled with whitish or cæcio-white soredia, broadly lobed, glaucous-yellowish: beneath gibboso-unequal, tomentose, pale-brown, the gibbi naked, white: lobes rounded, undulate and more or less crenate at the margins. Apothecia small, scattered, red or brownish-red, the margin thick, entire, inflexed: spores fusiform, 3-7-septate, colourless, 0.050-80 mm. long, 0.006-7 mm. thick.—Cromb. Grevillea, xv. p. 76.—*Stictina scrobiculata* Nyl. in Cromb. Lich. Brit. p. 30; Leight. Lich. Fl. p. 117, ed. 3, p. 110. *Sticta scrobiculata* Gray, Nat. Arr. i. p. 430; Hook. Fl. Scot. ii. p. 59; Eng. Fl. p. 206; Tayl. in Mack. Fl. Hib. ii. p. 151; Mudd, Man. p. 87, t. 1. f. 26. *Lichen scrobiculatus*, Scop. Fl. Carn. (1772) p. 384; Lightf. Fl. Scot. ii. p. 850; With. Arr. ed. 3, iv. p. 59; Eng. Bot. t. 497. *Lichen verrucosus* Huds. Fl. Angl. ed. 2, p. 545. *Lichenoides pulmonum villosum, superficie scrobiculata et peltata* Dill. Musc. 216, t. 29. f. 114. *Lichenoides arboreum foliosum cinereum et sinuatum, inferne scabrum* Dill. in Ray Syn. ed. 3, p. 75, n. 77.—*Brit. Exs.*: Leight. n. 201; Mudd. n. 65; Lerb. Cæsar. n. 14, Lich. Hb. n. 325; Cromb. n. 36.

A well-marked species, not likely to be confounded with any other in the tribe. In young plants the thallus is orbicular, less scrobiculose and sorediate. The lobes are occasionally more or less white-sorediate at the margins. The naked gibbi of the underside of the thallus are due to the faveolæ of the upper surface; and the rhizinae which constitute the tomentum are brown, pale, or greyish. In this country it is rather rare in a fertile condition. More frequently the apothecia appear in an abortive state, constituting the host of *Celidium stictitarum*, Tul.

Hab. On the trunks of old trees and on moist shady rocks, chiefly near streams and lakes in maritime and upland districts.—*Distr.* General and common in most parts of Great Britain: plentiful in the W. Highlands, Scotland, apparently rare in S. and W. Ireland, and in the Channel Islands.—*B. M.*: La Coupe, Island of Jersey; Jerbourg, Island of Guernsey. Tunbridge Wells and Lydd, Kent; Hastings, Sussex; Quarn Wood, Ryde, Isle of Wight; New Forest, Hants; South Brent, Ivy Bridge, and Dewerstone Rock, Devonshire; Helminston, Liskeard, Tregawn, near the Tavy and Lamorna, Cornwall; Bryer Island, Scilly; Charnwood Forest, Leicestershire; Malvern, Worcestershire; Hay Cop-

pice, Leicestershire; Cader Idris, near Dolgelly, and Barmouth, Merionethshire; Trefriw and Bettws-y-Coed, Denbighshire; Island of Anglesea; Oggeray Gill, Cleveland, near Halifax and Castle Howard, Yorkshire; Toesdale, Durham; Mardale, Westmoreland; Keswick and Calder Abbey, Cumberland; Cheviots, Northumberland. New Galloway, Kirkeudbrightshire; Beld Craig, Moffat, Dumfriesshire; Turtin Hill, near Edinburgh; Bowling Bay, Dumbartonshire; near Inverary, head of Loch Awe, and Barcaldine, Argyleshire; Loch Katrine, Pass of Leny, Loch Conn, Glen Lochay, Finlarig, Killin, Perthshire; Reeky Linn, Forfarshire; Craig Coimnoch and Invercauld, Braemar, Aberdeenshire; Glen Nevis and S. of Fort William, Invernessshire; Hill of the Doon, Nairn, Morayshire. Castlebernard, co. Cork; Muckross, Killarney, co. Kerry; Kylemore and near Renvyle, Connemara, co. Galway.

Subtribe II. *EUSTICTEI* Nyl. Flora 1879, p. 360.

Thallus either cyphellate or ecyphellate beneath; gonidial layer consisting of gonidia or gonidimia. Apothecia lecanoroid or parmeleine.

Separated from *Stictinei* by the nature of the gonidial layer. In other respects the two are very similar, several of their species being distinguishable from each other only by the gonidia.

46. **LOBARIA** Hoffm. Deutsch. Fl. ii. (1795) p. 138 pro min. parte; Nyl. emend. Flora, 1877, p. 233.—Thallus laciniato-divided, scrobiculose; beneath partly rhizinoso-tomentose (with rhizohyphæ), gibberoso-unequal, ecyphellate; gonidial layer consisting of true gonidia, bright-green or yellowish-green. Apothecia lecanoroid, with 1-3-septate spores; spermogones as in the preceding genera.

This has the same relation to *Sticta* that *Lobarina* has to *Stictina*, and is similarly distinguished by the scrobiculose upper, and the ecyphellate lower surface of the thallus. It includes a very few species.

1. **L. pulmonaria** Hoffm. Deutsch. Fl. ii. (1795) p. 146; Cromb. Grevillea, xv. p. 76.—Thallus dilated, rigid, somewhat shining or subopaque, reticulato-foveolate, laciniato-lobed, often sorediiferous, sometimes isidiiferous, olive-green when moist, pale cervine or lurid-brown when dry; lobes sinuato-lobulate, retuso-truncate at the apices; beneath bullato-unequal or papular, whitish, between the papulae ochraceo-testaceous and rhizineo-tomentose. Apothecia moderate, submarginal, red, the margin often ruguloso-crenate, concolorous, at length excluded; spores 1-3-septate, 0.018-30 mm. long, 0.005-9 mm. thick.—*Sticta pulmonaria* Hook. Fl. Scot. ii. p. 58; Sm. Eng. Fl. v. p. 206; Tayl. in Mack. Fl. Hib. ii. p. 151; Cromb. Grevillea, iii. p. 82. *Lichen pulmonarius* Linn. Fl. Suec. (1755) p. 1087; Huds. Fl. Angl. p. 449; Lightf. Fl. Scot. ii. p. 831; With. Arr. ed. 3, iv. p. 54; Eng. Bot. t. 572. *Sticta pulmonacea* Ach. Gray, Nat. Arr. i. p. 430; Mudd, Man. p. 87, t. 1. f. 25; Cromb. Lich. Brit. p. 31; Leight. Lich. Fl. p. 118, ed. 3, p. 111. *Lichenoides pulmoneum reticulatum vulgare, marginibus peltiferis* Dill. Musc. 212, t. 29. f. 113. *Lichenoides peltatum arbo-*

reum maximum Dill. in Ray Syn. ed. 3, p. 76, n. 86.—*Brit. Exs.*: Leight. n. 74; Mudd, n. 64; Cromb. n. 37.

The familiar "Tree Lungwort," when fully developed, is one of the largest, as it is one of the most common, of the British species of this tribe. It varies considerably in the breadth and divisions of the lobes, old plants being much broader and less lacinate. The thallus, which hangs loosely from the trunks on which it grows, is more or less shining, especially in young plants, while the laciniae are often whitish sorediate and isidiate at the margins. Usually also seriately arranged soredia and occasionally isidia are present in the costae between the faveole. States in which the isidia are numerous and crowded form the variety *papillaris* Del. Stict. p. 144, t. 17. f. 63. With us it is comparatively rare in a fertile condition, though the apothecia are sometimes very numerous.

Hab. On the trunks of forest trees, especially old oaks, in mountainous regions, rarely on mossy rocks in maritime districts.—*Distr.* General and for the most part plentiful in the Channel Islands, the more Western tracts of Great Britain, and probably of Ireland: fruiting more freely in the S.W. Highlands of Scotland.—B. M.: Boulay Bay, Island of Jersey: Island of Guernsey. Near Loughton, Essex: near Lydd, Kent: Ryde and Appuldurcomb, Isle of Wight: New Forest, Hants: Lydford, Totnes, Buckfastleigh, and Ivy Bridge, Devonshire: Bococonoc, Pentire, St. Minver, and near Penzance, Cornwall: Bryer Island, Scilly: Chedworth Woods, near Cirencester, Gloucestershire: Bagley Wood, near Oxford: Charnwood Forest, Leicestershire: near Ludlow, Shropshire. Cader Idris, Rhewgreidden, Aberdovey, and Barmouth, Merionethshire: near Dolgelly, Bettws-y-Coed, Denbighshire: Conway and Devil's Bridge, Carnarvonshire: Beaumaris, Island of Anglesea: Kildale, Cleveland, Yorkshire: Erlestone and Teesdale, Durham: near Grassmore, Westmoreland: Cheviots, Northumberland: Patterdale and Cald'r Abbey, Cumberland. New Galloway, Kirkcudbrightshire: near Moffat, Dumfriesshire: Pentland Hills and Turfin Hill, near Edinburgh: Inverary, head of Loch Awe, Barcaldine, and Appin, Argyshire: The Trossachs, Loch Katrine, and Killin, Perthshire: Reeky Linn, Lundie Craigs, and Clova, Forfarshire: Dunottar Castle, Kincardineshire: Craig Cluny and Corriemulzie, Braemar, Aberdeenshire: S. of Fort William, Inverness-shire: Applecross, Ross-shire. Dinish and Ronayne's Island, Killarney, co. Kerry; Lough Inagh, co. Galway.

Var. *pleurocarpa* Ach. Lich. Univ. p. 450 (Cromb. Exs. n. 137), is a state in which the apothecia are abortive, tuberculoso-diform and brownish-black in consequence of being the host of *Celidium stictarum*, Tul. In the Museum herbarium there are specimens showing this condition from the following localities:—Bococonoc, Cornwall: Hafod, Cardigan-shire: Cwn Bychan, Merioneth. Appin and head of Loch Awe, Argyshire: The Trossachs, Perthshire; Cawdor Woods, Nairn.

Form 1. *hypomela* Cromb. Grevillea, xv. (1887) p. 76.—Thallus with the interstices of the under surface reticulate with black rhizinae. Apothecia with the thalline margin rugoso-crenulate.—*Sticta pulmonacea* var. *hypomela* Del. Stict. (1825) p. 144, t. 17. f. 64; Nyl. Syn. i. p. 352.—*Brit. Exs.*: Cromb. n. 136.

Approaches *L. retigera* (Ach.), an exotic species, in the character of the thallus beneath, which probably results from the habitat, the type itself at times having the rhizinae dark brown. With us it is seldom well fruited.

Hab. On the trunks of old trees and on mossy rocks in maritime and mountainous districts.—*Distr.* Seen only in a characteristic state from S.W. England, N. Wales, the S. and W. Grampians, Scotland.—B. M.: Bryer Island, Scilly, Cornwall; Bettws-y-Coed, Denbighshire. Inverary and Barcaldine, Argyleshire; Glen Lochay, Perthshire; by Loch Linnhe, Inverness-shire.

Form 2. *aggregata* Cromb. Grevillea, xv. (1877) p. 76.—Thallus with cephalodoid tubercles, either simple or small and aggregate, testaceous or somewhat dark.—*Sticta pulmonacea* var. *aggregata* Del. Stict. (1825) p. 123, t. 17. f. 62.

Differs from the state *pleurocarpa* in bearing, not apothecia, but peculiar tubercles, which are rarely present on the under surface of the thallus.

Hab. On the trunks of old oaks in wooded mountainous districts.—*Distr.* Found only in the S.W. Highlands, Scotland.—B. M.: Inverary, Argyleshire.

47. **STICTA** Schreb. in Linn. Gen. Pl. ed. 8, ii. (1791) p. 768; Nyl. Syn. i. (1860) p. 351; Flora, 1875, pp. 303, 363.—Thallus lobate or laciniate, often more or less sorediiferous, beneath with simple rhizineæ (*rhizohyphæ*), cyphellate or pseudocyphellate; gonidial layer consisting of gonidia. Apothecia lecanoroid or parmeleine, with variously septate spores. Spermogones as in the preceding genera.

Distinguished from *Lobaria* by the thallus being cyphellate beneath and not scrobiculose above. From the character of the apothecia it may, like *Stictina*, be divided into two subgenera, viz. *Eusticta* and *Parmosticta*, the former with lecanorine and the latter with parmeleine apothecia. Nearly all the species are exotic, but one seen nowhere else in Europe occurs in Great Britain.

Subgenus **EUSTICTA** Cromb. Grevillea, xv. (1887) p. 76.—Thallus beneath cyphellate or pseudocyphellate. Apothecia lecanoroid.

a. Cyphellatæ.—Thallus cyphellate beneath, the cyphellæ thelotremoid or urceolate.

1. **S. damæcornis** Nyl. form *latior* Cromb. Grevillea, xv. (1887) p. 76.—Thallus expanded, smooth, slightly shining, laciniate, pale brownish-red; beneath tomentose, dark brown, paler at the circumference; lobes somewhat broadly dilated, sinuate, dichotomous and retuso-truncate at the apices. Apothecia moderate, chiefly marginal, reddish-brown, the margin entire or obsoletely crenulate; spores fusiform, 1-3-septate, 0.026-36 mm. long, 0.008-11 mm. thick.—*Sticta damæcornis a. macrophylla* Mudd. Man. p. 89; Cromb. Lich. Brit. p. 32; Leight. Lich. Fl. p. 119, ed. 3, p. 112. *Sticta macrophylla* Hook. in Sm. Eng. Fl. v. p. 205; Tayl. in Mack. Fl. Hib. ii. p. 150; Borr. in Eng. Bot. Suppl. t. 2697.—The specific name *macrophylla*, having been previously given by Delise (1825) to an

exotic variety, cannot be retained for our British form.—*Brit. Ees.*: Cromb. n. 38.

Differs from the type chiefly in having the lobes more broadly dilated, and approaches var. *Canariensis* Ach. It is a very interesting British form of an exotic lichen, which has not been found elsewhere in Europe. In fertile specimens the apothecia are numerous, chiefly marginal, but sometimes also sparingly scattered.

Hab. On shady rocks in maritime and upland districts.—*Distr.* Very local, though somewhat plentiful in S.W. Ireland.—B. M.: Turk Cascade, Killarney Woods, Cromaglown, co. Kerry; near Bantry, co. Cork.

Subgenus *PARMOSTICTA* Nyl. Flora, 1875, pp. 303, 363.—Thallus beneath with pulverulent sorediiform pseudocyphellæ; apothecia truly parmeleine (with gonidia present throughout, even to the extreme margin of the receptacle).

2. *S. aurata* Ach. Meth. (1803) p. 277.—Thallus expanded, opaque, or but slightly shining, lobato-divided, reddish-brown or red; beneath shortly tomentose, brownish-black in the centre, brownish at the circumference; lobes sinuato-incised, crenato-undulate, and generally citrino-pulverulent at the margins. Apothecia large, subpedicellate when young, marginal or submarginal, dark brown, the margin thin, usually inflexed; spores 3-septate, fusiform, brownish, 0.024–28 mm. long, 0.007–8 mm. thick.—Gray, Nat. Arr. i. p. 430; Sm. Eng. Fl. v. p. 205; Mudd, Man. p. 90; Cromb. Lich. Brit. p. 31; Leight. Lich. Fl. p. 119, ed. 3, p. 112.—*Lichen auratus* Eng. Bot. t. 2359. *Lichenoides lacunosum rutilum, marginibus flavis* Dill. Musc. 549, t. 84, f. 12.—*Brit. Ees.*: Cromb. n. 39; Leight. n. 261; Larb. Cæsar. n. 16.

The thallus with us is smooth and usually little expanded. The pseudocyphellæ and the medullary layer are citrine. In this country neither apothecia nor spermogones have been detected.

Hab. On trees, rocks, and heather in maritime localities.—*Distr.* Local and scarce in S.W. England, chiefly in the Channel and Scilly Islands.—B. M.: Near the Eperquerie, Island of Sark; Jerbourg, Island of Guernsey. Near Shanklin, Ryde, and Ventnor, Isle of Wight; coasts of Devonshire and Cornwall; Fresco Island and Bryer Island, Scilly.

Form *subglaucescens* Cromb. Grevillea, xv. (1887) p. 76.—Thallus pale brownish-glaucous, bright-green when moist; otherwise as in the type.

Though differing merely in the peculiar colour of the thallus both in a dry and wet condition, this must rank as a well-marked form.

Hab. On the branches of old apple-trees in maritime districts.—*Distr.* Very rare in one locality of S.W. England.—B. M.: The Undercliff, Lyme Regis, Dorsetshire.

48. *RICASOLIA* De Not. Giorn. Bot. Ital. i. (1846) p. 178; Nyl. Syn. i. (1860) p. 355.—Thallus frondose, lobed or laciniate, very rarely

sorediiferous ; beneath with fasciculate rhizine, or sometimes nearly glabrous, very rarely with cyphellæ ; gonidial layer composed of gonidinia. Apothecia parmeleine, usually scattered ; spores variously fusiform, septate. Spermatogones in mastoid prominences, with jointed sterigmata ; spermatia shortly cylindrical, somewhat thickened and obtuse at either apex.

Distinguished from the preceding genera of the tribe by the fasciculate rhizine, the nature of the gonidia, and the situation of the spermatogones. Most of the species are natives of equinoctial regions ; of the three which occur in Europe two are plentiful in our Islands.

1. **R. amplissima** Leight. Lich. Fl. (1871) p. 120.—Thallus orbicular, expanded, rigid, opaque, smooth or rugose in the centre, glomuliferous, laciniato-divided, glaucous-green or pale-brown, laciniae crowded, sinuato-lobed ; beneath pale, with brownish rhizine, cyphellæ none (K_{-}^{+} yellowish, $CaCl_{-}$). Apothecia large, concave, or at length plane, reddish, the margin entire, inflexed or granulate ; spores elongato-fusiform, (1-)3-septate, colourless, 0.32–60 mm. long, 0.006–7 mm. thick.—Leight. Lich. Fl. ed. 3, p. 112.—*Lichen amplissimus* Scop. Fl. Carn. ii. (1772) p. 386. *Ricasolia glomulifera* Cromb. Lich. Brit. p. 32. *Sticta glomulifera* Mudd, Man. p. 91. *Parmelia glomulifera* Gray, Nat. Arr. i. p. 436 ; Hook. Fl. Scot. ii. p. 52 ; Sm. Eng. Fl. v. p. 198. *Lichen glomuliferus* Lightf. Fl. Scot. ii. (1777) p. 853 ; With. Arr. ed. 3, iv. p. 57 ; Eng. Bot. t. 293. *Lichen laciniatus* Huds. Fl. Angl. (1762) p. 449. *Lichenoides subglaucum cumatile, foliis tenacibus, eleganter laciniatis* Dill. Musc. 197, t. 26. f. 99.—Hudson's specific name has priority, but having fallen into oblivion is not adopted.—*Brit. Exs.* : Leight. n. 110 ; Larb. Cæsar. n. 62 ; Cromb. n. 138.

One of the largest lichens, spreading in favourable situations extensively, and sometimes enveloping a large portion of the trunks of trees with an unbroken covering. It is easily recognized by the almost constant presence of the dark-green glomeruli of *Dendroscocaulon bolacinum* on the upper surface of the thallus. The apothecia are somewhat rare, but are generally abundant when present. Occasionally they are abortive, small and crowded, appearing as if cephalodine. The spermatogones in otherwise sterile plants are frequent, prominent, the ostiole brown, with spermatia 0.005 mm. long, about 0.001 mm. thick.

Hab. On the trunks of old trees, chiefly ash and oak, rarely on rocks in maritime and upland districts.—*Distr.* Not very general, though usually plentiful, chiefly in the western tracts of Great Britain ; rare in S.W. and N. Ireland and in the Channel Islands.—*B. M.* : Near Rozel, Island of Jersey ; Jerbourg, Island of Guernsey ; Chateau Point, Island of Sark. New Forest, Hampshire ; Manaton Moor, Brent Tor, and Ivy Bridge, Devonshire ; Boconnoc and near Launceston, Cornwall ; Llanforda, near Oswestry, Shropshire ; Hafod, Cardiganshire ; near Dolgeilly, Barmouth, Aberdovey, and Llanbedr, Merionethshire ; Island of Anglesea ; Sedburgh and Windermere, Westmoreland ; Horsleyhope Denes, Durham ; Keswick, Cumberland. New Galloway, Kirkcudbrightshire ; Minto Crags, Roxburghshire ; Mugdock Castle, near Glasgow ; Loch Long, near Rosneath, Inverary, and Barcaldine House, Argyleshire ; Loch Katrine, Glen

Lochay, and Kenmore, Perthshire; Clova, Forfarshire; Lochaber, Inverness-shire. Dinis Island, Killarney, co. Kerry; Glenarm, co. Antrim.

2. *R. lætevirens* Leight. Lich. Fl. (1871) p. 121.—Thallus orbicular, expanded, scarcely rigid, smooth or rugulose, somewhat shining, laciniato-lobed, bright-green or pale-brown, or lurid; beneath tomentose, pale, the rhizinae concolorous or white, cypphellate; lobes roundly crenate and undulate at the margins, cyphellae none (K^- , $CaCl^-$). Apothecia large, scattered, reddish, the margin granulato-rugulose, inflexed; spores fusiform, 1-septate, at length pale-brown, 0.026–44 mm. long, 0.009–11 mm. thick.—Leight. Lich. Fl. ed. 3, p. 113.—*Lichen lætevirens* Lightf. Fl. Scot. ii. (1777) p. 852; Eng. Bot. t. 294; With. Arr. ed. 3, iv. p. 58. *Ricasolia herbacea* Cromb. Lich. Brit. p. 32. *Sticta herbacea* Gray, Nat. Arr. i. p. 431; Mudd, Man. p. 91, t. ii. f. 27. *Parmelia herbacea* Hook. Fl. Scot. ii. p. 52; Sm. Eng. Fl. v. p. 200; Tayl. in Mack. Fl. Hib. ii. p. 141. *Lichen herbaceus* Huds. Fl. Angl. ed. 2 (1778) p. 544; Eng. Bot. t. 294; With. Arr. ed. 3, iv. p. 58. *Lichenoides lætevirens*, *scutellis fulvis* Dill. Musc. 195, t. 25. f. 98. *Lichenoides arboreum cinereo-virens*, *tenu et leve ubique*, *scutellis minoribus* Dill. in Ray, Syn. ed. 3, p. 73, n. 64.—*Brit. Ess.*: Leight. n. 75; Cromb. n. 40; Dicks. Hort. Sic. n. 23; Larb. Lich. Hb. n. 326.

Also a widely expanded plant, though not so much as the preceding. The thallus, which is somewhat membranaceous, is of a bright green colour, but in drying it becomes greyish-green and then lurid-brown. The apothecia are common, as are also the spermogones, which are similar to those of *R. amplissima*.

Hab. On the trunks of old trees, and occasionally on mossy boulders, in maritime and upland situations.—*Distr.* General and common in the hilly and mountainous regions of Great Britain; rare in W. Ireland and the Channel Islands; abundant in the S.W. Highlands, Scotland.—B. M.: Near Rozel, Island of Jersey; Shanklin and Appuldurcomb, Isle of Wight. New Forest, Hampshire; Ivy Bridge, South Brent, near Totnes, Beckey Falls, and near Haberton, S. Devon; Boconnoc and St. Minver, Cornwall; Bryer Island, Scilly; Dynevor Castle, Carmarthenshire; Charnwood Forest, Leicestershire; Derbyshire; near Dolgelly, Aberdovey, and Barmouth, Merionethshire; Bettws-y-Coed, Denbighshire; Island of Anglesea; Baysdale, Cleveland, Yorkshire; near Egglestone, Durham; Windermere and near Stockgill, Westmoreland; Calder Abbey, Cumberland. New Galloway, Kirkcudbrightshire; Largs, Ayrshire; near Inverary, Barcaldine, and Appin, Argyleshire; The Trossachs, Bracklin Falls, Glen Lochay, and Craighall, Perthshire; Clova, Forfarshire; Craig Cluny, Braemar, Aberdeenshire; Lochaber, Inverness-shire; Cawdor Woods, Nairn; Applecross, Ross-shire. Killarney and Cromaglow, co. Kerry; near Kylemore, co. Galway.

Tribe XV. **PELTIGEREI** Nyl. Mém. Soc. Cherb. ii. (1854)
p. 13; Syn. i. p. 315; Flora, 1882, p. 457.

Thallus frondosely dilated, membranaceous, the cortical layer distinctly cellular, usually wanting beneath; gonidial layer consisting of gonidimia, or more frequently of gonimia. Apothecia peltiform,

marginal and adnate either to the upper or the lower surface, or innate and scattered on the upper surface of the thallus; spores 8næ, rarely 4næ or 2næ, colourless, septate and fusiform in the marginal apothecia, brown, ellipsoid and bilocular in the scattered apothecia; paraphyses discrete, articulate, usually thickish. Spermatogones (in so far as known) immersed in the thallus, with jointed sterigmata.

Nylander points out the analogies of this tribe in various respects to *Sticti* (Pyr. Or. p. 31 note); but being less developed, it occupies an inferior place. The thallus for the most part is without a cortical layer on the lower surface, where also it is destitute of cyphellæ. It is a small tribe, though most of the species are widely distributed in the colder and more temperate regions of the globe. In Nylander's recent arrangement it is divided into the two following subtribes, distinguished from each other by anatomical characters (*cf.* Flora, 1884, p. 219).

Subtribe I. *PELTIDEI* Nyl. Flora, 1882, p. 457, 1884, p. 219.

Thallus bearing cephalodia; gonidial layer composed of gonidimidia. Apothecia and spores variable as in the tribe.

Well characterized by the thallus being cephalodiiferous and gonidimiose. Of the three genera, *Nephroma*, *Peltidea*, and *Solorina*, the first does not occur in Great Britain. It is distinguished from the others by the thallus being continuous beneath, with the apothecia adnate on its lower surface. The cephalodia are variable in their position, being either epigenous or hypogenous or endogenous; when rhizinae are present, they are composed of fasciculate filamentose elements.

49. **PELTIDEA** Ach. Meth. (1803) p. 282 pro parte; Nyl. Flora, 1866, p. 116.—Thallus fragile, the cortical layer not continuous on the under surface, which is nerved and erhizinose. Apothecia adnate on the marginal lobules of the upper surface of the thallus, ascending or horizontal; spores 3- or pluri-septate, fusiform; hymenial gelatine bluish with iodine. Spermatogones unknown.

A small genus distinguished from *Peltigera* of the following subtribe by the presence of cephalodia, and by the nature of the gonidia. It contains only two species, both of which occur in our Islands.

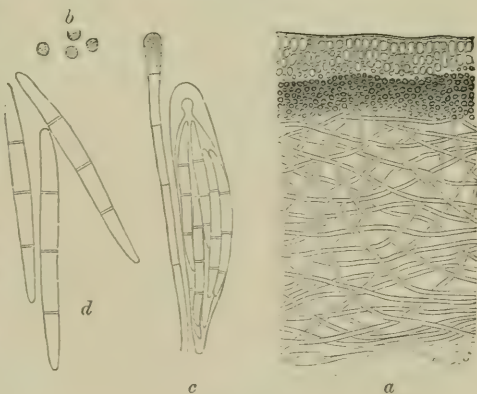


Fig. 48.

Peltidea aphthosa Ach.—a. Section of (entire) thallus, $\times 200$. b. Gonidimidia, $\times 350$. c. Theca and paraphysis, $\times 350$. d. Three spores, $\times 500$.

1. *P. aphthosa* Ach. Lich. Univ. (1810) p. 516.—Thallus broadly membranaceous, thin or moderate, smooth, somewhat shining, bearing cephalodia, bright grass-green when moist, glaucous-green or lurid-glaucous when dry; beneath either reticulately blackish-nervose or almost continuously brownish-black, with broad whitish margin; the rhizine long, blackish. Apothecia rotundate, moderate or large, ascending, reddish-brown, the margin inflexed and lacerate; spores 8næ, fusiform, 3–7-septate, colourless or pale-brown, 0.060–0.92 mm. long, 0.005–6 mm. thick.—Gray, Nat. Arr. i. p. 428; Hook. Fl. Scot. ii. p. 60; Sm. Eng. Fl. v. p. 215; Tayl. in Mack. Fl. Hib. ii. p. 153; Cromb. Lich. Brit. p. 28.—*Peltigera aphthosa* Mudd, Man. p. 81; Leight. Lich. Fl. p. 107, ed. 3, p. 101. *Lichen aphthosus* Linn. Fl. Suec. (1755) p. 1098; Lightf. Fl. Scot. ii. p. 847; Huds. Fl. Angl. ed. 2, p. 547; With. Arr. ed. 3, iv. p. 70; Eng. Bot. t. 1119. *Lichenoides digitatum late-virens, verrucis nigris notatum* Dill. Musc. 199, t. 27. f. 106.—Some of the above include no doubt also the following variety.—*Brit. Evs.*: Leight. n. 321; Cromb. n. 147.

The epigenous cephalodia distinguish this from other species of the tribe. They are patelliform or verrucoso-unequal, pale, either superficial or slightly impressed, usually numerous and sprinkled over the whole upper surface of the thallus. The underside is sometimes continuously blackish, with confluent nerves (form *verrucosa* Web.); but this seems to be an accidental state resulting from the nature of the substratum. In this country it is rarely seen in fruit; the old apothecia become rather large.

Hab. Among mosses on rocks and boulders, as also on turf walls in moist shady upland districts.—*Distr.* Local and scarce in W. and N. England and S. Scotland; more plentiful in the Grampians, Scotland, where it fruits more freely; rare in N. Ireland.—B. M., Stouts' Wood, Gloucestershire: near Buxton, Derbyshire; Craigforda, Herefordshire; Llyn Bodlyn, Merionethshire; Llanberris, Carnarvonshire; Teesdale, Durham; near Kendal, Westmoreland; Walla Crag, Cumberland; The Cheviots, Northumberland. Falls of the Clyde, Lanarkshire; near Inverary and Barcaldine, Argyleshire; Glen Lochay, Killin, Blair Athole, Den of Rechip, Perthshire; Sidlaw Hills, Forfarshire; Craig Cluny, Invercauld, and Craig Coinnoch, Braemar, Aberdeenshire; Loch Linnhe, Lochaber, Inverness-shire. Near Belfast, co. Antrim; Connemara, co. Galway.

Var. *β. leucophlebia* Not. Sällsk. F. et Fl. Fenn. Förh. n. s. v. (1866) p. 117.—Thallus less dilated, paler, more opaque; beneath entirely whitish; the nerves distinct, whitish or pale. Apothecia rare; spores 3-septate, 0.052–0.066 mm. long, 0.004–6 mm. thick.—*Peltigera aphthosa*, var. *leucophlebia* Nyl. Syn. i. (1860) p. 323.—*Brit. Evs.*: Mudd, n. 58.

Differs in the usually smaller thallus, the colour of its upper and under surfaces, and in the pauci-septate spores. Nylander (Syn. l. c.) observes that it had somewhat the habit of *Peltigera rufescens* (this, however, is less marked in our British specimens), but with the peculiar cephalodia of this species. In this country it is always sterile.

Hab. Among mosses on shady rocks in upland districts.—*Distr.* Local and rare in S.W. and N. England, in S. Scotland, and the S. and W.

Highlands; not seen from Ireland.—B. M.: Dartmoor, Devonshire; White Force, Teesdale, Durham; near Kendal, Westmoreland. New Galloway, Kirkcudbrightshire; Dalmahoy Hill, near Edinburgh; near Inverary, Argyshire; the Ochills, Rannoch, and the Trossachs, Perthshire.

2. *P. venosa* Ach. Meth. (1803) p. 282.—Thallus small, simple, ascending or suberect, ovate or nearly flabelliformi-lobate, somewhat shining, smooth, bright-green when moist, pale-greyish or greenish-brown when dry; beneath bearing cephalodia, white, with prominent black or brownish-black nerves ramifying from the base. Apothecia suborbicular, plane, horizontal, somewhat large, brownish-black, the margin crenulate, evanescent; spores 6-Snæ, fusiform, 3-septate, colourless or pale-brown, 0.030–0.045 mm. long, 0.007–8 mm. thick.—Gray, Nat. Arr. i. p. 427; Hook. Fl. Scot. ii. p. 59; Sm. Eng. Fl. v. p. 215; Cromb. Lich. Brit. p. 28.—*Peltigera venosa* Mudd, Man. p. 84, t. 1. f. 23; Leight. Lich. Fl. p. 111, ed. 3, p. 101. *Lichen venosus* Linn. Fl. Succ. (1755) n. 1097; Lightf. Fl. Scot. ii. p. 844; Huds. Fl. Angl. ed. 2, p. 545; With. Arr. ed. 3, iv. p. 69; Eng. Bot. t. 887. *Lichenoides parvum virescens, peltis nigricantibus planis* Dill. Muse. 208, t. 28. f. 109.—*Brit. Ears.*: Cromb. n. 42; Dicks. Hort. Sic. n. 25.

A small plant, easily recognized by the simple or slightly lobed flabelliform thallus and the horizontal fructification. The hypogenous cephalodia, which from their position are very apt to be overlooked, are usually visible upon the brown tomentose nerves. They “are granular, cartilaginous, glaucous or glaucous-grey (at length becoming dark or blackish), small, superficial, subglobose or somewhat depressed, not unfrequently crowded, and contain gonimia of moderate size and moniliform, in the thin cellular texture” (Nyl. Flora, *ut supra*). The apothecia, which are large in proportion to the size of the thallus, are horizontal, and more connected with the upper than the lower surface of the margin of the thallus.

Hab. On turf walls and on the ground in fissures of rocks in upland and alpine situations.—*Distr.* Local and rare in W. England, N. Ireland, and the hilly tracts of S. Scotland; more general in the Grampians, especially in Breadalbane.—B. M.: Whitecliffe Rocks, near Ludlow, Shropshire, Kirkmichael and near Moffat, Dumfriesshire; Habbie’s How, Pentland Hills, near Edinburgh; Menstrie Glen, near Stirling; Stronaclachan and Finlarig, Killin, Ben Lawers and Pass of Killiecrankie, Perthshire; Reeky Linn and Clova, Forfarshire. Near Belfast, co. Antrim.

50. *SOLORINA* Ach. Lich. Univ. (1810) p. 27; Nyl. Flora, 1884, p. 219.—Thallus fragile, the cortical layer not continuous on the under surface, which is sometimes obsoletely nervose and rhizinose. Apothecia innate, rotundate or oblong, scattered on the upper surface of the thallus; spores 6-Snæ, 4næ, or 2næ, fusiformi-oblong or ellipsoid, bilocular, brownish or reddish-brown; hymenial gelatine (and the thecæ) bluish with iodine. Spermatogones unknown.

The rhizinose thallus and innate fructification separate this from the preceding genus. The apothecia are at first covered with a thalline veil,

which at length forms an evanescent margin. All the species are normally terricole, the thallus being closely adnate to the ground. With the exception of *S. octospora*, all the European species have been found in Britain.

1. *S. crocea* Ach. Lich. Univ. (1810) p. 149.—Thallus orbicular, thickish, appressed, more or less smooth, laciniato-lobed, undulate at the margin, dark-greenish when moist, reddish- or cinnamon-greyish when dry; beneath (as also the medulla) deep orange- or saffron-coloured, villosa-nervose, indistinctly subrhizino-se. Apothecia moderate, plane, rotundate or oblong, tumid, dark brownish-red; spores 6-8næ, oblong or fusiformi-oblong, brownish, 0.035-45 mm. long, 0.010-12 mm. thick.—Gray, Nat. Arr. i. p. 429; Hook. Fl. Scot. ii. p. 36: Sm. Eng.

Fl. v. p. 214; Mudd. Man. p. 85; Cromb. Lich. Brit. p. 29; Leight. Lich. Fl. p. 112, ed. 3, p. 106.—*Lichen croceus* Linn. Fl. Suec. (1755) p. 1101; Lightf. Fl. Scot. ii. p. 856; Huds. Fl. Angl. ed. 2, p. 548; With. Arr. ed. 3, iv. p. 68; Eng. Bot. t. 49. *Lichenoides subtus croceum*, *peltis appressis* Dill. Musc. 211, t. 30. f. 120.—*Brit. Eas.*: Cromb. n. 46; Dicks. Hort. Sic. n. 50.

A beautiful plant, readily distinguished by the saffron-colour of the underside of the thallus, which, even when growing, is generally perceptible from the margins being more or less subfree and upturned. The apothecia are at first slightly immersed and rounded, then plane, oblong, and at length difform and somewhat large. On the thallus is occasionally seen the parasitic fungus, *Sphæria lichenicola* DeNot.

Hab. On the ground, and in fissures of rocks and boulders in alpine places.—*Distr.* Rather local and scarce towards the summits of some of the higher Scottish Grampians, abundant on the top of Ben Lawers: very rare on the mts. of S.W. Ireland.—*B. M.*: Ben Lomond, Stirlingshire; Ben More, Bonteskerney and Ben Lawers, Perthshire; Clova Mts., Forfarshire; Lochnagar, Morone, Ben-naboord, and Ben Macdhui, Aberdeenshire; Ben Nevis, Inverness-shire. Brandon Mts., co. Kerry.

2. *S. saccata* Ach. Lich. Univ. (1810) p. 149.—Thallus orbicular, submembranaceous, smooth or subsmooth, lobato-divided, pale-greyish or pale-brownish, occasionally white-pruinose; beneath



Fig. 49.

Solorina saccata Ach.—a. Gonidimia, $\times 350$.
b. Theca and paraphysis, $\times 350$. c. Three
spores, $\times 500$.

white, spongioso-tomentose, affixed by long scattered rhizinae; lobes rounded, incised, or slightly crenate at the margins. Apothecia urceolato-depressed, moderate, brown or blackish-brown, immarginate; spores 4næ, ellipsoid or oblong, reddish-brown, 0.032-50 mm. long, 0.018-27 mm. thick.—Gray, Nat. Arr. i. p. 429; Hook. Fl. Scot. ii. p. 36; Sm. Eng. Fl. v. p. 214; Tayl. in Mack. Fl. Hib. ii. p. 153; Mudd, Man. p. 85, t. i. f. 24; Cromb. Enum. p. 29; Leight. Lich. Fl. p. 112, ed. 3, p. 106.—*Lichen saccatus* Linn. Fl. Suec. (1755) p. 1102; Lightf. Fl. Scot. ii. p. 855; Huds. Fl. Angl. ii. p. 548; Eng. Bot. t. 288; With. Arr. ed. 3, iv. p. 67. *Lichenoides lichenis facie, peltis acetabulis immersis* Dill. Musc. 221, t. 30. f. 121.—*Brit. Exs.*: Mudd, n. 63; Leight. n. 111; Cromb. n. 47; Bohl. n. 4.

The thallus, which is bright green when moist, becoming in old herbaria specimens reddish-brown, varies somewhat in texture according to habitat, and is sometimes more or less white-pruinose (form *pruinosa* Fr. Lich. Eur. p. 49). The saccato-impressed apothecia, which in old plants are occasionally somewhat large, render this species easily recognized, though without examination of the spores it might be confounded with *S. bispora*.

Hab. On the ground and decayed mosses, in crevices of rocks, rarely on the mortar of old walls, in moist shady places, in upland and subalpine districts.—*Distr.* General, but not common, chiefly in W. and N. England, N. Wales, and on the Grampians, Scotland; scarce in S.W. and N. Ireland.—B. M.: Cheddar Cliffs, Somersetshire; near Buxton, Derbyshire; Apes Tor, Staffordshire; Whitecliffe Rocks, near Ludlow, Shropshire; Whernside and Bolton Woods, Yorkshire; Cwm Bychan, Merionethshire; Garn, Denbighshire; Island of Anglesea; Teesdale, Durham; Kentmere, Westmoreland; Alston, Cumberland. Head of Loch Awe and Island of Lismore, Argyleshire; Killin, Ben Lawers, Craig Tulloch, Perthshire; Canlochan Glen, Forfarshire; Craig Cluny, Carr Rocks, and Morrone, Braemar, Aberdeenshire. Bandon Hill, co. Kerry; Ben Bulbin, co. Sligo; near Belfast, co. Antrim.

3. *S. spongiosa* Nyl. *ex* Carroll, Journ. Bot. 1865, p. 288.—Thallus suborbicular, squamulose, dark-green when moist, greyish-brown when dry; squamules small, suberect, minutely inciso-lobed and crenate, at length becoming granulato-crustose. Apothecia deeply urceolate, becoming nearly plane, dark chestnut-coloured or almost blackish, bordered externally by a thinish, granulate, thalloid margin; spores 4næ, ellipsoid, brownish, 0.030-0.050 mm. long, 0.018-0.023 mm. thick.—Cromb. Lich. Brit. p. 30.—*Collema spongiosum* Sm. Eng. Fl. v. p. 214. *Polychidium spongiosum* Gray, Nat. Arr. i. p. 402. *Lichen spongiosus* Sm. Eng. Bot. 1805, t. 1374. *Solorina limbata* (Somm.), Mudd, Man. p. 85; Leight. Lich. Fl. p. 113, ed. 3, p. 107.

A singular-looking plant, sometimes regarded as a variety of *S. saccata*, with which perhaps it is connected by intermediate states, traces of the normal thallus being occasionally seen around the apothecia. It differs, however, from it in the squamulose thallus, and more slightly in the margined apothecia and the thinner spores. The large and sometimes numerous apothecia become nearly plane when old.

Hab. On the ground among rocks, and on turf walls, in upland districts.—*Distr.* Rather local and scarce, chiefly in N. England, among the

S. Grampians, Scotland (where it is plentiful); rare in N.E. Ireland.—B. M.: Buxton Dale, Derbyshire; Whernside and Guisboro' Moor, Cleveland, Yorkshire; Teesdale, Durham; near Kendal, Westmoreland. Finlarrig, Killin, near Tummel Bridge and Craig Tulloch, Perthshire. Glenariff, co. Antrim.

4. *S. bispora* Nyl. Syn. i. (1860) p. 331, t. 8. f. 42.—Thallus orbicular, somewhat small, subcoriaceous, subsmooth, lobato-divided, pale-greyish or brownish-green, white-pruinose; beneath white, spongioso-tomentose, with long scattered rhizinae; lobes rounded or incised and somewhat crenate at the margins. Apothecia urceolato-depressed, small or moderate, brown or dark-brown, immarginate; spores 2næ, reddish brown, ellipsoid, 0.065–88 mm. long, 0.033–42 mm. thick.—Stirt. Grevillea, ii. p. 60; Cromb. Journ. Bot. 1874, p. 147; Leight. Lich. Fl. ed. 3, p. 107.

This differs from *S. saccata* in the white-pruinose thallus, the two-spored thecæ, and the much larger spores. The thallus is also rather smaller, often somewhat rugulose, and thicker; and the apothecia are usually smaller. A variety *limbata*, described in Nyl. Syn. l. c., which is analogous to *S. spongiosa*, has not been detected in Great Britain.

Hab. On the ground in alpine districts.—*Distr.* Local and rare on the *S. Grampians*, Scotland.—B. M.: Ben Lawers, Perthshire.

Subtribe II. *PELTIGERINÆ* Nyl. Flora, 1882, p. 457;
1884, p. 219.

Thallus destitute of cephalodia; gonidial layer consisting of gonimia. Apothecia and spores variable as in the tribe.

This also contains three genera—*Nephromium*, *Peltigera*, and *Solorinina*—parallel to those of the preceding subtribe, except that the thallus is gonimiose and without cephalodia. *Solorinina* is exotic.

51. *NEPHROMIUM* Nyl. Mém. Soc. Cherb. v. (1857) p. 101 (nota); Syn. i. (1860) p. 318.—Thallus fragile, naked or villose beneath, the cortical layer there continuous and nerveless; gonidial layer with the gonimia usually moniliform. Apothecia reniform, adnate to the lower surface of the margin of the thallus, with thalline margin; thecæ clavate; spores 8næ, (1)–3-septate, fusiformi-oblong,

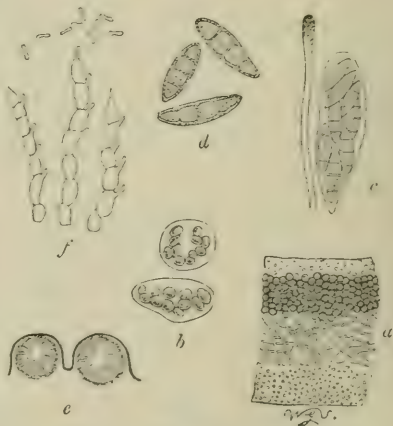


Fig. 50.

Nephromium larigatum Nyl.—a. Section of thallus, $\times 200$. b. Two syngonimia, $\times 350$. c. Theca and paraphysis, $\times 350$. d. Spores, $\times 500$. e. Vertical section of two spermatogones, $\times 30$. f. Sterigmata and spermatia, $\times 500$.

usually brownish; hymenial gelatine bluish with iodine. Spermatogones marginal, pale; spermatia somewhat incrassate at either apex, and obtuse.

Distinguished from the allied genera by the position of the apothecia and the cortical layer being continuous on the nerveless under surface. When rhizine are present, they are composed of non-fasciculate filaments. Most of the European species and varieties occur in this country, though some of them only very sparingly.

1. *N. tomentosum* Nyl. Mém. Soc. Cherb. v. (1857) p. 101, Syn. i. p. 319.—Thallus suborbicular, lobate or laciniato-lobate, glabrous or thinly tomentose, livid-glaucous or livid-chestnut or lurid-brown; beneath pale, villose (medulla white, K—). Apothecia moderate, testaceous-red, or reddish-brown, the receptacle crenulato-unequal and villose at back; spores colourless or brownish, 0,020–24 mm. long, 0,006–7 mm. thick.—Carroll, Journ. Bot. 1865, p. 288; Cromb. Lich. Brit. p. 28; Leight. Lich. Fl. p. 105, ed. 3, p. 99.—*Peltigera tomentosa* Hoffm. Deutsch. Fl. ii. (1795) p. 108. *Nephroma resupinata* Gray, Nat. Arr. i. p. 426; Hook. Fl. Scot. ii. p. 61; Sm. Eng. Fl. v. p. 216.

Readily distinguished by the villosity of the under surface of the thallus. The upper surface also is not unfrequently thinly tomentose, and sometimes also more or less sorediate, though these characters do not appear in our few British specimens. The apothecia are somewhat numerous, and the spermatogones, which are occasionally present, have the spermatia 0,005–6 mm. long, 0,0015 mm. thick.

Hab. On the trunks of old trees in rocky upland situations.—*Distr.* Very local and rare, on the N. Grampians, Scotland.—B. M.: Craig Cluny, Braemar, Aberdeenshire.

Subsp. *N. rameum* Nyl. ex Norrl. Medd. Sällsk. F. et Fl. Fenn. i. (1876) p. 18.—Thallus smaller, thinner, somewhat broadly lobed, glaucous, lobules appressed, expanded; the under surface pale, villose, with white papillæ (pseudocyphehellæ). Apothecia smaller.—*Nephromium tomentosum* var. *rameum* Leight. Lich. Fl. p. 106, ed. 3, p. 100. *Nephroma rameum* Schær. Enum. (1850) p. 18, t. ii. fig. 3.

The more or less pseudo-cypheellate under surface (the papillæ usually being numerous) gives this the rank of a subspecies. The apothecia are smaller, but internally similar to those of the type. There are no spermatogones on the only British specimen I have seen.

Hab. On the branches of old trees (birches) in wooded upland districts.—*Distr.* Extremely local and rare on the N. Grampians, Scotland, in Braemar and (*vide* Leight. l.c.) Forfarshire; not observed in recent years.—B. M.: Near Invercauld, Braemar, Aberdeenshire.

2. *N. lævigatum* Nyl. Mém. Soc. Cherb. t. v. (1857) p. 101, Syn. i. p. 320.—Thallus suborbicular, rotundato-lobed, smooth, subopaque, sinuato-crenate at the margins, chestnut- or livid-brown: beneath glabrous and slightly rugulose, pale (medulla

white, K—). Apothecia small or moderate, reddish-brown, the receptacle crenulato-unequal at the margin and depresso-granulate at the back; spores 0.020–24 mm. long, 0.006–7 mm. thick.—Cromb. Lich. Brit. p. 28; Leight. Lich. Fl. p. 104, ed. 3, p. 99.—*Nephroma lævigatum* Ach. Syn. (1817) p. 242; Mudd, Man. p. 81. *Nephroma resupinata* Tayl. in Mack. Fl. Hib. ii. p. 154. *Lichen resupinatus* Huds. Fl. Angl. p. 453; Lightf. Fl. Scot. ii. p. 843; With. Arr. ed. 3, iv. p. 71. *Lichenoides fuscum, peltis posticis ferrugineis* Dill. Musc. 206, t. 28. f. 105 A. *Lichenoides saxatile fuscum, peltis aversa foliorum superficie locatis* Dill. in Ray, Syn. ed. 3, p. 77, n. 91.—Most of these synonyms refer no doubt to *N. lusitanicum*. *Lichen resupinatus* of the older authors included other species, so that it cannot be retained.

Distinguished from the preceding by the absence of tomentum on the upper and by the naked under surface of the thallus. The thallus is generally of moderate size, and rarely expanded. The apothecia are usually numerous, though comparatively small, and the spermatogones have the spermatia 0.0035–0.040 mm. long (*vide* Nyl.).

Hab. On the trunks of old trees and on mossy boulders in mountainous districts.—*Distr.* Local and scarce in N. England and in the Grampians, Scotland.—B. M.: Keswick, Cumberland. Glen Lochay, Killin, Perthshire; Blair Athole, Perthshire; Craig Cluny, Braemar, Aberdeenshire.

3. *N. parile* Nyl. Flora, 1885, p. 47.—Thallus orbicular, membranaceous, rotundato-lobed, smooth, subopaque, crisp and cæsiosorediate at the margins; beneath naked, rugulose, brownish-black (medulla white, K—). Apothecia very rare, on short lobes; spores as in *N. lævigatum*.—Cromb. Grevillea, xv. p. 77.—*Nephromium lævigatum* var. *parile* Cromb. Lich. Brit. p. 28; Leight. Lich. Fl. p. 105, ed. 3, p. 99. *Nephroma lævigatum* β . *parile* Mudd, Man. p. 81. *Nephroma parile* Gray, Nat. Arr. i. p. 427; Sm. Eng. Fl. v. p. 220. *Lichen parilis* Ach. Prodr. (1798) p. 164, Eng. Bot. t. 2360. *Lichenoides fuscum, peltis posticis ferrugineis* Dill. Musc. 206, t. 28. f. 105 B, c.—*Brit. Exs.*: Cromb. n. 41.

Though regarded by more recent authors as a variety of the preceding, this differs in the sorediate margins, the colour of the under surface, and especially in the size of the spermatia. These, according to Nylander *in litt.*, are 0.004 mm. long, 0.001 mm. thick; so that it must again be raised to its specific rank. The soredia, which are normally marginal, are occasionally also more or less scattered over the surface, becoming blackish in age. It rarely occurs fertile, and never so with us.

Hab. On mossy rocks and boulders, and about the roots of old trees, in wooded upland districts.—*Distr.* Local in S. and W. England, in S. Scotland and among the Grampians, in S.W. and N. Ireland.—B. M.: Ivy Bridge, Hennock, near Bovey Tracey, Lustleigh Cleeve, and Totnes, S. Devon; Cound Moor and Craigforda, Shropshire; Dolgelly, Twll Du, and Rhewgrediden, Merionethshire; Windermere, Westmoreland; Braithwaite, Cumberland. Pentland Hills, near Edinburgh; Barcaldine, Argyshire; Glen Lochay and Pass of Killiecrankie, Perthshire; Craig Cluny, Braemar, Aberdeenshire; Caledonian Canal, Inverness-shire. Near Dunkerron, co. Kerry.

4. *N. subtomentellum* Nyl. *ex* Cromb. Journ. Bot. 1874, p. 147.—Thallus subcoriaceous, somewhat expanded, rotundato-lobed, opaque, rugulose, sinuato-lobed at the margins, dark lurid-brown; beneath rugulose, obsoletely tomentellose, brown (medulla white, K—). Apothecia moderate, dark-red, the receptacle coriaceous-rugulose or thinly areolato-granulose; spores 0,020–24 mm. long, 0,006–7 mm. thick.—*Nephromium laevigatum* var. *subtomentellum* Nyl. Not. Sällsk. F. et Fl. Fenn. Förh. n. s. v. (1866) p. 116; Leight. Lich. Fl. ed. 3, p. 99.—*Brit. Evs.*: Cromb. n. 149.

Distinguished by the rugulose thallus and receptacle, and by the obsolete tomentum of the under surface, which with the size of the spermatia show that it is a good species. The apothecia are numerous, occasionally rather large and crowded. The spermogones, which are more frequent than in any of the other British species, have the spermatia (*ex* Nyl. *in litt.*) 0,0025–0,0030 mm. long, 0,0010 mm. thick.

Hab. On the trunks of old ash trees in mountainous regions.—*Distr.* Local and scarce in N. Wales, and among the S. Grampians, Scotland.—B. M.: Rhewgreiddon, Merionethshire. Head of Loch Awe, Argyleshire; Glen Lochay, Killin, Perthshire.

5. *N. lusitanicum* Nyl. Flora, 1870, p. 38.—Thallus suborbicular, rotundato-lobed, smooth and somewhat shining, crenate, crisp and undulate at the margins, livid-chestnut or chestnut-brown; beneath glabrous, somewhat rugulose, pale (medulla yellow, K+purplish). Apothecia small or moderate, reddish-brown, the receptacle crenato-lacinate, incurved, the back minutely depresso-areolate; spores 0,020–24 mm. long, 0,006–7 mm. thick.—Leight. Ann. Mag. Nat. Hist. 1870, p. 41; Lich. Fl. p. 106, ed. 3, p. 100.—*Nephromium laevigatum* f. *lusitanicum* Cromb. Lich. Brit. p. 28. *Nephroma lusitanicum* Schær. Enum. (1850) p. 323. *Lichen resupinatus* Eng. Bot. t. 305; var. 2, With. Arr. ed. 3, iv. p. 71.—*Brit. Evs.*: Mudd, n. 57; Dicks. Hort. Sic. n. 23; Leight. n. 107; Larb. Lich. Hb. n. 288.

Similar to *N. laevigatum*, except in the colour of the medulla and the chemical reaction. These differences, however, are of sufficient importance to warrant our regarding it with Schærer as a distinct species. With us it is much more common than *N. laevigatum*, and is generally fertile.

Hab. On the trunks of old trees, and on mossy rocks and boulders in maritime and upland wooded districts.—*Distr.* General and common in S., W., and N. England, N. Wales, in S. and Central Scotland, and in N. and S.W. Ireland.—B. M.: Brechou and Guernsey, Channel Islands. Lydd, Kent; Lustleigh Cleeve and near Totnes, S. Devon; near Respring, Launceston, Liskeard, Penzance, and St. Austell, Cornwall; Malvern, Worcestershire; Pentregaer near Oswestry, Shropshire; Barmouth and Aberdovey, Merionethshire; Bettws-y-Coed, Carnarvon; Island of Anglesea; Cleveland, Yorkshire; Eglestone, Durham; Mardale, Westmoreland; Keswick and Bassenthwaite Lake, Cumberland. New Galloway, Kirkcudbrightshire; near Moffat, Dumfriesshire; Dumbarton Castle, Dumbartonshire; Barcaldine, Inverary, and head of Loch Awe, Argyleshire; Glen Lochay and Pass of Leny, Perthshire; Reeky Linn, Forfarshire; Craig Coinnoch, Braemar, Aberdeenshire; Cawdor Woods, Nairn; Loch Linnhe, Fort George, and Falls of Foyers, Inverness-shire;

Applecross, Ross-shire. Fairhead, co. Antrim; Luggelaw, co. Wicklow; Killarney, co. Kerry; Derryclare, Connemara, co. Galway.

Form **panniforme** Cromb. Grevillea, xv. (1887) p. 77.—Thallus lobulato-dissected, closely imbricate, the lobules small, crowded, beneath dark-brown. Apothecia small.

Has the appearance of other panniform conditions of foliaceous lichens. The apothecia, which in the specimens seen are with one exception very sparingly present, are small and confined to the larger lobules.

Hab. On the mossy trunks of trees, and on boulders in maritime and upland districts.—*Distr.* Local and scarce in S.W. England and the W. Highlands of Scotland.—B. M.: Near Penzance, Cornwall. Barcaldine, Argyleshire; Glen Lochay, Perthshire; by Loch Linnhe, Inverness-shire.

β. Hibernicum Nyl. ex Leight. Lich. Fl. ed. 3 (1879) p. 100.—Thallus with the medulla white (K+purplish). Apothecia with the back of the receptacle smoothish. Otherwise as in the type.

A very distinct variety, if not subspecies, characterized by the white or whitish medulla, in which respect it resembles *N. levigatum*. The chemical reaction, however, shows it to belong to *N. lusitanicum*. In the specimens seen the apothecia have the back of the receptacle smooth or subsmooth; though as this occurs also in younger and muscicole states of the type, it can scarcely be regarded as of diagnostic value.

Hab. On the trunks of old trees among mosses on rocks in maritime tracts.—*Distr.* Local and scarce in W. England, the W. Highlands of Scotland, and N.W. Ireland.—B. M.: Near Walkingham, Devonshire; Launceston, Cornwall; near Douglas, Isle of Man. Barcaldine, Argyleshire; by Loch Linnhe, Inverness-shire. Doughbruagh Mts., co. Galway.

52. PELTIGERA Hoffm. Deutsch. Fl. ii. (1795) p. 106 pro parte; Nyl. emend. Flora, 1866, p. 116.—Thallus fragile, opaque or somewhat shining, the cortical layer not continuous on the under surface, which is generally nerved; gonidial layer composed of gonimia. Apothecia adnate on the front margin of the thalline lobules, ascending or horizontal; spores (6-)8næ, 3- or pluriseptate, fusiform, colourless; hymenial gelatine bluish with iodine. Spermatogones not known.

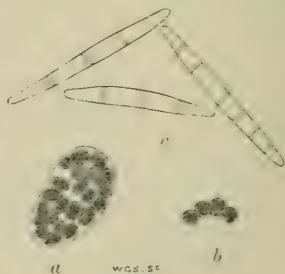


Fig. 51.

As previously observed, this is well separated from *Peltidea*, by the gonimiose and ecephalodiferous thallus. From the preceding it is distinguished by the cortical layer not being continuous beneath, and by the position of the apothecia. The rhizine also, when present, are composed of fasciculate filaments. All the European species occur in our Islands, and for the most part in considerable quantity.

1. *P. malacea* Fr. Lich. Eur. (1831) p. 44.—Thallus moderate, smooth, opaque, thickish, usually very minutely punctato-tomentellose, or obsoletely adperso-pulverulent, livid-brown when moist, greyish-glaucous or glaucous-brown, or partly brownish when dry; beneath densely tomentose, with confluent nerves and without veins, brownish-black, broadly whitish at the margin. Apothecia moderate, orbicular, or nearly transverse, vertically adnate, brownish-red, the margin crenulate; spores elongato-fusiform, 3-5-septate, 0.058-74 mm. long, 0.005-6 mm. thick.—Cromb. Journ. Bot. 1874, p. 147; Leight. Lich. Fl. ed. 3, p. 102 pro min. parte.—*Peltidea malacea* Ach. Syn. (1814) p. 240 pro parte.

A very distinct species, though having a superficial resemblance to some states of *P. rufescens*. The apothecia, which are not very numerous in our few British specimens, are adnate on short, somewhat broad thalline lobules.

Hab. Among mosses on rocks and about the roots of trees in mountainous regions.—*Distr.* Gathered only in the S.W. Highlands and the N. Grampians, Scotland; may be found elsewhere.—B. M.: Inverary, Argyleshire; Craig Cluny, Braemar, Aberdeenshire.

β. microloba Nyl. ex Lamy, Bull. Soc. Bot., xxv. (1878), p. 378.—Thallus smaller, more divided; the lobes short, crisp, narrow. Apothecia smaller, at length incurved.

Smaller in all its parts, and might be mistaken for *P. polydactyla* var. *hymenina*. In consequence of the thallus being more repeatedly lobed, the apothecia are more numerous than in the type.

Hab. Among mosses on walls in upland tracts of mountainous districts.—*Distr.* Found only in the S. Grampians, Scotland.—B. M.: Glen Lochay, Killin, Perthshire.

2. *P. canina* Hoffm. Deutsch. Fl. ii. (1795) p. 106.—Thallus large, impresso-unequal, opaque, more or less adpresso-tomentellose, of moderate thickness, roundly lobed, brownish-green when moist, greyish when dry; beneath whitish, with prominent, concolorous or pale nerves, and long white rhizinae. Apothecia moderate, subrotundate, at length revolute, brown or brownish-red, the margin nearly entire; spores elongato-fusiform, 3-5-septate, 0.066-70 mm. long, about 0.004 mm. thick.—Mudd, Man. p. 82, t. 1. fig. 22; Cromb. Lich. Brit. p. 29; Leight. Lich. Fl. p. 107, ed. 3, p. 101.—*Peltidea canina* Gray, Nat. Arr. i. p. 428; Hook. Fl. Scot. ii. p. 60; Sm. Eng. Fl. v. p. 215; Tayl. in Mack. Fl. Hib. ii. p. 153. *Lichen caninus* Linn. Fl. Suec. (1755) n. 1109; Huds. Fl. Angl. p. 454; Lightf. Fl. Scot. ii. p. 845; With. Arr. ed. 3, iv. p. 69; Eng. Bot. t. 2299. *Lichenoides digitatum cinereum, lutuce foliis sinuosis* Dill. Musc. 200, t. 27. f. 102 E. *Lichenoides peltatum terrestre cinereum majus, foliis divis* Dill. in Ray, Syn. ed. 3, p. 76, n. 78.—Most of the above, however, include also the following variety.—*Brit. Eas.*: Leight. n. 141; Mudd, n. 59.

The most common and best-known species of the genus, easily distinguished by the large thallus, with its tomentellose and (when dry)

ash-coloured upper surface, and its whitish under surface with long white rhizinae. The lobes are of moderate size, though many usually compose an individual plant, which then spreads extensively. It is common in fruit, especially with younger apothecia, nor do these attain any great size in age. On the margins of the lobes pycnides are occasionally seen. These are tubercular, brownish-black, the conceptacle colourless beneath; stylospores oblong, 0.009–0.012 mm. long, 0.004–5 mm. thick (*vide* Nyl. Syn. i. t. 1. f. 27).

Hab. Among mosses on the ground, the tops of old walls, on boulders and about the roots of trees in lowland and upland situations.—*Distr.* General and common throughout Great Britain, and probably Ireland; rare in the Channel Islands.—B. M.: Island of Guernsey. Epping Forest, Essex; New Forest, Hants; near Penzance and Withiel, Cornwall; Madingley, Cambridgeshire; Wychwood Forest, Oxfordshire; Clee Hills, Shropshire; near Dolgelly, Merionethshire; Snowdon, Carnarvonshire; Cleveland, Yorkshire; Teesdale, Durham; The Cheviots, Northumberland. New Galloway, Kirkcudbrightshire; Barcaldine, Argyleshire; Glen Lochay and Blair Athole, Perthshire; Durris, Kincardineshire; Countesswells and Castleton of Braemar, Aberdeenshire; near Forbes, Elginshire; Glen Nevis, Inverness-shire; Applecross, Ross-shire. Near Belfast, co. Antrim; Killarney, co. Kerry.

Var. β . *membranacea* Nyl. Syn. i. (1860) p. 324.—Thallus thinner, more glabrous (subtomentellose), roundly lobed, the fertile lobes short. Apothecia small.—Cromb. Lich. Brit. p. 29; Leight. Lich. Fl. p. 108.—*Peltidea canina* γ . *membranacea* Ach. Lich. Univ. (1810) p. 518.—*Brit. Exs.*: Lich. Hb. n. 45.

Distinguished by the thallus and apothecia, the characters of which, according to Nylander *in litt.*, entitle it probably to rank as a subspecies (*cf.* Zw. Lich. Heidel. p. 29). It is not frequent in fruit, and even when present the apothecia are but few.

Hab. Among mosses on the ground in shady places in maritime, lowland, and upland districts.—*Distr.* Not very general, though common where it occurs in Great Britain, and perhaps also in Ireland.—B. M.: Near Penzance, Cornwall; Hyde Park, London (olim); Barmouth, Merionethshire; near Conway, Carnarvonshire; Island of Anglesea; Patterdale, Cumberland. Barcaldine, Argyleshire; Killin and Blair Athole, Perthshire; Strathmartin, Forfarshire; Corriemulzie, Braemar, Aberdeenshire. Rostellan, co. Cork; Kylesmore, Connemara, co. Galway.

3. *P. rufescens* Hoffm. Deutsch. Fl. ii. (1795) p. 107.—Thallus moderate, somewhat thickish, subtomentellose, roundly lobed, crisp, greenish- or greyish-brown when moist, pale, pale-cervine or greyish-red when dry; beneath with thick coarse dark or brownish nerves and few rhizinae. Apothecia moderate, rotundato-oblong, at length revolute, red or brownish-red, the margin denticulate; spores elongato-fusiform, 3–5-septate, 0.042–72 mm. long, 0.004–5 mm. thick.—Cromb. Lich. Brit. p. 29; Leight. Lich. Fl. p. 108, ed. 3, p. 102.—*Peltigera canina* β . *rufescens* Mudd. Man. p. 82. *Peltidea rufescens* Hook. Fl. Scot. ii. p. 60; Sm. Eng. Fl. v. p. 216. *Lichen rufescens* Eng. Bot. t. 2300; With. Arr. ed. 3, iv. p. 405; *Lichen rufus* (errore) p. 70. *Lichen caninus* β . *rufescens* Lightf. Fl. Scot. ii. (1777) p. 846; Huds. Fl. Angl. ed. 2, p. 547. *Peltidea crispa*

(Ach.) Gray, Nat. Arr. i. p. 428. *Lichenoides digitatum rufescens*, foliis luteo crispis Dill. Musc. 203. t. 27. f. 103. *Lichenoides peltatum terrestre rufescens* Dill. in Ray Syn. ed. 3, p. 76, n. 88.—*Brit. Exs.*: Cromb. n. 43; Bohl. n. 87.

The smaller, smother, more crisp thallus, and the difference of colour, as also the darker or brownish veins of the underside, distinguish this from *P. canina*, to which it is intimately allied. Whether it is to be regarded as specifically distinct is doubtful, since intermediate states occur by which they may be connected. The apothecia when present are numerous, though it is often sterile.

Hab. Among mosses on shady rocks and the stumps of felled trees in maritime and mountainous districts.—*Distr.* Rather local and uncommon in the Channel Islands, W. and N. England, N. Wales, the S.W. Highlands of Scotland, and S. Ireland.—B. M.: Island of Guernsey. Near Totnes, S. Devon; Penzance, Cornwall; Cirencester, Gloucestershire; Hafed, Cardiganshire; Aberdovey, Merionethshire; Windermere and near Kendal, Westmoreland. New Galloway, Kirkcudbrightshire; Boreadine, Argyshire; Rannoch, Perthshire; Corriemulzie, Braemar, Aberdeenshire; S. of Fort William, Inverness-shire. Rosscarbery, co. Cork.

Form *prætextata* Flörke in Somm. Lapp. Suppl. (1826) p. 123.—Thallus with the lobes isidiiferous or minutely squamulose at the margins; otherwise as in the type.—Cromb. Linn. Soc. Journ. Bot. xvii. p. 574.—*Peltigera canina*, var. γ . *limbata* (non Del.) Mudd, Man. p. 83. *P. canina* var. *crispa* Leight. Lich. Fl. ed. 3, p. 102. *P. canina* form *lepidophora* (non Nyl.) Cromb. Grevillea, xv. p. 77.—*Brit. Exs.*: Mudd, n. 60; Leight. n. 262; Larb. Lich. Hb. n. 46; Bohl. n. 30.

Well marked by the isidioso-subgranulose excrescences by which the margins of the lobes are bordered (often densely), and which may be also scattered here and there upon their surface. It is not uncommon in fructification, the apothecia sometimes becoming large. Pycnides similar to those of *P. canina* are frequent on the marginal squamules.

Hab. Among mosses on shady rocks and walls, rarely on the ground, generally near water, in upland districts.—*Distr.* Somewhat local, but common in Great Britain and Ireland: rare in the Channel Islands; plentiful on the Grampians, Scotland.—B. M.: Rozel, Island of Jersey. Lustleigh and Widdecombe, S. Devon; Boveconoc, Cornwall; near Worcester: Barmouth and Dolgelly, Merionethshire; Easby and Sowerdale, Cleveland, Yorkshire; Teesdale, Durham; near Kendal, Westmoreland; Keswick, Cumberland. Appin, Argyshire; Glen Lochay, Killin, and Glen Fender, Blair Athole, Perthshire; Craig Cluny, Braemar, Aberdeenshire; S. of Fort William, Inverness-shire; Island of Skye. Kilbarney, co. Kerry; Glendalough, Connemara, co. Galway.

4. *P. spuria* Leight. Lich. Fl. (1871) p. 108.—Thallus small, subsimple, digitately lobed, ascending or suberect, adpresso-tomentellose, smooth, greyish-green; beneath whitish, with coarse concolorous nerves and a few short rhizinae. Apothecia small, subrotundate, at length oblongo-revolute, brown or reddish-brown, the margin crenulate or denticulate: spores aciculari-fusiform, 3-7.

septate, 0,056–75 mm. long, 0,0035–45 mm. thick.—Leight. Lich. Fl. ed. 3, p. 103; Cromb. Linn. Soc. Journ. Bot. xvii. p. 574.—*Peltigera rufescens* subsp. *spuria* Cromb. Lich. Brit. p. 29. *Peltidea spuria* Sm. Eng. Fl. v. p. 215. *Lichen spurius* Ach. Prodr. (1798) p. 159; Eng. Bot. t. 1542. *Peltigera canina* e. *pusilla* Koerb., Mudd, Man. p. 83. *Lichenoides digitatum cinereum*, *Lutacea foliis sinuosis* Dill. Musc. 200, t. 27. f. 102 A–D.

Differs from the preceding in the small digitately lobed thallus, the paler nerves, the smaller apothecia, and the longer spores. It so resembles *P. polydactyla* that it might readily be confounded with some of the states of that species. The thallus, which is sometimes pruinose, often grows in a scattered manner; the apothecia are numerous, nearly all the lobes being fertile.

Hab. On the ground among mosses and short grass, as also on the stumps of felled trees in maritime and upland districts.—*Distr.* Somewhat local in S., W., and N. England, N. Wales, on the Grampians, Scotland; not yet observed in Ireland.—B. M.: Sotterley, Suffolk; Epping Forest, Essex; Ightham, Kent; near Ryde and Shanklin, Isle of Wight; the Sussex Downs and Hurstpierpoint, Sussex; Totnes, S. Devon; near Cirencester, Gloucestershire; Gogmagog Hills, Cambridgeshire; near Bicester, Oxfordshire; Charnwood Forest, Leicestershire; Oswestry and Church Stretton, Shropshire; Ayton Moor, Cleveland, Yorkshire; Ynysfaig, N. Wales. Appin, Argyleshire; The Trossachs and Falls of Tummel, Perthshire; Durrus, Kincardineshire; Corriemulzie, Braemar, Aberdeenshire.

5. *P. scabrosa* Fr. fil. N. Act. Reg. Soc. Sc. Upsal. ser. 3, t. iii. (1861) p. 145.—Thallus moderate, subcoriaceous, very finely and minutely scabrid, roundly lobed, opaque, pale-livid or greyish-pale, beneath whitish, subreticulate, with pale, nearly confluent nerves, blackish in the centre. Apothecia moderate, subrotundate, at length revolute, brownish-red or dark-chestnut, the margin subcrenulate; spores 0,068–80 mm. long (or even longer), 0,004–0,005 mm. thick.—Cromb. Journ. Bot. 1885, p. 195.

A distinct species allied to *P. rufescens*, but differs in the minutely scabrous not tomentellose thallus, and in the more elongate spores. From *P. scutata* it is distinguished not only by the larger thallus and apothecia and the form of the lobes, but also by the almost verrucose epithallus, and the more septately divided spores. It is a plant of a boreal type, and is fertile only in subarctic regions.

Hab. On turf-covered walls in a mountainous region.—*Distr.* Extremely local and scarce on the N. Grampians, Scotland.—B. M.: Between Corriemulzie and Inverey, Braemar, Aberdeenshire.

6. *P. polydactyla* Hoffm. Deutsch. Fl. ii. (1795) p. 106.—Thallus thinish, digitato-lobed, ascending or suberect, glabrous and shining, smooth or obsoletely impresso-unequal, glaucous-green when moist, livid- or pale-glaucous or pale-brown when dry, beneath nearly glabrous, whitish or white, reticulate with coarse blackish-brown nerves, which are pale-reddish towards the circumference. Apothecia small, longitudinal, brown or reddish-brown, the margin

irregularly crenulate; spores attenuato-fusiform, thinly 3-7-septate, 0,060-81 mm. long, 0,004-5 mm. thick.—Mudd, Man. p. 83; Cromb. Lich. Brit. p. 29; Leight. Lich. Fl. p. 109, ed. 3, p. 103.—*Peltidea polydactyla* Gray, Nat. Arr. i. p. 428; Hook. Fl. Scot. ii. p. 61; Sm. Eng. Fl. v. p. 220; Tayl. in Fl. Hib. ii. p. 154. *Lichen polydactylon* Neck. Meth. Musc. (1771) p. 85; With. Arr. ed. 3, iv. p. 69. *Lichen caninus* γ . *polydactylon* Lightf. Fl. Scot. ii. p. 846; Huds. Fl. Angl. ed. 2, p. 547. *Lichenoides cinereum polydactylon* Dill. Musc. 207, t. 28. f. 107.—To a state of this belongs also the following:—*Peltidea pellucida* Ach., Gray, Nat. Arr. i. p. 429. *Lichen caninus* δ . Huds. Fl. Angl. ed. 2, p. 547. *Lichenoides membranaceum pellucidum*, *peltis digitatis geminatis* Dill. Musc. 208, t. 28. f. 108.—*Brit. Exs.*: Cromb. n. 148; Bohl. nos. 56, 71.

This approaches *P. rufescens*, but is distinguished by the numerously lobed thallus with its glabrous and shining upper surface, and by the form of the smaller apothecia. These are usually abundant, adnate or elongate and attenuate lobes, and at length become revolute. Sometimes they occur two together (geminate) on each fertile lobe, in which state it is represented in Dill. l. c. (*Peltidea pellucida* Ach.): On the margins of the lobes pyrenides occasionally occur, with stylospores oblong, oblongo-fusiform or almost ovoid, 0,007-0,012 mm. long, 0,003-4 mm. thick.

Hab. Among mosses and short grass in shady situations in maritime and upland districts.—*Distr.* General and usually plentiful in most parts of Great Britain; rare in Ireland and the Channel Islands.—B. M.: Island of Guernsey. Epping Forest, Essex; High Rocks, Tunbridge Wells, Kent; Dartmoor and near Totnes, Devonshire; near Penzance and Withiel, Cornwall; Milton, Oxfordshire; Gogmagog Hills, Cambridgeshire; near Worcester and Malvern, Worcestershire; near Oswestry, Shropshire; Aberdovey and near Dolgelly, Merionethshire; Island of Anglesea; Eglestone, Durham; Lamplugh, Cumberland. New Galloway, Kirkcudbrightshire; Auchindenny Woods, near Edinburgh; Barcaldine, Argyleshire; Glen Lochay and Glen Fender, Perthshire; Corriemulzie, Braemar, Aberdeenshire; Lochaber, Inverness-shire; near Forres, Elgin; Applecross, Ross-shire. Cromaglow, Killarney, co. Kerry; Kylesmore, co. Galway.

Form 1. *collina* Nyl. Lich. Scand. (1861) p. 90.—Thallus smaller, the lobes narrower, crisp at the margins. Apothecia as in the type.—Cromb. Journ. Bot. 1876, p. 360; Leight. Lich. Fl. ed. 3, p. 104.—*Lichen collinus* Ach. Prodr. (1798) p. 162.

Easily recognized by the lobes. The thallus is rather fragile when dry, and the apothecia are not numerous.

Hab. On decayed mosses on the ground and old walls in upland tracts.—*Distr.* Local and rare on the S. and N. Grampians, Scotland, and in W. Ireland; no doubt to be detected elsewhere.—B. M.: Glen Lochay, Perthshire; Glen Cluny, Braemar, Aberdeenshire. Killarney, co. Kerry.

Form 2. *microcarpa* Nyl. Syn. i. (1860) p. 327.—Thallus small, the fertile lobules short, narrow, subbidid. Apothecia minute.—Cromb. Grevillea, xv. p. 77.—*Peltidea polydactyla* γ . *microcarpa* Ach. Lich. Univ. (1810) p. 520.

The shorter fertile lobules and the minute and often numerous apothecia are the distinguishing marks of this form, which is perhaps only a starved condition.

Hab. On the ground among short mosses in upland districts.—*Distr.* Probably not rare in the mountainous regions of Great Britain, though as yet seen only in W. England and the Scottish Highlands.—B. M.: Oswestry, Shropshire. Appin, Argyleshire; Killin, Perthshire; Applecross, Ross-shire.

Var. *β. lophyra* Nyl. Lich. Scand. (1861) p. 90.—Thallus brownish; lobes scarcely ascending, rounded, beneath subvenose, brown or brownish-black. Apothecia small, rotundato-oblong or sometimes transverse.—Cromb. Lich. Brit. p. 29.—*Peltidea horizontalis* γ. *lophyra* Ach. Lich. Univ. (1810) p. 516.

Distinguished by the roundly-lobed thallus, scarcely veined beneath, and the form of the apothecia. In the only British specimen seen these are transverse, whence it was considered by Acharius as a variety of *P. horizontalis*, from which, however, it otherwise entirely differs.

Hab. On decayed mosses upon boulders in upland districts.—*Distr.* Very local and scarce on the S. Graupians, Scotland (though recorded from England by Acharius).—B. M.: Finlarig, Killin, Perthshire.

Var. *γ. hymenina* Nyl. Lich. Scand. (1861) p. 90.—Thallus with paler subconfluent veins on the under surface. Apothecia rotundato-oblong.—Cromb. Journ. Bot. 1876, p. 360; Leight. Lich. Fl. ed. 3, p. 104.—*Lichen polydactylos* var. 2, With. Arr. ed. 3, iv. p. 69. *Peltidea hymenina* Ach. Meth. (1803) p. 284.

Differs in the character of the thallus beneath, and in the form of the fructification. The thallus when dry is cervine-coloured, and the apothecia are generally but sparingly present.

Hab. Among mosses on the ground and about the roots of old trees in upland wooded districts.—*Distr.* Not general nor common in the hilly and mountainous tracts of W. and N. Ireland, N. Wales, and the W. Highlands of Scotland; rare in N.W. Ireland.—B. M.: Boconnoc, Cornwall; Malvern, Worcestershire; Harboro' Magna, Warwickshire; Hope Bowdler and High Rock, Bridgenorth, and near Caer Caradoc, Shropshire; near Aberdovey, Merionethshire; Llanberis, Carnarvonshire; Kildale Moor, Cleveland, Yorkshire; Windermere, Westmoreland; Alston, Cumberland. Kennmure, near Glasgow; Inverary and Appin, Argyleshire; Glen Lochay and Ben Lawers, Perthshire. Dawros River, Connemara, co. Galway.

7. *P. scutata* Leight. Lich. Fl. (1871) p. 110.—Thallus small, thinnish, sinuato-lobed, more or less minutely depresso-granulate, undulato-crenate, crisp and cæcio-sorediate at the margins, greyish-green when moist, pale-greyish or greyish-red when dry; beneath whitish, with pale-brown nerves and moderate whitish rhizinae. Apothecia small, suborbicular, ascending, brown or reddish-brown, the margin crenate and inflexed; spores elongato-fusiform, usually 3-septate, 0.044–60 mm. long, 0.004–5 mm. thick.—Leight. Lich. Fl. ed. 3, p. 104.—*Peltigera polydactyla* var. *scutata* Cromb. Lich.

Brit. p. 29. *Peltigera canina* δ . *scutata* Mudd, Man. p. 83. *Peltidea scutata* Gray, Nat. Arr. i. p. 427; Hook. Fl. Scot. ii. p. 60; Sm. Eng. Fl. v. p. 215. *Lichen scutatus* Deks. Crypt. fasc. iii. (1793) p. 18; With. Arr. ed. 3, iv. p. 71; Eng. Bot. t. 1834. *Lichenoides subfuscum*, *peltis horizontalibus planis* Dill. Musc. 205, t. 27. f. 104 c.—*Brit. Eas.*: Leight. n. 262 pro parte; Cromb. n. 44.

Well characterized by the sinuato-lobed thallus, minutely granulate above, and by the crisp and usually sorediate, though sometimes naked, margins; otherwise it is closely allied to *P. polydactyla*. The apothecia, which are rare, are adnate on very short lobes, and become dark-brown or blackish in dried plants.

Hab. Among mosses on the trunks of trees, rarely on turf walls, in wooded upland districts.—*Distr.* Local and scarce in the mountainous tracts of W. and N. England, S. and N. Wales, S. and Central Scotland; apparently rare in N.E. and S.W. Ireland.—*B. M.*: Shanklin, Isle of Wight; Elburton, Kingsbridge, South Brent, and near Harberton, Devonshire; Tregawn and Withiel, Cornwall; near Oswestry, Shropshire; near Edwinstford, Carmarthenshire; Hafod, Cardiganshire; Dolgelly and Llyn Bodlyn, Merionethshire; Hoggart's Wood, Cleveland, Yorkshire; Ambleside, Westmoreland. New Galloway, Kirkcudbrightshire; Colinton Woods, near Edinburgh; Inverary and Barmaldine, Argyshire; The Trossachs and Glen Lochay, Perthshire; S. of Fort William, Inverness-shire; Glenferness, Nairnshire. Near Belfast, co. Antrim; Killarney, co. Kerry.

S. P. horizontalis Hoffm. Deutsch. Fl. ii. (1795) p. 107.—Thallus expanded, rotundato-lobed, smooth or obsoletely impresso-unequal, somewhat shining, sinuato-crenate and slightly undulate at the margins, dull- or brownish-green when moist, pale-glaucous or pale-brown when dry; beneath white and reticulate with black or brownish-black subvillose nerves, which are pale at the circumference; rhizine few, scattered, blackish-brown. Apothecia large, orbicular or elliptical, transverse, plane, reddish- or blackish-brown, the margin subcrenulate; spores 6–8næ, fusiform, 3-septate, 0.030–0.042 mm. long, 0.006–0.007 mm. thick.—Mudd, Man. p. 84; Cromb. Lich. Brit. p. 29; Leight. Lich. Fl. p. 110, ed. 3, p. 104.—*Peltidea horizontalis* Gray, Nat. Arr. i. p. 427; Hook. Fl. Scot. ii. p. 60; Sm. Eng. Fl. v. p. 215; Tayl. in Mack. Fl. Hib. ii. p. 153. *Lichen horizontalis* Linn. Mant. (1771) p. 132; Huds. Fl. Angl. p. 543; Lightf. Fl. Scot. ii. p. 849; With. Arr. ed. 3, iv. p. 72; Eng. Bot. t. 888. *Lichenoides subfuscum*, *peltis horizontalibus planis* Dill. Musc. 205, t. 28. f. 104 A, B.—*Brit. Eas.*: Leight. n. 108; Mudd, n. 62; Cromb. n. 45; Larb. Lich. Hb. n. 249; Behl. n. 37.

The thallus sometimes spreads very extensively, and, except in its larger size, is similar to that of *P. rufescens*. From this as well as from the other species of the genus, the horizontal apothecia and the determinately 3-septate spores render it very distinct. The apothecia are usually very numerous, and occasionally become somewhat large.

Hab. On shady rocks and the mossy stumps of felled trees in upland districts.—*Distr.* General though not very common in the mountainous tracts of Great Britain, and probably of Ireland; most frequent on the

Grampians, Scotland.—B. M.: Betchworth, Surrey; Eridge Rocks and near Henfield, Sussex; New Forest, Hants; Dartmoor, Ilsham Walk, Torquay, and near Totnes, S. Devon; Pentire, Cornwall; Leigh Woods, near Bristol, Gloucestershire; Charnwood Forest, Leicestershire; Malvern, Worcestershire; Oswestry and Whitecliffe Rocks, Shropshire; Aberdovey and Barmouth, Merionethshire; Bettws-y-Coed, Carnarvonshire; Stogdale, Cleveland, Yorkshire; Teesdale, Durham; near Kendal, Westmoreland; Keswick, Cumberland; The Cheviots, Northumberland. New Galloway, Kirkcudbrightshire; Swanston, near Edinburgh; Bowling Bay, Dunbartonshire; Dunoon and Borealdine, Argyshire; Loch Katrine, near Callander, Kenmore, Craighall, and Dunkeld, Perthshire; Craig Cluny, Braemar, Aberdeenshire; Lochaber, Invernessshire; near Forbes, Elgin. Killarney, co. Kerry.

Form *muscorum* Schl. ex Schaer. Enum. (1850) p. 21.—Thallus thinner, less roundly lobed, the lobes smaller, narrower. Apothecia small.—Cromb. Journ. Bot. 1876, p. 360; Leight. Lich. Pl. ed. 3, p. 105.

Differs in being considerably smaller in all its parts. The apothecia are also fewer, at least in our British specimens.

Hab. Among mosses at the roots of old trees in upland districts.—*Distr.* Local and scarce in S.W. and N. England, on the S. Grampians, Scotland, and in N.W. Ireland.—B. M.: Paington, S. Devon; near Whitehaven, Cumberland. Glen Lochay, Killin, Perthshire. Kylemore Lake, co. Galway.

Tribe XVI. **PHYSCIEI** Nyl. Bull. Soc. Linn. Normand. sér. 2, vii. (1872) p. 322 (*cfr.* Cromb. Grevillea, v. p. 77).

Thallus foliaceous or sometimes fruticulose, usually stellato-orbicular; gonidial layer consisting of true gonidia. Apothecia lecanorine; spores 8mæ, subellipsoid or oblong, variously bilocular, or 1-septate, rarely quadrilocular, brown or colourless; paraphyses discrete. Spermatogones innate; sterigmata usually pluri-articulate; spermatia cylindrical or oblongo-cylindrical, occasionally obsoletely incrassate at either apex, very rarely acicular.

Consists of a single genus, formerly included under *Parmeliei*, but recently separated by Nylander as a distinct tribe. From the less developed thallus and the type of the apothecia it occupies an inferior place in the Series.

53. **PHYSCIA** Schreb., Linn. Gen. Pl. ed. 8, t. ii. (1791) p. 768; Nyl. Syn. i. (1869) p. 406.—Thallus horizontally expanded, or sometimes ascending, variously lobed or lacinate; beneath discolorous, very rarely concolorous, more or less fibrilloso-rhizinosæ; medullary layer woolly, composed of filaments loosely interwoven, cortical layer cellular, or with longitudinal cellular cavities. Apothecia sessile or pedicellate, rarely concolorous with the thallus; hypothecium colourless, rarely brownish-black; hymenial gelatine bluish with iodine. Spermatogones generally scattered, becoming at length

somewhat prominent, yellowish or blackish: sterigmata very rarely subsimple.

The species of this genus are diverse in habit, some being everniiform, a few subplacodioid: but the larger number are parmelioid. They also vary somewhat in the structure of the cortical layer, the form of the spores, and the spermatia. They agree, however, in what is more essential, the lecanorine apothecia. The colour of the thallus, here closely connected with differences in the fructification, enables us to arrange them under two sections, which are almost entitled to be regarded as subgenera.

A. FLAVESCENTES.—Thallus yellowish. Apothecia concolorous: spores polar-bilocular (the loculi usually connected by a thin tube), colourless. Spermatia yellowish, with spermatia oblongo-ellipsoid. — *Xanthoria* Fr. Pl. Hom. (1825) p. 213 pro parte.

1. *P. flavicans* DC. Fl. Fr. ii. (1805) p. 189.—Thallus subfruticulosus-filamentose, caespitose, very much and intricately branched, yellow or orange-yellow; beneath concolorous or subconcolorous, subcanaliculate; branches somewhat rounded, slender, attenuate, furcellate at the apices (K^+ purplish, $CaCl^-$). Apo-

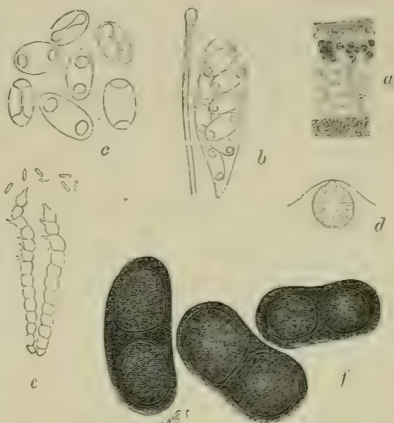


Fig. 52.

Physcia parietina, De Not.—a. Vertical section of thallus, $\times 200$. b. Theca and paraphysis, $\times 350$. c. Spores (mostly from the living plant), $\times 500$. d. Section of spermatia, $\times 30$. e. Jointed sterigmata and spermatia, $\times 500$. f. Spores of *P. ciliaris* DC. $\times 500$. thick.—Mudd, Man. p. 112, t. ii. f. 33; Cromb. Lich. Brit. p. 37; Leight. Lich. Fl. p. 141, ed. 3, p. 130.—*Parmelia flavicans* Tayl. in Mack. Fl. Hib. ii. p. 147. *Borreria flavicans* Hook. Fl. Scot. ii. p. 57; Sm. Eng. Fl. v. p. 224. *Lichen flavicans* Sw. Fl. Ind. Occid. iii. (1788) p. 1908; Eng. Bot. t. 2113. *Borreria leta* Gray, Nat. Arr. i. p. 435. *Lichen vulpinus* (non Linn.) Huds. Fl. Angl. p. 462; Lightf. Fl. Scot. ii. p. 896; With. Arr. ed. 3, iv. p. 49. *Usnea capillacea citrina, fruticuli specie* Dill. Musc. 73, t. 13. f. 16. *Lichenoides quod Muscus aureus tenuissimus* Dill. in Ray Syn. p. 65, n. 8.—*Brit. Ess.*: Leight. n. 169; Mudd, n. 84; Larb. Cæsar. n. 21; Cromb. n. 48.

A beautiful plant, easily recognized by the somewhat elongate orange-

coloured thallus, which is generally more or less sprinkled with yellowish-white soredia. Sometimes it is paler towards the base and on the under surface: when growing in moist shady places it is somewhat greenish. It varies considerably in size occasionally spreading rather extensively, but frequently stunted in small densely cæspitose tufts. The apothecia are extremely rare in Great Britain, and when they occur are few and small. The spermogones, which are more frequent, are scattered, usually somewhat prominent, with spermatia as in *P. parietina*, but rather thinner and pistillar.

Hab. On the trunks and branches of trees and shrubs, sometimes on rocks and walls, chiefly in maritime districts.—*Distr.* Usually plentiful where it occurs, in S. and W. England, N. Wales, in S. Ireland, and formerly in S.W. Scotland (Ailsa Craig).—B. M.: Islands of Sark, Alderney, and Guernsey. Lydd, Kent; St. Leonard's Forest, Fairlight Glen near Hastings, and Lewes, Sussex; Brockenhurst, New Forest, Hants; near Ventnor, Ryde, Appuldurcombe, and Shanklin, Isle of Wight; near Totnes, Lydford, Widdicombe, South Brent, and Torquay, Devonshire; Baccinoc, Penzance (frt.), Withiel, and Bude, Cornwall; Malvern Hills, Worcestershire; Aberdovey and Barmouth, Merionethshire; Holyhead, Island of Anglesea. Lambay Island, co. Dublin; Whiting Bay, co. Waterford; near Cork, Castlebernard Park, Bandon, and Cape Clear, co. Cork.

2. *P. chrysophthalma* DC. Fl. Fr. ii. (1805) p. 401.—Thallus cæspitoso-fruticulose, rigid, lacero-laciniate, yellow or yellowish-white; beneath whitish, laciniae narrow, ascending, divaricatomultifid, plane or concave, the apices fibrilloso-ramulose or spinose (K^+ purple, $CaCl^-$). Apothecia subterminal, moderate or large, concave or somewhat plane, orange-coloured, the margin fibrilloso-ciliate: spores 0.011–17 mm. long, 0.006–10 mm. thick.—Cromb. Lich. Brit. p. 37; Leight. Lich. Fl. p. 141, ed. 3, p. 131.—*Borrera chrysophthalma* Gray, Nat. Arr. i. p. 435; Sm. Eng. Fl. v. p. 233; Mudd, Man. p. 112, t. ii. f. 34. *Lichen chrysophthalmus* Linn. Mant. ii. (1771) p. 311; Eng. Bot. t. 1088. *Lichenoides pulmonarius minimus subluteus, receptaculis florum coronatis, mali aurantii coloris* (Mich.) Dill. Musc. 74, t. 13. f. 17.—*Brit. Exs.*: Leight. n. 394; Larb. Cæsar. n. 22; Bohl. n. 122.

Much smaller than the preceding, from which it is readily distinguished by the thallus and fructification. With us it occurs only in small scattered tufts, and is but little variable. It is generally well fruited, the apothecia being sometimes numerous and crowded. The spermogones are scattered towards the extremities of the laciniae, with the spermatia a little more slender than in the following species.

Hab. On the trunks and branches of trees in orchards, rarely on old pales, in maritime districts.—*Distr.* Rather local and scarce, in the Channel Islands, S. England, and S. Ireland; very doubtful in S.W. Scotland.—B. M.: Rozel and St. Brelade's, Island of Jersey; Islands of Sark and Guernsey. Near Brighton and Lewes, Sussex; near Ryde, Isle of Wight; Ilsham Walk, near Torquay, S. Devon. Carrigalin and Kilbrittain, co. Cork; Muckrone, co. Kerry.

Form 1. *Dickieana* Nyl. Syn. i. (1860) p. 410.—Thallus small,

glaucous-white. Apothecia small or moderate, nearly plane, with entire thalline margin.—Mudd, Man. p. 112; Cromb. Lich. Brit. p. 37; Leight. Lich. Fl. p. 142, ed. 3, p. 131.—*Physcia villosa*, var. *Dickiana* Linds. Trans. Roy. Soc. Edin. t. xxii. (1867) p. 254.

Apparently but an accidental state of the type, depending upon the nature of the habitat. It is distinguished by the pale thallus and the entire margin of the apothecia, which latter character, however, sometimes occurs in the type itself.

Hab. On shady rocks in maritime districts.—*Distr.* Very local and rare in the Channel Islands (?) and in N.E. Ireland.—B. M.: Newcastle, co. Down.

3. *P. parietina* De Not. Mem. R. Ac. Sc. Turin, ser. 2, x. (1849) p. 387.—Thallus suborbicular, appressed, imbricato-lobed, smooth, yellow; beneath paler or pale-whitish, sparingly fibrilloso-rhizinoso: lobes somewhat plane or concave, rounded and crenate at the margins (K^{+} violet-purplish, $CaCl^{-}$). Apothecia moderate, concave or plane, subconcolorous, the margin entire or nearly entire; spores 0.012–16 mm. long, 0.007–9 mm. thick.—Mudd, Man. p. 113; Cromb. Lich. Brit. p. 38; Leight. Lich. Fl. p. 142, ed. 3, p. 131.—*Parmelia parietina* Gray, Nat. Arr. i. p. 438; Hook. Fl. Scot. ii. p. 52; Sm. Eng. Fl. v. p. 204; Tayl. in Mack. Fl. Hib. ii. p. 141. *Lichen parietinus* Linn. Sp. Pl. (1753) p. 1143; Huds. Fl. Angl. p. 447; Lightf. Fl. Scot. ii. p. 822; Eng. Bot. t. 194; With. Arr. ed. 3, iv. p. 34. *Lichenoides vulgare sinuosum foliis et scutellis luteis* Dill. Musc. 180, t. 24. f. 76. *Lichenoides crusta foliosa scutellata, flavescens* Dill. in Ray Syn. ed. 3, p. 72, n. 59.—*Brit. Ecs.*: Leight. n. 10; Mudd, n. 85; Larb. Lich. Hb. n. 9; Bohl. n. 12.

A very common and well-known plant, easily recognized by its bright-yellow, smooth, appressed thallus. At first sight it looks as if it were a *Parmelia*, but its essential characters are those of this genus. It varies considerably in colour and in the character of the laciniæ, which give rise to the forms and varieties described. With us, as elsewhere, it is commonly fertile, the apothecia being chiefly central and crowded, with the margin somewhat thickish and inflexed or thin and entire. The spermogones are not very frequent in the type. They are usually more or less congregate, inclosed in thalline protuberances, with spermatia 0.0025 mm. long, 0.0015 mm. thick.

Hab. On the trunks and branches of trees, old pales, and walls, in maritime, lowland, and upland districts.—*Distr.* Very general and plentiful throughout Great Britain and probably Ireland.—B. M.: Bury St. Edmunds, Suffolk; Edgeware, Middlesex; Lydd, Kent; Lewes, Sussex; Appuldurcombe, Isle of Wight; Plymouth, Devonshire; Cirencester, Gloucestershire; Windsor, Berkshire; Madingley Park, Cambridgeshire; near Worcester; Harboro' Magna, Warwickshire; Grimsbury Green, Northamptonshire; Matlock and Buxton, Derbyshire; near Shrewsbury, Shropshire; Island of Anglesea; Cleveland, Yorkshire; Levens, Westmoreland; Hexham, Northumberland. New Galloway, Kirkcudbrightshire; near Stirling; Finlarig, Killin, Perthshire; Dundee, Forfarshire; Drum and Castleton of Braemar, Aberdeenshire; Abernethy, Banffshire;

Appl. cross, Ross-shire. Carrigaloe, co. Cork; Muckruss, Killarney, co. Kerry.

Form 1. *virescens* Nyl. Bull. Soc. Bot. t. xiii. (1866) p. 366.—Thallus pale-greenish. Apothecia scattered, the margin thin, entire, greenish.—Form *viridescens* Cromb. Journ. Linn. Soc. Bot. xvii. p. 572. *Lichen parietinus* var. 2, With. Arr. ed. 3, iv. p. 34.

Differs from the type in the colour of the thallus, which evidently results from the habitat, since in the herbarium it again partially reverts to the normal colour. The reaction with K is also less distinct or scarcely any. The apothecia are few, but it is rarely seen fertile.

Hab. On the trunks of trees in moist shady places in upland districts.—*Distr.* Among the S. and E. Grampians, Scotland; no doubt to be detected elsewhere.—B. M.: Finlarig, Killin, Perthshire; Drum, Aberdeenshire.

Form 2. *cinerascens* Leight. Lich. Fl. ed. 3 (1879) p. 133.—Thallus greyish-white. Apothecia with the margin greyish, entire or somewhat inflexed.—Cromb. Grevillea, xv. p. 78.

The colour of this form also depends upon the nature of the habitat. It may be considered as a debilitate condition, having the reaction with K fainter than in the type. It usually occurs fertile, with the apothecia fairly numerous.

Hab. On the trunks of old trees, chiefly elms, in shady places of maritime and lowland districts.—*Distr.* Somewhat local and rare in S. and Central England, in S. Scotland, and in S. Ireland.—B. M.: St. Leonard's Forest and near Brighton, Sussex; Lymington, Hants; Ilsham Valley, Torquay, Devonshire; Windsor, Berkshire; near Cirencester, Gloucestershire; Twycross, Leicestershire; Malvern, Worcestershire. Cramond, near Edinburgh. Carrigaloe, near Cork.

Var. β . *aureola* Nyl. Syn. i. (1866) p. 411.—Thallus orbicular, plicate-rugose, vitelline or golden-yellow; lobes conerete, dilated, plicate and inciso-crenate at the apices. Apothecia with the margin at length crenulate.—Mudd, Man. p. 113; Leight. Lich. Fl. p. 143, ed. 3, p. 132.—*Parmelia aureola* Ach. Lich. Univ. (1810) p. 487; Syn. p. 210.—*Brit. Exs.*: Larb. Lich. Hb. n. 212.

Distinguished by the plicate-rugose and more closely lobed thallus, which is also occasionally somewhat granulate in the centre, and there also frequently more or less zonately centrifugal. When fertile the apothecia are numerous, the margin becoming crenate, in this respect also differing from the type.

Hab. On trunks of trees and on walls in maritime and upland districts.—*Distr.* Only here and there throughout England, in S. Wales, and in E. Scotland.—B. M.: near King's Lynn, Norfolk; Withiel, Cornwall; Buxton, Derbyshire; Twycross, Leicestershire; Tenby, Pembrokeshire; Kendal, Westmoreland. Near Edinburgh; Cove, Kincardineshire; near Aberdeen.

Form *congranulata* Cromb. Grevillea, xv. (1887) p. 78.—Thallus

clothed with small, prominent, crowded granules. Apothecia concave, the margin thickish, inflexed and crenate.

A rather peculiar form referable to this variety, with which it agrees, except in the granulose thallus and the concave apothecia. It is allied to var. *subgranulosa*, Nyl. (Flora, 1876, p. 281), but is larger and more granulose. The granules are usually so numerous as almost to obliterate the lobes, unless at the circumference, and upon them are frequently seen the young apothecia and the spermatogones. It was apparently a spermatogoniferous state of this that Weddell (Bull. Soc. Bot. 1869, p. 198) describes as subvar. *tumida* (cf. Leight. Lich. Fl. iii. p. 133). In the specimens seen the apothecia are constantly concave, and do not become plane.

Hab. On trunks of trees and rocks in maritime, lowland, and upland districts.—*Distr.* Local and rare in S., Central, and N. England.—B. M.: Near Ryde, Isle of Wight; St. Minver, Cornwall; Great Comberton, Worcestershire; Weardale, Durham.

Var. *γ. ectanea* Nyl. Act. Soc. Linn. Bord. sér. 3, i. (1856) p. 306.—Thallus imbricato-laciniate, deep tawny-yellow or orange-red: laciniae narrow, multifid, plane or convex, impresso-unequal. Apothecia small or moderate, the margin entire or subentire.—Mudd, Man. p. 113; Leight. Lich. Fl. p. 143, ed. 3, p. 132.—*Parmelia parietina*, β. *ectanea* Ach. Lich. Univ. (1810) p. 464 pro parte. *Physcia parietina* var. *aureola* Cromb. Lich. Brit. p. 38.—*Lichen fulvus* Dicks. Crypt. fasc. iii. p. 16, is perhaps referable to this variety.—*Brit. Eas.*: Larb. Cæsar. n. 1.

Distinguished by the thallus being less determinate, intenser in colour, and by the narrow and more divided laciniae. States of it sometimes occur which at first sight closely resemble *Lecanora elegans*. In specimens which are less closely appressed to the substratum, the under surface of the thallus, at least towards the circumference, is occasionally subconcolorous with the upper. The apothecia, which are usually numerous, have the margin generally entire, though sometimes slightly crenulate.

Hab. On dry rocks in maritime, rarely in mountainous districts.—*Distr.* Local, though plentiful where it occurs, in the Channel Islands, S.W. and N. England, S. and N. Wales, in E. Scotland, and S.W. Ireland.—B. M.: Islands of Jersey, Sark, and Guernsey. Bolt Head, Devonshire: Penzance, Cornwall; Tenby, Pembrokeshire; Barmouth, Merionethshire: Isle of Man; Fern Islands, Northumberland; St. Bees, Cumberland. Cramond, near Edinburgh; Portlethen, Kincardineshire; Peterhead and on the Khol, near Ballater, Aberdeenshire. Near Blackwater Bridge, co. Kerry.

4. *P. polycarpa* Nyl. ex Lamy, Bull. Soc. Bot. t. xxx. (1883) p. 359.—Thallus effuse, subpulvinate, greenish-yellow; lobes short, granulato-conglomerate and granulato-crenate at the margins (K+purple). Apothecia small or nearly moderate, numerous, crowded, the margin turgid, entire; spores 0.011–15 mm. long, 0.006–8 mm. thick.—Cromb. Grevillea, xv. p. 78.—*P. parietina* f. *polycarpa* Mudd, Man. p. 113; Cromb. Lich. Brit. p. 38; Leight.

Lich. Fl. p. 144, ed. 3, p. 133. *Squamaria candelaria* β . *polycarpa* Hook. Fl. Scot. ii. p. 51; Sm. Eng. Fl. v. p. 198. *Psoroma polycarpum* Gray, Nat. Arr. i. p. 445. *Lichen polycarpus* Ehrh. Exs. (1785) n. 137; Eng. Bot. t. 1795.—*Brit. Exs.*: Leight. n. 265; Mudd, n. 86; Larb. Lich. Hb. n. 47.

Characterized by the less developed granulato-conglomerate thallus, which occasionally spreads somewhat extensively, and by the crowded apothecia, which may be so numerous as almost to cover the lobes except at the immediate circumference. The spores are somewhat smaller than in *P. parietina*. In less favourable habitats it occurs in small, orbicular, isolated patches.

Hab. On old pales and trees, chiefly larch, in maritime and upland districts.—*Distr.* Found here and there throughout England, in N. Wales, and in the Central Highlands of Scotland; not yet seen in Ireland.—B. M.: Yarmouth, Suffolk; St. Leonard's Forest, Sussex; Kemble, Gloucestershire; Gogmagog Hills, Cambridgeshire; Twycross, Leicestershire; near Oswestry, Shropshire; Island of Anglesea; Redcar, Cleveland, Yorkshire; near Hexham, Northumberland. Finlarig and near Lawer's Inn, Killin, Perthshire; Durris, Kincardineshire.

Form *lobulata* Cromb. Grevillea, xv. (1887) p. 78.—Thallus effuse, scattered, pulvinate, yellowish-orange; lobes very short, roundly crenate. Apothecia minute, numerous; spores 0.012–17 mm. long, 0.007–8 mm. thick.—*Physcia parietina* ϵ . *lobulata* Mudd, Man. p. 113; Cromb. Lich. Brit. p. 38. *Lecanora lobulata* Flörke, Deutsch. Fl. Exs. (1821) n. 14.—*Brit. Exs.*: Mudd, n. 86.

Probably a starved state of the type, with which it often grows associated, and from which it differs in the smaller and usually more scattered thallus and in the minute apothecia. Occasionally the thallus is only sparingly visible around the apothecia.

Hab. On old pales in upland districts.—*Distr.* Only in N. England and among the S. and N.E. Grampians, Scotland.—B. M.: Cleveland, Yorkshire. Killin, Perthshire; Durris, Kincardineshire.

5. *P. lychna* Nyl. ex Carroll, Journ. Bot. 1865, p. 288.—Thallus effuse, microphylline, ascending or erect, lacero-laciniate, orange-coloured or tawny-yellow; beneath paler; laciniae narrow, dissecto-multifid, crowded, entire and usually granuloso-pulverulent at the margins (K^{+} violet-purplish, $CaCl^{-}$). Apothecia subterminal, scattered, moderate, concolorous, the margin entire or crenate; spores 0.011–17 mm. long, 0.007–11 mm. thick.—Cromb. Grevillea, xv. p. 78.—*Physcia parietina* subsp. *lychna* Cromb. Lich. Brit. p. 38. *Physcia parietina* μ . *lychna* Mudd, Man. p. 114; Leight. Lich. Fl. p. 143, ed. 3, p. 132. *Parmelia candelaria* var. *lychna* Ach. Meth. (1803) p. 187. *Lichen candelarius* Eng. Bot. t. 1794 pro parte. *Lichen concolor* Dicks. pro parte, and also probably *Lichen candelarius* pro parte of our older authors.—*Brit. Exs.*: Leight. n. 11; Larb. Lich. Hb. n. 162.

The thallus occasionally spreads very extensively over the substratum. Though sometimes growing associated with *P. parietina*, yet it is entitled

to be regarded as distinct, on account of its manner of growth, its being much smaller in all its parts, and the absence of transition forms. It is not very common in a fertile condition; but the apothecia when present are numerous.

Hab. On rocks, walls, old pales, and the trunks of trees in maritime and upland districts.—*Distr.* Rather local and not common in Great Britain; apparently rare in N. Ireland.—B. M.: Hav Tor, Dartmoor, Devonshire; near Penzance and St. Austell, Cornwall: Windsor Park, Berkshire: Wheatfield Park, Oxfordshire; Colwall, Herefordshire; Malvern, Worcestershire; near Shrewsbury, Shropshire; Aberdovey, Merionethshire. Lawers, Killin, Perthshire: Findhaven Hill, Forfarshire; Durris, Kincardineshire; Lairg, Sutherlandshire. Co. Antrim.

Form *perfusa* Nyl. & Lamy Bull. Soc. Bot. t. xxv. (1878) p. 382.—Thallus smaller, widely expanded, densely stipate. Apothecia moderate.

As stated by M. Lamy, *l. c.*, this has the appearance of a granular crust, though composed of minute, very crowded, thalline laciniae. Our British specimens are well fertile.

Hab. On granitic walls of gardens and houses in maritime and upland situations.—*Distr.* Local, in N.E. Scotland and among the N. Grampians.—B. M.: Portlethen, Kincardineshire; Crathie, Braemar, Aberdeenshire.

Var. β . *pygmæa* Nyl. Lich. Scand. (1861) p. 108.—Thallus small, determinate; laciniae erect, narrowly divided, often almost rounded, the margin usually granuloso-pulverulent. Apothecia moderate; spores 0.010–0.014 mm. long, 0.007–0.009 mm. thick.—*Borrera pygmæa* Bory in Fr. Lich. Eur. (1831) p. 73.

Well distinguished from the type, with which, however, it is confluent through intermediate stages, by the very much smaller (almost minute) thallus, and by the nearly rounded laciniae. The thallus in our specimens is in small, discrete nodules, and the apothecia, which are numerous, are somewhat large in proportion to the size of the plant.

Hab. On exposed granitic walls in an upland district.—*Distr.* Extremely local and scarce, among the S. Grampians, Scotland.—B. M.: Ben Lawers, Perthshire.

B. CINERASCENTES.—Thallus greyish or whitish, rarely brown. Apothecia brownish or blackish; spores 1-septate, brown or dark-brown; spermogones black, with spermatia cylindrical or slightly thickened at either apex, rarely acicular.—*Euphyscia* Cromb. Grevillea, xv. (1887) p. 78.

a. Spermogones with cylindrical or subcylindrical spermatia.

6. *P. intricata* Schær. Enum. (1850) p. 11.—Thallus expanded, caespitose, suberect, roundly compressed, laciniate, densely puberulo-villose, greyish-glaucous or greyish-brown; beneath greyish-white, subcanaliculate; laciniae divaricately branched, very much entangled (K \square , CaCl \square). Apothecia lateral, sessile, moderate, plane or

sometimes slightly convex, brownish-black, the margin black, entire; spores dark-brown, 0.018–26 mm. long, 0.011–15 mm. thick.—Cromb. Lich. Brit. p. 37; Leight. Lich. Fl. p. 144, ed. 3, p. 133.—*Borrera intricata* Mudd, Man. p. 104. *Lichen intricatus* Desf. Fl. Atl. ii. (1800) p. 420, t. 258. f. 3. *Borrera Atlantica* Gray, Nat. Arr. i. p. 435; Sm. Eng. Fl. v. p. 223. *Lichen Atlanticus* Sm. in Eng. Bot. t. 1715. *Lichenoides subhirsutum teres, scutellis parvis nigris* Dill. Musc. 157, t. 21. f. 51.—*Brit. Exs.*: Mudd, n. 76; Cromb. n. 49.

A well-marked species, at first sight somewhat resembling narrower states of *P. villosa*, which does not occur so far north as the British Isles, but differing from it at once in the colour of the apothecia. The thallus sometimes spreads extensively, and the laciniae vary somewhat in length. As observed by Nylander (Syn. i. p. 409), the whitish villosity of the thallus, which occasionally becomes more or less evanescent, consists of hollow filaments scarcely articulate. The apothecia are extremely rare in this country, but the spermogones, which have the spermatia 0.003–4 mm. long, scarcely 0.001 mm. thick, are more frequent.

Hab. On rocks and trunks of old trees in maritime districts.—*Distr.* Only in S. England, in one or two places on the coast of Sussex.—B. M.: Bracklesham in Selsey Island, near Chichester, and cliffs near Hastings (fruit), Sussex.

7. *P. ciliaris* DC. Fl. Fr. ii. (1805) p. 396.—Thallus diffuse, subascending or decumbent, loosely adherent, linear-laciniate, greenish-grey or greyish-brown; beneath pale, canaliculate; laciniae multifid, imbricato-intricate, the margins, especially towards the apices, ciliate, with long fibrils (K⁺, CaCl⁺). Apothecia pedicellate, large, cæcio-pruinose or naked, brownish-black, the margin entire, crenate or ciliate; spores oblong, 0.030–50 mm. long, 0.018–24 mm. thick.—Cromb. Lich. Brit. p. 38; Leight. Lich. Fl. p. 145, ed. 3, p. 133.—*Borrera ciliaris* Gray, Nat. Arr. i. p. 434; Hook. Fl. Scot. ii. p. 56; Sm. Eng. Fl. v. p. 226; Mudd, Man. p. 105. *Lichen ciliaris* Linn. Sp. Pl. (1753) p. 1144; Huds. Fl. Angl. p. 448; Lightf. Fl. Scot. ii. p. 828; With. Arr. ed. 3, iv. p. 55; Eng. Bot. t. 1352. *Lichenoides hispidum majus et rigidius, scutellis nigris* Dill. Musc. 150, t. 20. f. 45. *Lichenoides arboreum foliosum cinereum, scutellis nigris, foliorum extremitatibus hispidis et pilosis* Dill. in Ray Syn. ed. 3, p. 73, n. 67.—*Brit. Exs.*: Mudd, n. 77; Leight. n. 364; Cromb. n. 50; Larb. Cæsar. n. 68; Lich. Hb. n. 125; Bohl. n. 38.

A rather variable plant as to thallus and apothecia. The thallus may have the laciniae longer or shorter, broader or narrower, often more or less white-pulverulent, with pale or sordid flexuose cilia. In colour it varies from greyish to greyish-brown or cervine according to nature of habitat, but when moist it is constantly greenish. States occasionally occur in S. England with the laciniae approaching to var. *crinalis* (Schl., Schær.), but not sufficiently typical. The apothecia, when present, are plentiful, becoming at length naked and darker, with the receptacular margin very variable, being frequently with us in the same specimen

entire, inflexed, denticulate, or proliferous. In this last condition it is digitately limbrate with laciniolate, whence var. *actinota* (Ach. Meth. p. 256). The spermogones, which are usually very numerous, are large, prominent, scattered or aggregate, from pale-brown becoming blackish, with spermatia cylindrical, 0,004-5 mm. long, 0,001 mm. thick. In otherwise sterile specimens they are sometimes much elevated, rendering the thallus verrucoso-papillate, whence var. *verrucosa* (Ach. Lich. Univ. p. 497).

Hab. On the trunks of old trees, chiefly oaks and elms, in cultivated lowland, rarely upland districts.—*Distr.* General, and plentiful where it occurs, in England, much scarcer in the Channel Islands and E. Scotland; apparently very local and rare in N. Wales and E. Ireland.—B. M.: Islands of Jersey, Sark, and Guernsey. Norwich, Norfolk; Bury, Suffolk; near Colchester and Walthamstow, Essex; Hythe, Kent; Dorking, Surrey; Glynde, Sussex; Winchester, Hants; near Ryde, Isle of Wight; Elburton and Newton Bushell, S. Devon; near Cirencester, Gloucestershire; near Farringdon and Windsor, Berkshire; near Swindon, Wiltshire; Madingley, Cambridgeshire; Twycross, Leicestershire; Overthorpe, Northamptonshire; Harboro' Magna, Warwickshire; Moor Park, Herefordshire; Malvern and Broadwas, Worcestershire; Clungunford, Shropshire; Hopton, Cheshire; Island of Anglesea; near Ayton, Cleveland, and Dalby, Yorkshire; Middleton, Teesdale, Durham; Kendal, Westmoreland; near Hexham, Northumberland. Rosslyn Woods, Midlothian; Finlarig, Killin, Perthshire; Foulis, Baldovan, Auldbar, and Melgund Castle, Forfarshire; Midmar Castle, Aberdeenshire. Oakpark, near Carlow, co. Carlow.

Var. *β. saxicola* Nyl. Mém. Soc. Cherb. v. (1857) p. 106, Syn. i. p. 414.—Thallus smaller, more appressed, greenish- or dark-cervine; laciniae narrow, with sordid or brownish-black marginal cilia. Apothecia naked.—Carroll, Journ. Bot. 1886, p. 22; Cromb. Lich. Brit. p. 35; Leight. Lich. Fl. p. 146, ed. 3. p. 134.—*Borrera ciliaris* var. *β. saxicola* Mudd, Man. p. 105.

The darker colour of the more appressed thallus and the narrower laciniae distinguish this variety, which sometimes occurs where the type is unknown. In this country it is only sterile, in which condition it is *Parmelia ciliaris* var. *γ. melanosticta* Ach. Meth. p. 255.

Hab. On rocks and walls (rarely on bare sandy soil) in maritime and mountainous regions.—*Distr.* Local and scarce in the Channel Islands, S., W., and N. England, the N. Grampians, Scotland, and in S.W. Ireland.—B. M.: Quenvais, Island of Jersey. Withiel, Cornwall; Buxton, Derbyshire; near Little Malvern, Worcestershire; Holyhead, Island of Anglesea; near Langbraugh, Cleveland, Yorkshire. Craig Tulloch, Blair Athole, Perthshire; Morrone, Braemar, Aberdeenshire. Sybil Head, co. Kerry.

S. P. leucomela Mich. Fl. Bor.-Amer. (1803) p. 356.—Thallus diffuse, subcaespitose, linear-laciniolate, whitish or glaucous-white; beneath white, subgranulose, subcanaliculate or plane; laciniae narrow, lax, subascending, fibrillose-ciliate at the margins (K^+ yellow, $CaCl^+$ yellow). Apothecia lateral, pedicellate, moderate, plane, caesio-pruinose, the margin radiating; spores often subquadricellular,

0,035–63 mm. long, 0,018–25 mm. thick.—Cromb. Lich. Brit. p. 38; Leight. Lich. Fl. p. 149, ed. 3, p. 138.—*Borrera leucomela* Gray, Nat. Arr. i. p. 434; Sm. Eng. Fl. v. p. 223; Mudd, Man. p. 104. *Lichen leucomelas* Linn. Sp. Pl. ed. 3 (1764) p. 1613; Eng. Bot. t. 2548. *Lichenoides angustifolium planum, crinibus nigris* Dill. Musc. 156, t. 2. f. 50.—*Brit. Ess.*: Leight. n. 166; Larb. Cæsar. n. 69; Cromb. n. 150.

Closely allied to *P. ciliaris*, but well distinguished by the simpler whiter laciniae and by the constantly dentate-cornate margin of the apothecia. The marginal cilia, which are usually short in our specimens, are generally blackish or partly brownish, according to exposure. The apothecia do not occur in this country, and the spermatogones, which are similar to those of the preceding, are but rarely present.

Hab. On the ground among mosses and short grass, rarely on mossy trunks of trees, in maritime districts.—*Distr.* Continued to the Channel Islands and S. coasts of England and Ireland.—B. M.: Quenvais and St. Owen's Bay, Island of Jersey; Islands of Sark and Alderney. St. Leonard's Forest, Sussex; Babbicombe and Bolt Head, S. Devon; The Lizard and Kynance Cove, Cornwall; Bryer and Trescoe Islands, Scilly. Ballycotton and Cape Clear Island, co. Cork.

9. *P. speciosa* Nyl. Act. Soc. Linn. Bord. sér. 3, i. (1856) p. 307. —Thallus appressed, stellato-laciniate, cæcio- or greyish-white, greenish-white when wet; beneath whitish, with whitish or sordid-whitish fibrillose rhizinae; laciniae narrow, multifid, plane subimbricate, with whitish or sordid marginal cilia, the apices dilated, obtuse, usually somewhat ascending and sorediiferous (K^+ yellow, $CaCl^-$). Apothecia sessile, moderate, brown, the margin incurved, entire or at length crenulate; spores 8næ, oblong, 1-septate, colourless, 0,025–36 mm. long, 0,012–19 mm. thick.—Cromb. Lich. Brit. p. 38; Leight. Lich. Fl. p. 151, ed. 3, p. 138.—*Borrera speciosa* Mudd, Man. p. 107. *Parmelia speciosa* Gray, Nat. Arr. i. p. 442; Hook. Fl. Scot. ii. p. 55; Sm. Eng. Fl. v. p. 201; Tayl. in Mack. Fl. Hib. ii. p. 149 pro parte. *Lichen speciosus* Wulf. in Jacq. Coll. iii. (1789) p. 119; Eng. Bot. t. 1979 (upper fig.).

Muscicolous states, in which the thallus is more diffuse and the laciniae narrower and more discrete, have somewhat the appearance of *P. leucomela*, while corticolous and saxicolous states, in which they are closer and more imbricate, are somewhat similar to *P. aipolia*. With us it never occurs in a typical condition, but only sorediiferous, as elsewhere in Europe. In the more imbricate states the marginal cilia are but very sparingly present or entirely absent; and when growing in more exposed situations these, as well as the rhizinae, become blackish. Specimens with the latter character are referred by Leighton (Lich. Fl. iii. p. 139) to var. *hypoleuca* (Ach.). The apothecia have not been detected in Great Britain; but the spermatogones occasionally occur in S.W. England.

Hab. On mosses, rocks, and trees, chiefly in maritime districts.—*Distr.* Local and scarce in the Channel Islands, in S. and W. England, the W. Highlands of Scotland, and in S.W. and N.E. Ireland.—B. M.: Rozel, Island of Jersey; Islands of Alderney and Guernsey. St. Leonard's Forest, Sussex; Bolt Head, Devonshire; The Lizard, Kynance Cove

and Roughton, Cornwall; Barmouth, Cwm Bychan, and Llyn Bodlyn, Merionethshire. Barcaldine and Ballachulish, Argyleshire; Glen Falloch, Perthshire. Dunkerron and Killarney, co. Kerry.

Var. *β. hypoleuca* Nyl. Syn. i. (1860) p. 417.—Thallus usually firmer, with the laciniae more closely imbricate; beneath white, here and there hispid with black rhizinae, the marginal cilia black. Apothecia with the margin of the receptacle crenate or radiato-fimbriate.—Cromb. Grevillea, xv. p. 78.—*Parmelia speciosa* var. *hypoleuca* Ach. Syn. (1814) p. 211. *Parmelia speciosa* Tayl. l. c. pro parte. *Lichen speciosus* Eng. Bot. t. 1979 (lower figs.).

An exotic variety which finds its way to S.W. Ireland. The thallus in our British specimens is more sorediate than in the type; and the margin of the apothecia, which are somewhat large and crowded, is thickish, crenate, and densely pulverulent.

Hab. On rocks in shady upland situations.—*Distr.* Extremely local and rare in S.W. Ireland.—B. M.: Dunkerron, co. Kerry.

10. *P. pulverulenta* Nyl. Act. Soc. Linn. Bord. sér. 3, i. (1856) p. 308.—Thallus suborbicular, somewhat firm, substellato-appressed, opaque, multifido-laciniate, pale-greyish or greyish-brown, more or less white-pruinose: beneath rough with dense blackish fibrillose rhizinae; laciniae plane, obtuse and crenato-incised at the apices (K^- , $CaCl^-$). Apothecia sessile, large, concave or plane, brownish-black, caesio-pruinose or naked, the margin thick, inflexed, entire, pruinose: spores oblong, 0.020–36 mm. long, 0.012–20 mm. thick.—Cromb. Lich. Brit. p. 38; Leight. Lich. Fl. p. 146, ed. 3, p. 135.—*Borrera pulverulenta* Mudd, Man. p. 110. *Parmelia pulverulenta* Gray, Nat. Arr. i. p. 443; Hook. Fl. Scot. ii. p. 55; Sm. Eng. Fl. v. p. 201; Tayl. in Mack. Fl. Hib. ii. p. 141. *Lichen pulverulentus* Schreb. Spic. (1771) p. 128. *Lichen stellaris β.* Huds. Fl. Angl. p. 448; With. Arr. ed. 3, iv. p. 31. *Lichenoides glaucum orbiculare, segmentis latiusculis, scutellis nigris* Dill. Musc. 177, t. 24. f. 71 A pro parte. *Lichenoides arborum, crusta foliosa virescenti, tenuiter et eleganter dissecta, scutellis nigris* Dill. in Ray Syn. ed. 3, p. 74, n. 73 pro parte.—*Brit. Eas.*: Leight. n. 49; Mudd, n. 82; Larb. Lich. Hb. n. 10; Bohl. n. 69.

This may generally be recognized by the pruina, with which, when growing and in a dry state, it is more or less covered. As noticed, however, by Acharius (Lich. Univ. p. 474), when wetted the pruina disappears both in the thallus and apothecia, the former being then greenish and the latter black; but when again dried the pruina returns in both. The colour in a dry state varies in recent specimens from pale greyish to greyish brown, and, as observed by Lightfoot (l. c. p. 825), specimens after being kept for some years in paper (or in herbaria) turn to a russet-grey (or cervine). In other respects the thallus and apothecia vary considerably in character, giving rise to the subspecies, forms, and varieties which follow. The apothecia are generally somewhat scattered, though

numerous, and the spermatogones, which are not uncommon, have the spermatia equally cylindrical, 0,006 mm. long, about 0,001 mm. thick.

Hab. On the trunks and branches of trees, and on old pales, rarely erratic on stone walls, chiefly in cultivated lowland and upland districts.—*Distr.* General and common throughout Great Britain and probably Ireland, becoming rare in N. Scotland; rare in the Channel Islands.—B. M.: Island of Guernsey. Bury St. Edmunds, Suffolk; Epping Forest, Essex; Edgeware, Middlesex; Hurstpierpoint and Lewes, Sussex; near Ryde, Isle of Wight; Wembury, Devonshire; near Withiel, Cornwall; Bourn, Cambridgeshire; Milton, Oxfordshire; Bolton Abbey, Lincolnshire; Twycross, Leicestershire; Moor Park, Herefordshire; Crowle, Worcestershire; near Shrewsbury, Shropshire; Aberdovey and Anglesea, N. Wales; Ayton, Cleveland, Yorkshire; Middleton, Teesdale, Durham; Kendal, Westmoreland. Largs, Ayrshire; near Edinburgh: Appin, Argyleshire; Killin and Blair Athole, Perthshire; Cults, near Aberdeen, and Abergeldie Castle, Aberdeenshire; Applecross House, Ross-shire; Carrigaloe and Aghada, co. Cork; Ballynagarde, co. Limerick; Dunkerron, co. Kerry.

Form 1. *panniformis* Cromb. Journ. Linn. Soc. Bot. xvii. (1880) p. 571; Journ. Bot. 1882, p. 273.—Thallus with the laciniae short, crowded, densely imbricate. Apothecia small.—*Lichenoides glaucum orbiculare, segmentis latiusculis, scutellis nigris* Dill. Musc. 177, t. 24. f. 71 d.

One of those panniform conditions of foliaceous lichens which have recently been noted, forming as it were a thickish congested crust, the laciniae presenting their normal appearance only at the extreme circumference of the thallus in entire specimens. In the fertile plants seen, the apothecia are few and small, with the receptacular margin thickish.

Hab. On the trunks of old trees in upland districts.—*Distr.* Only in W. England and among the Central Grampians, Scotland.—B. M.: Harboro' Magna, Warwickshire. Craig Tulloch, Blair Athole, Perthshire.

Form 2. *deminuta* Cromb. Journ. Bot. 1882, p. 273.—Thallus effuse, more or less diffract, the laciniae minute. Apothecia very small, pruinose.

Probably only a starved condition of the preceding form, in which the laciniae are either somewhat congested or scattered. In our few specimens the apothecia are, with one exception, very sparingly present.

Hab. On the trunks and branches of trees in maritime and upland districts.—*Distr.* Only sparingly in S. and W. England, S. Wales, and the Channel Islands.—B. M.: Island of Guernsey. Shanklin and Appuldurcombe, Isle of Wight; near Cirencester, Gloucestershire; Dolgelly, Merionethshire.

Form 3. *argyphaea* Nyl. Lich. Scand. (1861) p. 104.—Thallus entirely white-pruinose; laciniae somewhat firm and slightly dilated at the circumference. Apothecia constantly pruinose, the receptacle often unequal or sometimes subcrenulate.—Cromb. Journ. Linn. Soc. Bot. xvii. p. 571.—*Parmelia pulverulenta* β . *argyphaea* Ach. Lich.

Univ. (1810) p. 474. *Lichenoides glaucum orbiculare, segmentis latiusculis, scutellis nigris* Dill. Musc. 177, t. 24, f. 71 n.

The milk-white pruina with which the thallus and apothecia are covered is often but little dense. It has somewhat the appearance of subsp. *pityrea*, from which it at once differs in the absence of soredia. The apothecia are rare in the British specimens.

Hab. On trunks of trees in maritime and mountainous districts.—*Distr.* Very local and scarce in S. England, the Central Grampians, Scotland, and S.W. Ireland.—B. M.: Isle of Wight. Craig Tulloch, Blair Athole, Perthshire. Adare, co. Limerick.

Var. β . *subvenusta* Nyl. Bull. Soc. Linn. Normand. sér. 2, t. vi. (1872) p. 285.—Thallus more or less pruinose. Apothecia moderate or somewhat large, pruinose, the receptacle crowned at the base.—*Physcia pulverulenta* f. *laciniolata* Cromb. Journ. Bot. 1872, p. 358. *P. pulverulenta* var. *venusta* Leight. Lich. Fl. p. 147 pro parte, ed. 3, p. 136 pro parte. *Lichen pulverulentus* Eng. Bot. t. 2063. *Lichen stellaris* β . Lightf. Fl. Scot. ii. p. 824; γ . Huds. Fl. Angl. ed. 2, p. 534; var. 3, With. Arr. ed. 3, iv. p. 31. *Lichenoides scutellis limbo cinereo crispo cinctis* Dill. in Ray Syn. ed. 3, p. 75.

Distinguished by the lacinioli or lobules which crown the base of the receptacle, in which respect it is subsimilar to subsp. *venusta*. Occasionally the thallus also is more or less covered with minute suberect lobules. The apothecia are generally numerous, and, in entire specimens, some have the receptacle nearly or quite naked.

Hab. On the trunks of old trees in maritime and upland districts.—*Distr.* Somewhat local and scarce in England; rare in S. Scotland and among the S. Grampians.—B. M.: Norwich, Norfolk; Hentfield and Glynde, Sussex; Respring and near Penzance, Cornwall; Kemble, Wiltshire; Windsor Great Park, Berkshire; near Cambridge; Oswestry, Shropshire; Levens, Westmoreland. Ravelrig, near Edinburgh; Finlarig, Killin, Perthshire.

Var. γ . *angustata* Nyl. Act. Soc. Linn. Bord. sér. 3, i. (1856) p. 308.—Thallus somewhat small, pale greyish-red or subcervine, epruinose; laciniae narrow, discrete, beneath densely blackish-hispid with rhiziniae. Apothecia rather small, naked or pruinose, brown or brownish-black.—Cromb. Lich. Brit. p. 38; Leight. Lich. Fl. p. 147, ed. 3, p. 135.—*Borrera pulverulenta* β . *angustata* Mudd, Man. p. 110. *Lichen angustatus* Hoffm. Enum. (1784) p. 77, t. 11, f. 2.

The narrow discrete laciniae and the numerous rhiziniae render this a well-marked variety. In its typical condition, as noticed by Acharius, Lich. Univ. p. 474, the laciniae are continuous from the centre to the circumference; but intermediate states occur in which the laciniae are shorter and not so continuous, as is usually the case in Britain. The apothecia in our specimens are not very numerous.

Hab. On the trunks of old trees in upland districts.—*Distr.* Local and

rare in S. England and S.W. Scotland.—B. M.: Appuldurcombe, Isle of Wight; St. Leonard's Forest, Sussex; Ilsham Valley, Torquay, and Wembury, S. Devon. Near Creetown, Kirkcudbrightshire.

Var. *δ. subpapillosa* Cromb. Journ. Bot. 1882, p. 273.—Thallus greyish-white, pruinose, almost entirely subgranulato-unequal or subpapillato-granulate. Apothecia nearly moderate, pruinose, with turgid margin.

A very singular and, if constant, well-marked variety, which is so abnormal that at first sight it would scarcely be referred to this species. In the single specimen seen the thallus has only one or two short laciniae here and there visible at the extreme circumference. There are but two apothecia present, in which the margin is also slightly subpapillate.

Hab. On the trunk of an old tree in a lowland tract.—*Distr.* Seen only from E. England.—B. M.: Bury St. Edmunds, Suffolk.

Subsp. 1. *P. venusta* Nyl. ex Lamy, Bull. Soc. Bot. t. xxv. (1878) p. 383.—Thallus cervine or cervine-greyish, epruinose, somewhat narrowly incised. Apothecia moderate, the margin crowned with horizontal thalline lacinioles.—Cromb. Grevillea, xv. p. 78.—*Physcia pulverulenta* var. *venusta* Cromb. Lich. Brit. p. 39; Leight. Lich. Fl. p. 147 pro parte, ed. 3, p. 136 pro parte. *Parmelia venusta* Ach. Meth. (1803) p. 211, t. 8. f. 5.

Differs in the colour of the naked thallus, the narrower laciniae, and the coronate margins of the apothecia, which entitle it to rank as a subspecies. It is to be noted, however, that states occasionally occur evidently belonging to this subspecies in which the receptacular margin is nearly or almost denudate (form *ecoronata* Cromb.). The apothecia in the British specimens are not numerous, though somewhat crowded.

Hab. On trunks of old trees in wooded upland situations.—*Distr.* Local and scarce in S.W. England, S.W. Scotland, the S. and W. Highlands, and in S.W. Ireland.—B. M.: Ilsham, Torquay, S. Devon. New Galloway, Kirkcudbrightshire; by Loch Tay, Kenmore, Perthshire; S. of Fort William, Inverness-shire. Carrigaloe, co. Cork; Ballynegarde, co. Limerick.

Subsp. 2. *P. pityrea* Nyl. ex Lamy, Bull. Soc. Bot. t. xxv. (1878) p. 383.—Thallus subeffuse, thinner, appressed and adnate, greyish-white or subcervine; laciniae somewhat short, sorediate at the margins (K^- , $CaCl^-$). Apothecia small, pruinose, the margin crenulate or sorediato-lacerate; spores 0.024–28 mm. long, 0.015–18 mm. thick.—Cromb. Grevillea, xv. p. 78.—*Physcia pulverulenta* var. *pityrea* Cromb. Lich. Brit. p. 38; Leight. Lich. Fl. p. 146, ed. 3, p. 135. *Parmelia pityrea* Sm. Eng. Fl. v. p. 201. *Lichen pityreus* Ach. Prodr. (1798) p. 124; Eng. Bot. t. 2064. *Borreria pulverulenta* γ. *grisea* (Lam.) Mudd, Man. p. 111. *Lichenoides glaucum orbiculare, segmentis latiusculis, scutellis nigris* Dill. Musc. 177, t. 23.

f. 71 c.—*Brit. Ecs.*: Mudd, n. 83; Leight. n. 370; Cromb. n. 51; Larb. Lich. Hb. n. 48.

Well characterized by the thinner, more adnate thallus, the shorter and marginally sorediate laciniae, and the smaller apothecia with their usually sorediate thalline margin. These characters, more especially the soredia, which are sometimes very abundant and obliterate the laciniae in the centre of the thallus, make it a distinct sub-species. In our specimens the apothecia, which are central, are not often present; and the spermatogones, which are similar to those of the type, are also but rarely seen.

Hab. On the trunks of trees, rarely on old walls, in maritime, lowland, and upland cultivated tracts.—*Distr.* General and common in most parts of England; apparently rare in Scotland and the Channel Islands; not yet with certainty gathered in Ireland.—B. M.: Island of Guernsey. Saham Wood, Norfolk; near Bury, Suffolk; High Beech, Epping Forest, Essex; Basingstoke, Kent; Glynde, Sussex; Lymington, Hants; Ryde and Appuldurecombe, Isle of Wight; near Cheltenham and Cirencester, Gloucestershire; Edgeware, Middlesex; near Elstree, Herts; Pampisford, Cambridgeshire; near Adderbury, Oxfordshire; Malvern and near Kempsey, Worcestershire; Harboro' Magna, Warwickshire; Ludlow Park, Shropshire; Aberdovey, N. Wales; Carlton, Cleveland, Yorkshire; Windermere, Westmoreland. Appin, Argyshire; Blairdrummond, near Stirling; Glen Ample, Perthshire; Drum, near Aberdeen.

Subsp. 3. *P. muscigena* Nyl. Syn. i. (1860) p. 418.—Thallus depressed at the circumference, more or less ascending in the centre, livid-chestnut or cervine-brown, usually casio-pruinose; laciniae somewhat short, dilated and discrete (K^- , $CaCl^-$). Apothecia with the thalline margin crenate; spores 0.024–30 mm. long, 0.011–15 mm. thick.—Cromb. *Grevillea*, xv. p. 78.—*Physcia pulverulenta* var. *muscigena* Leight. Lich. Fl. Suppl. p. 479, ed. 3, p. 136. *Parmelia muscigena* Ach. Lich. Univ. (1810) p. 472.

Distinguished by the laciniae, the crenate margin of the apothecia, the smaller spores, and the nature of the habitat. These differences, however, are scarcely sufficient to warrant our regarding it, with some older and more recent authors, as a distinct species, but only as a well-marked sub-species of this very variable plant. In the only British specimen gathered the apothecia, which are elsewhere very rare, are not present, nor are the spermatogones visible.

Hab. On decayed mosses on the ground in a subalpine region.—*Distr.* Found only on the summit of one of the Central Grampians, Scotland.—B. M.: Craig Tulloch, Blair Athole, Perthshire.

11. *P. subdetersa* Nyl. Flora, 1878, p. 344.—Thallus orbicular, moderate, pale-cervine, subnaked or here and there yellowish-sorediate; laciniae somewhat short (K^-); medulla yellow ($K+$ deeper yellow). Apothecia unknown.

Well distinguished from *P. pulverulenta* var. *detersa* Nyl. (which has not occurred with us) by the colour of the medulla. It approaches *P. enteroxantha* Nyl., a Pyrenean plant, but differs in not being white-pruinose and in the medullary reaction. It is never seen fertile.

Hab. Among mosses on rocks in subalpine regions.—*Distr.* Only very sparingly in W. England and the S. Grampians, Scotland.—B. M.: North Hill, Malvern, Worcestershire. Ben Lawers, Perthshire.

12. *P. aquila* Nyl. Act. Soc. Linn. Bord. sér. 3, i. (1856) p. 309.—Thallus suborbicular, appressed, narrowly laciniate, chestnut-brown; beneath pale and sparingly blackish-fibrillose; laciniae multipartite, somewhat convex, explanate at the circumference, imbricato-congested (K^- , $CaCl^-$). Apothecia adnate, moderate, concave or somewhat plane, brownish-black, the margin tumid, subcrenate; spores 0.030–44 mm. long, 0.018–25 mm. thick.—Cromb. Lich. Brit. p. 39; Leight. Lich. Fl. p. 153, ed. 3, p. 142.—*Borreria aquila*, Mudd, Man. p. 111. *Parmelia aquila* Gray, Nat. Arr. i. p. 441; Hook. Fl. Scot. ii. p. 54; Sm. Eng. Fl. v. p. 203; Tayl. in Mack. Fl. Hib. ii. p. 143. *Lichen aquilus* Ach. Prodr. (1798) p. 109; Eng. Bot. t. 982. *Lichen pullus* Lightf. Fl. Scot. ii. p. 825. *Lichen fuscus* Huds. Fl. Angl. ed. 2, p. 533. *Lichen obscurus* With. Arr. ed. 3, iv. p. 28. *Lichenoides angustifolium fuscum, scutellis pullis* Dill. Musc. 175, t. 24. f. 69.—*Brit. Ews.*: Leight. n. 144; Larb. Cæsar. n. 23; Dicks. Hort. Sic. 25; Bohl. n. 111.

Easily recognized by its chestnut-brown, narrowly laciniate thallus, and by its saxicolous habitat. The thallus, of which the cortical layer presents intricate tubulose cavities, is sometimes widely expanded, in which case in old plants it occasionally becomes zonately centrifugal. States occasionally occur with us passing into var. *stippea* (Ach.), but not sufficiently typical. The apothecia are common, sometimes very numerous and crowded, with the spores often thicker at one or the other apex. The spermatogones also are not unfrequent.

Hab. On rocks in maritime districts, rarely on hills at some distance from the sea in upland tracts.—*Distr.* General and not uncommon on most of the rocky coasts of Great Britain, Ireland, and the Channel Islands: very abundant on the coast of Kincardineshire in N.E. Scotland.—B. M.: Petit Port, Island of Jersey; Island of Guernsey. Near Chichester, Sussex; Torquay, Bolt Head, Hay Tor, Dartmoor, and near Okehampton, Devonshire; Temple Moor, Stoneyford, Penzance, The Lizard, Roche rocks, and Helminston, Cornwall; Mynydd-y-Myfyr, near Oswestry, Shropshire; near Tenby, Pembrokeshire; Barmouth and Harlech Castle, Merionethshire; Llanberis, Carnarvonshire; Holyhead, Island of Anglesea; Douglas Head, Isle of Man; Holy Island, Northumberland; Barrowmouth, Cumberland. New Galloway, Kirkcudbrightshire; King's Park and Turfin Hill, near Edinburgh; Barcaldine, Argyleshire; Portlethen, Kincardineshire; near Peterhead, Aberdeenshire. Ballycotton and Mizen Head, co. Cork; Kenmare River, co. Kerry; Connemara, co. Galway; Ardglass, co. Down.

13. *P. stellaris* Nyl. Flora, 1870, p. 38.—Thallus orbicular, stellari-appressed, multifido-laciniate, white, greyish or glaucous-white; beneath whitish, with greyish fibrillose rhizine; laciniae sublinear, convex, contiguous ($K^{+yellow}$, $CaCl^-$). Apothecia submode-

rate, sessile, brownish-black, caesio-pruinose or naked, the thalline margin entire or crenate; spores 0.016-24 mm. long, 0.008-11 mm. thick.—Cromb. Grevillea, xv. p. 78.—*Parmelia stellaris* Hook. Fl. Scot. ii. p. 55 pro parte; Sm. Eng. Fl. v. p. 201 pro parte. *Lichen stellaris* Linn. Sp. Pl. (1753) p. 1144; Ach. Prodr. p. 111. *Borreria obscura* β . *chloantha* (non Ach.) Mudd, Man. p. 110. *Physcia retrogressa* Stirt. Trans. Glasg. Soc. Nat. 1875, p. 85 vix differt.—As observed by Acharius (Meth. p. 209) the synonymy was then (as it still is) for the most part doubtful. It is, however, the plant of Linnaeus according to specimens in his herbarium.—*Brit. Ees.*: Mudd, n. 81.

Distinguished from *P. pulverulenta* and its varieties by the smaller, pruinose thallus, which does not become greenish when moist, and by the smaller spores. It has been almost always confounded with the following species, and especially with its var. β . The apothecia are numerous, chiefly central, with the margin often flexuose. The spermatogones are not unfrequent, with spermatia equally cylindrical, 0.0045 mm. long, scarcely 0.001 mm. thick. It is a variable plant, presenting the varieties and subspecies to be described.

Hab. On the trunks and branches of trees by roadsides, and in avenues of lowland and upland tracts.—*Distr.* Seen only from a very few localities in N. England and the Grampians, Scotland; no doubt overlooked elsewhere.—*B. M.*: Near Ayton, Cleveland, Yorkshire. Finlarig, Killin, Perthshire; Monaltrie House, Ballater, Aberdeenshire.

Var. β . *leptalea* Nyl. Syn. i. (1860) p. 425.—Thallus narrowly laciniate; laciniae discrete, appressed, fibrilloso-ciliate at the margins, the cilia whitish or brownish; otherwise as in the type.—Cromb. Lich. Brit. p. 39; Leight. Lich. Fl. p. 151, ed. 3, p. 140.—*Lichen leptaleus* Ach. Prodr. (1798) p. 108. *Borreria hispida* Mudd, Man. p. 106. *Lichenoides hispidum minus et tenerius, scutellis nigris* Dill. Musc. t. 20. f. 46, A, B, D.

Differs in the narrower, more discrete, and marginally ciliate laciniae. It must not be confounded, as has sometimes been done, with less fornicate states of the following subspecies. The apothecia, which are not unfrequent, vary similarly to those of the type.

Hab. On the trunks of trees, rarely on rocks, in lowland and upland districts.—*Distr.* Occurs only here and there throughout England, in N. Wales, S.W. and Central Scotland; rare in Ireland.—*B. M.*: St. Leonard's Forest, Sussex; Lymington, Hants; Brading, Isle of Wight; Bolt Head, S. Devon; near Penzance, Cornwall; Oswestry, Shropshire; Aberdovey, Merionethshire; Island of Anglesea: near Gainsford, Durham. Near Edinburgh; Appin, Argyleshire; Killin and Blairdrummond, Perthshire; Auchterhouse, Forfarshire; Cults, near Aberdeen. Carrigaloe, Cork Harbour.

Var. γ . *subobscura* Nyl. Sällsk. F. et Fl. Fenn. Forh. iv. (1859) p. 239; Syn. i. p. 426.—Thallus greyish or greyish-brown, beneath white with scarcely any rhizinae; laciniae short, narrow, the marginal cilia blackish or dark; otherwise as in the preceding

variety.—Leight. Lich. Fl. ed. 3, p. 141; Cromb. Grevillea, xv. p. 78.

Might be taken for a state of *P. obscura* or *P. cæsia* esorediate, from both of which it is readily distinguished by the marginal cilia. It is closely allied to the preceding variety, from which it differs in the colour of the thallus and of the cilia, and in the almost entire absence of rhizinae on the under surface. In the few British specimens there are no apothecia.

Hab. On rocks in maritime districts.—*Distr.* Only in the Channel Islands, the S.W. Highlands of Scotland, and N.W. Ireland; no doubt to be detected elsewhere.—B. M.: La Moye, Island of Jersey. Barcal-dine, Argyleshire. Leenane, co. Galway.

Subsp. 1. *P. tenella* Nyl. Flora, 1874, p. 306.—Thallus subeffuse, narrowly laciniate; laciniae ascending, usually tubuloso-inflated or fornicate at the apices, white fibrilloso-ciliate at the margins. Apothecia small or moderate, the margin entire or crenulate.—Cromb. Grevillea, xv. p. 78.—*Physcia stellaris* var. *tenella* Cromb. Lich. Brit. p. 39; Leight. Lich. Fl. p. 151, ed. 3, p. 141. *Borrera hispida* β. *tenella* Mudd, Man. p. 106. *Parmelia tenella* Tayl. in Mack. Fl. Hib. ii. p. 147. *Borrera tenella* Gray, Nat. Arr. i. p. 434; Hook. Fl. Scot. ii. p. 56; Sm. Eng. Fl. v. p. 222. *Lichen tenellus* Scop. Fl. Carn. (1760) p. 1406; Eng. Bot. t. 1351; With. Arr. ed. 3, iv. p. 56. *Lichen ciliaris* β. Huds. Fl. Angl. ed. 2, p. 538; Lightf. Fl. Scot. ii. p. 828. *Lichenoides hispidum minus et tenerius, scutellis nigris* Dill. Musc. 152, t. 20. f. 46, c, e.—*Brit. Exs.*: Leight. n. 174; Mudd, n. 78; Cromb. n. 151; Larb. Lich. Hb. n. 330; Bohl. n. 20.

Looks at first sight as if it were a distinct species. It is readily recognized by the hooded-like apices of the ascendant laciniae, though these finally become sorediate. The thallus and the marginal cilia, which are either simple or variously divided, often become darker-coloured in age, or when growing in dry exposed places. The apothecia are not unfrequent, and the spermatogones are often numerous.

Hab. On the trunks and branches of trees, old walls, and occasionally boulders in maritime and upland districts.—*Distr.* General and common in Great Britain; apparently rare in Ireland and the Channel Islands.—B. M.: La Moye, Island of Jersey; Island of Guernsey. Earsham, Norfolk; Bury St. Edmunds, Suffolk; Walthamstow, Essex; Shanklin, Isle of Wight; Plymouth, Devonshire; near Penzance and Withiel, Cornwall; near Cirencester, Gloucestershire; Twycross, Leicestershire; Grimsbury Green, Northamptonshire; Buxton, Matlock, and Darley, Derbyshire; Herefordshire Beacon and Malvern, Worcestershire; Haughmond Hill, Shropshire; Tenby, Pembrokeshire; near Usk, Monmouthshire; Dolgelly and Llyn Bodlyn, Merionethshire; Island of Anglesea: near Stokesley and Kildale, Cleveland; Croft Head, Westmoreland; Holy Island, Northumberland; near Asby, Cumberland. Swanston Wood, near Edinburgh; Appin, Argyleshire; Killin and Ben Lawers, Perthshire; Montrose, Forfarshire; Castleton of Braemar, Aberdeenshire. Carrigaloe, co. Cork; Dromoreland, co. Clare.

Form *exempta* Fr. fil. Lich. Scand. (1871) p. 140.—Laciniae shorter, broader, imbricate, naked or very sparingly and shortly ciliate; otherwise as above.—*Parmelia tenella* var. *exempta* Tayl. in Mack. Fl. Hib. ii. p. 147. *Borreria tenella* γ. *exempta* Ach. Lich. Univ. (1810) p. 499.—As noticed by Taylor, *l. c.*, his specimen was referred by Borrer to *P. erosa*.

Seems to be merely a modification of the type, from which it is distinguished, at least as a well-marked form, by the characters of the laciniae. Our only British specimen is sterile.

Hab. On the trunks of willows in upland situations.—*Distr.* Seen only sparingly from S.W. Ireland.—B. M.: Ballynegarde, co. Limerick.

14. *P. aipolia* Nyl. Flora, 1870, p. 38.—Thallus orbicular, stellari-appressed, multifido-laciniate, whitish; beneath concolorous with greyish-brown rhizinae; laciniae somewhat plane, narrow, subcontiguous, discrete, and with the apices crenulate at the circumference (K^+ yellow, $CaCl^-$). Apothecia submoderate, somewhat convex, brownish-black, cesio-pruinose or naked, the thalline margin entire; spores 0.016–26 mm. long, 0.008–11 mm. thick.—Cromb. Journ. Bot. 1870, p. 97.—*Lichen aipolius* Ach. Prodr. (1798) p. 112. *Physcia stellaris* var. *acrita* Cromb. Lich. Brit. p. 39. *P. aipolia* form *acrita* Cromb. Journ. Linn. Soc. Bot. xvii. p. 571. *Lichen stellaris* Huds. Fl. Angl. p. 448 (ex specimine in Herb. Huds.). *Lichenoides cinereum, segmentis angustis stellatis, scutellis nigris* Dill. Musc. 176, t. 23. f. 70, A, B.

Frequently not distinguished, even as a variety, from the preceding, to which it is subsimilar. The planer, more divided laciniae, which are discrete at the circumference, and especially the positive reaction of the medulla, well characterize it and raise it to its Acharian specific rank. In its typical condition (*a. acrita* Ach. Lich. Univ. p. 477) the thallus is entirely smooth in a young state, but at length becomes slightly rugose in the centre. It is usually well fertile, the apothecia being chiefly central.

Hab. On the trunks and branches of trees in cultivated tracts, often in orchards, rarely on old pales, very rarely on calcareous walls, of maritime, lowland, and upland districts.—*Distr.* Rather local in S. and N. England, N. Wales, the S.W., Central, and N. Highlands of Scotland, and in N.W. Ireland.—B. M.: Near Lewes, Sussex; Shanklin, Isle of Wight; Ilsham Valley, Torquay, S. Devon; Penzance, Cornwall; Hafod, Cardiganshire; Dolgelly, Merionethshire; near Kendal, Westmoreland. Appin, Argyleshire; Killin and foot of Ben Lawers, Perthshire; Castleton of Braemar, Aberdeenshire; Applecross, Ross-shire. Kylemore and Lough Inagh, Connemara, co. Galway.

Var. β. *anthelina* Cromb. Grevillea, xv. (1887) p. 78.—Thallus narrowly laciniate, beneath with black rhizinae; laciniae more discrete, somewhat convex. Apothecia submoderate, crowded or scattered, at length slightly convex, the thalline margin entire.—

Physcia stellaris var. *aiPOLIA* f. *anthelina* Nyl. Lich. Scand. p. 111.
Lichen anthelinus Ach. Prodr. (1798) p. 111.

The narrower and more discrete laciniae, which are either entirely smooth or somewhat rugose, distinguish this variety. In what Acharius subsequently (Lich. Univ. p. 478) regarded as the more typical state, the laciniae are continuous from the centre to the circumference, when it is entirely analogous to var. *angustata* of *P. pulverulenta*. In the few British specimens the apothecia are numerous.

Hab. On the trunks and branches of trees in maritime and upland districts.—*Distr.* Only sparingly in S. England and S.W. Ireland.—B. M.: Henfield, Sussex; near Ryde, Isle of Wight; Ilsham Valley, near Torquay, Devonshire. Muckruss Demesne, Killarney, co. Kerry.

Var. γ . *cercidia* Nyl. ex Lamy, Bull. Soc. Bot. t. xxv. (1878) p. 384.—Thallus whitish or greyish-white, somewhat rugose, beneath with blackish rhizine; laciniae contiguous, somewhat convex, short, difform and crowded in the centre, plane and broader at the circumference. Apothecia moderate or somewhat large, plane, the thalline margin at length crenulate.—Cromb. Grevillea, xv. p. 78.—*Parmelia aiPOLIA* β . *cercidia* Ach. Lich. Univ. (1810) p. 478. *Physcia stellaris* Cromb. Lich. Brit. p. 39 (excl. var. *acrita*); Leight. Lich. Fl. p. 151, ed. 3, p. 140. *Borreria stellaris* Mudd, Man. p. 109. *Parmelia stellaris* Tayl. in Mack. Fl. Hib. ii. p. 142. *Lichen stellaris* Lightf. Fl. Scot. ii. p. 824; With. Arr. iv. p. 31 pro parte; Eng. Bot. t. 1697.—*Brit. Exs.*: Leight. n. 6; Mudd, n. 79; Larb. Lich. Hb. no. 161.

A larger and coarser plant with somewhat of the aspect of *P. pulverulenta*. It differs from the type in the colour of the rhizine and in the more contiguous, convex, and rugose laciniae, which are at times as if imbricato-squamose in the centre. The apothecia are often very numerous and crowded, sometimes nearly obliterating the thallus, when they become flexuose and deformed.

Hab. On the trunks of old trees, very rarely on calcareous walls, in cultivated tracts from maritime to upland districts.—*Distr.* General and plentiful in most parts of Great Britain: apparently rare in S. Ireland and in the Channel Islands.—B. M.: Island of Guernsey. Yarmouth, Norfolk; Walthamstow, Essex; Edgeware, Middlesex; near Elstree, Herts; Reigate, Surrey; Glynde, near Hastings, and Henfield, Sussex; near Ryde, Isle of Wight; Withiel and Penzance, Cornwall; near Nailsworth, Gloucestershire; Madingley Park, Cambridgeshire; Twycross, Leicestershire; Pixham, near Worcester, and North Malvern, Worcestershire; Harboro' Magna, Warwickshire; Llandrindod, Radnorshire; Aberdovey, Merionethshire; Clungunford and near Shrewsbury, Shropshire; near Aytton, Cleveland, Yorkshire; Kendal and Windermere, Westmoreland; Alston, Cumberland; near Hexham, Northumberland. Troquain, New Galloway, Kirkcudbrightshire; near Melrose, Roxburgh; near Edinburgh; Inverary Castle, Argyshire; Blair Drummond, near Stirling; Finlarig, Killin, Perthshire; Camperdown, Forfarshire; Cults, near Aberdeen, and Castleton of Braemar, Aberdeenshire; Fort William, Inverness-shire; Applecross, Ross-shire. Near Cork; Dunkerron, co. Kerry.

15. *P. melops* Duf. (sub *Parmelia*) ex Nyl. Flora, 1874, p. 16.—Thallus orbicular, stellari-appressed, multifido-laciniate, more or less cæcio-greyish; laciniae narrow, contiguous, convex (K^+ yellow, $CaCl^-$). Apothecia small, plane, the thalline margin entire or at length slightly crenulate; spores as in the preceding species.—Cromb. Journ. Bot. 1885, p. 195.

Closely allied to *P. alpina*, from which it differs chiefly in the darker caesious thallus. Our single British specimen is sterile, with the thallus not well developed. According to Nylander *l. c.* it is a widely distributed saxicolous plant in the mountainous regions of Europe.

Hab. On a calcareous wall among dead mosses in a maritime mountainous district.—*Distr.* Seen only in the S.W. Highlands of Scotland; no doubt to be detected elsewhere.—B. M.: Appin, Argyleshire.

16. *P. tribacia* Nyl. Flora, 1874, p. 48.—Thallus orbicular or subeffuse, moderate, shortly laciniate, glaucous-white or white, sprinkled with small, subglobose, concolorous soredia, usually slightly subfarinaceo-suffused; beneath whitish, with a few concolorous fibrillose rhizinae; laciniae crowded, imbricate, digitato-crenate at the apices (K^+ yellow, $CaCl^-$). Apothecia moderate, scattered, blackish, the thalline margin subentire or subcrenulate; spores oblong, 0015–20 mm. long, 0,008–11 mm. thick.—Cromb. Grevillea, xv. p. 78.—*Borreria caesia* β . *tribacea* Mudd, Man. p. 107. *Squamaria tribacia* Sm. Eng. Fl. v. p. 194 pro parte. *Psoroma tribacium* Gray, Nat. Arr. i. p. 445. *Lecanora tribacia* Ach. Lich. Univ. (1810) p. 415.

A plant little understood by authors, allied to *P. stellaris*, with which it agrees in the reactions. It differs, however, in the thallus being generally covered with a thin farina, in the presence of soredia, and in the more crowded laciniae being digitately crenate at the apices. In the soredia it approaches *P. caesia*, but differs in all other essential characters. The apothecia are not present in the British specimens (*cfr.* Ach. *l. c.*).

Hab. On fruit-trees of orchards in maritime districts.—*Distr.* Confined to a few localities in S. England and the Channel Islands.—B. M.: St. Martin's, Island of Jersey. Lymington, Hants; near Penzance, Cornwall.

17. *P. tribacoides* Nyl. Flora, 1874, p. 307.—Thallus orbicular, small, shortly laciniate, whitish, sprinkled with small, subglobose, white soredia, sparingly subfarinaceo-suffused; beneath whitish, nearly naked; laciniae narrow, crowdedly imbricate, digitato-crenate at the apices (K^+ yellow, $CaCl^-$). Apothecia not seen rightly developed.—Cromb. Grevillea, iii. p. 22; Leight. Lich. Fl. ed. 3, p. 140.

Subsimilar to the preceding species, from which, besides other characters, it at once differs in the reaction of the medulla with K. In the specimen gathered there are only two young apothecia.

Hab. On the smooth bark of a young tree in a maritime district.—*Distr.* Extremely local and rare, in S. England.—B. M.: Near Ryde, Isle of Wight.

18. *P. erosa* Leight. Lich. Fl. (1871) p. 152.—Thallus suborbicular, moderate, shortly laciniate, greyish or glaucous-white; beneath whitish, sparingly fibrilloso-rhizinose; laciniae crowdedly imbricate, more or less ascending, rounded and eroso-lacerate or at length pulverulent at the apices (K^+ yellow, $CaCl^+$ yellow). Apothecia moderate, brownish-black, the thalline margin subentire; spores oblong, 0,014–20 mm. long, 0,007–10 mm. thick.—Cromb. Journ. Bot. 1872, p. 358; Leight. Lich. Fl. ed. 3, p. 139.—*Parmelia erosa* Borr. Eng. Bot. Suppl. 1837, t. 2807. *Borreria cæsia* γ. *albinea* (non Ach.) Mudd, Man. p. 108, t. ii. f. 31; Cromb. Lich. Brit. p. 39. *Squamaria tribacia* Sm. Eng. Fl. ii. p. 194 pro parte.—*Brit. Eas.*: Leight. n. 266; Larb. Cæsar. n. 24; Lich. Hb. n. 294.

A well-marked species somewhat resembling *P. tribacia*, from which it is well distinguished by the efarinose and esorediate thallus, the apices of the laciniae, and the different chemical reactions. The apothecia, which with us are extremely rare, are chiefly central, numerous, with the thalline margin at length subcrenate.

Hab. On trees, walls, and rocks in maritime and upland districts.—*Distr.* Not very general nor common throughout England and in the Channel Islands; rare in S. Scotland, the S.W. Highlands and S. Grampians; not yet seen in Ireland.—B. M.: Rozel, St. Ouen's, and La Moye, Island of Jersey; Jerbourg and Moulin Huet, Island of Guernsey. Bexhill and Hurstpierpoint, Sussex; Porchester, Hants; Plymouth and Wembury, S. Devon; near Penzance and Withiel, Cornwall; St. Mary's, Scilly; near Swindon, Wilts; Malvern, Worcestershire; Nannau, Dolgelly, Barmouth, and Aberdovey, Merionethshire; near Ayton, Cleveland, Yorkshire; near Staveley, Westmoreland. New Galloway, Kirkcudbrightshire; Bercaldine, Argyleshire; Ben Lawers, Perthshire.

19. *P. astroidea* Nyl. Act. Soc. Linn. Bord. sér. 3, i. (1856) p. 308.—Thallus orbicular, thin, closely adpressed, granulose or leprose in the centre, laciniato-effigurate at the circumference, greyish-white; beneath whitish, black fibrilloso-rhizinose; laciniae narrow, contiguous (K^+ yellow, $CaCl^+$ yellow). Apothecia innato-sessile, small, concave or plane, brownish-blackish, naked or pruinose, the thalline margin inflexed, crenulate; spores ellipsoideo-oblong, 0,017–26 mm. long, 0,008–11 mm. thick.—Cromb. Lich. Brit. p. 39; Leight. Lich. Fl. p. 153, ed. 3, p. 139.—*Borreria astroidea* et β. *Clementi* Mudd, Man. p. 108, t. ii. f. 32. *Parmelia astroidea* Clem. Ens. Add. (1807) p. 302. *Squamaria Clementi* Sm. Eng. Fl. v. p. 196. *Parmelia Clementi* Turn. Trans. Linn. Soc. ix. p. 146, t. 13. f. 1; Gray, Nat. Arr. i. p. 439; Tayl. in Mack. Fl. Hib. ii. p. 147. *Lichen Clementi* Eng. Bot. t. 1779.—*Parmelia*

columnaris Tayl. in Fl. Hib. ii. p. 144, is a more granulose state.—*Brit. Exs.*: Leight. n. 324.

Easily recognized by the thallus being often almost entirely granulose or leprose, with the laciniae visible only at or towards the circumference. With us it is but seldom and sparingly seen with apothecia. The spermogones apparently do not occur in Britain.

Hab. On the trunks of trees, often in orchards, and on tiled roofs in maritime and lowland districts.—*Distr.* Somewhat local and scarce in S. and Central England, N. Wales, S. Ireland, and the Channel Islands: not seen from Scotland.—B. M.: St. Martin's, Island of Jersey; Island of Guernsey. Epping Forest, Essex; near Maidstone and Tunbridge Wells, Kent; near Lewes, between Hentfield and Brighton, and Hursley-point, Sussex; near Southampton, Hants; Ryde, Isle of Wight; near Plymouth, Devonshire; Penzance, Cornwall; West Haddon, Northamptonshire; near Barmouth, Merionethshire. Tervoe, co. Limerick; Carrigalim, near Cork.

Form elegans Nyl. ex Leight. Lich. Fl. ed. 3 (1879) p. 139.—Thallus glaucous-white; laciniae finely isidioso-fimbriate at the margins. Apothecia not seen.—*Brit. Exs.*: Larb. Lich. Hb. n. 88.

The peculiar fimbriate margins of the laciniae, which are not leproso-granulose, render this a somewhat distinct form. It does not occur fertile.

Hab. On rocks in a maritime district.—*Distr.* Found only very sparingly in N.W. Ireland.—B. M.: Kylemore Lake, co. Galway.

20. *P. cæsia* Nyl. Act. Soc. Linn. Bord. sér. 3, i. (1856) p. 308.—Thallus orbicular, closely adnate, stellate, multifido-laciniate, cæσιο-white or greyish-white, sprinkled with cæsius subglobose soredia; beneath pale and sparingly fibrillose; laciniae narrow, convex, contiguous, slightly dilated at the apices (K^+ yellow, $CaCl^-$). Apothecia sessile, small, concave or plane, black, naked or pruinose, the thalline margin thickish, entire or crenulate; spores oblong, 0.016–23 mm. long, 0.009–13 mm. thick.—Cromb. Lich. Brit. p. 39.—*Physcia stellaris* var. *cæsia* Leight. Lich. Fl. p. 152, ed. 3, p. 141. *Borreria cæsia* Mudd, Man. p. 107. *Squamaria cæsia* Sm. Eng. Fl. v. p. 196. *Parmelia cæsia* Gray, Nat. Arr. i. p. 443; Tayl. in Mack. Fl. Hib. ii. p. 147. *Lichen cæsius* Hoffm. Enum. (1784) p. 65, t. 12. f. 1; Eng. Bot. t. 1052. *Lichen Psora* Dicks. Crypt. fasc. iii. p. 17; With. Arr. ed. 3, iv. p. 26. *Lichenoides cinereum*, *segmentis argutis stellatis, scutellis nigris* Dill. Musc. 176, t. 24. f. 70 c.—*Brit. Exs.*: Leight. n. 323.

Distinguished from its more immediate allies by the pulvinate cæsius soredia, which are scattered regularly over the thallus and rarely become confluent. The apothecia are chiefly central and not of frequent occurrence.

Hab. On walls, roofs, and boulders in lowland and upland districts.—*Distr.* General though not common in England; much rarer in Scot-

land; rare in the Channel Islands and N. Wales; not seen from Ireland.—B. M.: Island of Guernsey. Acle, Norfolk; Walthamstow, Essex; Richmond House, Surrey; Withiel and near Penzance, Cornwall; near Oxford; Twycross, Leicestershire; near Harboro' Magna, Warwickshire; Buxton, Derbyshire; near Oswestry, Shropshire; Barmouth, Merionethshire; Ayton, Cleveland, Yorkshire; Teesdale, Durham; near Kendal, Westmoreland; near Hexham, Northumberland. New Galloway, Kirkcudbrightshire; near Edinburgh; Kirkfield, Lanarkshire; Appin, Argyleshire; Dunblane, Perthshire; Craig Tulloch, Blair Athole, Perthshire; Crathie, Braemar, Aberdeenshire.

Form *teretiuscula* Nyl. Lich. Scand. (1861) p. 112.—Laciniae narrower, more discrete, somewhat convex; otherwise as above.—*Parmelia casia* β . *teretiuscula* Ach. Lich. Univ. (1810) p. 479.

Differs from the type only in the minor characters of the laciniae, and intermediate states are not wanting. The British specimens are sterile.

Hab. On rocks in maritime and mountainous districts.—*Distr.* Seen only from W. England and S.W. Ireland.—B. M.: Penzance, Cornwall; Malvern, Worcestershire; Dunkerron, co. Kerry.

21. *P. obscura* Nyl. Act. Soc. Linn. Bord. sér. 3, i. (1856) p. 309.—Thallus orbiculari-stellate, closely appressed and adnate, dark or greyish-brown; beneath black-fibrillose; laciniae narrow, plane or slightly convex (K^- , $CaCl^-$). Apothecia sessile, small, blackish-brown, naked, the margin entire; spores ellipsoideo-oblong, 0,015–25 mm. long, 0,009–12 mm. thick.—Cromb. Lich. Brit. p. 39; Leight. Lich. Fl. p. 148 pro parte, ed. 3, p. 136 pro parte.—*Borrera obscura* Mudd, Man. p. 109 pro parte. *Lichen obscurus* Ehrh. Pl. Crypt. (1785) n. 177. *Parmelia cycloselis* Ach., Gray, Nat. Arr. i. p. 444 pro parte; Sm. Eng. Fl. v. p. 202 pro parte. *Lichen cycloselis* Eng. Bot. t. 1942.—*Brit. Exs.*: Larb. Lich. Hb. n. 252.

In its typical condition, which has seldom been rightly described, the thallus is entirely esorediate, with the margins of the laciniae efibrillose. The form *chloantha* (Ach. Syn. p. 217), with "pale-greyish thallus and laciniae lacerato-dentate at the margins," has not yet occurred with us, though recorded by Leighton, *l. c.*, as British. In our specimens the apothecia are fairly numerous. The spermatogones are more frequent, with spermatia oblong, 0,003 mm. long, about 0,001 mm. thick.

Hab. On the trunks of trees in upland situations.—*Distr.* Seen only from a very few localities in England and the S. Grampians, Scotland; no doubt frequent but overlooked.—B. M.: Brockenhurst, New Forest, Hants; near Cambridge; near Ledbury, Herefordshire. Finlarig, Killin, Perthshire.

22. *P. lithotea* Nyl. Flora, 1877, p. 354.—Thallus orbicular, appressed, narrowly lacinate, glaucous- or dark-brown, furfuraceous or granuloso-sorediate; beneath black-fibrillose; laciniae plane, closely imbricate, subciliate at the margins (K^- , $CaCl^-$). Apothecia central, blackish; spores as in the preceding species or slightly

smaller.—*Physcia obscura* subsp. *lithotea* Cromb. Grevillea, xv. p. 78; form *lithotea* Leight. Lich. Fl. ed. 3, p. 137. *Parmelia cyclo-selis* β . *lithotea* Ach. Meth. (1803) p. 199.

Subsimilar to *P. obscura*, but differs in being firmer, more or less furfuraceous, and especially in the cellular structure of the cortex, which consists of rounded cells, being more distinct. In age nearly the whole thallus and the margins of the laciniae are covered with a dark furfur. The state *sciastrea* (Ach. Meth. Suppl. p. 49) differs merely in being darker and sorediate only at the margins of the laciniae. The apothecia when present (for it is usually sterile) are small and few.

Hab. In depressions of rocks which are frequently moistened by the sea and by lakes and streams in maritime and mountainous districts.—*Distr.* Local and scarce in N. England, N. Wales (*vide* Leight.), among the S. Grampians, Scotland, and in N.W. Ireland.—B. M.: Near Newton, Cleveland, Yorkshire; Teesdale, Durham. Loch Dochart and Kenmore, Perthshire. Connemara, co. Galway.

23. *P. ulothrix* Nyl. Flora, 1875, pp. 360, 442.—Thallus orbiculari-stellate, greyish-glaucous or dark-brown, sometimes sublivid, esorediate: beneath black-fibrillose; laciniae discrete, narrow, linear, multifid, plane, ciliate at the margins, the cilia rigid, horizontal (K^- , $CaCl^-$). Apothecia moderate, dark-brown, the thalline margin entire, at length inflexed, the receptacle at the base black-fibrillose; spores oblong, 0.015–25 mm. long, 0.009–12 mm. thick.—Cromb. Linn. Soc. Journ. Bot. xvii. p. 571.—*Physcia obscura* var. *ulothrix* Cromb. Lich. Brit. p. 39; Leight. Lich. Fl. p. 149, ed. 3, p. 137. *Borreria obscura* δ . *ulothrix* Mudd, Man. p. 110. *Parmelia ulothrix* Tayl. in Mack. Fl. Hib. ii. p. 146. *Lichen ulothrix* Ach. Prodr. (1798) p. 113. *Lichen virellus* Eng. Bot. t. 1696 (lower fig.). *Lichen ciliatus* Dicks. Crypt. fasc. iii. p. 16; With. Arr. ed. 3, iv. p. 30. *Lichen stellaris* var. 4, With. l. c. p. 31. *Lichenoides viride, segmentis angustis distortis, scutellis pullis* Dill. Musc. 178, t. 24. f. 72 A.—*Brit. Evs.*: Leight. n. 80.

Usually regarded by more recent authors as a variety of the preceding; this was rightly viewed by Acharius as a distinct species, as warranted more especially by the peculiar character of the marginal cilia and in a minor degree by the radiating fibrillose receptacle of the apothecia. In this latter respect, as already observed, it is analogous to subsp. *Parmelia carporhizans*, though in old plants this character is less apparent. When sterile it is readily distinguished by the horizontal marginal cilia of the thallus. The apothecia are numerous and often crowded, and the spermatogones, which seem to be rather rare, are as in *P. obscura*.

Hab. On the trunks of trees, rarely on old pales and walls in maritime and upland districts.—*Distr.* Occurs only here and there in England, S. Scotland and the Highlands, and S. Ireland.—B. M.: Lakenham and near Yarmouth, Norfolk; Brighton and Allourne, Sussex; near Penzance, Cornwall; Cirencester, Gloucestershire; Gopsall Park, Leicestershire; Buxton, Derbyshire; near Worcester. New Galloway, Kirkcudbrightshire; Appin, Argyleshire; Finlarig, Killin, and Glen Fender, Blair Athole, Perthshire. Carrigaloe, near Cork.

Var. β . **virella** Cromb. Grevillea, xv. p. 78.—Thallus subeffuse, pale greyish-green, here and there greenish- or yellowish-sorediate; laciniae short, imbricate, with horizontal cilia at the margins. Apothecia small or submoderate, the receptacle black-fibrillose at the base.—*Physcia obscura* var. *virella* Leight. Lich. Fl. p. 148, ed. 3, p. 137. *Borrera obscura* γ . *virella* Mudd, Man. p. 110. *Parmelia virella* Sm. Eng. Fl. v. p. 202. *Lichen virellus* Ach. Prodr. (1798) p. 108; Eng. Bot. t. 1696 (two upper figs.). *Lichenoides viride, segmentis angustis distortis, scutellis pullis* Dill. Muse. 178, t. 24. f. 72 B.—*Brit. Ews.*: Mudd, n. 80; *Larb. Lich. Hb.* n. 126.

Overlooking the character of the marginal cilia of the laciniae and of the receptacle of the apothecia, lichenologists have associated this distinct variety with *P. obscura*. As suggested by Nylander *in litt.*, and confirmed by a specimen from Acharius in Herb. Linn. Soc. (fragmentary and abraded, though sufficient for recognition), it entirely belongs to this species. It differs from the type in the thallus being more effuse, often less closely appressed, paler in colour, and sprinkled with, or at times almost covered by, roundish soredia, as also in the shorter and usually more imbricate laciniae. When wet it is of a bright-green colour, and when growing associated with *P. parietina* it is suffused with chrysophanic acid, when the thallus and soredia are more or less yellowish (form *flavesceus* Cromb.). It then gives a purplish reaction with K, which, however, is quite abnormal. To this state is referable *Physcia endococcinea* (non Koerb.) Cromb. Journ. Bot. 1872, p. 359; Leight. Lich. Fl. ed. 3, p. 142. The cilia of the laciniae and the apothecia (frequently absent in the latter, as they occasionally are in the type itself) are at first pale, speedily becoming brownish, and at length in old plants blackish. The apothecia and the spermogones are frequent in our specimens.

Hab. On the trunks of old trees, rarely on walls, in maritime and upland districts.—*Distr.* Not uncommon in most parts of England; apparently rare in N. Wales, Scotland, and S.E. Ireland.—B. M.: Kennet and Ickworth, Suffolk; Epping Forest, Essex: Hemfield and near Brighton, Sussex; Ryde, Isle of Wight; Ilsham, Torquay, Devonshire; Newlyn Cliff, Penzance, Cornwall; near Cirencester and Honeybourne, Gloucestershire; Gogmagog Hills, Cambridgeshire; Darley, Derbyshire; Aberdovey, Merionethshire; Ayton, Cleveland, Yorkshire; near Hexham, Northumberland. Airds, Appin, Argyleshire; Finlarig, Killin, and Glen Fender, Blair Athole, Perthshire. Killaloe, co. Cork; Lyons, near Dublin.

b. Spermogones with long acicular spermatia.

24. **P. adglutinata** Nyl. Flora, 1862, p. 355.—Thallus small, orbicular, closely agglutinate, imbricato-stellate, sordid greenish-grey; beneath blackish, scarcely fibrillose at the margins; laciniae very narrow, multifid at the circumference, subleprose in the centre (K^- , $CaCl^-$). Apothecia small, plane, brownish-black, the thalline margin entire; spores ellipsoid, 0.014–21 mm. long, 0.008–10 mm. thick.—Cromb. Lich. Brit. p. 40; Leight. Lich. Fl. ed. 3, p. 137.—*Borrera obscura* ϵ . *adglutinata* Mudd, Man. p. 110; Leight. Lich. Fl. p. 149. *Lecanora adglutinata* Flörke Deutsch. Lich. iv. (1815) p. 7; Tayl. in Mack. Fl. Hib. ii. p. 146. *Parmelia clauina* Gray, Nat. Arr.

i. p. 439. *Squamaria elcaina* Sm. Eng. Fl. v. p. 197. *Lichen elcainus* Eng. Bot. t. 2158. — *Brit. Ess.*: Croub. n. 152; *Larb. Lich. Hb.* n. 49.

The thallus is often leproso-pulverulent in the centre, and sometimes subeffuse, through the confluence of several plants. From states of *P. obscura*, of which it has frequently been considered as a variety, it at once differs in the form of the spermatia. The apothecia are chiefly central. The spermogones, which are not uncommon, are olive-brown, with spermatia long, acicular, about 0.018 mm. long, scarcely 0.001 mm. thick.

Hab. On the trunks of trees, rarely on walls, in maritime and lowland districts.—*Distr.* Probably not uncommon throughout England and W. Ireland; rare in the Channel Islands; apparently absent from Scotland.—*B. M.*: Noirmont, Island of Jersey. Norwich, Norfolk; Walthamstow, Essex; Glynde, Hurstpierpoint, and between Henfield and Brighton, Sussex; Lymington, Hants; Penzance, Cornwall; near Cirencester, Gloucestershire; Gamlingay, Cambridgeshire; Cleveland, Yorkshire; Kendal, Westmoreland. Killarney, co. Kerry; Kylemore, co. Galway.

Form *sorediata* Nyl. *ex* Leight. *Lich. Fl.* ed. 3 (1879) p. 138.—Thallus leproso-sorediate almost throughout, glaucous-white; laciniae more dilated at the circumference and there only esorediate. Apothecia not seen.—*Brit. Ess.*: *Larb. Lich. Hb.* n. 127.

Apart from the paler colour and the broader laciniae this differs only in the much more sorediate thallus, in which respect it resembles var. *subvirella* Nyl. (*Pyr. Or.* p. 63), which does not occur in our Islands. The specimens seen are sterile.

Hab. On walls and trees in upland districts.—*Distr.* Only sparingly in N.W. Ireland.—*B. M.*: Letterfrack and Letter Hill, Connemara, co. Galway.

Tribe XVII. **GYROPHOREI** Nyl. *Mém. Soc. Cherb.*
iii. (1855) p. 175; *Lich. Scand.* p. 112.

Thallus membranaceo-foliaceous, monophyllous or subpolypheyllous, petate, umbilicately affixed in the centre to the substratum, corticate on both surfaces; internally with white lax filamentose medulla; gonidial layer containing gonidia. Apothecia either lecanoid, or lecideine and gyrose, black; spores solitary or usually 8nae, oblong or ellipsoid, simple or murali-divided, colourless or brown; paraphyses discrete. Spermogones either immersed or somewhat prominent, with jointed sterigmata.

The systematic position of this tribe has been variously regarded by authors. There is no doubt, however, that this is its true place as indicated by the character of the vegetative and reproductive organs, though the structure and form of the apothecia are rather peculiar. It is a very natural tribe, comprising two genera, the distinctive characters of which have recently been definitely pointed out by Nylander. The species are all saxicolous, characteristic of cold regions, and for the most part very brittle when dry.

4. UMBILICARIA

Hoffm. Pl. Lich. (1795) p. 109 pro parte; Nyl. Flora, 1875, p. 303.

—Thallus effrillulose beneath. Apothecia lecanoroid, with thalline receptacle, containing no gonidia; hypothecium brownish-black; spores solitary, 2næ or 8næ, brown or colourless, murali-locular or simple; hymenial gelatine bluish and then wine-red with iodine. Spermatogones somewhat prominent; spermatia short, cylindrical.

Formerly distinguished from the following genus by different authors on insufficient grounds, this has been definitely separated by Nylander on account of the peculiar type of the apothecia. These are in a certain way lecanorine, but not truly so; for though they present externally a thalline receptacle composed of the cortical and medullary layers, they do not contain gonidia (*vide* Nyl. Flora, l. c.). As to the structure of the thallus,

will be seen from fig. 53 *a* that this consists of four layers. These are—(1) an epithalline layer more or less developed or evanescent (whence the presence or absence of pruina on the upper surface); (2) a corticali-gonidial layer, the gonidia occupying the lower half of the more darkly delineated portion; (3) a white medullary layer; and (4) a cortical layer on the under surface, of which the upper portion is chondroid (sometimes partly wanting) and the lower (blackish) cellular (*cf.* Nyl. Flora, l. c.). The spermatogones have the spermatia in all the species of nearly the same size, viz. 0,004 mm. long, 0,001 mm. thick.

The genus is divided into two subgenera, founded upon differences in the cortical texture.

Subgen. 1. LASALLIA Mérat (Fl. Par. (1836) p. 202 pro parte). —Thallus papulose above, lacunoso-foveolate beneath, internally with the chondrohyphæ wanting in the lower concave portion of the pustules. Apothecia with the spores solitary or 2næ, murali-divided, brown.

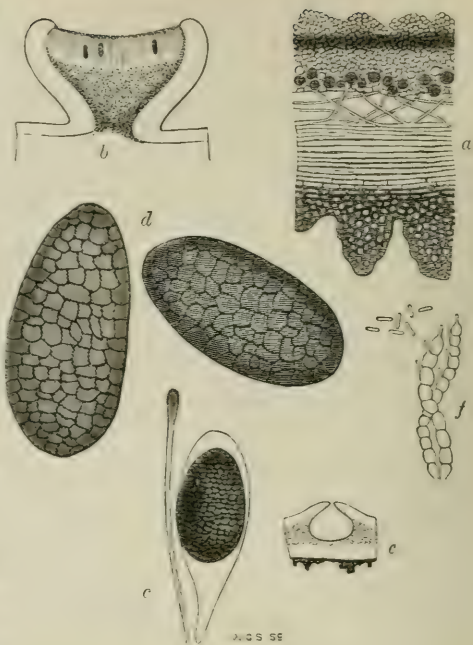


Fig. 53.

Umbilicaria pustulata Hoffm.—*a*. Vertical section of thallus, $\times 200$. *b*. Vertical section of apothecium, $\times 30$. *c*. A theca and paraphysis, $\times 350$. *d*. Two spores, $\times 500$. *e*. Vertical section of thallus with a spermatogone, $\times 30$. *f*. Sterigmata and spermatia, $\times 500$.

1. *U. pustulata* Hoffm. Deutsch. Fl. ii. (1795) p. 111.—Thallus large, monophyllous, inciso-lobed at the circumference, papulose, pale-greyish or greyish-brown, subpruinose, sprinkled with large fuliginoso-floccose glomeruli; beneath deeply lacunoso-foveolate, naked, brownish or greyish-pruinose, very minutely rimuloso-areolate (K^- , $CaCl^-$ + reddish). Apothecia moderate, superficial, scattered, somewhat plane; spores large, solitary, 0.028–70 mm. long, 0.018–34 mm. thick.—Sm. Eng. Fl. v. p. 219; Mudd, Man. p. 115, t. ii. f. 35; Leight. Ann. Mag. Nat. Hist. ser. 2, xviii. p. 294; Cromb. Journ. Linn. Soc. Bot. xvii. p. 576.—*Gyrophora pustulata* Gray, Nat. Arr. i. p. 478; Hook. Fl. Scot. ii. p. 42; Turn. & Borr. Lich. Br. p. 232; Tayl. in Mack. Fl. Hib. ii. p. 155; Cromb. Lich. Brit. p. 40; Leight. Lich. Fl. p. 154, ed. 3, p. 143. *Lichen pustulatus* Linn. Sp. Pl. (1753) p. 1150; Huds. Fl. Angl. p. 454; Lightf. Fl. Scot. ii. p. 858; With. Arr. ed. 3, iv. p. 64; Eng. Bot. t. 1285. *Lichenoides pustulosum cinereum et veluti ambustum* Dill. Musc. 226, t. 30. f. 131.—*Brit. Exs.*: Leight. n. 166; Lerb. Cæsar. n. 25; Cromb. n. 52; Bohl. n. 125.

The peculiar pustular and isidio-glomerulose upper, and the deeply pitted under surface of the thallus at once distinguish this from the other British species of the tribe. The thallus, which is greenish when moist, is normally orbicular, becoming at length irregular in shape, and often attains a very large size. The apothecia, which are rare in Britain, are scattered among the glomeruli chiefly towards the circumference, and are at first concave, then plane or convex, with the margin at length excluded.

Hab. On rocks and boulders, rarely on old walls, in mountainous districts.—*Distr.* Somewhat local, though plentiful where it occurs in the Channel Islands, S. and W. England, S. Scotland, the W. Highlands and Shetland, Scotland, and in S.W. Ireland.—B. M.: La Moye, Island of Jersey; Island of Guernsey. Blackstone Rock, near Bovey Tracey, Hay Tor and Hunter Tor, Dartmoor, Devonshire; Helmlinton, Cornwall; Malvern Hills, Worcestershire; Charnwood Forest, Leicestershire; Caer Caradoc, Shropshire; Cwm Bychan, Merionethshire; Capel Curig and Nant Gwynant, Carnarvonshire; Nepha, Westmoreland; Wastdale, Cumberland. New Galloway, Kirkcudbrightshire; Loch Sligachan and Loch Corruisk, Isle of Skye; Ben Nevis, Inverness-shire; Sandy Loch, near Lerwick, Shetland. Mizen Head and Glengarriff, co. Cork; near Dunkerron, co. Kerry.

Subgen. 2. AGYROPHORA Nyl. Flora, 1878, p. 247.—Thallus epapulose above, efoveolate beneath, internally with the chondrohyphæ continuous in the cortical layer of the lower surface. Apothecia with the spores 8næ, simple, colourless.

2. *U. atropuinosa* Schaer. Ser. Mus. Helv. vi. (1829) p. 109, t. 12–14.—Thallus moderate, monophyllous or subpolyphyllous, rigid, thinly areolate-rimulose or rugoso-areolate, brownish-black, greyish-pruinose in the centre; beneath smoothish or very finely granulato-areolate, black or partly paler, often pruinose (medulla K^- , $CaCl^-$). Apothecia somewhat prominent, nearly moderate,

plane; spores often obsoletely curved, 0.013–16 mm. long, 0.005–6 mm. thick.—Cromb. Journ. Bot. 1882, p. 273.

Differs very much from *U. pustulata* in the external appearance of the thallus, though agreeing with it in the character of the apothecia. It is well characterized by the somewhat rigid thallus having the upper surface minutely areolate and the lower smooth and glabrous, as also by the apothecia being constantly lecideioid and not becoming gyrose. The few British specimens are smaller than those of more boreal regions. They are, however, well fertile, the apothecia being numerous, though somewhat small.

Hab. On granitic boulders in exposed alpine places.—*Distr.* Found only very sparingly on one of the N. Grampians, Scotland.—B. M.: Summit of Cairntoul, Braemar, Aberdeenshire.

55. **GYROPHORA** Ach. Meth. (1803) p. 110; Nyl. Flora, 1875, p. 303.—Thallus naked or fibrillose beneath. Apothecia lecideine, usually more or less gyroso-plicate; hypothecium usually brown; spores 8næ, simple, colourless; hymenial gelatine bluish and then sordid wine-red with iodine. Spermatogones immersed; spermatia short, cylindrical.

Distinguished from *Umbilicaria* by the apothecia being lecideine, with the perithecium differing in texture from the cortex. The structure of the thallus scarcely differs from that of subgen. *Agyrophora*. The apothecia are either simply lecideine or beautifully gyroso-complicate, each individual epithecium being narrow and margined. The spermatogones have the spermatia similar in size to those of *Umbilicaria*. In several cases the chemical reaction of the medulla with CaCl affords a valuable aid in the discrimination of species otherwise with difficulty separable from each other.

1. **G. grisea** Turn. & Borr. Lich. Br. (1839) p. 236.—Thallus monophyllous, thin, minutely areolato-papillate, somewhat lobed and crenate at the margins, greyish-white or mouse-coloured; beneath finely granuloso-areolate, scabrous, naked or sparingly

fibrillose in the centre, blackish or greyish (K^- , $CaCl^+_{red}$). Apothecia at length convex, immarginate, gyroso-plicate; spores 0.014–18

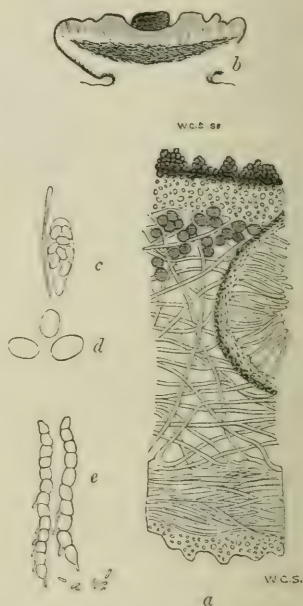


Fig. 54.

Gyrophora cylindrica Ach.—a.

Vertical section of thallus, with lateral portion of a spermatogone, $\times 200$. b. Vertical section of an apothecium, $\times 30$. c. Theca and paraphysis, $\times 300$. d. Three spores, $\times 500$. e. Sterigmata and spermatia, $\times 500$.

mm. long, 0.008–10 mm. thick.—Mudd, Man. p. 120; Cromb. Journ. Linn. Soc. Bot. xvii. p. 575.—*Umbilicaria grisea* Leight. Lich. Fl. p. 157, ed. 3, p. 147. *Umbilicaria varia* *η. grisea* Leight. Ann. Mag. Nat. Hist. ser. 2, xviii. p. 288. *Lichen griseus* Sw. in Westr. Vet. Ak. Handl. 1793, p. 52. *Gyrophora murina* Ach. Eng. Bot. t. 2486; Gray, Nat. Arr. i. p. 478; Sm. Eng. Fl. v. p. 218. *Lichen Dillenii* With. Arr. ed. 3, iv. p. 63. *Lichen deustus* Huds. Fl. Angl. p. 455. *Lichenoides coriaceum cinereum, peltis atris compressis* Dill. Musc. 219, t. 30. f. 117. *Lichenoides saxatile foliis minus divisis, cinereo-fuscum* Dill. in Ray, Syn. ed. 3, p. 73, n. 66.

Has its nearest ally in *G. hirsuta* Ach., which is unknown in this country. It is easily recognized from the allied British species by the colour of the thallus, which is generally monophyllous, and by the characters of its upper and lower surfaces. With us it is not seen fertile.

Hab. On rocks in maritime districts.—*Distr.* Found only very sparingly in the Channel Islands and S.W. England (Hb. Buddle).—B. M.: Beauport, Island of Jersey. St. Vincent's Rocks, Bristol, Gloucestershire. There is also a specimen marked ? Glyder Wawr, N. Wales, where it is not likely to have been gathered.

2. *G. proboscidea* Ach. Meth. (1893) p. 105.—Thallus monophyllous, somewhat thin, nearly moderate or small, crenate or slightly lobed at the margin, reticulato-rugose (especially in the centre), blackish-brown or blackish, greyish-pruinose in the centre; beneath smooth, naked, pale-greyish or partly dark-greyish (K_{-} , $CaCl_{+}^{+}$ reddish). Apothecia at first thinly margined and somewhat plane, at length immarginate, convex, gyroso-plicate: spores 0.012–18 mm. long, 0.006–8 mm. thick.—Eng. Bot. t. 2484; Gray, Nat. Arr. i. p. 476; Hook. Fl. Scot. ii. p. 41; Turn. & Borr. Lich. Br. p. 222; Sm. Eng. Fl. v. p. 217; Mudd, Man. p. 118.—*Umbilicaria proboscidea* Cromb. Lich. Brit. p. 40; Leight. Lich. Fl. p. 160, ed. 3, p. 147. *Lichen proboscideus* Ach. Prodr. (1798) p. 147. *Umbilicaria varia* *θ. deusta* Leight. Ann. Mag. Nat. Hist. ser. 2, xviii. p. 289. *Lichen deustus* Huds. Fl. Angl. p. 455; Lightf. Fl. Scot. ii. p. 861; With. Arr. ed. 3, iv. p. 63.

Distinguished from allied species by the thallus being more or less reticulato-corrugate on the upper surface, with the rugæ more distinct in the centre and less visible towards the circumference, where it is sometimes nearly smooth. The thallus is closely appressed to the substratum, thinnish, somewhat rigid and brittle, varying in other respects as in the forms and variety that follow. It is generally well fertile, with numerous and small, or fewer and nearly moderate apothecia. The spermatogones are rare, with the spermatia about 0.004 mm. long, 0.001 mm. thick.

Hab. On rocks and stone walls in upland and subalpine regions.—*Distr.* Somewhat local in N. Wales, N. England, and in S. Scotland; general and plentiful amongst the Grampians; reported also (but doubtfully) from S.W. Ireland.—B. M.: Cader Idris, Merionethshire; Snowdon, Carnarvonshire; Cadiganshire; Teesdale, Durham. New Galloway, Kirkcudbrightshire; Ben Lawers and Ben More, Perthshire; Clova,

Forfarshire; Craig Coinnoch, Lochnagar, near Invercauld, Glen Callater and Ben Macdhui, Braemar, Aberdeenshire; Glen Nevis and Ben Nevis, Inverness-shire.

Form 1. *fimbriata* Mudd, Man. (1860) p. 118.—Thallus sparingly fibrillose at the margins and on the under surface; otherwise as above.—Cromb. Grevillea, xv. p. 79.—*Umbilicaria proboscidea* form *fimbriata* Leight. Lich. Fl. p. 160, ed. 3, p. 147. *Gyrophora deusta* β . *fimbriata* Turn. & Borr. Lich. Br. (1839) p. 222.

Seems always to grow associated with the type, of which it is probably to be regarded only as a state, since at times similar conditions occur in the variety. The fibrillæ are usually very few, though occasionally they are more numerous.

Hab. On rocks and stone walls in upland and subalpine districts.—*Distr.* Local and rare in N. Wales and N. England; more common among the Grampians, Scotland.—B. M.: Snowden, Carnarvonshire; Swinhope Fell, Durham. Ben Lawers, Perthshire; Clova, Forfarshire; Craig Coinnoch, and Cairngorm, Braemar, Aberdeenshire.

Form 2. *exasperata* Ach. Meth. (1803) p. 165.—Thallus deeply plicato-corrugate, the plicæ crowded, undulate, and subreticulate.—Cromb. Grevillea, xv. p. 79.—*Umbilicaria proboscidea* var. *exasperata* Cromb. Lich. Brit. p. 40. *Gyrophora deusta* γ . *corrugata* (Hoffm.), Turn. & Borr. Lich. Br. p. 222. *Umbilicaria varia* θ . *deusta* c. *corrugata* Leight. Ann. Mag. Nat. Hist. ser. 2, xviii. p. 290. *Gyrophora proboscidea* c. *corrugata* Mudd, Man. p. 118. *Umbilicaria proboscidea* f. *corrugata* Leight. Lich. Fl. p. 160, ed. 3, p. 148.—The trivial name *corrugata* Hoffm. (Pl. Lich. (1794) p. 65) has priority; but I have retained that of Acharius in order to prevent confusion with *G. corrugata* (Ach.) Nyl.

Differs in the very prominent reticulate rugæ of the upper surface, which are nearly a line in height, and which "look like a series of erect curled squamules" sometimes developing into small lobules. These occur chiefly towards the centre of the thallus (except in smaller plants), beyond which it is usually very rugose, "almost papillose." To this latter state belongs var. *mesenteriformis* (non Wulf. nec Schær.), Turn. & Borr. l. c., Leight. l. cc., Mudd, Man. p. 118. The few British specimens are sparingly fertile.

Hab. On rocks and boulders in alpine places.—*Distr.* Very scarce among the N. Scottish Grampians.—B. M.: Ben-naboord, Braemar, Aberdeenshire.

Var. β . *deplicans* Fr. fl. Lich. Scand. i. (1871) p. 163.—Thallus brown-fuliginous, scarcely greyish in the centre, continuously rugose or rugulose on the upper surface.—Cromb. Journ. Bot. 1882, p. 273.—*Umbilicaria proboscidea* var. *deplicans* Nyl. Lich. Scand. (1861) p. 116.

Well distinguished from the type by the absence of reticulate plicæ. In the few British specimens the under surface and the margins are more or less fibrillose, so that in this respect they are analogous to form *fim-*

brata of the type. It somewhat resembles *G. arctica*, but at once differs in the smaller and thinner thallus. The apothecia are numerous, though small, in our specimens.

Hab. On granite rocks in alpine situations.—*Distr.* Very local and rare among the N. Grampians, Scotland.—B. M.: Head of Glen Callater and Ben-naboord, Braemar, Aberdeenshire.

3. *G. cylindrica* Ach. Meth. (1803) p. 107.—Thallus monophyllous or polyphyllous, moderate or somewhat small, thickish, smooth, sinuato-lobed, greyish or greyish-brown, usually greyish-pruinose, black-fibrillose at the margins; beneath pale, here and there blackish, more or less fibrillose (medulla K—, CaCl₂—). Apothecia at first sessile, plane, then pedicellate, and at length subglobose, gyroso-plicate, thinly margined; spores 0.010–14 mm. long, 0.006–8 mm. thick.—Gray, Nat. Arr. i. p. 477; Hook. Fl. Scot. ii. p. 42; Sm. Eng. Fl. v. p. 218; Tayl. in Mack. Fl. Hib. ii. p. 155; Mudd, Man. p. 119.—*Umbilicaria cylindrica* Cromb. Lich. Brit. p. 40; Leight. Lich. Fl. p. 161, ed. 3, p. 148. *Lichen cylindricus* Ach. Prodr. (1798) p. 148. *Gyrophora proboscidea* Turn. & Borr. Lich. Br. p. 219. *Umbilicaria varia* a. *proboscidea* Leight. Ann. Mag. Nat. Hist. ser. 2, xviii. p. 291. *Lichen proboscideus* Huds. Fl. Angl. ed. 2, p. 551; Eng. Bot. t. 522 (two upper figs.); With. Arr. ed. 3, iv. p. 65. *Lichen crinitus* Lightf. Fl. Scot. ii. p. 360. *Lichenoides corneum, marginibus eleganter fimbriatis* Dill. Musc. 218, t. 29. f. 116 A.—Brit. Fes.: Leight. n. 95; Mudd, n. 88.

Well distinguished from the preceding by the thallus being smooth, paler beneath and ciliate at the margins, as also by the absence of any medullary reaction. It is commonly monophyllous but often also polyphyllous, very unequally lobed, naked or sometimes covered with a caesious pruina. In other respects it is a rather variable plant, giving rise to the forms and varieties that follow. The apothecia are usually numerous, as are also the spermogones, especially in otherwise sterile specimens.

Hab. On rocks and boulders from upland to alpine situations.—*Distr.* Rather local in the mountainous tracts of W. and N. England and N. Wales; general and plentiful among the Grampians, Scotland; local in W. Ireland.—B. M.: Dartmoor, Devonshire; Dolcelly and Cwm Bychan, Merionethshire; Glyder Vawr, Carnarvonshire; Cronkley Scarr, Yorkshire; Teesdale, Durham. Ben Lawers and near Aberfeldy, Perthshire; Clova, Forfarshire; Ben-naboord, Morrong, and near Invercauld, Braemar, Aberdeenshire; Ben Nevis, Inverness-shire. Mangerton and Brandon Mts., co. Kerry; Connavalla, co. Cork.

Form 1. *denticulata* Ach. Meth. (1803) p. 107.—Thallus with the margins lacero-laciniate, coarsely fringed and denticulate; otherwise as in the type.—Mudd, Man. p. 119.—*Umbilicaria cylindrica* var. *denticulata* Leight. Lich. Fl. p. 162, ed. 3, p. 149. *Umbilicaria varia* a. *proboscidea* b. *denticulata* Leight. Ann. Mag. Nat. Hist. ser. 2, xviii. p. 293. *Gyrophora proboscidea* β. *denticulata* Turn. & Borr. Lich. Br. p. 219. *Lichen proboscideus* Eng. Bot. t. 522 (two lower figs.). *Lichenoides corneum, marginibus eleganter fimbriatis* Dill. Musc. 218, t. 29. f. 116 B.

Differs only in the marginal cilia being coarser, larger, and usually less numerous and scattered. In all probability it was this form Linnaeus had in view when he applied the trivial name of *proboscideus*, from the resemblance of the bristles (when magnified, as in Eng. Bot. lowest fig.) to the proboscis of the elephant beetle (*vide* Eng. Fl. l. c.). The apothecia in our specimens are generally but sparingly present.

Hab. On rocks and boulders in upland and subalpine mountainous districts.—*Distr.* Not very general nor common in W. and N. England, among the Scottish Grampians, and in E. Ireland.—B. M.: Llanberris, Snowdon, and Carnedd Llewelyn, Carnarvonshire; Teesdale, Durham; The Cheviots, Northumberland. Ben Lawers, Perthshire; Lochnagar and above Invercauld, Braemar, Aberdeenshire; Ben Nevis, Inverness-shire. Sleive Donard, co. Wicklow.

Form 2. *denudata* Mudd, Man. (1861) p. 119.—Thallus submonophyllous or polyphyllous, naked or nearly naked at the margins.—Cromb. Grevillea, xv. p. 79.—*Umbilicaria cylindrica* var. *denudata* Cromb. Lich. Brit. p. 40; Leight. Lich. Fl. p. 162, ed. 3, p. 149. *Umbilicaria varia* i. *proboscidea* c. *denudata* Leight. Ann. Mag. Nat. Hist. ser. 2, xviii. p. 293. *Gyrophora proboscidea* γ. *denudata* Turn. & Borr. Lich. Brit. (1839) p. 219.

Descends apparently from the preceding, from which it differs only in the entire or almost entire absence of marginal cilia. Occasionally, however, one or two very short denticulate cilia are here and there visible, especially when it is more polyphyllous. The thallus is at times somewhat rugose; the apothecia are numerous and occasionally pedicellate.

Hab. On rocks and boulders in subalpine regions.—*Distr.* Sparingly in N. Wales, N. England, among the Scottish Grampians, and in S.W. Ireland.—B. M.: Cader Idris, Merionethshire; Snowdon, N. Wales; The Cheviots, Northumberland; Ennerdale, Cumberland. Ben Lawers, Perthshire; Ben-naboord, Braemar. Brandon Mt., co. Kerry.

Form 3. *fimbriata* Ach. Lich. Univ. (1810) p. 224.—Thallus polyphyllous, shortly and densely black-ciliate at the margins, occasionally sparingly fibrillose beneath.—Gray, Nat. Arr. i. p. 477; Cromb. Grevillea, xii. p. 74.—*Umbilicaria cylindrica* var. *fimbriata* Cromb. Lich. Brit. p. 40. *Lichen proboscideus* var. 2, With. Arr. ed. 3, iv. p. 65.

A rather elegant form, which is constantly polyphyllous, and easily recognized by the lobes being densely pannoso-ciliate at the margins. The apothecia are occasionally pedicellate, smaller than in the type, and sometimes but slightly plicate.

Hab. On rocks and boulders, chiefly quartzose, in upland and subalpine districts.—*Distr.* Local and rare in S.W. and N. England, more common among the Scottish Grampians, especially in Braemar.—B. M.: Dartmoor, Devonshire; Teesdale, Durham. Ben Lawers and near Amulree, Perthshire; Clova, Forfarshire; above Invercauld, Morrene, Loch Phadrig, and head of Glen Callater, Braemar, Aberdeenshire.

Var. β. *Delisei* Fr. fil. Lich. Scand. i. (1871) p. 159.—Thallus larger, firmer, sparingly fibrillose or subnaked at the margins; beneath more or less brownish-hirsuto-rhizino-se. Apothecia pedi-

cellate, large, numerous, much gyroso-plicate.—Cromb. Journ. Bot. 1882, p. 273.—*Umbilicaria cylindrica* var. *Delisei* Despr. *vide* Nyl. Lich. Scand. (1861) p. 117.

A well-marked variety, distinguished by the characters of the thallus and of the apothecia. In the few British specimens seen the thallus is thick, shortly fibrillose or nearly quite naked at the margins, beneath of a somewhat pale pink colour and rhizinose, especially towards the circumference. The apothecia are large, crowded, and much gyroso-plicate.

Hab. On rocks and boulders in alpine places.—*Distr.* Only on the summits of two of the loftiest Scottish Grampians.—B. M.: Ben-naboord, Aberdeenshire; Ben Nevis, Inverness-shire.

Var. γ . *tornata* Fr. fil. Lich. Scand. (1871) p. 157.—Thallus polyphyllous, complicate, more or less rugose on the upper surface; lobes congested, ascending, undulate, crisp, naked or subnaked at the margins.—*Gyrophora tornata* Ach. Lich. Univ. (1810) p. 222, t. 2. f. 13. *Gyrophora proboscidea* δ . *exasperata* Turn. & Borr. Lich. Br. p. 219. *Umbilicaria varia* α . *proboscidea* δ . *exasperata* Leight. Ann. Mag. Nat. Hist. ser. 2, xviii. p. 294. *Gyrophora cylindrica* δ . *exasperata* Mudd, Man. p. 119. *Umbilicaria cylindrica* form *exasperata* Leight. Lich. Fl. p. 162, ed. 3, p. 149.

Characterized by the smaller, subeffuse, polyphyllous thallus and the congested ascending lobes, which are nearly naked at the margins. In the British specimens the apothecia, which are small, are but rarely present.

Hab. On rocks and boulders in subalpine regions.—*Distr.* Very sparingly in W. and N. England, and among the Grampians, Scotland.—B. M.: Falcon Clints, Teesdale, Durham. Cairn Turc, Braemar, Aberdeenshire.

4. *G. erosa* Ach. Meth. (1803) p. 103.—Thallus monophyllous, thin, rigid, rugose, densely cribose, erose or eroso-laciniate at the margins, olive-brown or brownish-black; beneath naked, usually thinly granulose, pale-brown (K^- , $CaCl^-$). Apothecia somewhat prominent, at first plane and thinly margined, at length convex and immarginate, gyroso-plicate; spores 0.011–12 mm. long, 0.006–7 mm. thick.—Cromb. Grevillea, xv. p. 79 (pro parte).—*Lichen erosus* Weber, Spic. Fl. Gott. (1778) p. 259.—*Gyrophora erosa* of other British authors belongs entirely to the following species.

Easily known by the peculiar reticulato-perforate upper surface and the usually finely lacero-laciniate margins of the thallus. It is also generally marked above by flexuose anastomosing black, indented lines, whence it appears as if insculpt with rivulose sutures. The apothecia are small, numerous, at first but very slightly, afterwards more plicate.

Hab. On rocks in alpine regions.—*Distr.* Very local and rare on one or two of the higher Scottish Grampians.—B. M.: Lochnagar, Morrone, and Ben-naboord, Braemar, Aberdeenshire.

5. *G. torrefacta* Cromb. Grevillea, xii. (1884) p. 74.—Thallus monophyllous, somewhat thickish, plicato-rugose, scarcely cribose,

usually little or non-eroso-laciniate at the margins, olive-brown or brownish-black; beneath lacunulose or trabeculose, granulose, more or less fibrillose, pale-brownish ($K(CaCl)^-_{+red}$). Apothecia and spores as in the preceding species.—*Lichen torrefactus* Lightf. Fl. Scot. ii. (1777) p. 862; With. Arr. ed. 3, iv. p. 62. *Umbilicaria erosa* var. *torrida* (Ach.), Cromb. Lich. Brit. p. 41. *Gyrophora erosa* Eng. Bot. t. 2066; Turn. & Borr. Lich. Br. p. 229; Gray, Nat. Arr. i. p. 477; Hook. Fl. Scot. ii. p. 42; Sm. Eng. Fl. v. p. 218; Tayl. in Mack. Fl. Hib. ii. p. 155; Mudd, Man. p. 117. *Umbilicaria erosa* Cromb. Lich. Brit. p. 41 pro parte; Leight. Lich. Fl. p. 158, ed. 3, p. 145. *Umbilicaria varia* ϵ . *erosa* Leight. Ann. Mag. Nat. Hist. ser. 2, xviii. p. 284. *Lichen polyrrhizos* Huds. Fl. Angl. p. 455. *Lichenoides rugosum durum pullum*, *peltis atris verrucosis* Dill. Musc. 118, t. 30. f. 118.—*Brit. Exs.*: Bohl. n. 19.

This has often either been confounded with or regarded as a variety of *G. erosa*, to which it is closely allied. It differs, however, in the characters of the upper and lower surfaces of the thallus, as also in the reaction of the medulla. For these reasons it has been raised to specific rank by Nylander (Flora, 1869, p. 387, s. n. *Umbilicaria torrida* (Ach.), Nyl.). Where the plant is abundant, the thallus is sometimes more or less deeply laciniato-divided at the circumference (form *subdividens* Nyl. ex Cromb. Journ. Bot. 1882, p. 273), and the lacunoso-trabeculose and fibrillose under surface is aptly compared in Eng. Bot. to "shavings." The apothecia are numerous, becoming when old large and beautifully gyroso-plicate, almost as in *G. polyrrhiza*.

Hab. On rocks and boulders in upland and subalpine regions.—*Distr.* General and common in most of the mountainous tracts of Great Britain and Ireland.—B. M.: Walkhampton and Dartmoor, Devonshire; Cader Idris and near Barmouth, Merionethshire; Carnedd Dafydd, Carnarvonshire; Swinhope Fell, Durham; The Cheviots, Northumberland. New Galloway, Kirkcudbrightshire; Goatfell, Island of Arran; Ben Cruachan, Argyleshire; Ben More and Ben Lawers, Perthshire; Katelaw and Clova, Forfarshire; Craig Coinnoch and Ben-naboord, Braemar, Aberdeenshire; Ben Nevis, Inverness-shire. Killarney Mts. and Mangerton, co. Kerry; Curslieve, co. Mayo; Doughruagh Mts., co. Galway.

6. *G. hyperborea* Ach. Meth. (1803) p. 105.—Thallus monophyllous, moderate, thin, unequal, papuloso-rugose, more or less lacerate at the margins, olive-brown or blackish-brown; beneath glabrous, sublacunoso-unequal, blackish or brownish-black, usually somewhat greyish ($K^-, CaCl^+_{red}$). Apothecia at first simple, lirellæform, at length gyroso-complicate; spores 0.013–16 mm. long, 0.007–8 mm. thick.—Turn. & Borr. Lich. Brit. p. 227; Mudd, Man. p. 117.—*Umbilicaria hyperborea* Cromb. Lich. Brit. p. 41; Leight. Lich. Fl. p. 157, ed. 3, p. 145. *Umbilicaria varia* γ . *hyperborea* Leight. Ann. Mag. Nat. Hist. ser. 2, xviii. p. 282. *Lichen hyperboreus* Ach. Vet. Ak. Handl. 1794, p. 89, t. 2. f. 2. *Lichen pullus* Dicks. Crypt. fasc. ii. p. 23. *Lichen Jacquini* With. ? Arr. ed. 3, iv. p. 62.

A very distinct species having a general resemblance to *G. erosa*, but differing in the upper surface being papuloso-rugulose and imperforate, and in the lower being darker, egranulose, and lacunose. It is also further separated by the reaction of the medulla. It is usually fertile, the apothecia being numerous and very variable according to age.

Hab. On rocks and large boulders in alpine situations.—*Distr.* Not yet with certainty gathered, except on a few of the higher Grampians, Scotland.—B. M.: Ben More, Breadalbane, Perthshire; Lochnagar, Morronge, and Ben-naboord, Braemar, Aberdeenshire; Ben Nevis, Lochaber, Inverness-shire.

7. *G. arctica* Ach. Meth. (1803) p. 106, t. 2. f. 6.—Thallus monophyllous, moderate or somewhat large, thick, rigid, slightly lobed, irregularly crenate and reflexed at the margins, crowdedly granulato-corrugate, brownish or blackish-brown, often pale greyish; beneath minutely granulato-rimulose, pale, blackish in the centre (K^- , $CaCl^-$ + red). Apothecia at length convex, gyroso-complicate; spores 0.012–16 mm. long, 0.006–8 mm. thick.—Turn. & Borr. Lich. Brit. p. 225; Eng. Bot. t. 2485; Gray, Nat. Arr. i. p. 477.—*Gyrophora proboscidea* β . *arctica* Sm. Eng. Fl. v. p. 217. *Gyrophora hyperborea* β . *arctica* Mudd, Man. p. 117. *Umbilicaria arctica* Cromb. Lich. Brit. p. 40; Leight. Lich. Fl. p. 157, ed. 3, p. 145. *Umbilicaria varia* δ . *arctica* Leight. Ann. Mag. Nat. Hist. ser. 2, xviii. p. 283. *Lichenoides atrum*, *Corii Persici instar exasperatum* Dill. Muse. 220, t. 30. f. 119.

By some authors (as subsequently by Acharius himself, Syn. p. 65) this has been regarded only as a variety of *G. proboscidea*; while others have viewed it as being a variety rather of *G. hyperborea*, with which it agrees in the reaction of the medulla. From both of these, however, it is sufficiently separated by the characters of the thallus to entitle it to specific rank. The few British specimens are only of moderate size, though sufficiently typical. With us the apothecia are extremely rare, and have only once been met with.

Hab. On rocks in alpine situations.—*Distr.* Found only with certainty on one or two of the Scottish Grampians in Braemar.—B. M.: Ben-naboord, Aberdeenshire.

8. *G. polyphylla* Turn. & Borr. Lich. Br. (1839) p. 214.—Thallus monophyllous or polyphyllous, small or moderate, somewhat rigid, smooth or subsmooth, irregularly lobed, black or brownish-black; beneath naked, smooth, black (K^- , $CaCl^-$ + f. reddish). Apothecia small, at first plane, thinly margined, at length convex, immarginate, only slightly gyroso-plicate; spores 0.013–18 mm. long, 0.007–8 mm. thick.—Sm. Eng. Fl. v. p. 217; Mudd, Man. p. 116, t. ii. f. 36; Cromb. Journ. Linn. Soc. Bot. xvii. p. 576.—*Gyrophora glabra* β . *polyphylla* Gray, Nat. Arr. i. p. 476; Hook. Fl. Scot. ii. p. 41. *Umbilicaria polyphylla* Cromb. Lich. Brit. p. 41; Leight. Lich. Fl. p. 155, ed. 3, p. 143. *Umbilicaria varia* α . *polyphylla* Leight. Ann. Mag. Nat. Hist. ser. 2, xviii. p. 278. *Lichen polyphyllus* Linn. Sp. Pl. (1753) p. 1150; Huds. Fl. Angl. p. 455; Lightf. Fl. Scot. ii. p. 863; With. Nat. Arr. ed. 3, iv. p. 65; Eng.

Bot. t. 1282. *Lichenoides tenue pullum, foliis utrinque glabris* Dill. Musc. 225, t. 30. f. 129.—*Brit. Exs.*: Leight. n. 313; Mudd, n. 87; Larb. Lich. Hb. n. 331.

A rather variable plant in its manner of growth, whence different states have been regarded by authors as more or less distinct varieties. In nature, it is originally monophyllous, consisting of a single small peltate leaf (form *monophylla* Turn. & Borr. l. c.; Leight. ll. cc.), which subsequently becomes more or less lobed and polyphyllous. Sometimes the lobes become deeply divided and lacerate at the margins (form *lacera* Leight. Lich. Fl. p. 156, iii. p. 144; Mudd, Man. p. 116; Cromb. Enum. p. 41). At other times the upper surface is occasionally marked by a few undulating cracks with black interstices (form *sulcata* Turn. & Borr. l. c.; Leight. Lich. Fl. ll. cc.). Both of these, however, are but mere states, and may be seen in the same specimen, so that they are not entitled to be regarded as distinct forms. The apothecia seem to be extremely rare in Great Britain.

Hab. On rocks, boulders, and walls in upland and subalpine districts.—*Distr.* General and not uncommon in the mountainous regions of Great Britain; apparently rare in those of E. Ireland.—B. M.: Dartmoor, Devonshire; near St. Clear, Cornwall; Charnwood Forest, Leicestershire; Cader Idris, Cellfawr, near Barmouth, Merionethshire; Carnedd Llewelyn, Carnarvonshire; Ingleby and Battersby Moors, Cleveland, Yorkshire; between Hyshope and Wasterly, Durham; Kentmere, Westmoreland; near Wallington, Northumberland. New Galloway, Kirkcudbrightshire; Ben Lomond, Stirlingshire; Ben Lawers, near Tummel Bridge, and Craig-y-Barns, Dunkeld, Perthshire; Sidlaw Hills, Clava Mts., and Cortachy, Forfarshire; Craig Coinnoch, Glen Callater, Morrone, and Lochnagar, Braemar, Aberdeenshire; Ben Nevis, Inverness-shire. Luggelaw, co. Wicklow.

Form 1. *glabra* Nyl. *ex* Stiz. St. Gall. Nat. Ges. 1876, p. 212.—Thallus larger, monophyllous, somewhat firm, slightly rugulose, the margin undulate and unequally inciso-lobed.—*Gyrophora glabra* Gray, Nat. Arr. i. p. 476; Hook. Fl. Scot. ii. p. 41. *Lichen glaber* Ach. Prodr. (1798) p. 144 pro parte. *Lichen anthracinus* Dicks. Crypt. fasc. iii. p. 19; With. Nat. Arr. ed. 3, iv. p. 63.

Differs in the rather thicker, less smooth, and larger thallus (2-3 in. broad), which is not polyphyllous, though more or less lobed at the circumference. Elsewhere the normally brownish-black colour of the thallus merges into greyish (lead-en-black), but this is not visible in our few British specimens. With us it is always sterile.

Hab. On rocks and boulders in upland mountainous districts.—*Distr.* Seen only sparingly among the Grampians, Scotland, and in E. Ireland; no doubt to be detected elsewhere.—B. M.: Ben Lawers, Perthshire; Loch Callater, Braemar, Aberdeenshire. Lough Bray, near Dublin.

Form 2. *congregata* Turn. & Borr. Lich. Br. (1839) p. 214.—Thallus very small, the lobes clustered and curled, with the margins erect or reflexed, entire or lacerate.—Cromb. Grevillea xv. p. 79.—*Umbilicaria polyphylla* form *congregata* Leight. Lich. Fl. p. 156, ed. 3, p. 144. *Umbilicaria varia* a. *polyphylla* b. *congregata* Leight. Ann. Mag. Nat. Hist. ser. 2, xviii. p. 279.—*Brit. Exs.*: Leight. n. 65.

A small form with the thallus pulvinate, polyphyllous, and the lobes numerous, congested, and variable at the margins. It is connected with the type by intermediate states, and is but rarely seen in its more characteristic form. Apparently it never occurs in fruit.

Hab. On rocks in upland mountainous tracts.—*Distr.* Found only (in a typical state) in W. and N. England.—B. M.: Arcoll Hill, Caer Caradoc, and The Wrekin, Shropshire; Howden Gill, Cleveland, Yorkshire.

9. *G. flocculosa* Turn. & Borr. Lich. Br. (1839) p. 217.—Thallus monophyllous or polyphyllous, moderate or small, thin, opaque, sub-smooth or obsoletely papuloso-unequal, often more or less squamulose, reflexed at the margins, olive-black or blackish-brown, black furfuraceo-floccose; beneath naked, subconcolorous, lacunose or impresso-punctate (K^- , $CaCl^+_{red}$). Apothecia plane, thinly margined, at length convex, immarginate, usually only slightly complicate; spores sometimes slightly curved, 0,018–27 mm. long, 0,007–9 mm. thick.—Cromb. Grevillea, xv. p. 79.—*Gyrophora polyphylla* β . *flocculosa* Mudd, Man. p. 116. *Umbilicaria flocculosa* Cromb. Lich. Brit. p. 41; Leight. Lich. Fl. p. 156, ed. 3, p. 144. *Umbilicaria varia* β . *flocculosa* Leight. Ann. Mag. Nat. Hist. ser. 2, xviii. p. 280, t. x. f. 4. *Lichen flocculosus* Wulf. in Jacq. Coll. iii. (1789) p. 99, t. i. f. 2. *Gyrophora deusta* (Linn.) Eng. Bot. t. 2483; Hook. Fl. Scot. ii. p. 42; Sm. Eng. Fl. v. p. 218; Gray, Nat. Arr. i. p. 478.—*Brit. Exs.*: Leight. n. 219.

Though generally regarded as a variety of the preceding, the different characters of the thallus and the larger spores render it as distinct a species as most of the others in the genus. It may at once be recognized by the peculiar flocculose and usually more or less squamulose upper surface of the thallus, which is sometimes paler in colour, lacunose beneath (form *brotera*, Ach. Meth. p. 103), and occasionally in old plants becomes subcribose at the margins. The apothecia are extremely rare in Great Britain, and are sparingly visible only in one or two specimens.

Hab. On rocks and walls in upland and subalpine districts.—*Distr.* Rather local in W., Central, and N. England, N. Wales, S. Scotland, and among the Grampians; not seen from Ireland.—B. M.: Whitwick Rocks, Leicestershire; Caer Caradoc, Shropshire; Cader Idris and Cellfawr, near Barmouth, Merionethshire; Eglestone, Durham. New Galloway, Kirkcudbrightshire; Pentland Hills, near Edinburgh; Achrosagan Hill, Appin, and Ben Cruachan, Argyleshire; Ben Lawers, Perthshire; Clova, Forfarshire; Glen Callater, Braemar, Aberdeenshire; Ben Nevis, Lochaber, Inverness-shire.

10. *G. polyrhiza* Krb. Par. (1859) p. 41.—Thallus monophyllous or subpolyphyllous, small or nearly moderate, smooth, unequally lobed, crenate and undulate at the margins, greenish-copper-coloured; beneath black, papilloso-granulose, reticulate, densely fibrilloso-pannose (K^- , $CaCl^+_{reddish}$). Apothecia at first simple, orbicular or lirellaform, plane, immarginate, becoming at length convex and very much gyroso-complicate; spores 0,008–11 mm. long, 0,004–5 mm. thick.—Mudd, Man. p. 119.—*Umbilicaria polyrhiza* Cromb. Lich.

Brit. p. 41; Leight. Lich. Fl. p. 159, ed. 3, p. 146. *Lichen polyrrhizos* Linn. Sp. Pl. (1753) p. 1151; Lightf. Fl. Scot. ii. p. 864; With. Arr. ed. 3, iv. p. 64. *Gyrophora pellita* Ach., Turn. & Borr. Lich. Br. p. 240; Gray, Nat. Arr. i. p. 478; Hook. Fl. Scot. i. p. 42; Sm. Eng. Fl. v. p. 219; Tayl. in Mack. Fl. Hib. ii. p. 155. *Lichen pellitus* Eng. Bot. t. 931. *Lichen velleus* Huds. Fl. Angl. p. 454. *Lichenoides pullum superne glabrum, inferne nigrum et cirrhosum* Dill. Musc. 226, t. 30. f. 130.—*Brit. Exs.*: Mudd, n. 89.

Somewhat similar to *G. polyphylla*, but differs at once in the black hirsute fibrillæ of the under surface. The upper is somewhat shining, and is occasionally sprinkled with a few small, irregular tufts of black fibres. The apothecia, which are very rare in this country, are finely gyroso-complicate, resembling, as stated in Sm. Eng. Fl. l. c., "the finest and most beautiful filagree-work."

Hab. On rocks and boulders in upland and subalpine districts.—*Distr.* Somewhat local and scarce in W., N. England, and N. Wales; general and plentiful among the Scottish Grampians; rare in E. Ireland (co. Wicklow).—B. M.: Dartmoor, Devonshire; Helmlinton, Cornwall; Carnedd Dafydd, Carnarvonshire; Cwm Bychan and near Barmouth, Merionethshire; Ayton Moor, Cleveland, Yorkshire; Teesdale, Durham; The Cheviots, Northumberland; Ennerdale, Cumberland. New Galloway, Kirkcudbrightshire; Dalmahoy Hill, near Edinburgh; Aberfeldy, Amulree and Glenshee, Perthshire; Cortachy and Clova, Forfarshire; Lochnagar, Loch Phadrig. Glen Callater, and Glen Dee, Braemar, Aberdeenshire; near Rothiemurchus, Ben Nevis, and Ben Ferrog, Inverness-shire.

Form *luxurians* Fr. fil. Lich. Scand. (1871) p. 159.—Thallus polyphyllous, lobulate or somewhat lacinate and crisp at the margins, beneath subnaked.—Cromb. Grevillea xv. p. 79.—*Umbilicaria polyrrhiza* var. *luxurians* Cromb. Lich. Brit. p. 41; Leight. Lich. Fl. ed. 3, p. 147. *Gyrophora pellita* β . *luxurians* Ach. Lich. Univ. (1810) p. 228.

As its trivial name denotes, this is a more luxuriant state of the type, with the thallus more divided, the lobes often much congested, crisp at the margins, and much less (or scarcely) fibrillose on the under surface. It is not seen fertile.

Hab. On rocks, boulders, and stone walls in mountainous districts.—*Distr.* Only in S.W. England and among the Grampians, Scotland.—B. M.: Walkhampton and Sharpitor, S. Devon. Ben Lawers and near Tummel Bridge, Perthshire; Glen Callater, Braemar, Aberdeenshire; Glen Nevis, Inverness-shire.

Series V. **Placodei** Nyl. Mém. Soc. Cherb. vii. (1855) p. 175.

Thallus variously crustaceous, sometimes evanescent, rarely entirely wanting; medullary layer, when present, usually cretaceous. Apothecia lecanorine, lecideine or biatorine, or lirellæform; paraphyses discrete or coherent, rarely not distinct. Spermogones with various sterigmata and spermatia.—*Placodea* Nyl. Mém. Soc. Cherb. ii. (1854) p. 13.

A very extensive series comprehending by far the largest number of Lichens. It is very variable in the characters of the thallus and fructification, though the tribes of which it is composed are in both these respects related to each other by connecting links. The less developed thallus, the absence of a distinctly filamentose medullary layer, and the inferior type of the apothecia distinguish it from the preceding series. The thallus is rarely hypophloeodal, and the apothecia are rarely parasitic.

Tribe XVIII. **LECANO-LECIDEI** Nyl. Flora, 1882, p. 458.

Thallus crustaceous; laciniate, squamose, granulose or pulverulent, sometimes but little visible, occasionally absent; internally rarely entirely cellular, containing gonidia, rarely gonimia; hypothallus more or less distinct. Apothecia lecanorine, lecideine or biatorine, occasionally difform. Spermogones with jointed or simple sterigmata.

This comprises the numerous species of the *Lecanorei* and *Lecidei*, formerly in the Nylanderian arrangement regarded as distinct tribes. They are now, however, more naturally united into a single tribe from the circumstance that in some instances lecanorine apothecia are not to be distinguished from lecideine; while in certain cases normally biatorine apothecia occur in species otherwise entirely referable to the *Lecanorei*. The tribe is primarily divided into six subtribes (one of which, *Heppiei*, does not occur in Great Britain), differing from each other in the fructification.

Subtribe I. **PANNARIEI** Nyl. Flora, 1882, p. 458.

Thallus squamulose or granulose, rarely monophyllous, cellular in texture, containing gonimia, which are usually somewhat moniliform. Apothecia either lecanorine or biatorine, rarely lecideine; spores 8næ, colourless, simple or variously septate; paraphyses discrete, often thickish, generally articulate. Spermogones with jointed sterigmata.

A subtribe well characterized by the structure of the thallus. Since it contains gonimia it holds much the same position in this as the *Peltigerei* in the preceding series, though the texture is otherwise very different.

56. **PANNARIA** Del. in Dub. Bot. Gall. (1830) p. 606; Nyl. *emend.* Flora, 1879, p. 360.—Thallus laciniately divided or squamulose. Apothecia lecanorine; spores ellipsoid or oblong, simple; hymenial gelatine variously tinged with iodine. Spermogones with spermatia somewhat short, cylindrical, slightly thickened and obtuse at either apex.

Owing to the separation of the following genus formerly included in it, this is now much better limited both in the character of the thallus and of the apothecia. Most of the species are exotic; but, with a few exceptions, those which are European occur in this country.

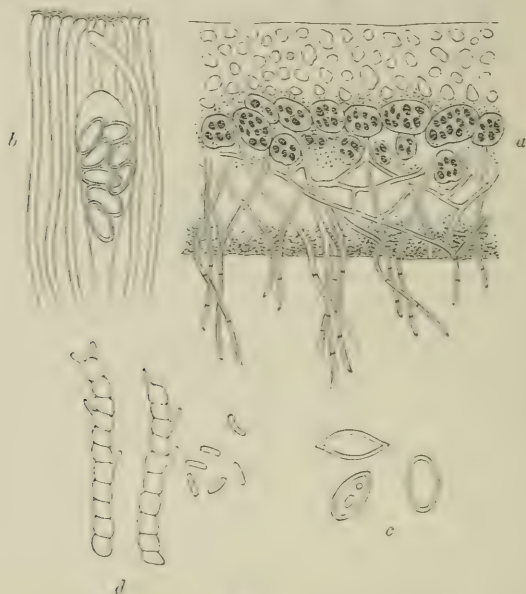


Fig. 55.

Pannaria rubiginosa Del.—a. Vertical section of thallus with hypothalline filaments, $\times 200$. b. A theca and paraphyses, $\times 350$. c. Spores, $\times 500$. d. Jointed sterigmata and spermatia, $\times 500$.

1. *P. rubiginosa* Del. in Dub. Bot. Gall. (1803) p. 606.—Thallus orbicular, membranaceous, appressed, smooth, lacinate at the circumference, livid-glaucous or pale; laciniae somewhat plane, incisobulbulate and crenate, crenulate and silvery-white at the margins; hypothallus spongioso-tomentose, bluish-black. Apothecia moderate, plane, red or reddish-brown, the thalline margin crenulate, silvery-white; spores ellipsoid, often somewhat acuminate at the apices, 0.017–0.030 mm. long, 0.006–0.011 mm. thick; hymenial gelatine bluish with iodine.—Mudd, Man. p. 122; Cromb. Lich. Brit. p. 42; Leight. Lich. Fl. p. 164, ed. 3, p. 150.—*Parmelia rubiginosa* Gray, Nat. Arr. i. p. 440; Hook. Fl. Scot. ii. p. 53. *Parmelia plumbea* β . *affinis* Tayl. in Mack. Fl. Hib. ii. p. 142. *Lichen rubiginosus* Thunb. Fl. Cap. (1794) p. 176. *Squamaria affinis* Sm. Eng. Fl. v. p. 196. *Lichen affinis* Dicks. Crypt. fasc. iv. p. 24, t. 12. f. 6; Eng. Bot. t. 983.—*Brit. Exs.*: Leight. n. 234; Cromb. n. 53; Larb. Lich. Hb. n. 11.

A rather beautiful plant, well marked by the silvery-white margins of the laciniae and by the bluish-black hypothallus. In the centre the

thallus is often squamoso-imbricate, and at the circumference the laciniae are approximate and radiating. The apothecia are chiefly central, numerous and crowded, becoming larger and deformed in age, with the margin at length flexuose.

Hab. On the trunks of old trees, rarely among mosses on walls and rocks, in maritime and upland districts.—*Distr.* General and usually plentiful in most of the mountainous tracts of Great Britain, and probably also of Ireland.—B. M.: Island of Guernsey. Appuldurcombe, Isle of Wight; near Totnes, S. Devon; Bocconoc and near Respring, Cornwall; Hay Coppice, Herefordshire; Aberdovey, Merionethshire; Teesdale and Eglestone Woods, Durham; Windermere, Westmoreland; Keswick and Emmerdale, Cumberland. Inverary, Head of Loch Awe and Appin, Argyshire; Loch Lomond, Dumbartonshire; Glen Falloch and Glen Lochay, Perthshire; Corriemulzie Falls, Braemar, Aberdeenshire; S. of Fort William, Inverness-shire; Applecross, Ross-shire. Dunkerron and Old Dromore, co. Kerry; Connemara, co. Galway.

Var. β . *cæruleo-badia* Mudd, Man. (1861) p. 122.—Thallus cæcio-pulverulent towards the centre, bluish-white; laciniae pulverulent at the margins. Apothecia small, appressed, the thalline margin pulverulent; spores 0,016–0,020 mm. long, 0,007–12 mm. thick; hymenial gelatine bluish (the thecae at length wine-reddish) with iodine.—Leight. Lich. Fl. p. 164, ed. 3, p. 151.—*Lichen cæruleo-badius* Schl. Cent. 2 (1805), n. 71. *Pannaria rubiginosa* var. *conopsea* (Ach.), Cromb. Lich. Brit. p. 42. *Parmelia plumbea* γ. *tumescens* Tayl. in Mack. Fl. Hib. ii. p. 142.—*Brit. Ees.*: Cromb. n. 54; *Larb. Lich. Hb.* n. 11.

Looks almost a distinct species, but is connected with the type by intermediate states. It is, however, in its most characteristic form, well distinguished by the densely granuloso-pulverulent (in old plants sorediate) thallus, with the laciniae often visible only at the immediate circumference. With us it is rarely fertile, and, even when present, the apothecia are few and scattered.

Hab. On the trunks of old trees in maritime and upland districts.—*Distr.* General and not uncommon in the Channel Islands, S.W. and N. England, N. Wales, W. Scotland, and S.W. Ireland.—B. M.: La Coupe, Island of Jersey; Island of Guernsey. Charlton Forest, Kent; St. Leonard's Forest, and Black Down, Sussex; Newton Bushell, and near South Brent, Devonshire; Withiel, Cornwall; Barmouth, Merionethshire; Teesdale Forest, Durham; Kentmere, Westmoreland. New Galloway, Kirkcudbrightshire; Barcaldine, Argyshire; Glen Lochay, Killin, Aberfeldy, and Den of Rechip, Perthshire; S. of Fort William, Inverness-shire; Glenfernes, Nairnshire; Applecross, Ross-shire. Killarney, co. Kerry.

2. *P. brunnea* Nyl. Mém. Soc. Cherb. ii, (1853) p. 324; Lich. Scand. p. 123.—Thallus suborbicular, granulato-squamulose, cervine or greyish-brown; squamules small, crenate, densely imbricate; hypothallus thin, arachnoid, greyish-white. Apothecia moderate or somewhat large, plane, red-testaceous or reddish-brown, the thalline margin crenulate; spores ellipsoid, 0,015–28 mm. long, 0,007–11 mm. thick; hymenial gelatine bright-blue, then sordid-bluish with iodine.—Mudd, Man. p. 124, t. ii. f. 37; Cromb. Lich.

Brit. p. 42.—*Lecanora brunnea* Hook. Fl. Scot. ii. p. 51. *Psoroma brunneum* Gray, Nat. Arr. i. p. 446. *Lichen brunneus* Sw. N. Act. Upsal. iv. (1784) p. 247; Eng. Bot. t. 1246. *Lecidea coronata* Sm. Eng. Fl. v. p. 182; Tayl. in Mack. Fl. Hib. ii. p. 127. *Pannaria pezizoides* (Weber), Leight. Lich. Fl. p. 165, ed. 3, p. 151. *Lichen pezizoides* Weber, Spicil. (1778) p. 200, seems doubtfully referable to this species, but denotes rather the following.—*Brit. Ees.*: Mudd, n. 90; Cromb. n. 55; Larb. Lich. Hb. n. 14.

Easily recognized from its British allies by the thallus and apothecia. The thallus is occasionally somewhat extended, and varies in colour according to the substratum and exposure. The apothecia are numerous and crowded, becoming somewhat flexuose, and vary in colour like the thallus. When growing on mosses in shady situations, it is cæcio-greyish with the squamules less imbricate and with paler apothecia; it is then *Lichen coronatus* Ach. Prodr. p. 75; *Pannaria brunnea* var. *coronata* Nyl., Cromb. Lich. Brit. p. 42; *cf.* Nyl. Syn. ii. p. 32. At high altitudes again it is much darker in colour (as are also the apothecia) with the hypothallus blackish.

Hab. On the ground and among rocks on decayed mosses, seldom on semiputrid stumps, in upland, rarely in alpine situations.—*Distr.* General and not uncommon in maritime and mountainous districts of Great Britain and Ireland.—B. M.: Dolgelly, Barmouth, and Cwm Bychan, Merionethshire; Bettws-y-Coed, Denbighshire; Gwydir and Glyder Vawr, Carnarvonshire; Battersby Bank, Cleveland, Yorkshire; Teesdale, Durham; Mardale, Westmoreland; Whitehaven, Cumberland; The Cheviots, Northumberland. New Galloway, Kirkcudbrightshire; near Roslin Castle, Midlothian; Bowling Bay, Dumbartonshire; Barcaldine and Airds, Appin, Argyshire; Killin, Ben Lawers, and Den of Rechip, Perthshire; Corriemulzie and Glen Ey, Braemar, Aberdeenshire; S. of Fort William, Inverness-shire. Brandon Mt., Turk Mt., Cromaglowm and Dunkerron, co. Kerry; Killery Bay, Connemara, co. Galway.

3. *P. nebulosa* Nyl. Mém. Soc. Cherb. ii. (1853) p. 324; Lich. Scand. p. 125.—Thallus indeterminate, thinly granuloso-crustose, greyish or dark cæcio-greyish; granules imbricato-congested, crenate. Apothecia small, plane or somewhat convex, crowned with the granulose thallus, red or reddish-brown, internally pale-whitish; spores ellipsoid or fusiformi-oblong, 0,015–24 mm. long, 0,006–9 mm. thick; hymenial gelatine faintly bluish and then wine-red with iodine.—Cromb. Lich. Brit. p. 42; Leight. Lich. Fl. p. 168, ed. 3, p. 153.—*Psora nebulosa* Hoffm. Deutsch. Fl. ii. (1795) p. 166. *Pannaria brunnea* var. *coronata* Leight. Lich. Fl. p. 166, ed. 3, p. 152; Mudd, Man. p. 124. *Lichen pezizoides* Dicks. Crypt. fasc. i. p. 10, t. 2. f. 4; With. Arr. iv. p. 21; Eng. Bot. Suppl. t. 2801. *Lecanora coronata* Floerke, Deutsch. Lich. n. 151, is only the type with paler margin of the apothecia (*vide* Nyl. Syn. ii. p. 32).—*Brit. Ees.*: Leight. n. 235; Larb. Cæsar. n. 26; Lich. Hb. n. 13.

Distinguished from the preceding by the colour of the granulose crustaceous thallus and by the smaller spores. The thallus sometimes spreads extensively, is but loosely coherent and very friable. The apothecia, which are usually numerous, are superficial or innate, becoming at length

convex and often with the thalline margin obliterated (form *hiatoroides* Cromb. Grevillea, xviii. p. 43).

Hab. On earth-covered walls and hedge-banks, rarely on decaying stumps, in maritime and upland districts.—*Distr.* Rather local, though plentiful where it occurs in the Channel Islands, here and there throughout England; scarce in N. Wales, Scotland, and S. Ireland.—B. M.: Quenvais and St. Brelade's Bay, Island of Jersey; Islands of Sark, Guernsey, and Alderney. North Wootton, Norfolk; Epping Forest, Essex; near Bovey Tracey, S. Devon; St. Germain's, Penzance, and Withiel, Cornwall; near Malvern, Worcestershire; Hay Forest, Herefordshire; Barmouth, Merionethshire; Bangor, Carnarvonshire; Egglestone, Durham; near Ennerdale Lake, Cumberland. New Galloway, Kirkeudbrightshire; Airds, Appin, Argyleshire; Loch Tay and Killin, Perthshire. Co. Cork.

4. *P. Hookeri* Nyl. Mém. Soc. Cherb. v. (1857) p. 109; Syn. ii. p. 32.—Thallus radiosocrustaceous, appressed, greyish or greyish-brown, granuloso-corrugate in the centre, radiately lineato-plicate or only lobulato-effigurate at the circumference; hypothallus thin, black. Apothecia nearly moderate, plane, black or blackish, internally pale, the thalline margin usually crenulate; spores ellipsoid, 0.014–0.015 mm. long, about 0.009 mm. thick; hymenial gelatine bluish, then sordid-red with iodine.—Mudd, Man. p. 125; Cromb. Grevillea, xviii. p. 43.—*Lecanora Hookeri* Hook. Fl. Scot. ii. p. 51. *Lichen Hookeri* Eng. Bot. xxxii. (1811) t. 2283. *Pannaria leucolepis* Cromb. Lich. Brit. p. 42; Leight. Lich. Fl. p. 165, ed. 3, p. 151. *Squamaria leucolepis* Sm. Eng. Fl. v. p. 194.—*Brit. Eas.*: Leight. n. 267.

An interesting species well characterized by the colours of the thallus and apothecia, as also by the nature of its habitat. The thallus when perfect is orbicular, placodioid, sometimes leaden-greyish, with the hypothallus little visible and at length evanescent. It is usually well fertile, with numerous, crowded apothecia, which in old plants are entirely black.

Hab. On micaceous-schistose rocks in alpine places.—*Distr.* Very local and rather scarce on the summits of a few of the S. Grampians, Scotland; reported also by Leighton, but very doubtfully, from N.W. Ireland (Connemara, co. Galway).—B. M.: Ben Lawers, Mael Graedha and Craig Calliach, Perthshire.

Var. *β. leucolepis* Nyl. Syn. ii. (1870) p. 33.—Thallus squamulose, greyish-white or lurid-greyish; squamules subimbricate, subcrenate, sometimes slightly striate towards the circumference. Apothecia black, the thalline margin subentire or at length subcrenate; spores about 0.015–0.019 mm. long, 0.008–0.010 mm. thick.—Cromb. Grevillea, xviii. p. 43.

Usually confounded with the type by British and other authors, but distinguished by the less developed thallus and by the size of the spores. The apothecia also are fewer, with the thalline margin less crenulate.

Hab. On decaying mosses upon rocks in alpine situations.—*Distr.* Extremely local and scarce on the summit of one of the S. Grampians, Scotland.—B. M.: Ben Lawers, Perthshire.

57. PANNULARIA Nyl. Flora, 1879, p. 360, l. c. 1882, p. 458. —Thallus squamulose or granulose. Apothecia biatorine, rarely lecideine: spores 8næ, ellipsoid or oblong, simple or variously septate, colourless; hymenial gelatine variously tinged with iodine. Spermatogones with spermatia as in the preceding genus, but sometimes shorter.

Differs from *Pannaria* in the less developed thallus and the different type of the apothecia, though occasionally these have a lecanoroid appearance. In some respects it might not inappropriately be referred to the subtribe of the *Lecideei*, but its true affinities are rather with *Pannaria*.

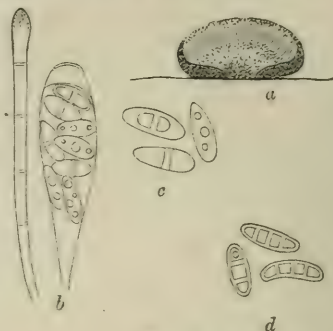


Fig. 56.

1. P. lepidiota Nyl. ex Stiz. St. Gall. Nat. Ges. 1882, p. 336.

—Thallus microlepidio-squamulose, lurid, lurid-brown or cervine; squamules moderate, imbricato-congested, firm, crenulate, often ascending at the margin, whitish beneath, more congested, smaller and granulato-crenulate in the centre.

Apothecia biatorine, nearly moderate, plane or convex, dark-red or brown, internally pale-whitish: spores ellipsoid, simple, 0.015–23 mm. long, 0.008–12 mm. thick; hymenial gelatine at first faintly bluish, then wine-red with iodine.—Cromb. Grevillea, xviii. p. 43.—*Lecidea carnosa* β. *lepidiota* Somm. Suppl. Fl. Lapp. (1826) p. 174. *Lichenoides granosum subglaucum*, *tuberculis planis nigricantibus* Dill. Musc. 544, t. 82. f. 2.

Pannularia nigra Nyl.—a. Vertical section of a young apothecium, ×30. b. A theca and paraphysis, ×350. c. Spores, ×500. d. Tri-septate spores of *P. psotina* Nyl., ×500.

Looks as if intermediate between *Pannaria rubiginosa* var. β and the following species, but is separated from the former by the biatorine apothecia, and from the latter by the more developed thallus and the larger spores. The thallus in its more typical state is pulvinato-acervulate with the squamules thickish and granulato-crenate; but it is often for the greater part granulose and lurid-cæsius in the centre. The apothecia are elsewhere sometimes crowned with the thalline granules, and thus have a lecanoroid aspect. The only British specimen seen is sparingly fertile.

Hab. Overspreading decayed mosses on the ground in alpine situations. —*Distr.* Extremely local and scarce on one of the S. Grampians, Scotland.—B. M.: Above Loch-na-Gat, Ben Lawers, Perthshire.

2. P. microphylla Nyl. ex Stiz. St. Gall. Nat. Ges. 1882, p. 336.—Thallus subdeterminate, squamuloso-crustaceous, areolato-diffract, cervine or livid-grey; squamules minute, crenate, closely imbricate, often whitish at the margins; hypothallus brownish-black. Apothecia small, biatorine, usually convex, brownish or reddish, intern-

ally pale or whitish; spores ellipsoid, simple, 0,010–17 mm. long, 0,005–8 mm. thick; hymenial gelatine somewhat bluish and then wine-red with iodine.—Cromb. Grevillea, xiii. p. 43.—*Pannaria microphylla* Mudd, Man. p. 123; Cromb. Lich. Brit. p. 42; Leight. Lich. Fl. p. 166, ed. 3, p. 152. *Lichen microphyllus* Sw. Vet. Ak. Handl. (1791) p. 301. *Lichen escharoides* Eng. Bot. t. 1247? *Lecidea coronata* β . *escharoides* Sm. Eng. Fl. v. p. 182.—*Brit. Ess.*: Larb. Cæsar. n. 71; Lich. Hb. n. 89.

Closely allied, as already intimated, to the preceding, but with an inferior type of thallus and smaller spores. The thallus is often effuse, and at times forms a thickish diffract crust. The apothecia are either scattered or approximate, somewhat plane or usually convex, rarely in a young state lecanoroid.

Hab. On rocks, seldom on the ground, in maritime districts.—*Distr.* Local and rare in the Channel Islands, S.W. England, the S.W. Highlands of Scotland, and N.W. Ireland.—B. M.: Rozel, Island of Jersey; Islands of Sark and Guernsey. Near Penzance, Cornwall. Barcaldine, Argyleshire. Connemara, co. Galway.

Form *cheilea* Nyl. ex Cromb. Grevillea, xviii. (1889) p. 43.—Thallus dark-cervine, the squamules concolorous at the margins. Apothecia subinnate-sessile, somewhat plane, crowned by the thallus: spores ellipsoideo-oblong, spuriously 1-septate.—*Pannaria microphylla* var. *cheilea* Nyl. Syn. ii. p. 35. *Pannaria cheilea* Nyl. in Mudd, Man. (1861) p. 126; Cromb. Lich. Brit. p. 43; Leight. Lich. Fl. p. 169, ed. 3, p. 155. *Massalongia cheilea* Mudd, Man. p. 126.

Differs from darker states of the type in the margins of the squamules not being whitish, in the apothecia being lecanoroid, though often at length biatorine, and in the spuriously septate spores. It is scarcely, according to Nylander in *litt.*, to be considered as a distinct variety, but only as a form.

Hab. On damp schistose rocks in maritime districts.—*Distr.* Very local and scarce in the S.W. Highlands of Scotland and in S.W. Ireland.—B. M.: Loch Creran, Barcaldine, Argyleshire. Western Blasquet Island and Blackwater Bridge, co. Kerry; Kilkee, co. Clare.

3. *P. triptophylla* Nyl. ex Stiz. St. Gall. Nat. Ges. 1882, p. 336.—Thallus thinly microlepideo-granulose or minutely and crowdedly coralloideo-squamulose, greyish-brown or leaden-greyish; hypothallus bluish-black or blackish. Apothecia biatorine, small, plane or convex, brown or reddish-brown, usually paler at the margin, internally brownish-black; spores ellipsoid, simple, 0,012–19 mm. long, 0,006–8 mm. thick; hymenial gelatine intensely bluish with iodine.—Cromb. Grevillea, xii. p. 58.—*Pannaria triptophylla* Leight. Lich. Fl. p. 167, ed. 3, p. 152; Mudd, Man. p. 123; Cromb. Lich. Brit. p. 42. *Lepidoma triptophyllum* Gray, Nat. Arr. i. p. 462. *Lecidea microphylla* Hook. Fl. Scot. ii. p. 41. *Placodium microphyllum* Sm. Eng. Fl. v. p. 198. *Parmelia plumbea* δ . *microphylla*

Tayl. in Mack. Fl. Hib. ii. p. 142. *Lichen microphyllus* Eng. Bot. t. 2128.—*Brit. Exs.*: Cromb. n. 153.

Externally subsimilar to *P. microphylla*, but differs in the less firm, squamulose thallus, and more especially in the infusate hypothecium. It forms a thin or thinnish crust, with the squamules at first plane and adnate on the hypothallus, becoming at length granulose and diffract, the squamules being visible only at the immediate circumference. The thallus varies somewhat in colour according to situation, becoming more or less blackish, whence form *nigricans* Leight. Lich. Fl. ed. 3, p. 153. The apothecia are scattered and occasionally darker in colour, but are seldom present in our specimens.

Hab. On the trunks of old trees in wooded upland districts.—*Distr.* Somewhat local, though plentiful where it occurs in the mountainous tracts of W. Britain and S.W. Ireland.—B. M.: Near Lydford, Hu-styn's Wood, and Lynton, Devonshire; St. Breck, Cornwall; Barmouth, Cwm Bychan, and Harlech, Merionethshire; Beddgelert, Carnarvonshire; Island of Anglesea. Kentmere, Westmoreland. New Galloway, Kirkcudbrightshire; Inverary, Barcaldine, and Appin, Argyleshire; Crian-larich, Loch Katrine, and Glen Lochay, Perthshire; Craig Cluny, Braemar, Aberdeenshire; Glen Ach-na-Shilloch, Ross-shire. Glen Bower Woods and Glengariff, co. Cork; Turk Mt. and Dinish, Killarney, co. Kerry.

Var. *β. incrassata* Nyl. ex Lamy. Bull. Soc. Bot. t. xxv. (1878) p. 389.—Thallus thick, densely coralloideo-stipate, brownish-black; hypothallus spongioso-rhizino-se. Apothecia very rare, convex, brownish-black.—Cromb. Grevillea. xviii. p. 44.—*Pannaria triptophylla* var. *incrassata* Nyl. Not. Sällsk. pro F. et Fl. F. Förh. v. (1866) p. 124. *Pannaria lasiella* Stirt. Scot. Nat. iv. p. 164.

Distinguished by the darker, much thicker thallus (4–6 mm. thick), and by the peculiar hypothallus. It has only recently been met with in a fertile condition.

Hab. On the trunks of old ash trees, rarely on mossy ground among rocks, in upland wooded districts.—*Distr.* Local and scarce in the S.W. Highlands, and among the S. and N. Grampians, Scotland.—B. M.: Glen Creran, Barcaldine, Argyleshire (*frt.*); Glen Lochay, Killin, Perthshire.

4. *P. nigra* Nyl. ex Stiz. St. Gall. Nat. Ges. 1882, p. 336.—Thallus subdeterminate, minutely coralloideo-granuloso-crustaceous, usually diffracto-areolate, thinnish, dark-greyish-black, brownish-black or black; hypothallus bluish-black. Apothecia lecideine, small, plane or slightly convex, black, internally pale-whitish, the margin entire, concolorous; spores ellipsoid, 1-septate (or simple and oleoso-locular), 0.011–18 mm. long, 0.005–7 mm. thick; hypothecium brownish-black, paraphyses thick; hymenial gelatine deep-bluish and then dark-violet with iodine.—Cromb. Grevillea. xii. p. 58.—*Pannaria nigra* Cromb. Lich. Brit. p. 43; Leight. Lich. Fl. p. 168, ed. 3, p. 154. *Lecothecium nigrum* Mass., Mudd. Man. p. 175 pro parte. *Collema nigrum* Sm. Eng. Fl. v. p. 207; Tayl. in Mack. Fl. Hib. ii. p. 107. *Placynthium nigrum* Gray, Nat. Arr. i. p. 395. *Lichen niger* Huds. Fl. Angl. ii. (1778) p. 524; With. Arr. iv. p. 10; Eng. Bot. t. 1161.—*Brit. Exs.*: Leight. n. 366.

Allied to *P. triptophylla*, of which it has sometimes been considered as a variety; but it is specifically distinct by the less developed thallus, the type of the apothecia, and by the spores not being definitely simple. The thallus, which forms a crowdedly diffracto-areolate crust, at times subramuloso-divided, is normally determinate, and is very distinctly limited by a broad, conspicuous hypothallus. Occasionally it is of a dark-brownish colour, as are also the apothecia, whence var. β *fusceum* (Hepp.) Mudd, Man. l. c. The apothecia are numerous, scattered or approximate, sometimes becoming convex with evanescent margin.

Hab. On calcareous rocks, mortar of walls and flint pebbles, in maritime, lowland, and upland tracts.—*Distr.* General and common throughout Great Britain, and no doubt also in Ireland; rarer in the Channel Islands.—B. M.: Gorey, Island of Jersey. Shiere, Surrey; Glynde, Sussex; Shanklin, Isle of Wight; Anstey's Cove, Torquay, and Paington, S. Devon; St. Minver, Cornwall; near Cromford and Buxton, Derbyshire; near Stroud, Gloucestershire; Bathampton Downs, Somersetshire; Llanymynech Hill and Bridgenorth, Shropshire; Barmouth, Merionethshire; Egglestone, Durham; Levens, Westmoreland; near Whitehaven, Cumberland. Appin, Argyleshire; Ben Lawers and Craig Tulloch, Blair Athole, Perthshire; Castleton of Braemar, Aberdeenshire; Applecross, Ross-shire. Near Belfast, co. Antrim.

Subsp. *P. psotina* Cromb. Grevillea, xviii. (1889) p. 44.—Thallus as in the type. Apothecia internally pale; spores occasionally 3-septate (the septa thin); hypothecium almost entirely colourless (or partly pale-brownish).—*Pannaria nigra* subsp. *psotina* Nyl. ex Cromb. Journ. Bot. 1873, p. 133. *P. psotina* Leight. Lich. Fl. ed. 3, p. 156. *Pannaria nigra* var. *psotina* Ach., fide Nyl. Lich. Scand. (1861) p. 126. *Lecothecium nigrum* Mudd, Man. p. 175 pro parte, t. iii. f. 65 (middle fig.).—*Brit. Ess.*: Mudd, n. 144.

Differs in the internal colour of the apothecia and in the spores being rarely triseptate. In our specimens the thallus is subeffuse, with the hypothallus rather narrow and at times little visible. In Flora, 1876, p. 239, Nylander seems inclined to regard it as a proper species.

Hab. On mortar of walls and calcareous rocks in maritime and lowland districts.—*Distr.* Only here and there in England and the Channel Islands; no doubt to be detected elsewhere.—B. M.: The Vale, Island of Guernsey. Eastbourne, Sussex; near the Horse, Windsor Great Park, Berkshire; Bilsdale, Yorkshire. Hexham, Northumberland; Whitehaven, Cumberland.

5. *P. triseptata* Nyl. ex Cromb. Grevillea, xviii. (1889) p. 44.—Thallus subdeterminate, granuloso-crustaceous, diffracto-areolate, brownish-black; hypothallus blackish, not very distinct. Apothecia lecideine, small, thinly margined, black or dark-reddish-brown, internally whitish; spores ellipsoid, 3-septate, 0.016–23 mm. long, 0.006–9 mm. thick; hypothecium blackish or brown; hymenial gelatine bluish with iodine.—*Pannaria nigra* var. *triseptata* Nyl. Lich. Scand. (1861) p. 126; Not. Sällsk. pro F. et Fl. F. Förh. v. p. 125; Cromb. Lich. Brit. p. 43, subsp. *tris ptata* Nyl. ex Cromb. Grevillea, i. p. 171.

Subsimilar to the preceding species, but differs at once in the determinately 3-septate and larger spores. At first sight it looks almost like *Pterygium pannariellum*, but it is not distinctly radiate at the circumference, and is more definitely separated by the presence of a more or less visible hypothallus. The apothecia are rather scattered and not numerous in the British specimens.

Hab. On micaceo-schistose rocks in subalpine and alpine regions.—*Distr.* Only sparingly among the S. and Central Grampians, Scotland.—B. M.: Craig Calliach, Ben Lawers, and Craig Tulloch, Perthshire.

6. *P. melantera* Cromb. Grevillea, xviii. (1889) p. 44.—Thallus effuse, diffracto-squamose, black, beneath bluish-black; squamules thickish, minutely papillose. Apothecia small, sessile, plane or somewhat convex, the margin shining; spores oblong, 1-3-septate or simple, 0.03-0.045 mm. long, 0.0045-0.005 mm. thick; hypothecium brownish; hymenial gelatine bluish, the thecae tawny with iodine.—*Pannaria melantera* Stirt. Scot. Nat. 1879, p. 16; Leight. Lich. Fl. ed. 3, p. 544.

Said by Dr. Stirton, *l. c.*, to be similar to *P. dolichotera* Nyl., a Scandinavian plant, but with longer spores. Evidently it would differ also, according to the diagnosis given, in the more squamose thallus and the distinct hypothallus. In the absence, however, of any specimen, I regard it as a doubtful species (probably only subsp. *P. psotina*).

Hab. On mica-schist rocks in an (?) alpine situation.—*Distr.* Found only on the S. Grampians, Scotland (Ben Lawers, Perthshire).

7. *P. carnosa* Cromb. Grevillea, xii. (1884) p. 62.—Thallus subdeterminate, squamuloso-lobed, livid- or ferrugineous-brown; lobes variously divided or crenato-incised, imbricate or ascending and congested, usually granuloso-crenate at the margins, whitish beneath; hypothallus brownish-black, evanescent. Apothecia biatorine, small or slightly concave, reddish-brown or dark-red, the margin paler; spores oblong, oblongo-fusiform or rarely ellipsoid, simple or obsoletely 1-septate, 0.016-31 mm. long, 0.005-8 mm. thick; hymenial gelatine yellow (the apices of the thecae deep bluish) with iodine.—*Pannaria carnosa* Leight. Lich. Fl. p. 169, ed. 3, p. 155. *Massalongia carnosa* Mudd, Man. p. 126, t. ii. f. 39. *Lichen carnosus* Dicks. Crypt. fasc. ii. (1790) p. 21, t. vi. f. 7; With. Arr. iv. p. 33; Eng. Bot. t. 1684. *Pannaria muscorum* (Ach.) Cromb. Lich. Brit. p. 43. *Squamaria muscorum* Sm. Eng. Fl. v. p. 194. *Lecanora muscorum* Hook. Fl. Scot. ii. p. 51; Tayl. in Mack. Fl. Hib. ii. p. 139. *Psoroma muscorum* Gray, Nat. Arr. i. p. 446.—*Brit. Exs.*: Cromb. n. 154; Leight. n. 393.

Readily recognized from other British species by the colour of the more distinctly squamulose thallus and by the variable narrow spores. The thallus is thinnish, usually spreading somewhat extensively over the substratum, but at times smaller, determinate, and bordered by the hypothallus. The apothecia are generally small and numerous, sometimes fewer and moderate, with the spores occasionally obsoletely brownish.

Hab. Among mosses on rocks and boulders in maritime and mountainous districts.—*Distr.* Local, though plentiful, in S.W., W., and N.

England, N. Wales; more general among the Grampians, Scotland; rare in E. Ireland.—B. M.: Near South Brent, Devonshire; Penzance, Cornwall; Cader Idris, Dolgelly, Cwm Bychan, and Barmouth, Merionethshire; Oswestry, Shropshire; Teesdale, Durham. Head of Loch Awe, Argyleshire; Foot of Ben More, Glen Lochay, and Ben Lawers, Perthshire; Glen Ey, Braemar, Aberdeenshire; by Loch Linnhe, Lochaber, Invernessshire. Kippure Mts., co. Dublin.

Var. β . *determinata* Cromb. Grevillea, xviii. (1889) p. 44.—Thallus microphylline, paler, livid, crenato-lobate. Apothecia small, the margin yellow-testaceous: spores determinately 1-septate, brownish, 0,026–36 mm. long, 0,007–8 mm. thick.—*Pannaria carnosa* var. *determinata* Leight. Lich. Fl. p. 169, ed. 3, p. 156. *Pannaria muscorum* var. *determinata* Nyl. Scand. (1861) p. 128; Cromb. Lich. Brit. p. 43.

Differs in the less developed thallus (resulting probably from the habitat) and in the regularly septate, larger, brownish spores, which sometimes present several spurious septa.

Hab. On moist soil in upland districts.—*Distr.* Apparently very local and rare in N.E. Ireland.—B. M.: Carnlough, co. Antrim.

8. *P. delicatula* Nyl. ex Cromb. Journ. Bot. 1882, p. 274.—Thallus thin, adnate, minutely granuloso-crustaceous, brown. Apothecia biatorine, small, somewhat convex, immarginate, brownish-black (reddish when moist); spores fusiform-vermicular, straight or substraight, 7–9-septate, 0,040–76 mm. long, 0,005–7 mm. thick; paraphyses yellowish-brown at the clavate apices, hypothecium colourless; hymenial gelatine (and the thecæ) bluish with iodine.—*Pannaria delicatula* Nyl. Sällsk. pro F. et Fl. F. Förh. v. (1866) p. 181. *Arctomia delicatula* Fr. fil. N. Act. Reg. Soc. Sc. Upsal. (1861) p. 387.

A minute but very distinct species, well characterized by the peculiar spores. The thallus is more or less adnate, closely appressed to the substratum, and scarcely visible except in wet weather. The apothecia, which, though small, are large in proportion to the size of the granules, are either scattered or crowded, and when moistened are of a bright wine-red colour. Originally included by Th. M. Fries among the *Collema*cei, it is entirely referable to this genus.

Hab. On decayed mosses in alpine situations.—*Distr.* Extremely local and scarce among the S. Grampians, Scotland, and (*vide* Nyl. in *litt.*) on the Mts. of N.W. Ireland (Connemara, Galway).—B. M.: Ben Lawers, Perthshire.

58. *COCCOCARPIA* Pers. in Gaudich. Voy. Uran. (1826) p. 206; Nyl. Syn. ii. p. 41.—Thallus monophyllous or submonophyllous, lobato- or laciniato-divided at the circumference. Apothecia biatorine, adnate; spores ellipsoid or oblong, simple, small; hymenial gelatine variously tinged with iodine. Spermatogones with short, cylindrical spermatia.

Intimately allied to *Pannaria*, but differs in the type of the thallus and

apothecia. Like *Pannularia*, it might almost be included among the *Lecidei* (vide Nyl. and Cromb. Journ. Linn. Soc. Bot. xx. p. 51); but its more appropriate place is in this subtribe. It comprises only a few species, which, with a single exception, are natives of warm regions.

1. *C. plumbea* Nyl. Mém. Soc. Cherb. v. (1857) p. 109; Lich. Scand. p. 128.—Thallus orbicular, coriáceo-membranaceous, sub-monophyllous, adnate, radiato-incised and radiately plicato-rugose at the circumference, the margins broadly expanded and crenate, livid-greyish or livid leaden-coloured; hypothallus thickish, tomentose, leaden-bluish. Apothecia small, plane or convex, reddish-brown, the margin thin, entire, paler; spores ellipsoid, simple,

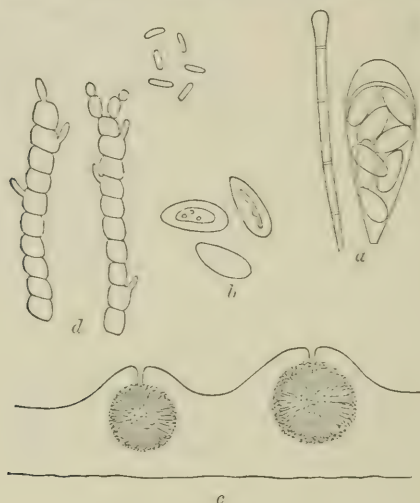


Fig. 57.

Coccocarpia plumbea Nyl.—a. A theca and paraphysis, $\times 350$. b. Three spores, $\times 500$. c. Vertical section of two spermatogones, $\times 30$. d. Jointed sterigmata and spermatia, $\times 500$.

0.016–30 mm. long, 0.007–11 mm. thick; hymenial gelatine bluish with iodine.—Cromb. Lich. Brit. p. 43.—*Pannaria plumbea* Mudd, Man. p. 121; Leight. Lich. Fl. p. 170, ed. 3, p. 154. *Placodium plumbeum* Sm. Eng. Fl. v. p. 197. *Parmelia plumbea* Hook. Fl. Scot. ii. p. 53; Gray, Nat. Arr. i. p. 440; Tayl. in Mack. Fl. Hib. ii. p. 142. *Lichen plumbeus* Lightf. Fl. Scot. ii. (1777) p. 826, t. 26 (lower fig.); With. Arr. iv. p. 60; Eng. Bot. t. 353. *Lichen cærulescens* Huds. Fl. Angl. ed. 2, p. 531. *Lichenoides tenue et molle, Agarici facie* Dill. Musc. 179, t. 24, f. 73.—Brit. Exs.: Leight. n. 233; Cromb. n. 56; Larb. Caesar. n. 72 pro parte; Lich. Hb. n. 253.

A well-marked and easily recognized plant, varying in diameter from 3 to 6 inches, and occasionally still more expanded. The thallus is often

concentrically rugulose towards the circumference, is very rarely partly panniform, and occasionally bears pale rhizine on the under surface. The apothecia are small in proportion to the size of the thallus, though sometimes moderate, occasionally having the appearance of being compound, while rarely they are proliferous, with the margin crenate and inflexed.

Hab. On the trunks of old trees, seldom on mossy boulders and walls, in maritime and upland wooded regions.—*Distr.* General and common, especially in the mountainous tracts of Great Britain and Ireland; scarce in the Channel Islands.—B. M.: La Coupe, Island of Jersey; Islands of Guernsey, Crevichou, and Alderney. Appuldurcombe, Isle of Wight; South Brent and Bolt Head, Devonshire; near Penzance, Bodmin, Pentire, Boccunoe and Respring, Cornwall; Cader Idris, and near Barmouth, Merionethshire; Aber, Carnarvonshire; Bettws-y-Coed, Denbighshire; Egglestone, Durham; Keswick and Ennerdale Lake, Cumberland. New Galloway, Kirkeudbrightshire; Barcaldine, Appin, and Head of Loch Awe, Argyleshire; Glen Falloch, Glen Lochay, and Killin, Perthshire; Clova, Forfarshire; Craig Coinnoch, Braemar, Aberdeenshire; S. of Fort William, Inverness-shire; Applecross, Ross-shire. Cromaglow and Blackwater Bridge, co. Kerry; Connemara, co. Galway.

Var. β . *myriocarpa* Nyl. Lich. Scand. (1861) p. 128.—Thallus microphylline or granulose in the centre. Apothecia rather small, numerous, often margined by the granulose thallus.—Cromb. Lich. Brit. p. 43.—*Pannaria plumbea* β . *myriocarpa* Mudd, Man. p. 122; Leight. Lich. Fl. ed. 3, p. 154. *Parmelia plumbea* var. *myriocarpa* Del. in Dub. Bot. Gall. (1830) p. 606.—*Brit. Ers.*: Cromb. n. 57; Lerb. Cæsar. n. 72 pro parte.

Differs in the smaller, less developed thallus, which is frequently granulose almost throughout, and is thus analogous to var. β of *Pannaria rubiginosa*. The apothecia are usually crowded, and in a young state are often crowned by greyish thalline granules (form *lecanoroides* Cromb. Grevillea, xviii. p. 44).

Hab. On the trunks of old trees in maritime and upland wooded regions.—*Distr.* Rather local in S.W. and N. England, N. Wales, the W. Highlands, and N.E. Scotland; rare in the Channel Islands and S. Ireland.—B. M.: Island of Jersey. Throwleigh, Totnes, and near Hopton, Devonshire; near Penzance, Cornwall; Bettws-y-Coed, Denbighshire; Island of Anglesea; Teesdale, Durham; Windermere, Westmoreland. Near Campsie, Dumbartonshire; Barcaldine, Argyleshire; The Trossachs, Aberfeldy, and Killin, Perthshire; S. of Fort William, Inverness-shire; Cawdor Woods, Nairn. Deer Park, Castlebernard, co. Cork.

Subtribe II. *LECANOREI* Nyl. Flora, 1882, p. 458.

Thallus squamulose, granulose or pulverulent, internally containing gonidia. Apothecia typically lecanorine; spores 8næ, rarely numerous, simple or variously divided; paraphyses discrete. Spermatogones usually with jointed sterigmata.

Well distinguished from the preceding subtribe by the gonidial layer consisting of eugonidia. It is very variable in the characters of the thallus and fructification, sometimes, in the latter respect, passing as it were into the subtribe of the *Lecidei*.

59. **LEPROLOMA** Nyl. Flora, 1883, p. 107.—Thallus monophyllo-lobate, submembranaceous, soft, pulverulent on the surface, containing gonidia. Apothecia and spermogones unknown.

A pseudo-genus separated by Nylander from *Amphiloma* (now restricted to exotic species) on account of the thallus being leprarioid and always sterile. Indeed in Lich. Scand. p. 129, he had said in regard to the single species of which it consists, "it is possible that our lichen may be a degraded state of a type which we do not yet know." In the absence of fructification, its systematic place is quite uncertain.

1. **L. lanuginosam** Nyl. l. c.—Thallus orbicular or subeffuse, granuloso-pulverulent in the centre, white or yellowish-white, lobes subimbricate, adpresso-adnate (K —): hypothallus tomentose, bluish-black.—Cromb. Grevillea, xviii. p. 44.—*Amphiloma lanuginosum* Mudd, Man. p. 126: Cromb. Lich. Brit. p. 44; Leight. Lich. Fl. p. 170, ed. 3, p. 156. *Squamaria lanuginosa* Sm. Eng. Fl. v. p. 53. *Parmelia lanuginosa* Hook. Fl. Scot. ii. p. 53; Gray, Nat. Arr. i. p. 439; Tayl. in Mack. Fl. Hib. ii. p. 148. *Lichen lanuginosus* Ach. Prodr. (1798) p. 120. *Lichen membranaceus* Dicks. Crypt. fasc. ii. p. 21, t. 6. f. 1; With. Arr. iv. p. 61.—*Brit. Exs.*: Leight. n. 55; Larb. Lich. Hb. n. 332.

The thallus, which is moderate, or at times somewhat expanded, is occasionally granuloso-pulverulent almost throughout, so that the lobes are nearly obliterated. It is never seen except sterile, though apothecia have been described both by Dickson and Acharius; by the former as being "few, minute, pale-yellow," and by the latter as "minute, reddish, with pulverulent margin." Apart from the discrepancy as to colour, these evidently were not the true fructification.

Hab. On decayed mosses on shaded rocks, chiefly granitic and schistose, in maritime and upland situations.—*Distr.* General and not uncommon in the mountainous tracts of Great Britain and probably also of Ireland: rare in the Channel Islands.—B. M.: Rozel, Island of Jersey; Island of Guernsey. Lustleigh Cleeve, S. Devon; Roche Rock, Cornwall; Bardon Hill, Leicestershire; Malvern, Worcestershire; Longmynd Hill and Stiperstones, Shropshire; Barmouth, Merionethshire; Falcon Clints, Durham; Kentmere, Westmoreland; Wastdale, Cumberland. Black Craig, New Galloway, Kirkcudbrightshire; Ben Lomond, Dumbartonshire; Achrosagan Hill, Appin; The Trossachs and Craig Calliach, Perthshire; Canlochan, Forfarshire; Craig Cluny, Braemar, Aberdeenshire; Glen Nevis, Invernessshire; near Lairg, Sutherlandshire. Bonane, near Dunkerron, co. Kerry.

60. **LECANORA** Ach. Lich. Univ. (1810) p. 77; Nyl. emend. Not. Sällsk. pro F. et Fl. F. Förh. v. (1866) p. 125.—Thallus radiato-laciniate, squamulose, granulose, rarely leprose or evanescent. Apothecia lecanorine, occasionally biatoroid; spores usually 8næ, seldom numerous, ellipsoid or oblong, rarely fusiform, simple or sometimes locular or septate, usually colourless; hymenial gelatine variously tinged with iodine. Spermogones with jointed, rarely simple sterigmata and various spermatia.

A large genus comprising several subgenera, formerly ranking as distinct genera, but not sufficiently differing to warrant this arrangement. Indeed, so intimately are they related that Nylander seems at times inclined to regard them as only leading sections. Some of these with biatoroid apothecia have sometimes been arranged under the *Lecidei*; but in most cases the apothecia are, at least in a young state, lecanorine, with the margin containing gonidia. In other instances the character of the spermogones indicates their true relation.

Subgenus 1. PSOROMA Nyl. Not. Sällsk. pro F. et Fl. F. Förh. v. (1886) p. 125.—Thallus squamulose or subgranulose, internally cellular. Apothecia lecanorine; spores 8næ, ellipsoid, simple; hymenial gelatine bluish, then wine-red with iodine. Spermogones with jointed sterigmata and short cylindrical spermatia slightly thickened at either apex.—*Psoroma* Ach. Prodr. (1798) p. 91 pro minima parte; Nyl. Mém. Soc. Cherb. iii. (1885) p. 322.

At once distinguished by the entirely cellular structure of the thallus. Most of the species are exotic, and of the few which are European, only one occurs in this country.

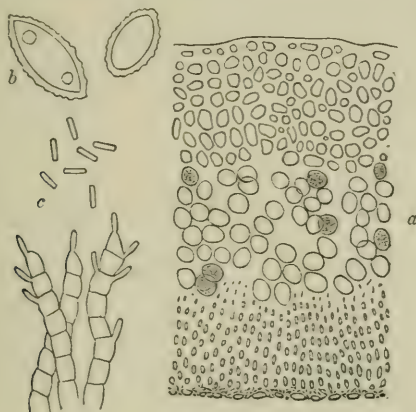


Fig. 58.

Lecanora (Psoroma) hypnorum Ach.—a. Vertical section of thallus, $\times 200$.
b. Spores, $\times 500$. c. Sterigmata and spermatia, $\times 500$.

1. *L. hypnorum* Ach. Syn. (1814) p. 193; Nyl. Not. Sällsk. pro F. et Fl. F. Förh. v. (1866) p. 125.—Thallus indeterminate, squamuloso-granulate, yellowish-brown or tawny-yellow; squamules minute, crenate or granulate (K—). Apothecia moderate or somewhat large, at first urceolate, then plane, red or brownish, the thalline margin granuloso-crenate; spores often somewhat acute at either apex, 0.016–21 mm. long, 0.008–11 mm. thick; hymenial gelatine bluish, then wine-red with iodine.—Cromb. Grevillea, xii. p. 60; Hook. Fl. Scot. ii. p. 51; Tayl. in Mack. Fl. Hib. ii. p. 139.

—*Psoroma hypnorum* Hoffm. Deutsch. Fl. ii. (1795) p. 166 ; Cromb. Lich. Brit. p. 44 ; Leight. Lich. Fl. p. 163, ed. 3, p. 149 ; Gray, Nat. Arr. i. p. 445. *Pannaria hypnorum* Mudd, Man. p. 124. *Squamaria hypnorum* Sm. Eng. Fl. v. p. 194. *Lichen hypnorum* Dicks. Crypt. fasc. iii. p. 14 ; With. Arr. iv. p. 22 ; Eng. Bot. t. 740.—*Brit. Exs.* : Larb. Cæsar. n. 70 ; Cromb. n. 58 pro parte.

Internally somewhat resembling more developed states of *Pannaria brunnea*, with which it is confounded in some of our older herbaria, but is definitely separated by the texture of the thallus. The plant is more or less effuse, with the squamules either somewhat discrete, or imbricately crowded, or sometimes little developed—according to the habitat. The hypothallus is very rarely visible, and only in corticolous specimens, where it is thin, greyish or greyish-brown (*vide* Nyl. Pyr. Or. p. 125). The apothecia are generally numerous, becoming larger in old plants.

Hab. Among mosses on the ground, rocks, and walls in maritime and upland districts.—*Distr.* Rather local in England, N. Wales, and the Channel Islands, more frequent in Scotland ; not recorded from Ireland.—B. M. : Grosnez, Island of Jersey ; Island of Guernsey. Yarmouth, Suffolk ; Respring, Cornwall ; Tresco, Scilly Islands ; Hale's End, near Malvern, Worcestershire ; Aberdovey, Merionethshire ; Eglestone, Durham ; The Cheviots, Northumberland. Pentland Hills, near Edinburgh ; Hills above Greenock, Renfrewshire ; Barealdine, Argyleshire ; Killin, Craig Calliach, Ben Lawers, and Glen Fender, Perthshire ; Clova and near Dundee, Forfarshire ; Craig Cluny, Braemar, Aberdeenshire ; Glen Nevis, Inverness-shire.

Form *deaurata* Nyl. Not. Sällsk. pro F. et Fl. F. Förh. v. (1866) p. 125.—Thallus bright-yellow or tawny-yellow. Apothecia rather large, with concolorous thalline margin.—Cromb. Grevillea, xviii. p. 44.—*Psoroma hypnorum* form *deaurata* Nyl. Lich. Scand. p. 121 ; Cromb. Lich. Brit. p. 44. *Lecanora lepidora* β . *deaurata* Ach. Lich. Univ. (1810) p. 418.—*Brit. Exs.* : Cromb. n. 58 pro parte.

Differs merely in the more yellowish thallus and the normally larger apothecia. When the thallus is less developed it is more luxuriant at the margins of the apothecia.

Hab. Among mosses on boulders and walls in maritime and upland districts.—*Distr.* Seen only from N. Wales and the Highlands of Scotland.—B. M. : Cwm Bychan, Merionethshire. Appin, Argyleshire ; Glen Lochay, Killin, Perthshire ; Corriemulzie, Braemar, Aberdeenshire.

Subgenus 2. SQUAMARIA Nyl. Not. Sällsk. pro F. et Fl. F. Förh. v. (1866) p. 125.—Thallus radiately lacinate or cartilagineo-squamose. Apothecia lecanorine ; spores Snc, ellipsoid, simple, colourless ; hymenial gelatine bluish with iodine. Spermatogones with simple sterigmata and long, arcuate, spermatia.—*Squamaria* DC. Fl. Fr. ii. (1805) p. 374 ; Nyl. Mém. Soc. Cherb. iii. p. 177.

Characterized by the type of the thallus, which is comparable with that of *Parmeliopsis*, and by the structure of the spermogones, which are immersed, their ostioles being concolorous with the thallus.

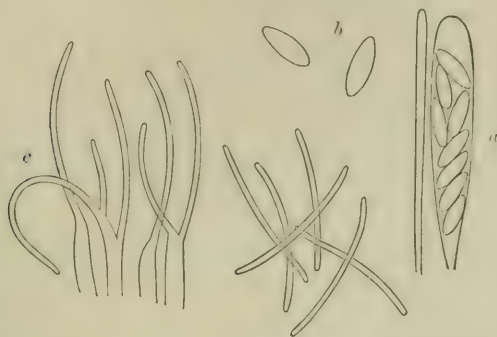


Fig. 59.

Lecanora (Squamaria) crassa Ach.—a. A theca and paraphysis, $\times 350$.
b. Two spores, $\times 500$. c. Sterigmata and spermatia, $\times 500$.

2. *L. crassa* Ach. Lich. Univ. (1810) p. 413.—Thallus indeterminate or suborbicular, subcartilaginous, loosely adpressed, thick, squamoso-imbricate, pale-livid or pale-yellowish; squamules somewhat depressed, roundly lobato-crenate (K—). Apothecia moderate, sessile, plane or somewhat convex, reddish-brown, the thalline margin entire, at length excluded; spores ellipsoid or oblongo-ellipsoid, 0.011–14 mm. long, 0.005–6 mm. thick.—Cromb. Grevillea, xviii. p. 44; Hook. Fl. Scot. ii. p. 51.—*Squamaria crassa* Sm. Eng. Fl. v. p. 193; Mudd, Man. p. 127; Cromb. Lich. Brit. p. 44; Leight. Lich. Fl. p. 171, ed. 3, p. 157. *Psoroma crassum* Gray, Nat. Arr. i. p. 444. *Lichen crassus* Huds. Fl. Angl. ed. 2 (1778), p. 530; Eng. Bot. t. 1893. *Lichen cartilagineus* Lightf. Fl. Scot. ii. p. 815; With. Arr. iv. p. 29. *Lichenoides cartilagineum, scutellis fulvis planis* Dill. Musc. 179, t. 24. f. 74.—*Brit. Ess.*: Leight. n. 5; Larb. Cæsar. n. 73; Lich. Hb. n. 333; Cromb. n. 157; Bohl. n. 2; Dicks. Hort. Sic. n. 24.

The largest British species of the subgenus, with the thallus usually very much expanded, rarely smaller and somewhat orbicular, often here and there whitish. With us it is much less variable than it is in warmer regions, presenting only the following form. It is usually well fertile, the apothecia becoming rather large in age.

Hab. On the ground and on rocks, chiefly calcareous, in maritime and upland districts.—*Distr.* General and common in England and Wales; rarer in Scotland, Ireland, and the Channel Islands.—B. M.: Quenvais, Island of Jersey; Islands of Herm and Guernsey. Hurstpierpoint, Sussex; Berry Head, S. Devon; St. Merryn, Cornwall; Cleve Hill and Cheddar Cliffs, Somersetshire; St. Vincent's Rocks, Bristol, Gloucestershire; Pont Eynon, Glamorganshire; near Tenby, Pembrokeshire; Aberdovey, Merionethshire; Snowdon and Great Orme's Head, Carnarvon-

shire; Rhyl, Flintshire; Beaumaris and Puffin Island, Anglesea; Llangollen, Denbighshire; Dovedale, Derbyshire; Oswestry, Shropshire; Eglestone, Durham; Whitbarrow, Westmoreland. Arthur's Seat, Edinburgh; Black Isle and Island of Lismore, Appin, Argyleshire. Mornington, co. Meath; Killarney, co. Kerry.

Form *melaloma* Ach. Lich. Univ. (1810) p. 414.—Thallus with the squamules rounded and subentire, here and there blackish at the margins.—Cromb. Grevillea, xviii. p. 44.—*Brit. Ees.*: Mudd, n. 91.

Differs in the squamules being less crenate and more or less blackish at the margins. It is often, however, confluent with the type, from which it is scarcely to be distinguished unless as a state.

Hab. On calcareous rocks in upland situations.—*Distr.* Apparently only in W. and Central England.—B. M.: Near Buxton, Derbyshire; Durdham Downs, near Bristol, Gloucestershire.

3. *L. lentigera* Ach. Lich. Univ. (1810) p. 423.—Thallus orbicular, crustaceo-foliaceous, moderate, loosely appressed, areolato-squamose in the centre, radiato-lobed at the circumference, whitish or pale-whitish, subpruinose; lobes plane or somewhat concave, undulato-crenate (K —). Apothecia adnate, pale-testaceous, the thalline margin thin, entire; spores ellipsoid or oblong, 0,009–12 mm. long, 0,045–0,005 mm. thick.—Cromb. Grevillea, xii. p. 61.—*Squamaria lentigera* Sm. Eng. Fl. v. p. 195; Mudd, Man. p. 128, t. ii. f. 40; Cromb. Lich. Brit. p. 44; Leight. Lich. Fl. p. 172, ed. 3, p. 159. *Placodium lentigerum* Gray, Nat. Arr. i. p. 447. *Lichen lentigerus* Weber, Spicil. (1778) p. 192; Dicks. Crypt. fasc. i. p. 11; Eng. Bot. t. 871; With. Arr. iv. p. 27.

Closely allied to *L. crassa*, into which, as observed by Nylander (Lich. Scand. p. 131), it seems to pass in the South of France. It is, however, distinguished by the thallus being smaller (at least twice as small), thinner, and differently coloured; while it is also effigurato-radiating at the circumference. The apothecia are numerous, submoderate, at length subbiatorine, with the thalline margin excluded.

Hab. On cretaceous soil in maritime and upland tracts.—*Distr.* Found only sparingly in S. and E. Central England; now almost extinct.—B. M.: Isle of Wight, Hampshire; Newhaven, Sussex; Gogmagog Hills and Newmarket Heath, Cambridgeshire.

4. *L. chryssoleuca* Ach. Lich. Univ. (1810) p. 411.—Thallus lobato-squamose, peltato-affixed, ochroleucous or whitish-straw-coloured; beneath sordid-pale, broadly blackish towards the circumference; squamules firm, imbricate, lobed, plane, crenate or crenato-incised at the circumference (K —). Apothecia moderate, generally crowded, concave or plane, reddish-flesh-coloured, the thalline margin thin, flexuose; spores ellipsoid, 0,009–12 mm. long, 0,0045–65 mm. thick.—Cromb. Grevillea, xviii. p. 44.—*Squamaria chryssoleuca* Leight. Lich. Fl. ed. 3, p. 158. *Lichen chryssoleucus* Sm. Trans. Linn. Soc. i. (1791) p. 82, t. 4. f. 5.

A well-marked species which is rather variable in different regions. Though recorded by Leighton, *l. c.* *vide* Dr. Stirton, it is a very doubtful British plant, and is not at all likely to have occurred in the locality specified, since it is certainly absent on the higher mts. of the vicinity.

Hab. On granitic and schistose rocks in alpine places.—*Distr.* Reported as gathered on Ben Brecht, Argyleshire.

5. *L. cartilaginea* Ach. Lich. Univ. (1810) p. 415.—Thallus expanded, cartilaginous, imbricato-laciniate, somewhat shining, pale ochroleucous or greenish-straw-coloured; laciniae narrow, linear or sublinear, whitish beneath, slightly dilated, dichotomously divided or inciso-lobed or crenate at the apices (K —). Apothecia large, somewhat plane, fleshy- or tawny-testaceous, the thalline margin entire or crenulate; spores oblong or oblongo-ellipsoid, 0,011–16 mm. long, 0,005–6 mm. thick.—Cromb. Grevillea, xviii. p. 44.—*Squamaria cartilaginea* Borr. Eng. Bot. Suppl. t. 2802; Mudd, Man. p. 128; Cromb. Enum. p. 44; Leight. Lich. Fl. p. 172, ed. 3, p. 158. *Lichen cartilagineus* Ach. Vet. Ak. Handl. (1795) p. 133, t. v. f. 4.

Intermediate between the preceding and the following species, to the one or other of which it approaches in different regions, but differs from both in the characters of the laciniae. In our British specimens the thallus is pulvinate, as it usually is elsewhere. The apothecia are numerous, becoming at length irregularly lobed and angulose.

Hab. On a single rock in a maritime locality.—*Distr.* With certainty only in N. Wales, though reported also from Yorkshire (*vide* Leighton).—B. M.: Near the outlet of Llyn Bodlyn, above Barmouth, Merionethshire.

6. *L. saxicola* Ach. Lich. Univ. (1810) p. 431.—Thallus orbicular, moderate or somewhat large, appressed, areolato-crustaceous in the centre, radiate at the circumference, greenish- or pale-ochroleucous; radii contiguous, plane or subpubescent, crenate at the apices. Apothecia small or moderate, plane or somewhat convex, pale- or brownish-testaceous, the thalline margin thin, entire or crenulate; spores ellipsoid, 0,010–16 mm. long, 0,006–7 mm. thick.—Cromb. Grevillea, xii. p. 61; Tayl. in Mack. Fl. Hib. ii. p. 140.—*Squamaria saxicola* Sm. Eng. Bot. v. p. 197; Mudd, Man. p. 129; Cromb. Lich. Brit. p. 44; Leight. Lich. Fl. p. 173, ed. 3, p. 158. *Placodium saxicolum* Gray, Nat. Arr. i. p. 447. *Lichen saxicola* Poll. Pl. Pal. (1777) p. 225; Eng. Bot. t. 1695. *Lichen muralis* Dicks. Crypt. fasc. i. p. 11; With. Arr. iv. p. 29.—*Brit. Ecs.*: Leight. n. 145; Mudd, n. 92; Lich. Hb. n. 213; Bohl. n. 55.

A rather variable plant which may be recognized from its British allies by the thallus being thinner, radiate, appressed, and areolate in the centre. Sometimes it is less appressed when it is rather thicker (approaching *L. cartilaginea*), and occasionally it is effuse and somewhat scattered. The apothecia are numerous and crowded, becoming flexuose and difform from mutual pressure, with the margin at times flexuose-crisp. Other and more marked differences in the thallus and apothecia give rise to the varieties and subspecies that follow.

Hab. On rocks, boulders, and walls, sometimes on flints, tiled roofs, rarely on oak pales, in maritime and upland districts.—*Distr.* General, though somewhat scarce where it occurs, in the Channel Islands and England; rarer in Scotland and Ireland.—B. M.: Fliquet Bay, Island of Jersey; Vale Castle, Island of Guernsey; Island of Sark. Thetford Warren, Norfolk; Yarmouth, Suffolk; near London, Middlesex; Shiere, Surrey; Penshurst, Kent; near Ryde, Isle of Wight; near Bovey Tracey, S. Devon; Penzance, Cornwall; Malvern Hills, Worcestershire; Bedfordshire; Ross, Herefordshire; Twycross, Leicestershire; Bridge of Ludlow, Haughmond Hill, Oswestry, and Caer Caradoc, Shropshire; Barmouth and Cader Idris, Merionethshire; Llandyssil, Cardiganshire; Island of Anglesea; Cliffrigg, Cleveland, Yorkshire; near Egglestone, Durham; Kendal and Brougham Castle, Westmoreland; Wark and Gunnerton Crags, Northumberland. New Galloway, Kirkcudbrightshire; Arthur's Seat and Dalmahoy Hill, Edinburgh; Kyles of Bute, Arran; Burntisland, Fifeshire; near Connel Ferry, Argyshire; Ben Lawers, Perthshire; Forfarshire; Castleton of Braemar, Aberdeenshire. Kilcully, near Cork; near Belfast, co. Antrim.

Var. β . *diffracta* Nyl. Lich. Scand. (1861) p. 133.—Thallus almost entirely areolato-diffract; areolæ angular, usually blackish at the margins. Apothecia dark-reddish.—Cromb. *Grevillea*, xviii. p. 44.—*Squamaria saxicola* var. *diffracta* Cromb. Lich. Brit. p. 45; Leight. Lich. Fl. p. 173, ed. 3, p. 159. *Lichen diffractus* Ach. Prodr. (1798) p. 63. *Squamaria saxicola* var. *areolata* Leight. Mudd, Man. p. 129.—*Brit. Exs.*: Leight. n. 81; Mudd, n. 93.

In this variety the radii, which are constantly plume, are visible only at the immediate circumference, the rest of the thallus being entirely areolate. The apothecia in our specimens are but sparingly present, with the thalline margin subrenate and at length nearly obliterated.

Hab. On rocks in upland and subalpine situations.—*Distr.* Local and scarce in S.W., W., and N. England, and among the S. and N. Grampians, Scotland.—B. M.: St. Minver, Cornwall; Haughmond Hill, Shropshire; near Ayton, Cleveland, Yorkshire. Ben Lawers, Perthshire; Craig Guie, Braemar, Aberdeenshire.

Var. γ . *versicolor* Fr. fl. Lich. Scand. (1871) p. 226.—Thallus whitish-yellow, more or less suffused with white. Apothecia with the thalline margin often white-pulverulent.—Cromb. *Grevillea*, xviii. p. 44.—*Squamaria saxicola* var. *versicolor* Leight. Lich. Fl. p. 174, ed. 3, p. 159. *Lichen versicolor* Pers. in Ust. Ann. vii. (1794) p. 24.

Differs in the colour of the usually smaller thallus, and in the character of the thalline margin of the somewhat crowded apothecia. Rarely it occurs with only the peripheral radii visible and scattered over the substratum (form *distans* Cromb.), but this is quite accidental.

Hab. On calcareous and schistose rocks in maritime and hilly tracts.—*Distr.* Rather sparingly in W. England, Wales, the S.W. Highlands and the Central Grampians, Scotland.—B. M.: Chance's Pitch, Malvern, Worcestershire; St. David's, Pembrokeshire; Barmouth, Merioneth. Island of Lismore, Argyshire; Craig Tulloch, Blair Athole, Perthshire.

Form *dispersa* Leight. Lich. Fl. ed. 3 (1879), p. 159.—Thallus pulvinate, the pulvinuli more or less distantly scattered, rounded, tumid, convex, white-suffused. Apothecia innate, minute, crowded.

A peculiar form which at first sight seems very distinct, but is connected with the type by the state already noticed. The apothecia are numerous, becoming angulose from mutual pressure.

Hab. On calcareous rocks in a maritime district.—*Distr.* Only in N. Wales and apparently very rare.—B. M.: Great Orme's Head, Carnarvonshire.

Subsp. *L. albomarginata* Nyl. *ex* Cromb. Journ. Bot. 1874, p. 147.—Thallus thicker, less appressed, with the radii broader, subimbricate, white at the margins. Apothecia somewhat large, the thalline margin thickish, inflexed or crenate, white.—*Lecanora saxicola* var. *albomarginata* Leight. Lich. Fl. ed. 3, p. 159. *Squamaria saxicola* var. *albomarginata* Nyl. Not. Sällsk. pro F. et Fl. F. Förh. xi. (1871) p. 181.

Entitled to rank as a subspecies on account of the marked difference in the characters of the thallus. In the only entire British specimen seen the thallus is orbicular and moderate, the apothecia being somewhat crowded in the centre.

Hab. Incrusting decayed mosses on rocks and walls in upland situations.—*Distr.* Local and scarce in S. and W. England.—B. M.: Near Lewes, Sussex; Cheshire.

7. *L. pruinifera* Nyl. Bull. Soc. Bot. Fr. t. 13 (1866) p. 368, not. 2.—Thallus orbicular, opaque, whitish, subfarinaceous on the surface, placodioid at the circumference (CaCl+red). Apothecia moderate, cæcio-pruinose, the thalline margin subcrenate or sometimes entire; spores ellipsoid, 0,010–13 mm. long, 0,005–6 mm. thick; hymenial gelatine bluish, then sordidly tawny-yellow with iodine.—Cromb. Journ. Bot. 1882, p. 274.—*Lecanora pruinosa* Chaub. in St. Amand. Fl. Agen. (1821) p. 495 has priority, but was previously applied to another species of the genus.

Near var. *β* of the preceding species, but at once differing in the subfarinaceous thallus, the pruinose apothecia, and the chemical reaction. In our only British specimen the thallus is small and the apothecia few.

Hab. On calcareous rocks in an upland tract.—*Distr.* Found only very sparingly in W. England.—B. M.: Cleve Hill, Somersetshire.

Subgen. 3. PLACOPSIS Nyl. Ann. Sc. Nat. Bot. t. xv. (1862) p. 376.—Thallus crustaceo-adnate, more or less effigurate at the circumference, cephalodiiferous, the cephalodia externally placodioid, internally containing gonimia. Apothecia lecanorine; thecae cylindrical; spores 8næ, oblong or ellipsoid, simple; paraphyses slender; hymenial gelatine bluish with iodine. Spermatogones with simple sterigmata and arcuate or substraight spermatia.

Allied to subgenus *Squamaria*, under which the species have usually been included, but distinguished by the cephalodia, which are constant in all the species (most of which are exotic) under all conditions of growth.

8. *L. gelida* Ach. Lich. Univ. (1810) p. 428.—Thallus orbicular, closely adnate, rimoso-areolate in the centre, laciniato-radiose at the circumference, sordid-white or pale-greyish (K + yellow, CaCl + red); cephalodia scattered, greyish- or brownish-flesh-coloured. Apothecia moderate, adnate, concave or plane, pale-testaceous, the thalline margin thick, entire; spores ellipsoid, 0.014–18 mm. long, 0.006–8 mm. thick.—Cromb. Journ. Linn. Soc. Bot. xv. p. 232; Hook. Fl. Scot. ii. p. 50; Tayl. in Mack. Fl. Hib. ii. p. 140.—*Squamaria gelida* Sm. Eng. Fl. v. p. 195; Mudd, Man. p. 129; Cromb. Lich. Brit. p. 45; Leight. Lich. Fl. p. 174, ed. 3, p. 159. *Placidium gelidum* Gray, Nat. Arr. i. p. 448. *Lichen gelidus* Linn. Mant. ii. (1771) p. 133; Dicks. Crypt. fasc. ii. p. 19; With. Arr. iv. p. 26; Eng. Bot. t. 699.—*Brit. Exs.*: Dicks. Hort. Sic. n. 25; Larb. Lich. Hb. n. 50.

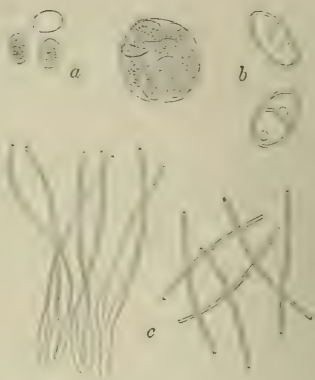


Fig. 60.

Lecanora (Placopsis) gelida Ach.—a. A gonimic glomerule and gonimic granules, $\times 350$. b. Two spores, $\times 500$. c. Sterigmata and spermatia, $\times 500$.

Easily recognized amongst British *Lecanorei* by the cephalodiferous thallus, which is usually of moderate size, greyish-flesh-coloured when moist, and occasionally sprinkled with greyish or greyish-olive, impressed soredia. The cephalodia, which are more or less numerous according to the development of the thallus, are depresso-verrucarioid, at length radiato-rimose, internally with the gonimia glomerulose, or often several moniliform. The apothecia, when present (for the thallus is often sterile), are usually sparingly scattered. A young sterile state, with the thallus little developed and scattered and bearing a few young cephalodia, is form *dispersa* (non Fr.), Cromb. Grevillea, i. p. 171; Leight. Lich. Fl. iii. p. 160.

Hab. On rocks, granitic, schistose, and old red sandstone, in upland and subalpine districts.—*Distr.* Rather local in England and Wales, more frequent in Scotland, and probably also in Ireland.—B. M.: St. Austell, Cornwall; Cader Idris, Dolgelly, and Llyn Bodlyn, Merionethshire; Eglestone and Teesdale, Durham; near Kendal, Westmoreland; Knock Morton Screes, Cumberland. New Galloway, Kirkcudbrightshire; Loch Awe, Argyshire; Craig Calliach, Ben Lawers, and Craig Tulloch, Perthshire; Clova and Camlochan, Forfarshire; Glen Caudlic and Glen Cluny, Braemar, Aberdeenshire; Rothiemurchus, Ben Nevis, and Fort Augustus, Invernessshire; Hills of Applecross, Ross-shire. Dunkerron, and Connor Cliffs, Dingle, co. Kerry; Letterfrack and Reess, Conemara, co. Galway; Carnlough, co. Antrim.

Subgen. 4. *PLACODIUM* Nyl. Not. Sällsk. pro F. et Fl. F. Förh. v. (1866) p. 126.—Thallus radiating, usually effigurate at the circumference. Apothecia often at length subbiatorine; spores Sae, ellipsoid, polari-bilocular, usually with longitudinal tube, very rarely simple or subsimple; hymenial gelatine (especially the thecae) bluish with iodine. Spermatogones with shortly jointed sterigmata, and straight, oblong or bacilliform spermatia.—*Placodium* DC. Fl. Fr. ii. (1805) p. 377; Nyl. Mém. Soc. Cherb. iii. p. 177.

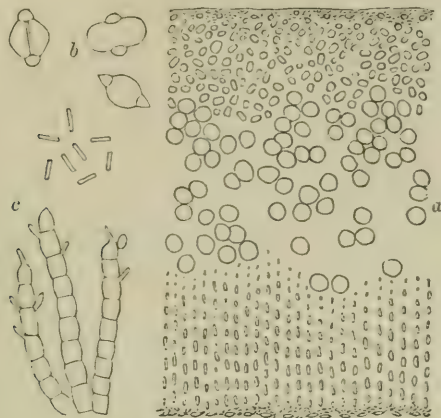


Fig. 61.

Lecanora (Placodium) callopisma Ach.—a. Vertical section of thallus, $\times 200$. b. Three spores, $\times 500$. c. Sterigmata and spermatia, $\times 500$.

Known by the more or less radiose thallus (which is variously yellow, very rarely whitish), by the usual mode of division of the spores, and by the short arthrosterigmata. The spermatogones are externally somewhat prominent, with the ostioles in the yellow thalli orange-yellow.

9. *L. fulgens* Ach. Lich. Univ. (1810) p. 437; Nyl. ex Hue, Revue Bot. 1886, p. 21.—Thallus orbicular, submonophyllous, adnate, opaque, laciniato-divided at the circumference, pale yellow or citrine; laciniae crenate or crenato-lobulate (K + reddish-purplish). Apothecia small, plane or convex, orange-coloured, K + purplish, the thalline margin concolorous, at length obliterated; spores simple, 0,009–12 mm. long, 0,005–6 mm. thick.—*Placodium fulgens* Gray, Nat. Arr. i. p. 447; Mudd, Man. p. 131; Cromb. Lich. Brit. p. 45; Leight. Lich. Fl. p. 178, ed. 3, p. 164. *Squamaria fulgens* Sm. Eng. Fl. v. p. 195. *Lichen fulgens* Sw. N. Act. Upsal. iv. (1794) p. 246; Eng. Bot. t. 1667; Dicks. Crypt. fasc. iv. p. 24.—*Brit. Ees.*: Larb. Cæsar. n. 27; Lich. Hb. n. 296; Cromb. n. 155.

From the simple spores this might be referred, as has often been done, to subgenus *Squamaria*. Its true place, however, is shown by the

structure of the spermogones. The thallus, which is of moderate size, is often thinly white-pruinose, especially towards the centre, but becomes citrine when moistened. The apothecia, which are chiefly central, are in age subbiatorine. The spermogones have the spermatia 0.003 mm. long, 0.001 mm. thick.

Hab. On calcareous soil, shell-sand, and in the crevices of rocks in maritime tracts.—*Distr.* Local, though not uncommon where it occurs in the Channel Islands, S. England, and S. Wales.—B. M.: Quenvais, Island of Jersey; Island of Guernsey. Freshwater Bay, Isle of Wight; Newhaven and Rottingdean Cliffs, Sussex; Bray Hill, St. Minver, Cornwall; Stackpole Court and Lydstep, Penbroke-shire.

10. *L. elegans* Ach. Lich. Univ. (1810) p. 435.—Thallus orbicular, appressed, stellato-radiate, thickish, orange- or tawny-red; laciniae subdiscrete, multifid, convex, torulose (K+purplish). Apothecia moderate, adnate, somewhat concave or nearly plane, concolorous (K+purplish), the thalline margin entire; spores ellipsoid or ovoid, 0.011–16 mm. long, 0.006–9 mm. thick.—Cromb. Grevillea, xviii. p. 44; Hook. Fl. Scot. ii. p. 50 pro parte.—*Placodium elegans* Mudd, Man. p. 131, t. ii. f. 41; Cromb. Lich. Brit. p. 45; Leight. Lich. Fl. p. 178, ed. 3, p. 163. *Squamaria elegans* Sm. Eng. Fl. v. p. 195. *Lichen elegans* Link, Ann. Bot. i. (1794) p. 37.—This is the plant of most British authors only in so far as relates to the diagnosis (evidently borrowed from Acharius) given by them, the localities and habitats cited being chiefly erroneous.

A beautiful lichen, somewhat resembling *Physcia parietina* var. *ectomra*, but is of an Arctic or Alt-alpine type. From the other species of the subgenus it is easily recognized by the thallus being distinctly corticate on both sides. Elsewhere in Europe it is rather variable, presenting several well-marked varieties, of which only one has been met with in this country. The few British specimens seen are rarely fertile, the spermogones also being rare, with spermatia 0.003–4 mm. long, 0.001 mm. thick.

Hab. On granitic rocks in alpine situations.—*Distr.* Only very sparingly among the N. Grampians, Scotland.—B. M.: Lochnagar and Cairngorm, Braemar, Aberdeenshire.

Var. *β. tenuis* Ach. Syn. (1815) p. 183.—Thallus small, thin; laciniae narrow, discrete. Apothecia small.—Cromb. Journ. Bot. 1885, p. 195.—*Lichen elegans β. tenuis* Wahlenb. Fl. Lapp. (1812) p. 417. *Lecanora elegans* form *minor* Cromb. Journ. Linn. Soc. Bot. xvii. p. 571. *Placodium elegans β. discreta* (Schær.), Mudd, Man. p. 131. *Lichenoides tenuissimum, scutellis exiguis miniatis* Dill. Muse. 175, t. 24, f. 68.

Differs in the much smaller thallus, the narrower subtiliform discrete radii, and the smaller apothecia. In most British specimens the thallus is minute, with the radii somewhat scattered, and very sparingly fertile.

Hab. On calcareous rocks in subalpine situations.—*Distr.* Very local and scarce in S. Wales, N. England, and among the N. Grampians, Scotland.—B. M.: Whinlold Rocks, near New Radnor, Radnorshire; East Avenaby, Northumberland. Craig Guie, Braemar, Aberdeenshire.

11. *L. murorum* Ach. Lich. Univ. (1810) p. 443; Nyl. Flora, 1883, p. 106.—Thallus orbicular, closely adnate, usually whitish-suffused, subrimoso-areolate in the centre, plicato-radiose at the circumference, vitelline-yellow or citrine; radii somewhat turgid, crenate and often also inciso-plicate at the apices (K + purplish). Apothecia moderate, plane or convex, tawny-yellow, orange-coloured or concolorous with the thallus (K + purplish); the thalline margin entire, paler or concolorous; spores 0,009–15 mm. long, 0,004–7 mm. thick.—Cromb. Grevillea, xviii. p. 44; Hook. Fl. Scot. ii. p. 50 pro parte; Tayl. in Mack. Fl. Hib. ii. p. 140 pro parte.—*Placodium murorum* Leight. Lich. Fl. p. 175 pro parte, ed. 3, p. 161 pro parte; Cromb. Lich. Brit. p. 45 pro parte; Mudd, Man. p. 132 pro parte; Gray, Nat. Arr. i. p. 447 pro parte. *Squamaria murorum* Sm. Eng. Fl. v. p. 194 pro parte. *Lichen murorum* Hoffm. Enum. (1784) p. 63; Eng. Bot. t. 2157 (lower fig.). *Lichen flavescens* Huds. Fl. Angl. p. 445 pro parte.

A species until recently little understood and very imperfectly limited, so that the trivial name of *murorum*, as applied to it by British and other authors, is, to a great extent, a *nomen vagum*. It appears under two conditions of growth—a larger, with the thallus more developed and extended (var. *β major* Wahl. Fl. Lapp. p. 416); and a smaller, with the thallus rosulate and stunted (var. *pulvinata* Mass. Symm. Lich. p. 13). Both states are usually well fertile, the apothecia being numerous and often crowded. The spermogones have the spermatia oblongo-bacilliform, 0,030–35 mm. long, 0,007–9 mm. thick.

Hab. On calcareous rocks and mortar of walls in maritime and lowland districts.—*Distr.* No doubt general and common, though seen only from a few localities in Great Britain.—B. M.: Glynde, Sussex; Anstey's Cove, Torquay, S. Devon; St. Austell, Cornwall; near Cirencester, Gloucestershire; Great Orme's Head, Carnarvonshire; Teesdale, Durham; Warkworth Castle, Northumberland. Morningside, near Edinburgh; Appin, Argyleshire; near Aberdeen.

Var. *β corticicola* Nyl. Bull. Soc. Bot. t. xiii. (1866) p. 366.—Thallus smaller, more contracted and less developed, vitelline-yellow or greyish-green. Apothecia numerous, congested; spores (often subsimple) 0,011–15 mm. long, 0,005–7 mm. thick.—Cromb. Grevillea, xviii. p. 44.—*Brit. Exs.*: Larb. Lich. Hb. n. 52.

From the structure of the spores probably referable rather to the next subspecies, as suggested by Dr. Arnold (Flora, 1875, p. 153), though also approaching subsp. *L. regularis* in external aspect. The plant, as described by Nylander, differs from the British specimens in the thallus being greyish-green, when the reaction with K is less distinct.

Hab. On the trunk of an elm and on old timber in lowland districts.—*Distr.* Apparently very rare in S. and E. England.—B. M.: Windsor Great Park, Berkshire; Great Willbraham, Cambridgeshire.

Subsp. 1. *L. decipiens* Nyl. Flora, 1869, p. 81 (nota), 1883, p. 106.—Thallus moderate, crowdedly verrucose in the centre, the verrucae often efflorescent with concolorous soredia, peripheral radii

rather narrow, imbricate. Apothecia small, the thalline margin entire, or at length suberenate; spores ellipsoid or oblongo-ellipsoid, often somewhat curved, 2-locular (with K polari-bilocular), 0,010–16 mm. long, 0,004–8 mm. thick.—Martind. Naturalist, 1887, p. 359. —*Physcia decipiens* Arn. Flora, 1866, p. 529, 1875, p. 153, t. v. figs. 2, 3.—*Placodium decipiens* Leight. Lich. Fl. p. 176, ed. 3, p. 162, refers chiefly to the following subspecies.

Characterized by the central thalline verrucæ, the narrower radii, and more especially by the spores, the true structure of which, however, as in many other instances, becomes apparent on the application of K. The typical condition here described, represented by Arnold's Lich. Exs. n. 445, may, as suggested by Nylander (Flora, 1883, l. c.), be the original *Lichen murorum* of Hoffmann. In the very few British specimens seen, the apothecia are few and not well developed. The spermatogones, however, are more frequent with spermatia oblongo-bacilliform, 0,030–25 mm. long, 0,0007–9 mm. thick. It is, as noted by Martindale, l. c., a somewhat variable plant, and the specimens (well fertile) issued by Larbalestier (s. n. var. *camboricum* Larb.) are referable to a state in which the thallus becomes effuse, or nearly so, the peripheral lobes being very irregularly produced.

Hab. On walls in lowland districts.—*Distr.* Local in S., W., and E. England.—B. M.: Shoreham, Kent; near Cirencester, Gloucestershire; Milton Church, Cambridgeshire.

Subsp. 2. *L. tegularis* Nyl. Flora, 1883, p. 106.—Thallus somewhat small, short, plicato-radiate at the circumference, diffracto-areolate in the centre, naked or suffused, vitelline, pale-yellow, or miniate. Apothecia small, concave, then plane, concolorous or subconcolorous with the thallus, the thalline margin entire; spores as in the type, or occasionally somewhat smaller (0,009–0,011 mm. long, 0,0035–45 mm. thick).—Cromb. Grevillea, xviii. p. 44.—*Lichen tegularis* Ehrh. Exs. n. 304 (1785). To miniate states are referable pro parte *Squamaria miniata* Sm. Eng. Fl. ii. p. 195. *Placodium murorum* γ. *miniatum* Mudd, Man. p. 132; Cromb. Lich. Brit. p. 45; Leight. Lich. Fl. p. 175, ed. 3, p. 162 (ut sp. propr.). *Lichen elegans* Eng. Bot. t. 2181 (two left-hand figs.).—Brit. Exs.: Leight. n. 207; Mudd, n. 95; Larb. Lich. Hb. n. 51.

A smaller and rather variable plant, distinguished from the type and the preceding subspecies, with both of which it is subconfluent, by the characters given. The thallus is at times somewhat scattered with the peripheral radii little distinct. It is always well fertile, the apothecia being numerous and varying in colour like the thallus. The spermatogones have the spermatia either as in the type or a little smaller (0,002–3 mm. long, 0,0007–8 mm. thick). It is to vermilion-coloured states that the trivial name *miniata* (Hoffm.) has more especially been applied; but as other species growing in dry and exposed habitats, especially calcareous, have similarly coloured thalli, the name cannot with propriety be used either in a specific or varietal sense.

Hab. On rocks and walls, very rarely on old timber, from maritime to upland situations.—*Distr.* Here and there throughout Great Britain; rare in the Channel Islands; not seen from Ireland.—B. M.: Rozel.

Island of Jersey. Near Glynde, Sussex; Kemble, Gloucestershire; Weston, Oxfordshire; Llanymynech Hill, Shropshire; Ayton, Cleveland, Yorkshire; Broughton Castle, Westmoreland. The Trossachs, Perthshire; Cove, Kincardineshire; near Aberdeen.

Form *Arnoldi* Nyl. Flora, 1883, p. 106.—Thallus very small, epuriose, cinnabarine, shortly and narrowly radiose, diffractoareolate in the centre. Apothecia minute, concolorous with the thallus.—Cromb. Grevillea, xviii. p. 44.—*Lecanora Arnoldi* Wedd. Bull. Soc. Bot. xxiii. (1876) p. 96. *L. miniata* Tayl. in Mack. Fl. Hib. ii. p. 140.

Only a minute condition of the type with naked miniate thallus and apothecia. The three British specimens seen are well fertile.

Hab. On dry calcareous rocks in maritime and mountainous districts.—*Distr.* Only in N.E. England, the N. Grampians, Scotland, and S.W. Ireland.—B. M.: Hartlepool, Durham. Morrone, Aberdeenshire. Dunkerron, co. Kerry.

Var. β . *obliterascens* Nyl. Flora, 1883, p. 99.—Thallus small, slightly and narrowly radiate at the circumference, vitelline. Apothecia small, plane or convex, the thalline margin at length often obliterated; spores 0,008–0,011 mm. long, 0,004–5 mm. thick.—Cromb. Journ. Bot. 1885, p. 195.

According to Nylander *l. c.*, apparently only a variety of this subspecies. In our British specimens, it occurs on the substratum in small scattered patches, which occasionally have a tendency to become confluent. The apothecia are numerous and crowded, almost obliterating the thallus.

Hab. On schistose rocks and walls in maritime and upland districts.—*Distr.* Found only in N. England, the Central Grampians, and N.E. Scotland.—B. M.: Near Ayton, Cleveland, Yorkshire; Bassenthwaite, Cumberland. Craig Tulloch, Blair Athole, Perthshire; Cove, Kincardineshire.

12. *L. dissidens* Nyl. Flora, 1875, p. 298.—Thallus orbicular, appressed, somewhat small, stellato-radiate, vitelline; laciniae narrow, plane or somewhat convex, discrete, subfree at the circumference (K+purplish). Apothecia small, plane, concolorous (K+purplish), the thalline margin subentire or crenulate; spores 0,009–0,016 mm. long, 0,005–7 mm. thick.—Cromb. Grevillea, iv. p. 180.—*Placodium murorum* form *dissidens* Leight. Lich. Fl. ed. 3, p. 161. *Lichen flavicans* With. Arr. ed. 3, iv. p. 25 pro parte.—*Lichen elegans* Eng. Bot. t. 2181 (right-hand fig.).

Looks like a variety of *L. elegans*, but is distinguished by the colour (rarely subminiate) of the planer laciniae. It approaches states of subsp. *L. regularis*, but the laciniae are more discrete, and the thalline margin of the apothecia usually more or less crenate. The British specimens are well fertile.

Hab. On slate roofs of outhouses and on brick walls in lowland and upland tracts.—*Distr.* Found only here and there in England, but probably

not uncommon.—B. M.: Near Groombridge, Sussex; near Stroud and King's Stanley, Gloucestershire; Gopsall, Leicestershire; Ayton, Cleveland, Yorkshire; Brigsteer, Westmoreland.

13. *L. callopisma* Ach. Lich. Univ. (1810) p. 437.—Thallus orbicular, closely adnate, smooth, radiato-lobed, bright-yellow, often very thinly white-suffused; lobes rimoso-areolate in the centre, dilated and nearly plane at the circumference (K + purplish). Apothecia subsessile, plane or slightly convex, orange-coloured (K + purple); the thalline margin thickish, flexuose or suberemulate, paler; spores broadly citriformi-ellipsoid, 0,008–15 mm. long, 0,006–10 mm. thick.—Cromb. Grevillea, xviii. p. 45.—*Placodium callopismum* Mudd, Man. p. 133, t. ii. f. 42; Cromb. Enum. p. 45; Leight. Lich. Fl. p. 176, ed. 3, p. 162. *Lichen murorum* Eng. Bot. t. 2157 (upper fig.). *Lichen caulelarius* β. Lightf. ? Fl. Scot. ii. p. 811. *Lichenoides crustosum, orbiculis et scutellis flavis* Dill. Musc. 236, t. 18. f. 18 A, C.—*Brit. Exs.*: Leight. n. 113; Larb. Lich. Hb. n. 164.

Subsimilar to *L. murorum*, but well distinguished by the form of the peripheral radii, and more especially by the shape of the spores. The apothecia are generally numerous, becoming convex, with the thalline margin at length excluded. The spermogones, which are rarely present, have the spermatia bacilliform, 0,040–50 mm. long, 0,006–8 mm. thick.

Hab. On rocks and the mortar of walls, often on old ruins, in maritime and upland districts.—*Distr.* Rather local in Great Britain; not seen from Ireland; rare in the Channel Islands.—B. M.: Island of Guernsey. Framlingham, Suffolk; near Torquay and Plymouth, S. Devon: Bathampton Downs, Somersetshire; near Cirencester, Gloucestershire; Quy Churchyard, Cambridgeshire; near Bonsall, Tong Priory, and Llanymynech Hill, Shropshire. Blair Athole, Perthshire.

Subsp. *L. sympagea* Nyl. Flora, 1873, p. 197.—Thallus smaller, somewhat shining, smoothish, or rugulose in the centre; laciniae narrow, contiguous, convex, incurved and suberemulate at the apices (K + purplish). Apothecia somewhat small.—Cromb. Grevillea, xviii. p. 45.—*Lichen sympageus* Ach. Prodr. (1798) p. 105. *Placodium callopismum* var. *plicatum* (Wedd.), Leight. Lich. Fl. p. 177, ed. 3, p. 163. In Herb. H. Davies there is a specimen with miniate thallus s. n. *Lichen fulvus* Dicks., but *vide* supra p. 299. According to Acharius (Lich. Univ. p. 47) it is *Lichen aurantius* Pers. in Ust. Ann. Bot. ii. p. 14, which, being only another form of the prior trivial name *Lichen aurantiacus* Lightf., cannot be retained in *Lecanora*.—*Brit. Exs.*: Mudd, nos. 94, 96; Larb. Lich. Hb. n. 15.

Externally often more resembling states of subsp. *L. tegularis*, but definitely separated by the form of the spores. From the type it differs so much in the laciniae, that it is well entitled to rank at least as a subspecies. The thallus, also, is usually smaller, often more or less shining and waxy-looking (miniate in maritime situations), with the apothecia fewer and smaller.

Hab. On rocks, chiefly calcareous, and on mortar of walls in maritime (chiefly) and upland districts.—*Distr.* General and not uncommon

in Great Britain, the Channel Islands, and probably also in Ireland.—B. M.: Vale Castle, Island of Guernsey; coast of Alderney. Reigate, Surrey; Glynde and Peasemars, Sussex; near Ryde, Isle of Wight; Torquay and North Lynton, Devonshire; St. Maws, Cornwall; near Baxton and Cromford, Derbyshire; Llanymynech Hill, Shropshire; near Southerndown, Glamorganshire; Manorbeer, near Tenby, Pembrokeshire; Island of Anglesea; Bilsdale, Yorkshire; near Hartlepool, Durham; Arnbarrow, Westmoreland; St. Bees, Cumberland. Island of Lismore, and Barcaldine, Argyleshire; West Water, Fifeshire; Blair Athole, Perthshire; Portlethen, Kincardineshire; near Aberdeen. Dunkerron, co. Kerry; Cleghan, Connemara, co. Galway.

Var. β . *brevilobata* Nyl. Flora, 1883, p. 99.—Thallus moderate, unequally diffract, or verrucoso-areolate in the centre, shortly or obsoletely lobulate at the circumference. Apothecia and spores as in the type.

Differs in the thalline characters given, the laciniae being also more discrete at the apices. The two British specimens seen are but sparingly fertile.

Hab. On schistose rocks in maritime and upland tracts.—*Distr.* Very rare in N.W. England and N.E. Scotland.—B. M.: Foreshield, Alston, Cumberland. Portlethen, Kincardineshire.

14. *L. cirrochroa* Ach. Syn. (1814) p. 181; Nyl. Not. Sällsk. pro F. et Fl. F. Förh. v. p. 126.—Thallus orbicular, closely adnate, narrowly laciniate, bright orange-yellow, verruculose and citrino-sorediate towards the centre, radiate at the circumference, internally citrine; radii minute, somewhat convex, occasionally whitish-pruinose at the margins (K + purplish). Apothecia minute, scattered, plane, orange-coloured (K + purple), the thalline margin subentire; spores 0.013–18 mm. long, 0.005–6 mm. thick.—Cromb. Grevillea, xviii. p. 45.—*Placodium cirrochroum* Cromb. Journ. Bot. 1874, p. 147; Leight. Lich. Fl. ed. 3, p. 161. *Lecanora linearis* Tayl. in Mack. Fl. Hib. ii. p. 260, according to a specimen from himself in Hb. Brit. Mus., is only a very young state.

Easily recognized by being internally citrine and superficially more or less citrino-sorediose. The thallus is small, rarely moderate (through the confluence of several thalli), with the radii slender. Specimens in which the radii become diffract and scattered (*e. g.* Taylor's plant) closely approach *L. obliterans* Nyl. (Flora, 1874, p. 7) and show that this, as suspected by Nylander, *l. c.*, is probably only a variety. With us it is always sterile.

Hab. On calcareous rocks in maritime and upland districts.—*Distr.* Rather local and scarce in S.W., Central, and N. England, in N. Wales; rare in the S.W. Highlands and the Central Grampians, Scotland, as also in S.W. Ireland.—B. M.: Sidmouth, Devonshire; Yatton and Weston-super-Mare, Somersetshire; Dovedale, Derbyshire; Great Orme's Head, Carnarvonshire; Arnbarrow and near Milnthorpe, Westmoreland; Alston, Cumberland. Island of Lismore, Argyleshire; Craig Tulloch, Blair Athole, Perthshire. Dunkerron, co. Kerry.

15. *L. lobulata* Somm. Suppl. Lapp. (1826) p. 104; Nyl. Flora, 1873, p. 105.—Thallus subeffuse, areolato-verrucose, thin, scarcely

effigurate at the circumference, bright-yellow or orange-red (K + purplish). Apothecia minute, numerous, plane or convex, concolorous (K + purple), thalline margin entire; spores 0,010–14 mm. long, 0,005–6 mm. thick.—Cromb. Grevillea, xviii. p. 45.—*Placodium murorum* β . *lobulatum* Mudd, Man. p. 132; Cromb. Lich. Brit. p. 45.—Var. *obliteratum* (Pers.) Leight. Lich. Fl. p. 176, ed. 3, p. 161.—*Brit. Ess.*: Leight. n. 268; Cromb. n. 156; Larb. Cæsar. n. 74; Lich. Hb. n. 295.

Distinguished from all the preceding species by the less developed and almost non-radiate thallus. In a young state it is orbicular and slightly effigurate, but becomes indeterminate (often spreading extensively), with the peripheral radii indistinct. When the colour is more miniate, it is *Lichen obliteratus* Pers. Ust. Ann. Bot. ii. p. 15 (*miniatus* auctorum pro parte). The apothecia are very numerous and crowded, usually almost obliterating the thallus, becoming at length convex and immarginate. The spermogones have the spermatia oblong, 0,002–3 mm. long, 0,0005–7 mm. thick.

Hab. On rocks in maritime districts.—*Distr.* Here and there throughout Great Britain, Ireland, and the Channel Islands; very abundant on the coast of Kincardineshire.—B. M.: Rozel, Island of Jersey; West Coast of Guernsey; Island of Alderney. Ilsham, Torquay, Devonshire; St. Maws, Cornwall; North Cliff, Tenby, Pembroke-shire; Southendown, Glamorganshire; Barmouth, Merionethshire; Island of Anglesea; Douglas, Isle of Man; St. Bees, Cumberland; Arnbarrow, Westmoreland. Appin, Argyshire; Portlethen, Kincardineshire; Peterhead, Aberdeenshire; Applecross, Ross-shire. Upper Lake, Killarney, co. Kerry; Ardglass, co. Down.

16. *L. scopularis* Nyl. Flora, 1883, p. 105.—Thallus orbicular, somewhat small, firm, naked, radiately divided at the circumference, verrucoso-areolate in the centre, vitelline; radii narrow, contiguous, convex (K + purplish). Apothecia small, numerous, plane, concolorous (K + purple), the thalline margin entire; spores 0,009–0,017 mm. long, 0,005–7 mm. thick.—Cromb. Journ. Bot. 1885, p. 195.

Approaches *L. lobulata*, but differs especially in the distinctly placodioid thallus. In the single fertile British specimen seen, the apothecia are numerous, with the thalline margin persistent. The spermogones are rarely present, with spermatia oblong, about 0,0025 mm. long, 0,0005 mm. thick.

Hab. On schistose rocks in a maritime district.—*Distr.* Found only very sparingly in N.E. Scotland.—B. M.: Portlethen, Kincardineshire.

17. *L. miniatula* Nyl. Flora, 1883, p. 98.—Thallus small, orbicular, plane, closely adnate, thinly rimoso-areolate, slightly subeffigurate at the circumference, deep tawny-vermilion-coloured (K + purplish). Apothecia minute, concolorous (K + purple), the thalline margin entire; spores 0,007–10 mm. long, 0,004–5 mm. thick.—Cromb. Journ. Bot. 1885, p. 195.

Subsimilar to *L. lobulata* (*obliterata*), but differs in the subeffigurate thallus, the smaller apothecia, and more especially in the smaller spores. It probably, however, descends from subsp. *L. tegularis*, of which it

would then be a variety. The thallus at length becomes indeterminate in consequence of the confluence of several thalli. The apothecia are numerous and crowded; but the spermogones are not present.

Hab. On quartzose rocks in a subalpine district.—*Distr.* Found only sparingly in a single locality among the N. Grampians, Scotland.—B. M.: Morrone, Braemar, Aberdeenshire.

18. *L. granulosa* Nyl. ex Lamy, Bull. Soc. Bot. Fr. t. xxx. (1883) p. 373.—Thallus orbicular, closely adnate, minutely diffractogranulose, shortly subradiate at the circumference, yellow-vitelline; granules usually crenulate, scattered, or agglomerate, but not continuous (K+purplish). Apothecia small, concolorous (K+purple), the thalline margin entire, at length subcrenulate; spores 0,010–16 mm. long, 0,006–8 mm. thick.—Cromb. Grevillea, xviii. p. 45.—*Amphiloma granuloseum* Müll. Arg. Mém. Soc. Phys. et Hist. nat. Genève. xvi. (1862) p. 380.

Not unlike less developed states of *L. cirrochroa*, as observed by Müller l. c., but differing entirely in the crenulato-granulose and non-efflorescent thallus. It is only sparingly effigurate at the extreme circumference, with the radii rugose, plane or convex. In the two British specimens seen, the apothecia are but few, with the thalline margin at times evanescent.

Hab. On calcareous rocks in a hilly district.—*Distr.* Only very sparingly in W. England.—B. M.: Cheddar Cliffs, Somersetshire.

19. *L. teicholyta* Ach. Lich. Univ. (1810) p. 425; Nyl. Flora, 1873, p. 197.—Thallus subdeterminate, thin, entirely pulverulentogranulose or occasionally radiato-lobed or crenate at the circumference, cæcio-greyish or greyish-white (K—). Apothecia small or submoderate, plane, orange- or tawny-red (K+deep purple), the thalline margin thickish, undulate, whitish; spores ellipsoid, 0,012–16 mm. long, 0,008–9 mm. thick.—Cromb. Grevillea, xviii. p. 45.—*Lecanora arenaria* Cromb. Lich. Brit. p. 46; Leight. Lich. Fl. p. 223, ed. 3, p. 212. *Callopisma arenarium* Mudd, Man. p. 139. *Lichen arenarius* Dicks. Crypt. fasc. iv. p. 27.—*Lecanora cæsiurufa* Sm. Eng. Fl. v. p. 189. *Lichen cæsiurufus* Eng. Bot. t. 1040. *Rinodina rubricosa* Gray, Nat. Arr. i. p. 452.—*Brit. Exs.*: Larb. Lich. Hb. n. 96.

Easily recognized by the cæcio-greyish, subpulverulent thallus and the saffron-red colour of the apothecia. The thallus is usually subeffuse, forming a loose crust, rarely determinate and slightly radiating at the circumference. It is at times almost entirely evanescent, when it is *Lichen arenarius* Pers. in Ust. Ann. vii. (1794) p. 27. The apothecia, which are innato-sessile, are scattered or occasionally a few congregated.

Hab. On sandstone rocks and walls, rarely on bricks, in maritime and lowland districts.—*Distr.* Local and scarce in S.E. and W. England, and in S. Wales.—B. M.: Strumpshaw, Norfolk; Bury St. Edmund's, Suffolk; Maidstone, Kent; Fairlight, Hastings, Sussex; Isle of Wight; near Hereford; near Monmouth; Wisbech and Waterbeach, Cambridge; near Lydstep, Pembrokeshire.

20. *L. Lallavei* Nyl. *ex* Stiz. St. Gall. Nat. Ges. 1880, p. 347.—Thallus determinate, thickish, smooth, rimoso-areolate, subeffigurate at the circumference, chalky-white (K—). Apothecia small, subinnate, at first lecanorine with thin thalline margin, at length biatorine and immarginate, bright-rusty- or blood-red (K+ dark crimson); spores ellipsoideo-oblong, polar-bilocular, 0.008–12 mm. long, 0.004–7 mm. thick.—Cromb. Lich. Brit. p. 46; Leight. Lich. Fl. p. 223, ed. 3, p. 212 (pro parte).—*Callopisma Lallavei* Mudd, Man. p. 139, t. ii. f. 44. *Lecidea Lallavei* Clem. Ess. (1807) p. 295.

Allied to the preceding species, but differs in the more tartareous, milk-white thallus, and the at first lecanorine apothecia. The thallus is sometimes described as limited by a thin, dark hypothallus, but this apparently belongs to a plant with which, at times, it grows associated. The apothecia are numerous and often crowded.

Hab. On calcareous rocks and walls in maritime districts.—*Distr.* Seen only very sparingly from S. and S.W. England and S.E. Ireland—B. M.: Isle of Wight, Hampshire; St. Austell, Cornwall. Lower Glanmire Road, co. Cork.

Subgen. 5. *LEPROPLACA* Nyl. Flora, 1883, p. 107.—Thallus leprose, soft, vitelline, sublobate. Apothecia and spermogones unknown.

Entirely leprarioid, having much the same relation to *Placodium* as *Leproloma* to *Amphiloma*.

21. *L. xantholyta* Nyl. Flora. 1879, p. 361.—Thallus subleprose, thin, crenulato-subeffigurate at the circumference, golden-citrine-coloured (K+ purplish), internally white.—Cromb. Grevillea, viii. p. 112, xviii. p. 45.

While in some respects allied to *L. cirrochroa*, with which it occasionally grows associated (as also with *L. callopisma*), it at once differs in being internally white. The thallus spreads extensively over the substratum and is always sterile.

Hab. On shady calcareous rocks in maritime and upland districts. *Distr.* Local, though plentiful where it occurs, in S.W., Central, and N. England, N. Wales, and the Central Highlands of Scotland.—B. M.: Swanage, Dorsetshire; Anstey's Cove, Torquay, Devonshire; Bathampton Downs, Gloucestershire; Buxton, Derbyshire; View Edge, near Stokesay, Shropshire; Great Orme's Head, Carnarvonshire; Scout Scar, Westmoreland. Craig Tulloch, Blair Athole, Perthshire.

Subgen. 6. *CANDELARIA* (Mass.). Nyl. Flora, 1881, p. 454 (*cfr.* Cromb. Grevillea, xviii. p. 45).—Thallus subeffigurate or entirely granulose, yellow or vitelline. Apothecia lecanorine; spores 8næ or numerous (12–16–32næ), ellipsoid, simple or apically bilocular, rarely 1-septate; hymenial gelatine not tinged, but the apices of the thecæ bluish with iodine. Spermogones with long simple sterigmata and straight spermatia.

Subsimilar in the colour of the thallus and apothecia to subgenus *Placodium*, but differs, among minor marks of distinction, in the absence of chrysophanic acid, and more essentially in the character of the sterigmata.

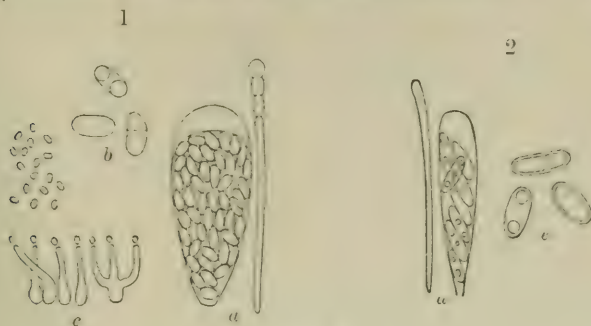


Fig. 62.

- (1) *Lecanora (Candelaria) laciniosa* Nyl.—*a*. A theca and paraphysis, $\times 350$. *b*. Three spores, $\times 500$. *c*. Sterigmata and spermatia, $\times 500$. (2) *Lecanora mediana* Nyl.—*d*. A theca and paraphysis, $\times 350$. *e*. Three spores, $\times 500$.

a. Thecae polyspored.

22. *L. crenata* Nyl. Not. Sällsk. pro F. et Fl. F. Förh. v. (1886) p. 130.—Thallus orbicular, closely adnate, crenato-granulose, narrowly radiato-effigurate at the circumference, citrine-yellow, opaque; radii convex, crenato-incised (K—). Apothecia moderate, somewhat plane, pale-citrine or livid-yellow (K—), the thalline margin crenate; spores 20–40 μ (or more), ellipsoid or oblong, simple or obsoletely 1-septate, 0.009–0.015 mm. long, 0.004–7 mm. thick.—Cromb. Grevillea, xviii. p. 45; Leight. Lich. Fl. p. 180, ed. 3, p. 166. The specific name *crenulata* Wahlenb. Fl. Lapp. p. 416, has priority, but cannot be retained, because of the previous homonym of Dickson.

Looks like a *Placodium*, but the absence of any reaction, the number of the spores, and the nature of the sterigmata place it in this subgenus. In the two British specimens seen, the thallus is not very well developed, and only one is sparingly fertile.

Hab. On rocks in maritime districts.—*Distr.* Very local and rare in N. Wales and N.E. Scotland.—B. M.: Aberdovey, Merionethshire. Portlethen, Kincardineshire.

23. *L. laciniosa* Nyl. Flora. 1881, p. 454.—Thallus suborbicular or effuse, minutely laciniato-divided, greenish-yellow; laciniae multifid, subimbricate, crowded, the margins crisp, more or less granuloso-pulverulent (K—). Apothecia small, subsessile, tawny-yellow (K—), the thalline margin entire or granulate; spores (10–100 μ) ellipsoid, simple, often subpolari-bilocular, variable in size, 0.006–0.014 mm. long, 0.004–6 mm. thick.—Cromb. Grevillea, xviii. p. 45.

—*Physcia parietina* ♂. *laciniosa* et ♀. *concolor* Mudd. Man. pp. 113, 114. *Parmelia parietina* e. *lucinosia* Duf. in Fr. Lich. Eur. (1831) p. 73. *Physcia candelaria* Mudd, Man. p. 114. *Lecanora candelaria* Hook. Fl. Scot. ii. p. 51 pro parte; Tayl. in Mack. Fl. Hib. ii. p. 139; Cromb. Lich. Brit. p. 48; Leight. Lich. Fl. p. 182, ed. 3, p. 167. *Squamaria candelaria* Sm. Eng. Fl. v. p. 194. *Psoroma candelarium* Gray, Nat. Arr. i. p. 445. *Lichen candelarius* Huds. Fl. Angl. p. 444 pro parte; Lightf. Fl. Scot. ii. p. 811 pro parte; With. Arr. p. 27 pro parte; Eng. Bot. t. 1794. *Lichen concolor* Dicks. Crypt. fasc. iii. p. 18, t. ix. f. 8 pro maxima parte.—*Lichen candelarius* of Linneus and the older authors is a *nomen vagum* including species belonging to different genera and cannot be retained. *Lichen concolor* Dicks. pro parte must also be rejected in order to prevent confusion with *Lecanora concolor* Ram. In Lamy, Lich. Mt. Dor. p. 65, Nylander proposes the name *concolorans*, but, as he states, Lich. Scand. p. 108, that *Parmelia laciniosa* Duf., according to original specimens, is entirely this species, Dufour's name must be adopted.—*Brit. Exs.*: Leight. n. 12; Larb. Lich. Hb. n. 53.

Closely resembles states of *Physcia lychnea*, with which it has often been confounded. It is, however, well distinguished by the absence of any reaction and by the number of the spores. The apothecia are not usually present in the British specimens. Var. *granulosa* Leight. *ll. cc.* Exs. n. 12, is only a stunted, more granulose state, of common occurrence.

Hab. On trunks of trees and on old pales, rarely on walls, in maritime, lowland, and upland districts.—*Distr.* General and common in Great Britain; apparently rare in Ireland and the Channel Islands.—B. M.: St. Lawrence, Island of Jersey; Vale Castle, Island of Guernsey. Walthamstow and Epping Forest, Essex; Penshurst Park, Kent; Lyndhurst, New Forest, Hants; near Penzance, Cornwall; Stowell Park, Gloucestershire; Windsor Great Park, Berkshire; Cherry Hinton, near Cambridge; Berwick, near Shrewsbury, Shropshire; near Barmouth, Merionethshire; Stokesley, Yorkshire; near Keswick, Cumberland; Levens Park, Westmoreland. Doune Castle and Killin, Perthshire; Durris, Kincardineshire; Abergeldie, Braemar, Aberdeenshire; Fort William and Rothiemurchus, Inverness-shire. Near Limerick; Blackrock, near Cork; Killarney and Dunkerron, co. Kerry.

24. *L. vitellina* Ach. Lich. Univ. (1810) p. 403.—Thallus effuse, subareolate, granulose, vitelline or yellow-vitelline; granules minute, crenate or sublobulate or verrucoso-glomerate, usually crowded (K—). Apothecia submoderate, sessile, plane or convex, tawny- or livid-yellow (K—), the thalline margin entire or granulato-crenulate; spores (12–24–32næ) ellipsoid or oblong, simple or obsoletely 1-septate (or apically 2-locular), 0.008–15 mm. long, 0.004–6 mm. thick.—Cromb. Lich. Brit. p. 48; Leight. Lich. Fl. p. 180, ed. 3, p. 186; Sm. Eng. Fl. v. p. 192; Hook. Fl. Scot. ii. p. 49; Tayl. in Mack. Fl. Hib. ii. p. 138.—*Calloprisma vitellinum* Mudd, Man. p. 135. *Lichen vitellinus* Ehrh. Exs. (1785) n. 155; Dicks. Crypt. fasc. iv. p. 23; Eng. Bot. t. 1792. To this is also referable var. *corruscans*

Cromb. Lich. Brit. p. 48; Leight. Lich. Fl. p. 181, ed. 3, p. 167.—*Parmelia vitellina* β . *corruscans* Ach. Meth. (1803) p. 177.—*Brit. Exs.*: Larb. Lich. Hb. nos. 214, 297, 298; Bohl. n. 78.

The thallus forms a thinnish, continuous or subdiffract crust, and generally spreads somewhat extensively over the substratum. In its more typical state, with the thalline granules and those of the margin of the apothecia distinctly crenate, it is var. *corruscans* Ach. Lich. Univ. p. 149 (*vide* Nyl. Lich. Scand. p. 141). When growing on maritime rocks, both the thallus and apothecia at times give an abnormally brownish-red reaction with K, the result probably of being suffused with salt water. The apothecia are numerous, generally crowded and then at times anguloso-diform, yellow suffused, and often yellow-olivaceous.

Hab. On rocks, walls, and on the earth in their crevices, also on trees and old pales in maritime, lowland and upland situations.—*Distr.* General and common in most parts of Great Britain, the Channel Islands, and no doubt also of Ireland.—B. M.: Rozel, Island of Jersey; Islands of Guernsey and Sark. Near Cromer, Norfolk; Yarmouth, Suffolk; Walthamstow, Essex; Dartmoor, Devonshire; St. Minver, Cornwall; Maddingley, Cambridgeshire; near Buxton, Derbyshire; Malvern Hills, Worcestershire; Longmynd, Shropshire; Barmouth, Merionethshire; Island of Anglesea; near Ayton, Cleveland, Yorkshire; Alston, Cumberland; Staveley, near Kendal, Westmoreland; Stocksfield, Northumberland. Craigleith, near Edinburgh; Appin, Argyleshire; Killin and Blair Athole, Perthshire; Will's Braes, Forfarshire; Portlethen, Kincardineshire; Rothiemurchus, Inverness-shire. Near Belfast, co. Antrim; Kylemore Lake, Connemara, co. Galway.

Var. β . *aurella* Ach. Lich. Univ. (1810) p. 177.—Thallus with the granules scattered, often subevanescent. Apothecia minute, the thalline margin entire or at length excluded.—Cromb. Lich. Brit. p. 48; Leight. Lich. Fl. p. 181, ed. 3, p. 167.—*Verrucaria aurella* Hoffm. Deutsch. Fl. ii. (1791) p. 197.

Differs from the type, with which it may be confluent, in the less contiguous, more or less obliterated thallus, and in the much smaller apothecia which frequently become biatoroid.

Hab. On rocks and walls in maritime and upland tracts.—*Distr.* Apparently local in the Channel Islands, the S.W. Highlands, and the S. Grampians, Scotland.—B. M.: Chateau Point, Island of Sark. Achrosagan Hill, Appin, Argyleshire; Killin, Perthshire.

Subsp. *L. xanthostigma* Nyl. Not. Sällsk. pro F. & Fl. Fenn. Förh. v. (1866) p. 130.—Thallus effuse, thin, subleprose. Apothecia small.—Cromb. Grevillea, xviii. p. 45.—*Lecanora xanthostigma* Cromb. Journ. Bot. 1882, p. 273. *L. citrina* β . *xanthostigma* Ach. Lich. Univ. (1810) p. 403. *Lichen citrinus* Eng. Bot. t. 1793 upper fig.

Characterized by the thinner, more leprose thallus, which at times is somewhat scattered. Nylander observes *l. c.* that it may be a distinct species. In the fertile British specimens the apothecia are numerous, at length convex, with the thalline margin obliterated.

Hab. On the trunks of old trees in wooded districts.—*Distr.* Only in S. and W. England; no doubt to be detected elsewhere.—B. M.: Walthamstow, Essex; Glynde, Sussex; near Bradford, Wiltshire; Windsor Great Park, Berkshire.

b. Thecæ 8-spored.

25. *L. medians* Nyl. Bull. Soc. Bot. Fr. xiii. (1866) p. 367.—Thallus orbicular, minutely granulose or leproso-granulose in the centre, plicato-radiose at the circumference, opaque, vitelline-yellow or citrine, greyish-white in the centre (K—). Apothecia moderate, plane, sordid-yellow or yellowish-brown (K—); the thalline margin entire or crenulate, citrine; spores oblongo-ellipsoid, simple, or occasionally 1-septate, 0.011–17 mm. long, 0.0045–65 mm. thick.—Cromb. Grevillea, xviii. p. 45; Leight. Lich. Fl. p. 205, ed. 3, p. 159.—*Placodium medians* Nyl. Bull. Soc. Bot. Fr. ix. (1862) p. 262.—*Brit. Exs.*: Larb. Lich. Hb. n. 59.

Externally subsimilar to *L. murorum*, to which at first sight it seems allied, but differs in the absence of any reactions and in the structure of the spores. The thallus is at length somewhat expanded, becoming almost leproso-dissolved in the centre, which is interspersed with citrine granules. It is seldom fertile, though when present the apothecia are numerous.

Hab. On calcareous rocks and walls in lowland and upland districts.—*Distr.* Sparingly in Central and W. England.—B. M.: Pimbury Park, Cirencester, Gloucestershire; Llanymynech Hill, Shropshire; Denny Abbey, Cambridgeshire.

26. *L. epixantha* Nyl. Act. Soc. Linn. Bord. t. xxv. (1864) p. 8.—Thallus effuse, thin, granulose, yellow-vitelline or greenish-grey (K—), often subevanescent. Apothecia small, sessile, plane or slightly convex, yellowish-orange or greenish-yellow (K—); the thalline margin thin, subcrenulate, pale-yellow; spores 8næ, oblong or ellipsoid, simple, at length polarilocular, 0.012–21 mm. long, 0.005–7 mm. thick.—Cromb. Grevillea, xviii. p. 45; Leight. Lich. Fl. p. 206, ed. 3, p. 213.—*Lecanora vitellina* vars. *epixantha* et *octospora* Nyl., Cromb. Lich. Brit. p. 48; var. *epixantha* Leight. Lich. Fl. p. 181, ed. 3, p. 167. *Lecidea epixantha* Ach. Lich. Univ. (1810) p. 208.

Externally scarcely distinguishable from *L. vitellina*, but differs definitely in the number of the spores. The thallus is entirely absent when the plant grows, as it often does, mixed up with other lichens. At times the thalline margin of the apothecia is at length excluded.

Hab. On rocks and walls in maritime and upland situations.—*Distr.* Seen only from a few localities in S. England, Wales, and S. Ireland; no doubt overlooked elsewhere, especially when athalline.—B. M.: Hastings, Sussex; Cheddar, Somersetshire; Llandyssil, Cardiganshire. Giant's Stairs, co. Cork.

Subgen. 7. *EULECANORA* Nyl. Not. Sällsk. pro F. et Fl. Fenn. Förh. n. s. v. (1866) p. 127.—Thallus crustaceous, granulose or leprose, very rarely radiate. Apothecia lecanorine or lecideoid; spores occasionally numerous, simple or variously septate, rarely brown; hymenial gelatine variously tinged with iodine. Spermatogones with jointed or simple sterigmata and various spermatia.

The largest subgenus of *Lecanora* and in several respects confluent with the preceding subgenera. According to the structure of the apothecia and spermatogones it is divided into different sections, most of which have been viewed as distinct genera by sporologists.

A. Spores 8næ (rarely 8–16næ), polari-bilocular, rarely simple or 1-septate, colourless; hymenial gelatine, especially the thecæ, bluish with iodine. Spermatogones with jointed sterigmata and straight spermatia. (*Eucaloplaca* Fr. fil. Lich. Scand. p. 172.)

a. Apothecia brightly coloured. (*Callopinella* Wedd. Mém. Soc. Cherb. t. xix. p. 276.)



Fig. 63.

Lecanora citrina Ach.
—a. A spore, ×
350. b. Jointed
sterigmata and
spermatia, × 500.

27. *L. citrina* Ach. Lich. Univ. (1810) p. 402; Nyl. Bull. Soc. Bot. Fr. t. xiii. p. 366.—Thallus effuse, granuloso-leprose, rimoso-subareolate, citrine (K + purplish). Apothecia moderate, plane or somewhat convex, orange-yellow (K + purple); the thalline margin thin, entire, at length obliterated; spores ellipsoid, polari-bilocular, colourless, 0,010–15 mm. long, 0,005–8 mm. thick.—Sm. Eng. Bot. ii. p. 192; Tayl. in Mack. Fl. Hib. ii. p. 138; Cromb. Grevillea, xii. p. 61.—*Placodium citrinum* Leight. Lich. Fl. p. 177, ed. 3, p. 163. *P. murorum* subsp. *citrinum* Cromb. Lich. Brit. p. 45; var. *ε. citrinum* Mudd, Man. p. 132. *Lichen citrinus* Eng. Bot. t. 1793 (three lower figs.). *Verrucaria citrina* Hoffm. Deutsch. Fl. ii. (1795) p. 198 pro parte. *Lichen candelarius* Huds. Fl. Angl. p. 444 pro parte; With. Arr. ed. 3, iv. p. 27 pro parte. *Lichenoides crustosum, orbiculis et scutellis flavis* Dill. Muse. 136, t. 18, f. 18 b.—*Brit. Exs.*: Leight. n. 86; Larb. Lich. Hb. n. 86.

Differs at once from *L. (Placodium) murorum*, of which it has frequently been regarded as a variety, in not being radiate at the circumference, while connecting states are never found. The thallus occasionally spreads extensively, varying somewhat in thickness, at times subevanescent, and is often of a greenish-yellow colour when growing in shady places, and in old plants is partially more or less greyish-citrine. The apothecia when present (for the plant is often sterile) are generally numerous, at first somewhat innate, becoming at length convex, with the thalline margin excluded.

Hab. On the mortar of walls, rarely on rocks, very rarely on old trunks of trees, chiefly about towns and villages, in maritime, lowland,

and upland tracts.—*Distr.* General and common in the Channel Islands, and throughout Great Britain: apparently rare in W. Ireland.—B. M.: Islands of Jersey and Sark. Norwich, Norfolk; Wimpole Park, Cambridgeshire; Bonchurch and St. Lawrence, Isle of Wight; Torquay, Devonshire; Withiel, Cornwall; Cirencester, Gloucestershire; near Windsor, Berkshire; Oswestry, and near Shrewsbury, Shropshire; near Monmouth; Island of Anglesea; near Ayton, Cleveland, Yorkshire; Brougham Castle, Westmoreland; Hexham, Northumberland; Lamplugh, Cumberland. Near Edinburgh; Gourrock, Renfrewshire; Cupar, Fifeshire; King's Park, Stirling; near Doune, Perthshire; Wills Braes, Forfarshire; Nigg, Kincardineshire; near Aberdeen. Dunkerron, co. Kerry; near Kylemore, Connemara, co. Galway.

Form *depauperata* Cromb. *Grevillea*, xviii. (1889) p. 45.—Thallus effuse, little developed, the granules minute, very much scattered. Apothecia small; otherwise as in the type.—*Brit. Exc.*: Lich. Lich. Hb. n. 128.

The thallus is but sparingly visible, and at times interspersed here and there over what seems to be *Pannularia nigra*, upon which the fructification then looks as if parasitic.

Hab. On granitic rocks in maritime tracts.—*Distr.* Seen only from the Channel Islands and N.W. Ireland.—B. M.: Island of Alderney. Kylemore, Connemara, co. Galway.

28. *L. flavocitrina* Nyl. *Flora*, 1886, p. 461.—Thallus indeterminate, thinnish, minutely squamulose, citrine-yellow; squamules appressed, more or less citrino-pulverulent (K + purplish). Apothecia small, somewhat concave or plane, biatoroid, orange-yellow (K + purple), the margin entire, paler; spores ellipsoid, polaribilocular, 0,007–10 mm. long, 0,006 mm. thick.—Cromb. *Grevillea*, xviii. p. 45.

Subsimilar to the preceding species, but differs in the character of the thallus and in the biatoroid apothecia. The squamules are either entirely citrino-pulverulent, or only so at the margins. The specimen seen is well fertile, with occasional traces of a thalline margin to the young apothecia.

Hab. On schistose walls in an upland situation.—*Distr.* Only in N.W. England (Staveley, near Kendal, Westmoreland).

29. *L. incrustans* Ach. *Lich. Univ.* (1810) p. 405; Nyl. *Flora*, 1883, p. 106.—Thallus effuse, crustaceous, verrucose, more or less diffract, pale-yellow, subpulverulent (K + purplish). Apothecia small, plane or slightly convex, deeper yellow, pruinose (K + purplish), the thalline margin thickish, entire; spores ellipsoid, polaribilocular, 0,008–13 mm. long, 0,004–8 mm. thick.—Cromb. *Grevillea*, xviii. p. 45.

A plant seldom rightly discriminated. It is allied to *L. citrina*, from which it may be recognized by the paler thallus and apothecia. In the only British specimen seen, the apothecia are numerous with the thalline margin persistent. The spermogones have the spermatia oblong or subellipsoid, 0,020–25 mm. long, 0,005–7 mm. thick.

Hab. On schistose walls in a maritime district.—*Distr.* Only very sparingly in N.E. Scotland; no doubt to be detected elsewhere.—B. M.: Portlethen, Kincardineshire.

30. *L. aurantiaca* Nyl. Mém. Soc. Cherb. t. v. (1858) p. 112; Lich. Scand. p. 142.—Thallus determinate or subeffuse, thinnish, granulato-verrucose, unequal, yellowish or pale-lemon-coloured (K + purplish); hypothallus dark-greyish, limiting the thallus, often obsolete. Apothecia moderate, sessile, plane or somewhat convex, orange-coloured (K + deep violet), usually biatorine with entire proper margin; the thalline margin thin, crenulate, speedily excluded; spores ellipsoid, polari-bilocular, 0.012–18 mm. long, 0.007–10 mm. thick.—Cromb. Lich. Brit. p. 46.—*Lecanora aurantiaca* var. *salicina* Leight. Lich. Fl. p. 217, ed. 3, p. 206. *Callopisma aurantiacum* a. *salicinum* Mudd, Man. p. 136. *Lecidea aurantiaca* Sm. Eng. Fl. v. p. 186; Tayl. in Mack. Fl. Hib. ii. p. 129; Gray, Nat. Arr. i. p. 476. *Lichen aurantiacus* Lightf. Fl. Scot. ii. (1777) p. 810 pro parte. *Rinodina salicina* Gray, Nat. Arr. i. p. 456. *Lichen salicinus* Eng. Bot. t. 1305. *Lichen flavorubescens* Huds. Fl. Angl. p. 443 pro parte; With. Arr. ed. 3, iv. p. 15 pro parte.—I have retained Lightfoot's specific name, instead of the more determinate one *L. salicina* Ach., owing to its being generally accepted, though it includes also the subspecies that follows.—*Brit. Exs.*: Mudd, n. 99; Leight. n. 212; Bohl. n. 118.

A very distinct species which cannot be confounded with any of its allies. The thallus is somewhat variable in colour, being occasionally whitish or greyish (when the reaction is less distinct), and at times is almost evanescent. The apothecia are numerous, though chiefly central, and except in a very young state are biatoroid. In otherwise sterile plants the spermatia are especially frequent and papilliform, with spermatia 0.003–4 mm. long, scarcely 0.001 mm. thick. This state is described by Acharius (Vet. Ak. Handl. 1810, p. 148) as var. *microthelia* (cfr. Gray, Nat. Arr. i. p. 456).

Hab. On the trunks of trees, chiefly poplars, ash, and willows, also on old pales, in maritime, lowland, and upland situations.—*Distr.* General and common in England, probably also in Wales, Scotland, and Ireland; rare in the Channel Islands.—B. M.: Island of Guernsey. Hadiscoe, Suffolk; Walthamstow, Essex; Halstead, Kent; Sussex; near St. Helen's and Bembridge, Isle of Wight; Isham Valley, Torquay, and near Plymouth, S. Devon; Cornwall; Windsor Great Park, Berkshire; Malvern and near Crowle, Worcestershire; Gopsall Park, Leicestershire; Oswestry and Shrewsbury, Shropshire; Black Mount, Abergavenny, Monmouthshire; Garn, Denbighshire; Island of Anglesea; Teesdale, Durham; Hexham and Wansbeck, Northumberland; Levens, Westmoreland. New Galloway, Kirkcudbrightshire; Largs, Ayrshire; near Edinburgh; Connel Ferry, Argyleshire; Finlarig, Killin, Perthshire; Abergeldie, Braemar, Aberdeenshire. Near Belfast, co. Antrim; Clonmel, co. Tipperary; Ballynegard, co. Limerick.

Subsp. 1. *L. erythrella* Nyl. Flora, 1873, p. 549.—Thallus effuse, thin, or submoderate, areolato-diffract, or rugose and rimose, yellow or orange-yellow (K + crimson). Apothecia biatorine (rarely

lecanorine), saffron-coloured or tawny-orange.—Cromb. Grevillea, xviii. p. 45.—*Lecanora aurantiaca* var. *erythrella* Cromb. Lich. Brit. p. 46; Leight. Lich. Fl. p. 217, ed. 3, p. 207 *Lecanora erythrella* Hook. Fl. Scot. ii. p. 49; Sm. Eng. Fl. v. p. 186. *Lecidea erythrella* Tayl. in Mack. Fl. Hib. ii. p. 130. *Rinodina erythrella* Gray, Nat. Arr. i. p. 456. *Lichen erythrellus* Ach. Prodr. (1798) p. 43; Eng. Bot. t. 1993. *Callopsisma aurantiacum* β . *flavovirescens* Mudd, Man. p. 137. *Lichen flavorubescens* Huds. Fl. Angl. i. p. 443 pro parte; With. Arr. iv. p. 15 pro parte. *Lichen aurantiacus* Lightf. Fl. Scot. ii. p. 810 pro parte.—*Brit. Exs.*: Mudd, n. 100; Larb. Lich. Hb. n. 20.

Distinguished by the areolate and more developed thallus, which is often widely expanded. The colour also is of a deeper yellow, though in shady places it is at times yellowish-green. The apothecia, which are numerous, are also smaller, more convex, with the thalline margin very seldom visible, even in young plants.

Hab. On rocks and old walls in maritime and upland localities.—*Distr.* Somewhat local, though plentiful where it occurs in the more hilly tracts of Great Britain; apparently rare in N.W. Ireland.—B. M.: Hastings, Sussex; Saltash and Valley of Rocks, Lynton, Devonshire; near Penzance, Cornwall; North Hill, Malvern, Worcestershire; Craig-y-Rhiw, Oswestry, and Llanymynech Hill, Shropshire; Snowdon, Carnarvonshire; Roseberry, Cleveland, Yorkshire; Brigsteer, Westmoreland; Alston, Cumberland. Appin and Glen Orchy, Argyleshire; Killin, Ben Lawers, Kinnoul Hill, and Blair Athole, Perthshire; Lundie Craigs, Forfarshire; Castleton of Braemar and Morrone, Aberdeenshire. Kylemore Lake, Connemara, co. Galway.

Var. β . *inalpina* Nyl. Lich. Scand. (1861) p. 142.—Thallus thin, paler or whitish; otherwise as in the type.—Cromb. Grevillea, xviii. p. 45; Lich. Brit. p. 46 pro parte; Leight. Lich. Fl. p. 218 pro minima parte, ed. 3, p. 207 pro minima parte.—*Callopsisma aurantiacum* γ . *inalpinum* Mudd, Man. p. 137 pro minima parte. *Lecanora inalpina* Ach. Lich. Univ. (1810) p. 388.

Differs in the colour of the thallus, which in our few specimens is rather scattered and pale-yellowish. By British authors it has not been rightly distinguished from *L. pyracea*.

Hab. On mica-schist rocks in upland situations.—*Distr.* Local and scarce in N.W. England and the S. Grampians, Scotland.—B. M.: Harris Moor, near Whitehaven, Cumberland. Glen Lochay and Ben Lawers, Perthshire.

Form *rubescens* Nyl. Lich. Scand. (1861) p. 142.—Thallus thinnish, pale-yellowish or whitish. Apothecia convex, reddish-saffron-coloured.—Cromb. Grevillea, xviii. p. 45.—*Lecidea aurantiaca* β . *rubescens* Ach. Meth. (1803) p. 69.

Only a form of the above variety characterized by the convex, differently coloured apothecia.

Hab. On schistose rocks in a subalpine region.—*Distr.* Very sparingly on one of the S. Grampians, Scotland.—B. M.: Ben Lawers Perthshire.

Subsp. 2. *L. irrubescens* Nyl. Flora, 1874, p. 318.—Thallus effuse, thin, scattered, tawny-yellow, at times subevanescent. Apothecia subminute, biatorine, sessile, becoming convex and immarginate, orange-red.—Cromb. Grevillea, xix. p. 60.

Differs in the characters given of the thallus and apothecia. The only British specimen (fragmentary) is in Hb. Salwey s. n. *Lecidea picta* Tayl., which Schærer (Enum. p. 149) referred to his var. *δ. rubescens* (non Ach.). It is, however, identical with that of Anzi, Lich. min. rar. n. 135, upon which Nylander founded this subspecies.

Hab. On schistose rocks in a mountainous district.—*Distr.* Seen only very sparingly from N. Wales.—B. M.: Near Barmouth, Merionethshire.

31. *L. crenulatella* Nyl. Flora, 1886, p. 461.—Thallus subeffuse, thin, unequal, rimose, citrine-coloured (K+purple). Apothecia moderate, plane, zeorine, subconcolorous (K+purple), the thalline margin when present finely crenulate; spores ellipsoid, polari-bilocular (the loculi moderate), 0,016–20 mm. long, 0,008–9 mm. thick.—Cromb. Grevillea, xviii. p. 45.

Well characterized by the double margin of the apothecia. It comes near subsp. *L. erythrella*, but, as Nylander *l.c.* observes, is scarcely to be subjoined under this. The thallus is little visible in the single specimen seen, but the apothecia are numerous and occasionally crowded.

Hab. On quartzose rocks in a maritime district.—*Distr.* Very local and scarce in N.W. England (Arnside, Westmoreland).

32. *L. ochracea* Nyl. in Cromb. Lich. Brit. (1870) p. 46.—Thallus determinate, thinnish, continuous or obsoletely rimoso-areolate, ochrey-yellow (K+crimson). Apothecia small, sessile, biatorine, at first concave, then plane, tawny-saffron or orange-coloured (K+purple), the margin thin, paler; spores ellipsoid, polari-bilocular, usually with longitudinal tube, 0,011–12 mm. long, 0,006–7 mm. thick.—Leight. Lich. Fl. p. 218, ed. 3, p. 208.—*Callophisma ochraceum* Mudd, Man. p. 138, t. 2. f. 43. *Lecidea ochracea* Schær. in Nat. Anz. 1819, p. 11. *Lecidea icterica* Tayl. Lond. Journ. Bot. 1847, p. 150 (*vide* Leight. *l.c.*).

Closely allied to *L. aurantiaca*, but distinguished among other characters by the constantly biatorine apothecia and the smaller spores. The structure of the latter definitely separates it from *L. tetrasticha* Nyl., to which externally it is almost similar and for which it is often mistaken. It is usually limited by a more or less distinct whitish hypothallus, and is always well fertile.

Hab. On calcareous rocks in maritime and upland tracts.—*Distr.* Very local and rare in S.W. England, S. Wales, the S.W. Highlands of Scotland, and ? S.W. Ireland.—B. M.: Hope Cove, near Kingsbridge, S. Devon; Giltar Point, Tenby, Pembrokeshire. Island of Lismore, Argyleshire.

33. *L. ferruginea* Nyl. Act. Soc. Linn. Bord. sér. 3, t. i. (1856) p. 322.—Thallus determinate or subeffuse, thinnish, areolate- or

verrucoso-unequal, or subsmooth, greyish or greyish-white (K + purplish). Apothecia small or submoderate, biatorine, plane or at length convex, bright rusty-red (K + purple), the proper margin thin, undulate, subpersistent; spores ellipsoid, polari-bilocular, with longitudinal tube or none, 0.011–16 mm. long, 0.006–9 mm. thick. —Cromb. Lich. Brit. p. 47; Leight. Lich. Fl. (forma *corticola*) p. 219, ed. 3, p. 208. —*Callopsisma ferrugineum* Mudd. Man. p. 139. *Lecidea ferruginea* Sm. Eng. Fl. v. p. 184 pro parte: Tayl. in Mack. Fl. Hib. ii. p. 128 pro parte: *Lichen ferrugineus* Huds. Fl. Angl. (1762) p. 444: Eng. Bot. t. 1650. *Lecidea casio-rufa* Gray, Nat. Arr. i. p. 473 pro parte; Hook. Fl. Scot. ii. p. 39 pro parte. *Lichen vernalis* Lightf. Fl. Scot. ii. p. 805 pro parte. *Lichenoides leprosum, tuberculis fuscis et ferrugineis* Bill. Musc. 126, t. 18. f. 4 pro parte. —*Brit. Exs.*: Larb. Lich. Hb. n. 95; Bohl. n. 108.

Easily recognized by the colour of the apothecia. In its typical state it is corticolous, seldom, at least in this country, saxicolous. The thallus varies considerably in thickness: when it is little developed the greyish-black hypothallus is here and there visible. It is usually well fertile, with numerous apothecia, which are occasionally proliferous. They are rarely crowned by the thallus when thicker and verrucose, whence form *sublecanorina* Nyl. Flora, 1873, p. 197, which occurs also in the variety.

Hab. On trunks of trees, very rarely on schistose rocks, in maritime and upland situations.—*Distr.* General in most parts of England; rarer in Scotland and Ireland; very rare in the Channel Islands.—B. M.: Island of Guernsey. Bury St. Edmunds, Suffolk; Epping Forest and Widdington, Essex; Hurst, St. Leonard's Forest, Lewes and Brighton, Sussex; New Forest. Hants: Isle of Wight; near Plymouth, Devonshire; near Bocconoc, St. Minver, and Penzance, Cornwall; Oswestry, Shropshire; Barmouth, Merionethshire; Island of Anglesea: Cleveland, Yorkshire; Teesdale, Durham; Levens, Westmoreland. Largs, Ayrshire; near Stirling; Finlarig and Kenmore, Perthshire. Kenmare and Glenmore Lake, co. Kerry; Kylemore, Connemara, co. Galway.

Var. *β. festiva* Nyl. Lich. Scand. (1861) p. 143.—Thallus thin or thinnish, greyish or dark, rimuloso-areolate, often evanescent. Apothecia small, with the proper margin entire, flexuose or crenulate, at length convex and immarginate.—Cromb. Lich. Brit. p. 47; Grevillea, xviii. p. 45.—*L. ferruginea* forms *saxicola*, *festiva* Leight. Lich. Fl. pp. 219, 220, ed. 3, pp. 208, 209. *Callopsisma ferrugineum β. festiva* Mudd, Man. p. 139. *Lecidea casio-rufa β. festiva* Ach. Syn. (1814) p. 44. *Lichen crenularius* With. Arr. ed. 3, iv. p. 405 (errore *crenulatus* p. 22). *Lecanora ferruginea* var. *crenularia* Cromb. Lich. Brit. p. 47.—*Brit. Exs.*: Leight. n. 85; Mudd, n. 102; Larb. Lich. Hb. n. 165.

When best developed almost confluent with the type. The thallus is very rarely whitish (in the darker states K -), and is frequently entirely absent. The apothecia are small or minute, at times crowded, with the margin often inflexed and more or less crenulate, whence *Lichen crenularius* With.

Hab. On rocks in maritime and mountainous districts.—*Distr.* Not unfrequent and plentiful where it occurs in Great Britain and

Ireland; not seen from the Channel Islands.—B. M.: Hastings, Sussex; Kingsbridge, S. Devon; near Penzance, Cornwall; Malvern, Worcestershire; Croesfaen, near Monmouth; Aberdovey, Merionethshire; Llandyssil, Cardiganshire; South Stack, Holyhead Mt., Anglesea; near Roseberry, Cleveland, Yorkshire; Egglestone and Teesdale, Durham; Whitehaven, Cumberland; Chollerford, Northumberland. Barcaldine and Head of Loch Awe, Argyleshire; The Trossachs, Perthshire; Lundie Craigs, Forfarshire; Portlethen, Kincardineshire; The Khoil, near Ballater, Aberdeenshire. Near Inniscarra, co. Cork; Kilkee, co. Clare; near Kylesmore, co. Galway.

34. *L. ferruginascens* Nyl. Flora, 1872, p. 427.—Thallus effuse, thin, areolato-diffract, whitish (K + purplish), often evanescent. Apothecia small, biatorine, plane and margined, or at length convex and immarginate, rusty-ochraceous or tawny-ferruginous (K + purple); spores oblong, polari-bilocular, with longitudinal tube, 0,011–16 mm. long, 0,004–6 mm. thick.—Cromb. Grevillea, xviii. p. 45.

Allied to var. β of the preceding species, but differs in the colour of the apothecia and in the spores, which, as observed by Nylander *l. c.*, often appear simple in the recent plant. In the British specimen seen the apothecia become at length rather dark.

Hab. On schistose rocks in an upland situation.—*Distr.* As yet only very sparingly in N.W. England.—B. M.: Near Kendal, Westmoreland.

35. *L. fuscoatra* Nyl. Flora, 1872, p. 427.—Thallus effuse, thin, minutely areolato-diffract, sordid-greyish (K + purplish-violet). Apothecia small, nearly plane, lecanorine, rusty-red (K + purplish), the thalline margin distinct, entire; spores polari-bilocular, 0,011–15 mm. long, 0,006–9 mm. thick.—Cromb. Grevillea, xviii. p. 45.—*Lecanora ferruginea* var. *fuscoatra* Cromb. Lich. Brit. p. 47; Leight. Lich. Fl. p. 220, ed. 3, p. 209. *Biatora ferruginea* $\hat{=}$ *fuscoatra* Bayrh. Uebers. (1849) p. 82.

Apparently specifically distinct from *L. ferruginea*, differing at once in the definitely lecanorine apothecia. Our few British specimens are well fertile.

Hab. On schistose rocks in maritime districts.—*Distr.* Only very sparingly in N.W. England, the S.W. Highlands, and N.E. coast of Scotland.—B. M.: North of Douglas, Isle of Man. Barcaldine, Argyleshire; Portlethen, Kincardineshire.

36. *L. concilians* Nyl. Flora, 1880, p. 388.—Thallus subdeterminate, granuloso-areolate, dark-greyish (K –). Apothecia moderate or small, rusty-brown or brownish-black, at first lecanorine, plane, with thin thalline margin, at length convex, biatorine, immarginate (K + dark purplish): spores ellipsoid, polari-bilocular, 0,012–17 mm. long, 0,006–9 mm. thick.—Cromb. Grevillea, xviii. p. 45.—*Lecanora ferruginea* forma *concilians* Nyl. Lich. Scand. (1861) p. 143; Cromb. Journ. Bot. 1870, p. 97; Leight. Lich. Fl. p. 220, ed. 3, p. 209 (obs.).—To this is referable the British specimens of *L. diphyodes*

(non Nyl.) Cromb. Journ. Bot. 1873, p. 133; Leight. Lich. Fl. ed. 3, p. 213.

A peculiar species known only from Scotland and Norway. It is now regarded by Nylander as distinct from *L. ferruginea* in its limited acceptance on account of the typically lecanorine apothecia. Specimens in which these are darker-coloured, and with a few exceptions entirely biatorine in appearance, closely approach *L. nigricans* Tuck., which, however, has the thallus little developed.

Hab. On schistose rocks in a maritime tract.—*Distr.* Extremely local in N.E. Scotland.—B. M.: Near Portlethen, Kincardineshire.

37. *L. cæsiurufa* Nyl. Flora, 1880, p. 388.—Thallus subdeterminate, rimoso- or diffracto-areolate, rugose, thickish, cæcio-greyish (Kf + purplish). Apothecia moderate, biatorine, at first concave, then plane, rusty-orange-coloured (K + purple), the margin prominent, entire or inflexed, paler; spores ellipsoid, polari-bilocular, with longitudinal tube, 0.014–16 mm. long, 0.007–9 mm. thick; hypothecium lax; paraphyses slender, jointed towards the apices; hymenial gelatine at length wine-red with iodine.—Cromb. Journ. Bot. 1882, p. 273. It may be *Lecidea cæcio-rufa* of British authors pro parte.

Well separated from *L. ferruginea*, with which until recently it has usually been confounded, not merely by minor differences of the thallus and apothecia, but more especially by the hypothecium, the cells of which are much less compact (*vide* Nyl. in litt.). The numerous apothecia are at times undulate and subcrenulate at the margins.

Hab. On rocks, chiefly sandstone and schist, in maritime and upland districts.—*Distr.* Seen only from a few localities in the Channel Islands, S.W. and W. England, S. Scotland, the S.W. Highlands, and S.W. Ireland.—B. M.: La Moye, Island of Jersey; Chateau Point, Island of Sark. The Lizard, Cornwall; Hollybush Hill, Malvern; St. Bees, Cumberland. Rerwick, Kirkeudbrightshire; near Edinburgh; Island of Lismore, Argyleshire. Kilkee, co. Clare.

38. *L. phæocarpella* Nyl. Flora, 1880, p. 388 nota.—Thallus indeterminate, thin, macular, greyish-white, often nearly obsolete (K—). Apothecia small, biatorine, plane, brown or dark-brown, often slightly æruginoso-suffused (K + purple), colourless within, thinly margined; paraphyses moderate, brownish at the apices; spores ellipsoid, polari-bilocular, often with longitudinal tube, 0.014–18 mm. long, 0.006–11 mm. thick.—Cromb. Grevillea, xix. p. 60.—*Lecanora nigricans* (non Tuck.), Cromb. Grevillea, xviii. p. 45.

Near *L. nigricans* (Tuck.), with which it was at one time joined by Nylander as a state (Lapp. Or. p. 128), but is now regarded by him as distinct. Like others of the more immediately allied species it looks almost a variety of *L. ferruginea*. The biatorino-lecideine apothecia in the only British specimen gathered are frequent.

Hab. On the trunk of a fir-tree in a mountainous region.—*Distr.* Only among the N. Grampians, Scotland, where probably it is not rare.—B. M.: Craig Cluny, Braemar, Aberdeenshire.

39. *L. atroflava* Nyl. in Zwach Lich. Heidelb. (1813) p. 83.—Thallus subeffuse, smooth, thin, rimoso-diffract, continuous, umbrine-blackish (K—). Apothecia small, plane, biatorine, ochraceo-ferruginous (K+purplish), the margin entire, paler; spores ellipsoid, polari-bilocular, 0,009–11 mm. long, 0,005–6 mm. thick.—Cromb. Grevillea, xviii. p. 45.—*Lecidea atroflava* Sm. Eng. Fl. v. p. 185; Turn. Linn. Trans. ix. (1808) p. 142, t. 11. f. 2. *Lichen atroflavus* Eng. Bot. t. 2009. *Lecanora scotoplaca* Nyl. Flora, 1876, p. 232. *Lecanora ferruginea* var. *scotoplaca* Leight. Lich. Fl. ed. 3, p. 209.—*Brit. Exs.*: Larb. Lich. Hb. n. 335.

Near to *L. caesiurufa*, but apparently a distinct species. The thallus, usually more or less effuse, is at times when associated with other crustaceous lichens (e. g. *Lecanora campestris*) well determinate. The apothecia are numerous and crowded, whence it has often been confounded with var. *holocarpa* of *L. pyracea*.

Hab. On siliceous rocks, usually exposed flints, in maritime, rarely upland tracts.—*Distr.* Local and scarce in S. and E. England, N. Wales, and in N.W. Ireland.—B. M.: Ryde, Isle of Wight; Beechy Head and the Downs, Sussex; Lyddbeach, Kent; Thetford Warren, Norfolk. Barmouth, Merionethshire; Island of Anglesea. Near Kylemore, Connemara, co. Galway.

40. *L. Turneriana* Nyl. ex Cromb. Journ. Bot. 1876, p. 360.—Thallus thin, areolato-rimose or diffract, the areolæ verrucoso-unequal, dark-grey or brownish-black (K—). Apothecia small, plane or somewhat convex, biatorine, reddish-yellow, the margin thick, entire, persistent, paler yellow (epithecium K+purplish); spores ellipsoid, polari-bilocular, 0,011–16 mm. long, 0,007–10 mm. thick.—Leight. Lich. Fl. ed. 3, p. 209.—*Lecidea Turneriana* Ach. Lich. Univ. (1810) p. 206.

Has the aspect of *L. pyracea*, but differs in the colour of the thallus and apothecia, and especially in the thicker spores. The thallus varies from dark-grey to deep-brown, passing into black; but in our specimens it is but sparingly visible. The apothecia are usually scattered, though here and there a few are crowded, the epithecium being at times of a darker colour.

Hab. On rocks in maritime districts.—*Distr.* Seen only sparingly from S. Wales, N.W. England, and N.W. Ireland.—B. M.: St. David's, Pembrokeshire; Burrowmouth, Whitehaven, Cumberland. Kylemore and Killerey Bay, Connemara, co. Galway.

41. *L. albolutescens* Nyl. Flora, 1881, p. 177.—Thallus thin, subfarinaceous, continuous or somewhat scattered, whitish (K—). Apothecia moderate, prominent, orange-coloured, subbiatorine, thickly margined, the margin externally thalline and whitish, but orange on the upper portion, epithecium unequal (K+purplish); spores ellipsoid, polari-bilocular, 0,015–18 mm. long, 0,007–10 mm. thick, the loculi large.—Cromb. Grevillea, x. p. 22.

Not to be confounded with *L. pyracea*, from which it at once differs in the larger, thickly margined apothecia and the larger spores. As observed

by Nylander *l. c.* it is more allied to *L. Turneriana*, from which it probably descends. The thallus is effuse, with no distinct hypothallus, and at times becomes evanescent (form *ecrustacea* Johns.). The apothecia are numerous, at times somewhat crowded, and at length angulose.

Hab. On granitic rocks in upland tracts.—*Distr.* Only very sparingly in N. England.—B. M.: Tyneside, Bywell, Northumberland; Scalegill, Cumberland.

42. *L. cerina* Ach. Lich. Univ. (1810) p. 390.—Thallus determinate, thin, smoothish or granulato-unequal, greyish-white (K + crimson), limited by a thin bluish-black hypothallus. Apothecia lecanorine, moderate, somewhat plane, pale waxy-yellow (K + crimson), the thalline margin thin, entire, persistent; spores ellipsoid, polari-bilocular, often with longitudinal tube, 0.012–18 mm. long, 0.006–9 mm. thick; paraphyses tawny-yellow at the apices.—Tayl. in Mack. Fl. Hib. ii. p. 136; Sm. Eng. Fl. v. p. 190; Cromb. Lich. Brit. p. 47; Leight. Lich. Fl. p. 220, ed. 3, p. 209.—*Callospisma cerinum* Mudd, Man. p. 136. *Rinodina cerina* Gray, Nat. Arr. i. p. 456. *Lichen cerinus* Ehrh. Exs. (1785) n. 216; Dicks. Crypt. fasc. iii. p. 14; With. Arr. ed. 3, iv. p. 24; Eng. Bot. t. 627.—*Brit. Exs.*: Leight. n. 83; Mudd, n. 97; Cromb. n. 60; Larb. Lich. Hb. n. 167.

A very variable plant as to the thallus and fructification, but readily known from its allies by the colour of the hypothallus and the regularly lecanorine apothecia. The thallus is often almost or entirely evanescent, though even then it always margins the apothecia. These are usually fairly numerous, sessile, occasionally of a paler colour, with the spores at times more broadly ellipsoid. From it descend the forms and subspecies that follow.

Hab. On the trunks of trees and on old pales in maritime, lowland, and upland districts.—*Distr.* General and common in the Channel Islands and England; apparently rare in N. Wales, S.W. and Central Scotland, and S. Ireland.—B. M.: Rozel, Island of Jersey; Islands of Guernsey and Sark. Coltishall, Norfolk: near Colchester and Widdington, Essex; Maidstone, Kent; Lewes, Sussex; near Shanklin, Isle of Wight; New Forest, Hants; Plymouth, S. Devon; Tregawn and Truro, Cornwall; near Cirencester, Gloucestershire; Cherry Hinton and near Quoy, Cambridgeshire; Oswestry and near Shrewsbury, Shropshire; Island of Anglesea; Bilsdale, Yorkshire; Derwent River, Durham; near Kendal, Westmoreland; Wansbeck, Northumberland. Largs, Ayrshire; Blair Drummond and Craig Tulloch, Perthshire. Near Cork; Killarney, co. Kerry; Adare, co. Limerick.

Form 1. *cyanolepra* Nyl. Lich. Scand. (1861) p. 144.—Thallus thin, evanescent; hypothallus chiefly present.—Leight. Lich. Fl. p. 220, ed. 3, p. 210.—*Patellaria cyanolepra* DC. Fl. Fr. ii. (1805) p. 560.

Well marked by the very distinct predominating hypothallus, upon which the proper thallus is only very sparingly here and there visible. The apothecia at times appear to arise from the hypothallus, but have a distinct greyish thalline margin.

Hab. On the smooth bark of ash and poplars in maritime and upland districts.—*Distr.* Sparingly in S. and W. England, and among the Central Grampians, Scotland.—B. M.: Shanklin, Isle of Wight; New Forest, Hants; Withiel, Cornwall. Craig Tulloch, Blair Athole, Perthshire.

Form 2. *albiseda* Nyl. Lich. Scand. (1861) p. 144.—Thallus very thin, white. Apothecia bright-yellow, the thalline margin thin, white.—Cromb. Grevillea, xviii. p. 46.

A peculiar form, differing in the colours of the thallus, the apothecia, and their thalline margin.

Hab. On old pales in upland districts.—*Distr.* Only very sparingly in S. England and S.W. Ireland.—B. M.: near Lewes, Sussex. Dunkerron, co. Kerry.

Var. β . *stillicidiorum* Nyl. Mém. Soc. Cherb. t. v. (1857) p. 112; Lich. Scand. p. 144.—Thallus effuse, very thin, granulose or leprose, greyish-white; hypothallus obsolete. Apothecia small, yellowish- or olive-green, or dark olive, pruinose, the thalline margin undulate, pale-greyish.—Cromb. Lich. Brit. p. 47; Leight. Lich. Fl. p. 221, ed. 3, p. 210.—*Callopisma cerinum* γ . *stillicidiorum* Mudd, Man. p. 136. *Rinodina stillicidiorum* Gray, Nat. Arr. i. p. 456. *Lichen stillicidiorum* Hornem. Fl. Dan. (1792) t. 1063. f. 2. *Lecanora chloroleuca* Hook. Fl. Scot. ii. p. 48; Sm. Eng. Fl. v. p. 190. *Lichen chloroleucus* Sm. Eng. Bot. t. 1373.—*Brit. Eas.*: Bohlf. n. 94.

Probably rather a subspecies (*cf.* Norrl. Medd. Sällsk. pro F. & Fl. Fenn. i. p. 22), differing in the absence of a hypothallus, the colour of the fructification, and in the habitat. The thallus spreads rather extensively and the apothecia are numerous, with the thalline margin rarely subpulverulent.

Hab. Incrusting masses, on calcareous rocks, in upland and subalpine situations.—*Distr.* Local, though not uncommon where it occurs in S.W., Central, and N. England, N. Wales, the S.W. Highlands and among the Grampians, Scotland; not seen from Ireland.—B. M.: Dartmoor, Devonshire; near Buxton, Derbyshire; Dolgelly, Merionethshire; Eglestone, Durham; Cuswick Scar, Westmoreland; near Skelton, Cumberland. Achrosagan Hill, Appin, Argyleshire; Craig Tulloch, Perthshire; Craig Guie and Morrone, Braemar, Aberdeenshire.

Subsp. 1. *L. chlorina* Nyl. *ex* Lamy, Bull. Soc. Bot. t. xxv. (1878) p. 505.—Thallus effuse, thickish, granuloso-verruculose or areolato-rimulose, verdigris- or dark-green; hypothallus not distinct. Apothecia darker cerine.—Cromb. Grevillea, xviii. p. 46.—*Lecanora cerina* var. *chlorina* Leight. Lich. Fl. p. 221, ed. 3, p. 210. *Callopisma cerinum* β . *chlorinum* Mudd, Man. p. 136. *Zeora cerina* var. *chlorina* Flot. Lich. Siles. (1849) p. 216.—*Brit. Eas.*: Larb. Lich. Hb. n. 22.

Distinguished as a subspecies by the more developed thallus, its very different colour, and by the darker apothecia. The hypothallus is confused with the thallus. In the few British specimens the apothecia are

numerous, though elsewhere it often occurs sterile (*vide* Fr. fil. Lich. Scand. p. 174), in which condition it has probably been overlooked in our country.

Hab. On shady rocks in upland situations.—*Distr.* Local and scarce in N. England and N.W. Ireland.—B. M.: Newton, Cleveland, Yorkshire; Levens Park, Westmoreland; Chollerford, Northumberland. Near Lough Corrib and Great Killery, co. Galway.

Form *cyanopolia* Nyl. Not. Sällsk. pro F. et Fl. Fenn. Förh. n. s. v. (1866) p. 128.—Thallus subleprose or depresso-granulate and rimoso-diffract, sordid greyish or sometimes caesio-bluish. Apothecia lecanorine, somewhat concave, at length biatorine, pale-yellowish-orange.—Cromb. Grevillea, xviii. p. 46.—*Lecanora cerina* f. *cyanopolia* Leight. Lich. Fl. ed. 3, p. 211.—*Brit. Ess.*: Larb. Lich. Hb. n. 23.

Apparently referable to this subspecies, with which it agrees in habitat, but differs in colour and in the thalline margin of the apothecia being at length excluded. Our only specimen seen is well fertile.

Hab. On wet stones in upland districts.—*Distr.* Only sparingly in N.W. Ireland.—B. M.: Between Lough Feagh and Lough Muck, Connemara, Galway.

Subsp. 2. *L. hæmatites* Nyl. Mém. Soc. Cherb. v. (1857) p. 112.—Thallus subeffuse or determinate, contiguous, verruculose, greyish; hypothallus bluish. Apothecia submoderate, plane, rusty-red, the thalline margin thickish, persistent.—Cromb. Grevillea, xviii. p. 46.—*Lecanora hæmatites* Charb. in St. Am. Fl. Agen. (1821) p. 492; Leight. Lich. Fl. ed. 3, p. 212.—*Brit. Ess.*: Larb. Lich. Hb. n. 56.

Often regarded as a distinct species, but scarcely with propriety, since it differs from the type chiefly in the colour of the apothecia. The thallus is somewhat small, often confused with and at times limited by the hypothallus. The apothecia, in the few specimens seen, are numerous and crowded.

Hab. On the smooth bark of young trees and their branches, chiefly in orchards, in maritime and lowland districts.—*Distr.* Found only sparingly in S.W., E., and W. England; no doubt to be detected elsewhere.—B. M.: Ilsham, Torquay, S. Devon; Cherry Hinton, Cambridgeshire; near Worcester.

43. *L. cerinella* Nyl. Bull. Soc. Bot. t. xiii. (1866) p. 370; Flora, 1872, p. 427.—Thallus thin, sordid-greyish, little visible (K + yellowish). Apothecia minute, subbiatorine, bright-yellow (K + purplish); spores 8–12–16 μ , ellipsoid, indistinctly bilocular, with thin septum, 0.009–0.011 mm. long, 0.005–6 mm. thick.—Cromb. Journ. Bot. 1882, p. 273.

Looks as if it were a small variety of *L. cerina*, but is distinct by the minute apothecia and the pluri-spored thecæ. On the application of K, the spores at once assume a placodine form, and are seen to be polaribilocular with longitudinal tube.

Hab. On branches of trees in lowland districts.—*Distr.* Apparently very local and scarce in E. England (near Cambridge); no doubt to be detected elsewhere.

44. *L. biloculata* Nyl. Flora, 1878, p. 248.—Thallus effuse, very thin, unequal or rugulose, whitish or glaucous-white, somewhat shining (K—CaCl—). Apothecia minute, adnate, lecideoid, plane and thinly margined, at length convex and immarginate, black (K—); spores ellipsoid, polari-bilocular, brownish, 0,015–18 mm. long, 0,008 mm. thick; hypothecium brownish-black; paraphyses thickish, dark-brown at the clavate apices, hymenial gelatine deep blue with iodine.—Cromb. Grevillea, xviii. p. 46.—*Lecidea polospora* (nomen inceptum); Leight. Trans. Linn. Soc. n. s. Bot. i. (1878) p. 241, t. xxxiii. figs. 4–6; Lich. Fl. ed. 3, p. 313.

A rather inconspicuous plant, with quite the aspect of a *Lecidea* allied to *L. myriocarpa*, as observed by Leighton *l. c.* According to Nylander *apud* Hue Rev. Bot. 1886, p. 29, it is in reality a *Lecanora* of this section. It evidently, however, departs from it in the colour of the apothecia and the spores, as also in the absence of any epithecial reaction with K. In the small specimen seen, it is only sparingly present associated with *Lecanora rugosa* and *Lecidea parasema*.

Hab. On an old hawthorn tree in a maritime tract.—*Distr.* Extremely local and rare in N.W. Ireland.—B. M.: Ballinahinch, near Kylesmore, co. Galway.

45. *L. pyracea* Nyl. Not. Sällsk. pro F. et Fl. Fenn. Förh. n. ser. v. (1866) p. 129.—Thallus effuse, very thin, granulato-leprose, greyish-white, often obsolete (Kf+reddish in thin section); hypothallus thin, whitish. Apothecia small or minute, somewhat plane or convex, yellow-orange-coloured (K+crimson), with the thalline margin speedily excluded; or biatorine with the proper margin thin, paler yellow; spores ellipsoid or oblongo-ellipsoid, polari-bilocular, with longitudinal tube, 0,011–16 mm. long, 0,005–7 mm. thick.—Cromb. Grevillea, xviii. p. 46; Lich. Brit. p. 47 pro parte; Leight. Lich. Fl. p. 221 pro parte, ed. 3, p. 211 pro parte.—*Parmelia cerina* & *pyracea* Ach. Meth. (1803) p. 176.—*Brit. Exs.*: Leight. n. 118; Mudd, n. 101; Larb. Lich. Hb. n. 132.

In some respects allied to *L. cerina*, from which it differs chiefly in the less developed thallus and the biatoroid apothecia. The thallus is usually sparingly visible, and at times entirely wanting. The apothecia are numerous, at first with thin, evanescent or obsolete thalline margin, so that they are seldom seen lecanorine. It is a rather variable plant, and hence the British variety, forms, and subspecies that follow.

Hab. On rocks and stones, rarely on trees and old pales from maritime to subalpine tracts.—*Distr.* Here and there in England and Wales, the Scottish Grampians and N.W. Ireland; no doubt often overlooked.—B. M.: Hastings and the South Downs, Sussex; near Ryde, Isle of Wight; near Bovey Tracey, S. Devon; St. Merryn, Cornwall; near Cirencester, Gloucestershire; near Cambridge; Barmouth, Merionethshire; Ingleborough, Lanbraugh, and near Easby, Cleveland, Yorkshire; Staveley, Kendal, Westmoreland; Chollerford, Northumberland. Ballachulish,

Argyleshire; Ben Lawers, Perthshire; Rothiemurehus and near Fort William, Inverness-shire. Ballynahinch, Connemara, co. Galway; Westport, co. Mayo.

Form *submersa* Nyl. Flora, 1885, p. 43.—Thallus thin, dark, at length rimuloso-diffract; otherwise as in the type.—Cromb. Grevillea, xviii. p. 46.

Differs merely in the character of the thallus, which is probably owing to the habitat. I have not seen a British specimen.

Hab. On stones in streams in upland situations.—*Distr.* Very sparingly in N.W. Ireland (near Kylemore, Connemara, co. Galway).

Var. β . *pyrithroma* Nyl. Bull. Soc. Bot. t. xiii. (1866) p. 367.—Thallus paler, often scarcely visible. Apothecia somewhat convex, deep-yellow or reddish; spores 0.010–13 mm. long, 0.004–6 mm. thick.—Cromb. Grevillea, xviii. p. 46; Lich. Brit. p. 47.—*Lecidea rupestris* β . *pyrithroma* Ach. Lich. Univ. (1810) p. 206.—*Brit. Exs.*: Larb. Lich. Hb. n. 335.

Differs chiefly in the size of the spores. It usually occurs athalline and mixed up with other crustaceous lichens, so that it is apt to be overlooked.

Hab. On rocks, walls, and flints in lowland and upland tracts.—*Distr.* Seen from only a few localities in Great Britain and N.W. Ireland.—B. M.: Thetford Warren, Norfolk; Kildale, Cleveland, Yorkshire. Craig Tulloch, Blair Athole, Perthshire; Park, near Aberdeen; Craig Guie, Braemar, Aberdeenshire. Lough Inagh, Connemara, co. Galway.

Form *picta* Cromb. Grevillea, xviii. (1889) p. 47.—Thallus thin, greyish, evanescent. Apothecia concave, then plane, pale greenish-dun coloured, yellow-pruinose, the proper margin thickish, inflexed.—*Lecidea picta* Tayl. in Mack. Fl. Hib. ii. (1836) p. 130.—*Lecanora pyracea* var. *pyrithroma* Leight. Lich. Fl. p. 222, ed. 3, p. 212.—*Brit. Exs.*: Larb. Lich. Hb. n. 55.

Only a form of var. β , distinguished chiefly by the bright-yellow pruina with which the fruit is covered. In specimens long preserved in Herbaria this disappears. The apothecia are minute or somewhat small, numerous and usually crowded.

Hab. On schistose rocks in mountainous regions.—*Distr.* Local and scarce on the S. Scottish Grampians and in W. Ireland.—B. M.: Ben Lawers and Craig Calliach, Perthshire. Carig Mt., co. Kerry; Lettermore, Connemara, co. Galway.

Var. γ . *lactea* Stiz. St. Gall. Nat. Ges. 1881, p. 352.—Thallus thinnish, amylaceous, chalky-white. Apothecia small, orange-red, at length convex and immarginate.—Cromb. Grevillea, xix. p. 60.—*Callopusia luteo-album* var. *lacteam* Mass. Sched. Crit. (1855) p. 133.

A good variety characterized by the colour of the thallus and of the apothecia. Massalongo, *l. c.* describes the latter as scattered; but, in the specimens seen, they are here and there congregate. It is a very doubtful

British plant, though there are two specimens from Mr. Mudd in Herb. Brit. Mus. purporting to have been gathered in the locality cited.

Hab. On calcareous rocks in a maritime district.—*Distr.* Only in ? N.E. England. B. M.: Hartlepool, Durham.

Subsp. *holocarpa* Nyl. Lich. Scand (1861) p. 145.—Thallus nearly obsolete. Apothecia contiguous, crowded, vitelline or yellow-orange; spores 0,010–14 mm. long, 0,006–10 mm. thick.—Cromb. Grevillea, xviii. p. 46; Lich. Brit. p. 47 pro parte; var. *holocarpa* Leight. Lich. Fl. p. 222 pro parte, ed. 3, p. 211 pro parte.—*Callospisma luteoalbum* β . *holocarpum* Mudd, Man. p. 127 pro parte. *Lichen holocarpus* Ehrh. Crypt. (1793) n. 284.

Occasionally there are visible slight traces of a thin, dark-greyish, granulose or subfurfuraceous thallus, which, however, is probably not proper. The apothecia are very numerous and crowded, so that, from mutual pressure, they become angular.

Hab. On old pales, very rarely on rocks, in lowland and upland situations.—*Distr.* Seen only from a few localities in Great Britain.—B. M.: Near Ayton, Cleveland and Rowcliff, Loftus (saxicolous), Yorkshire; Morpeth, Northumberland. Achmore, Killin, Perthshire.

46. *L. vitellinula* Nyl. Flora, 1863, p. 305.—Thallus subeffuse, very thin, yellowish or vitelline-yellow (K+purplish). Apothecia small, biatorine, plane, margined, at length convex, vitelline (K+purplish); spores polari-bilocular with longitudinal tube, 0,009–0,012 mm. long, 0,004–6 mm. thick.—Cromb. Journ. Bot. (1882) p. 273.

Closely allied to *L. pyracea*, from which it differs chiefly in colour and in the size of the spores. The thallus is at times nearly evanescent, and the apothecia are usually numerous. Only saxicolous in Britain.

Hab. On calcareous rocks in maritime and hilly tracts.—*Distr.* Only sparingly in the Channel Islands, S.W. and N. England, the S.W. Highlands of Scotland, and S.W. Ireland.—B. M.: Noirmont, Island of Jersey; Sidmouth, Devonshire; Yatton and Weston-super-Mare, Somersetshire; Overend, Egremont, Cumberland. Island of Lismore, Argyleshire. Carrigogumal, co. Limerick.

47. *L. luteoalba* Nyl. ex Lamy, Bull. Soc. Bot. t. xxv. (1878) p. 398.—Thallus effuse, thin, leprose, greyish-white (K—), often almost obsolete. Apothecia minute, biatorine, orange-yellow, at first innate, plane, with paler entire proper margin, at length convex and immarginate (K+purplish); spores ellipsoid, 1-septate, 0,009–11 mm. long, 0,004–5 mm. thick; paraphyses not very discrete.—Cromb. Grevillea, xviii. p. 46.—*Callospisma luteoalbum* Mudd, Man. p. 136 pro parte. *Lecidea luteo-alba* Gray, Nat. Arr. i. p. 475; Hook. Fl. Scot. ii. p. 40. *Lichen luteo-albus* Turn. Trans. Linn. Soc. vii. (1804) p. 92; Eng. Bot. t. 1426. *Lecanora pyracea* var. *ulmicola* (DC.) Leight. Lich. Fl. p. 222, ed. 3, p. 211. *Lecidea ulmicola* Sm. Eng. Fl. v. p. 185.—*Brit. Ecs.*: Leight. n. 84; Mudd, n. 98; Cromb. n. 61; Larb. Lich. Hb. n. 168; Bohl. n. 76.

Often confounded with or regarded only as a variety of *L. pyracea*, to which it is externally similar, though definitely separated by the distinctly-septate spores. It spreads extensively over the substratum, the thallus being frequently evanescent. The apothecia are very numerous, and at times much crowded with a thalline margin rarely visible in their earlier stage of growth. Though normally a corticolous plant, it at times occurs on chalk, mortar, and limestone (very rarely in Britain), when it is form *rupestris* (? Scop.) Nyl. Lich. Scand. p. 145; *Lecidea ulmicola* Tayl. in Mack. Fl. Hib. ii. p. 129.

Hab. On the trunks of trees, chiefly elms, rarely on rocks, from maritime to upland situations.—*Distr.* General in most parts of England, apparently rare in N. Wales, Scotland, and S. Ireland.—B. M.: Great Glenham and near Sotterly, Suffolk; Hale End, Epping Forest, Essex; Eynsford, Kent; Lewes and Glynde, Sussex; near Ventnor, Isle of Wight; near Cirencester, Gloucestershire; near Mill Hill, Middlesex; Elstree, Herts; Windsor Great Park, Berkshire; Stowe Park, Buckingham; Wimpole Park, Cambridgeshire; Twycross, Leicestershire; near Worcester and at North Malvern, Worcestershire; Island of Anglesea; near Masham, Yorkshire; Leven's Bridge, Westmoreland; Meldon Park, Wansbeck Valley, Northumberland. Doune Castle, near Stirling; Pitfour, Aberdeenshire. Castle Connell, co. Limerick; Rostellan, co. Cork; Inisfallen, Killarney, co. Kerry. The saxicolous state has occurred only in the following localities in S. and N. England and S.W. Ireland:—South Downs, Sussex; Newton Abbot, S. Devon; Ingleborough, Yorkshire. Dunkerron, co. Kerry.

48. *L. phlogina* Nyl. Mém. Soc. Cherb. v. (1857) p. 112: Lich. Scand. p. 141.—Thallus effuse, very thin, minutely granuloso-leprose, citrine or yellowish-green; granules globular, often somewhat scattered (K + purplish). Apothecia small, biatorine, plane or at length convex, yellowish-orange: spores elliptico-oblong, polaribilocular, 0,011–15 mm. long, 0,006–9 mm. thick.—Cromb. Journ. Bot. 1871, p. 178; Leight. Lich. Fl. p. 223, ed. 3, p. 213.—*Parmelia citrina* var. *phlogina* Ach. Meth. (1803) p. 189.—*Brit. Ees.*: Larb. Lich. Hb. n. 57.

Sometimes viewed as merely a corticolous state of *L. citrina*, but allied rather to *L. pyracea*, from which it is at once distinguished by the very different thallus. The apothecia are generally rather scattered.

Hab. On the trunks of old trees, ash and elm, rarely on old posts from maritime to upland districts.—*Distr.* Found only in a few localities in the Channel Islands and England.—B. M.: St. Clement's Bay, Island of Jersey. Near Ryde, Isle of Wight; near Hastings, Sussex; Penzance, Cornwall; Windsor Great Park, Berks; Pampisford, Cambridgeshire; near Worcester; Alston, Cumberland.

Var. β . *lutea* Nyl. Lich. Scand. (1861) p. 142.—Thallus leproso-pulverulent, whitish-citrine or pale-luteous. Apothecia pale-orange: spores 0,011–12 mm. long, 0,006–7 mm. thick.—Cromb. Grevillea, xviii. p. 46.—*Lecidea epicantha* var. *lutea* Ach. Lich. Univ. (1810) p. 209.

A peculiar variety, differing in the more pulverulent, paler thallus, the paler apothecia, smaller spores, and the nature of the habitat. The few British specimens are well fertile.

Hab. On vegetable detritus in maritime districts.—*Distr.* Only very sparingly in S. England and the S.W. Highlands of Scotland.—B. M.: Luccombe Cove, Isle of Wight; Rottingdean Cliffs, Sussex. Airds, Appin, Argyleshire.

49. *L. irrubata* Nyl. ex Norrl. Medd. Sällsk. pro F. & Fl. Fenn. i. (1876) p. 22.—Thallus determinate, thin, rimose or rimoso-areolate, sordid or greyish (K—). Apothecia adnate, small, biatorine, somewhat plane or convex, immarginate, yellow-reddish (K + purplish); spores ellipsoid or ovoid, simple, 0,009–0,011 mm. long, 0,005–6 mm. thick; paraphyses scanty.—Cromb. Grevillea, xii. p. 58.—*Lecanora calva* var. *irrubata* Cromb. Lich. Brit. p. 47. *Lecidea irrubata* Sm. Eng. Fl. v. p. 183; Tayl. in Mack. Fl. Hib. ii. p. 128. *Lecanora rupestris* forma *viridi-flavesceus* (Wulf.) Leight. Lich. Fl. p. 191, ed. 3, p. 204. *Lecidea rupestris* γ. *viridiflavesceus* Mudd, Man. p. 194. *Lichen rupestris* Eng. Bot. t. 2245.—*Brit. Ees.*: Leight. n. 119; Mudd, n. 161; Larb. Lich. Hb. n. 100.

Usually arranged by authors among the *Lecideae* owing to its simple spores and biatorine apothecia. Its true place, however, is among other biatorine species of this section, as shown by the spermogones. From the more developed thallus, which is usually limited, it is to be regarded as the specific type rather than the subspecies that follows. The apothecia are numerous, usually small, rarely submoderate. The spermogones, which are externally black-punctate, have the spermatia cylindrical, about 0,005–6 mm. long, 0,001 mm. thick.

Hab. On calcareous rocks, siliceous and cretaceous stones, and the mortar of walls in maritime and upland localities.—*Distr.* Not uncommon in England; not seen from Wales; apparently rare in Scotland and Ireland.—B. M.: Shiere, Surrey; Beachy Head, Sussex; Anstey's Cove, Torquay, and Cornworthy, S. Devon; near Penzance, Cornwall; Bathampton Downs, Somersetshire; Windsor Great Park, Berks; Norton, near Worcester; Whitecliffe Rocks, near Ludlow, Shropshire; Bonsall, Derbyshire; Bilsdale and near Carlton, Cleveland, Yorkshire; Beamish, Durham; Leven's Park, Westmoreland; Chollerford, Northumberland. Appin, Argyleshire; Craig Tulloch, Blair Athole, Perthshire; Kirkland, Fifeshire. Killarney, co. Kerry; Ben Bulbin, co. Sligo; near Kylesmore, co. Galway.

Subsp. *L. calva* Nyl. ex Lamy, Bull. Soc. Bot. t. xxx. (1883) p. 379.—Thallus effuse, very thin, whitish, or scarcely any. Apothecia small or moderate, convex, vitelline or tawny-yellow; spores 0,009–0,014 mm. long, 0,005–8 mm. thick; paraphyses thick.—Cromb. Grevillea, xviii. p. 46.—*Lecanora calva* Cromb. Lich. Brit. p. 47. *Lecanora rupestris* form *calva* Leight. Lich. Fl. p. 191, ed. 3, p. 203. *Lichen calvus* Dicks. Crypt. fasc. ii. (1790) p. 18, t. 6. f. 4; With. Arr. ed. 3, iv. p. 14; Eng. Bot. t. 948. *Lecidea rupestris* (? Scop.) Gray, Nat. Arr. i. p. 472; Sm. Eng. Fl. v. p. 183; Tayl. in Mack. Fl. Hib. ii. p. 128; Mudd, Man. p. 193.

Often spreads extensively with the thallus indistinct, being confused with the substratum. The apothecia are at times somewhat large, and then more convex, immarginate and scattered.

Hab. On calcareous rocks, rarely on flints in maritime and mountainous districts.—*Distr.* Rather local, though common where it occurs in Great Britain; not seen from Ireland.—B. M.: Reigate, Surrey; Lydd Beach, Kent; Peasemarsch and near Lewes, Sussex; Isle of Wight; Canning Dale, Buxton, Derbyshire; Island of Anglesea; Craig-y-Rhiw, Oswestry, Shropshire; Eglestone, Durham; Leven's Park, Westmoreland; Bywell, Northumberland. King's Park, Edinburgh; Achrosagan Hill, Appin, and near Ben Cruachan, Argyleshire; Craig Tulloch, Blair Athole, Perthshire; Craig Guie and Morrone, Braemar, Aberdeenshire.

Form *incrustans* Cromb. *Grevillea*, xviii. (1889) p. 46.—Thallus very thin, white, usually evanescent. Apothecia minute, immersed, plane or slightly convex, thinly margined.—*Lecanora rupestris* forma *incrustans* Leight. Lich. Fl. p. 191, ed. 3, p. 203. *Lecidea rupestris* β . *incrustans* Mudd, Man. p. 194. *Patellaria incrustans* DC. Fl. Fr. ii. (1805) p. 361.

Differs in the smaller, immersed, margined apothecia, which, if a constant character, would render it a distinct variety. At times, however, these in the same specimen become at length somewhat prominent and immarginate, so that it can rank only as a form.

Hab. On calcareous rocks in maritime and mountainous districts.—*Distr.* Seen only from S.W. England, the S.W. Highlands, and the N. Grampians, Scotland, though reported also by Leighton from W. England (Ludlow, Shropshire).—B. M.: Anstey's Cove, Torquay, S. Devon. Island of Lismore, Argyleshire; Morrone, Braemar, Aberdeenshire.

Subsp. *L. Siebenhaariana* Nyl. ex Stiz. St. Gall. Nat. Ges. 1874, p. 215.—Thallus effuse, rimoso-areolate, unequal, whitish or greyish. Apothecia small, adnate, convex, at first orange-coloured, at length sordid-olive or brownish tawny-yellow, internally dark; spores as in the type.—Cromb. Journ. Bot. 1885, p. 195.—*Biatora Siebenhaariana* Koerb. Syst. Lich. Germ. (1855) p. 207.

Characterized by the differently coloured apothecia and the dark hypothecium. This, as observed by Fries fil., Lich. Scand. p. 425, in the young apothecia is usually violet-rose-coloured, then becoming more and more brownish, though in these it at times presents the natural colour of the type. The thallus is at times almost evanescent and visible only around the apothecia, which are small and scattered, or minute and several congregated.

Hab. On moist mica-schist rocks in alpine situations.—*Distr.* Very sparingly on two of the S. Grampians, Scotland.—B. M.: Summits of Ben Lawers and Craig Calliach, Perthshire.

50. *L. nivalis* Nyl. Not. Sällsk. pro F. & Fl. F. Förh. v. (1866) p. 129.—Thallus effuse, very thin or slightly granulate, whitish or greyish-white (K + purplish). Apothecia small, adnate, ochraceous or orange-coloured, at first plane with an evanescent thalline margin, at length somewhat convex, biatorine with thin, entire proper margin (K + purplish); spores oblongo-cylindrical, simple or faintly 1-septate, 0.024–38 mm. long, 0.005–7 mm. thick; paraphyses

moderate, often divided at the apices.—Carroll, Journ. Bot. 1865, p. 288; Cromb. Lich. Brit. p. 48; Leight. Lich. Fl. p. 226, ed. 3, p. 217.—*Zocora nivalis* Koerb. Sert. Sudet. (1853) p. 1. *Lecanora fuscoluteolina* Mudd, Man. p. 153.

Externally resembles *L. fulvolutea* Nyl., a Scandinavian plant not yet detected in Great Britain, but differs at once in the spores, which with K are seen to be thinly 1-septate. The apothecia are usually numerous, crowded, and for the most part biatoroid.

Hab. On decayed mosses upon rocks and boulders in alpine places.—*Distr.* Very sparingly on one or two of the S. Grampians, Scotland.—B. M.: Ben Lawers and Ben Cruachan, Perthshire.

51. *L. tetrasticha* Nyl. Flora, 1874, p. 307.—Thallus subdeterminate, deplanate, thin, areolato-rimose, vitelline or yellowish-white (K+crimson). Apothecia small, biatorine, at first concave, then plane, thinly margined, or at length subimmarginate, orange-ochraceous (K+purplish); spores oblongo-ellipsoid, 4-locular or 3-septate (the transverse loculi retracted), 0,014–18 mm. long, 0,006–8 mm. thick.—Cromb. Journ. Bot. 1876, p. 360; Leight. Lich. Fl. ed. 3, p. 224.

Subsimilar, as noted by Nylander *l.c.*, to subsp. *L. erythrella*, but differing in the paler thallus and the different spores. It still more closely resembles *L. ochracea*, with which it is often confounded, but is widely separated by the spores, which ally it to *L. Brebissonii* (Fée), a South-American plant. The British specimens are well fertile.

Hab. On calcareous rocks in maritime and upland situations.—*Distr.* Local in S.W., Central, and N. England, and the S.W. Highlands of Scotland.—B. M.: Ilsham, Torquay, and near Plymouth, S. Devon; Cuning Dale, Buxton, Derbyshire; near Bonsall, Derbyshire; Malham Tarn, Yorkshire; Levens, Westmoreland. Island of Lismore, Argyleshire.

52. *L. refellens* Nyl. Flora, 1877, p. 458.—Thallus thin, continuous, unequal, greyish, minutely greenish-soresiate (K–). Apothecia small, plane, pale-reddish; the thalline margin thin, subpulverulent, at length excluded; epithecium yellowish (K–); spores polari-bilocular, with a longitudinal tube, variable, 0,009–11 mm. long, 0,005–7 mm. thick; paraphyses thickish.—Cromb. Grevillea, 1878, p. 111; Leight. Lich. Fl. ed. 3, p. 213.—*Brit. Exs.*: Larb. Lich. Hb. n. 24.

A singular species of this section, externally not unlike *L. Sambuci*, distinguished at once from its allies by the absence of any reaction of the epithecium. It is a rather inconspicuous plant, the thallus being but sparingly visible in the few specimens seen. The apothecia are numerous, becoming at length subbiatorine.

Hab. On the trunks of poplars in a mountainous district.—*Distr.* Only very sparingly in N.W. Ireland.—B. M.: Near Cleggan, Connemara, co. Galway.

b. Apothecia blackish (*Pyrenodesmia* Mass. Mon. Blast. p. 119 pro parte).

53. *L. candicans* Schaer. Spic. (1828) p. 119.—Thallus orbicular, adnate, squamoso-radiose, subarcolate and plane in the centre, plicato-lobate at the circumference, glaucous- or greyish-white, naked or pulverulent (K—). Apothecia small, appressed, plane or slightly convex, brownish-black, more or less pruinose (K—); the thalline margin thickish, entire, persistent; spores ellipsoid, 1-septate, 0.007–14 mm. long, 0.004–7 mm. thick.—Cromb. Grevillea, xviii. p. 46.—*Placodium candicans* Mudd, Man. p. 133; Cromb. Lich. Brit. p. 46; Leight. Lich. Fl. p. 176, ed. 3, p. 164. *Squamaria candicans* Sm. Engl. Fl. v. p. 195. *Lichen candicans* Dicks. Crypt. fasc. iii. (1793) p. 15, t. 9. f. 5; With. Arr. ed. 3, iv. p. 17; Eng. Bot. t. 1778. *Lecanora epigea* Ach., Hook. Fl. Scot. ii. p. 50. *Placodium epigeum* Gray, Nat. Arr. i. p. 446.—*Brit. Exs.*: Leight. n. 218.

A very distinct species, which can be confounded with no other British lichen, unless perhaps with *Lecidea canescens* (Dicks.), saxicolous, from which it is at once distinguished by the type of the apothecia and the absence of any thalline reaction. The thallus is small or submoderate, with the radii roundly dilated and crenate at the circumference, and without any visible hypothallus. It is usually well fertile, the apothecia being chiefly central and somewhat scattered.

Hab. On calcareous and cretaceous rocks in maritime and upland tracts.—*Distr.* Here and there throughout England; very rare in N. Wales and the S.W. Highlands of Scotland; not seen from Ireland.—B. M.: Near Beachy Head, Sussex; Portland Island and Swanage, Dorsetshire; Cleeve Hill and Bathampton Downs, Somersetshire; Malvern, Worcestershire; Buxton and near Cromford, Derbyshire. Near Oswestry and Llanymynech Hill, Shropshire; Great Orme's Head, Carnarvonshire; Teesdale and Eglestone, Durham; Arnbarrow and Helsington, Westmoreland. Near Shean Ferry, Argyleshire.

Var. β . *Cesatii* Nyl. ex Cromb. Grevillea, xviii. (1889) p. 46.—Thallus densely white-pruinose, the radii narrow, somewhat convex. Apothecia cesio-pruinose, the margin at length subobliterate.—*Placodium Cesatii* Leight. Lich. Fl. ed. 3, p. 164. *Ricasolia Cesatii* (Garov.) Mass. Mem. Lich. (1853) p. 47, t. 8. f. 46.

Distinguished by the more pruinose thallus and apothecia, the narrower, more convex circumferential radii, which are also somewhat incurved at the apices. The only British specimen seen is well fertile.

Hab. On calcareous rocks in an upland district.—*Distr.* Only very sparingly in W. England.—B. M.: Sherborne, Gloucestershire.

54. *L. chalybæa* Schaer. Enum. (1850) p. 60.—Thallus orbicular, adnate, smooth, diffracto-areolate in the centre, radioso-diffract and subeffigurate at the circumference, whitish- or greyish lead-coloured (K+ pale violet), usually limited by a blackish hypothallus. Apothecia small, innate or immersed, plane, black, naked or pruinose (K—); the thalline margin thin, entire, depressed; spores ellipsoid,

polari-bilocular, 0,011–15 mm. long, 0,006–8 mm. thick.—Cromb. Grevillea, xviii. p. 46.—*Placodium chalybeum* Mudd, Man. p. 134; Cromb. Lich. Brit. p. 46; Leight. Lich. Fl. p. 179, ed. 3, p. 165. *Parmelia chalybea* Duf. in Fr. Lich. Eur. (1831) p. 125.—*Brit. Ess.*: Cromb. n. 59.

Easily recognized by the colour of the thallus, which is somewhat thickish, small or considerably expanded, occasionally somewhat lobed or lobato-crenate at the circumference. The apothecia are numerous and crowded, becoming, when moistened, turgid, somewhat prominent, and livid-brown.

Hab. On calcareous rocks in maritime and mountainous districts.—*Distr.* Local in S.W. and N. England, N. Wales, and the Central Grampians, Scotland.—B. M.: Babbicombe, Devonshire; Llanymynech Hill, Shropshire; Great Orme's Head, Carnarvonshire; Penhill, Yorkshire; Craig Tulloch, Blair Athole, Perthshire.

55. *L. variabilis* Ach. Lich. Univ. (1810) p. 369.—Thallus determinate, adnate, thinnish, diffracto-areolate, greyish-brown or lurid-grey (K + violet), usually limited by a thin blackish hypothallus. Apothecia submoderate, slightly prominent, plane or convex, black, subpruinose (K—); the thalline margin entire, usually white-suffused; spores broadly ellipsoid, polari-bilocular, 0,013–16 mm. long, 0,007–0,010 mm. thick.—Cromb. Grevillea, xviii. p. 46. *Placodium variabile* Leight. Lich. Fl. p. 179, ed. 3, p. 165. *Lichen variabilis* Pers. in Ust. Ann. (1794) p. 26.

Similar to the preceding species, but distinguished by the thinner, darker non-effigurate thallus, the more prominent apothecia, and the rather larger spores. In the British specimens the hypothallus is only sparingly visible. The apothecia, which when moistened are livid-brown, are usually numerous, at times crowded and somewhat angulose.

Hab. On calcareous rocks in upland hilly situations.—*Distr.* Seen only from W. and Central England, and (*vide* Leight.) N.W. Ireland (Connemara, Galway).—B. M.: Bathampton Downs, Somersetshire; Grove Lane, Cirencester, Gloucestershire; Cuning Dale, Buxton, Derbyshire; Llanymynech Hill, Shropshire.

Var. β . *ecrustacea* Nyl. ex Cromb. Grevillea, xviii. (1889) p. 46.—Thallus indistinct. Apothecia small, lecideoid, subinnate, at length immarginate; otherwise as in the type.—*Placodium variabile* var. *ecrustacea* Nyl. Lich. Scand. (1861) p. 139. *P. Agardhianum* Hepp (non Ach.), Leight. Lich. Fl. ed. 3, p. 165.

Differs in the absence of a thallus and in the character of the apothecia. But for the form of the spores it might be taken for a *Lecidea*.

Hab. On calcareous rocks in maritime and upland districts.—*Distr.* In S.W., N.W. England, and S. Wales.—B. M.: Anstey's Cove, Torquay, S. Devon; Bathampton Downs, Somerset; Tenby, Pembrokeshire; Lamplugh, Cumberland.

B. Apothecia biatorino-lecanorine: spores 8næ, 1-septate, colourless; hymenial gelatine variously tinged with iodine. Spermogones with shortly jointed sterigmata and straight short spermatia.

56. *L. holophæa* Nyl. Bull. Soc. Bot. t. viii. (1861) p. 755.—Thallus determinate, squamulose, lurid-brown or cervine-chestnut; squamules firm, difform, subcontiguous or somewhat imbricate, repand or obtusely crenate at the margins (K—, CaCl—). Apothecia small, adnate, at first plane, with entire thalline margin, at length convex and biatoroid, dark-brown or concolorous with the thallus: spores sometimes 6næ, oblongo-fusiform, 0,014–18 mm. long, 0,004–5 mm. thick; paraphyses moderate, slightly incrassate and infusate at the apices, hypothecium colourless; hymenial gelatine and especially the apices of the thecæ bluish with iodine.—Carroll, Journ. Bot. 1866, p. 23; Cromb. Lich. Brit. p. 48; Leight. Lich. Fl. p. 227, ed. 3, p. 217.—*Psoroma holophæa* Mont. in Hist. Nat. Canar. (1840) p. 113. *Thalloidima sublurida* (Nyl.), Mudd, Man. p. 172.—*Brit. Ees.*: Leight. n. 380.

Might readily be taken for a *Lecidea* allied to *L. lurida*, were it not that the young apothecia, seldom present in our specimens, are distinctly lecanorine. Its true place is also well indicated by the character of the spermogones, which are not unfrequent. Our Herbaria specimens, owing to the fragile nature of the habitat, are chiefly fragmentary, but in the few which are perfect the thallus is small, orbicular, and well fertile.

Hab. On the ground in crevices of rocks and walls in maritime, very rarely upland districts.—*Distr.* Local in the Channel Islands, S. and W. England, S. and N.E. Ireland.—B. M.: Moulin Huet Bay, Island of Guernsey. Pulborough, Sussex; Bradstone churchyard and near Prawle Point, S. Devon; near Penzance, Cornwall; near Bridgenorth, Shropshire. Ardglass, co. Down; Sybil Head, co. Kerry; Coast of co. Clare.

Var. β . *glauco-psora* Nyl. Flora, 1868, p. 164; *cfr.* p. 473.—Thallus subeffuse, squamuloso-crenate, granuloso-squamulose or subleprose, glaucous- or greyish-white (K—, CaCl—). Apothecia moderate, livid-brown, the thalline margin subentire; spores fusiform, 0,012–18 mm. long, 0,003–4 mm. thick; paraphyses slender, clavate and brownish at the apices.—Cromb. Lich. Brit. p. 48; Leight. Lich. Fl. p. 227, ed. 3, p. 218.—*Brit. Ees.*: Larb. Caesar. n. 79.

Only a well-marked variety, though differing from the type in colour, the less developed thallus, and some other minor characters. It is rather variable in texture, becoming at length almost entirely leprose, the squamules being only here and there visible. The thalline margin of the rather scattered apothecia is persistent. The spermogones are not unfrequent with spermatia 0,003 mm. long, 0,001 mm. thick.

Hab. On rocks in maritime districts.—*Distr.* Only sparingly in the Channel Islands and S.W. England.—B. M.: Grosnez Common, Island of Jersey; Saint's Bay, Island of Guernsey; Island of Alderney. Near Endellion and Penzance, Cornwall.

57. *L. leucospirea* Nyl. Flora, 1868, p. 473.—Thallus thinly squamulose, white, opaque, the squamules subcrenate, adnate, scattered, often granuliform (K—, CaCl—). Apothecia plane, brown, subopaque, the thalline margin entire, white; spores oblong or ovoido-oblong, 1-septate, 0,011–13 mm. long, about 0,0035 mm. thick; paraphyses slender, yellow-infusate at the apices; hymenial gelatine bluish, then violet-coloured, with iodine.—Cromb. Lich. Brit. p. 48; Leight. Lich. Fl. p. 227, ed. 3, p. 218.

Allied to var. β of the preceding species, with which it agrees in the spermogones and other analytical characters, but differs in the white, scattered, little developed thallus and in the form of the smaller spores. Nylander says that it may be only a subspecies of *L. holophæa*, which in some habitats may readily pass into dissimilar secondary types. The fragmentary specimen seen is but sparingly fertile.

Hab. On gravelly soil in a maritime district.—*Distr.* Very rare in one of the Channel Islands.—B. M.: Boulay Bay, Island of Jersey.

58. *L. Ralfsii* Cromb. Grevillea, ii. (1873) p. 13.—Thallus subdeterminate, thin, continuous or slightly rimulose, frequently rimoso-subcolliculose, smooth, leaden-grey or dark olive-green (K—, CaCl—); hypothallus dark. Apothecia rather small or minute, biatoroid, sessile, somewhat prominent, plane, brownish or dark-reddish-brown, the margin thin, at length excluded; spores oblongo-ellipsoid, often slightly constricted in the middle, 0,018–23 mm. long, 0,006–9 mm. thick; paraphyses discrete or subdiscrete, jointed, brownish at the apices; hymenial gelatine bluish, then violet-coloured, with iodine.—Leight. Lich. Fl. ed. 3, p. 220 (excl. syn. *L. actæa*).—*Lecidea Ralfsii* Salw. Ann. Penzance Nat. Hist. Soc. ii. (1853) p. 144. *Biatorina Muddii* (Salw.), Mudd, Man. p. 178. *Lecidea Muddii* Cromb. Lich. Brit. p. 37; Leight. Lich. Fl. p. 315. *Lecanora jejuna* Nyl. Flora, 1875, p. 442; Cromb. Grevillea, iv. p. 181. *Lecidea subdiluta* Leight. Trans. Linn. Soc. Bot. i. p. 145, t. 22. figs. 13–16; Lich. Fl. ed. 3, p. 340.—*Brit. Ews.*: Larb. Lich. Hb. nos. 134, 346.

A species hitherto not well understood, as may be inferred from the variety of synonyms, originating in slight differences of the thallus and apothecia which depend upon age or habitat. In general appearance of the thallus, as noticed by Nylander *l. c.*, it approaches *L. gibbosa*, and in that of the apothecia it is subsimilar to *Lecidea coarctata*. From the presence of gonidia in the margin of the apothecia and from the structure of the spermogones, it is a true *Lecanora* of this section. It often grows associated with *L. prosechoides* and is usually well fertile. The spermogones are frequent, with spermatia ellipsoideo-oblong 0,002 mm. long, 0,0006 mm. thick.

Hab. On granitic and schistose rocks in maritime tracts.—*Distr.* Local in the Channel Islands, S.W. and N.W. England, the S.W. Highlands and N.E. Scotland, and in N.W. Ireland.—B. M.: Boulay Bay, Island of Jersey. Scilly Islands, the Lizard and near Penzance, Cornwall; Barrowmouth, Cumberland. Barcaldine, Argyshire; Bay of Nigg, Kincardineshire. Killery Bay, Connemara, co. Galway.

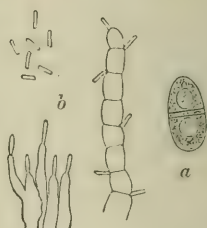
59. *L. spodomela* Nyl. Flora, 1876, p. 572, 1886, p. 101.—Thallus effuse, thin, opaque, subleprose, rimoso-diffract, greyish-brown (K—, CaCl—). Apothecia small, blackish, the thalline margin subentire; spores ellipsoid, usually 1-septate, 0.011–16 mm. long, 0.006–7 mm. thick; paraphyses slender, brown at the clavate apices; hymenial gelatine bluish, then violet, with iodine.—Cromb. Grevillea, v. p. 106; Leight. Lich. Fl. ed. 3, p. 221.

A peculiar plant having the aspect of some ally of *L. sophodes*. In the two specimens seen the thallus is rather scattered and little visible, being overrun by a foreign plant, but the apothecia are frequent.

Hab. On sandstone rocks in maritime tracts.—*Distr.* Local and scarce in N.W. Ireland.—B. M.: Killery Bay and Kylemore Lake, Connemara, co. Galway.

C. Apothecia lecanorine or sublecidine; spores 8 μ , very rarely 16–24 μ , ellipsoid, 1- very rarely 3-septate, brown or blackish, often 2-nucleolate; hymenial gelatine bluish with iodine. Spermatogones with jointed sterigmata and moderate, straight spermatia. (*Rinodina* Stiz. Beitr. Flecht. (1862) p. 169.)

Fig. 64.



Lecanora reboris Nyl.—
a. A spore, $\times 350$. b. Jointed sterigmata and spermatia, $\times 500$.

60. *L. sophodes* Ach. Lich. Univ. (1810) p. 356.—Thallus determinate or subdeterminate, granulate or granulato-areolate, moderate or thinnish, olive- or greyish-brown (K—, CaCl—); hypothallus thin, blackish, limiting the thallus. Apothecia small, plane, usually crowded, brownish-black, the thalline margin entire; spores, 0.012–20 mm. long, 0.006–8 mm. thick.—Cromb. Grevillea, xviii. p. 46; Gray, Nat. Arr. i. p. 450 pro parte; Sm. Eng. Fl. v. p. 188 pro parte; Cromb. Lich. Brit. p. 49 pro parte; Leight. Lich. Fl. p. 224 pro parte, ed. 3, p. 314 pro parte.—*Lichen sophodes* Ach. Prodr. (1798) p. 67. *Rinodina exigua* γ . *horiza* Koerb. Mudd, Man. p. 143.—*Brit. Ees.*: Mudd, n. 109.

Usually not rightly separated by authors from *L. exigua* and *L. reboris*. The thallus is generally small, macular, thin, distinctly limited by the hypothallus, rarely thickish and more expanded. It is always well fertile, the apothecia being chiefly central and becoming angulose from mutual pressure.

Hab. On trunks of trees, especially ash, in wooded maritime and upland tracts.—*Distr.* Local and scarce in S., W., and N. England, and in S. Wales.—B. M.: New Forest, Hampshire; near Anstey's Cove, Torquay, S. Devon; Kemble, Wilts; Donat, Glamorganshire; Ayton, Cleveland, Yorkshire.

Var. β . *malangica* Cromb. Grevillea, xviii. (1889) p. 46.—Thallus effuse, rimuloso-diffract, dark olive-green or blackish, fur-

furaceous on the surface. Apothecia minute, scattered: spores 0,010–18 mm. long, 0,006–8 mm. thick.—Forma *malangica* Leight. Lich. Fl. ed. 3, p. 214. *Rinodina leprosa* **malangica* Norm. Spec. loc. (1868) p. 103.

A very distinct variety, or probably subspecies, differing in the characters given of the thallus and apothecia. As observed by Th. M. Fries (Lich. Scand. p. 201), it is very dissimilar in habit to the type, but transition-states are not wanting.

Hab. On trunks of old trees in an upland tract.—*Distr.* Only sparingly in W. England.—B. M.: Haughmond Hill, Shropshire.

Subsp. *L. lævigata* Nyl. ex Stiz. St. Gall. Nat. Ges. (1882) p. 358.—Thallus effuse, thin, scattered, or scarcely any visible. Apothecia rather small, usually lecideoid; spores 0,014–20 mm. long, 0,007–10 mm. thick.—Cromb. Grevillea, xviii. p. 46.—*L. sophodes* β. *lævigata* Ach. Lich. Univ. (1810) p. 357; Cromb. Lich. Brit. p. 49; form *lævigata* Leight. Lich. Fl. ed. 3, p. 215.

Characterized by the little developed thallus, the type of the smaller apothecia, and the thicker spores. The thallus is often evanescent when the apothecia at length appear as if sublecidine (var. *lecideina* Nyl. olim. in Herb. Mus. Fenn. p. 87). This is the ordinary condition of the plant in this country, where it does not, as elsewhere, occur corticolous.

Hab. On rocks and walls in maritime and upland situations.—*Distr.* Only sparingly in a few localities in Great Britain and Ireland.—B. M.: Cirencester, Gloucestershire. Island of Lismore, Argyleshire; Craig Guie, Braemar, Aberdeenshire. Carrigaloe, co. Cork; Lettermore, Conemara, co. Galway.

61. *L. exigua* Nyl. Flora, 1873, p. 197.—Thallus subeffuse, thin, unequal, subgranulate or scattered, whitish, pale-greyish or dark (K—, CaCl—); hypothallus indistinct. Apothecia small, plane or convex, crowded, black or blackish; the thalline margin thin, often somewhat crenulate, whitish; hypothecium colourless; spores 0,011–18 mm. long, 0,006–8 mm. thick.—Cromb. Grevillea, xviii. p. 46; Sm. Eng. Fl. v. p. 187.—*Rinodina exigua* Gray, Nat. Arr. i. p. 450; Mudd, Man. p. 143 pro parte. *Lecanora sophodes* var. *exigua* Cromb. Lich. Brit. p. 49; form *exigua* Leight. Lich. Fl. p. 224, ed. 3, p. 214. *Lichen exiguus* Ach. Prodr. (1798) p. 69; Eng. Bot. t. 1849. *Lichen pericleus* (non Ach.) Eng. Bot. t. 1850. *Lecanora periclea* Sm. Eng. Fl. v. p. 187; Tayl. in Mack. Fl. Hib. ii. p. 133. *Rinodina periclea* Gray, Nat. Arr. i. p. 449 pro parte. *R. exigua* δ. *periclea* Mudd, Man. p. 143.—*Brit. Exs.*: Mudd, n. 107; Larb. Lich. Hb. nos. 169, 261.

Probably descends from *L. sophodes*, with which at times it seems subconfluent, but differs in the colour of the more effuse thallus, and especially in the smaller spores. It usually spreads extensively, but at times when associated with other crustaceous lichens it is much smaller, though scarcely limited by a distinct hypothallus. It is always well fertile.

Hab. On trees, old pales, rocks, walls, and tiled roofs in maritime, lowland and upland districts.—*Distr.* Not uncommon in England and the Channel Islands: apparently rare in N.E. Scotland, E. and N.W. Ireland, though probably often overlooked in both these countries.—B. M.: Noirmont, Island of Jersey; Chateau Point, Island of Sark; The Vale, Guernsey. Yarmouth, and near Brandon, Suffolk; Epping Forest, Essex; Hurstpierpoint, Sussex; Shanklin, Isle of Wight; Lyndhurst, New Forest, Hants; near Bristol, Somersetshire; Chartfield, Gloucestershire; near Worcester; Weston, Oxfordshire; near Oswestry, Shropshire; Barmouth, Aber-ty-Gyn, N. Wales; Port Soderick, Isle of Man; near Newton, Cleveland, Yorkshire; St. Bees, Cumberland. Portlethen, Kincardineshire. Portmaronock, near Dublin; Kylemore and Cleghan, Connemara, co. Galway.

Form *demissa* Stiz. St. Gall. Nat. Ges. 1822, p. 359.—Thallus thin, leproso-granulose, greenish-brown or pale, often evanescent. Apothecia minute, somewhat prominent, the thalline margin at length obliterated.—Cromb. Grevillea, xviii. p. 46.—*Rinodina metabolica* β . *demissa* Koerb. Syst. Lich. Germ. (1885) p. 124.

Distinguished by the colour of the thallus, and more especially by the minute, emersed, at length immarginate apothecia. In the very few British specimens these are numerous and here and there crowded.

Hab. On rocks in maritime tracts.—*Distr.* Only sparingly in S. England.—B. M.: Shanklin and near Luccombe, Isle of Wight.

Var. β . *lecideoides* Cromb. Grevillea, xviii. (1889) p. 46.—Thallus very thin, macular, greyish-white, usually evanescent. Apothecia small, lecideine, black or blackish, the margin dark-brown, at length obliterated: spores 0.016–20 mm. long, 0.008–11 mm. thick.—*Lecanora sophodes* var. *lecideoides* Nyl. Lich. Scand. (1861) p. 149; Leight. Lich. Fl. p. 225, ed. 3, p. 215 pro minima parte.

Might readily be taken on a cursory inspection for *Lecidea myriocarpa*, as observed by Nylander *l. c.*, but differs at once in the colour of the margin of the apothecia and in the whitish hypothecium. He also suggests that it probably descends from *Lecanora confragosa*, with which it agrees rather than with *L. exigua* in the size of the spores. The absence, however, of any reaction with K connects it with the present species. The thallus is but little visible in the few British specimens.

Hab. On old palings in an upland situation.—*Distr.* Apparently only among the S. Grampians, Scotland.—B. M.: Glen Lochay, Killin, Perthshire.

62. *L. subexigua* Nyl. Flora, 1874, p. 308.—Thallus effuse, subsmooth, unequal, rimose, pale-greyish or sordid-yellowish (K—, Ca Cl—). Apothecia minute, plane, black, the thalline margin thickish, entire; spores 0.012–15 mm. long, 0.006–7 mm. thick.—Cromb. Grevillea, iii. p. 22; Leight. Lich. Fl. ed. 3, p. 220.

Subsimilar to the preceding species, but differs in the characters of the

thallus and apothecia, and more especially in the smaller spores. The two specimens seen are well fertile.

Hab. On granitic rocks in a maritime district.—*Distr.* Only very sparingly in S.W. England.—B.M.: Near Penzance, Cornwall.

63. *L. roboris* Nyl. Flora, 1869, p. 412.—Thallus determinate or subdeterminate, thinish, continuous, granuloso-unequal, whitish or greyish-white (K+yellow, Ca Cl—); hypothallus black, often indistinct. Apothecia moderate or somewhat large, blackish, the thalline margin at length crenate; spores 0,015–18 mm. long, 0,006–9 mm. thick.—Duf. Hb. *vide* Nyl. Mém. Soc. Sc. Nat. Cherb. t. ii. (1854) p. 326; Cromb. Grevillea, xviii. p. 46.—*L. sophodes* forma *roboris* Leight. Lich. Fl. p. 225, ed. 3, p. 215.—*Brit. Ees.*: Larb. Lich. Hb. n. 260.

Often confounded with *L. sophodes*, but distinct in the colour and more especially in the reaction of the thallus with K, as also in the larger apothecia and their crenulate margin. The thallus at times is somewhat effuse, with the hypothallus visible only here and there at the circumference. The apothecia are generally numerous, though not crowded.

Hab. On trunks of trees, chiefly oaks, very rarely on the stems of heather, in maritime and upland situations.—*Distr.* Not unfrequent in England; rare in N. Wales, S. and N.W. Ireland; not seen from Scotland.—B.M.: East coast of Jersey; D'Ixcart, Island of Sark. Yarmouth, Suffolk; Epping Forest, Essex; Danny, Sussex; New Forest, Hants; Ilsham, Torquay, Devonshire; Launceston and Penzance, Cornwall; Savernake Forest, Wilts; Charnwood Forest, Leicestershire; near Worcester; near Harboro' Magna, Warwickshire; Cwm Bychan, Merionethshire; Teesdale, Durham; Calder Abbey, Cumberland; Felton Woods, Northumberland; Leven's Park, Westmoreland. Carrigaloe, near Cork; Doughruagh mt., Connemara, co. Galway.

64. *L. confragosa* Nyl. *ex* Lamy, Bull. Soc. Bot. Fr. t. xxv. (1878) p. 404.—Thallus effuse, thin, granulose or verrucoso-areolate, greyish- or sordid-white, the granules scattered or subcontiguous (K+yellow, Ca Cl—); hypothallus usually obsolete. Apothecia sessile, submoderate, plane, brownish-black or nearly black, the thalline margin at length inflexed and crenulate; spores ellipsoid, obtuse at the apices, 0,018–23 mm. long, 0,009–13 mm. thick.—Leight. Lich. Fl. ed. 3, p. 222.—*L. sophodes* var. *confragosa* Cromb. Lich. Brit. p. 49 pro parte. *Parmelia confragosa* Ach. Meth. Suppl. (1803) p. 33.—*Brit. Ees.*: Larb. Cæsar. n. 28; Lich. Hb. n. 301.

Looks almost a saxicolous state of *L. roboris*, but differs in the less continuous thallus and in the larger spores. In the British specimens the thallus, which rarely has a greyish-green tinge, is but seldom continuous, and the hypothallus is scarcely visible. The apothecia are numerous, here and there crowded, and then almost obliterating the granules. Subsp. *L. crassescens* Nyl. was erroneously recorded as British in Grevillea, xviii. p. 46.

Hab. On rocks, granitic and schistose, in maritime and upland tracts.—*Distr.* Sparingly in the Channel Islands, S. England, N.E. Scotland, S.E.

and N. Ireland.—B. M.: La Coupe, Island of Jersey. Near Hastings, Sussex. Portlethen, Kincardineshire. Near Crookhaven, co. Cork; Doughruagh mt. and Dawros River, Connemara, co. Galway; Ardglass, co. Down.

65. *L. milvina* Ach. Lich. Univ. (1810) p. 358.—Thallus effuse, moderate or thickish, granuloso-areolate or areolato-diffract, verruculoso-unequal, brownish or brownish-black (K—, CaCl—); hypothallus thin, black. Apothecia minute, plane, crowded, brownish-black, the thalline margin depressed, entire; spores ellipsoid, 0,014–20 mm. long, 0,007–12 mm. thick.—Borr. Eng. Bot. Suppl. t. 2662. f. 1; Sm. Eng. Fl. v. p. 187; Mudd, Man. p. 144; Cromb. Journ. Bot. 1874, p. 147; Leight. Lich. Fl. ed. 3, p. 216 pro parte.—*Parmelia milvina* Wahl. in Ach. Meth. Suppl. (1803) p. 34.—*Brit. Exs.*: Larb. Lich. Hb. n. 25.

As observed by Acharius (Meth. l. c.), this is quite distinct from *L. sophodes* in the darker, effuse thallus, the place of growth, and its general aspect. It differs also in the rather larger spores, and, as it constantly preserves its own type, may with propriety be regarded as a good species. The apothecia are for the most part crowded and angulose.

Hab. On rocks in maritime and upland districts.—*Distr.* Local in the Channel Islands, S.W. England, the S.W. Highlands and N.E. Scotland, as also in N.W. Ireland.—B. M.: Vale Castle, Island of Guernsey. Near Penzance, Cornwall. Barcaldine, Argyleshire; S. of Bay of Nigg, Kincardineshire. Maam Turk mts., co. Galway.

66. *L. atrocineria* Nyl. Lich. Par. (1854) n. 43; Flora, 1872, p. 247.—Thallus determinate, verrucoso- or granulato-areolate, smooth, greyish-white or dark-grey (K+yellow, CaCl+reddish); hypothallus black, persistent. Apothecia moderate, at first innate, then sessile, plane or at length convex, dark-brown or blackish, the thalline margin thin, subentire, at length obliterated; spores 0,020–30 mm. long, 0,011–16 mm. thick.—Cromb. Journ. Bot. 1870, p. 97; Leight. Lich. Fl. p. 226, ed. 3, p. 216.—*Rinodina atrocineria* Mudd, Man. p. 144, t. 2. fig. 49. *Lecideu atrocineria* Sm. Eng. Fl. v. p. 174. *Lichen atrocinerius* Dicks. Crypt. fasc. iii. (1793) p. 14, t. 9. fig. 2; With. Arr. iv. p. 19; Eng. Bot. t. 2096. *Lecanora milvina* Tayl. in Mack. Fl. Hib. ii. p. 134 saltem pro maxima parte.—*Brit. Exs.*: Leight. n. 146.

Not unlike *L. confragosa*, from which it has generally not been rightly discriminated. It differs, however, in the firmer, usually more continuous thallus, in the constantly entire thalline margin of the apothecia, in the larger spores, and more definitely in the thalline reaction with CaCl. In younger plants the thallus is distinctly limited by a subplumoso-radiating hypothallus, and is then only subcontinuous. It is always well fertile, the apothecia often becoming lecideoid. The spermatogones are frequent, with spermatia 0,007–9 mm. long, scarcely 0,002 mm. thick.

Hab. On rocks in maritime and mountainous districts.—*Distr.* Rather local in the Channel Islands, S. and W. England, N. Wales, the S.W. Highlands and N.E. Scotland, and in S. Ireland.—B. M.: Island of

Guernsey. Crown Hill, near Plympton, S. Devon; near Penzance, Cornwall; Lyth Hill, Shropshire; Barmouth, Merionethshire; Holyhead, Island of Anglesea. Barcaldine, Argyleshire; Portlethen, Kincardineshire. Near Cork; Cliffs of Moher, co. Clare; Dunkerron and Carig mt., co. Kerry.

67. *L. teichophila* Nyl. ex Iamy, Bull. Soc. Bot. Fr. t. xxv. (1878) p. 405.—Thallus subdeterminate, moderate, verrucoso-areolate, dark-greyish (K + yellowish, CaCl—). Apothecia submoderate, plane, black, the thalline margin thick, entire or often subrugose; spores ellipsoid, 0,018–25 mm. long, 0,011–16 mm. thick.—Cromb. Journ. Bot. 1882, p. 273.—*L. sophodes* var. *teichophila* Nyl. Bull. Soc. Bot. Fr. t. xiii. (1866) p. 367. *Rinodina exigua* β . *metabolica* (non Ach.) Mudd, Man. p. 143. *Lecanora sophodes* form *metabolica* Leight. Lich. Fl. p. 225, ed. 3, p. 215.—*Brit. Exs.*: Mudd, n. 108.

Also approaches *L. confragosa* in various respects, but differs in the darker thallus, and more especially in the larger, thicker spores. The apothecia are numerous and often crowded, with the thalline margin scarcely or but little prominent.

Hab. On rocks and walls in maritime and upland situations.—*Distr.* As yet seen only from a few localities in Great Britain and Ireland.—B. M.: Bathampton Downs, Somersetshire; Cirencester, Gloucestershire; Holly Bush Hill, Malvern, Worcestershire; near Ayton, Cleveland, Yorkshire. The Trossachs, Perthshire. Connemara, co. Galway.

68. *L. conioptia* Nyl. Flora, 1873, p. 19.—Thallus indeterminate, moderate or thickish, unequal, rimoso-diffract, brownish-grey or dark-brown (K—, K (CaCl) + reddish). Apothecia moderate, innate, black, at first plane, slightly margined, at length convex, immarginate, internally whitish; spores ellipsoid, slightly constricted, 1-septate, brownish-black, 0,015–20 mm. long, 0,008–10 mm. thick; epithecium brown, paraphyses moderate, subarticulate; hypothecium colourless.—Cromb. Grevillea, i. p. 141; Leight. Lich. Fl. ed. 3, p. 216.—*Brit. Exs.*: Cromb. n. 158.

Closely allied to *L. sciodes* Nyl., a plant of the E. Pyrenees, though from the evanescent thalline margin of the apothecia, which is visible only in their earliest stage of development, it has the appearance of a *Lecidea* allied to *L. conioptis*. The apothecia occur chiefly towards the centre of the thallus and are somewhat scattered. The spermatogones are abundant, black, punctate, with spermatia thinly bacillar, 0,0045 mm. long, 0,005 mm. thick.

Hab. On gneissic and granitic rocks in maritime districts.—*Distr.* Local, though plentiful, in the Channel Islands, S.W. England, and N.E. Scotland.—B. M.: La Moye, Island of Jersey. Near Penzance, Cornwall. Near Portlethen, Kincardineshire.

69. *L. Bischoffii* Nyl. ex Stiz. St. Gall. Nat. Ges. 1876, p. 217.—Thallus effuse, thin, leproso-farinose or rimuloso-granulose, greyish or brownish (K—, CaCl—), often indistinct. Apothecia minute, at first plane with entire thalline margin, at length convex and im-

marginate, brownish-black; spores broadly ellipsoid, very obtuse at the apices, with a broad transverse septum, 0.016-20 mm. long, 0.008-12 mm. thick; paraphyses not very discrete, brownish at the clavate apices; hymenial gelatine bluish, the thecæ violet-coloured, with iodine.—Cromb. Journ. Bot. 1875, p. 141; Leight. Lich. Fl. ed. 3, p. 220.—*Psora Bischoffii* Hepp, Lich. Europ. (1853) n. 81.

Well distinguished from the allied species by the broad septum of the spores. In our few British specimens the thallus is little visible, but the apothecia are numerous. When these are immarginate the plant has entirely a lecideine appearance.

Hab. On calcareous rocks in upland situations.—*Distr.* As yet only in W. England and the Central Grampians, Scotland; no doubt overlooked elsewhere.—B. M.: Rodmarton and Stroud Road, Gloucestershire; Ennerdale, Cumberland. Craig Tulloch, Blair Athole, Perthshire.

Var. *β. immersa* Cromb. Journ. Bot. 1876, p. 360.—Thallus evanescent. Apothecia foveolato-immersed, somewhat plane, blackish, the margin brownish, involute.—Leight. Lich. Fl. ed. 3, p. 221.—*Rinodina Bischoffii β. immersa* Koerb. Par. Lich. (1865) p. 75.

A rather inconspicuous plant, differing from the type in the immersed apothecia, with their usually involute margin. The thallus is generally confused with the stone, but when visible it is whitish and macular.

Hab. On calcareous rocks and walls in hilly tracts.—*Distr.* Local and scarce in S.W. England.—B. M.: Yatton and Weston-super-Mare, Somersetshire.

70. *L. colobina* Ach. Lich. Univ. (1810) p. 358.—Thallus subdeterminate, thinnish, granulato-pulverulent, cæcio-greyish or greyish-black (K + purplish). Apothecia minute, adnate, somewhat plane, blackish; the thalline margin entire, thickish, cæcio-greyish; spores oblongo-ellipsoid, sometimes slightly constricted in the middle, 0.016-20 mm. long, 0.007-9 mm. thick; epithecium K + purplish.—Cromb. Journ. Bot. 1882, p. 273.—*Brit. Ees.*: Larb. Lich. Hb. n. 91.

A good species, readily distinguished from its immediate allies by the different reactions. In the single British specimen seen the thallus is leprose, dark, and the apothecia only sparingly present.

Hab. On the trunks of old elms in a lowland district.—*Distr.* As yet only very sparingly in E. England; no doubt to be detected elsewhere.—B. M.: Near Cambridge.

71. *L. Conradi* Nyl. Not. Sällsk. pro F. et Fl. Fenn. Förh. xi. (1871) p. 182.—Thallus subeffuse, verrucoso- or subleproso-granulate, thinnish, griseous or greyish-brown (K—, CaCl—). Apothecia moderate, plane, blackish-brown, opaque, with the thalline margin rugulose or obsoletely crenulate, at length convex and immarginate; spores 4-locular, the cells nucleolate, 0.026-32

mm. long, 0.010–11 mm. thick; paraphyses not very discrete, brownish at the apices.—Cromb. Grevillea, xviii. p. 47.—*Rinodina Connadi* Koerb. Syst. Lich. Germ. (1855) p. 123. *Lecanora pyreniospora* Nyl. Cromb. Lich. Brit. p. 49; Leight. Lich. Fl. p. 230, ed. 3, p. 222.—Brit. Ees.: Larb. Cesar. n. 78; Lich. IIb. n. 263.

Closely resembles *L. turfacea* var. *archæa* Ach., which does not occur in our Islands, but differs in the character of the spores. The thallus, which elsewhere varies in thickness, is in our specimens thin and at times almost obliterated. The apothecia are either scattered or crowded, the young spores being 1-septate.

Hab. On decayed turf and the ground, rarely on old excrements of sheep, in maritime and upland districts.—*Distr.* Local and sparingly in the Channel Islands, E. England, and S. Wales.—B. M.: La Moye, Jersey; Islands of Sark and Jethou. Thetford Warren, Norfolk.

72. *L. diplinthia* Nyl. Ann. Sc. Nat. t. xix. (1863) p. 316.—Thallus indeterminate, thin or thinish, unequal or subgranulose, pale-greyish or pale-whitish (K—, CaCl—). Apothecia small, plane, brown (internally pale), the thalline margin entire; spores ellipsoid, 4-locular (the two apical loculi simple, the two central each with 2 or sometimes 3 transverse cells), 0.023–34 mm. long, 0.012–16 mm. thick; paraphyses scarcely discrete.—Leight. Lich. Fl. p. 230, ed. 3, p. 222.

An interesting plant, formerly known only corticolous from New Granada, S. America. It is allied to the preceding species, but differs in the character of the thallus, and in the smaller apothecia with their entire thalline margin. The two British specimens seen are fragmentary, but with numerous, crowded apothecia.

Hab. On the ground in fissures of rocks in a maritime district.—*Distr.* Extremely local and scarce in one of the Channel Islands.—B. M.: The Eperquerie and D'Excart Bay, Island of Sark.

73. *L. umbrinofusca* Nyl. Flora, 1860, p. 389.—Thallus determinate, thin, subcontinuous or obsoletely rimulose, umbrine-brown or umbrine-blackish (K—, CaCl—); hypothallus subplumoso-radiating, leaden-coloured, usually limiting the thallus. Apothecia lecideoid, minute, adnate, black, submarginate; spores brown, 0.010–11 mm. long, 0.006–7 mm. thick; epithecium brown; hypothecium colourless.—Cromb. Grevillea, x. p. 23.

Looks quite a *Lecidea*, though the young apothecia are sublecanorine. The spermatogones have not been seen, but it evidently belongs to this section, near to *L. griseofusca* Nyl., a Finland plant, to which it seems closely related. It forms small, dark maculæ upon the substratum, which here and there become subconfluent. The single specimen seen is well fertile.

Hab. On siliceous stones in an upland tract.—*Distr.* Found only very sparingly in E. England.—B. M.: Thetford Warren, Norfolk.

74. *L. æquata* Nyl. Flora, 1884. p. 392.—Thallus effuse, thin,

greyish-white, often scarcely visible or entirely obsolete (Kf + yellowish, CaCl—); hypothallus indistinct. Apothecia small, lecideoid, thinly margined, at length convex, blackish or dark-brown, whitish within; spores broadly ellipsoid, 0,016–20 mm. long, 0,010–11 mm. thick; hymenial gelatine deep blue with iodine.—Cromb. Grevillea, xviii. p. 47.—*Lecidea æquata* Nyl. olim, Cromb. Journ. Bot. 1874, p. 149. *Lecidea coniops* var. *β. æquata* Ach. Lich. Univ. (1810) p. 171.

A rather inconspicuous plant, having, like others of this section, entirely the appearance of a *Lecidea*, but with gonidia intruded into the margin of the apothecia. The single small British specimen is quite typical and well fertile.

Hab. On granitic rocks in a maritime locality.—*Distr.* Only very sparingly in S.W. England.—B. M.: Near Penzance, Cornwall.

75. *L. polyspora* Nyl. Not. Sällsk. pro F. et Fl. Fenn. Förh. xi. (1871) p. 182.—Thallus determinate, very thin, granulato-verrucose or smoothish, whitish or greyish (K—, CaCl—). Apothecia minute, adnate, brownish-black or blackish, at first plane with thin concolorous or paler margin, then convex and immarginate; spores 12–24 μ , oblong or ellipsoideo-oblong, straight or slightly curved, 0,013–16 mm. long, 0,006–8 mm. thick; paraphyses not discrete, yellowish-brown at the subclavate apices.—Cromb. Grevillea, xviii. p. 47.—*Rinodina polyspora* Fr. fil. Nov. Act. Reg. Soc. Sc. Upsal. ser. 3, vii. (1861) p. 226. *Rinodina sophodes* Koerb., Mudd, Man. p. 142.

Looks like a small *Lecidea*, though, as the apothecia have gonidia intruded into their margin, it is evidently a *Lecanora*, as is shown also by the structure of the spermogones. From all the allied species it is well distinguished by the polyspored thecæ.

Hab. On the smooth bark of an alder in a wooded mountainous district.—*Distr.* Only very sparingly on one of the S. Grampians, Scotland.—B. M.: Craig Calliach, Perthshire.

76. *L. isidioides* Nyl. Mém. Soc. Cherb. v. (1857) p. 115.—Thallus effuse, thin, subsquamuloso-stellate, whitish or greyish-white; squamules minute, simple or divided, cylindrical or slightly compressed, isidioid, the divisions often slightly constricted (K + yellowish, CaCl—). Apothecia small or moderate, plane, dull-purplish or brownish-black, the thalline margin tumid, entire or somewhat crenulate; spores oblong or ellipsoideo-oblong, 1-septate, occasionally slightly constricted in the middle, brownish, 0,026–30 mm. long, 0,013–15 mm. thick.—Cromb. Lich. Brit. p. 49; Leight. Lich. Fl. p. 224, ed. 3, p. 214.—*Borreria isidioides* Mudd, Man. p. 106. *Parmelia isidioides* Borr. Eng. Bot., Suppl. t. 2808.

A very interesting endemic species, well characterized by the peculiar isidioid, stellate thallus. In its general aspect it looks almost a *Physcia*, and though placed here by Nylander probably constitutes a distinct

section of *Lecanora*. The thallus is rather scattered, greenish-grey when moistened, usually but sparingly fertile; though in one corticolous fragment the apothecia are somewhat numerous.

Hab. On mossy and naked trunks of trees in upland situations.—*Distr.* Extremely local and scarce in N. Wales, where it has not recently been met with.—B. M.: Cwm Bychan and Crafnant, Merionethshire.

D. Thallus placodioid. Apothecia lecanorine: spores 8µe, ellipsoid, rarely subglobose, simple, colourless; paraphyses jointed. Spermatogones with simple or shortly jointed sterigmata and cylindrical, moderate, straight spermatia.

77. *L. melanaspis* Ach. Lich. Univ. (1810) p. 427; Nyl. Flora, 1873, p. 18, nota.—Thallus suborbicular, adnate, thinnish, areolate or verrucoso-rugose in the centre, radiato-laciniate at the circumference, greyish or leaden-greyish, the radii convex, multifid (K—, CaCl—). Apothecia small, appressed, plane, at length convex, the thalline margin entire; spores ellipsoid, 0.011–13 mm. long, 0.008–10 mm. thick; hymenial gelatine bluish, then wine-red with iodine.—Leight. Lich. Fl. ed. 3, p. 201.—*Lecanora alphoplaca* var. *melanaspis* Stirt. Scottish Naturalist, iv. p. 28.

Differs from *L. alphoplaca* (Wahl.), the typical species of this section, of which it has sometimes been made a variety, and which is not found in Britain, in the negative reaction with K, among other distinctive characters of the thallus and apothecia. I have, however, seen no British specimen, and regard it as of doubtful occurrence in the locality recorded.

Hab. On rocks in a mountainous region.—*Distr.* Said to have been found in the S.W. Highlands of Scotland (Ben Brecht, Argyleshire).

78. *L. circinata* Ach. Lich. Univ. (1810) p. 425.—Thallus orbicular, closely adnate, verrucoso-areolate in the centre, radiato-plicate at the circumference, greyish or greyish-white, the radii contiguous, narrow, somewhat plane or convex (K— or + yellowish). Apothecia small or submoderate, innate, at first suburceolate, then plane, brown or dark-brown, the thalline margin thin, entire; spores ellipsoid, 0.011–15 mm. long, 0.0065–85 mm. thick; hymenial gelatine bluish, then reddish with iodine.—*L. circinata* Cromb. Lich. Brit. p. 49; Leight. Lich. Fl. p. 195, ed. 3, p. 179; Hook. Fl. Scot. ii. p. 50. *Squamaria circinata* Mudd, Man. p. 130; Sm. Eng. Fl. v. p. 196. *Placodium circinatum* Gray, Nat. Arr. i. p. 448. *Lichen circinatus* Pers. in Ust. Ann. Bot. vii. (1794) p. 25, Eng. Bot. t. 1941.—A well-marked species, of which the type apparently does not occur in Britain, but only the peculiar form *subcircinata* Nyl. in litt., differing merely in the thalline reaction (K+yellow, then saffron-red). This being but a supplementary reaction, the plant is not now regarded by Nylander as constituting a distinct species as in Flora, 1873, p. 18, subsp. Cromb. Grevillea, xviii. p. 47.—*Lichen*

subimbricatus Relh. Fl. Cantab. 1785, p. 427; With. Arr. ed. 3, iv. p. 18.

The thallus is small or moderate (1-4 inches in diameter), often greyish-brown, rarely somewhat leaden-coloured, and at times in old plants becomes centrifugal. In some situations the thallus is reddish-grey with the apothecia brownish-red, when it seems to be var. *β. myrrhina* Fr. (non Ach.) Lich. Eur. p. 124; Cromb. Grevillea, xviii. p. 47. This, however, evidently arises from its being suffused either with peroxide of iron or with urine, so that it is only an accidental state. Our British specimens are well fertile, the apothecia, though central, being numerous, occasionally crowded and then subangulose. The spermatogones are frequent, dark-brown, with simplish sterigmata and spermatia 0,006-7 mm. long, about 0,001 mm. thick.

Hab. On rocks and walls, usually on the coping of bridges, in lowland and upland districts.—*Distr.* Here and there throughout England, in N. Wales, reported also from S.W. Scotland (Cathkin); very rare in the Channel Islands; not seen from Ireland.—B. M.: Island of Guernsey. Bury St. Edmund's, Suffolk: Clare Hall Bridge, Cambridge; near Stroud, Gloucestershire; Hale's End, Malvern and Pershore Bridge, Worcestershire; near Congerstone, Leicestershire: Oversley Bridge, Warwickshire; Garn Bridge, Conway Castle, Denbighshire: Barnard Castle and Eglestone, Durham; Kirkby Lonsdale, Westmoreland.

79. *L. circinatula* Nyl. Flora, 1883, p. 100.—Thallus small, appressed, diffract, radiately divided at the circumference, the radii plane, dark-greyish or brownish-grey (K+yellow, CaCl—). Apothecia innate, submoderate, plane, dark-brown, the thalline margin thin, entire; spores 8næ, ellipsoid, about 0,007 mm. long, 0,005 mm. thick; paraphyses thickish, jointed; hymenial gelatine bluish, then tawny wine-red with iodine.—Cromb. Grevillea, xii. p. 89.

Closely allied to *L. circinata*, from which it is distinguished by the different reaction and by the smaller thallus and spores. The apothecia are numerous and crowded except at the immediate circumference. The spermatogones have the sterigmata slender, 2-3-jointed, with straight bacilliform spermatia, 0,0035-45 mm. long, 0,0005 mm. thick.

Hab. On siliceous stones in a maritime district.—*Distr.* Only very sparingly in S. England.—B. M.: Near Beachy Head, Sussex.

E. Apothecia lecanorine or at times biatoroid: spores 8næ, very rarely 8-16næ, simple, rarely 1-septate, colourless; hymenial gelatine variously tinged with iodine. Spermatogones with simple sterigmata and acicular, arcuate, very rarely straight spermatia.

a. Thallus normally subeffigurate, K—.

80. *L. galactina* Ach. Lich. Univ. (1810) p. 424.—Thallus suborbicular, appressed, verrucoso-diffract, lobato-crenate at the circumference, opaque, subpulverulent on the surface (K—). Apothecia moderate, or somewhat small, adnate, somewhat plane, pale- or brownish-testaceous, white-pruinose or naked, the thalline margin at length crenulate and often flexuose; spores ellipsoid or oblong,

0,009–12 mm. long, 0,005–7 mm. thick; paraphyses slender, discrete, not clavate at the apices; hymenial gelatine bluish, then sordid with iodine.—Mudd, Man. p. 149; Cromb. Lich. Brit. p. 50; Leight. Lich. Fl. p. 206, ed. 3, p. 189.—*Parmelia galactina* Ach. Meth. (1803) p. 190. *Lichenoides crustosum, orbiculare, incanum* Dill. Musc. p. 135, t. 18. f. 17 B.—*Brit. Ees.*: Mudd, n. 116; Leight. n. 400.

A common plant overlooked by our older authors and rarely appearing in their herbaria s. n. *Lichen muralis*, along with *L. saxicola*. At first the thallus is orbicular, small, and squamarioid in appearance; but it is often little developed, and frequently at length is indeterminate. The apothecia are numerous, crowded towards the centre, and thus often angulose. It is in other respects a rather variable plant, presenting the form and subspecies that follow.

Hab. On walls and rocks, chiefly calcareous, from maritime to upland districts.—*Distr.* General and common in most parts of Great Britain; rare in the Channel Islands and in S.E. and N.W. Ireland.—B. M.: Island of Sark; Rozel, Jersey. Bury St. Edmund's, Suffolk; Holloway, London; Stanmore, Middlesex; Crystal Palace, Surrey; Peasemarch and Hastings, Sussex; Newlyn Cliff, Penzance and Withiel, Cornwall; Cleve Hill and Bathampton Downs, Somersetshire; Charnwood Forest, Leicestershire; Great Malvern, Worcestershire; Shiffnal and Oswestry, Shropshire; Island of Anglesea: near Ayton, Cleveland, Yorkshire. King's Park, Stirling; Ben Lawers and Craig Tulloch, Perthshire; Portlethen, Kincardineshire; Craig Guie, Braemar, Aberdeenshire; near Fort William, Inverness-shire. Near Cork; Kylemore Lake, Connemara, co. Galway.

Form *verrucosa* Leight. Lich. Fl. ed. 3 (1879), p. 190.—Thallus pulvinate, white, the pulvinuli thickish, convex, verrucose, scattered. Apothecia small, immersed, crowded.—Cromb. Grevillea, xviii. p. 67.

Differs in the form of the thicker, dispersed thallus, and in the innate apothecia, resulting probably from the nature of the habitat. It no doubt descends from var. *deminuta* (Stenh.) Cromb. Journ. Bot. 1885, p. 195, and is subconfluent with Hepp, *Ees.* n. 901 (left-hand specimen).

Hab. On calcareous rocks in maritime and upland districts.—*Distr.* Only a few localities in Wales, N.W. England, and the N. Grampians, Scotland.—B. M.: Mumbles, near Swansea, Glamorgan; Great Orme's Head, Carnarvonshire; Asby, Westmoreland. Craig Guie, Braemar, Aberdeenshire.

Subsp. 1. *L. dissipata* Nyl. Bull. Soc. Bot. t. xiii. (1866) p. 368.—Thallus macular or indeterminate, very sparingly visible, consisting chiefly of a blackish, subleprose hypothallus. Apothecia small, pale-livid, slightly white-suffused; the thalline margin white, opaque, subentire or obsoletely crenate; spores ellipsoid, 0,008–12 mm. long, 0,004–6 mm. thick; paraphyses not well discrete.—Cromb. Grevillea, xviii. p. 67.

A peculiar lichen, the only one which with a state of the type occurs in the immediate suburbs of London. In our British specimens, which

are evidently referable to Nylander's plant, the thallus at first appears as small scattered ink-like stains upon the substratum, which at length become confluent, so that it spreads extensively without any distinct limits. For the greater part it is only hypothalline, but here and there a few thalline verrucae are present, coloured blackish with smoke, as are also the gonidia (form *fumigata* Cromb.). The apothecia are numerous and crowded.

Hab. On composite walls and pillars of houses in lowland tracts.

—*Distr.* Confined apparently to the more open suburban districts of London, where it is not uncommon.—B. M.: Camden Town and Notting Hill, London; Crystal Palace, Surrey.

Subsp. 2. *L. dispersa* Nyl. Flora, 1873, p. 291.—Thallus obsolete or entirely wanting. Apothecia minute, more or less scattered, pale-livid, subcarneous or blackish, naked or pruinose, the thalline margin white, entire or subcrenulate; spores 0.009–14 mm. long, 0.0045–60 mm. thick; paraphyses slender, usually slightly incrassate at the apices.—Cromb. Grevillea, xviii. p. 68.—*Lecanora galactina* form *dispersa* Leight. Lich. Fl. p. 206, ed. 3, p. 190.

A good subspecies, characterized chiefly by the absence of a distinct thallus. It spreads extensively over the substratum, and as it occasionally grows associated with less developed states of the type, it probably descends from some of these. The apothecia are usually somewhat scattered, though at times rather crowded in the same specimen.

Hab. On rocks and walls in maritime and upland tracts.—*Distr.* Only here and there in Great Britain and Ireland; not seen from the Channel Islands.—B. M.: Ryde beach, Isle of Wight; Cirencester, Gloucestershire; near Oswestry, Shropshire; Hartlepool, Durham; Cuswick Scar, Westmoreland. Achosragan Hill, Appin, Argyleshire; Craig Tulloch, Blair Athole, and Glen Lochay, Killin, Perthshire; Morrone, Braemar, Aberdeenshire. Cliffs of Moher, co. Clare; Delphi, Connemara, co. Galway.

81. *L. urbana* Nyl. ex Cromb. Journ. Bot. 1885, p. 195.—Thallus subdeterminate, moderate, granulato-squamulose, white, opaque; granules depressed, crenate or subcrenate (K—). Apothecia moderate, crowded, pale, more or less white-suffused, the thalline margin subcrenulate; spores ellipsoid, 0.011–14 mm. long, 0.005–7 mm. thick; paraphyses thickish, jointed, not clavate at the apices; hymenial gelatine bluish, the thecae at length sordid-violet or bluish with iodine.—*Lecanora galactina* subsp. *urbana* Nyl. Bull. Soc. Bot. t. xiii. (1866) p. 368.

Differs from *L. galactina* in the thicker, whiter thallus, the longer spores, and more especially in the paraphyses being twice or thrice as thick and distinctly articulate. In the British specimens the apothecia are numerous, crowded, often subangulose, with thickish, slightly crenate margin.

Hab. On mortar of old walls near towns in lowland districts.—*Distr.* Only in S. England and S. Ireland: no doubt to be detected elsewhere.—B. M.: Near Dorking, Surrey; Folkestone, Kent; Lewes, Sussex. Cork.

82. *L. livida* Ach. Lich. Univ. (1810) p. 375.—Thallus indeterminate, pale-whitish or livid, squamuloso-diffract; squamules adnate, contiguous, moderate, usually crenulate at the margins (K—). Apothecia minute, more or less immersed, several in each squamule, plane or slightly convex, concolorous with the thallus or livid flesh-coloured, the thalline margin entire, scarcely prominent; spores ellipsoid, 0,010–12 mm. long, 0,005–7 mm. thick; hymenial gelatine faintly bluish, then tawny wine-red with iodine.—Cromb. Grevillea, xviii. p. 68.—*Lecanora galactina* var. *livida* Nyl. in Cromb. Lich. Brit. p. 50; Leight. Lich. Fl. p. 207, ed. 3, p. 190.

Now regarded by Nylander *in litt.* as a distinct species allied to *L. galactina* rather than to *L. saricola*, under which he mentions it, Lich. Scand. p. 133, as belonging doubtfully to subgenus *Squamaria*. From the other species of this subsection it is readily distinguished by the thallus and apothecia. Our few British specimens are well fertile.

Hab. On calcareous walls in upland districts.—*Distr.* Seen only from N. England and the S.W. Highlands of Scotland.—B. M.: Wansbeck Valley, Northumberland. Appin, Argyleshire.

83. *L. subluta* Nyl. Flora, 1876, p. 232.—Thallus indeterminate, continuous or dispersed, thin, minutely granulose, whitish (K—). Apothecia small, crowded, pale-yellow or yellow-sublivid, the thalline margin subcrenate; spores ellipsoid, 0,010–12 mm. long, 0,005–6 mm. thick; paraphyses not very distinct; hymenial gelatine bluish, then wine-red with iodine.—Cromb. Grevillea, v. p. 106; Leight. Lich. Fl. ed. 3, p. 190.

Evidently belongs to this subsection, though the spermatogones have not been detected. In the specimens seen the thallus is, with a single exception, somewhat scattered and developed chiefly about the apothecia. These are numerous, and from mutual pressure often become difform.

Hab. On calcareous rocks in upland situations.—*Distr.* Local in N.W. Ireland and the S. Grampians, Scotland.—B. M.: Recess and Dawros River, Connemara, co. Galway. Ben Lawers, Perthshire.

Form *perspersa* Nyl. Flora, 1876, p. 233.—Thallus obsolete. Apothecia distantly scattered; otherwise as in the type.—Cromb. Grevillea, v. p. 106; Leight. Lich. Fl. ed. 3, p. 190.

Differs merely in the absence of a thallus (though traces of it are rarely seen) and in the scattered apothecia, which are somewhat smaller.

Hab. On rocks in upland situations.—*Distr.* Only in N.W. Ireland.—B. M.: Dawros River, Connemara, co. Galway.

84. *L. aipospila* Ach. Lich. Univ. (1810) p. 385.—Thallus suborbicular or expanded, tuberculose or papillate towards the centre, radiately sulcate or crenulate at the circumference, thinnish or moderate, brown or greyish-brown (K—); hypothallus dark, limiting the thallus or obsolete. Apothecia small, innato-sessile on the papillæ, brown or blackish, at first plane with entire thalline margin, at length

somewhat convex and sublecidine; spores ellipsoid or oblong, 1-septate, 0,009–14 mm. long, 0,004–6 mm. thick; paraphyses submoderate, brownish at the apices; hymenial gelatine deep bluish, then dark violet with iodine.—Eng. Bot. Suppl. t. 2662. f. 2; Sm. Eng. Fl. v. p. 187; Cromb. Lich. Brit. p. 49; Leight. Lich. Fl. p. 228, ed. 3, p. 219.—*Lecania erysibe* γ. *aipospila* Mudd, Man. p. 141. *Parmelia aipospila* Wahl. in Ach. Meth. Suppl. (1803) p. 36.—*Brit. Ees.*: Cromb. n. 159.

A well-marked species, easily recognized by the papillose thallus and the situation of the apothecia. In herbaria specimens the thallus is usually entirely verrucoso-unequal or papillate, but in nature it is somewhat radiate at the circumference, and more or less limited by the hypothallus. When growing in drier situations, it becomes brownish-black or almost black. The apothecia are situated chiefly on the central papillæ, with the thalline margin eventually excluded. The spermogones are prominent and frequent towards the circumference of the thallus, with spermatia arcuate, 0,016–23 mm. long, scarcely 0,001 mm. thick.

Hab. On granitic and schistose rocks in maritime districts.—*Distr.* Local though plentiful in the Channel Islands, S.W. and N.E. England, N.E. Scotland, and S.W. Ireland.—B. M.: Le Fret, Island of Jersey; Jerbourg, Island of Guernsey. Tolpedn Penwith, near Penzance, Land's End, and the Lizard, Cornwall; Holy Island and Staples Island, Northumberland. Portlethen and Cove, Kincardineshire; near Peterhead, Aberdeenshire. Shirky Island, co. Kerry.

Var. β. *maritima* Nyl. Lich. Scand. (1861) p. 158.—Thallus thin, granulato-rugose, suberent at the circumference, greyish, the hypothallus scarcely visible; otherwise as in the type.—Cromb. Lich. Brit. p. 49; Leight. Lich. Fl. p. 229, ed. 3, p. 219.

Characterized by the epapillate, thinner, more continuous thallus, and by the hypothallus being less distinct. Sommerfelt (Lapp. Suppl. p. 97) says that the thallus at length becomes griseo-blackish, but this does not occur in our few specimens. The apothecia, which are situated on the granules, are frequently sublecidine.

Hab. On granitic and schistose rocks in maritime districts.—*Distr.* Very local and scarce in S.W. and W. England, and in N.E. Scotland.—B. M.: Near Penzance, Cornwall; near Douglas, Isle of Man. Portlethen, Kincardineshire.

85. *L. poliophæa* Ach. Lich. Univ. (1810) p. 398; Wahl. Fl. Lapp. p. 410, t. 27. f. 3.—Thallus subdeterminate, granulato-papilloso-diffract or papilloso-verrucose, greyish- or greenish-brown (K—); hypothallus fibrilloso-bysoid, whitish, often limiting the thallus. Apothecia small, adnate, plane, dull-brown or brownish, the thalline margin thin, crenulate; spores ellipsoid, simple, 0,007–13 mm. long, 0,004–6 mm. thick; paraphyses slender, the apices incrassate; hymenial gelatine bluish with iodine.—Cromb. Lich. Brit. p. 50; Leight. Lich. Fl. p. 214, ed. 3, p. 200.—*Parmelia poliophæa* Wahl. in Ach. Meth. Suppl. (1803) p. 38. *Lecanora spodophæa* (Wahl.) Borr. Eng. Bot. Suppl. t. 2662. f. 3; Sm. Eng. Fl. v. p. 187.—*Brit. Ees.*: Cromb. n. 62.

Differs from the preceding species in the colour of the thallus and hypothallus, in the character of the thalline margin, and in the simple spores. The papillæ of the thallus, which is either orbicular or somewhat expanded, are minute, very much crowded, rather fragile, and form a somewhat thickish and superficially granulose crust. In moister situations it is more greenish, its usual condition with us; whence form *spodophaea* Cromb. (*Parmelia spodophaea* Wahl. in Ach. Meth. Suppl. p. 37). The apothecia are numerous and crowded, with the thalline margin persistent and (except in very young apothecia) always crenulate.

Hab. On granitic and schistose rocks in maritime districts.—*Distr.* Local, though usually plentiful in the Channel Islands, S.W. England, and N.E. Scotland.—B. M.: Le Fret, Island of Jersey. Tolpedn Penwith, and near Penzance, Cornwall. Portlethen, Kincardineshire.

b. Thallus uniform, K+.

86. *L. subfusca* Nyl. Flora, 1872, p. 250, nota 2.—Thallus determinate, thin, subsmooth, or slightly rugoso-unequal, whitish (K+ yellowish, CaCl—). Apothecia moderate, plane or somewhat convex, brown or reddish-brown, opaque or somewhat shining, the thalline margin entire; paraphyses slender, discrete, brownish at the apices; epithecium non-granulose; spores 0.011–16 mm. long, 0.007–10 mm. thick; hymenial gelatine bluish, then dark-violet (the thecæ dark tawny-coloured) with iodine.—Cromb. Grevillea, xviii. p. 68.—*L. subfusca* form *argentata* Cromb. Lich. Brit. p. 51; Leight. Lich. Fl. p. 201, ed. 3, p. 186. *L. subfusca* γ . *glabrata* Mudd, Man. p. 146 pro parte. *L. subfusca* Hook. Fl. Scot. ii. p. 47, Sm. Eng. Fl. v. p. 189, is a *nomen vagum* pro maxima parte (ut videtur).—Brit. Eas.: Larb. Lich. Herb. n. 217.

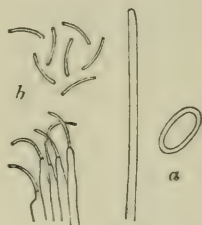


Fig. 65.

Lecanora subfusca Nyl.—
a. A spore and paraphysis, $\times 350$. b. Sterigmata and spermatia, $\times 500$.

A species until recently ill-defined and not well limited, several of those which immediately follow being either confounded with it or viewed simply as varieties. These are now separated chiefly by differences in the paraphyses and epithecium, and also, according to Nylander *l. c.*, in the size of the spermatia. The typical state includes *Lecanora subfusca* a. *argentata* Ach. Lich. Univ. p. 393, and γ . *glabrata* Ach. *l. c.*, which do not differ from each other. The apothecia are usually more or less crowded, rarely somewhat scattered. The spermatogones have the spermatia 0.016–19 mm. long (*vide* Nyl. in litt.), and in this, as in the allied species, are black above.

Hab. On trunks of trees, rarely on old pales, in maritime and lowland tracts.—*Distr.* Seen only from a very few localities in E., S., and W. England; no doubt to be detected elsewhere.—B. M.: Lyndhurst, New Forest, Hants; Ilsham, Torquay, S. Devon; near Cambridge; Churchill, near Worcester.

Var. β . *campestris* Nyl. Flora, 1873, p. 198.—Thallus granuloso-verrucose, greyish-white or grey. Apothecia small or submoderate, the thalline margin entire or at times subcrenulate.—Cromb. Grevillea, xviii. p. 68.—*L. subfusca* ζ . *campestris* Mudd, Man. p. 147; Cromb. Lich. Brit. p. 51. *L. subfusca* forma *argentata* Leight. Lich. Fl. p. 201, ed. 3, p. 186 pro parte. *Lecanora subfusca* Hook. Fl. Scot. ii. p. 47 pro parte (*i. e.* *saxicola*); Sm. Eng. Fl. v. p. 189 pro parte (*i. e.* *saxicola*). *Lichen punctatus* Dicks. Crypt. fasc. iii. p. 15, Eng. Bot. t. 450, With. Arr. ed. 3, iv. p. 15, according to specimens in Hb. Sowerby, is a young state of this variety with darker apothecia.—Brit. Exs.: Larb. Lich. Hb. n. 99.

Differs from the type, of which probably it is only a saxicolous form, in the thallus being more unequal (though transition-states are not wanting) and in the thalline margin of the apothecia being occasionally slightly crenulate. The thallus is rarely somewhat expanded and is usually well fertile. It is at times the host of a parasitic *Endococcus* hereafter to be described.

Hab. On rocks and walls, rarely on the ground, from maritime to upland districts.—*Distr.* General and common throughout Great Britain and Ireland, as also in the Channel Islands.—B. M.: St. Ouen's Bay, Island of Jersey; The Vale, Island of Guernsey. Near Yarmouth, Suffolk; Hastings, Sussex; Shanklin, Isle of Wight; Anstey's Cove, Torquay, S. Devon; Withiel and near Penzance, Cornwall; Stormy Down, Glamorganshire; Llandyssil, Cardiganshire; Barnsley Park, near Cirencester, Gloucestershire; Grecha Mt., Isle of Man; near Ayton, Cleveland, Yorkshire; Eglestone, Durham; Helington, Cumberland; near Kendal, Westmoreland; Chollerford, Northumberland. ? West Water, Fifeshire; Achosragan Hill, Appin, Argyleshire; Glen Lyon and Glen Fender, Perthshire; Cove, Kincardineshire; near Aberdeen. Cork Harbour and Kinsale, co. Cork; near Kilkee, co. Clare; Ballynahinch, Dawros Bridge and Lettermore, Connemara, co. Galway.

87. *L. spodophæoides* Nyl. Flora, 1872, p. 250, nota 2, *nomen*.—Thallus determinate, thinnish, rugulose, greyish (K + yellowish, CaCl—); hypothallus whitish, byssino-radiating. Apothecia small, plane, black-sanguineous, often crowded and angulose, the thalline margin subentire or subcrenulate; spores ellipsoid, 0.012–16 mm. long, 0.007–8 mm. thick; paraphyses moderate, subarticulate, subclavate at the agglutinate apices; epithecium deep yellow-brown; hymenial gelatine (especially the thecæ) bluish with iodine.—*L. subfusca* var. *spodophæoides*, Cromb. Grevillea, i. p. 171; Leight. Lich. Fl. ed. 3, p. 188.

Approaches var. β of the preceding species, but the characters of the hypothallus, apothecia, and paraphyses render it distinct. In the single entire specimen gathered the thallus is but of moderate size, and is distinctly limited by the hypothallus. The spermatogones are frequent, with spermatia 0.025 mm. long, 0.0006 mm. thick, *vide* Nyl., to whom I owe also the diagnosis of the plant.

Hab. On a mica-schist wall in an upland district.—*Distr.* Very local and rare in the Central Grampians, Scotland.—B. M.: Craig Tulloch, Blair Athole, Perthshire.

88. *L. allophana* Nyl. Flora, 1872, p. 250, nota 2.—Thallus determinate, unequal, rugose or granulato-corrugate, whitish or greyish-white (K + yellowish, CaCl -). Apothecia moderate, plane or slightly convex, brown or brownish-black; the thalline margin entire, at length subrenate and flexuose; paraphyses slender, not discrete at the apices; epithecium continuous (not granulose); spores 0,013-22 mm. long, 0,008-12 mm. thick; hymenial gelatine bluish, the thecæ violet-coloured with iodine.—Cromb. Grevillea, xviii. p. 68.—*L. subfusca* form *allophana* Cromb. Lich. Brit. p. 51; Leight. Lich. Fl. p. 200, ed. 3, p. 185. *L. subfusca* η . *allophana* Ach. Lich. Univ. (1810) p. 395. *Lichen subfuscus* Huds. Fl. Angl. p. 444 pro parte; Eng. Bot. t. 219. *Lichenoides crustaceum et leprosum scutellis subfuscis* Dill. in Ray Syn. ed. 3, p. 71 pro parte; Musc. 134, t. 18. fig. 16.—*Brit. Evs.*: Leight. n. 116 pro parte; Bohl. n. 35.

At one time Nylander, like some other authors, regarded this as the type of *L. subfusca*. This is so far warranted also by its being *Lichen subfuscus* Linn. (Fl. Suec. 1755, p. 409) pro maxima parte, according to specimens in his own herbarium; but it is better to adopt the nomenclature of Acharius as having a definite signification. It differs from *L. subfusca* chiefly in the more rugose thallus, the form of the thalline margin of the apothecia, the more conglutinate paraphyses, the smaller spores, and the size of the spermatia, which (*fide* Nyl. *in litt.*) are 0,018-24 mm. long.

Hab. On trunks of trees from maritime to upland districts.—*Distr.* Not uncommon in England; apparently rare in N. Wales, the S.W. Highlands of Scotland, and S.W. Ireland; probably often overlooked.—B. M.: Bury St. Edmunds, Suffolk; Lyndhurst, New Forest, Hants; St. Leonard's Forest, Sussex; Lustleigh, S. Devon; Windsor Great Park, Berkshire; Twycross, Leicestershire; near Worcester; near Shrewsbury, Shropshire; Aberdovey, Merionethshire; Ayton, Cleveland, Yorkshire. Finlarig, Killin, Perthshire; Inverary, Argyleshire. Castleconnell, co. Limerick.

89. *L. epibryon* Ach. Syn. (1814) p. 155; Nyl. Flora, 1872, p. 250.—Thallus subdeterminate, verruculose or granuloso-concretescent, white (K + yellowish, CaCl -). Apothecia somewhat large, plane, brown or reddish-brown; the thalline margin thin, entire, often flexuose; paraphyses slender; epithecium non-granulose; spores 0,014-23 mm. long, 0,008-11 mm. thick; hymenial gelatine bluish, the thecæ at length dark-wine-red with iodine.—Cromb. Grevillea, xviii. p. 68.—*Lecanora subfusca* var. *epibryon* pro parte Mudd, Man. p. 147; Cromb. Lich. Brit. p. 51; Leight. Lich. Fl. p. 203, ed. 3, p. 187. *Lichen epibryon* Ach. Prodr. (1798) p. 79.

Usually confounded by British authors with terricolous states of var. β of *L. subfusca*. It is, however, a plant of a more alpine type, and is well characterized by the much larger apothecia and spores. The only British specimen is well fertile; but the few spermatogones visible have become partially abraded. These elsewhere (*fide* Nyl. *in litt.*) have the spermatia 0,015-18 mm. long.

Hab. On decayed mosses on the ground in mid-alpine situations.—

Distr. Extremely rare on one of the S. Grampians, Scotland.—B. M.: Ben Lawers, Perthshire.

90. *L. Parisiensis* Nyl. Bull. Soc. Bot. t. xiii. (1866) p. 368.—Thallus determinate or subdeterminate, rugose or rugoso-granulate or subverrucose, greyish (K + yellowish, CaCl—). Apothecia moderate, plane, brownish-black or rarely brown, naked or occasionally cæsio-pruinose; the thalline margin rugose or suberenate; paraphyses distinctly articulate, slightly thickened and brownish at the apices; spores 0.010–18 mm. long, 0.006–8 mm. thick; hymenial gelatine bluish (the thecæ at length violet) with iodine.—Cromb. Journ. Bot. 1871, p. 178.—*Lecanora subfusca* forma *Parisiensis* Leight. Lich. Fl. p. 201, ed. 3, p. 185.—In Flora, 1883, p. 107, Nylander says that *Lecanora subfusca* ð. *horiza* Ach. Lich. Univ. (1810) p. 394, belongs pro parte (*i. e.* the French specimen) to this species, so that probably it ought to be called *L. horiza* (Ach.) Nyl.—*Brit. Ers.*: Leight. n. 116 pro parte; Larb. Lich. Hb. n. 58.

Distinguished from its more immediate British allies by the jointed paraphyses. At times the thallus is small and distinctly limited by a white hypothallus, and is then probably the var. *horiza* Ach. The apothecia occasionally are partly conglomerate, smaller, with the thalline margin subevanescent, a state which may be *L. subfusca* e. *rufa* Ach. Syn. p. 157. The spermogones (*vide* Nyl. in litt.) have the spermatia 0.018–28 mm. long.

Hab. On trunks of trees, seldom on old pales, in maritime and upland tracts.—*Distr.* Not unfrequent in England; rare in S. Ireland; not seen from Scotland or the Channel Islands.—B. M.: Walthamstow, Essex; Glynde, Sussex; New Forest, Hants; near Shanklin, Isle of Wight; Ilsham, Torquay, and near Bovey Tracey, S. Devon; Cherry Hinton, Cambridgeshire; Gopsall Park, Leicestershire; Barmouth, Merionethshire; near Shrewsbury, Shropshire; near Ayton, Cleveland, Yorkshire. Tullygreen, co. Cork.

91. *L. rugosa* Nyl. Flora, 1872, p. 250, nota 2.—Thallus determinate, thickish, granulato-rugose, whitish (K + yellowish, CaCl—). Apothecia moderate or somewhat large, at first concave, then plane, pale or brownish, sometimes slightly pruinose; the thalline margin thick, elevated, rugose or rugoso-crenate and inflexed; paraphyses crowded, colourless; epithecium granulose; spores 0.010–18 mm. long, 0.007–10 mm. thick; hymenial gelatine bluish, then wine-red with iodine.—Cromb. Grevillea, xviii. p. 68.—*L. subfusca* form *rugosa* Cromb. Lich. Brit. p. 51; Leight. Lich. Fl. p. 201, ed. 3, p. 186. *Lichen rugosus* Pers. *vide* Ach. Lich. Univ. (1810) p. 394 (sub *L. subfusca* ð. *horiza*). *L. subfusca* e. *atrynea* Mudd, Man. p. 147 pro parte.

May be recognized in its more typical state by the character of the thalline margin of the apothecia, which, with the granulose epithecium, readily distinguish it from the preceding corticolous species. The apothecia are at times crowded and angulose, and when also subpruinose

give it much the general aspect of states of *L. angulosa*. It is a rather variable plant, presenting the subspecies and varieties that follow.

Hab. On the trunks of old trees, from maritime to upland tracts.—*Distr.* General but not common throughout Great Britain and Ireland; not seen from the Channel Islands.—B. M.: New Forest, Hants; Ullacombe, near Bovey Tracey, S. Devon; near Cirencester, Gloucestershire; near Bakewell, Derbyshire; Hollybush Hill, Malvern, Worcestershire; Wark-on-Tyne, Northumberland; Calder Abbey and Alston, Cumberland; Levens Park, Westmoreland. Near Glasgow, Lanarkshire; Pennycuik Glen, near Edinburgh; Bercaldine, Argyshire; Blairdrummond, near Stirling; Killin, Perthshire; Cults, near Aberdeen. Rostellan, co. Cork; Old Dromore and Killarney, co. Kerry; Tervoe, near Limerick; Derryclare and Lough Inagh, co. Galway.

Subsp. *L. chlarona* Nyl. Flora, 1883, p. 107.—Thallus thin, smoothish or subrugulose, whitish or greyish-white. Apothecia small or submoderate, plane or slightly convex, pale or pale-brownish, the thalline margin subentire or finely crenulate; spores 0.009–15 mm. long, 0.005–9 mm. thick.—*Lecanora chlarona* Cromb. Grevillea, xviii. p. 68. *L. subfusca* forma *chlarona* Leight. Lich. Fl. p. 203, ed. 3, p. 188. *L. albella* form *chlarona* Cromb. Lich. Brit. p. 51. *L. subfusca* γ . *glabrata* (non Ach.) Mudd, Man. p. 147.—*Brit. Ecs.*: Leight. n. 115; Mudd, nos. 112, 113 pro parte; Lich. Hb. nos. 256, 257.

Distinguished from the type by the thinner, smoother thallus, and the non-rugose thalline margin of the apothecia. It so closely touches it, however, in other respects that Nylander *l. c.* does not regard it as specifically distinct. This view is further confirmed by the occurrence of intermediate states with difficulty referable to either. It is always well fertile, the apothecia being numerous, often crowded, and becoming darker in age.

Hab. On the smooth bark of trees, occasionally on old pales, from maritime to upland situations.—*Distr.* General and abundant in England; apparently rarer in N. Wales, Scotland, and Ireland.—B. M.: Epping Forest, Essex; Shiere, Surrey; Wrotham, Kent; Glynde, Sussex; Lyndhurst, New Forest, Hants; Ilsham, Torquay, and near Bovey Tracey, S. Devon; Withiel, Cornwall; near Cirencester, Gloucestershire; Amptill, Bedfordshire; Over and Babraham, Cambridgeshire; Gopsall Park, Leicestershire; Aberdovey, Merionethshire; Wrekin Hill, Shropshire; near Ayton, Cleveland, Yorkshire; Teesdale, Durham; Wastdale, Cumberland. Near Glasgow; Appin, Argyshire; Finlarig, Killin, Perthshire; Countesswells Wood, near Aberdeen; Loch Linnhe, Lochaber, Inverness-shire. Near Cork; Upper Lake, Killarney, co. Kerry.

Form *pinastri* Cromb. Grevillea, xviii. (1890) p. 68.—Thallus subeffuse, thin, subleprose, greyish-white. Apothecia small, plane or convex, brown, the thalline margin entire.—*Lecanora subfusca* ϵ . *pinastri* Schær. Enum. (1850) p. 74; Mudd, Man. p. 146.

Differs only in the less developed thallus and the entire thalline margin of the apothecia. At times, however, it is almost confluent with the type, so that the differential characters given seem owing to the habitat. The apothecia are either scattered or somewhat crowded.

Hab. On trunks and branches of firs and on fir pales in maritime and upland tracts.—*Distr.* Rather rare in England; not uncommon in Scotland; not seen from Wales or Ireland.—B. M.: Near Leith Hill, Surrey; near Penzance, Cornwall; Buxton, Derbyshire; Ayton Moor, Cleveland, Yorkshire; Staveley, Westmoreland. West Lomond Hill, Fifeshire; Achmore, Killin, Ben Lawers, and Blaeberry Hill, Perthshire; Durris, Kincardineshire; Countesswells Wood, near Aberdeen; Rothiemurchus, Inverness-shire; Applecross, Ross-shire.

Var. β . *geographica* Nyl. ex Cromb. Grevillea, xviii. p. 68.—Thallus finely decussate throughout, with black hypothalline lines. Apothecia subminute, plane or somewhat convex, brown.—*L. subfusca* ϵ . *geographica* Mass. Ric. Lich. (1852) p. 6.—*Brit. Ears.*: Mudd, n. 113 pro parte.

A well-marked and rather fine variety. The numerous black lines with which it is everywhere limited, so that the individual plants are of small size, seem to belong to *Lecidea parasema*, with which it is always associated in our specimens.

Hab. On shrubs and the branches of trees, chiefly ash, in wooded maritime and upland districts.—*Distr.* Only here and there throughout England, S.W. Scotland, the S.W. Highlands, and the S. Grampians; no doubt to be detected elsewhere.—B. M.: St. Leonard's Forest, Sussex; New Forest, Hants; Ullacombe, near Bovey Tracey, S. Devon; Bathampton, Somerset; Desford, Leicestershire; Malvern, Worcestershire; Cliffriigg, Cleveland, Yorkshire. Airds, Appin, Argyllshire; Finlarig, Killin, Perthshire.

92. *L. atrynea* Nyl. Flora, 1872, p. 250, nota 2.—Thallus determinate or indeterminate, granulate or verrucoso-areolate, whitish or greyish-white (K + yellowish, CaCl—). Apothecia moderate or somewhat large, plane or at length convex, brown or corneous-brown, the thalline margin crenulate, rarely subentire; paraphyses thickish; epithecium brown, granuloso-inspersed; spores 0,011–18 mm. long, 0,006–9 mm. thick; hymenial gelatine bluish, then wine-reddish (the thecæ violet) with iodine.—Cromb. Grevillea, xviii. p. 68.—*L. subfusca* ϵ . *atrynea* Mudd, Man. p. 147 pro parte; Cromb. Lich. Brit. p. 51; Leight. Lich. Fl. p. 203, ed. 3, p. 187. *Lecanora subfusca* ζ . *atrynea* Ach. Lich. Univ. (1810) p. 395.

In some conditions this also closely resembles *L. rugosa*, of which, as noted by Nylander (Flora, 1883, p. 107), it is almost a subspecies. The British specimens, with a single exception saxicolous, are for the most part not very typical. At times the apothecia are infested with *Sphæria epicymatia* Wallr., giving them much the aspect of those of *L. collocarpa*. The spermatogones have the spermatia (*vide* Nyl. in litt.) 0,020–30 mm. long, 0,0005 mm. thick.

Hab. On rocks, very rarely on trunks of trees, in maritime and upland situations.—*Distr.* Found only in a few localities in Great Britain and Ireland. B. M.: Shanklin, Isle of Wight; Buxton, Derbyshire; Barmouth, Merionethshire; near Whitehaven, Cumberland. Killin, Perthshire; Hill of Ardo, near Aberdeen. Dinis Island, Killarney, co. Kerry.

Var. β . *cenisia* Nyl. *ex* Lamy, Bull. Soc. Bot. Fr. t. xxv. (1878) p. 499.—Thallus more or less verrucose. Apothecia usually somewhat large and more convex, livid or yellowish-brown, slightly greyish-pruinose,—Cromb. Grevillea, xviii. p. 68.—*Lecanora cenisia* Ach. Lich. Univ. (1810) p. 361.

Regarded by some authors as the type of the species, from which it differs, though probably only as a form, in the character of the apothecia. In the single British specimen, which is well fertile, these are but small, not large as they are described by Acharius.

Hab. On schistose rocks in a maritime district.—*Distr.* Only very sparingly in N.E. Scotland.—B. M.: Near Portlethen, Kincardineshire.

Var. γ . *melacarpa* Nyl. *ex* Cromb. Grevillea, i. (1873) p. 171.—Apothecia somewhat small, black; epithecium more or less interspersed; spores 0.013–16 mm. long, 0.007–9 mm. thick.—*L. subfusca* forma *melacarpa* Leight. Lich. Fl. ed. 3, p. 187.

A well-marked variety characterized by the colour of the apothecia, which gives it much the aspect of the following species.

Hab. On mica-schist stones of a wall in an upland situation.—*Distr.* Only very sparingly on one of the Central Grampians, Scotland.—B. M.: Craig Tulloch, Blair Athole, Perthshire.

93. *L. coilocarpa* Nyl. *ex* Norrl. Medd. Sällsk. pro F. et Fl. Fenn. i. (1876) p. 23.—Thallus determinate or subdeterminate, thin, unequal or granulato-rugose, whitish or greyish-white (K + yellowish, CaCl—). Apothecia small or submoderate, concave or at length somewhat plane, brownish-black or blackish, the thalline margin entire or subentire; paraphyses slender, discrete, dark-brown at the apices; spores 0.012–18 mm. long, 0.006–9 mm. thick; hymenial gelatine bluish, then violet-coloured with iodine.—Cromb. Grevillea, xviii. p. 68.—*L. subfusca* form *coilocarpa* Cromb. Lich. Brit. p. 51; Leight. Lich. Fl. p. 202, ed. 3, p. 186 (excl. *pinastri* Schaer.). *L. subfusca* β . *coilocarpa* Ach. Lich. Univ. (1810) p. 393.—*Brit. Ees.*: Leight. n. 52; Mudd, n. 111; Larb. Cæsar. n. 77.

Often confounded with *L. atra*, but closely allied to subspecies *L. chlorona*, from which it differs in the colour of the apothecia and the characters of the thallus and paraphyses. In corticolous plants, of which I have seen no British specimens, though these no doubt occur in the Scottish Highlands, the thallus is thin, but in saxicolous ones much thicker and verrucoso-diffract. The apothecia in these are numerous and at times crowded.

Hab. On rocks and walls in maritime and upland districts.—*Distr.* Not uncommon in the Channel Islands and Great Britain; apparently rare in S. Ireland.—B. M.: Boulay Bay, Island of Jersey; Chateau Point, Island of Sark. Rusthall Common, Kent; Helmenton, Cornwall; Malvern, Worcestershire; Trellick, Monmouthshire; Barmouth, Merionethshire; Cwm Ffynnon Llwy and Nant Francon, Carnarvonshire; Haughmond Hill, Shropshire; Ayton, Cleveland, Yorkshire;

Staveley, Westmoreland; Alston, Cumberland. Dalmahoy Hill, near Edinburgh; Appin, Argyleshire; The Trossachs, Perthshire; Baldovan, Forfarshire; near Portlethen, Kincardineshire. Lambay Island, co. Cork.

Form *pulicaris* Nyl. ex Cromb. Grevillea, xviii. (1890) p. 68.—Thallus very thin or obsolete, whitish. Apothecia small, plane, at length convex; the thalline margin thin, entire, whitish.—*Lecanora pulicaris* Ach. Syn. (1814) p. 336. *Patellaria pulicaris* Pers. Act. Wetteraw. ii. (1810), *vide* Ach. l. c.

The few British specimens are entirely ecrustaceous, and are limited throughout by black hypothalline (?) lines. The apothecia are numerous, though not crowded.

Hab. On old fir palings in upland mountainous districts.—*Distr.* Very local among the Grampians, Scotland.—B. M.: Blair Athole, Perthshire; Crathie, Braemar, Aberdeenshire.

94. *L. gangaleoides* Nyl. Flora, 1872, p. 354.—Thallus subdeterminate, verrucoso-areolate, greyish-white (K + yellow, CaCl -). Apothecia moderate, sessile, plane, crowded, black; the thalline margin thin, entire; paraphyses moderate, epithecium not interspersed; spores 0.012–15 mm. long, 0.007–8 mm. thick; hymenial gelatine bluish, the thecae at length wine-coloured with iodine.—Cromb. Journ. Bot. 1876, p. 360; Leight. Lich. Fl. ed. 3, p. 189.—*L. subfusca* forma *gangalea* (non Ach.) Leight. Lich. Fl. p. 202, ed. 3, p. 187, may be this pro parte.—*Brit. Exs.*: Larb. Lich. Hb. n. 19.

Like the preceding apt to be confounded with *L. atra*, from which it is distinguished by the internal colour of the apothecia and by the arcuate spermatia. From *L. coilocarpa*, which it more closely approaches, it differs chiefly in the darker apothecia and the thicker paraphyses. Its nearest ally is *L. atrynea*, of which Nylander l. c. says it may probably be a variety distinguished by the colour of the apothecia and the reaction of the hymenial gelatine. The apothecia are often crowded, with the thalline margin occasionally slightly inflexed. The spermogones are frequent, with spermatia 0.020–30 mm. long, 0.0005 mm. thick.

Hab. On rocks and walls in hilly and mountainous regions.—*Distr.* Seen only from a few localities in N. England, the Scottish Highlands, and N.W. Ireland.—B. M.: N. Derbyshire; Bearmoor, Northumberland; Llanbedrog, Carnarvonshire; Wastdale, Cumberland. Achosragan Hill, Appin, Argyleshire; Craig Tulloch, Blair Athole, Perthshire. Letter Hill and Ballinakill, Conzemara, co. Galway.

Subsp. *L. schistina* Nyl. Flora, 1872, p. 429.—Thallus determinate, continuous, smooth, rugulose, areolato-rimose, glaucous-white. Apothecia moderate or somewhat large, black, opaque; the thalline margin at length flexuose, white; spores 0.011–14 mm. long, 0.006–8 mm. thick.—Cromb. Grevillea, xviii. p. 68.—*L. schistina* Cromb. Journ. Bot. 1182, p. 274.

Differs from the type more especially in the smoother deplanate thallus

and the character of the thalline margin of the apothecia. These in the British specimens are somewhat large and at times scattered.

Hab. On schistose rocks and walls in maritime and upland districts.—*Distr.* Only sparingly in the S.W. Highlands and the Central Grampians, Scotland.—B. M.: Barealdine, Argyleshire; Craig Tulloch, Blair Athole, Perthshire.

95. *L. intumescens* Koerb. Syst. Lich. Germ. (1855), p. 143.—Thallus determinate, thin, smooth, at length rimoso-areolate, whitish (K + yellowish, CaCl—). Apothecia somewhat convex, moderate, brown or carneous, at times slightly livid-pruinose: the thalline margin thick, entire, inflexed or subecrenate, snow-white; paraphyses crowded, thick, yellowish-brown towards the apices; epithecium granulose; spores 0,012–16 mm. long, 0,006–8 mm. thick; hymenial gelatine bluish, then wine-reddish with iodine.—Cromb. Grevillea, xii. p. 601.—*L. subfusca* forma *intumescens* Leight. Lich. Fl. p. 202, ed. 3, p. 186. *Parmelia intumescens* Rebert. Prodr. Fl. neom. (1804) p. 301. *Lichen pallidus* Dicks. Crypt. fasc. ii. p. 12.—*Brit. Eas.*: Dicks. Hort. Sic. n. 23.

Easily distinguished from the allied species by the colour of the thalline margin of the apothecia, though in this respect it is subconfluent with states of *L. rugosa*. From this, however, it differs in the thinner, smoother thallus, the less crowded and more convex apothecia, the colour of the paraphyses, and the thinner spores. The spermogones have the spermatia (as in *L. atrynea*) 0,020–30 mm. long.

Hab. On smooth trunks and branches of trees in wooded maritime and upland districts.—*Distr.* Local in Great Britain; very rare in S.W. Ireland.—B. M.: Shiere, Surrey; New Forest, Hants; Ullacombe, Bovey Tracey, S. Devon; Cirencester, Gloucestershire; Rhiwgreiddan, Merionethshire. New Galloway, Kirkcudbrightshire; Barealdine, Argyleshire; Finlarig, Killin, and Craig Calliach, Perthshire; Morrone, Braemar, Aberdeenshire; Loch Linnhe, Inverness-shire. Tervoe, co. Limerick.

96. *L. chlorotera* Nyl. Flora, 1872, p. 550, nota 1.—Thallus determinate or subdeterminate, thickish, areolato-diffract, verruculoso-granulate, white (K + yellow, CaCl—). Apothecia large, sessile, plane or somewhat convex, pale-testaceous, the thalline margin thick, crenulate; spores oblong or ellipsoideo-oblong, 0,009–11 mm. long, 0,007–9 mm. thick; paraphyses distinct, thick; epithecium not interspersed; hymenial gelatine persistently deep bluish with iodine.—Leight. Lich. Fl. ed. 3, p. 182.

Distinguished from subspecies *L. chlorona* by the thicker thallus, the large, paler apothecia, the non-interspersed epithecium, and the reaction of the hymenial gelatine. It has somewhat the aspect of states of *Lecanora pallescens*, with which, however, it can scarcely be confounded. The apothecia are either somewhat scattered or approximate and subconfluent, occasionally slightly pruinose, with the thalline margin at length flexuose. In the two British specimens seen the spermogones are only sparingly present, with the spermatia rather longer than in subsp. *L. chlorona*.

Hab. On the trunks of trees in upland districts.—*Distr.* Only in the

S.W. Highlands of Scotland and N.W. Ireland.—B. M.: Glen Creran, Barcaldine, Argyleshire. Letterfrack, Connemara, co. Galway.

97. *L. præpostera* Nyl. Flora, 1873, p. 19.—Thallus determinate, thin, smoothish, areolato-rimose, whitish, darkly limited and subfimbriate at the circumference (K + yellow, then cinnabarine-reddish, CaCl—). Apothecia moderate, blackish, opaque, glaucous-suffused or subdenudate, the thalline margin rugulose or subcrenate; spores ellipsoid, 0.009–14 mm. long, 0.005–6 mm. thick; paraphyses slender; epithecium yellow-inspersed; hymenial gelatine, especially the thecæ, bluish with iodine.—Cromb. Grevillea, 1873, p. 141; Leight. Lich. Fl. ed. 3, p. 173.

Looks at first sight as if only a peculiar variety of *L. atrynea*, but is well distinguished by the smaller spores, the reactions of the thallus and hymenial gelatine. The two specimens seen by me are evidently an old state of the plant, and though the apothecia are numerous the spores are seldom present.

Hab. On basaltic rocks in a maritime district.—*Distr.* Extremely local and rare in one of the Channel Islands.—B. M.: Rozel, Island of Jersey.

98. *L. albella* Ach. Vet. Ak. Handl. 1810, p. 137; Nyl. Flora, 1872, p. 365.—Thallus determinate, thin, smooth, whitish (K + yellow, CaCl—). Apothecia moderate, plane or slightly convex, pale-flesh-coloured, caesio-pruinose or naked, the thalline margin entire; paraphyses not very discrete; epithecium granulose (CaCl—); spores 0.010–12 mm. long, 0.005–8 mm. thick; hymenial gelatine bluish, then nearly colourless or somewhat yellowish, the thecæ tawny wine-red (their apices bluish) with iodine.—Gray, Nat. Arr. i. p. 453; Sm. Eng. Fl. v. p. 191; Mudd, Man. p. 148; Cromb. Lich. Brit. p. 51; Leight. Lich. Fl. ed. 3, p. 206.—*L. subfusca* forma *albella* Leight. Lich. Fl. ed. i. p. 204. *Lichen albellus* Pers. in Ust. Ann. Bot. xi. (1794) p. 18; Eng. Bot. t. 2154.

In several respects allied to more than one of the preceding species, from which externally it may be discriminated by the pale buff-coloured apothecia, which are rather scattered or sometimes crowded. It is, however, more definitely separated by the spermogones, which, as stated by Nylander (Flora, 1872, p. 250, note 2), are pale above. The spermatia are 0.016–20 mm. long (*vide* Nyl. *in litt.*). It is a somewhat variable plant, presenting the following forms.

Hab. On smooth bark of trees in wooded maritime and upland districts.—*Distr.* As yet only here and there sparingly in Great Britain and Ireland.—B. M.: Epping Forest, Essex; New Forest, Hants; Falls of Becky, S. Devon; Savernake Forest, Wiltshire; Hay Park, Herefordshire; Island of Anglesea. Barcaldine, Argyleshire; Morrone, Braemar, Aberdeenshire. Killaloe, co. Clare.

Form 1. *peralbella* Nyl. *ex* Cromb. Journ. Bot. 1876, p. 361.—Thallus as in the type. Apothecia small, pale-brownish, slightly pruinose; hymenial gelatine bluish, then wine-red with iodine.—

Lecanora peralbella Nyl. Flora, 1872, p. 365; Leight. Lich. Fl. ed. 3, p. 206.

Originally regarded by Nylander as specifically distinct, this is now viewed by him only as a form characterized by the reaction of the hymenial gelatine.

Hab. On thorns and trunks of trees in a maritime district.—*Distr.* Very rare in N.W. Ireland.—B. M. : Killery Bay and Ballynahinch, Conemara, co. Galway.

Form 2. *subalbella* Nyl. *ex* Hué, Rev. Bot. 1887, p. 161.—Spores 0,009–11 mm. long, 0,005–7 mm. thick; hymenial gelatine and the thecae bluish, then darker with iodine.—Cromb. Grevillea, xviii. p. 68.—*Lecanora subalbella* Nyl. Flora, 1872, p. 365.—*Lichen rosellus* Eng. Bot. t. 1651 (apotheciis magis convexis).

Only another form of *L. albella*, though more distinct than the preceding, differing not merely in the reaction of the hymenial gelatine but also in the slightly smaller spores and the slightly longer spermatia, which *vide* Nylander are 0,016–22 mm. long.

Hab. On the trunks of trees in wooded maritime and upland tracts.—*Distr.* Only sparingly in S. England.—B. M. : Netley Abbey, near Bartly Lodge, and Bramble Hill, New Forest, Hants.

99. *L. angulosa* Ach. Lich. Univ. (1810) p. 364; Nyl. Flora, 1872, p. 250.—Thallus determinate, thin, smooth, at length unequal or rugoso-subrimose, greyish-white (K + yellow, CaCl—). Apothecia small or submoderate, plane or slightly convex, crowded and subangulose, pale-brown or sordid-pale, slightly caesio-pruinose (epithecium CaCl + yellow); the thalline margin thin, subentire or somewhat crenulate, at length subevanescent; paraphyses slender, subdiscrete; epithecium granulose; spores 0,009–16 mm. long, 0,006–9 mm. thick; hymenial gelatine persistently bluish with iodine.—Leight. Lich. Fl. ed. 3, p. 205.—*L. albella* subsp. *angulosa* Cromb. Lich. Brit. p. 51; var. β . *angulosa* Mudd, Man. p. 148. *L. subfusca* var. *angulosa* Leight. Lich. Fl. ed. 1, p. 204. *Lichen angulosus* Schreb. Spicil. (1771) p. 136.—*Brit. Exc.*: Mudd, nos. 114, 115.

Usually regarded as only a variety (or subspecies) of *L. albella*, this essentially differs in the positive reaction of the epithecium with CaCl, and in the black colour of the spermogones above. Among minor characters it also differs in the crowded angulose apothecia, especially in the centre of the thallus, and in the rather larger spores. The spermatia are shorter than in the preceding species, being (*vide* Nyl. *in litt.*) 0,014–18 mm. long.

Hab. On trunks of trees, rarely on old pales, in maritime and upland districts.—*Distr.* Here and there in Great Britain and Ireland; not seen from the Channel Islands.—B. M. : Epping Forest, Essex; near Lewes and Hastings, Sussex; New Forest, Hants; Ullacombe, Bovey Tracey, S. Devon; Cirencester, Gloucestershire; Cliffrigg and near Easby, Cleveland, Yorkshire; Catterleen, Cumberland. Appin, Argyleshire; Finlarig,

Killin, Perthshire. Near Belfast, co. Antrim; Castleconnell, co. Limerick; Killaloe, co. Clare.

Var. *β. chondrotypa* Stiz. Bot. Zeit. 1868, p. 899.—Thallus as in the type. Apothecia convex, often crowded, whitish or subcarneous, the thalline margin excluded.—Cromb. Grevillea, xviii. p. 68.—*Lecanora chondrotypa* Ach. Lich. Univ. (1810) p. 365. According to Nylander (Lich. Scand. p. 162) this is present in Hb. Acharius s. n. *Lichen glabratus* Dicks., but as Dickson does not record it his specific name cannot be retained.

Differs in the character of the apothecia, which, however, in a very young state are plane with a distinct thalline margin.

Hab. On the trunks of trees in wooded upland tracts.—*Distr.* Local and scarce in S. England.—B. M.: Bembridge, Isle of Wight; St. Leonard's Forest, Sussex; Lyndhurst, New Forest, Hants; Ullacombe, Bovey Tracey, S. Devon.

100. *L. glaucoma* Ach. Lich. Univ. (1810) p. 362.—Thallus subdeterminate, at first continuous, then rimoso-areolate, whitish or glaucous-white (K + yellow, CaCl—); hypothallus thin, whitish. Apothecia moderate, innate or appressed, plane or convex, carneous-livid or livid-black, cæcio-pruinose (CaCl + yellow); the thalline margin thin or tumid, at length flexuose and obliterated; spores ellipsoid, 0.010–13 mm. long, 0.006–7 mm. thick; paraphyses somewhat slender, conglutinate; hymenial gelatine deep blue, the thecæ violet with iodine.—Hook. Fl. Scot. ii. p. 48; Sm. Eng. Fl. v. p. 189; Tayl. in Mack. Fl. Hib. ii. p. 135; Mudd, Man. p. 153; Cromb. Lich. Brit. p. 50; Leight. Lich. Fl. p. 215, ed. 3, p. 204.—*Rinodina glaucoma* Gray, Nat. Arr. i. p. 453. *Lichen glaucoma* Eng. Bot. t. 2156. *Verrucaria glaucoma* Hoffm. Deutsch. Fl. ii. (1795) p. 172. *Lichen rupicola* (? Linn.) Lightf. Fl. Scot. ii. p. 806; Huds. Fl. Angl. ed. 2, p. 525; With. Arr. ed. 3, iv. p. 13.—*Brit. Exs.*: Leight. n. 53; Mudd, n. 122; Larb. Lich. Hb. n. 259.

A very variable plant as to the thallus and apothecia, whence the forms, varieties, and subspecies that follow. It may, however, always be easily recognized by the livid-pruinose apothecia. The thallus, which is rarely cæcio-greyish, is thickish, more or less expanded, the hypothallus being visible only in shaded situations at the circumference. It is usually well fertile, the apothecia being numerous (at times aggregato-conglomerate), with the pruina persistent (forma *cinereopruinosa* Leight. Lich. Fl. p. 216) unless when accidentally rubbed off. The spermatogones are frequent, black-punctate, immersed, with spermatia arcuate, as in the allied species. Both the thallus and the apothecia are the hosts respectively of two different parasites hereafter to be described.

Hab. On rocks, boulders, and walls, granitic, schistose, and whinstone, in maritime and upland situations, chiefly in mountainous districts.—*Distr.* General and common in Great Britain; no doubt also in Ireland.—B. M.: La Moye, Island of Jersey; The Vale, Guernsey; Island of Sark. Near Folkestone, Kent; Bolt Head, S. Devon; Valley of Rocks, Lynton, N. Devon; St. Minver and Penzance, Cornwall; Bardon Hill,

Leicestershire; Malvern Hills, Worcestershire; Pwllheli, Carnarvonshire; Island of Anglesea; Haughmond Hill, Shropshire; Cliffrigg, Cleveland, and Ribblesdale, Yorkshire; near Milnthorpe, Westmoreland; Swinhope, Northumberland; Catterleen, Cumberland. New Galloway, Kirkcudbrightshire; Kyles of Bute; Barcaldine and Ben Cruachan, Argyleshire; Killin, Perthshire; near Dundee, Forfarshire; Portlethen, Kincardineshire; Castleton of Braemar, Aberdeenshire. Lambay Island and Kinsale, co. Cork.

Form 1. *decussata* Cromb. Grevillea, xviii. (1890) p. 68.—Thallus white or greyish-white, finely marked throughout with black hypothalline (?) lines. Apothecia as in the type, with concolorous thalline margin.

Looks at first sight as if almost referable to *L. calcarea*, but has the reactions of this species. In our two British specimens the spermogones are very abundant, giving the thallus a black-punctate appearance. It seems to be the plant alluded to by M. Lamy, Lich. Mt. Dor. p. 75.

Hab. On rocks in maritime and upland districts.—*Distr.* Very sparingly in the Channel Islands and N. England.—B. M.: Chateau Point, Island of Sark. Gunnerton Crags, Northumberland.

Form 2. *complanata* Leight. Lich. Fl. ed. 3 (1879) p. 205.—Thallus and apothecia in an uniform plane, the apothecia innate.—Cromb. Grevillea, xviii. p. 68.

Differs merely in the thallus and apothecia being smoothed down to the same level, but is connected with the type by intermediate states, and no doubt depends upon the nature of the substratum. Leighton describes the apothecia as blackish; but this is accidental, and in other specimens referable to this form they are of the normal colour.

Hab. On slate-rocks in maritime districts.—*Distr.* Only sparingly in S. Wales, the W. Highlands of Scotland, and S.E. Ireland.—B. M.: Near Towy, Pembrokeshire. Ballachulish, Argyleshire. Kinsale, co. Cork.

Var. β . *inflexa* Johns. ex Cromb. Grevillea, xviii. (1890) p. 68.—Thallus rimoso-areolate, greyish-white. Apothecia plane, crowded; the thalline margin prominent, thickish, snow-white, crenate and flexuose.

A distinct variety characterized by the thalline margin of the apothecia. These are for the most part aggregate and become angulose through mutual pressure. It is scarcely referable to var. *rugosa* (Ach.) Fr. fil. Lich. Scand. p. 271.

Hab. On quartzose rocks in an upland district.—*Distr.* Very local in N.W. England.—B. M.: Alston, Cumberland.

Var. γ . *Swartzii* Nyl. Lich. Scand. (1861) p. 159.—Thallus unequal, rimose or verrucoso-granulate, subradiate or at times byssinoradiate at the circumference. Apothecia subglobose, usually aggregato-conglomerate, the thalline margin at length evanescent.—Cromb. Lich. Brit. p. 50; Leight. Lich. Fl. p. 216, ed. 3, p. 205.—

Lichen Swartzii Ach. Prodr. (1798) p. 55, t. 1. fig. 2 (non bonum); Dicks. Crypt. fasc. iv. p. 23.

The form of the thallus at the circumference and that of the apothecia are the distinguishing marks of this variety. In the former respect, however, the radii are visible only in entire specimens and are sometimes absent even in the growing plant. The apothecia are occasionally much deformed.

Hab. On rocks in mountainous districts.—*Distr.* Only very sparingly on the S. and N. Grampians, Scotland.—B. M.: Ben Cruachan, Argyleshire; Morrone, Braemar, Aberdeenshire.

Subsp. 1. *L. subradiosa* Nyl. Flora, 1872, p. 549.—Thallus and apothecia as in the type, but the former with different reaction. Thallus CaCl + orange passing into reddish. Apothecia (epithecium) CaCl + yellow.—Cromb. Grevillea, xix. p. 60.

Nylander *l. c.* says that this may be only a state of *L. glaucoma*, mixed up with which it frequently occurs in the E. Pyrenees, though not in the very few British specimens as yet detected. These, apart from the reactions, from a diagnosis given me by Mr. Johnson present no special marks of distinction.

Hab. On stones of a wall in an upland district.—*Distr.* Very local and scarce in N.E. England (Sinderhope, East Allendale, Northumberland).

Subsp. 2. *L. bicincta* Nyl. Act. Soc. Sc. Fenn. vii. (1863) p. 398.—Thallus as in the type. Apothecia glauco-pruinose, with double margin, a thalline and within this a black proper margin; spores 0.011–14 mm. long. 0.007–8 mm. thick.—*Lecanora bicincta* Ram. Mus. Nat. Hist. Mém. xiii. (1825) p. 248.

At least a good subspecies well characterized by the zeorine apothecia, though in other respects agreeing with *L. glaucoma*. The type does not occur in Britain, but only the variety that follows.

Var. β . *lecideina* Cromb. Grevillea, xviii. (1890) p. 68.—Apothecia small, lecideoid, black, more or less pruinose, the proper margin slightly prominent and flexuose.—*Lecanora rimosa* b. *lecidina* Schaer, Enum. (1850) p. 71. *L. glaucoma* var. *cærulata* (Flot.) Leight. Lich. Fl. p. 215, ed. 3, p. 204.

Probably only a form, as in the single British specimen seen a few young apothecia are zeorine. Otherwise they are lecideine, convex and aggregate, with the thalline margin obliterated.

Hab. On a quartzose rock in a mountainous district.—*Distr.* Found only very sparingly on one of the N. Grampians, Scotland.—B. M.: Morrone, Braemar, Aberdeenshire.

101. *L. subcarnea* Ach. Lieb. Univ. (1810) p. 365.—Thallus subdeterminate, yellowish-white, rimoso-areolato-granulate (K + yellow, then deep orange-red). Apothecia moderate, plane or convex, sometimes conglomerate and difform, flesh-coloured or livid-testaceous,

thinly pruinose (epithecium $\text{CaCl}-$); the thalline margin undulate, at length nearly obliterated; spores ellipsoid, 0,011–13 mm. long, 0,006–7 mm. thick; epithecium granulose, brown; hymenial gelatine bluish, the thecae violet with iodine.—Leight. Lich. Fl. p. 216, ed. 3, p. 205.—*Lecanora glaucoma* var. *subcarnea* Mudd, Man. p. 153; Cromb. Lich. Brit. p. 50. *Lecidea subcarnea* Sm. Eng. Fl. v. p. 184. *Lichen subcarneus* Sw. Vet. Ak. Handl. 1791, p. 126. *Lichen pallescens* With. Arr. ed. 3, iv. p. 2, pro parte.

Usually regarded as a variety of the preceding species, but, among other characters, at once differs in the reaction of the epithecium. The thallus in entire specimens is subradiate at the circumference, but is usually widely expanded. The apothecia are numerous, and occasionally become substipitate.

Hab. On rocks in maritime and upland mountainous districts.—*Distr.* Local in the Channel Islands, N. Wales, N. England, on the Grampians, and in N.E. Scotland.—B. M.: Boulay Bay, Island of Jersey; Island of Alderney. Barmouth, Merionethshire; Keighley and Ayton, Cleveland, Yorkshire. Craig Tulloch, Blair Athole, Perthshire; near Porlethen, Kincardineshire; Morrone, Braemar, Aberdeenshire.

102. *L. fuscescens* Nyl. Flora, 1872, p. 552, nota 1.—Thallus subdeterminate, thinly granulose, whitish or greyish (K + yellowish, $\text{CaCl}-$); hypothallus thin, brownish-black. Apothecia small or submoderate, adnate or adnato-sessile, plane, thinly margined, pale-brown or blackish, internally whitish; paraphyses submoderate, blackish or brownish at the clavate apices; spores globular or subglobose, 0,006–9 mm. long, 0,005–7 mm. thick; hymenial gelatine bluish, the thecae at length wine-coloured or tawny-reddish with iodine.—Cromb. Journ. Bot. 1875, p. 140; Leight. Lich. Fl. ed. 3, p. 200.—*Lecidea fuscescens* Samm. Suppl. Fl. Lapp. (1826) p. 161.

Formerly regarded by authors as a *Lecidea* (*Biatora*), this, as pointed out by Nylander *l. c.*, is in reality a *Lecanora* with gonidia intruded in the margin of the apothecia. In a young state these are truly lecanorine, though afterwards they become convex and immarginate so as to appear biatoroid. In the British specimens, which are well fertile, the thallus is rather scattered, with the hypothallus predominant. According to Th. M. Fries (Lich. Scand. p. 461) the spermatia are “long, acicular, curved.”

Hab. On trunks of birch in a mountainous district.—*Distr.* Only sparingly on one of the N. Grampians, Scotland.—B. M.: Morrone, Braemar, Aberdeenshire.

c. Thallus uniform, K—.

103. *L. umbrina* Nyl. Bull. Soc. Bot. t. xiii. (1866) p. 339.—Thallus subeffuse, thinnish, granulato-unequal, sordid-greenish or greyish (K—, $\text{CaCl}-$). Apothecia somewhat small, plane, umbrine-brown, at times slightly caesio-suffused; the thalline margin thin, whitish, subcrenulate; spores 0,008–12 mm. long, 0,005–6 mm. thick; paraphyses thickish, jointed, brownish at the clavate apices;

hymenial gelatine bluish, then tawny-wine-coloured or violet with iodine.—Carroll, Journ. Bot. 1867, p. 255; Croub. Grevillea, xviii. p. 68; Lich. Brit. p. 51, pro parte; Leight. Lich. Fl. p. 207, ed. 3, p. 191.—*Lichen umbrinus* Ehrh. Crypt. (1793) n. 245.

Easily recognized in this subsection by the colour of the apothecia. The thallus, which is usually indeterminate, varies somewhat in thickness according to the habitat. Rarely it is more or less scattered over the substratum and little developed (olive-brownish hypothalline), when it is forma *subdistans* Nyl. ex Croub. Journ. Bot. 1870, p. 97. The apothecia are at times subbiatorine. The spermogones have the spermatia semicircular, 0,015–22 mm. long, 0,0005 mm. thick.

Hab. On rocks, occasionally on old pales, rarely on the ground in maritime and upland districts.—*Distr.* Only here and there in Great Britain, Ireland, and the Channel Islands.—B. M.: La Moye, Island of Jersey. Lamorna Cliff, Penzance, Cornwall; Lydd, Kent; Aberdovey, Merionethshire; Ayton, Cleveland, York-shire. Barcaldine, Argyleshire; Blair Athole, Perthshire; Portlethen and Bay of Nigg, Kincardineshire. Cliffs of Moher, co. Clare; Killery Bay, Connemara, co. Galway.

104. *L. crenulata* Nyl. Not. Sällsk. pro F. et Fl. Fenn. Förh. n. s. v. (1866) p. 181; Flora, 1872, p. 250.—Thallus effuse, very thin, often scarcely visible, greyish-white (K—, CaCl—). Apothecia small, scattered, brownish-grey, at times caesio-suffused; the thalline margin whitish, deeply crenulate; paraphyses thickish, jointed, brownish at the apices; spores 0,010–16 mm. long, 0,005–7 mm. thick; hymenial gelatine bluish, then wine-coloured with iodine.—Sm. Eng. Fl. v. p. 190 pro parte.—*L. umbrina* subsp. *crenulata* Croub. Grevillea, xii. p. 59, form *crenulata* Croub. Lich. Brit. p. 51, Leight. Lich. Fl. p. 207, ed. 3, p. 191. *L. albella* δ. *crenulata* Mudd, Man. p. 148. *Lichen crenulatus* Dicks. Crypt. fasc. iii. (1793) p. 14, t. 9. f. 1; Eng. Bot. t. 930; With. Arr. ed. 3, iv. p. 17. According to a specimen from his own Herb. this is also *L. galactina* β. *disperso-areolata* (non Schaer), Mudd, Man. p. 149.—*Brit. Ess.*: Larb. Lich. Hb. n. 258.

Frequently confounded with subsp. *dispersa* of *L. galactina*, but distinct in the character of the paraphyses and in the smaller spores, as pointed out by Nylander, who first definitely discriminated between them. From the preceding species it is distinguished by the tessellato-crenate margin of the apothecia.—the crenulations being deeply divided and separated by a furrow, though in abraded specimens this character is scarcely apparent. It differs also from it in the size of the spermatia, which (*vide* Nyl. *in litt.*) are 0,011–15 mm. long, 0,0005 mm. thick.

Hab. On calcareous, rarely sandstone, rocks in maritime and upland situations.—*Distr.* Seen only from a few localities in S.W. and N. England, the Grampians, Scotland, and N.W. Ireland.—B. M.: Watcombe Bay, S. Devon: Albhick, Worcestershire; near Ayton and Carlton Bank, Cleveland, Yorkshire; Eglestone, Durham; Lamplugh, Cumberland; Teesdale, Durham. Craig Tulloch, Blair Athole, Perthshire; Craig Guie, Braemar, Aberdeenshire. Oughterarde, co. Galway.

105. *L. Zosteræ* Nyl. Flora, 1876, p. 577.—Thallus effuse, very thin, glaucous-grey, subevanescent (K—, CaCl—). Apothecia minute, plane, scattered or aggregate, reddish-brown, naked or slightly pruinose; the thalline margin thin, entire or subcrenate, white-pulverulent; spores 0,011–14 mm. long, 0,006–7 mm. thick; paraphyses very slender, discrete; hymenial gelatine persistently bluish with iodine.—*Lecanora umbrina* subsp. *Zosteræ* Nyl., Cromb. Journ. Bot. 1874, p. 148; forma *Zosteræ* Leight. Lich. Fl. ed. 3, p. 191.—*Lecanora subfusca* var. γ . *Zosteræ* Ach. Syn. (1814) p. 158.

Allied to *L. umbrina*, but differs in the pulverulent thalline margin of the smaller apothecia, the size of the spores, the slender paraphyses, and the reaction of the hymenial gelatine. It may be recognized from its peculiar place of growth, though Nylander (Flora, *l. c.*) says that *L. Hageni* also occurs zostericolous in Jersey.

Hab. On old leaves of *Zostera marina* in maritime districts. *Distr.* Sparingly in the Channel Islands, S.W. England, and S.W. Ireland.—B. M.: La Moye, Island of Jersey; The Eperquerie, Island of Sark; Moulin Huet Bay, Guernsey. Pentire and the Lizard, Cornwall. Kilkee, co. Clare.

106. *L. Hageni* Ach. Lich. Univ. (1810) p. 367 (excl. vars.); Nyl. Flora, 1872, p. 250.—Thallus effuse, very thin, leproso-verruculose, greyish-white, often nearly obsolete (K—, CaCl—). Apothecia small, plane or at length convex, pale- or dark-brown, naked or cæcio-suffused; the thalline margin thin, subpersistent, crenulate or subentire, white; spores 0,009–11 mm. long, 0,005–6 mm. thick; paraphyses thickish, jointed, brownish at the apices; hymenial gelatine bluish, then sordid wine-coloured with iodine.—Leight. Lich. Fl. p. 208, ed. 3, p. 192.—*L. umbrina* var. *Hageni* Cromb. Lich. Brit. p. 51. *L. albella* γ . *Hageni* Mudd, Man. p. 148. *Lichen Hageni*, Ach. Prodr. (1798) p. 57.—*Brit. Evs.*: Larb. Lich. Hb. nos. 131, 219.

A plant not rightly discriminated by most authors from *L. umbrina*. Among other marks of distinction, however, as well as in general aspect, it at once differs from this in the shorter spermatia, as pointed out by Nylander, *l. c.* These he gives *in litt.* as being 0,011–15 mm. long, 0,0005 mm. thick. The thallus frequently spreads extensively, and is occasionally scarcely visible from the numerous crowded apothecia. These at times become convex with the thalline margin excluded.

Hab. On trunks (usually decorticated) of trees, old pales, very rarely on schistose rocks, from maritime to upland tracts.—*Distr.* Not uncommon in England, rare in Scotland, Ireland, and the Channel Islands; not seen from Wales.—B. M.: St. Aubin's Bay, Island of Jersey. Lyndhurst, New Forest, Hants; near Ryde, Isle of Wight; Wellow, near Bath, Somerset; Windsor Great Park, Berks; Brandon, Suff. lks; Wimpole Park, Cambridgeshire; Aytou, Cleveland, Yorkshire; Ennerdale, Cumberland. Inverary, Argyleshire; Achmore, Killin, Perthshire; Portlethen, Kincardineshire (saxicolous). Castlemartyr, co. Cork; Ballynagarde, co. Limerick.

Form *calcigena* Nyl. *ex* Cromb. Journ. Bot. 1876, p. 361 (nomen); Leight. Lich. Fl. ed. 3, p. 192.—Thallus determinate, thicker, areolato-diffract, greyish. Apothecia livid, subpruinose, the thalline margin entire.

Differs in the characters given of the thallus and apothecia. It is probably a good variety, but has been seen too sparingly to decide.

Hab. On calcareous rocks in a maritime district.—*Distr.* Very local and scarce in N.W. Ireland.—B. M.: Lettermore, Connemara, co. Galway.

107. *L. Agardhiana* Ach. Syn. (1814) p. 152; Nyl. Lich. Scand. p. 138. Thallus effuse, thin, contiguous, smooth, opaque, dark-greyish (K—, CaCl—). Apothecia small, at first innate, concave, with whitish entire thalline margin, at length sessile, convex, immarginate, brownish-black, slightly pruinose or naked (epithecium HNO₃ rosaceous); spores ellipsoid. 0.010–14 mm. long, 0.004–5 mm. thick; paraphyses thickish, brownish at the apices; hymenial gelatine bluish with iodine.—Cromb. Grevillea, xviii. p. 69.

A plant, according to Nylander *in litt.*, allied to *L. Hageni*, though the apothecia are at length lecideoid. In the few British specimens the thallus is indistinct, so that they may be referred to a form *ecrustacea* Cromb. The apothecia are numerous, though not crowded, and for the most part epruinose. The spermogones are rarely present, with spermatia 0.012–15 mm. long, 0.0005 mm. thick.

Hab. On calcareous rocks in a maritime district. *Distr.* As yet only in N. Wales.—B. M.: Great Orme's Head, Carnarvonshire.

108. *L. prosechoides* Nyl. Flora, 1872, p. 250.—Thallus determinate, thinnish, areolate-rimose, whitish or sordid-yellowish (K—, CaCl—). Apothecia small or moderate, plane, somewhat prominent, brownish or blackish, the thalline margin subentire; spores ellipsoid or oblongo-ellipsoid, occasionally 1-septate, 0.008–12 mm. long, 0.0045–55 mm. thick; paraphyses discrete, moderate or thickish, brownish or yellowish-brown at the clavate apices; hymenial gelatine persistently bluish with iodine.—Cromb. Grevillea, iii. p. 82.—*Lecanora umbrina* subsp. *prosechoides* Nyl. in Cromb. Lich. Brit. (1870). p. 51; forma *prosechoides* Leight. Lich. Fl. p. 208, ed. 3, p. 191. To this *fide* Nyl. *in litt.* is referable *Lecanora helicopsis f. dilutior* Nyl. Lich. Scand. p. 159. Carroll, Journ. Bot. 1866, p. 23, Cromb. Lich. Brit. p. 50; also *Parmelia subfusca* var. *lainea* Fr. Lich. Suec. Exs. n. 371. *Lecanora prosecha* (non Ach.) Leight. Lich. Fl. ed. 3, p. 224.—*Brit. Exs.*: Cromb. n. 67; Larb. Lich. Hb. n. 94.

At first regarded as a subspecies of *L. umbrina* by Nylander, this differs in the colour of the thallus and of the apothecia, in the form of the spores, and in the reaction of the hymenial gelatine. The thallus, though determinate, is at times somewhat expanded, and varies in colour, being paler in shady situations. The apothecia are numerous, with the thalline margin occasionally at length obliterated. They are rarely the

host of *Arthonia varians* (Day.). The spermatogones have the spermatia arcuate, 0,022–23 mm. long, about 0,0005 mm. thick.

Hab. On schistose, very rarely cretaceous, rocks in maritime districts. *Distr.* Local in the Channel Islands, S.W. and N.W. England, Wales, the S.W. Highlands and N.E. Scotland, S. and N.E. Ireland.—B. M.: Noirmont, Island of Jersey; Vale Bay, Island of Guernsey. Between Porlock and Lynton, Devonshire; Penzance, Cornwall; Manorbeer, near Tenby, Pembrokeshire; Southerndown, Glamorganshire; The Mowd-och and Barmouth, Merionethshire; Pwllheli, Carnarvonshire, Port Soderick, Isle of Man. Loch Creran, Argyleshire; Portlethen, Kincardineshire. Kilkee, co. Clare; Ardglass, co. Down.

Form *sublutior* Nyl. Flora, 1882, p. 456.—Thallus as in the type. Apothecia pale-brownish.—Cromb. Grevillea, xix. p. 60 (lapsu s. n. *dilutior*).

Differs in the colour of the fruit, which probably arises from the habitat. In the single British specimen the thalline margin of the apothecia is here and there evanescent, so that they then appear biatoroid.

Hab. On moist schistose rocks in a maritime district. *Distr.* Extremely rare in N.E. Scotland.—B. M.: near Cove, Kincardineshire.

109. *L. prosechoidiza* Nyl. Flora, 1881, p. 3.—Thallus thin, areolato-diffract, greyish (K—, CaCl—). Apothecia moderate, blackish or brownish-black, at first with entire whitish thalline margin, at length convex and immarginate; spores ellipsoid, 0,009–12 mm. long, 0,004–6 mm. thick; paraphyses rather coherent; hymenial gelatine bluish and then (especially the thecae) violet or subtawny with iodine.—Cromb. Journ. Bot. 1885, p. 195.

Approaches the preceding species, from which it differs more especially in the less discrete paraphyses. Nylander, *l. c.*, observes that it is probably to be regarded only as a subspecies of *L. umbrina*; but from this it at once differs in the colour of the apothecia. In the single British specimen the thallus is indeterminate and the apothecia are numerous. The spermatogones are only here and there visible, with spermatia 0,016–22 mm. long, 0,0005 mm. thick.

Hab. On schistose rocks in a maritime district.—*Distr.* Extremely local and scarce in N.E. Scotland.—B. M.: near Portlethen, Kincardineshire.

110. *L. conferta* Nyl. Ann. Sc. Nat. Bot. 1867, p. 314, nota 1.—Thallus effuse, thin, granulato-unequal, greyish-white or greenish-grey, often obsolete (K—, CaCl—). Apothecia small, plane, crowded, subangulose, testaceous or pale-testaceous, with thin crenulate thalline margin, or frequently subbiatorine; spores 0,009–15 mm. long, 0,0045–55 mm. thick; paraphyses submoderate, brownish at the apices; hymenial gelatine deep-bluish (the thecae dark-violet) with iodine.—Cromb. Grevillea, xviii. p. 69.—*Lecanora umbrina* var. *conferta* Cromb. Journ. Bot. 1870, p. 97. *L. Hageni* var. *conferta* Leight. Lich. Fl. p. 208, ed. 3, p. 192. *Patellaria conferta* Dub. Bot. Gall. ii. (1830) p. 654.

Closely related, like all the other plants of this subsection, to *L. umbrina*, from which it differs in the characters given. In the British specimen gathered the thallus is subgreenish and somewhat scattered, with numerous, mostly subbiatorine apothecia, in which the paraphyses are scarcely discrete.

Hab. On granitic stones of a wall in a lowland district.—*Distr.* Only sparingly in N.E. Scotland; no doubt to be detected elsewhere.—B. M.: Woodside, near Aberdeen.

111. *L. mammillifera* Stirt. Trans. Glasgow Soc. Nat. 1875, p. 85.—Thallus minutely areolato-diffract, dark- or brownish-grey, the areolæ plane (K—, CaCl—). Apothecia small, prominent, convex, black or brownish-black, internally pale-greyish, the margin (? thalline) obtuse, at length depressed; spores ellipsoid, 0,008–010 mm. long, 0,007–0,0085 mm. thick; paraphyses few, discrete, thickish, brownish at the clavate apices; hypothecium colourless; hymenial gelatine bluish, then tawny (especially the thecæ) with iodine.—Leight. Lich. Fl. ed. 3, p. 201.

I have seen no specimen of the plant, and as the author says nothing as to its affinities or the character of the spermatogones, it may not belong to this section.

Hab. On rocks in a mountainous district.—*Distr.* Very local on one of the Central Grampians, Scotland (Ben-y-gloe, Blair Athole, Perthshire).

d. Thallus usually more or less yellowish.

112. *L. sulphurea* Ach. Lich. Univ. (1810) p. 399.—Thallus thickish, rimoso-areolate, greenish-sulphur-coloured, the areolæ tumid, smooth (K + yellowish, CaCl—); hypothallus indistinct. Apothecia moderate, at first innate, then protruded, biatorine, plane or convex, difform, livid, olive- or livid-black, subpruinose, the thalline margin speedily excluded; spores ellipsoid, 0,010–15 mm. long, 0,005–6 mm. thick; paraphyses not discrete; epithecium granulose, brownish; hymenial gelatine bluish and then sordid with iodine.—Mudd, Man. p. 152; Cromb. Lich. Brit. p. 52; Leight. Lich. Fl. p. 198, ed. 3, p. 182.—*Lecidea sulphurea* Sm. Eng. Fl. v. p. 181; Gray, Nat. Arr. i. p. 470; Hook. Fl. Scot. ii. p. 38; Tayl. in Mack. Fl. Hib. p. 127. *Lichen sulphureus* Hoffm. Enum. (1784) p. 32; Dicks. Crypt. fasc. ii. p. 17; With. Arr. ed. 3, iv. p. 12; Eng. Bot. t. 1186, upper fig.—*Brit. Exs.*: Leight. n. 114; Mudd, n. 121; Larb. Lich. Hb. nos. 61, 92; Bohl. n. 117.

Distinguished from the allied species chiefly by the colour of the thallus and by the biatorine, usually immarginate apothecia. It frequently spreads extensively over the substratum, the thallus varying somewhat in thickness. The apothecia are numerous and crowded, becoming more or less confluent. The spermatogones are punctiform, immersed, livid-black, and often crowded.

Hab. On rocks and walls in maritime, upland, rarely mountainous districts.—*Distr.* General and common in most parts of Great Britain and Ireland; rare in the Channel Islands.—B. M.: Island of Sark.

Walthamstow, Essex; Hastings, Sussex; St. Minver and Penzance, Cornwall; Cheveley Park, Cambridgeshire; Bardon Hill, Leicestershire; Malvern Hills, Worcestershire; Wrekin Hill, Shropshire; Barmouth and Dolgelly, Merionethshire; Island of Anglesea; Roseberry, Cleveland, Yorkshire; Egglestone, Durham; Staveley, near Kendal, Westmoreland; Wansbeck, Northumberland. Rerrick, Kirkeudbrightshire; Appin, Argyshire; Ben Lawers, Perthshire; Portlethen, Kincardineshire; Craig Guie, Braemar, Aberdeenshire. Lambay Island, co. Cork; Killarney, co. Kerry; Letter Hill, Connemara, co. Galway.

113. *L. orosthea* Ach. Lich. Univ. (1810) p. 400.—Thallus effuse, thin, areolato-rimulose or subpulverulent, yellowish-sulphur-coloured (K + yellow, CaCl—). Apothecia small, biatoroid, convex or tuberculoso-diform, immarginate, subconcolorous with the thallus or yellowish-flesh-coloured, sometimes sordid or subpruinose; spores ellipsoid or oblong, 0.009–16 mm. long, 0.006–7 mm. thick; hymenial gelatine bluish with iodine.—Leight. Lich. Fl. p. 199, ed. 3, p. 183 pro parte.—*Lecanora varia* subsp. *orosthea* Cromb. Lich. Brit. p. 52. *Lecidea orosthea* Gray, Nat. Arr. i. p. 470. *Lichen orostheus* Ach. Prodr. (1798) p. 38.

Approaches *L. sulphurea*, but differs in the thinner, paler, more or less pulverulent thallus and the smaller apothecia. It grows chiefly on the smooth sides of perpendicular rocks, is very widely effuse, and is either entirely sterile or sparingly fertile. The apothecia are more or less scattered, varying in colour according to degree of exposure.

Hab. On rocks, granitic and schistose, in maritime and upland districts.—*Distr.* Seen from only a few localities in Great Britain and Ireland, but is no doubt more widely distributed, though, from being so frequently sterile and the nature of the habitat, specimens are rare in herbaria.—B. M.: Land's End, Cornwall; Ennerdale, Cumberland. West Water, Fifeshire; Craig Calliach, Perthshire; Portlethen, Kincardineshire. Croghane, co. Kerry; co. Wicklow; Kylemore, Connemara, co. Galway.

Var. *β. sublivescens* Nyl. Flora, 1872, p. 248.—Thallus as in the type. Apothecia often livid or livid-black, epruinose.—Cromb. Grevillea, xviii. p. 69.—*Lecanora varia* var. *symmicta* form *livescens* Nyl. in Cromb. Lich. Brit. p. 52.

Differs in the apothecia being naked, frequently variously livid, and more especially in the habitat. In our specimens the thallus is usually less pulverulent and rather darker. The apothecia are very numerous and crowded, some at times appearing as if crowned by the thallus.

Hab. On the trunks of aged beech-trees in wooded upland districts.—*Distr.* Only a few localities in S. and E. England, where, however, it is plentiful.—B. M.: Near Lyndhurst, New Forest, Hants; Highbeech, Epping Forest, Essex; Windsor Great Park, Berkshire.

114. *L. epanora* Ach. Lich. Univ. (1810) p. 377.—Thallus effuse, granulose, thinnish, greenish-yellow, citrino-sorediate, the granules globuloso-congested, contiguous or dispersed (K—, CaCl—); hypothallus blackish or obsolete. Apothecia submoderate, lecanorine,

sessile, plane, brownish- or reddish-yellow; the thalline margin tumid, flexuose or suberenate; spores ellipsoid, 0,008–11 mm. long, 0,005–7 mm. thick; paraphyses not discrete, tawny-yellow at the apices; hymenial gelatine scarcely tinged, but the thecæ bluish with iodine.—Cromb. Lich. Brit. p. 53; Leight. Lich. Fl. p. 205, ed. 3, p. 189.—*Lichen epanorus* Ach. Prodr. (1798) p. 39. *Lecanora albo-flavida* Tayl. in Mack. Fl. Hib. ii. p. 260; Mudd, Man. p. 155.—*Brit. Exs.*: Leight. n. 397.

Well characterized by the citrine soredia with which the thallus is sprinkled throughout, and which often at length obliterate the subsquamulose granules. In the British specimens the hypothallus is scarcely visible, and the granules are more or less scattered. The apothecia are present on a single specimen sparingly and not very well developed.

Hab. On rocks and walls, chiefly schistose, in maritime and upland districts.—*Distr.* Local in N. Wales, the S.W. and Central Highlands of Scotland, and in S.W. Ireland.—B. M.: Cader Idris, Dolgelly (fruit), and Barmouth, Merionethshire. Ballachulish, Argyleshire; Glen Fender, Blair Athole, Perthshire. Dunkerron, co. Kerry.

115. *L. varia* Ach. Syn. (1814) p. 161.—Thallus subdeterminate or effuse, thinish, areolato-verrucose or granulato-unequal, yellowish-green or straw-coloured (K+yellow, CaCl—); hypothallus indistinct. Apothecia numerous, moderate, sessile, plane or subplane, concolorous with the thallus or pale-yellow or sublivid, often pruinoso-suffused; the thalline margin persistent, subentire, at length angulose; spores ellipsoid, 0,009–11 mm. long, 0,005–6 mm. thick; paraphyses not discrete; epithecium granulose; hymenial gelatine bluish, then somewhat sordid with iodine.—Cromb. Grevillea, xviii. p. 69; Sm. Eng. Fl. v. p. 190 pro parte; Tayl. in Mack. Fl. Hib. ii. p. 137 pro parte; Mudd, Man. p. 149 pro parte; Cromb. Lich. Brit. p. 52 pro parte; Leight. Lich. Fl. p. 192 pro parte, ed. 3, p. 176 pro parte.—*Rinodina varia* Gray, Nat. Arr. i. p. 452. *Lichen varius* Ehrh. Crypt. (1785) n. 68; Eng. Bot. t. 1666.—*Brit. Exs.*: Leight. n. 51; Larb. Lich. Hb. n. 215; Bohl. n. 107.

A much less variable plant than its trivial name imports and as was formerly supposed, in consequence of the separation by Nylander on anatomical and other grounds of several species that follow. With us the thallus is generally widely effuse and at times is very scanty. The apothecia are often crowded, angulose, almost obliterating the thallus. The spermogones, which are not unfrequent, are immersed, dark brown or blackish.

Hab. On old pales and on the trunks of trees (chiefly pines) in maritime and upland districts.—*Distr.* General and common in Great Britain, rare in the Channel Islands and apparently in Ireland.—B. M.: Island of Guernsey. Near Yarmouth, Suffolk; Walthamstow, Essex; Finchley, Middlesex; Shiere, Surrey; St. Leonard's Forest, Sussex; Lyndhurst, New Forest, Hants: near Bovey Tracey, S. Devon; Elstree, Hertfordshire; Gaulingay, Cambridgeshire; Gopsall Park, Leicestershire; Hay Park, Herefordshire; Battenhall, near Worcester; Harboro' Magna, Warwickshire; Barmouth, Merionethshire; near Shrewsbury, Shropshire; Ayton, Cleveland, Yorkshire; Wark-on-Tyne and near Hexham,

Northumberland. Killin, Perthshire; Durris, Kincardineshire; Crathie and Glen Dee, Braemar, Aberdeenshire; Rothiemurchus, Inverness-shire. Carrigaline, co. Cork; Killarney, co. Kerry.

Form *pleorytis* Ach. Syn. (1814) p. 161 (excl. syn.).—Thallus determinate, thickish, granulate, yellow. Apothecia crowded, concolorous, the thalline margin inflexed and crenulate.—Cromb. *Grevillea*, xviii. p. 69.—*Parmelia varia* β . *pleorytis* Ach. Meth. (1803) p. 178.

Differs chiefly in the character of the thalline margin, which is as if incised. This, however, is less visible in the young apothecia of the only British specimen (fragmentary).

Hab. On old pales in an upland district.—*Distr.* Only very sparingly in the S. Grampians, Scotland.—B. M.: Lawers, Killin, Perthshire.

116. *L. conizæa* Nyl. Flora, 1872, p. 249.—Thallus effuse, thickish, leproso-pulverulent, whitish-yellow (K + yellow, CaCl—). Apothecia lecanorine, small or moderate, plane or somewhat convex, pale or pale flesh-coloured, at length brownish; the thalline margin entire or flexuose, somewhat thickish, pulverulent; spores ellipsoid, 0,010–14 mm. long, 0,0045 mm. thick; hymenial gelatine bluish, then tawny-yellow with iodine.—Cromb. Trans. Essex Field Club. iv. p. 64.—*Lecanora varia* var. *conizæa* Cromb. Lich. Brit. p. 52; Leight. Lich. Fl. p. 193. *Lecanora capallens* var. β . *conizæa* Ach. Lich. Univ. (1810) p. 374. *Lecanora lutescens* Leight. Lich. Fl. ed. 3, p. 184 pro parte. *Lecanora sarcopsis* subsp. *homopsis* (non Nyl.) Cromb. Journ. Bot. 1873, p. 133. *Lecidea farinaria* Borr. Eng. Bot. Suppl. t. 2727.—*Brit. Exs.*: Cromb. n. 163; Leight. n. 378.

Well distinguished from *L. varia* by the paler, leprose thallus and the pulverulent margin of the apothecia. In a young state the thallus is thinnish, but subsequently becomes rather thick and spreads extensively. The apothecia are numerous when present (for the plant is often sterile), and become dark-brown and flexuose in age.

Hab. On old pales, chiefly oak, in lowland and upland districts.—*Distr.* Local in S., Central, W. and N. England, but abundant where it occurs.—B. M.: Albourne, Sussex; Finchley, Middlesex; Reigate, Surrey; Epping Forest, Essex; Elstree, Herts; Penshurst, Kent; Gopsall Park, Leicestershire; Stableford, Shropshire; Urpeth Valley, Durham; Asby, Cumberland.

117. *L. conizæoides* Nyl. ex Cromb. Journ. Bot. 1885, p. 195.—Thallus effuse, somewhat thickish, leprose or subleprose, pale- or whitish-yellow (Kf + yellowish, CaCl—). Apothecia lecanorine, submoderate, innato-sessile, pale-yellow or livid-brownish; the thalline margin persistent, crenulate and often inflexed; spores oblong, 0,009–11 mm. long, 0,005–7 mm. thick; hymenial gelatine bluish, then sordid with iodine.

Intermediate between *L. varia* and *L. conizæa*, to which latter the thallus is almost similar, though the spores are more turgid. From *L.*

varia it at once differs in the leprose thallus, though in all other respects it nearly agrees with that species (Nyl. *in litt.*). The margin of the young apothecia is leproso-pulverulent.

Hab. On old beeches (near the roots) and on aged pines in wooded upland tracts.—*Distr.* Only a few localities in E., S., Central, and N. England, but plentiful in these.—B. M.: Near Highbeech, Epping Forest, Essex; New Forest, Hampshire; near Buxton, Derbyshire; Overend, Egremont, Cumberland.

118. *L. expallens* Ach. Lich. Univ. (1810) p. 374.—Thallus effuse, thin or thinnish, leproso-pulverulent, pale-sulphur-coloured (K + yellow, CaCl + orange-red). Apothecia small, lecanorine, subinnate, plane or slightly convex, pale-yellow or flesh-coloured, the thalline margin thin, pulverulent, at length obliterated; spores ellipsoideo-oblong, 0,011–16 mm. long, 0,004–5 mm. thick.—Cromb. *Grevillea*, xviii. p. 69; Leight. Lich. Fl. p. 199 pro parte, ed. 3, p. 184 pro parte.—*Lecidea expallens* Sm. Eng. Fl. v. p. 181 (excl. “on rocks”); Tayl. in Mack. Fl. Hib. ii. p. 127. *Lepraria expallens* Pers. *vide* Ach. *l. c.* *Lecanora varia* ♂. *orosthea* Mudd, Man. p. 150. *Lichen orostheus* Eng. Bot. t. 1549.—*Brit. Exs.*: Larb. Lich. Hb. n. 216.

Easily recognized by the colour of the leprose thallus, which spreads very extensively over the substratum. In more shaded habitats it is somewhat thicker, whitish-sulphureous, sterile, and might readily be taken for a “*Lepraria*.” The apothecia, which are comparatively rare, are usually somewhat scattered, though at times several are subconfluent. The spermogones, which, however, are much more frequent in the following variety, have the spermatia 0,020 mm. long, 0,0009 mm. thick (*vide* Nyl. *in litt.*).

Hab. On the trunks of trees, firs and oaks, and on old pales in lowland and upland districts.—*Distr.* Here and there throughout England and in N. Wales; rare in S.W. and N.W. Ireland; not seen from Scotland, though no doubt it exists there in a leprarioid state.—B. M.: Thetford, Norfolk; Ickworth, Suffolk; Tetsworth, Oxfordshire; New Forest, Hants; near Newton Abbot, Devonshire; Colshorne and Oakley Park, Cirencester, Gloucestershire; Upton, Worcestershire; Dolgelly, Merionethshire; Garn Dingle, Denbighshire; Island of Anglesea; Airyholme Wood and Ripon, Yorkshire; St. Bees, Cumberland. Ballynahinch, Connemara, co. Galway.

Var. *β. lutescens* Nyl. Flora, 1872, p. 248.—Thallus minutely granulato-pulverulent. Apothecia numerous, crowded, at length convex, submoderate, sessile, with the thalline margin inflexed or excluded.—Cromb. *Grevillea*, xviii. p. 69.—*Lecanora lutescens* Cromb. Journ. Bot. 1873, p. 133; Leight. Lich. Fl. ed. 3, p. 164.—*Patellaria lutescens* DC. Fl. Fr. ii. (1805) p. 354.—*Brit. Exs.*: Cromb. n. 65.

Differs from the type, with which it has usually been confounded, in the more granulate thallus, and the larger, sessile apothecia with epulverulent thalline margin. These are often so numerous as almost to obliterate the thallus.

Hab. On the trunks of trees and on old pales, especially fir, in maritime and upland districts.—*Distr.* Probably general in Great Britain, usually plentiful where it occurs; rare in the Channel Islands and S. Ireland.—B. M.: Beauport Bay, Island of Jersey. Lydd, Kent; New Forest, Hants; near Torquay and Totness, S. Devon; Roche, Cornwall; Malvern, Worcestershire; near Ludlow, Herefordshire; Battws-y-Coed and Trefriw, Carnarvonshire; Staveley, near Kendal, Westmoreland; Emmerdale, Cumberland. New Galloway, Kirkcudbrightshire; Barcaldine, Argyshire; Craig Calliach and near Losh Tunnal, Perthshire; near Forfar; Durris, Kincardineshire; Countesswells Wood, near Aberdeen, and Mar Forest, Braemar, Aberdeenshire; Rothiemurchus Woods, Inverness-shire. Glenbower Wood and Castlebernard Park, co. Cork.

Var. *γ. smaragdocarpa* Nyl. Flora, 1872, p. 248, nota 1.—Thallus as in the type. Apothecia bright emerald-green.—Cromb. Grevillea, xviii. p. 69.

From the peculiar colour of the apothecia to be regarded as a distinct variety. In the only British specimen the thallus is scarcely visible, though the apothecia are somewhat crowded, convex, with the margin at length excluded.

Hab. On decorticated stumps of oak in an upland district.—*Distr.* Very rare in Central England.—B. M.: Summit of the Chiltern Hills, Oxfordshire.

Subsp. *L. inversa* Nyl. Flora, 1879, p. 361.—Thallus nearly as in the type. Apothecia small, the thalline margin distinct, persistent, subentire, epulverulent; spores not seen.—Cromb. Grevillea, xviii. p. 69.

As observed by Nylander *l.c.* the thallus (which is somewhat firmer) agrees in the reaction with *L. expallens*, while the thalline margin of the apothecia is subsimilar to that of *L. varia*. Were the spores known, it might probably be a distinct species.

Hab. On the branches of furze in an upland district.—*Distr.* Only a fragmentary specimen from S.W. Ireland (s. n. *Lecanora albo-flavida* Tayl. nov. sp.).—B. M.: Finnechy River, co. Kerry.

119. *L. symmetrica* Ach. Syn. (1814) p. 340; Nyl. Flora, 1872, p. 249.—Thallus subeffuse, thin or very thin, subleprose or minutely granulose, pale yellowish-green or whitish-straw-coloured (K + yellow, CaCl + orange). Apothecia small, biatorine, at first plane with thin, entire margin, speedily convex and immarginate, pale-yellow or pale-testaceous, partly olivaceous; spores oblong, 0.011–14 mm. long, 0.004–5 mm. thick; paraphyses slender, not very well discrete; hymenial gelatine bluish, then sordid-yellow with iodine.—Cromb. Grevillea, xviii. p. 69.—*Lecanora symmetrica* Leight. Lich. Fl. ed. 3, p. 183 (excl. vars.). *Lecanora varia* ζ. *symmetrica* Ach. Lich. Univ. (1810) p. 379; Mudd, Man. p. 150 pro parte; Cromb. Lich. Brit. p. 52 pro parte; Leight. Lich. Fl. ed. 1, p. 193 pro parte.

May be recognized from its more immediate allies chiefly by the con-

stantly biatorine apothecia and by the thalline reaction with CaCl. In the few British specimens seen the thallus is comparatively small and determinate; but the apothecia are numerous and occasionally 2-3-aggregate. The spermogones are only very sparingly present, with spermatia 0,018-20 mm. long, 0,0005 mm. thick.

Hab. On trunks of firs and on old pales in maritime and upland tracts.—*Distr.* Seen only from a few localities in S. England, N. Wales, the S.W. Highlands of Scotland and S.E. Ireland: no doubt to be detected elsewhere.—B. M.: Lyndhurst, New Forest, Hants; Island of Anglesea. Appin, Argyleshire. Great Island, co. Cork.

Var. β . *sæpincola* Nyl. Flora, 1872, p. 249.—Thallus effuse, granulose or granuloso-unequal, at times subevanescent. Apothecia biatorine-lecideine, convex, sordid-reddish or blackish; spores occasionally thinly 1-septate, 0,010-17 mm. long, 0,004-5 mm. thick.—Leight. Lich. Fl. ed. 3, p. 183; Cromb. Grevillea, xviii. p. 69.—*Lecanora varia* var. *sæpincola* Cromb. Lich. Brit. p. 52; Leight. Lich. Fl. ed. 1, p. 193.—*Lecidea sæpincola* Ach. Syn. (1814) p. 35.

Evidently referable to this species, of which it is a good variety, differing in the colour of the apothecia and the rather longer, less simple spores. The thalline reaction with CaCl at once keeps it distinct from var. β of the following species, with which it might be confounded.

Hab. On old pales in upland situations.—*Distr.* Local in N. England and among the Grampians, Scotland.—B. M.: Hart, Durham; Lamplugh, Cumberland. Killin, Perthshire; Crathie, Braemar, Aberdeenshire.

120. *L. symmictera* Nyl. Flora, 1872, p. 249.—Thallus effuse, subleprose or subgranulose, yellowish-straw-coloured (K + yellow, CaCl—). Apothecia small, biatorine, convex, concolorous with the thallus, pale or dark-olivaceous, the margin excluded; spores oblong, 0,010-15 mm. long, 0,003-5 mm. thick; hymenial gelatine bluish, then tawny with iodine.—Cromb. Journ. Bot. 1873, p. 133; Leight. Lich. Fl. ed. 3, p. 200.—*Brit. Ears.*: Mudd, n. 117; Larb. Lich. Hb. n. 130.

Subsimilar to the preceding species, with which till recently it has been confounded, but differs at once in the reaction with CaCl. In Britain it is a much more common plant, with the thallus spreading extensively and the apothecia numerous. The spermogones are frequent with spermatia as in *L. symmicta*.

Hab. On old pales and the trunks of trees in maritime and upland districts.—*Distr.* General in Great Britain; rare in the Channel Islands; not seen from Ireland.—B. M.: Beauport, Island of Jersey. Henfield, Sussex; Lyndhurst, New Forest, Hants; near Bovey Tracey, S. Devon; near Penzance, Cornwall; near Minety, Wiltshire; Millhill, Middlesex; Gamlingay, Cambridgeshire; Dolgelly, Merionethshire; Island of Anglesea; near Ayton, Cleveland, Yorkshire; Levens, Westmoreland. New Galloway, Kirkcudbrightshire; Blairdrummond, near Stirling; Finlarig, Killin, and Ben Lawers, Perthshire; Nigg, Kincardineshire; Crathie, Braemar, Aberdeenshire.

Var. β . *aitema* Nyl. Flora, 1873, p. 229.—Thallus somewhat thickish, leprose, bright yellow. Apothecia small or submoderate, convex, lecideoid, black; spores 0.012–17 mm. long, 0.0045–55 mm. thick.—Cromb. Grevillea, xviii. p. 69.—*Lecanora varia* var. *aitema* Cromb. Lich. Brit. p. 52; Leight. Lich. Fl. p. 192. *L. symmicta* var. *aitema* ed. 3, p. 183. *Lecidea aitema* Ach. Lich. Univ. (1810) p. 178. *Lecanora varia* ζ . *denigrata* (non Fr.), Mudd, Man. p. 151.—*Brit. Evs.*: Cromb. n. 66; Larb. Lich. Hb. n. 255; Mudd, n. 118.

Looks entirely as if a *Lecidea*, near *L. parasema*. It is, however, only a variety of this species, with which it agrees in the reactions, but differs in the more leprose thallus and the colour of the apothecia. The thallus at times occurs in small determinate maculae and is always well fertile, the apothecia being colourless within. A state in which there are few or no traces of a thallus, with the apothecia crowded and often less convex, is form *depauperata* Cromb. Grevillea l. c.

Hab. On old palings in upland districts.—*Distr.* Not infrequent in Great Britain; not seen from Ireland or the Channel Islands.—B. M.: Near Lyndhurst, New Forest, Hamp-shire; Shanklin, Isle of Wight; Dartmoor, S. Devon; near Millhill, Middlesex; near Gamlingay, Cambridge-shire; Battersby, Cleveland, Yorkshire; Alston, Cumberland. Finlarrig, Kenmore, and Glen Lyon, Killin, Glen Fender, Blair Athole, Perthshire; Crathie, Braemar, Aberdeenshire; Rothiemurchus, Inverness-shire.

121. *L. trabalis* Nyl. Flora, 1877, p. 458.—Thallus effuse, glebuloso-granulate, subverrucoso-diffract, thinnish or submoderate, greyish (K+yellowish, CaCl—). Apothecia small, adnate, somewhat convex, immarginate, pale-livid, sordidly pale-testaceous or livid-blackish; spores rarely spuriously 1-septate, oblong, 0.009–0.014 mm. long, 0.0035–45 mm. thick; epithecium granulose, paraphyses slender; hymenial gelatine bluish, then subincolorous (the thecæ subpersistently bluish) with iodine.—*Lecidea sapincola* var. *trabalis* Ach. Syn. (1814) p. 35.

Allied to *L. symmictera*, of which Nylander l. c. says it may perhaps be a subspecies. In the British specimens, one of which was recently determined by him, the thallus is chiefly dark-grey from age. The apothecia are numerous and often difformi-connate.

Hab. On a decorticated stump of hornbeam oak in a wooded upland tract.—*Distr.* As yet only sparingly in E. England.—B. M.: Highbeech, Epping Forest, Essex.

122. *L. piniperda* Koerb. Par. Lich. (1865) p. 81.—Thallus effuse, thin, verruculoso-leprose, whitish (Kf+yellowish, CaCl—). Apothecia minute, plane or convex, subcarneous or brownish, pruinose, the thalline margin pale, thin, entire, or subcrenulate, at length excluded; spores oblongo-ellipsoid, 0.008–12 mm. long, 0.004–5 mm. thick; hymenial gelatine deep blue, then tawny with iodine.—Cromb. Journ. Bot. 1873, p. 133; Leight. Lich. Fl. ed. 3. p. 174.—*Brit. Evs.*: Leight. n. 176; Cromb. n. 160.

May readily be distinguished from the allied species by the colour of the thallus and of the minute apothecia. These are usually crowded, at first concave, becoming in age convex and immarginate. The spermogones, rarely visible in our specimens, have the spermatia 0,011 mm. long.

Hab. On old pales and the trunks of firs in lowland and upland situations.—*Distr.* Only a few localities in Great Britain and Ireland; no doubt often overlooked.—B. M.: Near Millhill and Edgware, Middlesex; near Worcester; Tugford Churchyard, Shropshire. Appin, Argyleshire; near Loch Tummel, Perthshire. Maam, Connemara, co. Galway.

Var. β . *ochrostoma* Koerb. Par. Lich. *l. c.*—Apothecia subbiatorine, convex, yellowish- or rusty-red, epruinose, immarginate.—*Leight. Lich. Fl. ed. 3, p. 174 (excl. loc. cit.)*; *Cromb. Grevillea, xviii. p. 69.*

Differs in the form and colour of the naked biatoroid apothecia. In the few British specimens seen the thallus is almost obsolete.

Hab. On old pales in wooded districts.—*Distr.* Only sparingly in S. and W. England.—B. M.: New Forest, Hants; Braydon Forest, Wiltshire.

Subsp. *L. glauccella* Nyl. *ex Cromb. Grevillea, xix. (1891) p. 60.*—Thallus glaucescent, at times subevanescent. Apothecia sublivid, glauco-pruinose, the thalline margin entire, subpersistent; spores 0,009–13 mm. long, 0,003–4 mm. thick.—*Lecanora albella* var. *glauccella* Flot. Lich. Exs. n. 348 (1850).

Characterized by the colour of the thallus and apothecia, which entitle it to rank as a subspecies according to Nyl. *in litt.* The few British specimens are well fertile.

Hab. On the bark of pine trees in an upland district.—*Distr.* As yet only very sparingly in N.W. England.—B. M.: Staveley, near Kendal, Westmoreland.

123. *L. fugiens* Nyl. *Flora, 1873, p. 289.*—Thallus effuse, very thin, granulate, scattered, glaucous or pale-whitish-yellow (K + yellow, CaCl + orange). Apothecia minute, sessile, whitish-isabelline, the thalline margin entire or sometimes crenulate; spores ellipsoid, 0,009–0,013 mm. long, 0,005–6 mm. thick; paraphyses slender; hymenial gelatine bluish, then (especially the thecæ) tawny wine-coloured with iodine.—*Cromb. Grevillea, ii. p. 89*; *Leight. Lich. Fl. ed. 3, p. 184.*

Near *L. piniperda* (ex Nyl. *l. c.*), but is well distinguished by the characters given. In the two specimens seen the thallus is scattered with the granules scarcely, or rarely, conrescent. The minute apothecia are scattered, or here and there a few together. The spermogones have the spermatia arcuate, 0,012–16 mm. long, 0,0005 mm. thick.

Hab. On rocks in maritime districts.—*Distr.* Extremely local and scarce in the Channel Islands and N.W. Ireland.—B. M.: Ríozel, Island of Jersey. Near Salrock, Connemara, co. Galway.

124. *L. metaboloides* Nyl. Flora, 1872, p. 250.—Thallus effuse, subgranulose, thin, whitish, often evanescent (K+yellow, CaCl—). Apothecia small, biatoroid, at first plane and thinly margined, then convex, immarginate, pale, livid-brown or blackish, naked or slightly pruinose; spores oblongo-ellipsoid, 0,007–11 mm. long, 0,0035 mm. thick; hymenial gelatine persistently bluish with iodine.—Cromb. Journ. Bot. 1882, p. 274. To this, *vide* Nyl. Flora, 1881, p. 184, is referable *Biatora sarcopisioides* Mass. Rich. Lich. (1852) p. 128; *Lecidea minuta* var. *sarcopisioides* Cromb. Lich. Brit. p. 69; Leight. Lich. Fl. p. 266, ed. 3, p. 264. This, however, is a mere state of Nylander's plant, whose name has a wider and more definite signification.—*Brit. Exs.*: Cromb. n. 162 pro parte.

Looks quite a *Biatora*, but the spermogones show its true relation. It is a somewhat variable plant both as to thallus and apothecia, though the differences in these merely indicate states resulting from habitat. The thallus is seldom well developed, and usually is entirely obsolete. At times it is dark-greyish with blackish apothecia (form *obscurior* Cromb. Grevillea, xviii. p. 69). It spreads very extensively over the substratum, and is always abundantly fertile.

Hab. On old pales, decorticated stumps of trees, rarely on stems of gorse, in maritime and upland wooded tracts.—*Distr.* Sparingly in S.W. and N. England: abundant among the S. and Central Grampians, Scotland.—B. M.: Shanklin, Isle of Wight; New Forest, Hampshire; Stiperstones, Shropshire; Cleveland, Yorkshire; Emmerdale, Cumberland. Achmore, Glen Lochay and Finlarig, Killin; Glen Fender, Blair Athole, Perthshire.

125. *L. polytropa* Schaer. Enum. (1850) p. 81 pro parte; Nyl. Flora, 1872, p. 251.—Thallus subdeterminate or effuse, granulated- or rimoso-areolate, or subsquamulose, pale sulphur-coloured or yellowish-green, often subevanescent (K+yellowish, CaCl—); hypothallus, when present, thin, black. Apothecia small or moderate, adnate, usually biatorine, at first plane with thin, entire, subflexuose margin, at length convex, with the margin excluded, yellowish-flesh-coloured or pale-testaceous; spores ellipsoid, 0,010–13 mm. long, 0,005–6 mm. thick: paraphyses slender or not well discrete; hymenial gelatine bluish, then sordid-violet with iodine.—Cromb. Grevillea, xviii. p. 69; Mudd, Man. p. 151; Leight. Lich. Fl. p. 197, ed. 3, p. 180.—*Lecanora varia* var. *polytropa* Cromb. Lich. Brit. p. 52. *Lecidea polytropa* Gray, Nat. Arr. i. p. 475; Sm. Eng. Fl. v. p. 185. *Lecidea Ehrhartiana* β . *polytropa* Hook. Fl. Scot. ii. p. 40. *Lichen polytropus* Ehrh. Crypt. (1793) n. 294; Dicks. Crypt. fasc. iv. p. 22; Eng. Bot. t. 1264 (two lower figs.).—*Brit. Exs.*: Leight. n. 179 (atypical).

Often regarded as only a saxicolous variety of *L. varia*, this has now been definitely separated by Nylander on account of the different characters it presents. At the same time it is a very variable species both as to the thallus and apothecia. The thallus, which frequently spreads extensively, varies in thickness and at times is scarcely, if at all, visible, whence var. *acrustacea* Schaer, Mudd, Man. p. 151; Leight. Exs. cit. A

condition of this with small apothecia is var. *κ. illusoria* Ach. Lich. Univ. p. 380, Cromb. Lich. Brit. *l. c.* (non Leight. Lich. Fl. *ll. c.*). The apothecia are variable in size, usually very numerous so as almost to obliterate the thallus, and at times in old plants several are conglomerate. The sperm-gones, which are also frequent, are punctiform, immersed, dark-brown or blackish.

Hab. On rocks, boulders, and walls in maritime and mountainous districts.—*Distr.* General in Great Britain and Ireland, plentiful among the Grampians, Scotland; rare in the Channel Islands.—B. M.: La Moye, Island of Jersey. Bolt Head, S. Devon; near Penzance, Cornwall; Aberdovey, Merionethshire; Nesscliffe Hill, Shropshire; Cliffig, (Leve-land, Yorkshire; Eglestone, Durham; Keswick, Cumberland. Appin, Argyleshire, Ben Lawers and Craig Tulloch, Perthshire; Portlethen, Kincardineshire; Ben-naboord, Braemar, Aberdeenshire; Ben Nevis, Inverness-shire. Kinsale, co. Cork; Derryquin, near Dunkerron, co. Kerry; Doughruagh mts.; Connemara, co. Galway.

Form 1. *efflorescens* Cromb. Grevillea, xviii. (1890) p. 69.—Thallus sprinkled here and there with pale-yellowish soredia. Apothecia small, plane or somewhat convex, usually immarginate.

Apparently a rare condition not previously observed, but resulting no doubt from the habitat. The soredia are yellowish with K. It is very different from *L. epanora*.

Hab. On shaded stones of a schistose wall in an upland district.—*Distr.* Only very sparingly on one of the Central Grampians, Scotland.—B. M.: Craig Tulloch, Blair Athole, Perthshire.

Form 2. *alpigena* Schaer. Enum. (1850) p. 81. Thallus rimoso-areolate, pale yellow. Apothecia large, appressed, plane or convex, concolorous, the thalline margin paler, flexuose.—Leight. Lich. Fl. p. 197, ed. 3, p. 181.—*Lecanora varia* var. *ι. alpigena*, Ach. Lich. Univ. (1810) p. 381 (excl. vars.).

Evidently confluent with the type, differing chiefly in the larger paler apothecia. These at length become convex, more or less aggregate, with the thalline margin excluded.

Hab. On schistose rocks in alpine places.—*Distr.* Very rare on one of the S. Grampians, Scotland.—B. M.: Ben Lawers, Perthshire.

Form 3. *subglobosa* Cromb.—Thallus effuse, thin, granulate, greenish-yellow, often nearly obsolete. Apothecia small, numerous, convex or subglobose, greenish-yellow or sub-brownish, immarginate.—*Lecanora polytropa* var. *ζ. conglobata* (non Flot.) Mudd, Man. p. 152, form *conglobata* (non Somm.) Leight. Lich. Fl. p. 197, ed. 3, p. 180. *Lecanora varia* var. *polytropa* form *conglobata* (non Somm.) Cromb. Lich. Brit. p. 52.—*Brit. Eas.*: Leight. n. 152; Mudd, n. 120.

In this form, as observed by Leighton *ll. c.*, the crowded apothecia are yet distinct, though at times scattered and confluent. The thallus is sometimes scarcely visible, when, except in the shape of the apothecia, it differs little from the so-called var. *illusoria* Ach. As the young apothecia,

however, are plane and margined, it is, like the preceding form, confluent with the type.

Hab. On rocks, boulders, and walls in upland and subalpine districts.—*Distr.* Local in N. Wales, W. and N. England, and among the Grampians, Scotland.—B. M.: Dolgelly, Merionethshire; near Oswestry, Shropshire; Guisboro' and Ayton Moors, Cleveland, Yorkshire. Ben Lawers and Craig Tulloch, Perthshire; Morrone, Braemar, Aberdeenshire.

Subsp. *L. intricata* Nyl. Flora, 1872, p. 251.—Thallus determinate, thinnish or submoderate, areolato-diffract, subeffigurate at the circumference, yellowish-white or greyish-yellow (K + yellowish, CaCl—); hypothallus black, often limiting the thallus. Apothecia small, adnate, plane or somewhat convex, lecanorine, or at length often sublecideine, variable in colour, sordid-pale-testaceous, brownish, olive or blackish; spores ellipsoid or oblongo-ellipsoid, 0.010–12 mm. long, 0.005–7 mm. thick.—Cromb. Grevillea, xviii. p. 69.—*Lecanora intricata* Tayl. in Mack. Fl. Hib. ii. p. 137; Leight. Lich. Fl. p. 198, ed. 3, p. 181. *L. polytropus* *ε. intricata*, Mudd, Man. p. 152; Cromb. Lich. Brit. p. 52. *Lecidea intricata* Sm. Eng. Fl. v. p. 185. *Lichen intricatus* Schrad. Journ. Bot. (1881) p. 72.—*Lichen polytropus* Eng. Bot. t. 1264, two upper figs. *Lecanora polytropus* *γ. alpigena* Mudd, Man. p. 152, is merely a state of this.—*Brit. Exs.*: Leight. n. 153; Mudd, n. 119.

Well distinguished as a subspecies by the more distinct hypothallus and the colour of the usually lecanorine apothecia, which, however, are at length often lecideino-biatorine and immarginate. A lignicolous condition, differing from the type merely in the thallus being more effuse and the hypothallus less distinct, is rarely met with in the Highlands of Scotland.

Hab. On rocks, boulders and walls, rarely on old palings, in maritime and mountainous districts.—*Distr.* Somewhat local and much less common than the type, in N. Wales, N. England, among the Scottish Grampians, and in W. Ireland.—B. M.: Barmouth and Dolgelly, Merionethshire; Llyn Geirionydd, Carnarvonshire; Bodbury Ring, near Church Stretton, Shropshire; Ingleby and Kildale, Yorkshire; Egglestone, Durham; Staveley, Westmoreland; Swinhope, Northumberland; Crianlarch, Killin, Ben Lawers, Craig Tulloch, Perthshire; Portlethen, Kincardineshire; Morrone, Braemar, Aberdeenshire; Ben Nevis, Invernessshire. Dunkerron, co. Kerry.

Var. *β. leptacina* Nyl. ex Stiz. St. Gall. Nat. Ges. 1882, p. 351.—Thallus small, thin, granulato-squamulose, straw-coloured, the granules smooth, crenate (K + yellowish, CaCl—). Apothecia moderate, plane, olive or blackish, obsoletely yellowish-suffused, the thalline margin persistent, usually crenulate; spores 0.010–12 mm. long, 0.005–6 mm. thick.—Cromb. Grevillea, xviii. p. 69.—*Lecanora varia* subsp. *leptacina* Cromb. Journ. Bot. 1873, p. 134; Leight. Lich. Fl. ed. 3, p. 177. *Lecanora leptacina* Somm. Lapp. Suppl. (1826) p. 96. *Lecanora varia* form *terrestris* Cromb. Lich. Brit. p. 52; Leight. Lich. Fl. p. 193.

Looks at first sight a distinct species, but is evidently referable to subsp. *intricata*. It is, however, a very well-marked variety characterized by the constantly lecanorine apothecia and the peculiar habitat. The hypothallus also is not distinctly visible. The apothecia are numerous and crowded.

Hab. On tufts of mosses (*Grimmias* and *Andreæas*) upon boulders in alpine places.—*Distr.* Only very sparingly on the summits of two of the Grampians, Scotland.—B. M.: Ben Lawers, Perthshire; Ben-naboord, Braemar, Aberdeenshire.

126. *L. stenotropa* Nyl. Flora, 1872, p. 251.—Thallus subeffuse, thin, yellowish-green; otherwise as in the preceding species. Apothecia small, convex, immarginate, pale-yellowish; paraphyses thickish: spores ellipsoid, 0.010–12 mm. long, 0.003–4 mm. thick: hymenial gelatine bluish, then sordidly wine-coloured with iodine. Cromb. Grevillea, xviii. p. 69.

The thallus is little visible in the single authentic British specimen (determined by Nylander) which, however, is well fertile. It differs from *L. polytropæ*, of which it may be but a subspecies, only in the thicker paraphyses and thinner spores.

Hab. On schistose stones of a wall in an upland district (associated with *Lecidea leucophæa* Flerke).—*Distr.* Only very sparingly on one of the Central Grampians, Scotland.—B. M.: Craig Tulloch, Blair Athole, Perthshire.

127. *L. subintricata* Nyl. Flora, 1872, p. 249.—Thallus effuse, very thin, granulose, ochroleucous or sordid-greyish, often obsolete (Kf+yellowish, CaCl—). Apothecia small, plane or slightly convex, biatoroid, variable in colour, yellowish, brown, olive, livid-brown or blackish, the margin thin, entire or excluded; spores ellipsoideo-oblong, 0.007–10 mm. long, 0.003–4 mm. thick; paraphyses slender: hymenial gelatine bluish with iodine.—Cromb. Journ. Bot. 1873, p. 133 (excl. form *obscurior*): Leight. Lich. Fl. ed. 3, p. 177 pro parte.—*Lecanora varia* var. *subintricata* Nyl. Flora, 1868, p. 478.—*Brit. Evs.*: Cromb. n. 162 pro parte.

As observed by Nylander, this is intermediate in appearance between *L. symmictæ* var. *sepincola* and *L. polytropæ* subsp. *intricata*. It is, however, well distinguished from both by the smaller spores and the character of the spermatia. The thallus, elsewhere somewhat variable, is almost evanescent in the British specimens. Both apothecia and spermogones are numerous, the latter with spermatia thinly acicular, abolutely or very slightly arcuate, 0.006–7 mm. long, 0.0005 mm. thick.

Hab. On old pales in an upland district.—*Distr.* As yet found only among the Central Grampians, Scotland. B. M.: Glen Fender, Blair Athole, Perthshire.

128. *L. sarcopis* Ach. Syn. (1814) p. 176; Nyl. Flora, 1869, p. 412.—Thallus subeffuse, thinnish or submoderate, granulose, yellowish-grey or sordid-yellow (K+yellow, CaCl—). Apothecia

lecanorine, small, plane or slightly convex, reddish-flesh-coloured or reddish, the thalline margin persistent, crenulate; spores ellipsoid, 0,008-12 mm. long, 0,006-8 mm. thick; hymenial gelatine bluish (the thecae often persistently), then tawny-wine-red with iodine. —Cromb. Grevillea, xviii. p. 69; Leight. Lich. Fl. p. 187 pro parte, ed. 3, p. 174 pro parte.—*Lecanora varia* subsp. *sarcopis* Cromb. Lich. Brit. p. 52 pro parte. *Parmelia sarcopis* Wahl. in Ach. Meth. Suppl. (1803) p. 40. To this is also referable *L. sarcopis* subsp. *homopis* Nyl. Flora, 1872, p. 251 (cfr. Nyl. Flora, 1881, p. 184).

A plant apparently constant to its type, and from the characters given sufficiently diverse from the others of this subsection. It is also, and more especially, distinguished by the form of the spermatia. The apothecia in our specimens are numerous, and the spermogones are not unfrequent. These have the spermatia crescent-shaped, 0,009-11 mm. long, 0,0025 mm. thick (ex Nyl. in litt.).

Hab. On old (indurated) pales in upland districts.—*Distr.* Only sparingly in N. England and the Scottish Highlands.—B. M.: Near Carlton, Cleveland, Yorkshire. Glen Lyon, Perthshire; Glen Dee, Braemar, Aberdeenshire; Glen Morriston, Inverness-shire.

129. *L. effusa* Ach. Lich. Univ. (1810) p. 386.—Thallus effuse, thin, subleprose, sordid-yellow (K + yellowish, CaCl—), at times subevanescent. Apothecia lecanorine, plane, pale-reddish-brown; the thalline margin thin, subpulverulent or subcrenulate, at length convex, biatorine, immarginate; spores 0,008-12 mm. long, 0,005-7 mm. thick.—Cromb. Grevillea, vi. p. 21.—*Lichen effusus* Pers. in Hoffm. Deutsch. Fl. ii. (1795) p. 174. *Lecanora varia* β . *sarcopis* Mudd, Man. p. 150 pro maxima parte; Cromb. Lich. Brit. p. 52 pro maxima parte; Leight. Lich. Fl. p. 187, et ed. 3, p. 174 pro maxima parte.—*Brit. Exs.*: Cromb. n. 161.

According to Nylander (Flora, 1872, p. 249) this may be only a variety of the preceding with less developed thallus. It differs also in the apothecia becoming biatoroid. The spermogones are as in *L. sarcopis*, but are less frequently seen, at least in our specimens.

Hab. On old pales, rarely decorticated stumps of trees, in maritime, lowland, and upland tracts.—*Distr.* Here and there throughout England; rare in Scotland and the Channel Islands; not seen from Ireland.—B. M.: Beauport Bay, Island of Jersey. Near Lewes, Sussex; Lyndhurst, New Forest, Hants; Penzance, Cornwall; Gopsall Park, Leicestershire; Norton, near Worcester; near Ayton, Cleveland, Yorkshire; Teesdale, Durham; Levens, Westmoreland. Loch Katrine and Killin, Perthshire; Crathie, Braemar, Aberdeenshire.

130. *L. argopholis* Ach. Lich. Univ. (1810) p. 346; Nyl. Lich. Scand. p. 166.—Thallus subdeterminate, verrucoso-(glabuloso-) granulate, firm, whitish-straw-coloured, whitish-yellow or whitish, the granules contiguous, imbricate, subcrenate at the circumference (K + yellow, CaCl—). Apothecia moderate, sessile, plane or convex, brownish-black, the thalline margin entire or crenate, persistent;

spores oblongo-ellipsoid, 0,011–18 mm. long, 0,007–9 mm. thick; hymenial gelatine bluish, then sordid with iodine.—Cromb. Lich. Brit. p. 52; Leight. Lich. Fl. p. 196, ed. 3, p. 180; Sm. Eng. Fl. v. —*Parmelia argopholis* Wahl. in Ach. Meth. Suppl. (1803) p. 32.

Varies considerably in the colour of the thallus, which in the British specimens is usually whitish, so that these might be taken for *L. gangaleoides*, but for the character of the thalline granules and the often crenate margin of the apothecia. These are numerous and crowded, becoming somewhat angulose. The spermatogones are frequent with the usual arcuate spermatia of this subsection.

Hab. On rocks in hilly and mountainous districts.—*Distr.* Apparently local in S.W. and N. England, N. Wales, the S.W. Highlands and the S. Grampians, Scotland, and N.W. Ireland.—B. M.: Cleve Hill, Somersetshire; Trefriw, Carnarvonshire; Pugh Crag, Westmoreland; Gunnerton Craggs, Northumberland Achosragan Hill, Appin, Argyleshire; Craig Calliach and Ben Lawers, Perthshire. Near Letter Hill, Connemara, co. Galway.

131. *L. frustulosa* Ach. Lich. Univ. (1810) p. 405; Nyl. Lich. Scand. p. 166.—Thallus subdeterminate, thickish, verrucoso-areolate or glebuloso-verrucose, whitish-yellow or white-sulphur-coloured, the glebules usually discrete, subradiately effigurate (K+ yellowish, CaCl—). Apothecia small, sessile, plane or somewhat convex, brownish-black; the thalline margin thickish, entire or suberenate, at length excluded; spores oblongo-ellipsoid, 0,010–12 mm. long, 0,005–6 mm. thick; paraphyses coherent, brownish at the apices; hymenial gelatine bluish, then sordid with iodine.—Hook. Fl. Scot. ii. p. 48; Sm. Eng. Fl. v. p. 189; Mudd, Man. p. 145; Cromb. Lich. Brit. p. 52; Leight. Lich. Fl. p. 196, ed. 3, p. 179.—*Rinodina frustulosa* Gray, Nat. Arr. i. p. 451. *Lichen frustulosus* Dicks. Crypt. fasc. iii. (1793) p. 13, t. 8. f. 10; With. Arr. ed. 3, iv. p. 19; Eng. Bot. t. 2273.—*Brit. Ews.*: Leight. n. 293; Cromb. n. 165.

Sometimes regarded as a variety of the preceding, to which it is nearly related, but is sufficiently distinguished by the characters given of the thallus and apothecia, as also by the altitude at which it grows in this country. It is rather a fine plant, conspicuous by the colour of the thallus amongst the darker cryptogamic vegetation with which it is associated on the rocky ledges. At times it is well fertile, though the apothecia are more or less scattered.

Hab. On mica-schist rocks in alpine situations.—*Distr.* Only, with certainty, on two of the S. Grampians, Scotland; reported by Dickson from Yorkshire, but this is extremely doubtful, and by Leighton erroneously from the Island of Anglesea.—B. M.: Summits of Craig Calliach and Ben Lawers and above Loch-na-Gat, Ben Lawers, Perthshire.

132. *L. chlorophæodes* Nyl. Flora, 1873, p. 290.—Thallus effuse, verrucoso-granulate, moderate, yellowish-glaucous, the granules subdispersed or conglomerate (K+ yellow, K (CaCl) + orange-red). Apothecia moderate, somewhat plane or convex, reddish-brown

or testaceo-reddish, the thalline margin thickish, crenate; spores ellipsoid, 0,009-11 mm. long, 0,006-8 mm. thick; paraphyses moderate, granulato-inspersed, not very discrete, epithecium brownish; hymenial gelatine bluish, then yellow (the thecae tawny-yellow) with iodine.—Cromb. Journ. Bot. 1874, p. 148; Leight. Lich. Fl. ed. 3, p. 184.

More closely allied to *L. subventosa* Nyl., a North-American plant, than to any British species of this section. In the two specimens seen the thallus is more or less scattered, with the hypothallus scarcely visible. The apothecia in these are either scattered or crowded: the spermogones are seldom present.

Hab. On granitic rocks in a maritime district.—*Distr.* Only sparingly in the Channel Islands; (erroneously recorded by Leighton from N.W. Ireland).—B. M.: Vale Castle, Island of Guernsey.

e. Thecae polyspored.

133. *L. Sambuci* Nyl. Lich. Scand. (1861) p. 168.—Thallus effuse, very thin, granulose or subleprose, whitish or greyish, often nearly evanescent (Kf+ yellowish, CaCl—). Apothecia minute, plane, brown or reddish-brown, the thalline margin persistent, more or less crenulate, white; spores 12-16-32 μ (rarely 8 μ), ellipsoid, 0,008-12 mm. long, 0,005-7 mm. thick; hymenial gelatine bluish, then pale-violet with iodine.—Carroll, Journ. Bot. 1866, p. 23; Cromb. Lich. Brit. p. 53; Leight. Lich. Fl. p. 186, ed. 3, p. 171.

A rather inconspicuous plant resembling *L. Hageni*, from which it is well distinguished by the numerous spores. These in the single British specimen seen are usually 12 μ , though they vary in plants from other countries from 8 μ to 32 μ in the same apothecium. The thallus, when whitish, gives a positive reaction with K, as stated by Th. M. Fries (Lich. Scand. p. 248), but this is scarcely visible in our specimen, in which the thallus is nearly evanescent.

Hab. On trunks of trees, chiefly poplars, in upland tracts.—*Distr.* Very sparingly among the S. Grampians, Scotland, and in N.E. Ireland (co. Armagh).—B. M.: Craig Calliach, Perthshire.

F. Apothecia usually biatoroid; spores 8 μ or 16 μ , simple or 1-3-septate, colourless; hymenial gelatine variously tinged with iodine. Spermogones with simple sterigmata and arcuate spermatia. (*Lecania* Mass. Alcen. Gen. (1853) p. 12.)

134. *L. erysibe* Nyl. Mém. Soc. Cherb. t. v. (1857) p. 114, Lich. Scand. p. 167.—Thallus effuse, thin, diffract, leproso-granulose, greyish- or greenish-olive, or sordid-greyish (K—, CaCl—). Apothecia small, innato-sessile, plane or convex, brownish-red or livid-testaceous, the thalline margin little distinct or evanescent; spores oblongo-ellipsoid, simple or often thinly 1-septate, 0,010-16 mm. long, 0,004-6 mm. thick; hymenial gelatine bluish with iodine.—Cromb. Lich. Brit. p. 53; Leight. Lich. Fl. p. 228, ed. 3, p. 218.—

Lecania erysibe Mudd, Man. p. 141 pro parte, t. ii. f. 47.—*Lichen erysibe* Ach. Prodr. (1798) p. 50.—*L. erysibe* β . *Rabenhorstii* (Hepp), Mudd, Man. *l. c.* is entirely confluent with the type.—*Brit. Eas.*: Mudd, nos. 104, 105.

A very variable plant, the differences in the thallus and apothecia of which give rise to the forms, varieties, and subspecies that follow. With its usually biatoroid apothecia it is at times not unlike *Lecidea rubella* (Ehrh.), of which Acharius (Lich. Univ. p. 196) makes it a variety. The apothecia are occasionally aggregate, and become darker in age. The spermatogones, which are not very frequent in our specimens, have the spermatia 0.015–18 mm. long, 0.0005 mm. thick.

Hab. On rocks, very rarely on decorticated trunks of trees, in maritime and upland districts.—*Distr.* Here and there throughout Great Britain; apparently rarer in the Channel Islands and Ireland.—*B. M.*: St. Aubin's Fort, St. John's and St. Brelade's (lignicolous), Island of Jersey. Rottingdean Cliffs, Sussex; near Torquay, S. Devon: near Penzance, Cornwall; Norton, Worcestershire; near Ayton and Coatham, Cleveland, Yorkshire; St. Bees, Cumberland. Island of Lismore and Barcaldine, Argyleshire; Portlethen, Kincardineshire; Craig Guie, Braemar, Aberdeenshire. Lower Glanmire Road, co. Cork; near Kilkee, co. Clare; co. Down.

Form *cinereofusca*, Cromb. Grevillea, xviii. (1890) p. 69.—Thallus very thin, greyish-brown. Apothecia minute, plane, at length convex, dark-brown, slightly pruinose; spores indistinctly 1-septate, often 2-3-nucleolate.—*Lecania erysibe* var. δ . *cinereofusca* Mudd, Man. (1861) p. 141, t. 2. f. 48.—*Brit. Eas.*: Mudd, n. 106.

Only a form with thinner thallus and smaller subpruinose apothecia, the pruina disappearing in age. Apparently it is confluent with the type and results from the habitat.

Hab. On rocks and walls in maritime and upland tracts.—*Distr.* Only sparingly in S., W., and N. England.—*B. M.*: Hastings, Sussex; Crowle, near Worcester; near Ayton, Cleveland, Yorkshire.

Var. β . *sincerior* Nyl. Flora, 1876, p. 577.—Thallus subgranulate, areolato-rimose, pale-greyish or subochraceo-whitish. Apothecia lecanorine, pale-brown, the thalline margin persistent.—Cromb. Grevillea, v. p. 108; Leight. Lich. Fl. ed. 3, p. 219.

Differs in the colour of the more granulate thallus and in the persistently lecanorine apothecia. Nylander *l. c.* observes that it may rank as a subspecies.

Hab. On schistose and arenaceous rocks and walls in maritime tracts.—*Distr.* Found sparingly in the Channel Islands, S. and N. England, and N.W. Ireland.—*B. M.*: La Coupe, Island of Jersey. Hastings, Sussex; near Torpoint, S. Devon; St. Bees, Cumberland; North Tyne, Northumberland. Lettermore, Connemara, co. Galway.

Subsp. 1. *L. albariella* Nyl. Flora, 1881, p. 454.—Thallus areolato-diffract, whitish-cream-coloured. Apothecia biatorine, small or submoderate, brown or brownish-black; spores ovoid, 1-septate, 0.012–16 mm. long, 0.005–6 mm. thick; hymenial gelatine at length

violet-red with iodine.—Cromb. Grevillea, xviii. p. 69.—*Lecanora albariella* Nyl. Bot. Zeit. 1861, p. 338 (nota), cfr. Act. Soc. Linn. Bord. t. xxv. (1864) p. 63; Jones, Nat. Hist. Soc. Dublin, 1864, p. 119; Cromb. Lich. Brit. p. 50; Leight. Lich. Fl. p. 229, ed. 3, p. 219.

Apparently a good subspecies, characterized by the differences given in the thallus and apothecia. According to Nylander in litt., *L. (Aspicilia) lactea* Mass. Symm. Lich. 1855, p. 26, is scarcely different. The two British specimens seen are fairly typical and well fertile.

Hab. On calcareous (rarely arenaceous) rocks and mortar of walls in maritime districts.—*Distr.* Extremely local and scarce in S. England and N.E. Ireland.—B. M.: Isle of Wight, Hampshire; near Eastbourne, Sussex. Glenarm, co. Antrim.

Subsp. 2. *proteiformis* Nyl. Flora. 1881, p. 538.—Thallus thickish or somewhat thin, granuloso-verrucose, areolato-diffract or subpulverulent, glaucous-grey, greenish-brown or sordid-white. Apothecia biatorine, at first plane and thinly margined, then convex and immarginate, yellowish-brown, reddish-brown or blackish, naked or pruinose; spores 1-septate, 0.009–12 mm. long, 0.003–4 mm. thick; hymenial gelatine bluish with iodine.—*Biatora proteiformis* Mass. Sched. crit. (1855) p. 92.

Very variable in external appearance, but distinguished by the smaller spores, which in our specimens are 0.010–11 mm. long, 0.0035 mm. thick. These were erroneously referred by me in Journ. Bot. 1874, p. 148, to *L. lactea* (Mass.), to which they are superficially subsimilar.

Hab. On calcareous rocks and walls in upland tracts.—*Distr.* Only sparingly in W. England.—B. M.: Bathampton Downs, Somersetshire; near Painswick and Cirencester, Gloucestershire.

135. *L. phæoleucodes* Nyl. Flora, 1879, p. 356.—Thallus effuse, deplanate, areolato-diffract, whitish (K—, CaCl—). Apothecia minute, convex, brown, biatoroid, the thalline margin speedily excluded; spores 0.016–20 mm. long, 0.005 mm. thick; hymenial gelatine bluish, then wine-red with iodine.—Cromb. Grevillea, viii. p. 112.

Probably distinct from *L. erysibe*, to which in the apothecia it is subsimilar, though differing in the longer spores. The thalline margin of the apothecia, which are darker in age, is visible only in their young condition. The spermogones, which are common, have the spermatia arcuate, 0.016–20 mm. long, 0.0005 mm. thick.

Hab. On a calcareous rock in a maritime district.—*Distr.* Local and scarce in the S.W. Highlands of Scotland.—B. M.: Island of Lismore, Argyleshire.

136. *L. Hutchinsia* Nyl. Flora, 1867, p. 336.—Thallus effuse, thin, rimose or rimuloso-diffract, pale- or yellow-greyish (K—, CaCl—). Apothecia small, convex, biatoroid, the thin thalline margin being speedily excluded, red-testaceous, whitish within; spores fusiform, usually distinctly 1-septate, 0.010–12 mm. long,

0.003–4 mm. thick; paraphyses thickish, somewhat jointed, thickened and colourless at the apices; hypothecium colourless; hymenial gelatine bluish, then often wine-red with iodine.—Carroll, Journ. Bot. 1867, p. 255; Cromb. Lich. Brit. p. 50; Leight. Lich. Fl. p. 226, ed. 3, p. 217.—*Lecidea albocarnea* Nyl. Flora, 1876, p. 234 (cfr. Flora, 1879, p. 361); Cromb. Grevillea, 1876, p. 26; Leight. Lich. Fl. ed. 3, p. 340.—*Brit. Exs.*: Cromb. n. 164; Larb. Lich. Hb. nos. 97, 133.

Looks like a *Lecidea* near *L. sphaeroides*, but is a true *Lecanora* allied to the preceding species, as shown by the distinct thalline margin in very young apothecia (seldom present in herbaria specimens) and by the character of the spermogones. It is somewhat variable as to the thallus and apothecia, whence the form and variety that follow. The spores are rarely simple, or in the same apothecium obsoletely 1-septate, so that Nylander *ut supra* named this state *Lecidea albocarnea*. The spermogones have the spermatia arcuate, thin, 0.014–22 mm. long, scarcely 0.001 mm. thick.

Hab. On schistose rocks and walls in maritime and upland districts.—*Distr.* Local, though at times plentiful in the Channel Islands, S.W. England, S. Wales, S.W. and N.W. Ireland.—B. M.: Near Rozel, Island of Jersey; Moulin Huet Bay, Island of Guernsey. St. John's, Devonport, S. Devon: near Penzance, Cornwall; Goodwick Bay, Pembrokeshire. Derryquin, Killarney, co. Kerry; near Kylemore and Doughruagh mts., Connemara, co. Galway.

Form *bellissima* Leight. Lich. Fl. ed. 3 (1879), p. 217.—Thallus thinnish, subgranulate. Apothecia rather small, usually congregate, pale-rosaceous, slightly pruinose; spores rarely simple.—*Brit. Exs.*: Larb. Lich. Hb. n. 97.

Differs in the more granulose thallus and the colour of the apothecia, which occur for the most part in small, more or less scattered groups. It is apparently the same as form *congregabilis* Nyl. Flora, 1879, p. 361, Cromb. Grevillea, viii. p. 114, judging from the typical specimen seen of the latter.

Hab. On shady walls in a maritime district.—*Distr.* Very scarce in N.W. Ireland.—B. M.: Cleghan, near Kylemore, co. Galway.

Var. β . *accessitans* Nyl. Flora, 1879, p. 361.—Thallus very thin, leprose or subevanescent. Apothecia convex, immarginate; spores usually simple.—Cromb. Grevillea, xviii. p. 69.—*Lecidea accessitans* Nyl. Flora, 1876, p. 306; Cromb. Grevillea, 1876, p. 26; Leight. Lich. Fl. ed. 3, p. 260.—*Brit. Exs.*: Larb. Lich. Hb. n. 224.

Characterized by the less developed thallus, which in the specimens seen is scarcely visible, and by the spores being most frequently simple (not definitely 1-septate).

Hab. On shady rocks in a maritime district.—*Distr.* Only sparingly in N.W. Ireland.—B. M.: Near Renvyle, Connemara, co. Galway.

137. *L. umbraticula* Nyl. Flora, 1879, p. 205.—Thallus effuse, thin, subleprose, greenish (K—, CaCl—). Apothecia small, some-

what plane, biatoroid, fleshy-yellow or subyellowish, colourless within; paraphyses submoderate; epithecium colourless; spores fusiform, simple, or at times thinly 1-septate, 0,008–16 mm. long, 0,002–3 mm. thick; hymenial gelatine wine-reddish with iodine.—Cromb. Grevillea, viii. p. 28.

Allied to var. β of the preceding species, but differs in the thallus and the thinner spores, the form of which Nylander says are as in *Lecidea globulosa*. The single fragmentary specimen seen is well fertile. The spermogones have the spermatia 0,014–19 mm. long, 0,0005 mm. thick.

Hab. On shady calcareous rocks in a maritime district.—*Distr.* Extremely local and scarce in N.W. Ireland.—B. M. : Kylemore, Connemara, co. Galway.

138. *L. spodophæiza* Nyl. Flora, 1873, p. 290.—Thallus determinate, moderate, granuloso-verrucose, greyish, thinly white-fimbriate at the extreme circumference (K—, CaCl—). Apothecia small, somewhat plane, badio-reddish, the thalline margin subentire; spores oblong or fusiformi-oblong, simple or often spuriously 1-septate, 0,009–18 mm. long, 0,004–6 mm. thick; epithecium pale-brownish; hymenial gelatine pale-bluish, then wine-coloured with iodine.—Cromb. Grevillea, ii. p. 89; Leight. Lich. Fl. ed. 3, p. 220.

Has much the appearance of a young state of *L. poliophæa*. In the specimens seen the thallus occurs chiefly in small patches, which at times become more or less confluent. The apothecia are only sparingly present, with the thalline margin persistent and scarcely prominent except in a young condition. The spermogones have the spermatia 0,018–25 mm. long, scarcely 0,0005 mm. thick.

Hab. On granite maritime rocks.—*Distr.* Confined to one of the Channel Islands, and there very sparingly.—B. M. : Mont Orgueil, Island of Jersey.

139. *L. actæa* Nyl. Flora, 1873, p. 290.—Thallus determinate, moderate or thinnish, unequal, rimoso-diffract, greyish-leadencoloured, bluish and thinly white-fimbriate at the circumference (K—, CaCl—). Apothecia small, somewhat prominent, at length convex, biatorine, blackish; spores ellipsoid or subfusiform, 1-septate, 0,012–14 mm. long, 0,0045 mm. thick; epithecium dark bluish; paraphyses thickish, jointed; hymenial gelatine bluish (the thecæ at length violet) with iodine.—Cromb. Grevillea, ii. p. 89.

A peculiar species, externally similar to *L. Ralfsii*, but differing in the character of the thallus at the circumference, and in the colour of the epithecium. More important anatomical differences are the smaller spores and especially the character of the spermogones, which latter places it in this section. In the two fragmentary specimens seen the apothecia are very sparingly present. The spermogones also are rare, with the spermatia, 0,016–20 mm. long, 0,001 mm. thick.

Hab. On rocks in a maritime district.—*Distr.* Very rare in one of the Channel Islands.—B. M. : Boulay Bay, Island of Jersey.

140. *L. syringeæ* Ach. Vet. Ak. Handl. 1810, p. 75; Lich. Univ. p. 368.—Thallus effuse, very thin, or scarcely any visible, glaucous or greyish-white (K—, CaCl—). Apothecia small, sessile, at first plane with thin, entire thalline margin, then convex and immarginate, brownish or brownish-black, naked, or slightly cæsiopruinose; paraphyses not discrete, brownish at the apices; spores 8-16næ, oblong, or elliptico-oblong, obtuse at the apices (1)–3-septate, usually somewhat curved, 0.012–16 mm. long, 0.004–6 mm. thick; hymenial gelatine bluish, then wine-red or violet with iodine.—Cromb. Grevillea, xviii. p. 78.—*Parmelia Hageni* ß. *syringeæ* Ach. Meth. (1803) p. 163. *Lecanora athroocarpa* Dub. Cromb. Lich. Brit. p. 53 pro parte; Leight. Lich. Fl. p. 231 pro parte, ed. 3, p. 223 pro parte. *L. athroocarpa* var. *fuscella* (Schaer), Cromb. Lich. Brit. l. c.; Leight. Lich. Fl. p. 232, ed. 3, l. c. *Lecania fuscella* Mudd, Man. p. 140 (corticola), t. ii. f. 45.

Though the specific name of Acharius is more circumscribed and refers rather to a form of *L. athroocarpa* Dub. (Bot. Gall. ii. p. 669), it may on the ground of priority be retained. The plant is somewhat variable, at times not unlike *L. Hageni* and again resembling some *Lecidea* near *L. vernalis*, according to the character of the apothecia. These are often crowded, and are then more or less biatoroid.

Hab. On the trunks and branches of trees, chiefly poplar and maple, in maritime and upland tracts.—*Distr.* Only very sparingly in S. and W. England.—B. M.: Near Brading, Isle of Wight; Glynde, Sussex; Brockenhurst and near Stonev Cross, New Forest, Hants; Ilsham, near Torquay, S. Devon; near the Beck, Malvern, Worcestershire.

Form metabolica Nyl. Lich. Scand. (1861) p. 169 (sub *L. athroocarpa*).—Thallus very thin, whitish or greyish-white. Apothecia minute, biatorine, dark-brown or nearly black.—*L. athroocarpa* var. *metabolica* Cromb. Lich. Brit. p. 53; Leight. Lich. Fl. p. 232, ed. 3, p. 224. *Lecanora metabolica* Ach. Lich. Univ. (1810) p. 351.

Only a form with smaller, darker, more constantly biatorine apothecia. These in our specimens are also more scattered than in the type, with which probably it is confluent.

Hab. On trunks and branches of maple in maritime districts.—*Distr.* Extremely local in the Channel Islands and S. England.—B. M.: Trinity, Island of Jersey. Brading, Isle of Wight.

141. *L. Nylanderiana* Nyl. ex Norrl. Sällsk. pro F. et Fl. Fenn. i. (1876) p. 24.—Thallus effuse, granulato-unequal, rimoso-arcolate, sordid-greyish-white (K—, CaCl—). Apothecia submoderate, at first plane with thin thalline margin, at length convex and often immarginate, brown or brownish-black, glauco-pruinose or occasionally naked; spores 8næ, 3-septate, oblong or subfusiform, straight (very rarely slightly curved), 0.014–20 mm. long, 0.0045 mm. thick; paraphyses jointed, brownish at the thickened apices; hymenial gelatine bluish, then wine-red with iodine.—*Lecania Nylanderiana* Mass. Sched. crit. (1855) p. 152. *L. cærulescens* Mudd, Man. p. 140, t. 2. f. 46. *Lecanora athroocarpa* form *cæru-*

lescens Cromb. Lich. Brit. p. 53; Leight. Lich. Fl. p. 231, ed. 3, p. 223.—*Brit. Evs.*: Leight. n. 294; Mudd, n. 103.

Closely allied to the preceding species, but among other characters, apart from habitat, separated by the thecae being definitely 8-spored, the spores themselves being normally straight. Mudd describes the thallus of his plant, which is evidently only a state, as being leaden-greyish and pruinose, both of which characters disappear in Herbaria specimens. The apothecia are numerous and aggregate, with the margin, when persistent, at length undulate and angulose from their confluence.

Hab. On old walls in upland situations.—*Distr.* Very sparingly in W. and N. England.—B. M.: Preston, near Cirencester, Gloucestershire; near Marske, Cleveland, Yorkshire.

Var. β . *cæruleorubella* Cromb.—Thallus thickish, granuloso-leprose, sordid-greyish or cæsius. Apothecia innato-sessile, scattered, reddish or dark-red, the thalline margin whitish, persistent.—*Lecania cærulescens*, var. β . *cæruleorubella* Mudd Man. (1861) p. 141.

Probably a good variety, judging from the two specimens seen. It is characterized by the more pulverulent thallus, the less prominent, more scattered apothecia and their persistent thalline margin, otherwise it is similar to the type.

Hab. On old walls (arenaceous) in an upland district.—*Distr.* Extremely local and scarce in N. England.—B. M.: Near Ayton, Cleveland, Yorkshire.

142. *L. dimera* Nyl. Not. Sällsk. pro F. et Fl. Fenn. Förh. xi. (1871) p. 184.—Thallus effuse, very thin, greyish-white, or scarcely any visible (Kf + yellowish, CaCl—). Apothecia minute, biatorine, convex, pale- or dark-brownish, naked, the margin thin, evanescent; paraphyses not well discrete, brownish at the apices; epithecium K + pale rose-coloured: spores 8næ, oblong or subellipsoid, 1-septate, usually somewhat curved, 0.012–18 mm. long, 0.004–6 mm. thick; hymenial gelatine bluish, then wine-reddish or violet with iodine.—Cromb. Grevillea, xviii. p. 70.—*Lecanora athrocarpa* subsp. *dimera* Nyl. Lich. Scand. (1861) p. 169.

Might readily be taken for *L. syringæ* but for the number of the less divided spores. In the single British specimen, which is well fertile, the thallus forms small, somewhat scattered maculæ on the substratum. The young apothecia are distinctly lecanorine, but the thalline margin speedily disappears.

Hab. On the smooth bark of a poplar in an upland district.—*Distr.* As yet only very sparingly in the N. Grampians, Scotland.—B. M.: Morrone, Braemar, Aberdeenshire.

143. *L. rhypariza* Nyl. Öfvers. Vet.-Ak. Förh. 1860, p. 296; Lich. Scand. p. 169.—Thallus effuse, granulose or granuloso-squamulose, pale, or pale-lurid-greyish, the granules (or squa-

mules) sublobulato-concrescent or sub-dispersed (K+yellowish, then blood-red, CaCl-). Apothecia moderate, plane, occasionally slightly convex, brown or reddish-brown, the thalline margin entire, at length excluded; spores oblong or cylindrico-oblong, simple, 0,021-27 mm. long, 0,006-7 mm. thick; hymenial gelatine bluish, then wine-red with iodine.

A very distinct species of which the type does not occur in this country, but only the following form, which seems to descend from var. *castanea* (Hepp), Nyl., also unknown in Britain.

Form *curvescens* Nyl. Not. Sällsk. pro F. et Fl. Fenn. Förh. n. ser. v. (1866) p. 135 (nota).—Thallus very thin, minutely granuloso-squamulose, dark reddish-brown. Apothecia with the thalline margin often inflexed; spores fusiform, at times spuriously 1-3-septate, occasionally somewhat curved, 0,030-34 mm. long, 0,005-6 mm. thick.—Cromb. Lich. Brit. p. 53; Leight. Lich. Fl. p. 214, ed. 3, p. 199.—*Pannaria curvescens* Mudd, Man. (1861) p. 125, t. 2. f. 38.

The thallus is visible only here and there upon the substratum, from which, when less developed, it is scarcely distinguishable. The apothecia are but sparingly present, with the thalline margin at length obliterated.

Hab. Encrusting mosses (Andræas and Grimmias) in an alpine situation.—*Distr.* Extremely local and rare on one of the S. Grampians, Scotland.—B. M.: Summit of Ben Lawers, Perthshire.

G. Apothecia lecanorine; spores 3næ, simple, colourless. Spermatogones with simple sterigmata and long straight spermatia.

144. *L. atra* Ach. Lich. Univ. (1810) p. 334 (excl. vars. β , γ); Nyl. Act. Soc. Linn. Bord. sér. 3, t. i. p. 336.—Thallus determinate, somewhat thick, granulate or verrucoso-unequal, whitish or greyish-white (K+yellowish, CaCl-); hypothallus thin, blackish, limiting the thallus. Apothecia moderate, sessile, plane or slightly convex, black, internally blackish; the thalline margin entire or suberennulate, often flexuose; spores ellipsoid, 0,010-15 mm. long, 0,006-8 mm. thick; paraphyses robust, not discrete, violet-coloured, darker at the apices; hymenial gelatine bluish with iodine.—Hook. Fl. Scot. ii. p. 47; Sm. Eng. Fl. v. p. 186; Tayl. in Mack. Fl. Hib. ii. p. 133; Mudd, Man. p. 145 pro parte; Cromb. Lich. Brit. p. 54; Leight. Lich. Fl. p. 194, ed. 3, p. 177.—*Rinodina atra* Gray, Nat. Arr. i. p. 449. *Lichen ater*, Huds. Fl. Angl. i. (1762) p. 445; Lightf. Fl. Scot. ii. p. 813; With. Arr. ed. 3, iv. p. 18; Eng. Bot. t. 949. *Lichenoides crustaceum et leprosum, scutellis nigricantibus majoribus et minoribus*, Dill. in Ray, Syn. 71, 43 pro parte, Musc. 133, t. 18. f. 15 A.—*Brit. Exc.*: Larb. Lich. Hb. nos. 16, 54.

Much resembles *L. subfusca* var. *coilocarpa* and *L. gangaleoides*, which are frequently mixed up with it in Herbaria. From both of these, how-

ever, it is at once distinguished by the colour internally of the apothecia and by that of the paraphyses. The thallus varies somewhat in thickness and is often widely expanded. The apothecia are generally numerous and somewhat crowded. The spermatia also are frequent, with spermatia long, slender, somewhat straight, 0.018-26 mm. long.

Hab. On rocks, walls, and the trunks of trees from maritime to sub-alpine regions.—*Distr.* General and common in Great Britain, as no doubt also in Ireland. Apparently rare in the Channel Islands.—B. M.: Island of Sark. Near Yarmouth, Suffolk; Reigate Hill, Surrey; Lydd Beach, Kent; New Forest, Hants; Ilsham Walk, Torquay, Devonshire; St. Minver, Cornwall; Cirencester, Gloucestershire; Cheveley Park and near Newmarket, Cambridgeshire; Worcester and Malvern Hills, Worcestershire; Woodfield, Monmouthshire; Dolgelly, Merioneth; Island of Anglesea; Oswestry, Shropshire; Staveley Head, Westmoreland; St. Bees and Alston, Cumberland. Near Glasgow; Barcaldine and Appin, Argyleshire; West Water, Fifeshire; Loch Tay, Craig Tulloch, Ben Lawers, and Kinnoul Hill, Perthshire; Portlethen, Kincardineshire; Hill of Ardo, near Aberdeen. Near Cork; Killaloe, co. Clare; Dawros, Connemara, co. Galway.

Var. β . *grumosa* Ach. Lich. Univ. (1810) p. 344.—Thallus rimoso-granulate, caesio-greyish, leproso-fatiscent. Apothecia depressed, subrimate.—*Lichen grumosus*, Pers. in Ust. Ann. xi. (1794) p. 15.

Differs in the characters given of the thallus (which is usually thickish) and of the apothecia. It is probably connected with the type by intermediate states.

Hab. On rocks and walls in (?) maritime and upland districts.—*Distr.* Only from two localities in S. Wales and N.W. England, though I believe I have seen it also in N.E. Scotland (near Cove, Kincardineshire).—B. M. Woodfield, Monmouthshire; Brougham Castle, Westmoreland.

? Var. γ . *subbyssoides* Stirt. Trans. Glasg. Soc. Nat. 1875. p. 85.—Thallus granulose, greyish-black or nearly black, effigurate at the circumference; hypothallus white, subbyssoid.—Leight. Lich. Fl. ed. 3, p. 178.

Doubtfully referable to this species, as I have indicated in Grevillea, xviii. p. 70. It is at once separated by the colour of the hypothallus, and is most probably referable to *L. ganyaleoides*. I have, however, seen no specimen.

Hab. On rocks in an upland situation.—*Distr.* Only among the Central Grampians, Scotland (Blair Athole, Perthshire).

H. Apothecia lecanorine; spores 8næ, simple, colourless: hymenial gelatine bluish with iodine. Spermatogones with jointed sterigmata and bacillar spermatia.

145. *L. badia* Ach. Lich. Univ. (1810) p. 407.—Thallus indeterminate, granulato-areolate or subsquamulose, olive-brown or dark-greyish-brown, somewhat shining (K—, CaCl—); hypothallus

thin, black. Apothecia small or moderate, appressed, plane or at length somewhat convex, brownish-black or badious-brown, the thalline margin entire or slightly crenulate; spores fusiform-ellipsoid, 0,009–15 mm. long, 0,004–6 mm. thick; paraphyses robust, brownish at the apices.—Mudd, Man. p. 144, t. 2. f. 50; Cromb. Lich. Brit. p. 53; Leight. Lich. Fl. p. 212, ed. 3, p. 198.—*Rinodina badia*, Gray, Nat. Arr. i. p. 450. *Lichen badius*, Pers. Ust. Ann. Bot. vii. (1794) p. 27.—*Brit. Exs.*: Leight. n. 206; Mudd, n. 110; Larb. Lich. Hb. n. 334.

A well-marked species easily recognized by the colour of the thallus and of the apothecia. It spreads extensively over the substratum, and is always well fertile. In alpine situations the apothecia have the thalline margin more or less flexuose. The spermatogones are frequent, with spermatia 0,007–0,010 mm. long, 0,001 mm. thick. Very singularly the plant was overlooked by our older authors, though in Sowerby's herbarium it appears s. n. *Lichen squamulosus* from Teesdale (*Lecanora squamulosa* Tayl. in Mack. Fl. Hib. ii. p. 109).

Hab. On rocks and boulders from maritime to alpine tracts.—*Distr.* General and common in most parts of Great Britain and Ireland; rare in the Channel Islands.—B. M.: Noirmont, Island of Jersey; Island of Guernsey. Bolt Head, S. Devon: near Penzance, Cornwall; Bardon Hill, Leicestershire; Malvern, Worcestershire; near Buxton, Derbyshire; Long Mynd, Shropshire; Barmouth and Dolgelly, Merionethshire; Llyn Geirionydd, Carnarvon; Roseberry, Cleveland, Yorkshire; Teesdale and near Egglestone, Durham; Blacklot and Stavely Head, Westmoreland; Ennerdale, Cumberland. New Galloway, Kirkcudbrightshire; Appin, Argyleshire; Ben Lawers, Perthshire; Nigg and Portlethen, Kincardineshire; Cairn Turc and Morrone, Braemar, Aberdeenshire; Glen Nevis, Inverness-shire. Mount Leinster, co. Carlow; Kylemore Castle, co. Galway; Lurgedon Mt. and near Carnlough, co. Antrim.

Var. *β. cinerascens* Nyl. Lich. Scand. (1861) p. 170.—Thallus paler, greyish, with the thalline margin of the apothecia concolorous: otherwise as in the type.—Cromb. Lich. Brit. p. 54; Leight. Lich. Fl. p. 213, ed. 3, p. 198.

Differs only in colour; but this is so marked as to entitle it, in the absence of intermediate states, to rank as a good variety.

Hab. On shady schistose rocks and walls in maritime and mountainous districts.—*Distr.* Local in S. Wales, the Central Grampians and N.E. Scotland.—B. M.: Cader Idris, Merionethshire. Craig Tulloch, Blair Athole, Perthshire; Portlethen, Kincardineshire.

Subsp. *L. picea* Nyl. Flora, 1868, p. 478.—Thallus and apothecia pitch-black, shining; spores oblong, 0,007–11 mm. long, 0,004–5 mm. thick.—Cromb. Journ. Bot. 1869, p. 108; Lich. Brit. p. 54.—*L. badia* form *picea*, Leight. Lich. Fl. p. 214, ed. 3, p. 199.

Characterized by the colour of the thallus and of the apothecia, and more especially by the smaller spores. This latter character keeps it distinct from darker states of the type with which it might be con-

founded. In age the apothecia become somewhat large and convex, with the thalline margin obliterated.

Hab. On quartzose rocks in mountainous districts.—*Distr.* Only sparingly among the Grampians, Scotland.—B. M.: Ben Lawers, Perthshire; Morrone, Braemar, Aberdeenshire.

146. *L. austera* Nyl. Flora, 1874, p. 309.—Thallus subdeterminate, thin, unequal, rimose, cervine or cervine-badious (K—, CaCl—); hypothallus thin, black, little visible. Apothecia moderate or somewhat large, plane, badio-brownish, often proliferous; the thalline margin flexuose, often subcrenate, slightly shining; spores ellipsoid, about 0,009 mm. long, 0,007 mm. thick; paraphyses moderate, jointed; hymenial gelatine scarcely tinged, but the thecæ bluish with iodine.—Cromb. Grevillea, iii. p. 23; Leight. Lich. Fl. ed. 3, p. 199.

Closely allied to the preceding species, but differing especially in the less developed thallus and the much shorter spores. The only specimen gathered is well fertile, the apothecia varying as above. The spermatogones also are frequent, with spermatia 0,004–5 mm. long, scarcely 0,001 mm. thick.

Hab. On weathered quartzose stones, in an alpine locality.—*Distr.* Very local and scarce on one of the S. Grampians, Scotland.—B. M.: Sunmit of Ben Cruachan, Argyleshire.

147. *L. atriseda* Nyl. Act. Soc. Linn. Bord. sér. 3, t. i. (1856) p. 337; Lich. Scand. p. 170.—Thallus areolato-granulate, brown or dull-brown; the granules contiguous or scattered, convex (K—, CaCl—); hypothallus thin, black, often obsolete. Apothecia moderate, at first immersed, then appressed, plane or somewhat convex, brown or dark-brown; the thalline margin thin, entire; spores ellipsoid, obtuse at the apices, 0,008–12 mm. long, 0,005–7 mm. thick; paraphyses rather stout, not very discrete, brownish at the apices.—Cromb. Journ. Bot. 1871, p. 178.—*Lecanora badia* var. *atriseda* Leight. Lich. Fl. p. 213, ed. 3, p. 198. *Parmelia badia* γ. *atriseda* Fr. N. Sched. crit. 1827, p. 6; Lich. Eur. p. 149.—*Lecanora nephæa* Somm. Suppl. Lapp. Or. (1826) p. 103, is an abnormal state of this, *fide* Fr. fil. Lich. Scand. p. 268, and is therefore scarcely to be adopted, though having priority.

A good species, looking at first sight as if allied to *L. squamulosa*. In our few British specimens the thallus is determinate with the granules sufficiently contiguous. The apothecia are numerous and crowded, at times almost obliterating the verrucæ. The spermatogones, which are sparingly present, are impressed, blackish at the apices, with spermatia 0,018–20 mm. long, 0,001 mm. thick.

Hab. On rocks in mountainous districts.—*Distr.* Rare in Wales, N. England, and the N. Grampians, Scotland.—B. M.: Dolgelly, Merionethshire; Ennerdale, Cumberland; Morrone, Aberdeenshire.

148. *L. nitens* Ach. Syn. (1814) p. 335; Nyl. Flora, 1869, p. 298.—Thallus indeterminate, thickish, subsquamulose, badious-brown, shining (K—, CaCl—); hypothallus black, little visible. Apothecia moderate, appressed, plane, brownish-black, the thalline margin entire, paler; spores oblong, 0,009–0,018 mm. long, 0,0035–45 mm. thick.—Cromb. Journ. Bot. 1882, p. 274.—*Patellaria nitens* Pers. Ann. Wetter. ges. Nat. xi. (1810) p. 12.

Intimately related to *L. badia*, from which it differs chiefly in the form and size of the spores, whence Nylander *l. c.* is inclined to regard it as specifically distinct. The specimens gathered are well fertile, with the apothecia numerous, crowded, at times 2–3 confluent. As previously observed (p. 85), it is one of the hosts of *Sphinctrina kylemoriensis*.

Hab. On schistose rocks in a maritime district.—*Distr.* Very local, though plentiful where it occurred in one of the Channel Islands.—B. M.: Chateau Point, Island of Sark.

149. *L. torquata* Nyl. Act. Soc. Linn. Bord. sér. 3, t. i. (1856) p. 338.—Thallus continuous, smooth, rimoso-diffract, pale-murine or fumose (K—); hypothallus black, limiting the thallus. Apothecia submoderate, sessile, brownish-black; the thalline margin pale, persistent entire, or flexuose; spores narrowly ellipsoid, 0,005–7 mm. long, 0,003–5 mm. thick.—Cromb. Journ. Bot. 1874, p. 147; Leight. Lich. Fl. ed. 3, p. 200.—*Parmelia torquata* Fr. Pl. Hom. (1825) p. 284.

In general appearance subsimilar to *Lecidea kochiana*, but separated by the lecanorine apothecia. These, according to Fries (Lich. Europ. p. 147), are at times obsoletely pruinose, a character not apparent in the two British specimens seen.

Hab. On moist rocks in a maritime district.—*Distr.* Only very sparingly in the Channel Islands.—B. M.: Island of Alderney.

I. Apothecia lecanorine; spores 8næ, pluriseptate, colourless. Spermatogones with simple sterigmata and arcuate spermatia. (*Hæmatomma* Mass. Rich. (1852) p. 32.)

150. *L. coccinea* Cromb. Grevillea, xviii. (1890) p. 70.—Thallus effuse, thinnish or moderate, farinose or leprose, sulphur-coloured or white-yellowish (K+yellow); hypothallus fibrillose, white. Apothecia innate or subsessile, moderate, plane or somewhat convex, crimson (K+violet-purplish); the thalline margin whitish-pulverulent, often little conspicuous; spores elongato-fusiform, 3–7-septate, 0,030–60 mm. long, 0,005–7 mm. thick, paraphyses not discrete; hymenial gelatine deep blue with iodine.—*Lichen coccineus* Dicks. Crypt. fasc. i. (1785) p. 8, t. 2. f. 1; With. Arr. ed. 3, iv. p. 16; Eng. Bot. t. 223. *Hæmatomma coccineum* Mudd, Man. p. 157. *Lichen hæmatomma* Ehrh. Hanov. Mag. 1786, p. 285; Eng. Bot. t. 486. *Lecanora hæmatomma* Hook. Fl. Scot.

ii. p. 49; Sm. Eng. Fl. v. p. 190; Tayl. in Mack. Fl. Hib. ii. p. 136; Cromb. Lich. Brit. p. 57; Leight. Lich. Fl. p. 232, ed. 3, p. 224. *Rinodina haematomma* et *R. porphyria* Gray, Nat. Arr. i. p. 457.—As the specimens published by Dickson are sufficiently typical, his specific name has priority.—*Brit. Ees.*: Dicks. Hort. Sic. n. 24; Leight. n. 214; Mudd, n. 130; Larb. Lich. Hb. n. 339; Bohl. n. 120.

The thallus spreads very extensively and varies somewhat in thickness and colour. In some other countries it occurs on the trunks of aged trees, but it has not with certainty been found upon such in Great Britain; though what may be the sterile thallus has been noticed sparingly on oaks in the New Forest. The apothecia are numerous, though somewhat scattered, with the thalline margin often obliterated. The sporogones, which are very minute, scattered, and slightly prominent, might readily be mistaken for very young apothecia, with which they are concolorous.

Hab. On shaded perpendicular rocks and boulders in maritime and upland districts.—*Distr.* Probably general and common in Britain and the Channel Islands, as also in Ireland; but from the nature of the habitat specimens are with difficulty obtained.—B. M.: Rozel, Island of Jersey; Islands of Guernsey, Brechou, and Alderney. Withyham and Ardingley, Sussex; near Penzance, Cornwall; Stonehenge, Wiltshire; Acton Burnell and Nesscliffe Hill, Shropshire; Moel-y-golfa, Montgomeryshire; Barmouth, Merionethshire; Nant Francon, Carnarvonshire; Battersby, Cleveland, Yorkshire; near Eglestone, Durham; Harlaw Hill, Northumberland. Roslin, near Edinburgh; Bowling Bay, Dumbar-tonshire; Airds, Appin, Argyleshire; West Water, Fife; The Trossachs and Craig Calliach, Perthshire; Portlethen, Kincardineshire; Morrone, Braemar, Aberdeenshire; Glen Nevis, Inverness-shire. Near Belfast, co. Antrim; Western Blasquet Island, co. Kerry.

Var. *β. saxetana* Cromb. Grevillea, xviii. (1890) p. 70.—Thallus subcontinuous, thickish, white or whitish. Apothecia sessile, convex, dark sanguineous; the thalline margin obliterated.—*Lecanora haematomma* form *saxetana* Cromb. Lich. Brit. p. 58. *Lecidea saxetana* Ach. Vet. Ak. Handl. 1808, p. 269.

Distinguished by the less pulverulent, constantly whitish thallus and by the darker biatoroid apothecia. It seems a distinct variety rather than a state of the so-called variety *porphyria* (Pers.), into which the type passes in certain situations.

Hab. On the side of an exposed perpendicular rock in an upland district.—*Distr.* Only very sparingly on one of the N. Grampians, Scotland.—B. M.: Morrone, Braemar, Aberdeenshire.

151. *L. elatina* Ach. Lich. Univ. (1810) p. 387.—Thallus effuse, thin, granulato-leprose, whitish or pale-yellowish (K+yellow, CaCl—). Apothecia moderate, sessile, brownish-testaceous (K—), at first somewhat plane with thin entire thalline margin, then convex and biatorine; spores fusiformi-acicular, 3–5-septate, usually

curved, 0.045–50 mm. long, 0.004–5 mm. thick; paraphyses slender, not well discrete; hymenial gelatine not tinged, but the thecæ deep-blue with iodine.—Cromb. Journ. Bot. 1870, p. 28; Leight. Lich. Fl. p. 231, ed. 3, p. 223.

Presenting much of the habit of the preceding species; this differs in the thinner, more leprose thallus, the colour of the apothecia, the reactions of the epithecium and hymenial gelatine, as also in being constantly corticolous. The apothecia are scattered, with the thalline margin speedily excluded, and become dark-brown in age. In young apothecia the spores often appear to be simple, so that they have sometimes been described as simple or septate.

Hab. On the bark of old hollies in a wooded upland district.—*Distr.* Only very sparingly in S.W. Ireland.—B. M.: near Derrycuntry, Killarney, co. Kerry.

K. Apothecia at first lecanorine; spores 8næ, pluriseptate, colourless. Spermatia with jointed sterigmata and cylindrical straight spermatia. (*Hæmatomma* Mass. emend. Koerb. Syst. Lich. Germ. (1885) p. 153.)

152. *L. ventosa* Ach. Lich. Univ. (1810) p. 399.—Thallus determinate, thick, firm, verrucoso-rugose, subareolato-diffract, sulphur-coloured or greenish-yellow, rarely greyish-white (K—, CaCl—). Apothecia moderate, appressed, plane or convex, often difform, dark crimson or blood-red (K+ violet-purplish); the thalline margin thin, usually speedily excluded; spores elongato-fusiform, somewhat curved or contorted, 3–7-septate; paraphyses not discrete; hymenial gelatine deep blue with iodine.—Hook. Fl. Scot. ii. p. 48; Sm. Eng. Fl. v. p. 189; Tayl. in Mack. Fl. Hib. ii. p. 136; Cromb. Lich. Brit. p. 57; Leight. Lich. Fl. p. 233, ed. 3, p. 225.

—*Hæmatomma ventosum* Mudd, Man. p. 157, t. ii. f. 52. *Rinodina ventosa* Gray, Nat. Arr. i. p. 451. *Lichen ventosus* Linn. Sp. Pl. (1753) p. 1141; Lightf. Fl. Scot. ii. p. 806; Huds. Fl. Angl. ed. 2, p. 527; Eng. Bot. t. 906; With. Arr. ed. 3, iv. p. 16. *Lichen gelidus* Huds. Fl. Angl. ed. i. p. 528. *Lichenoides tartarcum lividum, scutellis rufis margine exili* Dill. Musc. 133, t. 18. f. 14.—*Brit. Exs.*: Leight. n. 9; Mudd, n. 129; Bohl. n. 36; Dicks. Hort. Sic. v. n. 23.

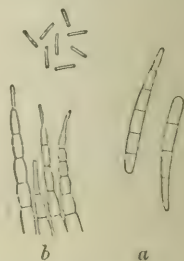


Fig. 66.

Lecanora ventosa Ach.—
a. Two spores, $\times 350$.
b. Jointed sterigmata and spermatia, $\times 500$.

A rather fine plant distinguished at once from its allies by the thicker verrucose thallus. This is often considerably expanded and varies in colour according to the nature of the habitat. The apothecia are numerous, often variously deformed, more or less convex, usually biatorine in appearance, the thalline margin being chiefly visible only in their

very young state, though in alpine habitats it is more or less persistent. The spermatogones are frequent, prominent, agglomerate, black, and look almost like foreign apothecia. On the thallus there is occasionally a parasitic *Endococcus* afterwards to be described.

Hab. On exposed rocks and boulders, granitic and schistose, rarely red sandstone from upland to alpine situations.—*Distr.* General in the more mountainous regions of Great Britain, abundant on the Grampians, Scotland; apparently very rare in Ireland; not seen in the Channel Islands.—B. M.: Pew Tor, Dartmoor, Devonshire; Clee Hills, Shropshire; Moel-y-Goffa, Montgomeryshire; Cader Idris, Merionethshire; Penmaenmawr, Trefriw and Moel Siabod, Carnarvonshire; Kildale Moor and Dent, Yorkshire; Teesdale, Durham; Gunnerton Crag, Northumberland. North Berwick Law, Berwickshire; Achosragan Hill and Ben Cruachan, Argyleshire; Ben Lawers, Ben Rackie, and Birnam Hill, Perthshire; Katelaw, Clova, Forfarshire; Hills at Nigg, Aberdeenshire; Lochnagar, Morrone, and Glen Callater, Braemar; Ben Nevis, Inverness-shire; Hills of Applecross, Ross-shire. Co. Wicklow.

Form *lævigata* Johns. ex Cromb. *Grevillea*, xix. (1891) p. 60.—Thallus areolato-diffract, substramineous; the areolæ smooth, equal. Apothecia small, depressed.

Differs in the characters given, and may be a good variety. The specimen seen is too fragmentary, however, for deciding the point.

Hab. On rocks in an upland district.—*Distr.* Extremely local and scarce in N. England.—B. M.: Bowness Knolt, Ennerdale Lake, Cumberland.

Var. β . *subfestiva* Nyl. in Cromb. *Lich. Brit.* (1870) p. 57.—Thallus thickish, verrucoso-granulate, yellow-greyish. Apothecia small, plane, usually more or less aggregate, rusty-red, biatoroid, the proper margin thin, often inflexed, paler red.—Cromb. *Linn. Soc. Journ. Bot.* xi. p. 490.

Differs in the colour of the smaller apothecia which look almost like those of *L. ferruginea* var. *festiva*, for which, but for the different thallus, the plant might readily be mistaken. It is only sparingly fertile, the apothecia being scarcely prominent.

Hab. On schistose boulders in a mountainous district.—*Distr.* Found only very sparingly on one of the N. Grampians, Scotland.—B. M.: Morrone, Braemar, Aberdeenshire.

L. Apothecia urceolato-zeorine; spores distinctly 3-septate; hymenial gelatine bluish with iodine. Spermatogones unknown.

153. *L. rubra* Ach. *Lich. Univ.* (1810) p. 389.—Thallus effuse, thin, granuloso-pulverulent, white or glaucous-white (K—, CaCl—); hypothallus whitish, little visible. Apothecia moderate, adnate, concave, rosy-red or reddish flesh-coloured, occasionally slightly pruinose, the thalline margin rugoso-crenulate; spores oblong or oblongo-ellipsoid, 3-septate, 0,016–23 mm. long, 0,005–8 mm. thick;

paraphyses scarcely discrete, the apices incrassate.—Hook. Fl. Scot. ii. p. 49; Sm. Eng. Fl. v. p. 190; Leight. Angl. Lich. p. 86, t. 14. f. 1; Lich. Fl. p. 230, ed. 3, p. 222; Cromb. Lich. Brit. p. 58.—*Phialopsis rubra* Mudd, Man. p. 166, t. 3. f. 58. *Rinodina rubra* Gray, Nat. Arr. i. p. 457. *Verrucaria rubra* Hoffm. Pl. Lich. i. (1793) p. 81. *Lichen Ulmi* Sm. Eng. Bot. t. 2218.—*Brit. Ess.*: Leight. n. 236; Mudd, n. 138; Cromb. n. 168.

Well characterized by the constantly 3-septate spores, which separate it from all the other species of the genus, so that it has been placed by sporologists in a distinct genus *Phialopsis*. From the form of the apothecia it might at first sight be taken for a *Gyalecta* approaching *L. foveolaris*; but it is at once removed from this by their distinct thalline margin. The thallus spreads very extensively over the substratum. The apothecia are numerous, becoming at length dark-red. The spermatogones have not yet been detected.

Hab. On trunks of old elms, occasionally overspreading mosses on walls and rocks in upland districts.—*Distr.* Local in W. and N. England, and on the Central and N. Grampians, Scotland; other localities from which it has been reported being very doubtful.—B.M.: Wigmore Castle, Herefordshire; Craig-y-Rhiw, near Oswestry, Shropshire; near Rievaulx, Bilsdale, and Greta Bridge, Yorkshire. Craig Tulloch, Blair Athole, Perthshire; Morrone, Braemar, Aberdeenshire.

M. Apothecia lecanorine: spores 8μ or $4-6\mu$, very rarely 2μ , large, simple, colourless; hymenial gelatine bluish with iodine. Spermatogones with simple sterigmata and acicular straight spermatia. (*Ochrolechia* Mass. Rich. (1852) p. 30.)

154. *L. tartarea* Ach. Lich. Univ. (1810) p. 371, t. 7. f. 3.—Thallus orbiculari-expanded, thick, tartareous, granuloso- or verrucoso-conglomerate, unequal, whitish or greyish-white (K+yellowish, the apices of the verrucæ CaCl+red); hypothallus white, often indistinct. Apothecia large, concave, plane or tuberculato-convex, rugulose, pale-testaceous (CaCl+reddish); the thalline margin thick, entire or inflexed, at length undulate; spores 8μ , ellipsoideo-oblong, 0.040–72 mm. long, 0.027–40 mm. thick; paraphyses thin, not well discrete.—Hook. Fl. Scot. ii. p. 49; Sm. Eng. Fl. v. p. 191; Tayl. in Mack. Fl. Hib. ii. p. 138; Mudd, Man. p. 156, t. ii. f. 31; Cromb. Lich. Brit. p. 54; Leight. Lich. Fl. p. 187, ed. 3, p. 175.—*Rinodina tartarea* Gray, Nat. Arr. i. p. 455. *Lichen tartareus* Linn. Sp. Pl. (1753) p. 1141; Huds. Fl. Angl. p. 444; Lightf. Fl. Scot. ii. p. 811; With. Arr. ed. 3, iv. p. 23; Eng. Bot. t. 156. *Lichenoides crustaceum et lepro-*

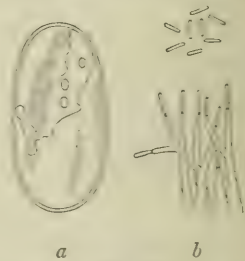


Fig. 67.
Lecanora tartarea. — a. A spore, $\times 350$. b. Sterigmata and spermatia, $\times 500$.

sum, acetabulis majoribus luteis, limbis argenteis Dill. in Ray Syn. ed. 3, 71. 46; Musc. 132, t. 18. f. 13.—*Brit. Ees.*: Leight. n. 82; Mudd, n. 128; Bohl. n. 10; Cromb. n. 69.

This, the "Cudbear Lichen" of Scotland, is a variable plant as to the thallus and apothecia, whence the varieties and subspecies that follow. The thallus, which often spreads extensively over the substratum, is thick, at times very thick, rarely thinnish when the hypothallus is more distinctly visible at the circumference. A state with the verrucæ subglobose, growing on *Genista* in Teesdale, was termed by Acharius var. *grandinosa*, Lich. Univ. p. 372; Cromb. Enum. l. c.; Leight. Lich. Fl. l. c.; but this is a frequent character when corticolous, whence also var. *arborea* (DC. Fl. Fr. ii. p. 364), Schaer, Enum. p. 80; Mudd, Man. p. 156 pro parte.—The apothecia, which are numerous, are generally large and occasionally become proliferous. The spermatogones are abundant, verruciform, often congregate, with spermatia 0,005–7 mm. long, 0,0005 mm. thick (*vide* Nyl.).

Hab. On rocks and old trunks of trees, rarely on the ground, in maritime but chiefly mountainous districts to high altitudes.—*Distr.* General and abundant in Great Britain and Ireland; rare in the Channel Islands.—B.M.: Island of Alderney. Near Lyndhurst, New Forest, Hants; Bolt Head and Dartmoor, Devonshire; Lamorna, near Penzance, Cornwall; Cader Idris and Aberdovey, Merionethshire; Conway Falls, Denbighshire; Clee Hill, Shropshire; Highcliff, Cleveland, Yorkshire; Teesdale, Durham; Kentmere, Westmoreland; Alston, Cumberland; The Cheviots, Northumberland. New Galloway, Kirkcudbrightshire; Ayrshire; Pentland Hills and Dalnaboy Hill, near Edinburgh; Kilmun, Ben Cruachan, and Barcaldine, Argyleshire; Glen Falloch, Finlarig, Craig Calliach, Ben Lawers, Amulree, Craig Vinean, and Craig Tulloch, Perthshire; Portlethen, Kincardineshire; Craig Koynoch, Morrong, Ben-naboord, and Glen Callater, Braemar, Aberdeenshire; Rothiemurchus Woods and Glen Nevis, Inverness-shire; Larig, Sutherlandshire; Applecross, Ross-shire. Clonmel, co. Tipperary; Doughruagh mts., Connemara, co. Galway.

Var. *β. frigida* Ach. Lich. Univ. (1810) p. 372.—Thallus effuse, thin, papillate, subspinulose or granulate. Apothecia small or submoderate, the thalline margin occasionally subspinulose.—Mudd, Man. p. 156; Cromb. Lich. Brit. p. 40; Leight. Lich. Fl. p. 188, ed. 3, p. 175; Hook. Fl. Scot. ii. p. 49 (ut var. *γ*).—*Rinodina frigida* Gray, Nat. Arr. i. p. 454. *Lichen frigidus* Sw. Meth. Musc. (1781) p. 36, t. 2. f. 4; Eng. Bot. t. 1879; With. Arr. ed. 3, iv. p. 22. *Lichen Upsaliensis* Eng. Bot. t. 1634, Dicks. Crypt. fasc. i. p. 12, t. ii. f. 7, and *Lecanora tartarea β. Upsaliensis* Sm. Eng. Fl. v. p. 191, denote only espinulose states of this variety.—*Brit. Ees.*: Cromb. n. 70.

Well distinguished by the thinner, more or less spinulose thallus, which on peaty or detrital soil becomes somewhat granulose. It is usually well fruited, especially at higher altitudes. A state with minute apothecia occasionally occurs, and is form *microcarpa* Fr. fil. Lich. Scand. p. 234; Cromb. Grevillea, xviii. p. 70.

Hab. Incrusting mosses on the ground upon moorlands and mountains

from upland to alpine situations.—*Distr.* Local in E. and N. England, N. Wales, and S. Scotland; general and plentiful on the Grampians; not seen from Ireland.—B. M.: Near Norwich, Norfolk; near Bury St. Edmund's, Suffolk; Cwm Bychan, Merionethshire; Ayton Moor, Cleveland, Yorkshire; Teesdale, Durham. Pentland Hills, near Edinburgh; Ben Cruachan, Argyleshire; Ben Lawers, Ben Vrackie, Blair Athole, Perthshire; Katalaw and Clova mts., Forfarshire; Morrone, Ben Macdhuì, Glen Dee and mts. about Invercauld, Braemar, Aberdeenshire; Glen Nevis, Inverness-shire.

Var. *γ. gonatodes* Ach. Lich. Univ. (1810) p. 372.—Thallus subramulose, the branches divaricate, tortuous, gibbous, lobato-verrucose, difform. Apothecia very rare; spores 0,036–40 mm. long, 0,025–27 mm. thick.—Leight. Lich. Fl. ed. 3, p. 176 (excl. *ll. cit.*); Cromb. Grevillea, xviii. p. 70.—*Lichen gonatodes* Ach. Prodr. (1798) p. 89.

A peculiar and well-marked plant, though probably only a monstrosity, as observed by Acharius (Lich. Univ. *l. c.*). It is apparently extremely rare in fruit, the spores having only been recently described by Nylander (Lich. Nov. Zeland. p. 145) from specimens gathered in the Falkland Islands.

Hab. On decayed mosses on the ground in alpine situations.—*Distr.* Only a single specimen found on the N. Grampians, Scotland (Leighton's specimens from Wales belong to var. *β*).—B. M.: Summit of Ben Avon, Braemar, Aberdeenshire.

Subsp. *L. subtartarea* Nyl. Flora, 1882, p. 550.—Thallus more or less variolose or at length leprose (K + yellow, the variolæ CaCl + reddish). Apothecia somewhat small or submoderate (CaCl + reddish), the thalline margin inflexed.—Cromb. Journ. Bot. 1882, p. 274.—*Lecanora tartarea* subsp. *pallescent* f. *leprosa* Nyl. Not. Sällsk. pro F. et Fl. Fenn. Förh. v. (1886) p. 135. *Lecanora tartarea* forma *leprosa* Leight. Lich. Fl. ed. 3, p. 175. Var. *β. arborea* Mudd, Man. p. 156 pro parte. *Lichenoides tartareum farinaceum, scutellarum umbone fusco* Dill. Musc. 132, t. 18. f. 12.

The reactions of the thallus and apothecia show that this belongs to *L. tartarea*, of which it is a good subspecies. When sterile it is easily recognized by the variolarioid thallus, which at times becomes almost entirely leproso-dissolved (form *leprosa* Nyl. *l. c.*, Cromb. Journ. Bot. *l. c.*). The apothecia, seldom present, are few, usually small and difform, occasionally crowned with the leprose thallus.

Hab. On the trunks of old trees and on rocks in upland and subalpine situations.—*Distr.* Probably common in Great Britain and Ireland, though seen only from comparatively few localities.—B. M.: Eridge Rocks, Sussex; New Forest, Hants; Falls of Beckey, S. Devon; Roughton, Cornwall; Lynn Gwernon, Merionethshire; Rosedale, Yorkshire. New Galloway, Kirkcudbrightshire; Roslin, near Edinburgh; Barcaldine, Argyleshire; Craig Calliach, Craig Tulloch, and Ben Vrackie, Perthshire; Morrone, Braemar, Aberdeenshire. Ronayne's Island, Killarney, co. Kerry; Clonmel, co. Tipperary; Killerey Bay, Connemara, co. Galway.

155. *L. parella* Ach. Lich. Univ. (1810) p. 370 pro parte; Nyl. Not. Sällsk. pro F. et Fl. Fenn. Förh. n. ser. v. (1866) p. 135.—Thallus subdeterminate or effuse, thickish, granulato-rugose, verrucoso-granulate or rimoso-diffract, whitish or greyish-white (K—, CaCl—); hypothallus white, usually little visible. Apothecia moderate, concave, then plane, at length more or less convex, rugose or verrucose, pale, naked or white-pruinose (epithecium K(CaCl) + reddish), the thalline margin thick, entire (K(CaCl)—); spores 6–8 μ ae (rarely 2 μ ae), ellipsoid or subglobulose, 0.048–88 μ m. long, 0.025–46 μ m. thick.—Cromb. Grevillea, xviii. p. 70; Sm. Eng. Fl. v. p. 191; Tayl. in Mack, Fl. Hib. ii. p. 137; Hook. Fl. Scot. ii. p. 48; Cromb. Lich. Brit. p. 54 pro parte; Leight. Lich. Fl. p. 188 pro parte, ed. 3, p. 201 pro parte.—*L. pallescens* a. *parella* Mudd, Man. p. 155. *Rinodina parella* Gray, Nat. Arr. i. p. 453. *Lichen parellus* Linn. Mant. (1767) p. 132; Huds. Fl. Angl. ed. 2, p. 530; Lightf. Fl. Scot. ii. p. 814; With. Arr. ed. 3, iv. p. 17; Eng. Bot. t. 727. *Lichenoides leprosum tinctorium, scutellis lapidum canceri figura* Dill. Musc. 130, t. xviii. f. 10. *Pertusaria incarnata* Leight. Lich. Fl. ed. 3, p. 235 (cfr. Nyl. Flora, 1883, p. 534).—*Brit. Ess.*: Leight. n. 8; Mudd, n. 125; Dicks. Hort. Sic. x. n. 23; Bohl. n. 54; Larb. Cæsar. n. 75; Lich. Hb. n. 300; Cromb. n. 166.

The *Perelle d'Auvergne* of S. France, so that, as observed by Sir J. E. Smith, Linnaeus ought to have written the trivial name *perellus* as in Eng. Bot. &c. The thallus, usually very widely expanded, varies considerably in thickness according to habitat, and when lignicolous and corticolous is at times very scanty. The apothecia are numerous, often crowded and anguloso-diform, almost obliterating the thallus; they are at first depresso-globulose and poriform (the disc being scarcely visible) with very tumid thalline margin, a condition which in some situations seems to be permanent (form *porinoides* Cromb.). *Lichen tumidulus* Pers. Ust. Ann. Bot. xi. (1794) p. 181, with shields crowded, tumid, the margin thickish (*non* Ach. Lich. Univ. p. 371), is only a corticolous (also saxicolous) condition (var. *tumidula* Cromb. Lich. Brit. p. 54; Leight. Lich. Fl. p. 189, ed. 3, p. 202), not to be distinguished even as a form.

Hab. On rocks, walls, and trunks of trees, rarely on old pales, from maritime to subalpine tracts.—*Distr.* General and common in Great Britain and the Channel Islands; no doubt also in Ireland.—B. M.: Boulay Bay, Island of Jersey; Chateau Point, Island of Sark. Greenwich Park and near Tunbridge Wells, Kent; Ardingly Rocks, Peasemarch, and near Hastings, Sussex; Penzance, Duloc, and St. Issey, Cornwall; near Tenby, Pembrokeshire; Barmouth, Merionethshire; Llandysil, Cardiganshire; Nant Francon, Carnarvonshire; Bardon Hill, Leicestershire; near Shrewsbury, Shropshire; Ayton, Cleveland, Yorkshire; Eglestone, Durham; St. Bees and Bassenthwaite, Cumberland; Chollerford, Northumberland. Arthur's Seat and Meadowbank Woods, Edinburgh; West Water, Fifeshire; Balcaldine and Ballachulish, Argyshire; Sidlaw Hills and Baldovan, Forfarshire; Ben Lawers, Aberfeldy, and Craig Tulloch, Blair Athole, Perthshire; Portlethen and Cove, Kincardineshire; Morrone, Glen Callater, and Glen Dee, Braemar, Aberdeenshire; Glen Nevis, Lochaber, Inverness-shire; Applecross, Ross-shire. Annemount near Cork, and Kilbrittain near Bandon, co. Cork; Killarney, co. Kerry.

Form 1. **crenularia** Cromb. Grevillea, xviii. (1890) p. 70.—Thallus as in the type. Apothecia with the thalline margin rugoso-crenulate.

Differs merely in the coarsely crenulate thalline margin of the apothecia, which, however, is occasionally less distinctly visible in their juvenile state, so that it is scarcely a variety.

Hab. On rocks and trunks of old trees in maritime and upland situations.—*Distr.* Only a very few localities in Great Britain and Ireland.—B. M.: New Forest, Hants; Hale's End, Malvern, Worcestershire; Wansbeck Valley, Northumberland. Island of Lismore, Argyshire. Brandon mt., co. Kerry.

Form 2. **nivea** Cromb.—Thallus and the thalline margin of the apothecia soft, snowy-white; otherwise as in the type.

Apparently a well-marked form, which, if the characters given are constant, would be a good variety. In the two small British specimens the thallus is verrucoso-rugose and the apothecia concave with thick thalline margin.

Hab. On the trunk of an old tree in an upland situation. *Distr.* Seen only very sparingly from W. Ireland.—B. M.: Killaloe, co. Clare.

Var. β . **Turneri** Nyl. Mém. Soc. Cherb. v. (1857) p. 113.—Thallus more or less leproso-dissolved, whitish or greenish-white. Apothecia submoderate, white-pruinose; the thalline margin thick, entire, white-pulverulent.—Cromb. Lich. Brit. p. 54; forma *Turneri* Leight. Lich. Fl. p. 190, ed. 3, p. 203.—*L. pallescens* γ . *Turneri* Mudd, Man. p. 155. *Rinodina Turneri* Gray, Nat. Arr. i. p. 454. *Lecanora Turneri* Sm. Eng. Fl. v. p. 191. *Lichen Turneri* Eng. Bot. t. 857.—*Brit. Exs.*: Mudd. n. 127; Leight. n. 237.

A good variety characterized by the white-sorediate thallus and the pulverulent margin of the apothecia. These are usually rather scattered, with the thalline margin rarely subcrenulate (form *subcrenata* Cromb. Grevillea, xviii. p. 70).

Hab. On trunks of old trees in maritime and upland wooded regions.—*Distr.* Here and there throughout England; rare in N. Wales, the S.W. Highlands and N. Grampians, Scotland, as also in S. Ireland.—B. M.: Epping Forest, Essex; The Holmwood, Surrey; Hurstpierpoint, Sussex; Carrisbrook and Bembridge, Isle of Wight; New Forest, Hampshire; Gillingham, Dorsetshire; Ugbrook Park, Chudleigh, S. Devon; Saverlake Forest, Wiltshire; near Barmouth, Merionethshire; near Ayton, Cleveland, Yorkshire; Eggleston, Durham. By Loch Creran, Barcaldine, Argyshire; Morrone, Braemar, Aberdeenshire. Old Deer Park, Castlemartyr, co. Cork; Muckruss, Killarney, co. Kerry.

156. **L. pallescens** Nyl. Bull. Soc. Linn. Normand. sér. 2. t. ii. (1868) p. 68.—Thallus determinate, thinnish, granulato-unequal, whitish or greyish-white (K—, CaCl—); hypothallus white, limiting the thallus. Apothecia submoderate, concave or somewhat plane,

rugulose, often thinly white-pruinose (epithecium K (CaCl) + red-dish), the thalline margin somewhat thin, entire (K (CaCl) + red-dish); spores 8 μ , ellipsoid, 0.054–0.064 mm. long, 0.030–0.034 mm. thick.—Cromb. Grevillea, xviii. p. 70.—*Lecanora parella* forma *pallescens* Leight. Lich. Fl. p. 189 pro parte; ed. 3, p. 202 pro parte. *L. tartarea* subsp. *pallescens* Cromb. Lich. Brit. p. 54 pro parte. *Lichen pallescens* Linn. Fl. Suec. (1755) p. 499. *Lecanora pallescens* var. β . *tumidula* Mudd, Man. p. 155.—*Brit. Ecs.*: Mudd, n. 126; *Larb. Cæsar.* n. 76.

Similar to *L. parella*, with which until recently it has been confounded, but differs, though probably only as a subspecies, in the reaction of the thalline margin of the apothecia, which also distinguishes it from all corticolous states of *L. tartarea*. The thallus is usually somewhat zonate at the circumference.

Hab. On trunks of trees in maritime and upland situations.—*Distr.* Seen from only a few localities in Great Britain, Ireland, and the Channel Islands.—B. M.: St. Lawrence, Island of Jersey. Near Hastings, Sussex; Shanklin, Isle of Wight; New Forest, Hants; near Lustleigh, S. Devon; Launceston, Cornwall; Barmouth, Merionethshire; Trefriw, Carnarvonshire; near Easby, Cleveland, Yorkshire. Barcaldine, Argyshire. Macroom Demesne, co. Cork; Killarney, co. Kerry.

157. *L. Upsaliensis* Nyl. ex Nörrl. Not. Sällsk. pro F. et Fl. Fenn. Förh. xiii. (1873) p. 332; Flora, 1881, p. 454.—Thallus effuse, thin, smooth or somewhat verruculose, glaucous- or greyish-white (K—, CaCl—). Apothecia small or submoderate, concave or at length plane, pale, more or less white-pruinose (K(CaCl)—): the thalline margin thickish, entire; spores 4–8 μ , 0.055–0.058 mm. long, 0.026–0.038 mm. thick.—Cromb. Grevillea, xviii. p. 70; Leight. Lich. Fl. p. 192 pro parte, ed. 3, p. 176 pro parte.—*Lecanora parella* var. *Upsaliensis* Cromb. Lich. Brit. p. 54. *Lichen Upsaliensis* Linn. Sp. Pl. (1753) p. 1142.

Also closely allied to *L. parella*, but differs in the nature of the habitat and especially in the chemical reaction of the apothecia. The thallus is at first very thin and smooth, but at length becomes thicker and granulate. The apothecia are usually numerous with the disc coarsely granulate.

Hab. Incrusting mosses on the ground in alpine situations.—*Distr.* Only very sparingly on a few of the Grampians, Scotland.—B. M.: Craig Calliach, Perthshire; Morrone, Braemar, Aberdeenshire.

158. *L. geminipara* Fr. fil. Lich. Scand. (1871) p. 236.—Thallus subeffuse, verrucose or papillose, greyish-white (K + yellowish-red; the papille subglobose or somewhat angulose, at length sorediate at the apices (CaCl + reddish). Apothecia on the apices of the papillæ, concave, at length plane, purplish-black, naked; the thalline margin thick, inflexed or crenate; spores 2 μ , ellipsoid, 0.022–0.024 mm. long, 0.015–0.020 mm. thick; hymenial gelatine deep blue with iodine.—Cromb. Grevillea, xviii. p. 70.—*Lecanora leprothelia* Nyl. Flora,

1874, p. 16; Cromb. Journ. Bot. 1882, p. 274, is according to Wainio and Arnold a sterile and less developed state of this plant.

A very distinct species which at first sight seems near *L. oculata*, but, as rightly conjectured by Nylander *l. c.*, from sterile specimens, belonging to this section. The papillæ are scattered or here and there crowded, becoming at times entirely leprose. In the very few British specimens neither apothecia nor spermogones, the latter as yet unknown, are present.

Hab. Overspreading decayed mosses on the ground in alpine places.
—*Distr.* Very local and rare on one of the S. Grampians, Scotland.—*B. M.*: Ben Lawers, Perthshire.

X. Apothecia innate, lecanorine or rarely lecideine; hypothecium usually colourless; spores 8næ or 6næ (rarely 4næ or 2næ), simple, colourless; hymenial gelatine variously tinged with iodine. Spermogones with simple sterigmata and acicular, straight or very rarely arcuate spermatia. (*Aspicilia* Mass. Rich. (1852) p. 36 pro parte.)

a. Gonidial system composed of ordinary eugonidia (*Pachyospora* Mass. Rich. (1852) p. 42 pro parte).

159. **L. Bockii** Fr. fil. Bot. Not. 1867, p. 105.—Thallus indeterminate, either minutely granulose with the granules variously subglobose, or plane and areolato-diffract, olive-brown or brownish-grey (K(CaCl) + reddish); hypothallus thin, black. Apothecia sessile, small, at length angular or linearly-compressed, black, the thalline margin entire; spores ellipsoid, 0,017–25 mm. long, 0,011–15 mm. thick; paraphyses slender; epithecium and hypothecium brownish; hymenial gelatine tawny wine-red with iodine.—Cromb. Journ. Bot. 1882, p. 274.—*Parmelia Bockii* Rodig. ex Fr. Pl. Hom. (1825) p. 285.

A rather singular plant of this section both as to thallus and apothecia. The subglobose verrucæ are usually discrete, and when rubbed are more or less yellow-greenish at the apices. The apothecia are at length as if gyroso-plicate, whence Fries (Lich. Eur. p. 151) observed that, if normal, the plant would belong to a distinct genus. Its true systematic place, however, is shown by Nylander, Flora, 1876, p. 233 (*cf.* Flora, 1879, p. 204), s. n. *Lecanora sophodopsis*, under which synonym the first complete diagnosis is given. The British specimens in which neither the thallus nor apothecia are well developed belong to a form *pauperata* Nyl. *in litt.* The spermogones are here and there visible, with spermatia straight, 0,0045 mm. long, 0,0005 mm. thick.

Hab. On schistose walls in an upland district.—*Distr.* Only sparingly in N.W. England; no doubt to be detected elsewhere.—*B. M.*: Near Staveley, Kendal, Westmoreland.

160. **L. superiuscula** Nyl. Flora, 1879, p. 355.—Thallus indeterminate, thin, squamuloso-areolate, greyish-brown or dark-brown; squamules minute, scattered, appanate or slightly convex,

crenulate (K—, CaCl—). Apothecia minute, innate or slightly emersed, plane or somewhat convex, blackish, the thalline margin thickish; spores Sæe, subellipsoid, simple, 0,010–14 mm. long, 0,007–8 mm. thick; paraphyses stout, discrete, brownish at the apices; hymenial gelatine bluish with iodine.—Cromb. Grevillea, viii. p. 112.

Allied to *L. complanata* Koerb., of which it may be a subspecies, but differs among other characters in the larger spores. The thallus spreads very extensively over the substratum in the Scottish habitat, but was only here and there well fertile. The spermogones, however, in the few specimens gathered are plentiful, with spermatia arcuate, 0,018–25 mm. long, 0,0006 mm. thick.

Hab. On a mica-schist rock in an alpine situation.—*Distr.* Only sparingly on one of the S. Grampians, Scotland.—B. M.: Above Loch-na-Gat, Ben Lawers, Perthshire.

161. *L. leucophyma* Leight. Lich. Fl. (1871) p. 204; ed. 3, p. 188.—Thallus subdispersed, thin, smooth, unequal, rimoso-diffract, pale or pale-greyish, internally yellowish, sprinkled with frequent mastoid papillæ (K—, CaCl—). Apothecia moderate, adnate, radio-reddish or brownish-black; the thalline margin distinct, entire, at length flexuose; spores ellipsoid, 0,023–27 mm. long, 0,011 mm. thick; paraphyses slender; hypothecium colourless; hymenial gelatine bluish, the thecæ at length tawny-violet with iodine.—Cromb. Grevillea, xix. p. 57.

Easily recognized by the peculiar somewhat fragile papillæ with which the thallus is covered, and which are often of a pinkish colour. With us it is for the most part only sparingly fertile, the apothecia becoming dark in age. The spermogones are more common, with spermatia minute, 0,0015 mm. long, 0,0005 mm. thick. According to Nylander, who describes it, 'Flora,' 1879, p. 204, s. n. *Lecanora acceptanda*, its affinity is with *L. complanata* Koerb.

Hab. On micaceous rocks in alpine situations.—*Distr.* Local and scarce on the Grampians, Scotland.—B. M.: Summit of Ben Lawers and Craig Calliach, Perthshire.

162. *L. oculata* Ach. Syn. (1814) p. 148.—Thallus effuse, more or less dactylino-papillate, glabrous, white or greyish-white (K+ yellowish, then rusty-red, CaCl—). Apothecia innate in the apices of the papillæ, moderate, somewhat concave or nearly plane, naked, black; the thalline margin tumid, entire; thecæ subcylindrical; spores ellipsoid, 0,020–30 mm. long, 0,011–14 mm. thick; paraphyses branched (epithecium K+ violet); hymenial gelatine not tinged, but the thecæ bluish with iodine.—Hook. Fl. Scot. ii. p. 47; Mudd, Man. p. 156; Cromb. Lich. Brit. p. 56; Leight. Lich. Fl. p. 200, ed. 3, p. 173.—*Rinodina oculata* Gray, Nat. Arr. i. p. 449. *Isidium oculatum* Turn. and Borr. Lich. Br. p. 103 pro parte; Sm. Eng. Fl. v. p. 232 pro parte. *Lichen oculatus* Dicks. Crypt. fasc. ii. (1790) p. 17, t. 6. fig. 3; With. Arr. ed. 3, iv. p. 7.

A very distinct plant, which when less developed and sterile entirely resembles isidioid states of a *Pertusaria*, in which genus it has been placed by Th. M. Fries (Lich. Scand. p. 307) and to which probably it really belongs. The peculiar papillæ are corallinoid, fragile, more or less branched, at first short, then somewhat elongate, often bearing at the apices dark brown verrucae, which were mistaken for the fructification by some older authors. In our Islands it is rarely well fertile. The spermatogones, however, are not unfrequent, with spermatia (*vide* Nyl.) 0,0035 mm. long, 0,0005 mm. thick.

Hab. On mosses upon the ground, rarely on schistose rocks in alpine situations.—*Distr.* Local and scarce towards the summits of a few of the higher mts. of the S. and N. Grampians, Scotland.—B. M.: Craig Calliach and Ben Lawers, Perthshire; Cairngorm and Cairntoul, Braemar, Aberdeenshire.

Form *depressa* Cromb.—Thallus epapillate, greyish-white. Apothecia minute, adnate, numerous and crowded.

Perhaps only a stunted condition depending on situation, as a few very short, simple papillæ are here and there visible.

Hab. On the bare ground in an alpine locality.—*Distr.* Very sparingly on one of the N. Grampians, Scotland.—B. M.: Summit of Ben-naboord, Braemar, Aberdeenshire.

163. *L. cinerea* Somm. Suppl. Fl. Lapp. (1826) p. 99; Nyl. Not. Sällsk. pro F. et Fl. Fenn. Förh. n. ser. v. (1866) p. 136.—Thallus determinate or subeffuse, rimoso-areolate or diffracto-areolate, grey or greyish-white (K+yellow, then rusty-red, CaCl—, medulla I—); hypothallus black. Apothecia small or submoderate, immersed and concave, at length sessile and plane, black, naked; the thalline margin entire, subpersistent; spores 8næ (rarely 6næ), subellipsoid, 0,015–23 mm. long, 0,008–14 mm. thick; paraphyses not discrete; hymenial gelatine bluish, then tawny or wine-red with iodine.—Cromb. Lich. Brit. p. 54; Leight. Lich. Fl. p. 195, ed. 3, p. 172.—*Aspicilia cinerea* Mudd, Man. p. 162 pro parte. *Urceolaria cinerea* Sm. Eng. Fl. v. p. 172; Tayl. in Mack. Fl. Hib. ii. p. 132; Gray, Nat. Arr. i. p. 458. *Lichen cinereus* Ach. Prodr. (1798) p. 32; Eng. Bot. t. 1751.—As observed by Acharius *l. c.* this is scarcely *Lichen cinereus* Linn. Mant. i. (1767) p. 132, of which there is no specimen in his Herbarium; nor is it *Lichen cinereus* Huds. Fl. Angl. ed. 2, p. 525.

A good species, though often not well characterized nor rightly limited. In this latter respect various others have been subsumed under it which are now readily separated, apart from the other distinctive characters, by their negative reactions with K. It is thus a much less variable plant than was supposed, and is not so apt to be confused with some of its allies. The thallus, which is generally well fertile, occasionally spreads extensively, but is usually limited by the hypothallus. A state very rarely occurs in Britain on schistose rocks (Tremadoc, N. Wales, *vide* Leighton) in which the thallus is greyish-ochreous, when it is form *ochracea* Leight. Lich. Fl. ed. 3, p. 193 (*Urceolaria cinerea* γ. *ochracea* Schaer. Spicil. p. 72). The spermatogones are frequent, with spermatia 0,016–21 mm. long, scarcely 0,001 mm. thick.

Hab. On rocks and walls in maritime and mountainous tracts.—*Distr.* Rather local, though plentiful where it occurs in Great Britain, Ireland, and the Channel Islands.—B. M.: La Coupe, Island of Jersey; Moulin Huet Bay, Guernsey. Bray Hill, St. Minver, Cornwall; Cader Idris and Barmouth, Merionethshire; Snowdon, Carnarvonshire; Teesdale, Durham. Barcaldine, Argyshire; Glen Lachay, Killin, and Ben Lawers, Perthshire; Portlethen, Kincardineshire. Lambay Island, co. Cork; co. Wicklow.

Form *lepidota* Leight. Grevillea, iii. (1875) p. 116; Lich. Fl. ed. 3, p. 173.—Thallus greyish-brown, squamuloso-areolate, the squamules convex, often rugose. Apothecia innate, small; the thalline margin persistent.—Cromb. Grevillea, xix. p. 57.

Differs in the more squamulose and darker thallus, which renders it a good form, if not a distinct variety. Both apothecia and spermogones are frequent in the specimens seen.

Hab. On maritime rocks and by lakes in mountainous districts.—*Distr.* As yet only in the Channel Islands and N. Wales.—B. M.: Beauport, Island of Jersey. Llyn Dinas, near Beddgelert, Carnarvonshire.

Subsp. *L. epiglypta* Nyl. Flora, 1881, p. 4.—Thallus rimoso-areolate, dark-greyish, the areolæ plane. Apothecia at length prominent, somewhat convex, the epithecium crowdedly corrugate or ruguloso-insculpt: otherwise as in the type.—Cromb. Grevillea, xix. p. 57.

Well distinguished by the peculiar character of the epithecium, which gives the fruit as it were a gyrose appearance. This, however, is not visible in the young urceolate apothecia. The spermogones are frequent, with spermatia straight, 0.015–23 mm. long, 0.0005–6 mm. thick.

Hab. On schistose rocks in maritime and mountainous districts.—*Distr.* Only very sparingly in N. Wales and the S.W. Highlands of Scotland.—B. M.: Cader Idris, Merionethshire. Barcaldine, Argyshire.

164. *L. intermutans* Nyl. Flora, 1872, pp. 354, 429.—Thallus determinate, diffracto-areolate, whitish or casto-greyish (K + yellow, then rusty red, CaCl—). Apothecia submoderate, immersed, concave, blackish; the thalline margin entire, at length inflexed; spores usually 8me, 0.023–34 mm. long, 0.009–0.015 mm. thick; hymenial gelatine bluish, then wine-red with iodine.—Cromb. Grevillea, xix. p. 57.

Closely allied to the preceding species, but differs in the larger spores and the much shorter spermatia, which are 0.007–9 mm. long, scarcely 0.001 mm. thick. Nylander says that the thallus in the E. Pyrenees is at times milky-white, and often occurs insulated, from the intrusion of rudimentary thalli of other species. In the single British (fragmentary) specimen seen it is associated with *Lecanora atra*.

Hab. On schistose rocks in a maritime district.—*Distr.* Extremely local and scarce in W. Ireland.—B. M.: Near Kylemore, Connemara, co. Galway.

165. *L. alpina* Somm. Suppl. Fl. Lapp. (1826) p. 94; Nyl. Flora, 1869, p. 413.—Thallus indeterminate, areolate or areolato-verrucose, greyish or leaden-greyish; areolae rounded or angulose (K + yellowish, then reddish, CaCl—, medulla I + bluish); hypothallus black. Apothecia immersed or at length superficial, plane, reddish or reddish-black; the thalline margin prominent, subpersistent: spores 8næ, ellipsoid or ovoid, 0.009–13 mm. long, 0.006–8 mm. thick; paraphyses not discrete, brownish towards the apices; hymenial gelatine deep blue, the thecae at length violet or wine-reddish with iodine.—Cromb. Grevillea, xix. p. 57, *non* Leight. Grevillea, i. p. 125.—*Lecanora cinereo-rufescens* Cromb. Lich. Brit. p. 55, Leight. Lich. Fl. p. 211, ed. 3, p. 197, is entirely referable to this species.

A well-marked plant differing at once from all states of *L. cinerea*, with which it is so far comparable, in the positive reaction of the medulla with iodine. In the single British specimen, which is well fertile, the areolae are contiguous, though in more northern regions they are often discrete, when the hypothallus is more visible. The spermatogones have the spermatia cylindrical, straight, 0.004–6 mm. long, about 0.001 mm. thick. A closely allied species or perhaps only a variety is *L. Myrini* Nyl. Flora, 1869, p. 413 (*Parmelia* Fr. Sum. Veg. Scand. (1845) p. 108), distinguished chiefly by the yellowish thallus, the black apothecia, and the rather shorter spermatia. This is said by Leighton (Lich. Fl. ed. 3, p. 173) to have been gathered at Barmouth: but the specimen in hb. Salwey referred to in Grevillea, i. p. 125, is from Norway.

Hab. On a mica-schist rock in an alpine situation.—*Distr.* Very local and scarce on one of the S. Grampians, Scotland.—B. M.: Ben Lawers, Perthshire.

166. *L. cinereorufescens* Nyl. Not. Sällsk. pro F. et Fl. Fenn. Förh. n. ser. v. (1866) p. 137.—Thallus subdeterminate, verrucose or rimoso-areolate, pale or dark greyish (K—, CaCl—, medulla I + bluish); hypothallus blackish. Apothecia small or submoderate, at first innate and concave, then somewhat prominent and plane, brownish- or dark-red; the thalline margin entire; spores 8næ, ellipsoid, 0.012–24 mm. long, 0.007–16 mm. thick: paraphyses submoderate, brownish at the incrassate apices; hymenial gelatine bluish, the thecae wine-red with iodine.—Cromb. Grevillea, xix. p. 57.—*Urecolaria cinereorufescens* Ach. Lich. Univ. (1810) p. 677.

In some respects related to the preceding, but differs, among other characters, in the negative reaction of the cortical layer with K. The type has not yet occurred with us, but only the following form.

Form *diamarta* Nyl. l. c.—Thallus ochraceo-reddish. Apothecia with the thalline margin often flexuose.—Cromb. Lich. Brit. p. 55; Leight. Lich. Fl. p. 211, ed. 3, p. 197.—*Lichen diamartus* Wahl. Fl. Lapp. (1812) p. 414. *Lichen sinopicus* Eng. Bot. t. 1776 (lower magnified fig.).

The colour of the thallus, as in other similar instances, depends upon the presence of peroxide of iron in the substratum. In the British specimens the apothecia are numerous and at times angulose from mutual pressure. Only a few spermatogones are visible, with spermatia 0,001–5 mm. long, about 0,001 mm. thick.

Hab. On moist mica-schist rocks in an alpine situation.—*Distr.* Only on one of the S. Grampians, Scotland.—B. M.: Above Loch-na-Gat, Ben Lawers, Perthshire.

167. *L. recedens* Nyl. Flora, 1879, p. 361.—Thallus determinate, thick, subverrucoso-unequal, rimoso-diffract, greyish (K—, CaCl—, medulla I—). Apothecia small, innate, brownish-black, colourless within; the thalline margin slightly prominent; spores 8næ, subglobose or ellipsoid, 0,009–14 mm. long, 0,007–9 mm. thick; paraphyses thick, jointed; epithecium brownish; hymenial gelatine slightly bluish, then wine-red with iodine.—Cromb. Grevillea, xix. p. 57.—*Lecidea recedens* Tayl. in Mack. Fl. Hib. ii. (1836) p. 117. *Lecanora subcinerea* Nyl. Flora 1869, p. 82; Cromb. Journ. Bot. 1875, p. 140; Leight. Lich. Fl. ed. 3, p. 197.—*Brit. Exs.*: Lich. Hb. n. 299 (macrior).

Well distinguished from the allied species by the subglobose spores and the articulate paraphyses. It approaches *L. cinerorufescens*, but from this it differs also in the thicker thallus, the negative reaction of the medulla with iodine, and the shorter spores. Our British specimens are for the most part well fertile. Though describing it as a *Lecidea*, Taylor *l. c.* says that it is allied to *Urceolaria cinerea*.

Hab. On rocks in maritime and mountainous districts.—*Distr.* Only in N. Wales, N. England, and W. Ireland.—B. M.: Llyn Bodlyn, Barmouth, Merioneth; Holwick Scar, Yorkshire. Dunkerron, co. Kerry; Derryclare, Connemara, co. Galway.

168. *L. pelobotrya* Somm. Lapp. Suppl. (1826) p. 99; Nyl. Lich. Scand. p. 155.—Thallus determinate, tartarcous, thickish, areolato-verrucose, the verrucæ gibbose or somewhat plane, smooth, crowded, whitish (K—, CaCl—). Apothecia moderate, plane, slightly immersed in the areolæ, brownish-black; the thalline margin rather thick, inflexed; spores 4–8næ, ellipsoid or oblongo-ellipsoid, 0,023–35 mm. long, 0,012–16 mm. thick; hypothecium brownish-black or blackish; paraphyses slender; hymenial gelatine bluish with iodine.—Leight. Lich. Fl. ed. 3, p. 195.—*Aspicilia pelobotrya* Mudd, Man. p. 164. *Lecidea pelobotrya* Cromb. Lich. Brit. p. 80; Leight. Lich. Fl. ed. 1, p. 298. *Urceolaria pelobotryon* Wahl. in Ach. Meth. Suppl. (1803) p. 31.

A rather peculiar species of this section, which from the dark hypothecium might be taken for a *Lecidea*. The distinct thalline margin, however, of the apothecia in well-developed specimens shows that it is a true *Lecanora*. The thallus, which has a whitish evanescent hypothallus, is at first plane and continuous, becoming at length thickish and verrucose,

and occasionally bears pale-reddish cephalodia similar to those of *Lecidea punceola*. When growing in wet places by streams it is more expanded, of a livid-grey colour, non-cephalodiferous, with the thalline margin of the apothecia usually obliterated (form *rivularis*, Cromb.). The apothecia are somewhat scattered, innate or at length nearly superficial, with the disc free at the circumference.

Hab. On micaceo-schistose rocks in alpine places.—*Distr.* Only very sparingly near the summits of two of the S. Grampians, Scotland.—B. M.: Ben Lawers and Craig Calliach, Perthshire.

169. *L. gibbosa* Nyl. Not. Sällsk. pro F. et Fl. Fenn. Förh. n. s. v. (1866) p. 137.—Thallus determinate, thick, areolato-verrucose or gibbous, greyish, dark-grey or dark-greenish-brown (K—, CaCl—, medulla I—); hypothallus black, limiting the thallus. Apothecia at first immersed and concave, then emersed and plane, submoderate, black, naked; the thalline margin entire or slightly crenulate, persistent; spores 6-8 μ , rarely 4 μ , ellipsoid or subglobose, large, 0.021-38 μ long, 0.012-24 μ thick; paraphyses not discrete; hymenial gelatine pale-bluish, then tawny or sordid-wine-red with iodine.—Leight. Lich. Fl. ed. 3, p. 193, ed. 1, p. 209 pro parte; Cromb. Lich. Brit. p. 55 pro parte.—*Aspicilia gibbosa* Mudd, Man. p. 162. *Urceolaria gibbosa* Sm. Eng. Fl. v. p. 172; Gray, Nat. Arr. i. p. 458. *Lichen gibbosus* Ach. Prodr. (1798) p. 30.—*Lichen gibbosus* Dicks. Crypt. fasc. ii. (1790) p. 20, t. vi. f. 5; With. Arr. ed. 3, p. 20, from the diagnosis and locality cited is evidently not this species.—*Brit. Exs.*: Leight. n. 175; Cromb. n. 167; Larb. Lich. Hb. n. 220.

A very variable plant presenting the varieties and subspecies that follow: while several states of the type itself were by older authors regarded as distinct species. In a young condition, especially when silicicolous, the predominating hypothallus, black and radiately subplumose, is everywhere visible, the thalline verrucæ being more or less scattered. It is then *Lichen fibrosus* Eng. Bot. t. 1739; *Urceolaria gibbosa* var. β . *fimbriata* Ach., Gray Nat. Arr. i. p. 458. The same with the verrucæ here and there greenish-soresdiferous, owing no doubt to habitat (moist flints), is *Lecanora aspersa* Borr. Eng. Bot. Suppl. t. 2728; Sm. Eng. Fl. v. p. 188. Another state, in which the thalline verrucæ are subglobular and often discrete, is *Lichen tuberculosus* Eng. Bot. t. 1733; *Rinodina tuberculosa* Gray Nat. Arr. i. p. 452; *Lecanora tuberculosa* Sm. Eng. Fl. v. p. 188. Occasionally the thalline margin of the young apothecia is coarctate or subcrenulate, whence forma *porinoidea* (Flot. Lich. Siles. i. p. 128) Leight. Lich. Fl. ed. 3, p. 194. All of these, however, where the plant is very abundant (as in the Kentish locality), often pass into and are mixed up with each other in the same specimen. The spermatogones, especially in younger states of the plant, are very frequent, with spermatia 0.009-0.012 μ long, scarcely 0.001 μ thick (*vide* Nyl. Lich. Pyr. Or. Obs. nov. p. 59).

Hab. On rocks and stones (chiefly flints) in maritime and hilly districts.—*Distr.* Local, though plentiful, in S. W., and N. England; rare in Wales and in the S.W. Highlands of Scotland; not seen from Ireland nor the Channel Islands.—B. M.: Ryde, Isle of Wight; Lydd Beach, Kent; Lewes, S. Downs, St. Leonard's, and Beachy Head, Sussex;

Chesil Beach, Portland Island, Dorsetshire; Lyndhurst Moor, Hants; Thetford Warren, Norfolk; Hereford Beacon, Malvern, Worcestershire; Crossfen, Monmouthshire; Caer Caradoc and Longmynd, Shropshire; Eglestone, Durham. Appin, Argyleshire.

Var. β . *zonata* Wainio. Medd. Soc. pro F. et Fl. Fenn. t. vi. (1881) p. 168.—Thallus determinate, thinly rimoso-areolate, greyish glaucous, effigurate at the circumference with concentric and parallel paler lines and limited by a very thin, black hypothallus. Apothecia as in the type.—Cromb. Grevillea, xix. p. 57.—*Sagedia zonata* Ach. Vet. Ak. Handl. (1809) p. 165; Lich. Univ. p. 329.

A distinct variety, usually overlooked by authors, but well characterized by the thallus being more or less broadly zonate at the circumference. The lines with which it is there marked are at times whitish, as stated by Acharius, but this apparently is the result of abrasion. A young and less developed condition may be var. *squamata* (Flot.) Fr. fil. Lich. Scand. p. 276 (*non* Leight. Lich. Fl. ed. 3, p. 194, which is only the so-called form *porinoidea* hypothalline).

Hab. On siliceous stones in maritime and upland situations.—*Distr.* Extremely local and scarce in S.E. England.—B. M.: Lydd Beach, Kent; South Downs, Sussex.

Var. γ . *lusca* Nyl. Pyr. Or. Obs. Nov. (1891) p. 59 (nota 1).—Thallus thinnish, rimoso-areolate, subrugulose, greyish or dark-grey; hypothallus little visible. Apothecia somewhat small, often flexuose; spores 0,016–21 mm. long, 0,010–16 mm. thick.—*Lecanora lusca* Nyl. Flora, 1873, p. 69 (nota 1); Cromb. Journ. Bot. 1882, p. 274; subsp. *lusca* Cromb. Grevillea, xix. p. 57.

Now viewed by Nylander as only a variety of *L. gibbosa*, differing in the characters given and more especially in the rather longer spermatia, which are 0,016–21 mm. long, 0,010–14 mm. thick. In other respects it approaches subspecies *L. subdepressa*. The small apothecia are at times numerous, crowded, and difform.

Hab. On rocks in maritime and mountainous districts.—*Distr.* Only a few localities in Great Britain and the Channel Islands.—B. M.: Chateau Point, Isle of Sark. Breidden mt., Montgomery; Barmouth, Merionethshire; near Newton, Cleveland, Yorkshire; Scale Hill, Lazonby, Cumberland. Ben Lawers and Craig Calliach, Perthshire; S. of Bay of Nigg, Kincardineshire.

Subsp. 1. *L. depressa* Nyl. Not. Sällsk. pro F. et Fl. Fenn. n. s. v. (1866) p. 137.—Thallus effuse, areolato-rimulose, greyish or dark; hypothallus indistinct. Apothecia somewhat small, sublecidine, at length plane; spores 0,018–24 mm. long, 0,008–0,014 mm. thick.—Cromb. Lich. Brit. p. 55; Leight. Lich. Fl. p. 210 pro parte, ed. 3, p. 194 pro parte.—According to Th. M. Fries (Lich. Scand. p. 282) this is not *Sagedia depressa* Ach. (Lich. Univ. p. 327, t. 6. f. 3), which has thalline reaction K+ and is a form of *L. cinerea*.

Well characterized as a subspecies by the type of the apothecia, which

only in a young state are more or less lecanorine. In the two British specimens, the thallus is subolivaceous with the areolæ somewhat gibbous at the circumference. They are well fertile, but the spermatogones are very rarely present.

Hab. On a mica-schist boulder in a mid-alpine situation.—*Distr.* Extremely local and rare on one of the S. Grampians, Scotland.—B. M.: Loch-na-Gat, Ben Lawers, Perthshire.

Subsp. 2. *L. subdepressa* Nyl. Flora, 1873, p. 69.—Thallus subdeterminate, thickish, rimoso-areolate, greyish or dark-grey; hypothallus indistinct. Apothecia small or submoderate, concave or somewhat plane, black; the thalline margin depressed, at length excluded; spores variable in size, from 0,018–24 to 0,027–32 mm. long, 0,011–15 mm. thick.—Cromb. Grevillea, xix. p. 57; Journ. Bot. 1885, p. 195 (ut sp. propr.).—*Urceolaria rufescens* Tayl. in Mack. Fl. Hib. ii. p. 132 pro parte.

Subsimilar to the preceding subspecies, but differs at once in the longer spores and the more distinctly lecanorine apothecia. Nylander says (Lich. Fret. Behr. p. 30) that the thallus in specimens from Behring's Straits is subradiate at the circumference, which is not the case in ours. The apothecia are either somewhat scattered or at times several and small in each areola. The spermatogones have the spermatia 0,009–15 mm. long, scarcely 0,0001 mm. thick.

Hab. On schistose rocks in mountainous regions.—*Distr.* Local but plentiful where it occurs, in Great Britain and Ireland.—B. M.: Cader Idris and Camlan Valley, near Dolgelly, Merionethshire; Snowdon, Carnarvonshire; Windermere, Westmoreland. Barcaldine, Argyleshire; Craig Calliach and Ben Lawers, Perthshire; Morrone, Braemar, Aberdeenshire. Cappamore, near Dunkerron, co. Kerry; Maam Turk mt., Connemara, co. Galway.

170. *L. cæsiocinerea* Nyl. Flora, 1872, p. 364.—Thallus determinate, thickish, areolato-verrucoso-diffract, cæcio-greyish, greyish-white or sordid-greyish (K—, CaCl—); hypothallus black, usually limiting the thallus. Apothecia submoderate, at first immersed and concave, at length somewhat prominent and plane, black or dark-olive; the thalline margin thickish, entire, or subentire; spores 8-æte, ellipsoid, 0,018–25 mm. long, 0,010–14 mm. thick; hymenial gelatine tawny wine-red with iodine.—Leight. Lich. Flora, ed. 3, p. 134; Cromb. Grevillea, xix. p. 57.—*Brit. Exs.*: Leight. n. 204; Larb. Lich. Hb. n. 60.

Usually confounded with *L. gibbosa*, but now definitely separated by differences in the thallus and fructification. At times it is widely expanded with the hypothallus little visible. In shady habitats the thallus is more cæsius and but sparingly fertile. The spermatogones (*vide* Nyl.) have the spermatia 0,007–11 mm. long, 0,0005–7 mm. thick.

Hab. On rocks in maritime and mountainous districts.—*Distr.* Only here and there throughout Great Britain and Ireland.—B. M.: Roughton and near Penzance, Cornwall; Llandyssil, Cardiganshire; Malvern Hills, Worcestershire; Longmynd, Shropshire; Lamplugh, Cumberland. Barcaldine, Argyleshire; King's Park, Stirling; Glen Lyon and Ben

Lawers, Perthshire; near Portlethen, Kincardineshire; Morrone, Braemar, Aberdeenshire. Kilcully, near Cork; Kilkee, co. Clare; Doughruagh and Maam mts., Connemara, co. Galway; Black mt., co. Antrim.

Form *obscurata* Nyl. Flora, 1872, p. 364.—Thallus dark- or olive-greyish. Apothecia and spermogones as in the type.—Leight. Lich. Fl. ed. 3, p. 195.—*Parmelia cinerea* var. *obscurata* Fr. fil. Lich. Succ. n. 343.—*Brit. Eas.*: Leight. n. 175; Mudd, n. 135.

Variously placed by authors, but evidently referable to this species, with which, except in the darker thallus, it entirely agrees. In this respect, however, transition states at times occur.

Hab. On rocks and boulders in upland and subalpine tracts.—*Distr.* Found only in a few localities in Great Britain and S.W. Ireland.—B. M.: Malvern Hills, Worcestershire; Caer Caradoc, Shropshire; Cliff-rigg, Cleveland, Yorkshire; Reston Scar, Staveley, Westmoreland. King's Park, Stirling; Craig Tulloch, Blair Athole, Perthshire; Morrone, Braemar, Aberdeenshire. Killarney, co. Kerry.

171. *L. lævata* Nyl. Flora, 1872, p. 364, 1881, p. 183.—Thallus determinate or effuse, very thin or thin, continuous or here and there rimulose, smooth, somewhat shining, sordid-lurid-glaucous (K—, CaCl—); hypothallus black, often indistinct. Apothecia minute, concave, black, the thalline margin somewhat tumid, prominent, entire or subcrenulate; spores 0.015–24 mm. long, 0.009–14 mm. thick; hymenial gelatine pale-bluish, then tawny wine-coloured with iodine.—*Sagedia lævata* Ach. Lich. Univ. (1810) t. 6. f. 5.

Generally regarded as only a variety of *L. gibbosa*, but distinct in the much thinner, more continuous thallus and the minute apothecia. More definitely, however, it is separated from it, and from all the allied species, by the form of the spermatia. These are slightly arcuate, 0.020–32 mm. long, 0.0005 mm. thick (*vide* Nyl. Lich. Fret. Behring, p. 31). In the single British specimen the thallus is indeterminate, but Acharius (Syn. p. 134) says it is now and then limited by a black serpentine (hypothalline) line. Both apothecia and spermogones are numerous, the former being here and there somewhat crowded.

Hab. On a damp quartzose riparian rock in a subalpine district.—*Distr.* Extremely local and scarce among the N. Graupians, Scotland.—B. M.: Glen Callater, Braemar, Aberdeenshire.

172. *L. calcarea* Somm. Suppl. Fl. Lapp. (1826) p. 102; Nyl. Flora, 1869, p. 409.—Thallus determinate or subeffuse, tartareo-farinoso, continuous or rimoso-areolate, white-cretaceous or greyish-white (K—, CaCl—, medulla I—); hypothallus white. Apothecia immersed, at length somewhat plane, submoderate, caesio-pruinose; the thalline margin entire or rugoso-plicate; spores 2–6 μ , rarely 8 μ , ellipsoid or often subglobose, 0.018–30 mm. long, 0.014–27 mm. thick; paraphyses not discrete, dark at the apices; hymenial gelatine bluish, then sordid-yellow with iodine.—Cromb. Lich. Brit. p. 54; Leight. Lich. Fl. 209, ed. 3, p. 192.—*Aspicilia cal-*

careæ Mudd, Man. p. 161, t. 3. f. 55. *Urceolaria calcarea* Sm. Eng. Fl. v. p. 172; Tayl. in Mack. Fl. Hib. ii. p. 132; Gray, Nat. Arr. i. p. 459. *Lichen calcareus* Linn. Sp. Pl. (1753) p. 1140; Huds. Fl. Angl. p. 442; With. Arr. ed. 3, iv. p. 6 pro minima parte. *Lichen tessellatus* Eng. Bot. t. 553. *Urceolaria tessellata* Ach., Gray, Nat. Arr. i. p. 460.—*Brit. Exs.*: Leight. n. 13; Mudd, n. 133; Larb. Lich. Hb. n. 166.

Easily recognized among British species by the whitish or chalky-white thallus. In its more typical condition it is *a. concreta* (Schaer. Spicil. p. 73) Leight. Lich. Fl. ed. 3, p. 192 (*tessellata*, Ach.), with the thallus determinate, often subeffigurate at the circumference, and the areolæ contiguous, angulose. The apothecia are numerous, often crowded, at times naked, with the proper margin at length discrete from the thalline margin. The spermatogones are frequent, dark-brown or blackish, with spermatia aciculari-cylindrical, 0.007–9 mm. long, about 0.001 mm. thick.

Hab. On calcareous rocks and walls, rarely granitic, in maritime and upland districts.—*Distr.* General and common in limestone tracts of Great Britain and Ireland; not seen from the Channel Islands.—B. M.: Burgh Castle, Suffolk; Peasemars, Sussex; Plymouth, S. Devon; near Penzance, Cornwall; Bathampton Downs, Somerset; Cuning Dale, near Buxton, Derbyshire; Malvern Hills, Worcestershire; Barmouth, Merionethshire; Great Orme's Head, Carnarvon; Island of Anglesea; Bilsdale, Yorkshire; Eglestone and Teesdale, Durham; Levens, Westmoreland. Appin and Island of Lismore, Argyshire; Craig Tulloch, Blair Athole, Perthshire; Morrone, Braemar, Aberdeenshire. Dunkerron, co. Kerry; Maam, Connemara, co. Galway.

Var. *β. contorta* Nyl. Flora, 1872, p. 554.—Thallus effuse, white or greyish-white, the areolæ more or less discrete, elevated in the centre, depressed and at times subeffigurate at the circumference. Apothecia immersed.—Leight. Lich. Fl. ed. 3, p. 193.—*Aspicilia calcarea β. contorta* Mudd, Man. p. 162. *Urceolaria contorta* Tayl. in Mack. Fl. Hib. ii. p. 132. *Lichen contortus* Hoffm. Deutsch. Fl. ii. (1795) p. 186.—*Brit. Exs.*: Leight. n. 322.

Distinguished by the form of the discrete or subdiscrete thalline areolæ. It usually spreads extensively over the substratum and is well fertile.

Hab. On calcareous rocks in maritime, but chiefly upland districts.—*Distr.* Somewhat local in Great Britain and Ireland.—B. M.: Near Kingskerswell, S. Devon; Symmond's Yat, Herefordshire; Ashwood Dale, Derbyshire; near Oswestry, Shropshire; Great Orme's Head, Carnarvonshire; Teesdale, Durham. The Ochils, near Stirling; Craig Tulloch, Blair Athole, Perthshire; Craig Guie, Braemar, Aberdeenshire. The O'Donoghue's Prison, Killarney, co. Kerry.

Form *monstrosa* Cromb. Grevillea, xix. (1891) p. 57.—Thallus effuse, snow-white; areolæ discrete, scattered, rounded, convex, entire at the margins. Apothecia abortive, minute, deeply immersed.—*L. calcarea* var. *monstrosa* Lamy, Bull. Soc. Bot. t. xxx. (1883) p. 392.

Only a well-marked form of this variety, characterized by the isolated areolæ, in each of which there is a central umbilicus indicating the abortive apothecia. Probably it may be only a very young condition.

Hab. On calcareous stones of a wall in an upland situation.—*Distr.* Only very sparingly among the Central Grampians, Scotland.—B. M.: Glen Fender, Blair Athole, Perthshire.

Var. γ . *Hoffmanni* Somm. Suppl. Fl. Lapp. (1826) p. 102.—Thallus thinish or thick, contiguous or subcontiguous, glaucescent. Apothecia elevated, moderate or somewhat large, the margin often rugoso-crenate; spores 0.021–34 mm. long, 0.016–18 mm. thick.—Cromb. Grevillea, xix. p. 57; Lich. Brit. p. 54 pro parte; forma *Hoffmanni* Leight. Lich. Fl. p. 209 pro parte, ed. 3, p. 193. *Urceolaria Hoffmanni* Gray, Nat. Arr. i. p. 459 pro parte. *Lichen Hoffmanni* Ach. Prodr. (1798) p. 31; Engl. Bot. t. 1940.—*Brit. Eas.*: Mudd, n. 134.

A very distinct variety, if not a subspecies, having much the general aspect of *L. gibbosa*, but belonging to *L. calcarea*, as shown by the spermatia, which in form and size are identical. From var. β , with which it has often been confused, it differs in the more contiguous and differently coloured (at times subplumbeous) thallus and the less immersed apothecia.

Hab. On rocks and walls (not exclusively calcareous) in maritime, but chiefly in hilly districts.—*Distr.* Only here and there in Great Britain; apparently rare in N.W. Ireland.—B. M.: Beachy Head, Sussex; near Cirencester, Gloucestershire; Buxton, Derbyshire; Chance's Pitch, Malvern, Worcestershire; near Roseberry, Cleveland, Yorkshire; Levens, Westmoreland. Ben Cruachan, Argyleshire; Glen Fender, Blair Athole, Perthshire; Portlethen, Kincardineshire. Doughruagh mts., Connemara, co. Galway.

173. *L. verrucosa* Nyl. Mém. Soc. Cherb. t. v. (1857) p. 113; Lich. Scand. p. 156.—Thallus effuse, verrucoso-unequal, naked or slightly pulverulent, white or glaucous-white (K—, Ca Cl—). Apothecia immersed in the verrucæ, moderate, concave, at length somewhat plane, blackish, naked or pruinose, the thalline margin thick, entire, inflexed; spores subellipsoid, large, 0.030–62 mm. long, 0.016–52 mm. thick; paraphyses not discrete; hymenial gelatine pale-bluish, then sordid-yellow or wine-red with iodine.—Cromb. Lich. Brit. p. 55; Leight. Lich. Fl. p. 214, ed. 3, p. 200.—*Aspicilia verrucosa* Mudd, Man. p. 164. *Urceolaria verrucosa* Ach. Lich. Univ. (1810) p. 339.—*Brit. Eas.*: Cromb. n. 73.

Characterized by the white, usually more or less farinose thallus, by its place of growth, and by the large spores. The thallus varies somewhat in thickness and colour according to the habitat, while on more sterile soil it is smaller and determinate. The apothecia are numerous, at first urceolate, then plane, the thalline margin rarely obsolete, when the proper margin, which is thin and blackish, becomes conspicuous.

Hab. Incrusting mosses on rocks, rarely on the ground (chiefly calcareous), in upland and subalpine situations.—*Distr.* Local in N. England

and on the S. and Central Grampians, Scotland.—B. M.: Cunswick Sear, Westmoreland. Craig Calliach, above Loch-na-Gat, Ben Lawers, and Craig Tulloch, Blair Athole, Perthshire.

174. *L. poriniformis* Nyl. Flora, 1865, p. 353—Thallus effuse, thinnish, firm, rimoso-diffract, greyish or pale-grey (K+yellow). Apothecia small, innate in convex, somewhat prominent verrucæ, pertusarioid, pale or brownish; the epithecium pale, punctiformi-contracted; spores 6-Snæ, ellipsoid, 0,070-80 mm. long, 0,034-50 mm. thick; paraphyses slender; hymenial gelatine bluish, then tawny-yellow with iodine.—Carroll, Journ. Bot. 1866, p. 23; Cromb. Lich. Brit. p. 56; Leight. Lich. Fl. p. 190, ed. 3, p. 203.—*Brit. Exs.*: Cromb. n. 74.

Looks exactly like a *Pertusaria*, allied to *P. xanthostoma* Somm. The characters, however, of the hymenium, of the thecæ (which are fugacious), and of the spores show that it is a *Lecanora* distantly related to the preceding species. The thallus spreads somewhat extensively with the fertile verrucæ scattered or approximate. Usually there is but a single apothecium in each verruca, though not unfrequently there are 3 or 4, when the verrucæ are rather larger.

Hab. On schistose rocks and walls, rarely incrusting mosses, or on trunks of old firs, in maritime and subalpine districts.—*Distr.* Local and scarce among the S. and Central Grampians and on the N.E. coast of Scotland.—B. M.: Ben Lawers and Craig Tulloch, Perthshire; near Portlethen, Kincardineshire.

175. *L. Dicksonii* Nyl. *ex* Carroll, Journ. Bot. (1867) p. 255.—Thallus determinate, thin, smooth, rimose or areolato-rimose, ochraceo-ferruginous, opaque (K—, CaCl—); hypothallus thin, black, limiting the thallus. Apothecia lecideine, small, innate, concave, black, internally blackish (greyish in the centre), the proper margin thick, black; spores Snæ, ellipsoid, 0,011-14 mm. long, 0,006-8 mm. thick; hypothecium brownish-black; paraphyses not discrete, fuliginous towards the apices; hymenial gelatine bluish, then wine-red with iodine.—Cromb. Lich. Brit. p. 55; Leight. Lich. Fl. p. 211, ed. 3, p. 196.—*Lichen Dicksonii* Ach. Prodr. (1798) p. 76. *Lecidea melanophora* Fr., Mudd, Man. p. 206. *Lecidea Ederi* (non Web.) Tayl. in Mack. Fl. Hib. ii. p. 122; Sm. Eng. Fl. v. p. 178; Hook. Fl. Scot. ii. p. 38; Gray, Nat. Arr. i. p. 466. *Lichen Ederi* Eng. Bot. t. 1117; With. Arr. ed. 3, iv. p. 11 pro parte.—*Brit. Exs.*: Leight. n. 127; Cromb. n. 72.

By many authors regarded as a *Lecidea*, with much the aspect of *L. Ederi*, with which it has been confounded; but its most appropriate place is in this section. The peculiar colour of the thallus, as in various other instances, is owing to suffusion with peroxide of iron. Typically, according to specimens from Kerguelen Land, it is greyish (*vide* Linn. Soc. Journ. Bot. xv. p. 190 s. n. *Lecidea sincerula* Nyl.). The apothecia are numerous and at times somewhat crowded.

Hab. On rocks and walls, chiefly schistose, in mountainous regions.—*Distr.* Somewhat local, though usually plentiful in Great Britain and in

S.W. Ireland.—B. M.: Fingle Bridge, near Chagford, S. Devon; Dolgelly and Rhiwgreiddan, Merionethshire; Bettwys-y-coed, Denbighshire; Island of Anglesea; Wrekin Hill, Shropshire; Eglestone, Durham; Staveley, Kendal, Westmoreland; Lamplugh, Cumberland. King's Park, Edinburgh; Ben Lawers and Craig Tulloch, Perthshire; Glen Callater and Morrone, Braemar, Aberdeenshire. Crogham and Mangerton, co. Kerry.

Form *atrata* Cromb. Grevillea, xix. (1891) p. 58.—Thallus only here and there sparingly visible upon the predominating hypothallus. Apothecia scattered, minute.—*Gyalacta atrata* Ach. Vet. Ak. Handl. 1808, p. 229.

A rudimentary, though apparently permanent condition in which scanty traces of a ferruginous thallus are seen only around the apothecia, which in the British specimens are numerous.

Hab. On quartzose rocks in an alpine locality.—*Distr.* Only very sparingly on one of the N. Grampians, Scotland.—B. M.: Morrone, Braemar, Aberdeenshire.

176. *L. lacustris* Fr. fil. Vet. Akad. Handl. vii. (1867) p. 24.—Thallus determinate or subeffuse, thin, smooth, rimuloso-diffract, pale testaceous or ochraceous (K—, CaCl—). Apothecia minute, urceolato-innate, reddish testaceous or brownish; the thalline margin tumid or usually little distinct; spores 8 μ , ellipsoid, 0.013–18 mm. long, 0.006–9 mm. thick; paraphyses not discrete, slightly brownish or yellowish at the apices; hypothecium colourless; hymenial gelatine bluish, then sordid-wine-red or tawny with iodine.—Cromb. Grevillea, i. p. 172; Leight. Lich. Fl. ed. 3, p. 195 (excl. forma *punctata*).—*Lecanora gibbosa* forma *lacustris* Leight. Lich. Fl. ed. i. p. 210; subsp. *lacustris* Cromb. Lich. Brit. p. 55. *Lichen lacustris* With. Arr. ed. 3 (1796) iv. p. 21, t. 31. fig. 4. *Urceolaria Acharii* Gray, Nat. Arr. i. p. 457; Hook. Fl. Scot. ii. p. 47; Sm. Eng. Fl. v. p. 172; Tayl. in Mack. Fl. Hib. ii. p. 132 (incl. var. β). *Lichen Acharii* Westr. Eng. Bot. t. 1087. *Aspicilia epulotica* Mudd, Man. p. 161 pro maxima parte.—*Brit. Exs.*: Cromb. n. 71.

The thallus is normally pale, almost white, but is usually more or less ochraceous from being tinged with peroxide of iron. It often spreads extensively over the substratum and is at times semi-aquatic. The apothecia, which are numerous and often crowded, are at first minute, immersed, rarely at length prominent, occasionally in age becoming sub-moderate, plane, and distinctly margined by the thallus. Occasionally the spores are rather thicker, 0.012 mm., when it is *Lecidea subepulotica* Nyl. Mém. Soc. Cherb. t. v. p. 337, a state which occurs also in Great Britain and Ireland.—Var. β . *cyrtaspis* (Ach.) Cromb. Grevillea, xix. p. 58, does not belong to this species (*cfr.* Fr. fil. Lich. Scand. p. 288).

Hab. On rocks (often inundated) in streams in upland and subalpine districts.—*Distr.* Only here and there, though plentiful where it occurs, in Great Britain and Ireland.—B. M.: Lyndhurst Moor, New Forest, Hants; Dartmoor, Devonshire; Withiel, Cornwall; Naunau, Dolgelly, and near

Barmouth, Merionethshire; Trefriw Falls, Carnarvonshire; Teesdale, Durham. Appin and Glencoe, Argyshire; Glen Falloch and Ben Lawers, Perthshire; Glen Calliter, Braemar, Aberdeenshire. Ballaghbeama Gap and Dunkerron, co. Kerry; Connor Cliffs, Dingle, co. Kerry; Ballynakill and Lough Inagh, Connemara, co. Galway.

177. *L. flavida* Hepp, Exs. (1860) n. 630; Fr. fil. Vet. Ak. Handl. vii. (1867) p. 24.—Thallus effuse, very thin, rimoso-arcolate, subleprose, pale ochraceous or glaucous-grey (K—, CaCl—). Apothecia very minute, innate, at first concave, then plane, black; the thalline margin thin, entire; spores 8næ, ellipsoid, 0.012–18 mm. long, 0.007–11 mm. thick; paraphyses not discrete, bluish towards the apices; hymenial gelatine deep blue with iodine.—Leight. Lich. Fl. ed. 3, p. 195.—*Aspicilia ochracea* (non Schaer.) Mudd, Man. p. 163. *Lecanora gibbosa* forma *lacustris* Leight. Lich. Fl. ed. 1, p. 210 pro parte.—Brit. Exs.: Leight. n. 292; Mudd, n. 136.

A rather inconspicuous plant which, in dry weather, might readily be overlooked, but is well characterized by the characters given. When sub-ochraceous, the black apothecia and the more leprose thallus at once distinguish it from the preceding species; while the minute fruit, apart from anatomical differences, definitely separates it from the ochraceous state of *L. calcarea*. The apothecia are usually very numerous.

Hab. On moist rocks and stones in hilly districts.—*Distr.* Found only in N. England.—B. M.: Cockshaw Bank, Cleveland, Yorkshire.

178. *L. Prevostii* Fr. fil. Lich. Scand. (1871) p. 288.—Thallus effuse, very thin, continuous, whitish, greyish- or fleshy-white, often obsolete (K—, CaCl—). Apothecia minute, deeply immersed, subrotundate or variously difform, concave, carneous or pale-carneous, the proper margin connivent, discrete from the thalline margin; spores ellipsoid, 0.014–22 mm. long, 0.009–11 mm. thick; paraphyses not discrete; epithecium colourless; hymenial gelatine bluish, then sordidly wine-coloured with iodine.—Leight. Lich. Fl. ed. 3, p. 198; Cromb. Grevillea, xix. p. 58.—*Lecanora epulotica* var. *Prevostii* Cromb. Lich. Brit. p. 55; Leight. Lich. Fl. ed. 1, p. 212. *Gyalecta groica* Ach.? Leight. Anglo. Lich. t. 15. fig. 1. *Gyalecta Prevostii* Fr. Lich. Eur. (1831) p. 197.

At one time regarded by Nylander as a variety of the following species, differing chiefly in the irregular foveolate apothecia. It belongs, however, to this subsection, from the character of the gonidia, which *vide* Th. M. Fries (Lich. Scand. p. 289) are 0.009–16 mm. in diameter. In the British specimens the thallus is usually confused with the substratum, whence forma *proletaria* Fr. fil. *l. c.* It is then, from the colour of the very small, though numerous, apothecia, a rather inconspicuous plant.

Hab. On calcareous rocks in upland tracts of hilly and mountainous districts.—*Distr.* Seen from only a few localities in W. and N. England, as also from the Grampians, Scotland.—B. M.: Bathampton Downs, Somerset; Teesdale, Durham; Levens, Westmoreland. Craig Tulloch, Blair Athole, Perthshire; Craig Guie, Braemar, Aberdeenshire.

Form *melanocarpa* Stiz. St. Gall. Nat. Ges. 1881, p. 383.—Thallus as in the type. Apothecia at length emerged, prominent, black, the thalline margin obliterated.—Cromb. Grevillea, xviii. p. 58.—*Hymenelia Prevostii* var. β . *melanocarpa* Krempelh. Lich. Fl. Bayer. (1861) p. 167. *Lichen punctatus* Eng. Bot. t. 450 (according to the specimen figured in Hb. Sowerby and the diagnosis given). *Aspicilia epulotica* var. β . *punctata* Mudd, Man. p. 161. *Urceolaria cyrtaspis* Gray, Nat. Arr. i. p. 458? *U. Acharii* var. β . *cyrtaspis* Ach., Sm. Eng. Fl. v. p. 172.

Though not described by Krempelhuber *l. c.*, the British specimens quite correspond with one from his own herbarium. Were it not that the young apothecia are as in the type, it would form a good variety. When the fruit is immersed it looks much like young states of *Lecidea calcarea*.

Hab. On calcareous rocks in upland situations.—*Distr.* Apparently very local and scarce in S.W. and N. England, as also on the Central Grampians, Scotland.—B. M.: Bathampton Downs, Somersetshire; Teesdale, Durham. Craig Tulloch, Blair Athole, Perthshire.

Var. β . *affinis* Nyl. ex Stiz. St. Gall. Nat. Ges. 1881, p. 385.—Thallus thin, pale-flesh-coloured or subochraceous. Apothecia very minute, at length slightly emerged, pale-testaceous, the thalline margin persistent; spores 0.014–18 mm. long, 0.009–13 mm. thick.—Cromb. Grevillea, xix. p. 58 (lapsu sub *L. epulotica*).—*Hymenelia affinis* Mass. Geneac. Lich. (1854) p. 13; Symm. Lich. p. 23.

Regarded as a distinct species by Massalongo and others, this is only a variety of *L. Prevostii*, with which it is subconfluent, differing only in the more emergent apothecia and the size of the spores. In the British specimens the thallus is at times slightly ochraceous.

Hab. On calcareous and serpentine rocks in subalpine tracts.—*Distr.* Extremely rare in N. England and on the Grampians, Scotland.—B. M.: Teesdale, Durham. Craig Tulloch, Blair Athole, Perthshire; the Khoil, near Ballater, Aberdeenshire.

- b. Gonidial system composed of chrysogonidia, large and concatenate, with thickish, firm membrane or perigonidium. (*Ionaspis* Fr. fil. Lich. Scand. i. (1881) p. 273.)

179. *L. epulotica* Nyl. in Cromb. Lich. Brit. (1870) p. 55 (excl. var.).—Thallus determinate or subeffuse, thin or very thin, continuous or rimulose, pale or pale-whitish (K—, CaCl—). Apothecia innate, somewhat concave, submoderate, pale or pale-rose-coloured; the thalline margin thickish, often circumscribed from the thallus; spores ellipsoid or subglobose-ellipsoid, 0.018–20 mm. long, 0.010–11 mm. thick; hymenial gelatine bluish with iodine.—Leight. Lich. Fl. p. 212 pro parte, ed. 3, p. 197 pro parte.—*Aspicilia epulotica* Mudd, Man. p. 161 pro parte, t. 3. f. 54. *Gyalecta epulotica* Ach. Lich. Univ. (1810) p. 151, t. i. f. 7 (secundum specimen primarium ex Anglia).

Externally not unlike states of *L. lacustris*, with which it is apt to be

confounded, but, among other distinctive characters, differs essentially in the type of the gonidia, which *vide* Th. M. Fries (Lich. Scand. p. 289) are 0.020–32 mm. in diameter. The British specimens are well fertile, with the apothecia either scattered or several crowded (as in the figure of Acharius) and then somewhat flexuose at the margin.

Hab. On calcareous and schistose rocks in upland and subalpine districts.—*Distr.* Very sparingly in N. England and among the Grampians, Scotland.—B. M.: Teesdale, Durham; Marlake, Westmoreland. Craig Calliach and Craig Tulloch, Perthshire; Morrone, Braemar, Aberdeenshire.

180. *L. chrysophana* Nyl. *ex* Stiz. St. Gall. Nat. Ges. 1881, p. 385.—Thallus effuse, thin, rimuloso-areolate, sordid- or chestnut-reddish, when dry at length dark green (K —, CaCl —). Apothecia minute, concave, blackish-green; the thalline margin thin, at length excluded; epitheciium greenish; spores 8 μ , ellipsoid, 0.009–12 mm. long, 0.005–7 mm. thick; hymenial gelatine bluish with iodine.—Cromb. Journ. Bot. 1882, p. 274.—*Aspicilia chrysophana* Koerb. Syst. Lich. Germ. (1855) p. 159.

Distinguished at once by the colour of the thallus and fruit from the other British species of this subsection. The chrysogonidia (*vide* Arnold) are 0.036–45 mm. long, 0.025–30 mm. thick. In our few specimens the apothecia are rather scattered, though here and there a few are congregate.

Hab. On quartzose rocks and stones in alpine situations.—*Distr.* Extremely local and rare on two of the higher Grampians, Scotland.—B. M.: Above Loch-na-Gat, Ben Lawers, Perthshire; Ben-naboord, Braemar, Aberdeenshire.

O. Apothecia lecanorine, not immersed; spores 8 μ , simple, colourless. Spermatogones with subarticulate sterigmata and ellipsoid spermatia.

181. *L. decincta* Nyl. Flora, 1882, p. 452.—Thallus determinate, thin, smooth, rimulose, umbrine, greyish at the circumference (K —, CaCl —). Apothecia submoderate, plane, black, opaque, internally subincolorous or brownish, the thalline margin not prominent; spores 8 μ , ellipsoid, 0.010–14 mm. long, 0.006–8 mm. thick; paraphyses discrete, submoderate, thicker and brown towards the apices; hymenial gelatine pale-blue and then (especially the thecæ) tawny with iodine.—Cromb. Grevillea, xii. p. 89.

Allied to *L. interincta* Nyl., with which it constitutes a distinct section (*vide* Nyl. Flora, 1881, p. 531) characterized by the form of the sterigmata and spermatia. From *L. interincta*, which does not occur in Britain, it differs chiefly in the colour of the thalline margin of the apothecia and in the larger spores. In the single specimen seen the apothecia are numerous, somewhat small, and the spermatogones frequent, with spermatia 0.0025–35 mm. long, 0.0015 mm. thick.

Hab. On schistose rocks in a hilly locality.—*Distr.* Very local and scarce in N.W. England.—B. M.: Red Screes, Westmoreland.

P. Apothecia lecanorine, more or less immersed; thecae myriospored; spores (very rarely 8-32næ) simple, usually small, colourless; hymenial gelatine variously tinged with iodine. Spermatogones with simple sterigmata and minute oblongo-ellipsoid spermatia. (*Acarospora* Mass. Rich. (1852) p. 27 pro maxima parte.)

182. *L. glaucocarpa* Ach. Vet. Ak. Handl. (1810) p. 151.—Thallus squamulose, opaque, pale-livid or lurid-brown, white beneath; squamules somewhat erect or depressed, thickish, scattered or rarely subimbricate, free and crenate at the margins (K —, CaCl —). Apothecia somewhat large, nearly plane, cæcio-pruinose or naked, thick, reddish-brown; the thalline margin thick, entire; spores oblongo-bacillar, 0.003-6 mm. long, 0.0015-25 mm. thick; hymenial gelatine intensely and persistently bluish with iodine.—Cromb. Lich. Brit. p. 56; Leight. Lich. Fl. p. 182, ed. 3, p. 168.—*Lichen glaucocarpus* Wahl. Vet. Ak. Handl. 1806, p. 143, t. iv. f. 4.

A well-marked plant easily recognized by the characters of the thalline squamules and of the apothecia. In the British specimens the thallus is somewhat scattered, at times little developed and visible chiefly around the apothecia (form *discreta*, Kreppeh. Lich. Fl. Bayer. p. 17). These are occasionally somewhat aggregate with the margin flexuose. It is a somewhat variable plant, of which the British forms may be included under the variety that follows.

Hab. On calcareous and schistose rocks in mountainous regions.—*Distr.* Local in N. England and on the Grampians, Scotland.—B. M.: Craig-y-Rhiw, Oswestry, Shropshire; Teesdale, Durham. Ben Lawers and Craig Tulloch, Perthshire; Craig Guie, Braemar, Aberdeenshire.

Var. β . *depauperata* Cromb. Journ. Bot. 1873, p. 134; Grevillea, xix. p. 58.—Thallus obsolete. Apothecia sublecidine, variable in size, naked or pruinose, scattered or crowded, the margin more or less thickish.—Leight. Lich. Fl. ed. 3, p. 169.—*Acarospora cervina* γ . *glaucocarpa* **depauperata* Koerb. Syst. Lich. Germ. (1855) p. 155.

Confluent with less developed states of the type, but differs in being ecrustaceous and in the variable apothecia. According to the differences in these it presents two well-marked forms.

Form 1. *pruinifera* Cromb. Grevillea, xix. (1891) p. 58.—Apothecia moderate, scattered or crowded, cæcio-pruinose, the margin entire or undulate.—The trivial name *pruinosa* given to this by Kreppehuber (Lich. Fl. Bayer. (1861) p. 172) is not to be retained, having been previously applied to an allied species.

Characterized by the pruinose apothecia, which give it much the appearance of *L. pruinosa* (Sm.) Nyl. When more crowded they often become agglutinate.

Hab. On calcareous rocks in mountainous districts.—*Distr.* Only sparingly on the Central and N. Grampians, Scotland.—B. M.: Craig Tulloch, Blair Athole, Perthshire; Craig Guie and Morrone, Braemar, Aberdeenshire.

Form 2. *denudata* Cromb. Grevillea, xix. (1891) p. 58.—Apothecia moderate or small, naked, brownish-red or chestnut-brown, the margin entire.

The epruinose apothecia chiefly distinguish this form. Otherwise they are in some specimens moderate and crowded (form *conferta* Cromb. Journ. Bot. 1873, p. 134); while in others they are small and somewhat scattered (form *conspersa* Fr., "apotheciis minoribus," Cromb. Grevillea, i. p. 171).

Hab. On calcareous and schistose rocks in mountainous districts.—*Distr.* Found only in N. England and the Central and N. Grampians, Scotland.—B. M.: Near Dent, Yorkshire. Craig Tulloch, Blair Athole, Perthshire; Craig Guie, Braemar, Aberdeenshire.

183. *L. squamulosa* Nyl. Flora, 1872, p. 554.—Thallus areolato-squamulose, opaque, cervine, pale badious or badius-brown; squamules adnate, rounded at the margins, white beneath (K (CaCl)—). Apothecia somewhat large, plane, reddish- or dark-brown, the thalline margin usually depressed; spores oblongo-ellipsoid, 0,008–12 mm. long, 0,004–5 mm. thick; paraphyses not discrete, occasionally jointed, brownish at the apices; hymenial gelatine deep blue with iodine.—Cromb. Grevillea, xix. p. 58; Leight. Lich. Fl. p. 183 pro parte, ed. 3, p. 169 pro parte.—*Lichen squamulosus* Schrad. Crypt. Exs. (1797) n. 153. *Lecanora cervina* (Pers.), Cromb. Lich. Brit. p. 56 pro minima parte. *Acarospora cervina* *a. squamulosa*, Mudd, Man. p. 158 pro parte.

Readily distinguished from the preceding species by the closely appressed thallus, the contiguous differently coloured squamules, as also by the thinner spores. It is not very variable, presenting only the form that follows. The apothecia are at first immersed and then become superficial.

Hab. On calcareous rocks in mountainous districts.—*Distr.* Apparently very local and scarce in N. Wales, N.W. England, and on the Grampians, Scotland.—B. M.: Dolgelly, Merionethshire; near Staveley, Kendal, Westmoreland. Craig Tulloch, Blair Athole, Perthshire; Craig Guie and Morrone, Braemar, Aberdeenshire.

Form *albomarginata* Cromb.—Thalline squamules densely white-pulverulent at the margins; otherwise as in the type.

Analogous to form *mosaica*, Duf., Nyl., of *L. castanea* (Ram.), a plant which does not occur in this country.

Hab. On calcareous rocks in a subalpine district.—*Distr.* Extremely rare on one of the Central Grampians, Scotland.—B. M.: Craig Tulloch, Blair Athole, Perthshire.

184. *L. percænoides*, Nyl. *a* Wedd. Bull. Soc. Bot. xvi. (1869) p. 202.—Thallus verrucoso-squamulose, thickish, chestnut-coloured, white- or caesio-pruinose, the squamules convex, scattered or imbricate (K—, CaCl—). Apothecia innate, concave, irregular, rounded or difform, often crowded, reddish- or dark-brown, naked, the thalline margin prominent, whitish; spores ellipsoid, 0,004–6 mm.

long, 0,002 mm. thick; paraphyses usually jointed; hymenial gelatine bluish with iodine.—Cromb. Grevillea, xix. p. 58.—*Lecanora castanea* (Ram.) form *percanoides* Nyl. Bull. Soc. Bot. t. x. (1863) p. 268.

Looks in some respects as if intermediate between *L. glaucocarpa* and *L. squamulosa*, but is very different in the characters of the thallus and the apothecia. The single British specimen is scarcely typical.

Hab. On calcareous rocks in an upland situation.—*Distr.* Found only in S.W. England.—B. M.: Near Yatton, Somersetshire.

185. *L. peliocypha* Nyl. Not. Sällsk. pro F. et Fl. Fenn. Förh. n. ser. v. (1866) p. 182.—Thallus areolato-diffract or verrucoso-squamulose, thickish, somewhat shining, the squamules often crenate, slightly convex, cervine-brown, blackish beneath (K(CaCl) —). Apothecia at first immersed, then plane or slightly convex, papillose in the centre, reddish-brown, naked, the thalline margin persistent, crenulate and flexuose; spores oblongo-cylindrical, 0,003–5 mm. long, 0,0010–15 mm. thick; hymenial gelatine bluish, then wine-red with iodine.—Cromb. Grevillea, xix. p. 58.—*Parmelia peliocypha* Wahl. in Ach. Meth. Suppl. (1803) p. 41.

A plant of an alpine type which might readily be confounded with the following, especially with its variety, from which the negative reactions of the thallus and the papillate apothecia keep it distinct. The single fragmentary British specimen gathered is well fertile.

Hab. On an exposed granitoid boulder in an alpine situation.—*Distr.* Only very sparingly on one of the N. Grampians, Scotland.—B. M.: The Braeriach, Braemar, Aberdeenshire.

186. *L. fuscata* Nyl. Flora, 1872, p. 364.—Thallus appressed, areolato-squamulose, pale-chestnut or cervine-brown, opaque, the squamules angular and sublobate, blackish beneath (K(CaCl) + reddish). Apothecia at first punctiformi-impressed, minute, then concave, small, difformi-angulose and rimose, reddish- or dark-brown, the thalline margin thin, flexuose; paraphyses not discrete; spores oblongo-cylindrical, 0,003–4 mm. long, 0,001–0,0015 mm. thick; hymenial gelatine (especially the thecæ) tawny wine-red with iodine.—Cromb. Grevillea, xix. p. 58; Lich. Brit. p. 56 pro minima parte; Leight. Lich. Fl. p. 186 pro parte, ed. 3, p. 17 pro parte.—*Lichen fuscatus* Schrad. Spicil. Fl. Germ. (1794) p. 83. *Acarospora cervina* (Pers.) Mudd, Man. p. 158 pro maxima parte. *Lecanora cervina* Cromb. Lich. Brit. p. 56 pro parte. *Psoroma cervinum* Gray, Nat. Arr. i. p. 444. *Lichen squamulosus* Eng. Bot. t. 2011 (male). *Lecanora squamulosa* Hook. Fl. Scot. ii. p. 350; Sm. Eng. Fl. v. p. 187 pro parte.—*Brit. Exs.*: Leight. n. 24; Mudd, n. 131.

Differs from *L. squamulosa*, from which it has frequently not been rightly discriminated, in the form of the thalline squamules, their chemical reaction, and the colour of their under surface, as also in the character of the apothecia. As in all the allied plants the hypothallus is

absent, so that the thallus is indeterminate and developed directly from the prothallus (cf. Nyl. Pyr. Or. p. 34). The apothecia when present, for the plant is often sterile, at times remain persistently punctiform.

Hab. On rocks, boulders, and walls from maritime to upland districts.—*Distr.* General and common in England; rarer in Scotland and the Channel Islands; apparently very rare in S.W. Ireland.—B. M.: La Moya and L'Etacq, Island of Jersey; Island of Alderney. Gorleston, Suffolk; near Hastings, Sussex; Morwell Rocks, Devonshire; near Penzance, Cornwall; Charnwood Forest, Leicestershire; Ankerdine Hill, Worcestershire; Buckstone, near Monmouth, and Croesfaen, Monmouthshire; Barmouth, Dolgelly, and Aberdovey, Merionethshire; Llyn Geirionydd, Carnarvonshire; Oswestry and Haughmond Hill, Shropshire; Ayton and Guisboro' Moors, Cleveland, Yorkshire; Eglestone, Durham; near Hexham, Northumberland; Staveley, Kendal, Westmoreland. King's Park, Stirling; Ballachulish, Argyshire; Craig Calliach, Perthshire; Portlethen, Kincardineshire; The Stocket, near Aberdeen; Applecross, Ross-shire. Dunkerron, co. Kerry.

Var. β . *peliscyphoides* Nyl. Flora, 1872, p. 364.—Thallus and apothecia as in *L. peliocypha*, but the thalline reaction K (CaCl) + reddish.—*Lecanora peliscypha* Cromb. Journ. Bot. 1873, p. 134; Leight. Lich. Fl. ed. 3, p. 172 (quoad loc. cit.).

A good variety entirely referable to this species, though externally similar to the preceding, for which the British specimens were originally taken. It is one of those lichens in which the Nylanderian reactions are most useful for the discrimination of plants which otherwise might readily be confounded.

Hab. On walls in a maritime district.—*Distr.* Only in N.E. Scotland, where in the locality given I believe it is plentiful.—B. M.: About Portlethen, Kincardineshire.

187. *L. rufescens* Nyl. Flora, 1872, p. 364, 1879, p. 356.—Thallus squamulose, rimoso-areolate or areolato-glebulose, reddish or reddish-brown (K(CaCl) —), dark beneath. Apothecia immersed, small, one or several immersed in each areola, at first concave then somewhat plane, the thalline margin irregular; spores 0.003–4 mm. long, 0.001 mm. thick; hymenial gelatine bluish, then tawny with iodine.—Cromb. Grevillea, xix. p. 58.—*Urcularia rufescens* Sm. Eng. Fl. v. p. 173. *Lecidea rufescens* Borr. Eng. Bot. Suppl. t. 2657. *Acarospora cervina* γ . *rufescens* Mudd, Man. p. 159. *Endocarpon smaragdulum* \hat{c} . *rufescens* Leight. Angio. Lich. p. 16, t. 4. f. 4. *Sagedia rufescens* Turn. in Ach. Lich. Univ. (1810) p. 329.

Often confounded with *L. fuscata*, but at once distinguished by the negative thalline reaction. It is more nearly related to *L. smaragdula*, of which it may probably be the more developed and typical condition. The apothecia are at times numerous and crowded.

Hab. On rocks and walls, chiefly arenaceous, rarely schistose, in maritime and upland districts.—*Distr.* Only a very few localities in E. and N. England, Wales, and the S.W. Highlands of Scotland.—B. M.: Gorleston, Suffolk; Dolgelly, Merionethshire; Ayton, Cleveland, Yorkshire. Appin, Argyshire.

188. *L. rhagadiza* Nyl. Flora, 1881, p. 178.—Thallus continuous, unequal, variously rhagadiosely fissured, dark-olive-greyish (K(CaCl)—). Apothecia small, innate, concave or plane, reddish-flesh-coloured; paraphyses slender; spores oblongo-bacillar, about 0,0035 mm. long, about 0,0010 mm. thick; hymenial gelatine tawny-wine-coloured with iodine.—Cromb. Grevillea, x. p. 23.

A peculiar plant, as observed by Nylander *l. c.*, near *L. rufescens*, but differs in the characters given of the thallus and apothecia. In the single specimen gathered the thallus is well fertile.

Hab. On moist sandstone rocks in a maritime locality.—*Distr.* Extremely local and scarce in N.W. England (Barrowmouth, Whitehaven, Cumberland).

189. *L. admissa* Nyl. Flora, 1867, p. 370, et 1872, p. 364.—Thallus indeterminate, adnate, anguloso-areolate, brownish- or dark-red, the areolæ plane, contiguous, opaque, blackish beneath (K(CaCl)—). Apothecia minute, impressed, somewhat angular, subconcolorous, the thalline margin obtuse or little distinct; paraphyses moderate, jointed; spores oblong, 0,004–5 mm. long, 0,0010–15 mm. thick; hymenial gelatine bluish, then tawny wine-coloured with iodine.—Cromb. Grevillea, xix. p. 58.—*L. discreta* Leight. Lich. Fl. ed. 3, p. 171 pro parte.

A good species well separated from *L. rufescens*, to which it is allied, by the characters of the thallus and the fructification. The apothecia are rarely solitary, but usually several slightly impressed in each areola. In the Scottish locality the thallus was widely expanded, and, along with the normal apothecia, bearing in the centre a few others, large, superficial and deeply fissured at the margins.

Hab. On exposed schistose rocks in subalpine and alpine situations.—*Distr.* Extremely local and rare in N. Wales and on one of the S. Grampians, Scotland.—B. M.: Y Fegle fawr, near Barmouth, Merionethshire. Summit of Ben Lawers, Perthshire.

190. *L. discreta* Nyl. Flora, 1872, p. 364.—Thallus verrucoso-areolate, dark- or badious-brown, the areolæ turgid, discrete, subrugulose (K—, CaCl—). Apothecia minute, impressed in the areolæ, at times slightly convex in the centre, concolorous, the thalline margin obtuse; spores oblong, 0,003–4 mm. long, 0,001 mm. thick; paraphyses slender; hymenial gelatine wine-red with iodine.—Cromb. Grevillea, xix. p. 58; Leight. Lich. Fl. ed. 3, p. 171 pro parte.—*Parmelia squamulosa* γ . *discreta* Ach. Meth. Suppl. (1803) p. 41. *Lecanora admissa* (non Nyl.) Cromb. Lich. Brit. p. 57; Leight. Lich. Fl. p. 185.

Characterized by the normally turgid and discrete thalline areolæ; though occasionally in the British specimens they are here and there more depressed and subcontiguous, rarely several confluent. The apothecia are usually solitary, but sometimes several in each areola.

Hab. On rocks in subalpine tracts.—*Distr.* Local and scarce in N. England and on the N. Grampians, Scotland.—B. M.: Teesdale, Durham. Summit of the Khoil, near Ballater, Aberdeenshire.

191. *L. smaragdula* Nyl. Flora, 1872, p. 429.—Thallus squamulose, greenish or greenish-brown, the squamules plane or slightly convex, rounded, more or less discrete (K—, CaCl—). Apothecia minute, punctiform, immersed, solitary or several in each squamule, dark-brown; spores about 0.003–4 mm. long, scarcely 0.001 mm. thick; hymenial gelatine pale blue, then tawny with iodine.—Cromb. Grevillea, xix. p. 58.—*Lecanora fuscata* var. *smaragdula* Cromb. Lich. Brit. p. 56. *L. squamulosa* forma *smaragdula* Leight. Lich. Fl. p. 184, ed. 3, p. 169. *Acarospora cervina* δ . *smaragdula* et η . *privigna* Mudd, Man. p. 159. *Endocarpon smaragdulum* Wahl. in Ach. Meth. Suppl. (1803) p. 29; Hook. Fl. Scot. ii. p. 44; Sm. Eng. Fl. v. p. 158; Gray, Nat. Arr. i. p. 499; Leight. Anglo. Lich. p. 16, t. 4. f. 3. *Lichen smaragdulus* Eng. Bot. t. 1512. *Endocarpon rufes-virescens* Tayl. in Mack. Fl. Hib. ii. p. 100.—*Brit. Exs.*: Leight. n. 271; Mudd, n. 132.

Looks distinct but, as already intimated, probably descends from *L. rufescens*, of which it would then be a subspecies characterized by the small, scattered squamules and the minute apothecia. The former, however, are at times more approximate and when much scattered are only sparingly fertile.

Hab. On rocks and walls in maritime and upland districts.—*Distr.* Rather local in Great Britain, rare in S.W. Ireland and the Channel Islands.—B. M.: Island of Guernsey. Redruth, Cornwall; Wickwar, Gloucestershire; Barmouth, Merioneth; Howden Gill and near Ayton, Cleveland, Yorkshire; Teesdale, Durham; near Hexham, Northumberland; near Kendal, Westmoreland. Barcaldine, Argyleshire; King's Park, Stirling. Ben Lawers, Perthshire; S. of Bay of Nigg, Kincardineshire. Derriquin and Sybil Head, co. Kerry; near Kylemore, co. Galway.

Form *sinopica* Nyl. ex Nörrl. Not. Sällsk. pro F. et Fl. Fenn. Förh. t. xiii. (1873) p. 332.—Thallus areolato-squamulose, rusty-red. Apothecia black.—Cromb. Grevillea, xix. p. 58.—*Lecanora fuscata* var. *sinopica* Cromb. Lich. Brit. p. 56. *L. squamulosa* forma *sinopica* Leight. Lich. Fl. p. 184, ed. 3, p. 170. *Acarospora cervina* δ . *sinopica* Mudd, Man. p. 160. *Endocarpon sinopicum* Wahl. in Ach. Meth. Suppl. (1803) p. 30; Sm. Eng. Fl. v. p. 159; Gray, Nat. Arr. i. p. 499. *E. smaragdulum* β . *sinopicum* Leight. Anglo. Lich. p. 16, t. 5. f. 1. *Lichen sinopicus* Eng. Bot. t. 1776 (upper fig.).

Differs merely in the colour of the more contiguous thallus and in the darker apothecia, which are more frequently solitary in the squamules. The ferruginous colour, as in other instances, is owing to suffusion from peroxide of iron.

Hab. On rocks and boulders, chiefly schistose, in mountainous regions.—*Distr.* Only in N. Wales and on the Scottish Grampians.—B. M.: Dolgelly, Merionethshire; Aber and Beddgelert, Carnarvonshire; Island of Anglesea. Achrosagan Hill, Appin, Argyleshire; Killin, Ben Lawers, and Ben Vrackie, Perthshire; Glen Cluny, Braemar, Aberdeenshire; Glen Nevis, Inverness-shire.

192. *L. Heppii* Nyl. Not. Sällsk. pro F. et Fl. Fenn. Förh. n. s. v. (1866) p. 182.—Thallus effuse, very thin, continuous, greyish-white or sordid-ochraceous (K—, CaCl—). Apothecia minute, concave, brown, the margin entire, at length inflexed; epithecium gyalectoid-impressed; paraphyses slender, not discrete; spores oblongo-ellipsoid, 0,0040–45 mm. long, 0,0015–20 mm. thick; hymenial gelatine bluish, then wine- or sordid-wine-red with iodine.—Cromb. Lich. Brit. p. 57.—*Lecanora squamulosa* forma *Heppii* Leight. Lich. Fl. ed. 3, p. 170. *Acarospora cervina* ϕ . *Heppii* Mudd, Man. p. 160. *Myriospora Heppii* Naeg. in Hepp, Exs. (1853) n. 37. *Lecanora squamulosa* forma *privigna* Leight. Lich. Fl. ed. 1, p. 185 pro parte.—*Brit. Exs.*: Leight. n. 196.

A rather inconspicuous plant very apt to be overlooked. It is apparently a distinct species, though its claims to be so have at times been questioned. The thallus is often scarcely visible and, as observed by Th. M. Fries (Lich. Scand. p. 218), is rarely minutely verruculose. The form of the minute, usually numerous apothecia give it much the aspect of some young *Gyalecta*.

Hab. On arenaceous and calcareous rocks and flints in maritime and upland situations.—*Distr.* Only a few localities in England and S. Wales.—B. M.: South Downs, Hastings, and Bexley Hill, Sussex; Lyndhurst, New Forest, Hants; Great Ayton, Cleveland, Yorkshire. Llandrindod, Radnorshire.

Q. Apothecia normally lecideine; thecae myriospored; spores simple, minute, colourless. Spermatogones with simple sterigmata, attenuate at the apices, and ellipsoid, very minute spermatia. (*Sarcogyne* Mass. Geneac. (1854) p. 10.)

193. *L. pruinosa* Nyl. in Cromb. Lich. Brit. (1870) p. 57.—Thallus very thin, leprose, greyish-white (K—, CaCl—), usually obsolete. Apothecia moderate, appressed, plane, reddish-black when moist, black and more or less caesio-pruinose when dry, whitish within, the margin thin, entire, sometimes undulate; hypothecium thin, subincolorous; paraphyses slender, not discrete, brown at the apices; spores oblongo-cylindrical, 0,005–6 mm. long, scarcely 0,0003 mm. thick; hymenial gelatine bluish, then wine-red with iodine.—Cromb. Grevillea, xix. p. 58.—*Lecanora*

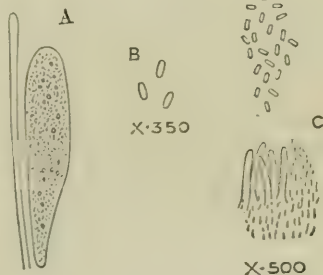


Fig. 63.

Lecanora pruinosa Nyl.—A. A theca with paraphysis (separated by K), $\times 350$. B. Three spores, $\times 350$. C. Sterigmata and spermatia, $\times 500$.

glaucocarpa forma *pruinosa* Leight. Lich. Fl. p. 183, ed. 3, p. 168. *Lecidea pruinosa* Sm. Eng. Fl. v. p. 179; Tayl. in Mack. Fl. Hib.

ii. p. 125. *Biatorella pruinosa* Mudd, Man. p. 191, t. 3. fig. 74. *Lichen pruinus* Sm. Eng. Bot. xxxii. (1811) t. 2244.—*Brit. Eas.* : Leight. n. 300 ; Mudd, n. 160.

It is only occasionally that a thallus varying from whitish to dark greyish is distinctly visible, so that the plant is often described as ecrustaceous. Were it not for the character of the spermogones it might readily be taken for a polyspored *Lecidea*. A state occasionally occurs on chalk pebbles in which the apothecia are much smaller and subimmersed as if calcivorous (var. *immersa*, Fr. Lich. Eur. p. 296).

Hab. On calcareous rocks and mortar of walls from maritime to upland tracts.—*Distr.* General and common in Great Britain ; probably also in Ireland.—B. M. : Shiere, Surrey ; Lewes, Sussex ; Shanklin, Isle of Wight ; near Penzance, Cornwall ; Cirencester, Gloucestershire ; near Hereford ; near Malvern and Whittington, Worcestershire ; Harboro' Magna, Warwickshire ; near Corwen, Merioneth ; Bilsdale, Cleveland, Yorkshire ; near Gainford, Durham ; Leven's Park, Westmoreland. Appin, Argyleshire : King's Park, Stirling ; Craig Tulloch, Blair Athole, Perthshire ; near Aberdeen. Dunkathal, co. Cork.

Form *nuda* Nyl. ex Lamy, Bull. Soc. Bot. t. xxv. (1878) p. 423.—Thallus little visible or entirely wanting. Apothecia small or moderate, reddish-brown, epruinose.—Cromb. Grevillea, xix. p. 58.

Differs merely in the constantly naked apothecia, which probably depends on habitat.

Hab. On rocks, chiefly calcareous, rarely arenaceous, and mortar of walls in upland situations.—*Distr.* Only here and there in Great Britain ; but no doubt often overlooked.—B. M. : Egerton, Kent ; near Bovey Tracey, S. Devon ; Cirencester, Gloucestershire ; Malvern, Worcestershire. Appin, Argyleshire : Ben Lawers and Craig Tulloch, Blair Athole, Perthshire ; Applecross, Ross-shire.

Var. *β. albocincta* Cromb.—Thallus obsolete. Apothecia thinly pruinose or naked, with a white pruinose epithalline margin ; otherwise as in the type.

Looks entirely lecanorine and as if the type of the species, but has no gonidia intruded in the spurious margin, which becomes evanescent in age. It is probably the plant referred to by Th. M. Fries in Lich. Scand. p. 407, s. n. *Lecidea immersa* var. *β. atrosanguinea* Somm. Suppl. Fl. Lapp. p. 152 ; but as the latter l. c. says that the margin is "black," I have named it as above. The apothecia in the two British specimens seen are here and there congregate when the epithalline margin is flexuose.

Hab. On the mortar of a wall in an upland district.—*Distr.* Extremely local and scarce in W. England.—B. M. : Mathon, Malvern Hills, Worcestershire.

194. *L. eucarpa* Nyl. Not. Sällsk. pro F. et Fl. Fenn. Förh. xi. (1871) p. 184.—Thallus absent or scarcely any visible. Apothecia large, lecideine, often aggregate, at first concave then plane, black, dark-reddish when moist, reddish within, the margin black, persistent ; hypothecium thin, blackish-brown ; spores oblongo-ellipsoid, 0.004–5 mm. long, about 0.002 mm. thick ; hymenial gelatine deep-bluish with iodine.—Cromb. Grevillea, xix. p. 58.—*Lecanora glaucocarpa*

forma *eucarpa* Leight. Lich. Fl. p. 183, ed. 3, p. 168. *Lecidea eucarpa* Nyl. Bot. Not. 1863, p. 163.

Looks as if it descended from *L. glaucocarpa* (athalline), but from the type of the apothecia it belongs to this section. These are either simple and umbilicately affixed or several connate in a common umbilicus. The lower stratum of the hypothecium, as observed by Nylander, is thin, black. The peculiar fructification at once distinguishes it from all the allied species.

Hab. On granitic rocks in maritime districts.—*Distr.* Very local and scarce in the Channel Islands and those of S.W. England.—B. M.: West coast of Guernsey. Scilly Islands, Cornwall.

195. *L. privigna* Nyl. Flora, 1873, p. 69.—Thallus obsolete. Apothecia plane, small or submoderate, usually approximate, rounded or angulose, brick-red when moist, blackish when dry, the margin black, entire or flexuose, persistent; spores 0.003–4 mm. long, 0.0015 mm. thick; hypothecium colourless; paraphyses slender, jointed, brownish at the conglutinate apices; hymenial gelatine bluish, then sordid or slightly tawny with iodine.—Cromb. Grevillea, xix. p. 58.—*Lecanora fuscata* var. *privigna* Cromb. Lich. Brit. p. 56. *L. squamulosa* forma *privigna* Leight. Lich. Fl. p. 185, ed. 3, p. 170. *Lecidea privigna* Ach. Meth. Lich. (1803) p. 49; Sm. Eng. Fl. v. p. 184. *Lichen simplex* Eng. Bot. t. 2152 (two right-hand figs.).—*Brit. Eas.*: Larb. Lich. Hb. n. 254.

Apparently a distinct species intermediate as it were between *L. pruinosa* form *nuda* and less plicate states of *L. simplex*. From both, however, it differs in the characters given, though more nearly allied to the latter. The apothecia are frequently in groups with the margin constantly black.

Hab. On arenaceous and granitic rocks in maritime tracts.—*Distr.* Only here and there in the Channel Islands, S. and N. England, and the E. coast of Scotland.—B. M.: St. Brelade's Bay, Island of Jersey; Island of Alderney. Tyneside, near Bywell, Northumberland. South of Bay of Nigg, Kincardineshire; Old Machar, near Aberdeen.

196. *L. hypophæa* Nyl. Flora, 1870, p. 34.—Thallus effuse, thin, granulato-unequal, greyish or greyish-green (K –). Apothecia submoderate, lecideine, blackish or dark-sanguineous, at first plane with the margin subcrenulate or unequal, black, at length convex with the margin excluded; paraphyses moderate or thickish, jointed, amber-brown at the apices; hypothecium colourless, infusate beneath; spores oblong, 0.005–6 mm. long, 0.0015 mm. thick; hymenial gelatine bluish, then wine-red or tawny-reddish with iodine.—Cromb. Journ. Bot. p. 97; Leight. Lich. Fl. p. 186, ed. 3, p. 172.

Very near the preceding species, but differs in the character of the paraphyses and the darker lower stratum of the hypothecium. It would differ also externally in the presence of a thallus were this really proper, which is rather doubtful. The two British specimens are well fertile.

Hab. On granitic stones of a wall in a lowland submarine district.—*Distr.* Extremely local and rare in N.E. Scotland.—B. M.: Near Old Machar Cathedral, Aberdeen.

197. *L. simplex* Nyl. in Cromb. Lich. Brit. (1870) p. 57.—Thallus obsolete. Apothecia lecideine, minute, plane, or concave, variously corrugate or plicate, black, the margin flexuose and irregularly crenate; spores very numerous, 0.003–6 mm. long, about 0.001–2 mm. thick; hymenial gelatine bluish, then wine-red with iodine.—*Lecanora squamulosa* form *simplex* Leight. Lich. Fl. p. 185, ed. 3, p. 170. *Acarospora cervina* u. *simplex* Mudd, Man. p. 160. *Lecidea simplex* Sm. Eng. Fl. v. p. 179; Tayl. in Mack. Fl. Hib. ii. p. 124. *Lichen simplex* Dav. Trans. Linn. Soc. ii. (1794) p. 283, t. 28. f. 2; With. Arr. ed. 3, iv. p. 5; Eng. Bot. t. 2152 (two left-hand figs.). *Rinodina privigna* Gray, Nat. Arr. i. p. 450.—*Brit. Ews.*: Leight. nos. 272, 273.

Well characterized by the form of the fruit and the very minute spores. Occasionally there are traces of a very thin, dark-brown or blackish thallus, but this is evidently foreign. The apothecia are rather variable, often crowded, rotundate or somewhat angular, with the disc, which is constantly black even when moistened, but little visible. When more rotundate with the disc rugose and the margin involute and rimulose, it is form *strepsodina* (Ach.) (*Opegrapha Persoonii* γ. *strepsodina* Lich. Univ. p. 247). When more angulose and much gyroso-plicate as if gyro-phoroid it is form *complicata* Cromb. Grevillea, xix. p. 58. Both of these, however, pass into and are frequently mixed up with more typical conditions.

Hab. On rocks, chiefly schistose and calcareous, in maritime and mountainous districts.—*Distr.* Here and there throughout Great Britain and the Channel Islands; apparently rare in W. Ireland.—B. M.: La Moye, Island of Jersey; Chateau Point, Island of Sark. Buckfastleigh, Ashburton and Ilfracombe, Devonshire; Tintagel, Withiel, and Penzance, Cornwall; Barmouth, Dolgelly, and Capel Arthog, Merionethshire; Bangor, Carnarvonshire; Island of Anglesea; north of Douglas, Isle of Man; Hexham, Northumberland. Barcaldine and Ballachulish, Argyleshire; Craig Calliach, Ben Lawers, and Craig Tulloch, Perthshire; South of Bay of Nigg, Kincardineshire; Craig Guie and Morrone, Braemar, Aberdeenshire. Dunkerron, co. Kerry; Glencorbol, Connemara, co. Galway.

Form *herpes* Cromb. Grevillea, xix. (1891) p. 58.—Apothecia very minute, punctiform, impressed.—*Sarcogyne simplex* var. *herpes* Norm. Bot. Not. 1873, p. 34.

Readily overlooked from being scarcely visible to the naked eye. Probably it is only a poorly developed state depending on the nature of the substratum.

Hab. On shady schistose rocks in a maritime locality.—*Distr.* Only very sparingly in the W. Highlands of Scotland.—B. M.: Ballachulish, Argyleshire.

61. *DIRINA* Fr. Pl. Hom. (1825) p. 244: Nyl. Mém. Soc. Cherb. iii. p. 180.—Thallus crustaceous, continuous or rimulose, containing chrysogonidia. Apothecia tuberculoso-lecanorine; spores Sae, fusiform, 3-septate, colourless; hypothecium thick, black; paraphyses slender, not very discrete; hymenial gelatine wine-

red with iodine. Spermatogones tuberculoso-immersed, with simple sterigmata and acicular, arcuate spermatia.

A small genus closely allied to *Lecanora*, from which it differs chiefly in the character of the hypothecium. In this respect, as also in their form, the apothecia resemble those of *Roccella*.

1. *D. repanda* Nyl. Mém. Soc. Cherb. v. (1857) p. 116.—Thallus determinate, thick, tartareo-farinose, tuberculoso-unequal, subeffigurate at the circumference, white (Kf + yellow, CaCl + red); hypothallus white. Apothecia elevated, plano-depressed, at first closed, then expanded and dilated, black, cæcio- or white-pruinose; the thalline margin thick, obtuse, more or less inflexed; spores often slightly curved, 0.027–30 mm. long, about 0.004 mm. thick.—Cromb. Journ. Bot. 1871, p. 178; Leight. Lich. Fl. p. 235, ed. 3, p. 226.—*Parmelia repanda* Fr. Lich. Eur. (1831) p. 177.

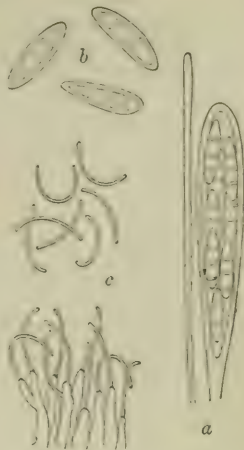


Fig. 69.

Dirina repanda Nyl.—a. A theca and paraphysis, $\times 350$. b. Three spores, $\times 500$. c. Sterigmata and spermatia, $\times 500$.

A plant chiefly of S. Europe and N. Africa which finds its way to a few localities in our Islands. The peculiar apothecia are numerous, at times crowded and difform with the thalline margin then flexuose. In sterile specimens the spermatogones are abundant, with sterigmata 0.010 mm. long, 0.001 mm. thick. The corticolous form (*Lecanora Ceratoniæ* Ach. Lich. Univ. p. 361, t. 7. f. 5) does not occur with us.

Hab. On rocks in maritime districts.—*Distr.* Only sparingly in the Channel Islands, S.W. England, and N. Wales.—B. M.: La Coupe and Rozel, Island of Jersey. Portland Island, Dorsetshire; Great Orme's Head, Carnarvonshire.

Subtribe III. *PERTUSARIEI* Nyl. Lich. Scand. (1861) p. 177.

Thallus variously crustaceous, continuous; gonidial layer containing typical eugonidia. Apothecia more or less inclosed in thalline verrucæ, punctiform or with the disc expanded and lecanoroid; spores variable in number, simple. Spermatogones with simple sterigmata.

Arranged by many authors among the *Pyrenocarpei* from the fruit of both being frequently subsimilar. As, however, the more developed forms of the apothecia in *Pertusariei* resemble those of many *Lecanorei*, its two genera are more appropriately included in this tribe.

62. *PERTUSARIA* DC. Fl. Fr. ii. (1805) p. 139; Nyl. Mém.

Soc. Cherb. iii. p. 180.—Thallus continuous, verrucoso-unequal, or smoothish, very rarely hypophlœodal. Apothecia endocarpoid or lecanoroid; spores 1-4 μ , 6-8 μ , large, ellipsoid or oblong, colourless, rarely blackish, with a thick or thickish epispore; paraphyses lax or coherent, variously branched and arcuate; hymenial gelatine, but chiefly the thecæ, deep-lilac with iodine. Spermatogones with acicular, straight spermatia.

A natural and well-defined genus, most of the European species of which occur in our Islands, where also one or two seem to be endemic. Several of the plants included in it frequently occur only in a variolarioid or isidioid state, constituting the pseudogenera *Variolaria* and *Isidium* of older authors. A few of these enumerated by Turner and Borrer in their 'Lichenographia Britannica' and subsequently figured in Eng. Bot. Suppl., being very doubtful, are here omitted.

A. Thecæ pauci-spored; spores colourless.

a. Spores solitary.

1. *P. bryontha* Nyl. Lich. Scand. (1861) p. 178; Flora, 1881, p. 538.—Thallus effuse, thin, subgranulato-unequal, white or whitish, white-sorediose (K+yellowish, soredia CaCl+reddish). Apothecia lecanorine, moderate, at first urceolate, then subplane, prominent or substipate, opaque, sordidly liver-coloured, or sordid-brownish, the thalline margin at length depressed or excluded; spores 0.150-0.230 mm. long, 0.050-0.070 mm. thick.—Cromb. Lich. Brit. p. 58; Leight. Lich. Fl. p. 240, ed. 3, p. 230.—*Parmelia sulfusca* β . *bryontha* Ach. Meth. (1803) p. 167. *Pertusaria macrospora* Hepp, Mudd, Man. p. 277.

Looks almost a state of *Lecanora epibrya*, but is very different in the structure of the fruit and the form of the spermatia. The apothecia, which are at first pale, are in our few specimens at times somewhat crowded. It is one of our rarest British lichens.

Hab. On the ground, encrusting mosses and decayed Carices, in alpine places.—*Distr.* Extremely local and scarce on one or two of the N. Grampians, Scotland.—B. M.: Cairngorm and Ben-naboord, Braemar, Aberdeenshire.



Fig. 70.

Pertusaria communis DC.—
A 2-spored theca and paraphyses, $\times 250$.

2. *P. dactylina* Nyl. Act. Soc. Sc. Fenn. t. vii. (1863) p. 447 (nota 1).—Thallus thin, unequal, papillato-dactyloid, white; papillæ erect, thickish, simple or rarely divided (K + yellowish, then reddish, CaCl—). Apothecia inclosed in the apices of the papillæ, rarely lecanorine, sometimes sublecanorine, blackish, usually covered with a thalline operculum; spores 0,125–220 mm. long, 0,065–85 mm. thick.—Cromb. Lich. Brit. p. 60; Leight. Lich. Fl. p. 239, ed. 3, p. 230.—*Lichen dactylinus* Ach. Prodr. (1798) p. 89. *Lichen oculatus* Eng. Bot. t. 1833, also of the older British authors pro parte (*vide* sub *Lecanora oculata*).

Subsimilar to *Lecanora oculata*, but differs in the thicker and usually larger papillæ. These are generally constipate and rarely once or twice divided. The reaction with K is not always very distinct (*cf.* Nyl. Lapp. Or. p. 141). In the British specimens, which are usually sterile, the apothecia are occasionally sublecanorine.

Hab. On the bare ground and overspreading decayed mosses in alpine situations.—*Distr.* Local and scarce on the summits of a few of the higher Grampians, Scotland.—B. M.: Ben Lawers, Perthshire; Morrone and Ben-naboard, Braemar, Aberdeenshire.

3. *P. Hutchinsiae* Leight. Anglo. Lich. (1851) p. 30, t. 11. f. 1.—Thallus effuse, thin, minutely rugoso-unequal, whitish or cream-coloured (K—, CaCl—). Apothecia lecanoroid, in small or sub-moderate, crowded, difform verrucæ; the ostiola large, brownish-black, cæcio-pruinose, depressed, lacerate at the margins; spores 0,08–12 mm. long, 0,040–55 mm. thick.—Mudd, Man. p. 277; Cromb. Lich. Brit. p. 59; Leight. Lich. Fl. p. 243, ed. 3, p. 233.—*Thelotrema Hutchinsiae* Borr. Eng. Bot. Suppl. (1831) t. 2652; Turn. & Borr. Lich. Br. p. 178; Sm. Eng. Fl. v. p. 162; Tayl. in Mack. Fl. Hib. ii. p. 103.

Externally somewhat resembles *Lecanora verrucosa*, with which it agrees in habitat, but the structure of the apothecia is very different. From *Urceolaria scruposa* subsp. *bryophila*, to which, as observed by Borrer, it is also subsimilar, it is at once distinguished by the reaction with CaCl. Its nearest ally in this genus seems to be *P. panyrga* (Ach.) Fr. fil.; but from this it differs among other characters in the thallus not becoming papillate. It is apparently peculiar to Ireland.

Hab. On the ground incrusting mosses and heaths in an upland situation.—*Distr.* Extremely local and scarce in S.W. Ireland.—B. M.: Hills near Bantry, co. Cork.

4. *P. melanochlora* Nyl. Flora, 1873, p. 70.—Thallus determinate, thickish, rugoso-verrucose, subrimose, densely papillose, greyish-white or greyish-fumose (K (CaCl) — + violet rose-coloured); papillæ short, thick, cylindrical, simple, sorediate at the apices. Apothecia minute, several (2–5) inclosed in the apices of the papillæ; spores 0,180–250 mm. long, 0,075–100 mm. thick.—Cromb. Grevillea, xix. p. 59.—*Isidium melanochlorum* DC. Fl. Fr. ii. (1805) p. 326.

A well-marked species readily recognized, even when sterile, by the peculiar thalline papillæ. The apothecia, recently described by Nylander, from plants gathered in the E. Pyrenæes, are seldom rightly developed in the few British specimens. The spermogones, also rare in these, have the spermatia bacillar, about 0,004–5 mm. long, scarcely 0,001 mm. thick (*vide* Nyl.).

Hab. On quartzose and schistose rocks in a mountainous region.—*Distr.* Seen only sparingly from N. Wales.—B. M.: Barmouth, Merionethshire.

5. *P. monogona* Nyl. Flora, 1873, p. 71.—Thallus subdeterminate, rugose, areolato-rimose, greyish-white (K $\bar{+}$ yellow, then saffron-orange). Apothecia at first innate in the areolæ, then somewhat prominent, the thalline margin entire or subcrenate; epithecium dilated, brownish, uneven, white-pulverulent; spores oblongo-ellipsoid, 0,150–235 mm. long, 0,070–80 mm. thick.—Cromb. Grevillea, xix. p. 59.

Nylander *l. c.* says that this is subsimilar to *P. dealbata*, from which it at once differs in the monospored thecæ. The other characters given sufficiently distinguish it from this and other British *Pertusarias*. In our specimens the fertile verrucæ are numerous and here and there crowded. The spermogones are not infrequent, with spermatia about 0,004 mm. long, nearly 0,001 mm. thick.

Hab. On schistose rocks in a mountainous region.—*Distr.* Extremely local and scarce in N. Wales—B. M.: Cader Idris, Merionethshire.

6. *P. multipuncta* Nyl. Not. Sällsk. pro F. et Fl. Fenn. Förh. xi. (1870) p. 185.—Thallus determinate or subdeterminate, thinnish, granulato- or rugoso-unequal, rimose, whitish or greyish-white; fertile verrucæ small, prominent, usually white-sorediate (K—, CaCl—, I $\bar{+}$ dark-bluish). Apothecia usually numerous in each verruca, pale or blackish, cæsio-pruinose, at length naked; spores oblong or lineari-oblong, 0,106–140 mm. long, 0,028–68 mm. thick.—Cromb. Grevillea, xix. p. 59.—*Pertusaria multipunctata* Leight. Lich. Fl. p. 236, ed. 3, p. 226. *P. globulifera* β . *multipunctata* Mudd, Man. p. 274; Cromb. Lich. Brit. p. 59. *Variolaria multipuncta* Turn. Trans. Linn. Soc. ix. (1808) p. 137, t. 10. f. 1; Turn. & Borr. Lich. Br. p. 73; Gray, Nat. Arr. i. p. 490; Sm. Eng. Fl. v. p. 170. *Lichen multipunctus*, Eng. Bot. t. 2061.—A saxicolous state is *Pertusaria subluctea* Leight. Ann. Mag. Nat. Hist. 1870, vi. p. 474; Lich. Fl. p. 245, ed. 3, p. 236 (*cf.* Nyl. Flora, 1883, p. 534).—*Brit. Exs.*: Mudd, n. 262.

It has often externally the aspect of some *Phlyctis*, as noticed by Th. M. Fries (Lich. Scand. p. 309). From the other species of the genus it is well separated by the more elongate spores. The verrucæ are usually very numerous, though distinct, each with from 1 to 12 apothecia. The thalline reaction with K is erroneously given by Leighton, there being only visible at times a very faint yellow tinge immediately passing into brown.

Hab. On trunks and branches of trees, very rarely on schistose rocks, in maritime and upland districts.—*Distr.* Not uncommon in England and Wales; rarer in Ireland; very rare in the S.W. Highlands of Scotland.—B. M.: Shiere, Surrey; St. Leonard's Forest and Glynde, Sussex; Isle of Wight; Lyndhurst, New Forest, Hants; East Lynn, Devonshire; Boveconoe, Cornwall; Cirencester, Gloucestershire; Twycross, Leicestershire; Barmouth and Cwm Bychan, Merionethshire; Conway Falls, Carnarvonshire; Brantsdale, Yorkshire; Teesdale, Durham; Asby, Cumberland. Barcaldine, Argyleshire. Ravenscourt, co. Wicklow; Castlebernard, co. Cork; Cromaglow and Turk Mt., Killarney, co. Kerry; Kylemore Lake, Connemara, co. Galway.

Form 1. *lævigata* Cromb.—Thallus thin, continuous or very slightly rimose, scarcely subrugulose, the thalline verrucæ depressed, more or less scattered.—*Variolaria multipuncta* var. *β. lævigata* Turn. & Borr. Lich. Br. (1839) p. 73; Sm. Eng. Fl. v. p. 170. *V. constellata* Tayl. in Mack. Fl. Hib. ii. p. 113 pro parte.

Apparently only a less developed condition resulting from the nature of the substratum.

Hab. On smooth bark of young trees in wooded upland tracts.—*Distr.* Only a few localities in S. England and S.W. Ireland.—B. M.: St. Leonard's Forest, Sussex; New Forest, Hants; Falls of Beckey, S. Devon. Askew Wood, co. Kerry.

Form 2. *fastigiata* Cromb.—Thalline verrucæ submoderate or somewhat large, hemispherical, crowded, substipitate, fastigate and sorediate at the apices: otherwise as in the type.—*Pertusaria fastigiata* Leight. Ann. Mag. Nat. Hist. 1870, vi. p. 474; Lich. Fl. p. 245, ed. 3, p. 236. *Isidium oculatum* var. *β. fastigiatum* Turn. & Borr. Lich. Br. (1839) p. 103, *fide* Leight.; Sm. Eng. Fl. v. p. 232. *Variolaria polythecia* Tayl. in Mack. Fl. Hib. ii. p. 113.

A well-marked form, if not a distinct variety, differing in the character of the verrucæ. Dr. Taylor *l. c.* says that it is "conspicuous by the crowded and stalked apothecia placed in contact, like certain basaltic columns." In the few specimens seen the spores are very seldom well developed.

Hab. On naked rocks and incrusting mosses in mountainous regions.—*Distr.* Found only in S. and W. Ireland. (Bantry, co. Cork; Connemara, co. Galway.)—B. M.: Dunkerron, co. Kerry.

7. *P. globulifera* Nyl. Mém. Soc. Cherb. v. (1857) p. 116.—Thallus suborbicular, cartilagineo-membranaceous, verrucoso-rugose, greyish or glaucous, white-sorediate, smoothish and zonate at the circumference (K—, CaCl—). Apothecia inclosed in large thalline verrucæ, which are at first globular, closed, slightly depressed at the apices, corticate, at length lacero-dehiscient, pseudo-scutelliform, white-sorediate; spores (rarely 2næ) 0.207–276 mm. long, 0.050–80 mm. thick.—Mudd, Man. p. 273 (excl. vars.); Cromb. Lich. Brit. p. 59 (excl. vars.); Leight. Lich. Fl. p. 243, ed. 3, p. 233.—*Variolaria globulifera* Turn. Trans. Linn. Soc. ix. (1808) p. 139; Turn. & Borr.

Lich. Br. p. 59; Gray, Nat. Arr. i. p. 490; Sm. Eng. Fl. v. p. 169. *Lichen globuliferus* Eng. Bot. t. 2008. *Lichenoides candidum et furinaceum, scutellis fere planis* Dill. Musc. 131, t. 18. f. 11 B.—*Brit. Exs.*: Mudd, n. 263 pro parte.

The thallus, which usually spreads extensively, is somewhat depressed at the circumference, where it presents zones of various shades, chiefly brown and carneous. The fertile verrucæ, of which the form and ultimate development are aptly described by Turner and Borrer, *l. c.*, are not of common occurrence and are usually but few on the same plant. More frequently the verrucæ are sterile, plane, with a thickish margin and densely white-sorediate having a lecanoroid appearance. In this abortive condition of the apothecia, which at times occurs on the same plant as their normal state, it is form *discoidea* Cromb. Grevillea, xix. p. 59; *Lichen discoideus* Eng. Bot. t. 1714; *Variolaria discoidea* Turn. & Borr. Lich. Br. p. 61, Sm. Eng. Fl. v. p. 168, Tayl. in Mack. Fl. Hib. ii. p. 112, Dill. *l. c.* f. 11 C.

Hab. On trunks of old trees in wooded maritime and upland districts.—*Distr.* General and common where it occurs in Great Britain; apparently rare in Ireland. B. M.: Yarmouth, Norfolk; Epping Forest, Essex; Penshurst, Kent; Shiere, Surrey; St. Leonard's Forest and Danny, Sussex; New Forest, Hants; Chudleigh and Beckey Falls, S. Devon; Boconnoc and near Withiel, Cornwall; Savernake Forest, Wilts; Cirencester, Gloucestershire; Madingley, Cambridgeshire; Charnwood Forest, Leicestershire; Malvern, Worcestershire; Lambeth, S. Wales; Barmouth, Merionethshire; Island of Anglesea; Craig-y-Rhiw and Haughmond Hill, Shropshire; near Ayton, Cleveland, Yorkshire; Teesdale, Durham. Helensburgh, Dumbartonshire; Inverary and by Loch Creran, Argyleshire; Craigforth, Stirling; Glen Lochay, Killin, and Blaeberry Hill, near Perth, Perthshire; Murtle, near Aberdeen; by Loch Linnhe, Inverness-shire. Castlemartyr and Macroom demesne, co. Cork; Ashley Park, near Galway.

8. *P. ophthalmiza* Nyl. Flora, 1865, p. 354.—Thallus effuse, thin, smoothish, or slightly rugoso-unequal, greyish (K—, CaCl—); fertile verrucæ small, more or less crowded. Apothecia 1, rarely 2–3 in each verruca, lecanoroid, blackish, crowned with a rugose or subleprose thalloid margin; spores 0,160–205 μ m. long, 0,080–100 μ m. thick.—Carroll, Journ. Bot. 1866, p. 23; Leight. Lich. Fl. p. 242, ed. 3, p. 233.—*P. globulifera* subsp. *ophthalmiza* Cromb. Lich. Brit. p. 59; var. *ophthalmiza* Nyl. Lich. Scand. (1861) p. 180.

Well distinguished from the preceding, to which it has a superficial resemblance, by the form of the fructification. It spreads extensively, though interruptedly, over the substratum with no visible circumferential line. The fertile verrucæ are usually numerous, at times almost obliterating the rest of the thallus.

Hab. On the trunks of aged pines in an upland district.—*Distr.* Only sparingly in the S.W. Highlands of Scotland.—B. M.: Glen Falloch, and Black Wood, Rannoch, Perthshire.

9. *P. amara* Nyl. Flora, 1873, p. 22.—Thallus determinate, rugoso-rimose, unequal, subpulverulent, greyish-white, brown and zonate at the circumference (K—, CaCl—). Apothecia white-

pulverulent, in convex, thinly margined, at length immarginate verrucae (K+yellow, K(CaCl)+violet); spores 0,190–236 mm. long, 0,050–070 mm. thick.—Cromb. Grevillea, xix. p. 59.—*Variolaria amara* Ach. Lich. Univ. (1810) p. 324; Hook. Fl. Scot. ii. p. 46; Gray, Nat. Arr. i. p. 491. *Lichen fagineus* Linn. Huds. Fl. Angl. p. 443?; Lightf. Fl. Scot. ii. p. 807?; With. Arr. ed. 3, iv. p. 4 pro parte; Eng. Bot. t. 1713. *Variolaria faginea* Turn. & Borr. Lich. Br. p. 64; Sm. Eng. Fl. v. p. 169 (non Tayl. in Mack. Fl. Hib. ii. p. 112). *Pertusaria faginea* Leight Lich. Fl. p. 242, ed. 3, p. 232. *Lichenoides candidum et farinaceum, scutellis fere planis* Dill. Musc. 131, t. xviii. f. 11 C.—As *Lichen fagineus* of the older authors is for the greater part a “nomen vagum,” the determinate and very expressive trivial name of Acharius is here adopted.—*Brit. Ees.*: Mudd, n. 263 pro parte.

As noticed by Acharius (*L. c.*) the taste of the whole lichen is very bitter, almost as in *Cinchona*. It has at times been confounded with the discoid state of *P. globulifera*, but the taste, the chemical reactions, and the smaller verrucae keep it distinct. The soredia are very numerous, confluent, frequently almost obliterating the thallus except towards the circumference. In Britain, as elsewhere, the apothecia are very rare in a well-developed condition.

Hab. On trunks of old trees, chiefly beech and elms, occasionally ash, in maritime and upland wooded tracts.—*Distr.* General and not uncommon in Britain: apparently rare in S.W. Ireland; not seen from the Channel Islands.—B. M.: Great Glenham, Suffolk; Hainault Forest and near Gosfield, Essex; St. Leonard's Forest, Sussex; New Forest, Hants; Lydford, S. Devon; Withiel and near Penzance, Cornwall; Minsty, Wiltshire; Cwm Bychan, Merionethshire; Island of Anglesea; Teesdale, Durham; Windermere, Westmoreland; Asby, Cumberland; Meldon Park, Northumberland. Near Glasgow, Lanarkshire: Craigforth, Stirling; Airds, Appin, Argyleshire; Finlarig, Killin, Perthshire; Craig Cluny, Braemar, Aberdeenshire; Applecross, Ross-shire. Dunkerron, co. Kerry.

10. *P. velata* Nyl. Lich. Scand. (1861) p. 179.—Thallus determinate, smoothish or rugoso-unequal, rimulose, obsoletely radiato-rugose or plicate towards the circumference, whitish or milk-white (K—, CaCl+red). Apothecia submoderate, plane, lecanoroid, pale or white-suffused, thinly veiled, in small, depressed, concolorous verrucae; spores very large, 0,214–310 mm. long, 0,067–090 mm. thick, or occasionally somewhat smaller.—Mudd, Man. p. 274; Cromb. Lich. Brit. p. 59; Leight. Lich. Fl. p. 241, et ed. 3, p. 232 pro parte.—*Variolaria velata* Gray, Nat. Arr. i. p. 490; Sm. Eng. Fl. v. p. 170.—*Parmelia velata* Turn. Trans. Linn. Soc. ix. (1808) p. 143, t. 12. f. 1. *Lichen velatus* Eng. Bot. t. 2062.

Might readily be taken for a state of *Lecanora parella*, but is at once distinguished by the veiled apothecia and the thalline reaction with CaCl. From *Pertusaria multipuncta*, which it more distantly resembles, it similarly differs in the reaction, as also in the form of the apothecia and the larger spores. The fertile verrucae are occasionally very numerous and crowded.

Hab. On trunks and branches of trees in wooded upland tracts.—*Distr.* Very sparingly in S. England, N. Wales, and S. Ireland.—B. M.: St. Leonard's Forest, Sussex; near Rusthall Common, Kent; Quarn Wood, Isle of Wight; New Forest, Hants; East Lulworth, Dorsetshire; Ivy Bridge, S. Devon; Island of Anglesea. Castlemartyr, co. Cork.

Form *aspergilla* Cromb. *Grevillea*, xix. (1891) p. 59.—Fertile verrucæ scattered, elevated, scarcely margined, white-pulverulent; otherwise as in the type.—*Variolaria aspergilla* Turn. & Borr. Lich. Br. p. 67; Sm. Eng. Fl. v. p. 170; Eng. Bot. t. 2401; Tayl. in Mack. Fl. Hib. ii. p. 112. *V. communis* var. *γ. aspergilla* Gray, Nat. Arr. i. p. 491. *Lichen aspergillus* Ach. Prodr. (1798) p. 28?

Differs in the character of the verrucæ; while in the British specimens seen the thallus is also thinner. Our plant, which is that of Turner and Borrer *pro maxima parte*, may be different from that of Acharius and other authors, who speak of it as only saxicolous.

Hab. On trunks of trees and pales in upland situations.—*Distr.* Only a few localities in S. and Central England.—B. M.: Ickworth, Suffolk; Sevenoaks, Kent; St. Leonard's Forest, Sussex; Shiere, Surrey; New Forest, Hants; Gopsall Park, Leicestershire; Hay Park, Herefordshire.

11. *P. reducta* Stirt. Scottish Naturalist, iv. (1877) p. 28.—Thallus thin, rimuloso-areolate, greyish or greyish-brown (K + yellow, then deep red). Apothecia sessile, lecanorine, inclosed in monocarpous thalline verrucæ, brown or reddish-brown, cæcio-pruinose; spores 0.09–14 mm. long, 0.03–0.4 mm. thick.—Leight. Lich. Fl. ed. 3, p. 229.

The author says *l.c.* that it is "closely allied to *P. multipuncta*;" but from this it is widely separated by the type of the apothecia and the thalline reaction. I have seen no specimen.

Hab. On trees in a mountainous region.—*Distr.* Local and rare in the S.W. Highlands of Scotland (Ben Brecht, Argyleshire).

12. *P. lactea* Nyl. Flora, 1881, p. 539.—Thallus determinate, smooth, rimoso-areolate, subeffigurate at the circumference, greyish or whitish (K —, CaCl + reddish). Apothecia lecanorine, small, scattered, white, subleprose above, the thalline margin irregular; spores 0.0180–205 mm. long, 0.063–70 mm. thick.—Cromb. *Grevillea*, xix. p. 59.—*Variolaria lactea* Gray, Nat. Arr. i. p. 492; Hook. Fl. Scot. ii. p. 46; Turn. & Borr. Lich. Br. p. 62; Sm. Eng. Fl. v. p. 170; Tayl. in Mack. Fl. Hib. ii. p. 113. *Pertusaria lactescens* β. *lactea* Mudd, Man. p. 272. *Lichen lacteus* Linn. Mant. (1767) p. 132; Huds. Fl. Angl. ed. 2, p. 526; With. Arr. ed. 3, iv. p. 5; Eng. Bot. t. 2410.

A plant whose systematic place was doubtful till the recent discovery of the fructification, which renders it a very well-marked species. The thallus, though orbicular, usually spreads very extensively over the substratum, varying somewhat in thickness, the sterile verrucæ being at times numerous and subconfluent in the areolæ. With us it is very rarely fertile.

Hab. On rocks, granitic and schistose, in maritime and mountainous districts.—*Distr.* Rather local in Great Britain, Ireland, and the Channel Islands.—B. M.: Chateau Point, Island of Sark. Aberdovey and Cwm Bychan, Merionethshire; Island of Anglesea. Near Moffat, Dumfriesshire; West Water, Forfarshire; Ben Lawers and Craig Calliach, Perthshire; Portlethen, Kincardineshire; Glen Ey, Braemar, Aberdeenshire. Blackwater, co. Kerry.

b. Spores normally 2næ.

13. *P. communis* DC. Fl. Fr. ii. (1805) p. 230.—Thallus determinate, membranaceo-cartilaginous, smoothish, rugose or verrucoso-areolate, the verrucæ subglobose, difform, greyish or glaucous-white (K + yellowish + orange, CaCl—). Apothecia 1 or several, usually 2 in each verruca; the ostiola minute, punctiform (or slightly depressed), black or blackish (epithecium K + violet); spores 2næ (occasionally solitary or 3næ), 0,130–160 mm. long, 0,045–65 mm. thick.—Leight. Lich. Fl. p. 238, ed. 3, p. 229; Angio. Lich. p. 27, t. 9. f. 3; Cromb. Lich. Brit. p. 58; Mudd, Man. p. 275; Sm. Eng. Fl. v. p. 160; Turn. & Borr. Lich. Br. p. 196.—*Porina pertusa* Hook. Fl. Scot. ii. p. 45; Gray, Nat. Arr. i. p. 495. *Lichen pertusus* Linn., Huds. Fl. Angl. ed. 2, p. 525; Lightf. Fl. Scot. ii. p. 802; With. Arr. ed. 3, iv. p. 15; Eng. Bot. t. 677. *Lichenoides verrucosum et rugosum, cinereum, glabrum* Dill. Musc. 128, t. 18. f. 9 pro parte.—According to the specimens in his Herb. this is *Lichen pertusus* Linn. Mant. ii. (1771) p. 134, but his specific name is not adopted as it has fallen into desuetude.—*Brit. Exs.*: Mudd, n. 264.

The most common and widely distributed (at least in a fertile state) of the British Pertusarias. The thallus is orbicular, limited by a pale, zonate, narrow, rarely broad, hypothalline line, and is but moderately thick even when best developed. It is almost always very well fertile, the verrucæ being numerous, often crowded, and then more or less confluent and difform by mutual pressure. The apothecia, as observed by Turner and Borrer, vary from one to twelve in each verruca; while in old plants they are often without spores. The ostioles are occasionally whitish, an "immature" state called *leucostoma* by Schaerer (Enum. p. 229), owing probably to the plant growing in shade, when the epithecium gives no reaction with K.

Hab. On the trunks of old trees, rarely on pales, in maritime, lowland and upland tracts.—*Distr.* General and abundant in Great Britain; no doubt also in Ireland and the Channel Islands.—B. M.: Islands of Sark and Guernsey. Great Glenham, Suffolk; Epping Forest, Essex; Shiere, Surrey; Penuhurst, Kent; St. Leonard's Forest and near Hastings, Sussex; Appuldurcombe, Isle of Wight; New Forest, Hants; Ullacombe, near Bovey Tracey, and Lustleigh, S. Devon; Withiel, Cornwall; Cirencester, Gloucestershire; Gopsall Park, Leicestershire; Millersdale, Derbyshire; Malvern, Worcestershire; Dolgelly and Barmouth, Merionethshire; Hafod, Cardiganshire; Bettws-y-Coed, Denbighshire; Island of Anglesea; Church Stretton and Llanforda, Shropshire; Kildale and near Ayton, Cleveland, Yorkshire; Teesdale, Durham; Windermere, Westmoreland; Calder Abbey, Cumberland. New Galloway, Kirkcudbrightshire; Roslin and Colinton Woods, Midlothian; near Glasgow;

Barcaldine, Argyleshire; Glen Lochay, S. of Loch Tay, Killin and Balthayock Woods, near Perth, Perthshire; Countesswells Woods near Aberdeen, and Craig Cluny, Braemar, Aberdeenshire; near Fort William, Inverness-shire; Lairg, Sutherlandshire; Applecross, Ross-shire. Blarney, co. Cork; Dunkerron, co. Kerry.

Form *rupestris* DC. Fl. Fr. ii. (1805) p. 320; Nyl. Flora, 1881, p. 456.—Fertile verrucæ more or less aggregato-diform, verrucoso-areolate; otherwise as in the type.—Cromb. Lich. Brit. p. 59 (excl. syn.); Leight. Lich. Fl. p. 239, ed. 3, p. 230.—*Pertusaria rupestris* Mudd, Man. p. 272. Var. β . *areolata* Mudd (non Clem.), l. c., is merely a darker state.—*Brit. Exs.*: Mudd, n. 259.

Only a saxicolous condition of the type, from which it scarcely differs except in the thallus being usually more verrucose.

Hab. On rocks in maritime and upland districts.—*Distr.* Only sparingly in S. and N. England and the S.W. Highlands of Scotland.—B. M.: Hastings, Sussex; Ayton, Cleveland, Yorkshire; near Whitehaven, Cumberland; Island of Lismore, Argyleshire; Aberfoyle, Perthshire.

Subsp. *P. areolata* Nyl. *ex* Hue, Rev. Bot. 1886, p. 74.—Thallus thickish, rimoso-areolate, rugose, shortly and more or less densely papillate, greyish-white (K $\frac{+}{+}$ yellow). Apothecia as in the type.—*Pertusaria areolata* Nyl. Flora, 1881, p. 456; Cromb. Grevillea, xix. p. 59. *Thelotrema pertusum* var. *areolatum* Clem. Ens. &c. Add. (1807) p. 300.

Often confounded with the preceding form, but differs in the character of the thallus and in the reactions. As Nylander says, it may be a distinct species. In the British specimens only a few scattered apothecia, not well developed, are present.

Hab. On rocks and walls, schistose and arenaceous, in mountainous districts.—*Distr.* Local among the Grampians and in the N.W. Highlands of Scotland.—B. M.: Craig Calliach and Craig Tulloch, Blair Athole, Perthshire; Morrone, Braemar, Aberdeenshire; Hills of Applecross, Ross-shire.

14. *P. dealbata* Nyl. *ex* Cromb. Lich. Brit. (1870) p. 59 (excl. syn. *P. lactescens*); Flora, 1880, p. 390.—Thallus subindeterminate, granuloso-unequal or papillose, rimose or diffract, thickish or somewhat thin, whitish or greyish-white (K+yellow, CaCl—, I $\frac{-}{+}$ pale blue). Apothecia in globulose, pulverulent verrucæ; epithecium dark or sordid-glaucous, somewhat plane, suffused: spores 2næ, 0,080–15 mm. long, 0,050–82 mm. thick.—Cromb. Grevillea, xii. p. 57; Leight. Lich. Fl. p. 238, et ed. 3, p. 228 pro parte.—*P. syncarpa* et β . *dealbata* Mudd, Man. p. 273. *Lichen dealbatus* Ach. Prodr. (1798) p. 29. *Variolaria chlorothecia* Tayl. in Mack. Fl. Hib. ii. p. 114. *Isidium paradoxum* Turn. & Borr. Lich. Br. p. 97; Sm. Eng. Fl. v. p. 231. *Variolaria corallina* Gray, Nat. Arr. i. p. 492; Tayl. in Mack. Fl. Hib. ii. p. 113.—*Brit. Exs.*: Leight. n. 320; Mudd, n. 261.

The thallus spreads extensively and is occasionally of considerable thickness. It is usually more or less covered with short, simple, concolorous papillæ which are at length fractured into rugose areolæ. When fertile the verrucæ are generally aggregate, becoming irregularly lacerate. It is, however, more frequently sterile, and is then at times the host of the parasitic *Spiloma sphaerale* Ach., which occurs also on the form.

Hab. On rocks, boulders, and walls in maritime and mountainous regions.—*Distr.* Apparently general and common in Great Britain and Ireland; rare in the Channel Islands.—B. M.: Island of Sark, Dartmoor Tors, Devonshire; St. Austell, Cornwall; Malvern Hills, Worcestershire; Barmouth, Aberdovey, and Cwm Bychan, Merionethshire; Island of Anglesea; Oswestry and Caer Caradoc, Shropshire; Kildale Moor, Cleveland, Yorkshire; Teesdale, Durham. Ben Cruachan, Argyshire; The Trossachs, Crianlarich, Ben Lawers, and Craig Calliach, Perthshire; Sidlaw Hills and Clova, Forfarshire; Glen Callater, Braemar, Aberdeenshire. Dunkerron and Finnehy River, co. Kerry; Dawros River, Connemara, co. Galway.

Form *corallina* Cromb. Grevillea, xii. (1883) p. 59.—Thallus thick, densely papillose; the papillæ elongate, thin, simple and branched.—*P. syncarpa* γ. *corallinum* Mudd, Man. p. 273. *Isidium corallinum* Gray, Nat. Arr. i. p. 412; Turn. & Borr. Lich. Br. p. 100; Hook. Fl. Scot. ii. p. 66; Sm. Eng. Fl. v. p. 231. *Lichen corallinus* Linn. Mant. (1767) p. 131; Huds. Fl. Angl. ed. 2, p. 526; Lightf. Fl. Scot. ii. p. 898; With. Arr. ed. 3, iv. p. 16 pro parte; Eng. Bot. t. 1541.

Differs from the type in the character of the isidioid papillæ. It is, however, connected with it by intermediate states, so that perhaps it is to be regarded only as a luxuriant condition. It is never seen fertile.

Hab. On rocks in maritime and upland situations.—*Distr.* Seen in a typical state only from a few localities in Great Britain and Ireland.—B. M.: near Pont-ned-vechan, Brecknockshire; Barmouth, Merionethshire; Island of Anglesea; Ayton Moor, Cleveland, Yorkshire; Eglestone, Durham; Alston, Cumberland. Ben-y-gloe, Perthshire; Baldovan Woods, Forfarshire. The Dargle River, co. Wicklow.

15. *P. ceuthocarpa* Turn. & Borr. Lich. Br. (1839) p. 200; Nyl. Mém. Soc. Cherb. t. v. p. 116.—Thallus determinate, thickish, areolato-diffract, cream-coloured; the areolæ convex, undulato-rugose (K + yellow, then deep orange-red).—Apothecia few, in subglobose, smooth, conglomerate verrucæ; the ostioles minute, punctiform, blackish; spores 2næ, 0.150–170 mm. long. 0.057–60 mm. thick.—Sm. Eng. Fl. v. p. 160; Mudd, Man. p. 271; Cromb. Lich. Brit. p. 58; Leight. Anglo. Lich. p. 28, t. 9. f. 4; Lich. Fl. p. 237, ed. 3, p. 228.—*Porina ceuthocarpa* Tayl. in Mack. Fl. Hib. ii. p. 102. *Lichen ceuthocarpus* Sm. Eng. Bot. xxxiii. (1812) t. 2372.—*Brit. Ews.*: Leight. n. 284.

Apparently an endemic species well distinguished by the characters given. The areolæ are at times plane, especially towards the circumference, where the plant is limited by a dark-olive hypothalline margin.

The verrucæ, occasionally very tumid, vary considerably according to the number of the ostioles. These are usually 1, but sometimes 3, 4, 5, or even more, appearing like minute, blackish subpapillate dots.

Hab. On rocks in maritime and mountainous districts.—*Distr.* Rather local in S.W. England, N. Wales, the S.W. Highlands, and the S. Grampians, Scotland, as also in S. Ireland.—B. M.: Pentire, Lamorna, near Penzance, Cornwall; Barmouth and near Dolgelly, Merionethshire. Appin, Argyleshire; Craig Calliach, Perthshire. Lambay Island, near Cork.

Form 1. *microstictica* Cromb.—Thallus sprinkled with short, simple, concolorous papillæ, brownish at the apices.—*Lichen microsticticus* Sm. Eng. Bot. xxxii. (1811) t. 2243. *Isidium microsticticum* Turn. & Borr. Lich. Br. p. 94; Hook. Fl. Scot. ii. p. 66; Gray, Nat. Arr. i. p. 774; Sm. Eng. Fl. v. p. 231.—*Brit. Ess.*: Leight. n. 342.

A sterile condition analogous to form *Westringii* of *P. concreta*. The papillæ, as noticed by Turner and Borrer, *l. c.*, are minute, scattered, rarely confluent, brittle, and when abraded leave a minute white impression in the crust.

Hab. On rocks in maritime and mountainous districts.—*Distr.* Sparingly in the Channel Islands, N. Wales, and S.W. Ireland.

Form 2. *variolosa* Cromb. Grevillea, xix. p. 59.—Thalline verrucæ sterile, transformed into white, pulverulent soredia.—Var. β . *variolosa* Mudd, Man. (1861) p. 271.—*Brit. Ess.*: Leight. n. 341.

Though looking as if distinct, it is only one of those variolarioid conditions so common in the plants of this genus.

Hab. On rocks in maritime districts.—*Distr.* Very local in N. Wales and the S.W. Highlands of Scotland.—B. M.: Barmouth and Dolgelly, Merionethshire. Barcaldine, Argyleshire.

16. *P. coccodes* Nyl. Mém. Soc. Cherb. t. v. (1857) p. 146.—Thallus determinate or effuse, unequal, subleprose, rimulose or rimose, at times verruculose, whitish, often limited by a dark line at the circumference (K+yellow, then deep rusty red, CaCl—). Apothecia usually several in scattered subglobose or nodulose verrucæ: the ostioles punctiform, black, slightly prominent; spores 0.115–140 mm. long, 0.040–60 mm. thick.—Cromb. Lich. Brit. p. 59. *Pertusaria globulifera* var. δ . *coccodes* Mudd, Man. p. 274. *Isidium coccodes* Turn. & Borr. Lich. Br. p. 89; Sm. Eng. Fl. v. p. 230; Gray, Nat. Arr. i. p. 412. *Lichen coccodes* Ach. Prodr (1798) p. 10; Eng. Bot. t. 1511.

A distinct species, though by some authors mixed up with the preceding, from which, apart from the habitat, it is sufficiently separated by the characters given. The sterile thallus, which, when more leprose, is apt to be mistaken for *Lecanora porella*, var. *Turneri*, is often somewhat isidioid with the isidia cylindrical, short and simplish. When fertile, as it rarely is in the British specimens, the verrucæ are at times as if glomerulose.

Hab. On trunks of old trees in upland districts.—*Distr.* Only here and there throughout England; not seen in Scotland or Ireland.—B. M.: Near Norwich, Norfolk; near Quendon, Epping and Hainault Forests, Essex; Albourne, Sussex; New Forest, Hants; Salperton, Gloucestershire; Hay Park, Herefordshire; Baysdale, Cleveland, Yorkshire.

Form *bacillosa* Nyl. ex Lamy, Bull. Soc. Bot. t. xxv. (1878) p. 425.—Thallus covered with numerous, long, isidioid papillæ which are obtuse and branched.—Cromb. Grevillea, xix. p. 59.

Only a very luxuriant though well-marked condition of the type. It is always sterile.

Hab. On the trunk of an old tree in a wooded upland situation.—*Distr.* Only very sparingly in S. England.—B. M.: Near Lyndhurst, New Forest, Hants.

17. *P. concreta* Nyl. Mém. Soc. Cherb. v. (1857) p. 117; Flora, 1876, p. 234.—Thallus determinate, continuous, thickish, rimose, unequal, white or whitish, subeffigurate at the circumference (K $\frac{+}{+}$ yellow, then saffron-red). Apothecia immersed in convex, variously confluent, thalline verrucæ, endocarpoid, colourless, indicated externally by a dark punctiform ostiole; spores 0.015–0.025 mm. long, 0.052–0.080 mm. thick.—Cromb. Grevillea, v. p. 25; Leight. Lich. Fl. ed. 3, p. 227.

A rather interesting plant, forming, as observed by Nylander (Flora, l. c.), the typical condition of "*Isidium Westringii*," the relation of which to the allied species had previously been very uncertain. On the thallus of the Irish specimens, which are well fertile, traces occur here and there of a few short abortive papillæ.

Hab. On schistose rocks in a maritime district.—*Distr.* Extremely local and scarce in N.W. Ireland.—B. M.: Letterfrack, Connemara, co. Galway.

Form *Westringii* Nyl. Flora, 1876, p. 234.—Thallus more or less densely papillose; papillæ at first minute, subglobose, then elongate, subcylindrical, simple and branched, brown at the apices. Cromb. Grevillea, xix. p. 59.—*P. Westringii* Leight. Lich. Fl. p. 236, ed. 3, p. 227 pro minima parte. *Lichen Westringii* Ach. Vet. Ak. Handl. 1794, p. 179, t. 6. f. 1; Eng. Bot. t. 2204; Dicks. Crypt. fasc. iv. p. 20. *Isidium Westringii* Turn. & Borr. Lich. Br. p. 92; Gray, Nat. Arr. i. p. 412; Hook. Fl. Scot. ii. p. 66; Sm. Eng. Fl. v. p. 239.

Only a sterile isidioid condition, though at first sight appearing very distinct. The papillæ are sometimes 2–3 confluent, and in age the apical globules become dark- or reddish-brown.

Hab. On rocks and walls in maritime and mountainous districts.—*Distr.* Here and there throughout Great Britain; rare in the Channel Islands and W. Ireland; probably often overlooked.—B. M.: Island of Guernsey. Near St. Austell and Penzance, Cornwall; Barmouth and Aberdovey, Merionethshire; Arkendale, Durham; Thornthwaite, near

Keswick, Cumberland. Achosragan Hill, Appin, Argyleshire; Craig Tulloch, Blair Athole, Perthshire; Glen Callater, Braemar, Aberdeenshire. Kylemore Lake, Connemara, co. Galway.

18. *P. melaleuca* Dub. Bot. Gall. t. ii. (1830) p. 673.—Thallus subeffuse, thin, smoothish, rimuloso-verrucose, yellowish-cream-coloured (K + yellowish, K(CaCl) + orange-red). Apothecia in convexo-depressed, irregular verrucæ, lacerate at the margins, the ostioles depressed, brownish-black, at length pseudo-disciform; spores 2næ, 0,072–75 mm. long, 0,023–25 mm. thick.—Mudd, Man. p. 275; Leight. Lich. Fl. p. 240, ed. 3, p. 230; Brit. Anglo. Lich. p. 29, t. 10. f. 3.—*Thelotrema melaleucum* Turn. & Borr. Lich. Br. p. 183; Sm. Eng. Fl. v. p. 161. *Lichen melaleucus* Eng. Bot. xxxv. (1813) t. 2461.

The fertile verrucæ are for the most part scattered, at times 2–3 confluent, very rarely crowded, with the ostioles 1 or more, and the margins lacerate, inflexed and irregular. They thus appear lecanoroid, and give the plant somewhat the aspect of young states of *P. Wulfenii*. From this, however, it is definitely separated by the number of the spores.

Hab. On smooth trunks of trees in upland wooded situations.—*Distr.* Found only in a few localities in S. and Central England and in N. Wales.—B. M.: Shiere, Surrey; St. Leonard's Forest, Sussex; New Forest, Hants; Twycross, Leicestershire; near Barmouth, Merionethshire.

19. *P. pustulata* Nyl. Act. Soc. Linn. Bord. sér. 3, t. i. (1856) p. 441.—Thallus subeffuse, thinnish, subrimose, greyish-white (K—, CaCl—). Apothecia several, in small, convex verrucæ; the ostioles punctiform, confluent, blackish; spores 2næ, 0,070–0,120 mm. long, 0,034–44 mm. thick.—Cromb. Grevillea, xix. p. 59; Leight. Anglo. Lich. p. 30, t. 10. f. 4?; Lich. Fl. p. 244, ed. 3, p. 234 pro parte; Mudd, Man. p. 275 pro parte; Cromb. Lich. Brit. p. 60 pro parte.—*Porina pustulata* Ach. Lich. Univ. (1810) p. 309.

Often confounded with *L. leioplaca*, from which, among other characters, it differs in the number of the spores. It has more the general aspect of *P. communis*, but apart from the different thalline reactions, the verrucæ are smaller and the ostioles less depressed. There is also a leucostomous state (form *superpallens* Nyl. Flora, 1886, p. 466) which has been very sparingly gathered in Britain.

Hab. On trunks of trees in wooded upland situations.—*Distr.* Local and scarce in E., S. and N. England, and N. Wales.—B. M. Epping Forest, Essex; New Forest, Hants; Hinton Abbey, Somersetshire; Giggarron, Cumberland; Dolgelly, Merionethshire.

B. Thecæ pauci- or pluri-spored; spores blackish.

20. *P. lactescens* Mudd, Man. (1861) p. 272 (excl. var. β).—Thallus subdeterminate, thickish, continuous, at length rugoso-unequal, rimoso-diffract, greyish or cream-coloured (K + yellow, then

saffron-red, CaCl —). Apothecia rugoso-diform, innate in non-prominent thalline areolæ, brownish-black, internally subincolorous; spores 2næ (rarely 3–4næ), olive-blackish ($\text{K} + \text{violet}$), 0,090–130 mm. long, 0,055–85 mm. thick.—Cromb. Grevillea, xix. p. 59.—*P. spilomanthodes* Nyl. Flora, 1881, p. 179; Cromb. Grevillea, x. p. 23.—*Brit. Exs.*: Mudd, n. 260.

With the following well characterized by the blackish spores, though Mudd erroneously describes them (in their immature state) as pale-yellowish-green or pale-yellow. It comes very near *P. spilomantha* Nyl., a plant of the Eastern Pyrenees, but differs in the normally 2-spored thecæ and the smaller spores. The apothecia are rather scattered in the specimens seen.

Hab. On rocks and walls in upland districts.—*Distr.* Only sparingly in a few localities of N. England.—B. M.: Ayton Moor, Cleveland, Yorkshire; Ennerdale, Cumberland.

21. *P. urceolaria* Nyl. Bull. Soc. Linn. Normand. vi. (1873) p. 324 (nota).—Thallus effuse, thin, areolato-rimose, subpapilloso-scabrid, greyish- or yellowish-white ($\text{K} + \text{yellow}$, then orange-red, CaCl —). Apothecia small, depressed, urceolariiform, black; spores 1–4næ, blackish ($\text{K} + \text{violet}$), 0,100–140 mm. long, 0,050–75 mm. thick.—Cromb. Grevillea, xix. p. 59; Leight. Lich. Fl. ed. 3, p. 238 pro parte.

An endemic plant easily recognized by the urceolato-depressed apothecia. It is allied to the preceding species, but differs in the thallus being more or less rough with papille and in the form of the fruit. The two specimens seen are well fertile.

Hab. On granitic stones of a wall in a maritime district.—*Distr.* Extremely local in one of the Channel Islands.—B. M.: La Moye, Island of Jersey.

C. Thecæ pluri-spored; spores colourless.

a. Spores 8næ.

22. *P. Wulfenii* DC. Fl. Fr. ii. (1805) p. 320.—Thallus determinate or subeffuse, membranaceo-cartilaginous, thickish, plicato-rugose, rimose, whitish- or greyish-yellow ($\text{Kf} + \text{yellowish}$, $\text{K}(\text{CaCl}) + \text{orange-yellow}$); fertile verrucæ crowded, irregularly depressoglobose or difform. Apothecia with the ostiola dilated, confluent, difform, sublecanoroid, blackish, undulate and suberenate at the margin (epithecium $\text{K} + \text{violet}$); spores 0,058–85 mm. long, 0,028–38 mm. thick.—Cromb. Grevillea, xix. p. 59.—*P. fallax* (Ach.) Sm. Eng. Fl. v. p. 160; Leight. Br. Angio. Lich. p. 29, t. 10. f. 2; Mudd, Man. p. 276; Cromb. Lich. Brit. p. 60; Leight. Lich. Fl. p. 240, ed. 3, p. 231. *Lichen hymenius*, Eng. Bot. t. 1731. *Thelotrema hymenium* Turn. & Borr. Lich. Br. p. 185. *Porina hymenea* Gray, Nat. Arr. i. p. 495. *Porina fallax* Tayl. in Mack. Fl. Hib. ii. p. 102. *Lichenoides verrucosum et rugosum, cinereum, glabrum* Dill. Musc. 128, t. 18. f. 9 pro parte.—*Brit. Exs.*: Mudd, n. 266; Leight. n. 71.

In general appearance not unlike *P. communis*, but differs in the colour of the thallus, the form of the apothecia, and more especially in the 8-spored thecæ. The thallus is at times widely expanded, and is often almost entirely covered with the numerous crowded verrucæ, which from mutual pressure become much deformed. By the confluence of the ostiola when there are more than one in the same verruca, the apothecia assume a discoid aspect with a thick, inflexed, rugoso-crenate thalloid margin. The spermatogones are not unfrequent, with spermatia 0.013–23 mm. long, 0.0005 mm. thick.

Hab. On trunks of trees, chiefly in forests and large woods, from maritime to upland districts.—*Distr.* General and not uncommon in England; apparently rare in Scotland and Ireland.—B. M.: Sotterly, Ugley, and Yarmouth, Suffolk; Epping and Hainault Forests, Essex; Penshurst, Kent; St. Leonard's Forest, Sussex; New Forest, Hants; near Totnes and Lustleigh, S. Devon; Bccconoc and Withiel, Cornwall; Charnwood Forest, Leicestershire; Dolgelly and Aberdovey, Merionethshire; Trefriw, Denbighshire; near Conway, Carnarvonshire; Oswestry and Llanyblodwell, Shropshire; Ingleby Park, Cleveland, Yorkshire; Teesdale Forest, Durham; Keswick, Cumberland. Barcaldine, Argyleshire; Craig Calliach and Blair Athole, Perthshire; Durris, Kincardineshire; Craig Cluny, Braemar, Aberdeenshire. Castlebernard Park, co. Cork; Dinish, Killarney, co. Kerry.

Form 1. *carnea* Fr. Lich. Eur. (1831) p. 424.—Thallus as in the type. Apothecia with the disc protruded, tumid and flesh-coloured.—Cromb. Grevillea, xix. p. 59.—*Thelotrema hymenium* var. *γ. carneum* Turn. & Borr. Lich. Br. (1849) p. 185.

Evidently a monstrosity with abortive fructification. Though the thallus is said by Turner and Borrer to be thin and filmy on the bark of cherry and holly, yet when growing on beeches it is quite as in the type.

Hab. On the bark of trees in wooded upland tracts.—*Distr.* Very local and scarce in S. England.—B. M.: New Forest, Hants; Toy's Hill, Canterbury, Kent.

Form 2. *sparsilis* Nyl. ex Leight. Lich. Fl. ed. 3, (1879) p. 232.—Thallus scanty, whitish-yellow, the fertile verrucæ few, distantly scattered; otherwise as in the type.

A rather singular condition, depending probably upon the habitat. In the few fragments seen the thallus is little visible.

Hab. On moist shady rocks in an upland situation.—*Distr.* Only very sparingly in W. Ireland.—B. M.: Lough Inagh, Connemara, co. Galway.

Var. *β. glabrescens* Nyl. Flora, 1873, p. 71.—Thallus thin, smoothish or slightly rugulose, yellowish-grey or greyish-green. Apothecia with the epithecium subrimose, blackish.—Cromb. Grevillea, xix. p. 59.

Apparently a good variety characterized by the thinner, smoother thallus and the form of the epithecium. In the single British specimen the fertile verrucæ are mostly somewhat scattered.

Hab. On the trunks of holly in a mountainous district.—*Distr.* Only in the S.W. Highlands of Scotland, though probably to be detected elsewhere.—B. M.: Barcaldine, Argyleshire.

Var. *γ. rupicola* Nyl. Flora, 1873, p. 71.—Thallus effuse, thickish, areolato-verrucose, sulphur- or greenish-yellow colour; fertile verrucæ crowded, difform. Apothecia with the ostioles punctiform, blackish, depressed.—Cromb. Grevillea, xix. p. 59.—*Pertusaria fallax* var. *β. sulphurea* Mudd, Mann. p. 276; Leight. Lich. Fl. ed. 3, p. 231. *Pertusaria sulphurea* var. *β. rupicola* Schaer. Enum. (1850) p. 229.

Differs in the deeper colour of the thallus and in the habitat. In this country it is very rarely fertile. The thallus is occasionally sprinkled with small sorediose (abortive) verrucæ, when it is *Endocarpon sulphureum* Tayl. in Mack. Fl. Hib. ii. p. 100, approaching subspecies *P. flavicans* Lamy, Bull. Soc. Bot. t. xxv. p. 427.

Hab. On rocks in maritime and mountainous regions.—*Distr.* Only a few localities in W. and N. England, the S.W. Highlands of Scotland, and W. Ireland.—B. M.: Dolgelly, Merionethshire; Snowdon, Carnarvonshire; Island of Anglesea; Ingleby Park, Cleveland, Yorkshire. Island of Lismore, Argyleshire; The Trossachs, Perthshire. Dunkerron, co. Kerry; Dawros River, Connemara, co. Galway.

23. *P. lutescens* Lamy, Bull. Soc. Bot. t. xxv. (1878) p. 427.—Thallus subeffuse, thin, pulverulent, yellow, at times thinly zonate at the circumference; sterile verrucæ transformed into concolorous soredia (K (CaCl) + orange-yellow). Apothecia very rare, lecanoroid, dilated, blackish, the margin tumid; spores 0,054–79 mm. long, 0,028–40 mm. thick.—Cromb. Grevillea, xix. p. 59.—*Isidium lutescens* Turn. & Borr. Lich. Br. p. 87; Sm. Eng. Fl. v. p. 230. *Lepraria lutescens* Eng. Bot. t. 1529. *Lepra lutescens* Hoffm. Pl. Lich. (1784) t. 23. ff. 1, 2. *Pertusaria fallax* var. *γ. variolosa* Fr., Mudd, Man. p. 276.

Has quite a leprarioid appearance when sterile, as it always is in this country. By Th. M. Fries, who first described the fructification (Lich. Scand. p. 312) it is regarded as only a variety of the preceding. From this, however, it scarcely descends, while it differs in the much shorter spores. The apothecia have as yet been found only in Sweden.

Hab. On the trunks of old trees, chiefly oaks, in wooded upland situations.—*Distr.* Seen from only a few localities in S., W., and N. England; probably often overlooked.—B. M.: Ickworth Park, Suffolk; Epping Forest, Essex; Ockham, Surrey; Hurstpierpoint, Sussex; New Forest, Hants; Oswestry, Shropshire; near Battersby, Cleveland, Yorkshire.

24. *P. carneopallida* Anzi, Nyl. Flora, 1868, p. 478.—Thallus hypophlæodal, macular, pale or pale-glaucous (K —, CaCl —). Apothecia erumpent, minute, pseudo-lecanorine, at first plane with a thin, irregular, white, spurious margin, then pulvinato-convex, immarginate; spores 8næ, 0,018–32 mm. long, 0,011–20 mm. thick.—Cromb. Grevillea, xii. p. 60.—*Lecidea carneopallida* Nyl. Bot. Not. 1853, p. 183; Lich. Scand. p. 196, t. 1. f. 9. *Lichen cupularis* With. Arr. ed. 3, iv. p. 22 pro parte (*i. e.* “on trees”).

A peculiar plant, looking, with its white spurious margin, as if allied to *Lecidea coarctata*, but with all the essential characters of this genus. Superficially it still more resembles *L. carneolutea* (Turn.), but among other characters at once differs in the simple spores. Nylander observes (Lich. Scand. p. 197) that there are scanty gonidia towards the base of the apothecia and that their margin consists chiefly of minute crystals of oxalate of lime. In the two British specimens the thallus is almost obsolete.

Hab. On the bark of alders in mountainous regions.—*Distr.* Seen only from the S.W. Highlands of Scotland and N. Wales.—B. M.: Appin, Argyleshire.

25. *P. inquinata* Fr. fil. Bot. Not. 1867, p. 108.—Thallus subdeterminate, areolato- or verrucoso-rimose, greyish (K—, CaCl—). Apothecia innate, one or several in each areola, the ostioles somewhat plane, variously flexuose, and rotundate, the margins irregular, thin, persistent, paler; spores 0,025–30 mm. long, 0,014–18 mm. thick.—Leight. Lich. Fl. ed. 3, p. 235; Cromb. Grevillea, xix. p. 59.—*Lecanora coarctata* δ . *inquinata* Ach. Lich. Univ. (1810) p. 353.

Might readily be taken for a *Lecanora* allied to *L. gibbosa* or *L. cinerea*, as noted by Th. M. Fries (Lich. Scand. p. 311). The microscopical characters of the apothecia, however, show its true place, though, with the following, it has in other respects a connection with the *Aspicilia* section of *Lecanora*. In the few fragmentary British specimens, which are well fertile, the thallus is thinnish, though elsewhere it varies in thickness, according to the nature of the substratum.

Hab. On rocks in maritime and upland situations.—*Distr.* Very local and scarce in N.E. England (Gunnerton Craggs, Northumberland), W. Ireland, and the S.W. Highlands of Scotland.—B. M.: Barcaldine, Argyleshire. Lettermore, Connemara, co. Galway.

26. *P. nolens* Nyl. Flora, 1864, p. 489.—Thallus determinate, smooth, areolato-rimose, greyish (K—, CaCl—). Apothecia innate, not prominent, two or more approximate, colourless within; the ostioles plane, difform, rotundate or oblong, black, whitish at the margins; spores 0,030–42 mm. long, 0,015–22 mm. thick.—Carroll, Journ. Bot. 1865, p. 289; Cromb. Lich. Brit. p. 61; Leight. Lich. Fl. p. 245, ed. 3, p. 235.

Probably not specifically distinct from the preceding, to which it is intimately related; though differing, among some minor characters, in the larger spores. In his observations upon the original specimen gathered by him, Admiral Jones (Nat. Hist. Soc. Dublin, May 1864) says:—"In the beginning this plant might be supposed to be '*Urceolaria*,' but the *Urceolarian* appearance is of short duration. There are no prominent warts as in *Pertusaria*, but the nuclei are in masses, as in this genus, and the ostioles are irregular in form with a white pulverulent margin. Internally the plant is altogether a *Pertusaria* in asci, spores and paraphyses."

Hab. On rocks in maritime districts.—*Distr.* Only very sparingly in N.E. and W. Ireland.—B. M.: Glenarm, co. Antrim; Lough Feagh, Connemara, co. Galway.

27. *P. gyrocheila* Nyl. Flora, 1865, p. 354.—Thallus determinate, subgranuloso-unequal, rimoso-diffract, greyish (K + yellow, CaCl —). Apothecia in thelotremoid tubercles, simple or at length subgyrose, the thalline margin thick, subgyrose; epithecium glypholeceine, hymenium pale; spores 0.065–70 μ m. long, 0.036–50 μ m. thick; hymenial gelatine and the thecae bluish with iodine.—Carroll, Journ. Bot. 1866, p. 23; Croub. Lich. Brit. p. 61; Leight. Lich. Fl. p. 241, ed. 3, p. 232.

A very distinct species well characterized by the peculiar form of the fructification. The thallus is small, with the fertile verrucæ more or less scattered and crateriform. The very few specimens gathered are only sparing fertile.

Hab. On mica-schist rocks in an alpine situation.—*Distr.* Extremely local and scarce on one of the S. Graupians, Scotland.—B. M.: Summit of Ben Lawers, Perthshire.

b. Spores normally 4næ.

28. *P. leioplaca* Schaer. Spicil. (1823) p. 66; Nyl. Lich. Scand. p. 181.—Thallus subdeterminate, thin or rarely submoderate, smooth or ruguloso-unequal, rimose, milk-white, yellowish-white or whitish (K — or f + yellowish). Apothecia in somewhat convex, smooth, usually discrete verrucæ, the ostioles solitary or few (1–3–5), punctiform, dark; spores usually 4næ (but variable in number), oblongo-ellipsoid or subellipsoid, 0.042–75 μ m. long, 0.020–38 μ m. thick.—Mudd, Man. p. 267; Croub. Lich. Brit. p. 60; Leight. Lich. Fl. p. 244, ed. 3, p. 234.—*Porina leioplaca* Ach. Vet. Ak. Handl. 1809, p. 159; Lich. Univ. p. 309, t. 7. f. 2. *Pertusaria communis* var. δ . *leioplaca* Turn. & Borr. Lich. Br. p. 197.—*Brit. Ess.* Leight. n. 230; Mudd, nos. 265, 267.

The thallus varies somewhat in thickness, becoming at times subconcurrent, when the verrucæ are more prominent. As noted by Th. M. Fries (Lich. Scand. p. 316), the chemical reaction varies according to the colour of the thallus, being little (or not) distinct when it is dealbate. The apothecia are also variable, usually solitary, rarely 3 or 5 in the verrucæ, with the spores at times 3–5–6–8næ, very rarely 2næ (in a single British specimen).

Hab. On the trunks of trees in maritime and upland districts.—*Distr.* In most parts of Great Britain, no doubt also of Ireland: not seen from the Channel Islands.—B. M.: Near Highbeach, Epping Forest; Ightham, Kent; St. Leonard's Forest, Sussex; Shanklin, Isle of Wight; New Forest, Hants; Lustleigh, S. Devon; Withiel, Cornwall; near Cirencester, Gloucestershire; Woodbury Hill and Malvern, Worcestershire; Gopsall Park, Leicestershire; Gloddaeth, Carnarvonshire; Bettws-y-coed, Denbighshire; Island of Anglesea; Newton Wood and Sowerdale, Cleveland, Yorkshire; Lamplugh, Cumberland. Barcaldine, Argyleshire; Craig Calliach, Killin and Falls of Moness, Aberfeldy, Perthshire; Moor of Morrone, Braemar, Aberdeenshire; Glen Nevis, Inverness-shire. Enniskean, co. Cork; McCarthy's Island and Upper Lake, Killarney, co. Kerry; Renvyle Wood, Connemara, co. Galway.

Form *hexaspora* Nyl. Lich. Scand. (1861) p. 182.—Spores usually 6næ, 0,038–86 mm. long, 0,025–38 mm. thick. Otherwise as in the type.

Differs merely in the thecæ being generally 6-spored, though in the same apothecium they are occasionally 4-spored. Nylander (*l. c.*) says the spores are rarely 3næ, which is not the case in our specimens.

Hab. On trunks of trees in maritime and upland wooded situations.—*Distr.* Only a few localities in S. and W. England.—B. M.: Shauklia, Isle of Wight; near Lyndhurst, New Forest, Hants; Ullacombe, Bovey Tracey, S. Devon; Oakley Park, Cirencester, Gloucestershire.

29. *P. glomerata* Schaer. Spicil. (1823) p. 66.—Thallus effuse, thin, interruptedly plicato-verrucose, white or yellow-cream-coloured, the fertile verrucæ subglobose, conglomerate (K+ bright yellow, then cinnabar-red, CaCl–). Apothecia usually solitary, the ostioles punctiform or slightly dilated, generally somewhat prominent, blackish; spores 0,072–125 mm. long, 0,028–44 mm. thick.—Mudd, Man. p. 277; Cromb. Lich. Brit. p. 60; Leight. Lich. Fl. p. 237, ed. 3, p. 227.—*Lichen glomeratus* Schleich. Pl. Crypt. Cent. iii. (1807) n. 77, *fide* Ach. Lich. Univ. p. 310 (sub *Porina*). *Pertusaria glomulifera* (Borr.) Leight. Lich. Fl. p. 243, ed. 3, p. 234, Anglo. Lich. p. 30, t. 11. f. 2, is only an old dealbate state in which the reaction with K is absent.

An alpine plant well distinguished from its allies by the characters given and by the habitat. The thallus, scarcely contiguous, is itself white (K–), as noted by Th. M. Fries (Lich. Scand. p. 315); but the fertile verrucæ, which are occasionally 2–3 conerescent, are more or less ochroleucous. The few British specimens are well fertile, the ostioles being at times two and often subpapillate. The spermatogones, rarely present, have the spermatia aciculari-fusiform, 0,008–11 mm. long, 0,0005 mm. thick (*fide* Nyl.).

Hab. Incrusting dead mosses at high altitudes on mountains.—*Distr.* Local and scarce on the S. Grampians, Scotland.—B. M.: Craig Calliach and Ben Lawers, Perthshire.

30. *P. xanthostoma* Fr. Lich. Eur. (1831) p. 427.—Thallus effuse, thin, smooth, milk-white, the fertile verrucæ elevated, depresso-subglobose (K–, CaCl–). Apothecia punctiform, usually 1–2 in each verruca; the ostioles depressed, pale or pale-yellowish; spores ellipsoid or ellipsoideo-oblong, 0,060–76 mm. long, 0,034–40 mm. thick.—Cromb. Journ. Bot. 1875, p. 141; Leight. Lich. Fl. ed. 3, p. 235.—*Porina xanthostoma* Somm. in Vet. Ak. Handl. 1823, p. 115.

Has at first sight a considerable resemblance to *Lecanora poriniiformis* Nyl. The verrucæ sometimes occur 2–3 together, and the ostioles are occasionally tinged pale-reddish. Rarely 1–5 apothecia are seen in each verruca.

Hab. On old stems of *Ericas* in alpine and subalpine localities.—*Distr.* Sparingly on the N. Grampians and in the N. Highlands of Scotland.—B. M.: Morrone, Braemar, Aberdeenshire; near Lairg, Sutherlandshire.

63. **VARICELLARIA** Nyl. Mém. Soc. Cherb. t. v. (1857) p. 117; Lich. Scand. p. 182.—Thallus thinly crustaceous, pulveraceous or subleprarioid. Apothecia variolarioid or sorediiform (in convex verrucæ), pale, carneo-punctate or suffused; thecæ ventricose, monosporous; spores very large, 1-septate, colourless; paraphyses scanty, subdiscrete, slender, variously arcuate. Spermatogones not yet seen.

Among other characters well distinguished from *Pertusaria* by the septate spores, which are also the largest observed among lichens. Only a single species is known, which has recently been recorded as British.

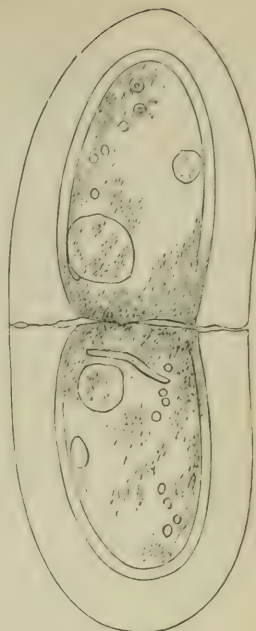
1. **V. microsticta** Nyl. Mém. Soc. Cherb. t. v. (1857) p. 117; Lich. Scand. p. 183, t. i. f. 8.—Thallus effuse or subdeterminate, unequal, rimose or granulato-pulverulent, subleprose, whitish (K—, CaCl—). Apothecia moderate, prominent, rotundate, above plane or unequal, often 2-3 confluent, white-suffused or denudate, concolorous within; spores ellipsoid or ovoid, 0.225-0.350 mm. long, 0.095-0.115 mm. thick; hymenial gelatine and the thecæ deep blue (then often denigrate) with iodine.—Cromb. Journ. Bot. 1882, p. 274.—According to Th. M. Fries (Lich. Scand. p. 322) it is *Pertusaria rhodocarpa* Koerb. Syst. Lich. Germ. p. 384, "sec. spec. orig."; but as Koerber's diagnosis by no means corresponds, the specific name of Nylander must be adopted.

When sterile and less developed the plant looks quite like a leprarioid or variolarioid state of some *Pertusaria*. The apothecia are innate in the thalline glomerules, subglobose or at length depressed; in the two British specimens they are only sparingly present in a rightly developed condition.

Hab. On the ground in an alpine situation.—*Distr.* Extremely local and scarce on one of the N. Grampians, Scotland; though it probably also occurs corticolous in the same district.—B. M.: Ben Avon, Braemar, Aberdeenshire.

Subtribe IV. **THELOTREMEI** Nyl. Lich. Scand. (1861) p. 183, emend. apud Stiz. St. Gall. Nat. Ges. 1880, p. 394.

Thallus crustaceous, continuous, areolate or pulverulent, internally containing gonidia. Apothecia urceolato-impressed, often with double margin; spores variable in number, plurilocular



X 350

Fig. 71.

Varicellaria microsticta Nyl.—
A spore, X 350.

or murali-divided. Spermogones with simple or slightly branched sterigmata.

Differs from the preceding subtribe in the apothecia being usually more open, and especially in the spores being murali-divided. It comprises 7 genera, four of which are entirely exotic, while *Belonia* Koerb., though European, does not occur in Britain.

64. **PHLYCTIS** Wallr. Naturg. der Flecht. (1825) p. 527.—Thallus thinly crustaceous, continuous or pulverulent. Apothecia rotundato-diform, usually suffused, erumpent, the thalline margin irregularly dehiscent or indistinct; hypothecium colourless; spores large, 1-2 μ , ellipsoid or oblong, murali-divided, colourless; paraphyses slender; hymenial gelatine scarcely tinged, but the thecæ bluish with iodine. Spermogones with simple sterigmata and short, slender, straight spermatia.

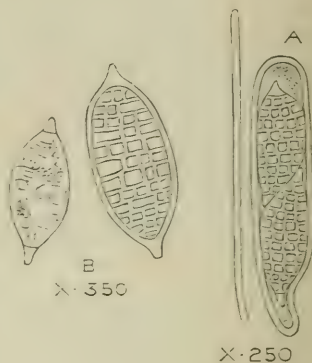


Fig. 72.

A small genus the plants belonging to which are, from the appearance of the fructification, readily overlooked. In some respects it approaches *Pertusaria*, but is definitely separated by the muriform spores. Of the three European species two are found in this country.

Phlyctis agelæa Koerb.—A. A 2-spored theca and paraphysis, \times 250. B. Two spores, \times 350.

1. ***P. agelæa*** Koerb. Syst. Lich. Germ. (1855) p. 391.—Thallus effuse or subdeterminate, thin, rugose or smoothish, often subleprose, white or greyish-white (K + yellow, then deep-red). Apothecia minute, blackish, white- or caesio-suffused; spores 2 μ (3-4 μ), ellipsoid, mucronate at the apices, 0.045-70 μ long, 0.014-27 μ thick.—Mudd, Man. p. 279, t. 5. f. 118; Cromb. Lich. Brit. p. 61; Leight. Lich. Fl. p. 246, ed. 3, p. 237.—*Thelotrema agelæa* Gray, Nat. Arr. i. p. 494 pro parte. *Variolaria agelæa* Turn. & Borr. Lich. Brit. p. 78; Sm. Eng. Fl. v. p. 171. *Lichen agelæus* Ach. Prodr. (1798) p. 30; Eng. Bot. t. 1730. *Variolaria constellata* Tayl. in Mack. Fl. Hib. ii. p. 113 pro parte (ex specimine ab ipso).—Brit. Ews.: Leight. n. 282; Mudd, n. 269.

Occasionally spreads very extensively and then covers the lower portion of the trunks of trees. The apothecia, which are scattered or more frequently crowded, are at first entirely enclosed in thalline verrucae and at length leproso-coronate or almost covered by the thallus. The spermogones are very seldom visible in the British specimens.

Hab. On trunks of trees in maritime and upland situations.—*Distr.* General and common in England; scarce in S. Ireland; not seen from Scotland or the Channel Islands.—B. M.: Ickworth, Suffolk; near Yarmouth, Norfolk; Epping Forest, Quendon, and Rickling, Essex; Penhurst, Kent; Shiere, Surrey; Glynde and Hensfield, Sussex; Caris-

brook, Isle of Wight; New Forest, Hants; Ilsham Walk, Torquay, S. Devon; Bathampton Downs, Somersetshire; Cirencester, Gloucestershire; Harboro' Magna, Warwickshire; Huglith, near Church Stretton, and Oswestry, Shropshire; Barmouth and Aberdovey, Merionethshire; Airyholme Wood and Hoggart's Wood, Cleveland, Yorkshire. Kitsboro', Riverstone and Castlebernard Park, co. Cork; Dunkerron, Killarney, co. Kerry.

2. *P. argena* Koerb. Syst. Lich. Germ. (1855) p. 391.—Thallus effuse, thin, smoothish or rugose, pulverulent, silvery-grey or cream-coloured (K+yellow, then deep red). Apothecia minute, brownish-black, caesio-suffused; spores solitary, oblong or cylindric-oblong, very large, 0,100–0,140 mm. long, 0,027–50 mm. thick.—Mudd, Man. p. 280; Cromb. Lich. Brit. p. 61; Leight. Lich. Fl. p. 246, ed. 3, p. 237.—*Variolaria argena* Turn. & Borr. Lich. Brit. p. 75; Sm. Eng. Fl. v. p. 171. *Lichen argenus* Ach. Prodr. (1798) p. 8; Eng. Bot. t. 1923.

Subsimilar to the preceding, from which it at once differs in the non-apiculate spores. It usually occurs only in a sterile condition, when it is very apt to be overlooked. The apothecia are either scattered or aggregate, and in the former case are with difficulty detected by the naked eye.

Hab. On the trunks of old trees in upland tracts.—*Distr.* Local (at least in fruit) in S. and W. England.—B. M.: Epping Forest, Essex; Ightham, Kent; New Forest, Hants; Haslemere, Surrey; Beckey Falls, S. Devon; Burnham Beeches, Bucks; Charnwood Forest, Leicestershire; Barmouth, Merionethshire; Oswestry, Shropshire.

65. **THELOTREMA** Ach. Meth. (1803) p. 130 pro parte; Nyl. Mém. Soc. Cherb. t. iii. (1855) p. 324.—Thallus thinly crustaceous, continuous, containing chrysogonidia. Apothecia verruciform, at first closed, then open, with a proper and a thalline margin; spores variable in number (1–4næ or 8næ), oblong or fusiform, usually colourless; paraphyses slender; hymenial gelatine not tinged with iodine. Spermatogones with simple sterigmata and short straight spermatia.

A genus well characterized by the fructification. Nearly all the species are exotic and natives of warm regions. The three which occur in Europe, one of which is confined to our Islands, belong to the sub-genus *Euthlotrema* Nyl.

1. *T. lepadinum* Ach. Meth. (1803) p. 132 pro parte; Syn. p. 115.—Thallus subeffuse or rarely determinate, thin, smooth or slightly ruguloso-unequal, protuberant around the apothecia, whitish or cream-coloured (K+red, CaCl–). Apothecia submoderate, urceolato-scutelliform, dark-brown or blackish, caesio-pruinose or naked: the proper margin lacerate, inflexed, the thalline margin thin, even; spores (4næ) 8næ, oblongo-fusiform, colourless, 0,035–70 mm. long, 0,011–16 mm. thick.—Leight. Angio. Lich. p. 31, t. 12. f. 1; Lich. Fl. p. 247, ed. 3, p. 238; Cromb. Lich. Brit. p. 61; Mudd, Man. p. 278, t. 5. f. 116; Turn. & Borr. Lich. Brit. p. 180; Sm. Eng. Fl. v. p. 161; Gray, Nat. Arr. i. p. 494; Hook. Fl. Scot. ii.

p. 45.—*Lichen lepadinus* Ach. Prodr. (1798) p. 30. *Lichen inclusus* Eng. Bot. t. 678.—*Brit. Exs.*: Leight. n. 121; Mudd, n. 268.

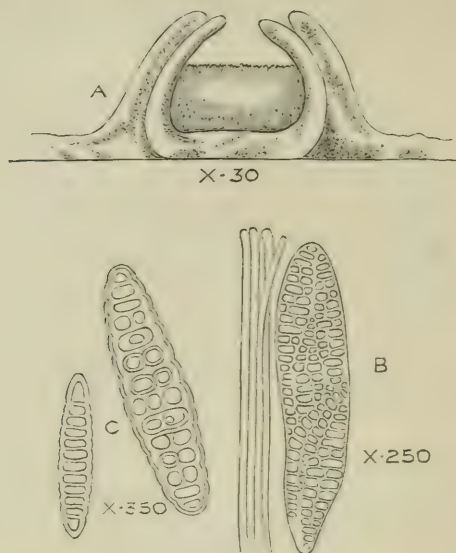


Fig. 73.

Thelotrema lepadinum Ach.—A. Section of apothecium, $\times 30$. B. Theca and paraphyses, $\times 250$. C. Two spores, $\times 350$.

The thallus varies somewhat in thickness, and at times, especially when growing on holly, is determinate and marked by a narrow, black, hypothalline line. In a young state the apothecia might be taken for those of a *Pertusaria*, but when fully developed they are very different in appearance. They are usually more or less scattered, but occasionally in old plants become crowded.

Hab. On smooth bark of trees from maritime to upland tracts.—*Distr.* General and common in England; rarer in Scotland: apparently very rare in Ireland.—B. M.: Ugley and Walthamstow, Essex; Ightham, Kent; St. Leonard's Forest, Sussex; New Forest, Hants; Ilsham Walk, Torquay, S. Devon; St. Breock, Cornwall; Bagley Wood, Berks; Bardon Hill, Leicestershire; Hollybush Hill, Malvern, Worcestershire; Cwm Bychan and Barmouth, Merionethshire; Hafod, Cardiganshire; Haughmond Hill, Church Stretton, and Acton Burnel Hill, Shropshire; Baysdale, Cleveland, Yorkshire; Teesdale, Durham; Calder Abbey, Cumberland; Felton Woods, Northumberland. Foot of Ben Lomond, Dumbartonshire; Barcaldine and Appin, Argyleshire; Glen Falloch and Loch Katrine, Perthshire; Morrone, Braemar, Aberdeenshire. Riverstone, co. Cork; Killarney, co. Kerry.

Var. *β . scutelliforme* Ach. Lich. Univ. (1810) p. 312; Syn. p. 115.—Thallus effuse, thickish, unequal, at times subpulverulent, cream-coloured. Apothecia prominent, somewhat large, crowded,

disc dilated, the thalline margin tumid, rugose.—Cromb. *Grevillea*, xix. p. 60.

A good variety apparently constant to the characters given. The apothecia are often here and there aggregate in small protuberant groups.

Hab. On trunks of old trees in wooded maritime and mountainous tracts.—*Distr.* Only a few localities in S. and N. England, N. Wales, the S.W. Highlands of Scotland, and S. Ireland.—B. M.: New Forest, Hants; Nannau, Dolgely, Merionethshire; Wark, Northumberland. Loch Creran, Argyshire. Glenstale, co. Tipperary; Derrieminty, Killarney, co. Kerry.

Form *rupestre* Cromb. Lich. Brit. (1878) p. 61.—Thallus more or less scattered, occasionally evanescent, otherwise as in the variety.—Leight. Lich. Fl. p. 248, ed. 3, p. 238.—*Var. rupestre* Turn. & Borr. Lich. Br. (1839) p. 180; Leight. Anglo. Lich. p. 32, t. 12. f. 2; Mudd, Man. p. 278. *Var. scutelliforme* Tayl. in Mack. Fl. Hib. ii. p. 103.

A depauperate state rather than a distinct form, resulting no doubt from the habitat. The thallus is at times subochraceous as noted by Leighton, who, however, erroneously says that the spores are 1-2 μ .

Hab. On rocks in maritime and upland situations.—*Distr.* Sparingly in N. Wales, N. England, the S.W. Highlands of Scotland, and W. Ireland.—B. M.: Llyn Bodlyn and Cammlan Valley, Merionethshire; Teesdale, Durham. Island of Lismore, Argyshire. Kenmare Road, Killarney, co. Kerry; Kylemore and Doughruagh Mts., Connemara, co. Galway.

2. *T. subtile* Tuck. Americ. Journ. Sc. & Art, t. xxv. (1858) p. 426; Nyl. Flora, 1864, p. 491.—Thallus macular, somewhat shining, cream-coloured or whitish (K+yellowish, CaCl—). Apothecia erumpent, small, colourless, the thalline margin slightly prominent, the proper margin often white-pulverulent; spores 3 μ , oblong, 10-13-localar, colourless, 0.040-0.05 mm. long, 0.009-0.010 mm. thick.—Carroll, Journ. Bot. 1865, p. 289; Cromb. Lich. Brit. p. 61; Leight. Lich. Fl. p. 248, ed. 3, p. 239.—*Brit. Exs.*: Cromb. n. 169; Larbal. Lich. Herb. n. 62.

An interesting plant, elsewhere found only in the United States of America. At first sight it looks as if it were only *T. lepadinum* with filmy thallus and smaller apothecia; but its real affinity is with *T. bincinctulum* Nyl., an Australasian species, from which it differs chiefly in the larger spores.

Hab. On smooth bark of trees in shady upland situations.—*Distr.* Only sparingly in W. Ireland.—B. M.: Turk Mt., Cromaglow, Killarney, and Lough Incliquin, co. Kerry; Lough Derryclare and Holly Island, Lough Inagh, Connemara, co. Galway.

66. *URCEOLARIA* Ach. Prodr. (1798) p. 30 (ut tribus); Meth. p. 141 (ut genus) pro parte; Nyl. Mém. Soc. Cherb. iii. (1855) p. 180.—Thallus crustaceous, continuous or areolate, very rarely obsolete; hypothallus white. Apothecia urceolato-impressed, with a proper and a thalline margin; hypothecium brown or blackish;

spores 4–8næ, oblong or ellipsoid, septate and murali-divided, at first colourless, then dark; paraphyses slender; hymenial gelatine scarcely tinged or tawny with iodine. Spermatogones with somewhat branched sterigmata and cylindrical spermatia.

A small but well-marked genus, whose systematic place has been variously viewed by authors. Evidently, however, it is in this subtribe as now definitely fixed by Nylander. From *Thelotrema*, to which it is subsimilar in the structure of the apothecia, it differs chiefly in the green gonidia of the thallus and in the form of the sterigmata.

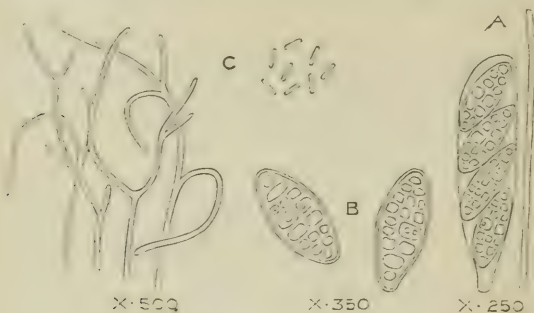


Fig. 74.

Urceolaria scruposa Ach.—A. A theca with spores and a paraphysis, $\times 250$. B. Two spores, $\times 350$. C. Sterigmata and spermatia of subsp. *U. bryophila*, $\times 500$.

1. *U. scruposa* Ach. Meth. (1803) p. 147; Lich. Univ. p. 338.—Thallus determinate, tartareo-farinose, verrucoso-rugose, continuous or areolate-diffract, greyish or greyish-white (K —, CaCl $^{+}$ red, I $^{+}$ blue). Apothecia moderate, black or blackish, usually cæsiopruinose, the proper margin connivent, greyish-black, the thalline margin thick, rugose or slightly crenulate on the inner side; spores 5-septate, muriform, ellipsoideo-oblong, 0,026–38 mm. long, 0,012–15 mm. thick; paraphyses brown at the apices.—Mudd, Man. p. 165; Leight. Lich. Fl. p. 234, ed. 3, p. 239; Tayl. in Mack. Fl. Hib. ii. p. 132; Sm. Eng. Fl. v. p. 172; Gray, Nat. Arr. i. p. 459.—*Lecanora scruposa* Cromb. Lich. Brit. p. 58. *Lichen scruposus* Linn. Mant. ii. (1771) p. 131; Eng. Bot. t. 266; With. Arr. ed. 3, iv. p. 19; Dicks. Crypt. fasc. i. p. 11. *Lichenoides crustaceum et leprosum, scutellis nigricantibus majoribus et minoribus* Dill. Musc. 133, t. 18. f. 15 B.—Brit. Exs.: Leight. nos. 54, 379; Mudd, n. 137; Cromb. n. 75; Larb. Lich. Hb. n. 136.

An easily recognized species which can scarcely be confounded with any other lichen. In some habitats it spreads rather extensively, while it varies in the thickness of the thallus. The apothecia are also variable in size, from punctiform becoming moderate or somewhat large, and are either somewhat scattered or at times crowded. The spermatogones are not uncommon, with spermatia 0,005–6 mm. long, 0,001 mm. thick.

Hab. On rocks and walls, very rarely on old wood, from maritime to subalpine districts.—*Distr.* General and common in Great Britain; apparently rare in the Channel Islands and in Ireland, though plentiful where it occurs.—B. M.: Island of Guernsey. Livermere, Suffolk; Walthamstow, Essex; Kew Gardens, Surrey; Barton Mills, Sussex; near Shanklin, Isle of Wight; Lustleigh, S. Devon; near Padstow, Cornwall; Bathampton Downs, Somerset; Amphill, Bedfordshire; Gormagrog Hill and Chevely Park, Cambridgeshire; near Buxton, Derbyshire; Bard on Hill, Leicestershire; Cader Idris and Barmouth, Merionethshire; Island of Anglesea: Oswestry, Gruishill, near Shrewsbury, and High Rock, Bridgenorth, Shropshire; Lonsdale, Cleveland, Yorkshire; Teesdale, Durham; Staveley, Westmoreland; Chesters, Northumberland; Alston, Cumberland. New Galloway, Kirkcudbrightshire; King's Park and Craig Lockhart, Edinburgh; West Water, Fife; Appin, Argyshire; Den of Mains, Forfarshire; Ben Vrackie and near Dunkeld, Perthshire; Morrone, Braemar, Aberdeenshire; near Fort William, Invernessshire. Kileully, co. Cork; Loughcooter, co. Galway.

Form *plumbea* Ach. Meth. (1803) p. 147.—Thallus greyish-lead-coloured. Apothecia usually small and naked; otherwise as in the type.

Characterized chiefly by the darker thallus, which is probably owing to the nature of the substratum.

Hab. On calcareous and cretaceous soil in maritime and upland situations.—*Distr.* Apparently local and scarce in S. and Central England and the S.W. Highlands of Scotland.—B. M.: Near Hoathly, Sussex; Buxton, Derbyshire. Island of Lismore, Argyshire.

Subsp. *U. bryophila* Nyl. ex Nörrl. Medd. Sällsk. pro F. et Fl. Fenn. i. (1876) p. 27.—Thallus thinner, smoother, or less rugose, greyish-white or whitish, often obsolete or scarcely visible. Apothecia smaller, the thalline margin subevanescent; otherwise as in the type.—Cromb. Grevillea, xix. p. 60.—*U. scurpota* var. *bryophila* Mudd, Man. p. 165; Cromb. Lich. Brit. p. 50; forma, Leight. Lich. Fl. p. 235, ed. 3, p. 240. *Lichen bryophilus* Ehrh. Exs. (1785) n. 236.—*Brit. Ees.*: Leight. nos. 359, 360; Larb. Lich. Hb. nos. 63, 221.

A good subspecies distinguished by the characters given. The thallus, which is usually somewhat effuse, is at times somewhat dealbate and subpulverulent, when it is var. *β. dealbata* Ach. Lich. Univ. p. 341. It often grows upon the folioles and the podetia of forms of *Cladonia pyxidata* either as a parasite or with scanty traces of a proper thallus, and it is then *Lecanora scurpota β. parasitica* Somm. Suppl. Fl. Lap. p. 100 pro parte, form *ecrustacea* Nyl. Cromb. Grevillea, xix. p. 60. This condition, however, is scarcely entitled to rank even as a form.

Hab. Overspreading mosses and on *Cladonia pyxidata* in maritime and upland tracts.—*Distr.* Not uncommon in Great Britain and Ireland; rare in the Channel Islands.—B. M.: Quenvais, Island of Jersey. Thetford Warren, Norfolk; Epping Forest, Essex; near Torquay and on Lustleigh Cleeve, S. Devon; St. Minver and Penzance, Cornwall; Pembury Park, Cirencester, Gloucestershire; Matlock, Derbyshire; Dolgelly and Barmouth, Merioneth; High Rock, Bridgenorth, Shropshire; Lanbraugh, Cleveland, Yorkshire; Egglestone, Durham. Island of Lismore and Appin, Argyshire; Glen Lochay, Killin, Ben Lawers,

Blaeberry Hill, and Craig Tulloch, Perthshire; Morrone and Craig Guie, Braemar, Aberdeenshire. Deer Park, Belfast, co. Antrim; near Kileully, co. Cork; Killarney, co. Kerry; Glen Inagh, Connemara, co. Galway.

2. *U. gypsacea* Ach. Lich. Univ. (1810) p. 338.—Thallus thick, soft, continuous, rugoso-unequal, pulverulent, white (K—, CaCl⁺₊ red, I[—]). Apothecia moderate, black, cæcio-pruinose; the thalline margin tumid, inflexed, the proper margin subrugose; spores (rarely 2næ) 5-septate, muriform, ellipsoid, 0,033–57 mm. long, 0,016–24 mm. thick.—Cromb. Grevillea, xix. p. 60.—*U. scruposa* forma *gypsacea* Leight. Lich. Fl. p. 234, ed. 3, p. 239. *Urceolaria scruposa* β. *albissima* Ach. Meth. (1803) p. 147 (nomen informè).

Usually considered as only a variety of *L. urceolata* differing in the softer, white, pulverulent thallus, this has now been rightly separated by Nylander on account of the negative reaction on the medulla with iodine (*vide* Nörrl. Fl. Karel. Oneg. p. 27). We have thus another instance of the judgment of older authors being confirmed by modern chemical tests. In the British specimens the apothecia are more or less scattered.

Hab. On calcareous and cretaceous rocks in maritime and upland tracts.—*Distr.* Only a very few localities in S. and Central England, S. Wales, and W. Ireland; probably often overlooked.—B. M.: The Downs, Lewes, Sussex; Bathampton Downs, Somersetshire; N. Derbyshire. Aberdw Rocks, Brecknockshire. Glencorbot, co. Galway.

3. *U. actinostoma* Pers. *ex* Ach. Lich. Univ. (1810) p. 288.—Thallus subdeterminate, thickish, smooth, rimoso-areolate, the areolæ more or less convex, greyish white (K—, CaCl⁺ + red, I[—]_{+blue}). Apothecia minute, immersed, one or several in each areola, subglobose, at length explanate, blackish, cæcio-pruinose, the proper margin finely plicato-striate; the thalline margin thick, entire or slightly crenulate; paraphyses very slender, intricate; spores 2næ, ovoid or ellipsoid, 5–6-septate, muriform, 0,030–34 mm. long, 0,016–20 mm. thick.—Cromb. Journ. Bot. 1885, p. 196.

A singular species with much the aspect of a *Ferrucaria*, in which genus it was placed by Acharius (*l. c.*). In the essential characters, however, of the fructification it is clearly an *Urceolaria*, the apothecia, though long remaining as if verrucarioid, having the disk ultimately open, plane and margined as in the other species of the genus. The British specimens are scarcely typical, but belong rather to the following variety.

Var. β. *cæsioplumbea* Nyl. Flora, 1873, p. 70.—Thallus somewhat shining, greyish leaden-coloured; otherwise as in the type.—Cromb. Grevillea, xix. p. 60.

Differs in the characters given, though perhaps only as a well-marked form depending on the habitat.

Hab. On rocks in maritime districts.—*Distr.* Only very sparingly in the Channel Islands and N.W. England.—B. M.: Chateau Point, Island of Sark. St. Bees, Cumberland.

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W. H. FLOWER,
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• British Museum
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