NORDIC LICHEN FLORA

Volume 3

Cyanolichens

2012

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This work may be cited as:
Nordic Lichen Society 2012: Nordic Lichen Flora Vol. 3. Cyanolichens. Göteborg (2:nd edition).

Individual contributions may be cited as:
Jørgensen, P. M. 2007. Massalongiaceae. – Nordic Lichen Flora 3: 87–90.

Logotype: Erik Acharius' drawing in Westring, Svenska lafvarnas färghistoria p. 205, 1808.

ISBN 978-91-85221-28-8
2:nd edition: 2012 (300 ex).
This volume is produced by Naturcentrum AB, Stenungsund
and printed by Zetterqvist Tryckeri AB, Göteborg.
PDF version produced by Naturcentrum AB 2026

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Publication is sponsored by:
ArtDatabanken (Swedish Species Information Centre).
Bergen Museum, University of Bergen.
Museum of Evolution, Uppsala University.
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Preface

This volume differs from the others hitherto published in that it does not concentrate on taxonomically closely related genera, but includes all lichens which have cyanobiontic partners (cyanobacteria or blue-green algae), which is not a taxonomic approach. It was felt important that a survey of the "small black ones" could be presented in the first volumes of the Nordic Lichen Flora. Such a survey has not been done in Norden since Forssell in 1885 made an attempt which is now largely outdated. Important papers surveying the generic and family taxonomy have been available (Henssen 1963, 1980; Schultz & Büdel 2002), but the species have largely remained unrevised and are difficult to name. This task proved to be more complicated than originally thought, but I hope that it has been possible to sort out the taxa and their problems in such a way that our treatment may form a satisfactory basis for further research on these often neglected lichens. In order to give a full comparison with the squamulose "blue-greens" which may be confused with those of Lichinaceae s. lat., other families where included, and finally also those with large, foliose thalli which at first sight appeared well-known and easy, but which on closer inspection proved to have concealed problems.

One of the largest stumbling stones for those who try to identify the small black species is to determine the identity of the cyanobionts. This is often quite difficult, since they are frequently malformed in the lichen thalli. Actually an exact identification is often possible only after cultivation, which can be rather difficult and time-consuming. For practical purposes I have found a schematic survey published by Büdel in 1992 very useful. With kind permission from the author his scheme has been reproduced here (Fig. 1, p. 6), so that users of this flora have the advantage in a quick an easy way to locate the cyanobionts in the scheme. More detailed work on this problem is usually not necessary for pure identification work of a lichen specimen. Otherwise this volume closely follows the structure of previous volumes.

When finishing this introduction I feel a particular need to express my gratitude especially to Prof. Dr. Aino Henssen, Marburg, who has contributed so much to sort out the taxonomy of the difficult genera of the cyanophilous lichens, and who most generously supported my first imperfect attempts to understand them. We are both pupils of Prof. Rolf Santesson, Uppsala, who spent much time to guide us, his two eager students, the result of which can be seen in this work, which is dedicated to him on the occasion of his 90th birthday.

Bergen 3 April 2007
Per M. Jørgensen

In the **2:nd edition** some small corrections have been done, for example a number of misspellings and some distribution data. A few minor text updates were also carried out.

Stenungsund 11 June 2012
Svante Hultengren

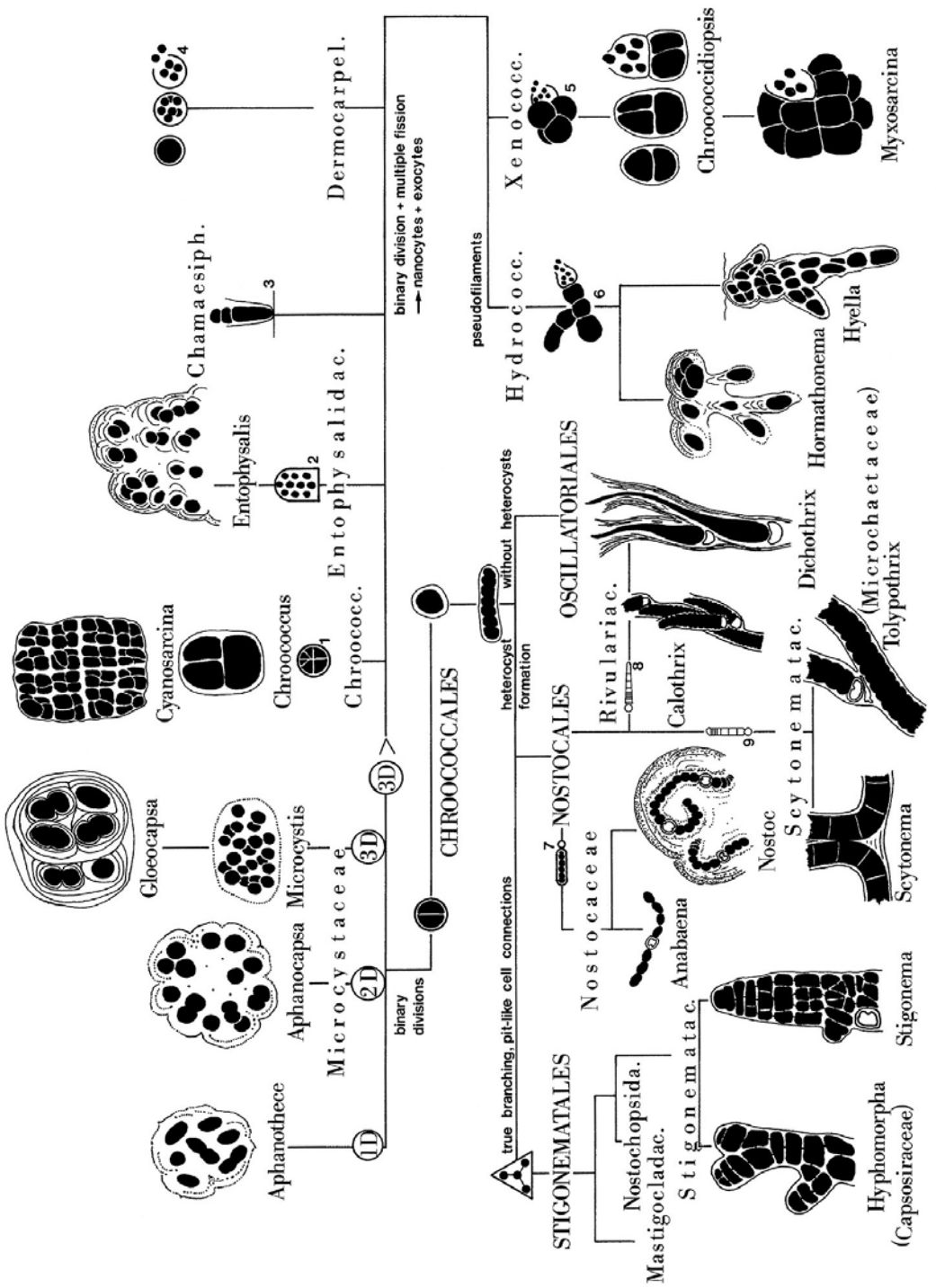

Fig. 1. From: Büdel, B. (1992). Taxonomy of lichenized procaryotic blue-green algae. In: Algae and symbioses, Reisser, W. (Ed.), pp. 301–324, Biopress Ltd. Bristol.

Guide to the families

Since there is not yet a general key to this flora, it may be difficult for the untrained user to know where he/she should start searching to identify a given specimen containing cyanobionts. To make a formal key to the families, which is the main order of this volume, is a daunting task and would result in a quite complicated key. Instead the following guide has been prepared, which will hopefully assist the reader to get to the right part of the book, though it does not necessarily cover the full taxonomic scope. It is mostly based on general, easily observed characters, and does not necssarily lead to exact and immediate identification of the family to which the specimen belongs.

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1 Thallus foliose, leaf-like (large lichens with lobes more than 5 mm wide) 2
– Thallus not so (small lichens, often crustose to squamulose or threadlike) 7
2 Thallus gelatinous, often blackish or bluish; invariably without secondary substances ..... Collemataceae p. p. (p. 14)
– Thallus not gelatinous, often greyish or brownish; often with complex chemistry 3
3 Apothecia sunk in thallus which mainly has a green photobiont and cephalodia ..... Peltigeraceae p.p. (*Solorina* p. 129)
– Apothecia, if present, sessile or on lobules; thallus mostly with cyanobiont 4
4 Thallus placoid, resting on a blackish prothallus, without secondary substances ..... Pannariaceae p. p. (*Degelia* p. 96)
– Thallus foliose, without prothallus, usually with secondary substances 5
5 Apothecia laminal; often with holes or naked areas on the tomentose lower surface ..... Lobariaceae (p. 77)
– Apothecia on often ascending lobules; lower surface without holes 6
6 Apothecia upon saddle-shaped, upturned lobes; lower surface non-corticate, veined and with conspicuos rhizines ..... Peltigeraceae (p. 113)
– Apothecia on the lower surface of lobes; lower surface corticate, smooth to pubescent ..... Nephromataceae (p. 91)
7 Thallus threadlike or fruticulose, forming carpets or small cushions 8
– Thallus crustose or squamulose 11
8 Thallus mostly forming cushions with terminal pycnoascocarps ..... Lichinaceae p. p. (p. 46)
– Thallus mostly carpeting with lateral apothecia 9
9 Thallus with blue-green rhizinae at the base, containing *Stigonema* ..... Coccocarpiaceae (p. 12)
– Thallus without blue-green rhizinae, containing *Nostoc* or *Scytonema* 10
10 Thallus mostly shrubby, containing *Nostoc* ..... Massalongiaceae p. p. (*Polychidium* p. 89)
– Thallus mostly carpeting, containing *Scytonema* ..... Lichinaceae p. p. (p. 46)[1]
11 Fruitbodies immersed in thallus, usually pycnoascocarps 12
– Fruitbodies sessile, usually apothecia 14
12 Thallus crustose-squamulose, dark-coloured; photobiont chroococcoid with reddish brown sheaths ..... Lichinaceae p.max p.[2] (p. 46)
– Thallus squamulose, peltate/umbilicate mostly olivaceous grey; photobiont variable, mostly without coloured sheeths 13
13. Thallus without soredia, often fruiting with 8-spored, prototunicate asci; photobiont mainly filamentous ..... Heppiaceae (p. 43)
– Thallus sorediate at margins, if with fruitbodies asci polysporous, rostrate; photobiont chroococcoid ..... Peltulaceae (p. 132)
14 Thallus crustose-squamulose, mostly gelatinous 15
– Thallus squamulose, mostly not gelatinous 18
15 Thallus with chroococcalean photobiont; asci prototunicate, thin-walled ..... Lichinaceae p. p. (p. 46)
– Thallus mainly with *Nostoc*; asci unitunicate with thickened apical parts 16
16 Apothecia with thalline margin; asci with distinct amyloid ring-structure and broadly ellipsoid, often muriform spores ..... Collemataceae p. p. (p. 14)
– Apothecia without thalline margin, asci without distinct amyloid ring-structure and with narrowly ellipsoid to fusiform, septate spores 17
17 Apothecia translucent with thin, proper margin soon excluded; asci without (or faintly developed) amyloid ring-structures ..... Arctomiaceae (p. 9)

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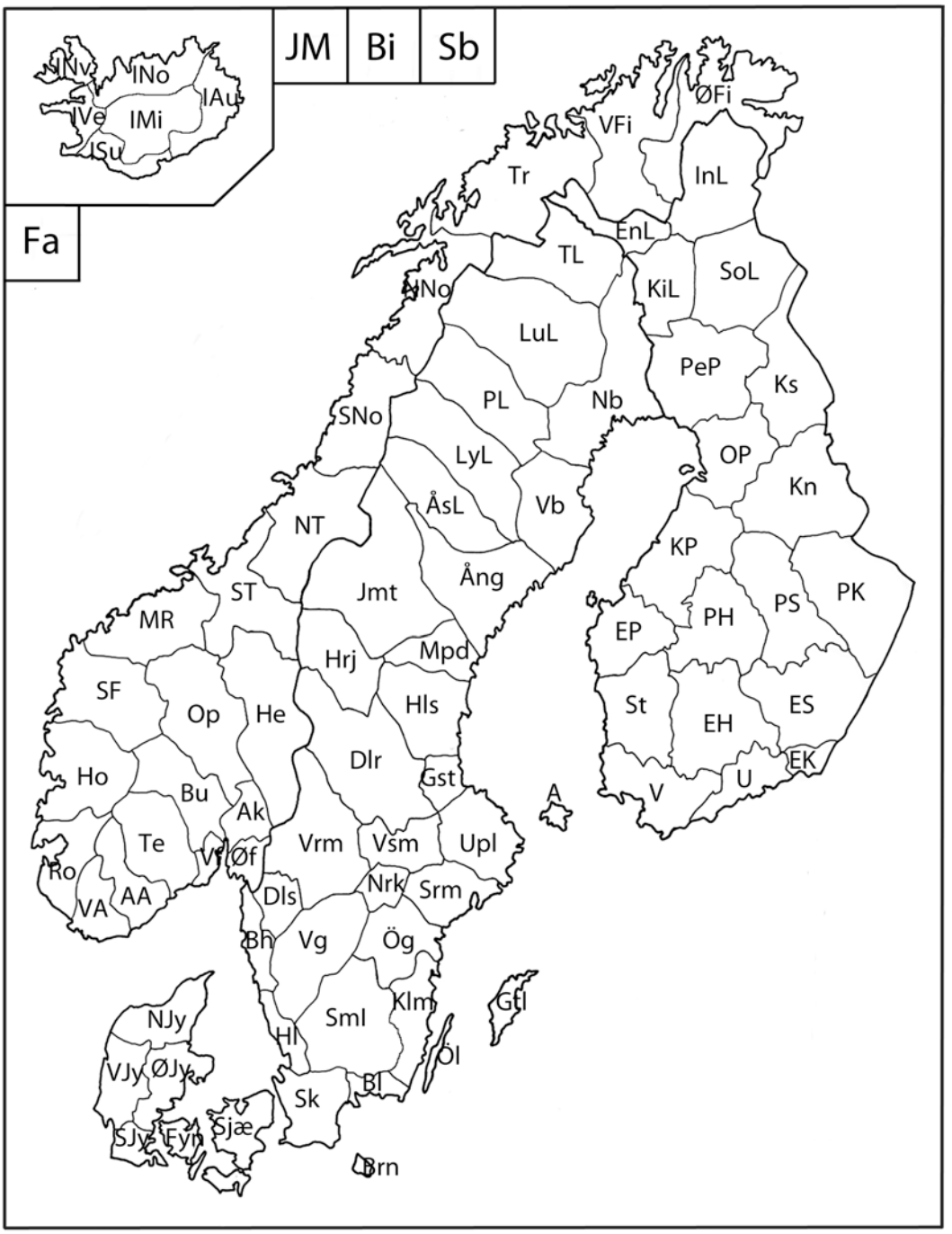
[1] If with *Stigonema* check *Ephebe* in the Lichinaceae which does not have blue-green rhizinae and different fruitbodies.

[2] Note that there are some clearly squamulose members of the Lichinaceae, such as *Anema*, *Lempholemma, Thyrea* and *Thallinocarpon* which may be confused mainly with members of the Collemataceae, but except for *Lempholemma* these do not contain *Nostoc,* and they have totally different fruitbodies (if present).

– Apothecia opaque with distinct proper margin; asci with apical amyloid sheaths .. Massalongiaceae p. p. (p. 87)

18 Thallus growing closely attached to substrate, photobiont scytonemoid, invariably without secondary substances; apothecial disc blackish ..... Placynthiaceae (p. 134)

– Thallus growing loosely over the substrate; photobiont mostly *Nostoc*, mainly with secondary substances; apothecial disc usually brown ..... Pannariaceae (p. 96)



Arctomiaceae

P. M. Jørgensen

THALLUS crustose to squamulose, brownish. ASCOMATA biatorine apothecia with broadly cylindrical, apically thickened asci without or with faintly amyloid ring structures, containing fusiform, colourless, multiseptate spores. CONIDIOMATA immersed, with bacilliform conidia. PHOTOBIONT *Nostoc*.

Chemistry. No secondary substances (by TLC).

Note. Small family, which has an isolated position in need of further clarification.

Literature: Henssen, Svensk Bot. Tidskr. 63: 126–137 (1960); Henssen & Jahns, Lichenes: 322 (1973); Lumbsch et al., Lichenologist 37: 291–302 (2005).

1 Thallus squamulose, not goniocystal, spores fusiform, multiseptate ..... *Arctomia*
– Thallus crustose, composed of goniocysts, spores ellipsoid, simple ..... *Gregorella*

Arctomia Th.Fr.

Lich. Arct.: 287 (1860). – TYPE: *Arctomia delicatula* Th.Fr.

F: nystyräjäkälät **S:** dvärggytterlavar

Literature: Fries, Lich. Arct.: 287 (1860); Henssen, Svensk Bot. Tidskr. 63: 126–138 (1969); Poelt & Vězda, Biblioth. Lichenol. 9: 17 (1977); Jørgensen, Lichenologist 35: 287–289 (2003).

THALLUS crustose-squamulose, semigelatinous, irregularly scattered over the substrate, attached by rhizoids, with cortex of brown-pigmented cells in one row. APOTHECIA red-brown, often convex, with excluded proper exciple, often coalescent. Asci with 8 colourless, fusiform, multiseptate spores, apically thickened, I+ blue. CONIDIOMATA rare; conidia bacilliform, colourless. PHOTOBIONT *Nostoc* in clusters, individual cells 5–7 µm diam.

Chemistry. No secondary substances (by TLC).

Note. Genus with four species, two present in our region, with one species in the Himalayan region, and one subantarctic species apparently incorrectly placed in the genus. Inconspicuous, easily overlooked lichens, readily recognized by the fusiform, multiseptate spores, which are unusual among the cyanolichens.

1 Thallus irregular, red-brown to olive-grey, loosely organized. Spores longer than 50 µm, 7–10-septate ..... 1. *Arctomia delicatula*
– Thallus forming distinct, rosette-like, red-brown, compact thalli. Spores not longer than 50 µm, mostly 4–6-septate .....2. *Arctomia interfixa*

1. Arctomia delicatula Th.Fr.

Lich. Arct.: 287 (1860). – TYPE: Norway, Tromsø, 1857 Th. Fries (UPS lectotype, Henssen, Svensk Bot. Tidskr. 63: 134, 1969).

Syn. *Pannaria acutior* Nyl., *Arctomia delicatula* var. *acutior* (Nyl.) Henssen, *Arctomia delicatula* ssp. *cisalpina* Hulting

F: nystyräjäkälä **S:** dvärggytterlav

Literature: Same as for the genus.

Figs: Henssen 1969: 128, 138 (Taf. I).

THALLUS irregular, crustose-squamulose, often nodulose, rarely with distinct lobes to 0.2 mm wide, red-brown to olive, scattered over the substrate. With distinct cellular cortex and a loose network of hyphae throughout. APOTHECIA common, red-brown, nearly translucent when wet, usually convex, to 0.5 mm diam., often coalescent. Spores colourless, to 8–10-septate, fusiform (40–)55–70(–80) × (3–)4–5(–7) µm, rarely with attenuated lower cell (Fig. 1). CONIDIOMATA rare, to 50 µm diam.,;conidia bacilliform, 2–3 × 1 µm.

Chemistry. No secondary substances (by TLC).

Habitat. Mainly muscicolous or terricolous, occasionally on rotting bark of trees, especially *Populus tremula* in moist habitats, rarely other woody plants (*Juniperus*, *Salix*, *Sorbus*).

Distribution. The most common species of the genus, particularly in the North. **Gr. F:** *Ks EnL InL*. **I:** *ISu IVe IMi INv INo*. **N:** *Op ST NT SNo Tr VFi ØFi*. **AI:** *Bi Sb*. **S:** *Vg Dlr Ång Hrj Jmt ÅsL LyL LuL TL*. Also known

from Ireland, northern Asia, North America and Patagonia(?).

Note. There is considerable variation in the thallus development. It is sometimes very poorly developed and mostly granular, while other specimens have more distinct lobes, presumably as a result of the growth-conditions. The colour varies from olive brown to normally distinctly red-brown. Also the spores vary unusually much in size and septation. These variations are not correlated, but are in need of further study. The infraspecific taxa previously described now appear, when more material has become available, to represent extremes of one variable species.

This species is unlikely to be confused with any other cyanolichen due to the fusiform, multiseptate spores. The thallus may remind that of *Euopsis granatina* (Sommerf.) Nyl., which, however, does not contain cyanobacteria (except for cephalodia) and has totally different apothecia and spores. The most lobate specimens may be confused with one of the small *Leptogium* species, which has shorter submuriform spores and thallus cellular throughout.

2. **Arctomia interfixa** (Nyl.) Vain.

Ark. Bot. 8(4): 98 (1909). – *Pannularia interfixa* Nyl., Flora 68: 446 (1885). – TYPE: Russia, Chukchi Pen., Fretum Behringii (Bering Strait), Lawrence Bay, 1879 Almquist (H-NYL 31216 lectotype, Henssen, Svensk Bot. Tidskr. 63: 135, 1969).

Syn. *Arctomia delicatula* ssp. *andreaearum* Th.Fr.

S: rosettlik dvärggytterlav

Literature: Same as for the genus.

Figs: Henssen 1969: 128, 138 (Taf. I).

THALLUS forming distinct red-brown rosettes, to 2 cm wide, with at least marginal lobes well-developed, imbricate towards the centre. With distinct brown-pigmented cellular cortex, internally with predominant, compact, cellular network of hyphae, encapsuling the photobiont (Fig. 1). APOTHECIA red-brown, convex, with excluded proper margin, to 0.5 mm diam., often coalescent. Spores colourless, fusiform, 3–6-septate, 26–40(–45) × 3–6 µm. CONIDIOMATA unknown.

Chemistry. No secondary substances (by TLC).

Habitat. On the ground among mosses and lichens, in rather dry habitats, often overgrowing *Andreaea*.

Distribution. Rare, arctic-alpine species. **Gr. F:** *EnL*. **I:** *IVe INv INo*. **N:** *ST ØFi*. **AI:** *Sb*. **S:** (*TL*). Outside our region known from Russian Fennoscandia, northern Asia, Alaska and Canada.

Note. The spores are markedly shorter than in *Arctomia delicatula* (Fig. 1), from which this species is clearly distinguished, also in the well-delimited rosettes of imbricate, red-brown lobes and its preference for rather dry habitats.

Gregorella Lumbsch

Lichenologist 37: 298 (2005). – TYPE: *Gregorella humida* (Kullh.) Lumbsch

Literature: Lumbsch, H. T., Prado, R. del & Kantvilas, G., Lichenologist 37: 291–302 (2005).

THALLUS crustose, thin, granular, olivaceus to dull grey-brown, bluish grey when wet, consisting of corticate goniocysts. APOTHECIA sessile with thin proper exciple of long-celled, thin-walled hyphae, and non-amyloid hymenium. Asci clavate, apically thickened, but without any amyloid structures, 8-spored. Spores ellipsoid, colourless, simple, sometimes with pseudosepta. CONIDIOMATA unknown. PHOTOBIONT *Nostoc* in clusters.

Chemistry. No secondary substances (by TLC).

Note. Recently established monospecific genus with its closest relatives in the Southern Hemisphere.

1. **Gregorella humida** (Kullh.) Lumbsch

Lichenologist 37: 300 (2005). – *Biatora humida* Kullh., Not. Sällsk. Fauna Fl. Fenn. Förh. 15: 274 (1870), *Lecidea humida* (Kullh.) Th.Fr., *Moelleropsis humida* (Kullh.) Coppins & P.M.Jørg. – TYPE: Finland, Tavastia australis, Tammela, Mustiala, 1869 Kullhem (H holotype).

Syn. *Leprocollema europaeum* H.Magn.

F: nuhrujäkälä **S:** småfruktigt blågryn

Red-listed in: **D S**

Literature: Vainio, Lichenogr. Fenn. 4: 212, 229 (1934); Magnusson, Hedwigia 78: 219–221 (1938); Jørgensen, Opera Bot. 45: 112 (1978); Lumbsch et al. 2005: 291–302.

THALLUS crustose, thin, olivaceous to grey-brown, soon becoming dissolved in goniocysts, 30–60 µm diam., with cortex. APOTHECIA sessile, to 0.5 mm diam., red-brown, convex, with proper exciple which soon is excluded. Hymenium and ascus-apex I–. Spores simple, colourless, ellipsoid, thin-walled, 14–19(–25) × 7–10 µm, sometimes with pseudosepta. PHOTOBIONT *Nostoc* in clusters.

Chemistry. No secondary substances (by TLC).

Habitat. Naked, recently disturbed, clayey soil; short-lived pioneer.

Distribution. Scattered, rare and ephemeral, only known from a few recent collections in our region, otherwise extinct in former localities (incl. the type locality). **D:** (*Sjy*) **F:** *V* (*EH*) **S:** *Vrm* (*Upl*). Outside the region only reported from the British Isles and northern Germany.

Note. Although mostly being found in the same habitats as *Moelleropsis*, to which genus it has been previously referred, it is not likely to be confused with *M. nebulosa* because of its gelatinous, none-pulverulent nature. It is rather more similar to *Placynthiella* (*uliginosa*) which grows in more peaty habitats and have different characters of apothecia and spores.

Coccocarpiaceae

P. M. Jørgensen

THALLUS foliose or rarely filamentose lichens, containing cyanobacteria in chains. ASCOMATA biatorine apothecia formed from paraplectenchymatous generative tissue and straight ascogenous hyphae. Asci apically thickened, with sheet-like amyloid structures. PHOTOBIONT *Scytonema*, *Stigonema* or *Hyphomorpha*.

Chemistry. No secondary substances (by TLC).

In our region represented only by one filamentous genus.

Literature: Arvidsson, Opera Bot. 67: 1–96 (1983); Henssen, Symb. Bot. Upsal. 18(1): 86–93 (1963).

Spilonema Bornet

Mém. Soc. Sci. Nat. Cherbourg 4: 225 (1856). – TYPE: *Spilonema paradoxum* Bornet

Literature: Henssen, Symb. Bot. Upsal. 18(1): 93–98 (1963).

THALLUS filamentous or subfruticose, forming blackish mats or cushions of filaments containing cyanobacteria surrounded by an irregular network of thick, periclinal hyphae, attached to the rocks by blue-green rhizohyphae. APOTHECIA sessile, blackish brown, convex, with excluded proper exciple; hymenium blue-green (or violaceous) pigmented in upper parts, I+ blue with internal amyloid structures in asci. Spores simple, colourless, ellipsoid, often poorly developed. CONIDIOMATA sessile, globose with blackish green wall; conidia bacilliform, simple, colourless on short, catenate conidiogenous cells. PHOTOBIONT *Stigonema* (or *Hyphomorpha* in two extraregional species).

Chemistry. No secondary substances (by TLC).

Note. Distinguished from most other filamentous cyanophilous genera, particularly the rather similar *Ephebe* or *Thermutis*, by the presence of blue-green rhizoidal hyphae. When present the biatorine apothecia are diagnostic.

1 Thallus forming irregular mats of loosely interwoven filaments; apothecia superficial, hypothecium pale ..... 1. *S. paradoxum*

– Thallus forming small cushions of suberect filaments; apothecia formed laterally within the cushions, hypothecium dark ..... 2. *S. revertens*

1. **Spilonema paradoxum** Bornet

Mém. Soc. Sci. Nat. Cherbourg 4: 225 (1856). – TYPE: France, Cannes, 1856 Bornet (H-NYL 43040 lectotype, Jørgensen, Nordic Lichen Flora 3: 143, 2007).

Syn. *Spilonema tenellum* Vain.

S: storfruktig smaltrådslav

Literature: Henssen, Symb. Bot. Upsal. 18(1): 94–95 (1963).

Figs: Henssen 1963: Taf. 26a, b; Ozenda & Clauzade 1970: 297.

THALLUS filamentous, to 2 cm diam., forming irregular, blackish mats of loosely interwoven filaments to 40 µm wide, containing *Stigonema*, individual cells of the chain 9–15 µm diam., encircled by 4–7 µm wide hyphae, at the basis with projecting bluegreen rhizoids. APOTHECIA rare, blackish, convex, to 1 mm diam., seemingly apical on filaments on the surface, proper exciple usually excluded; hymenium violaceous green in upper parts, I+ blue; hypothecium paraplectenchymatous, colourless. Spores simple, colourless, ellipsoid, often poorly developed, 7–9 × 2–3 µm. CONIDIOMATA rare, blackish, globose, to 0.2 mm wide; conidia bacilliform, 2–3 × 1 µm. PHOTOBIONT *Stigonema*, individual cells 9–15 × 9–12 µm.

Chemistry. No secondary substances (by TLC).

Habitat. Moist, acid rocks.

Distribution. Scattered, but widespread, commonest in southern parts. **F:** *St EH PH PS PK PeP InL*. **N:** *Ak Ho* **S:** *Vg Vrm*. Present in Europe, North Africa, North and South America.

Note. Habitually rather similar to *Ephebe*, and in the sterile state best distinguished by the blue-green rhizoids and the finer filaments.

2. **Spilonema revertens** Nyl.

Flora 48: 601 (1865). – TYPE: Finland, Tavastia australis, Asikkala, 1863 Norrlin (H-NYL 43046 lectotype, Jørgensen, Nordic Lichen Flora 3: 143, 2007).

Syn. ?*Asirosiphon densatulum* Nyl., *Spilonema subsimile* Vain.

S: smaltrådslav

Literature: Henssen, Symb. Bot. Upsal. 18(1): 95–97 (1963).

Figs: Henssen 1963: Taf. 26c.

THALLUS subfruticose, forming blackish, compact cushions to 1.5 cm wide and 6 mm high. The stiff, mostly erect filaments to 60 µm wide, containing *Stigonema*, individual cells 11–20 × 9–15 µm encircled by 4–7 µm wide hyphae. APOTHECIA scarce, convex, blackish, 0.5 mm diam., produced on lateral branchlets and enclosed within the cushions; hymenium violaceous green in upper parts, I+ blue; hypothecium paraplectenchymatous, violaceous. Spores simple (rarely with plasma bridge, appearing septate), colourless, ellipsoid, rarely fully developed, 7–10 × 3–4 µm. CONIDIOMATA immersed, wart-like, blackish, to 0.2 mm diam.; conidia bacilliform, colourless, 2–3 × 1 µm. PHOTOBIONT *Stigonema*, individual cells 10–20 × 9–15 µm.

Chemistry. No secondary substances (by TLC).

Habitat. Scattered but locally common, saxicolous on wet, exposed rocks in the lowlands.

Distribution. Widespread. **Gr. F:** *V U St EH ES PK Kn OP Ks EnL InL*. **N:** *Ak He Op ST SNo Tr*. **S:** *Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Scattered in the temperate to arctic parts of the Northern Hemisphere.

Note. Usually easily distinguished from *S. paradoxum* by the growth-form which may remind more of that of *Thermutis velutina*, which, however, contains *Scytonema* and is much weaker lichenized and when fertile showing quite different apothecia with distinct proper exciple.

The taxon called *Asirosiphon densatulum* Nyl., though anatomically indistinguishable from *Spilonema paradoxum*, appears to differ in its constantly stouter and coarser filaments and its preference for drier, more basic, alpine habitats, often under overhangs, where it mainly associates with *Psorula rufonigra* (Tuck.) Gotth. Schneid. The status of this filamentous lichen is uncertain, as it has never been found fertile, and is in need of further (molecular) studies.

Excluded species

Spilonema proboscideum Nyl. ex Vain. (TYPE: Finland, Tavastia australis, Korpilahti, Haukkavuori, 1873 Lang TUR-V 11760 holotype) was referred to *Placynthium pannariellum* f. *conferciens* (Nyl.) Räsänen by Gyelnik in Rabenh. Krypt.-Fl. Ed. 2, 9, Abt. 2(2) (1940), but is rather a growth form of *P. nigrum*, see Henssen (1963).

Collemataceae

P. M. Jørgensen

THALLUS gelatinous, foliose or squamulose, mostly homoimerous with pseudocortex or sometimes with true cortex, and with rhizoid hyphae or hapters on the lower surface. ASCOMATA apothecia, cupular, with an open or closed annular proper exciple, the structure of which is taxonomically important, thalline margin sometimes present. Hymenium usually I+ blue, with simple, apically enlarged paraphyses. Asci usually with an apical, I+ blue ring structure, containing muriform, transversally septate or rarely simple spores. CONIDIOMATA terminal or lateral, conidia with short-celled, septate conidiophores producing bacilliform, simple conidia. PHOTOBIONT *Nostoc* spp.

Chemistry. Invariably without secondary substances (TLC).

Literature: Degelius, Symb. Bot. Ups. 13(2): 1–499 (1954), Symb. Bot. Ups. 20(2): 1–215 (1974); Sierk, Bryologist 67: 245–247 (1964); Henssen, Lichenologist 3: 29–41 (1965).

Key to genera

1 Apothecia lacking thalline margin ..... *Leciophysma*
– Apothecia with thalline margin 2
2 Spores simple ..... *Staurolemma*
– Spores-septate, usually muriform 3
3 Thallus with proper cortex, at least at upper surface, not swelling much ..... *Leptogium*
– Thallus only with pseudocortex, swelling much when wet ..... *Collema*

Collema F.H.Wigg. *nom. cons.*

Prim. Fl. Holsat.: 89 (1780). – TYPE: *Collema lactuca* (Weber) F.H.Wigg., *nom. illeg.* (=*Collema nigrescens*).

F: hyytelöjäkälät **N:** glyelav **S:** gelélavar

Literature: Degelius, Symb. Bot. Ups. 13(2): 1–499 (1954), Symb. Bot. Ups. 20(2): 1–215 (1974).

THALLUS mainly foliose, rarely crustose-squamulose, dark-coloured (blackish brown or olivaceous), swelling when wet, gelatinous, homoiomerous, without cortices, sometimes attached to the substratum by hapters or white rhizohyphae. The upper surface smooth, or often wrinkled to pustulose, with isidia or secondary lobules, but soralia are unknown. APOTHECIA often present, sessile, lecanorine, thalline margin usually persistent. True exciple cupular, usually well developed, paraplectenchymatous or euthyplectenchymatous. Disc usually visible, plane to convex (rarely concave), mainly brownish, often glossy, rarely pruinose in Nordic species. Hymenium hyaline, I+ blue, paraphyses septate, simple (or rarely somewhat branched apically), gelatinous, often apically clavate and brown-pigmented. Asci clavate to subcylindrical with apical amyloid structures, usually with a ring-structure, rarely with a cap. Spores normally eight in asci (rarely fewer or more), hyaline, ellipsoid (rarely cuboid) to fusiform, septate, often (sub)muriform. CONIDIOMATA pycnidia, innate, marginal or laminal with pale depressed ostiole, containing branched, short-celled conidiophores; conidia simple, bacilliform with swollen apices. Rarely so-called internal conidia may be produced. PHOTOBIONT different species of *Nostoc*.

Chemistry. Invariably without secondary secondary substances (TLC).

Note. In general an easily recognized genus by the gelatinous, dark-coloured thallus, but sometimes difficult to distinguish from *Leptogium*, which has a proper cortex and often brighter coloured, less gelatinous thallus. The genus is heterogeneous in relation to ascus- and spore-types, and generic splits have been attempted, none of which has achieved general acceptance. In his monographs Degelius (1954, 1974) arranged them in informal groups. The species of *Collema* vary considerably in appearance, mainly as a result of the environment, and small, poorly developed specimens – which are often found – are difficult to name with certainty. These are not taken into account in the key.

1 Thallus with lobes normally much wider than 3 mm, usually large (>3 cm) 2
– Thallus with lobes less than 3 mm wide, usually small (<3 cm) 11
2 Thallus ridged and/or with pustules 3
– Thallus smooth, uneven or with sharp wrinkles 7

3 Thallus non-isidiate, often with apothecia 4
– Thallus isidiate 5
4 Thallus expanded (to 10 cm) with crowded apothecia, spores more than 40 µm long; widespread ..... 24. *C. subnigrescens*
– Thallus smaller (to 4 cm) with scattered apothecia, spores less than 40 µm long; rare ..... 9. *C. curtisporum*
5 Thallus thick, partly small-pustulose, lobes ascending ..... 14. *C. fuscovirens*
– Thallus membranaceous, with distinct pustules and ridges, lobes flat 6
6 Isidia terete, mostly on pustules, apothecia rare and scarce ..... 13. *C. furfuraceum*
– Isidia granular, mostly on ridges, apothecia numerous and crowded ..... 19. *C. nigrescens*
7 Thallus non-isidiate, usually with apothecia 8
– Thallus isidiate, apothecia rare 9
8 Thallus cushion-formed with appressed marginal lobes, apothecia crowded centrally, spores curved, 25–50 µm; corticolous ..... 16. *C. leptaleum*
– Thallus irregularly spreading with partly ascending, undulating marginal lobes, apothecia scattered, spores straight, 17–30 µm; saxicolous ..... 26. *C. undulatum*
9 Isidia finally flat, scale-like ..... 11. *C. flaccidum*
– Isidia globular to terete 10
10 Lobes appressed, thin (to 100 µm), not undulating, mainly corticolous, or on acidic rocks . 23. *C. subflaccidum*
– Lobes ascending, thicker (to 300 µm), undulating, terricolous or on calcareous rocks ..... 26. *C. undulatum* var. *undulatum*
11 Thallus with narrow lobes (at most 0.5 mm), crustose, squamulose or strap-like 12
– Thallus with broader lobes (to 3 mm), foliose 19
12 Thallus with narrow, strap-like lobes 13
– Thallus crustose or small-squamulose 14
13 Lobes flat to convex, repeatedly branched ..... 18. *C. multipartitum*
– Lobes canaliculate with swollen margins, at most dichotomously divided ..... 8. *C. cristatum* var. *marginale*
14 Terricolous, with large apothecia (to 3 mm), four spores in asci ..... 17. *C. limosum*
– Not terricolous, apothecia at most 1 mm, eight spores in asci 15
15 Saxicolous or bryophilous, blackish 16
– Corticolous, brownish 18
16 Bryophilous, forming cushions of erect, terete squamules, to 3 cm diam. ..... 4. *C. ceraniscum*
– Saxicolous, forming flat patches, to 1.5 cm diam. 17
17 Thallus appressed, lobes radiate forming circles, partly isidiate, sterile, on calcareous rocks ... 21. *C. parvum*
– Thallus tufted, often areolate, apothecia to 1 mm diam., on schist ..... 3. *C. callopismum*
18 Thallus effuse, granular, becoming pulvinate, spores cuboid; widespread ..... 20. *C. occultatum*
– Thallus small-squamulose, forming small rosettes, spores ellipsoid to oval; rare ..... 12. *C. fragrans*
19 Corticolous, apothecia often crowded centrally 20
– Not corticolous, apothecia scattered, if present 21
20 Apothecia with thick, wrinkled margin, spores more than 50 µm, multiseptate; rather common ..... 10. *C. fasciculare*
– Apothecia with thin, smooth margin; spores less than 25 µm, one-septate; rare ..... 6. *C. conglomeratum*
21 Terricolous, thallus much swollen and pulpy when wet (*C. tenax* group) 22
– Saxicolous, thallus not pulpy, but occasionally rather swollen 25
22 Thallus nearly crustose, not distinctly lobed, asci four-spored ..... 17. *C. limosum*
– Thallus distinctly lobed, asci eight-spored 23
23 Thallus of shiny, imbricate, coccoid lobes, spores one-septate; rare ..... 5. *C. coccophorum*
– Thallus usually not shiny, with radiating, more or less discrete lobes; spores usually submuriform; rather common 24
24 Apothecia with markedly crenulate thalline margin; spores brownish ..... 2. *C. bachmanianum*
– Apothecia with variable, not crenulate thalline margin. Spores colourless ..... 25. *C. tenax*
25 Thallus isidiate, rarely with apothecia 28
– Thallus non-isidiate, normally with apothecia 26
26 Apothecia mostly on ascending lobules, more or less covering the thallus, spores septate. 22. *C. polycarpum*
– Apothecia scattered on the upper surface, spores submuriform 27
27 Thallus strongly concave with elevated, coarsely dentate margins ..... 8. *C. cristatum*
– Thallus flat to concave, densely beset with secondary lobules ..... 7. *C. crispum*
28 Isidia terete, often forming a continuous crust ..... 15. *C. glebulentum*
– Isidia globose, usually scattered over the surface or along the margin 29
29 Thallus swollen and pulpy when wet, striate/wrinkled when dry 30
– Thallus not swollen when wet, smooth or pustulose 31
30 Thallus blackish, plicate; terricolous in arctic-alpine regions ..... 2. *C. bachmanianum* var. *millegranum*
– Thallus brownish, striate; saxicolous; southern ..... 1. *C. auriforme*
31 Thallus very dark, smooth, isidia mainly along the wavy ascending margins, spores fusiform, 3-septate ..... 26. *C. undulatum* var. *granulosum*

– Thallus paler olivaceous, nearly transparent, isidia grouped on the surface, spores ellipsoid, submuriform..... 14. *C. fuscovirens*

1. **Collema auriforme** (With.) Coppins & J.R.Laundon

Lichenologist 16: 228 (1984). – *Riccia auriformis* With., Bot. Arr.Veg. Gr. Brit. 1: 704 (1776). – TYPE: England, Oxford, on the paths of University Botanic Gardens, Dillenius, Icon in Dillenius, Historia Muscorum, tab. 19, fig. 24, 1742 (holotype); corresponding specimen marked A in herb. Dillenius (OXF epitype, Jørgensen, Nordic Lichen Flora 3: 143, 2007).

Syn. *Collema auriculatum* Hoffm., *Collema granosum* auct.

D: øre-bævrelav **I:** kýlaslembra **N:** moseglye **S:** örongelélav

Red-listed in: **D**

Literature: Degelius 1954: 346–358; Laundon, Lichenologist 16: 228 (1984).

Figs: Degelius 1954: pl. IVa; Krog et al. 1980: 161.

THALLUS foliose, large, to 8 cm diam. with extended, auricular lobes, to 10 mm wide, swelling much when wetted, to 0.5 mm thick; upper surface dark brown, rugulose, often with lobules, mainly at the margins, as well as numerous clavate isidia, which often are crowded. APOTHECIA rare, often immersed when young, 2–3 mm diam., with brownish concave to plane disc, often hidden by the granular-isidiate thalline margin, with an occasionally visible, thin proper exciple inside. Spores colourless, ellipsoid to ovoid, submuriform, 25–35 × 9–13 µm. CONIDIOMATA rare, marginal, visible as pale globose dots; conidia bacilliform, simple, 4–5 × 1–2 µm. PHOTOBIONT *Nostoc* in chains, individual cells 5–6 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On mossy calciferous rocks, mainly in the lowlands.

Distribution. Rather southern element. **D:** (*Sjæ*) *Fyn*. **I:** *ISu INv*. **N:** *Ak Op Bu Vf Te VA Ro Ho SF SNo*. **S:** *Öl Gtl Dls Ög Vsm LuL*. Otherwise widespread but scattered in temperate parts of the Northern Hemisphere.

Note. Characterised by large, thick lobes, only likely to be confused with the commoner *C. fuscovirens*, a thinner, pustulose, more olivaceous species which normally grows directly on the rocks.

2. **Collema bachmanianum** (Fink) Degel.

Symb. Bot. Ups. 13(2): 189 (1954). – *Collemodes bachmaniana* Fink, Mycologia 10: 237 (1918). – TYPE: USA, Iowa, Fayette Co., 1894 Fink 1127 (MICH lectotype, Jørgensen, Nordic Lichen Flora 3: 143, 2007).

F: kalkkihyytelöjäkälä **I:** barðaslembra **N:** tannjordglye **S:** kransgelélav

Red-listed in: **D F N**

Literature: Degelius 1954: 189–198.

Figs: Nash et al. 2004: 68.

var. **bachmanianum**

THALLUS small-foliose, forming round, deeply lobate, dark greenish black thalli; lobes 2–3(5) mm wide, swelling considerably when wet, to 0.6 mm thick; upper surface uneven to ridged (when dry), without isidia, but occasionally with secondary lobules, mainly along the margins. APOTHECIA common, 2–3 mm diam. with convex, brown disc and conspicuous crenulate thalline margin. Spores pale brownish, ellipsoid, submuriform, 25–35 × 9–15 µm. CONIDIOMATA lacking, though conidia are produced internally; conidia acicular (by that differing from those normally found in the genus), 10–13 × 2–3 µm. PHOTOBIONT *Nostoc* in chains, individual cells 3–5 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. A pioneer on calciferous soil, sand or clay, mainly in the lowlands.

Distribution. Not uncommon in southern Fennoscandia, rarer towards the north **D:** (*Brn*) (*Sjæ*). **Fa. F:** *A V U EK ES Kn PeP*. **I:** *ISu IVe IMi IAu INv INo*. **N:** *Øf Ak Op SF ST SNo Tr ØFi*. **S:** *Öl Gtl Bh Vg Ög Srm Vsm Upl Dlr Gst Jmt TL*. Otherwise widespread but scattered in temperate parts of the Northern Hemisphere.

var. **millegranum** Degel.

Symb. Bot. Ups. 13(2): 192 (1954). – TYPE: Norway, Tromsø, Fløyfjeldet, 1864 Th. M. Fries (UPS holotype).

Syn. *Collema furvum* subsp. *subhirsutulum* Nyl.

Differs from var. *bachmanianum* by its globular isidia, which are also found on the thalline margine of the apothecia, though it is usually sterile, and then rather difficult to recognize (see below).

Habitat. As in var. *bachmanianum*, but in arctic-alpine habitats.

Distribution. Rather uncommon but widespread, mainly an arctic-alpine taxon. **Gr. F:** *A V U Ks*. **N:** *Ak ST SNo NNo Tr VFi ØFi*. **AI:** *Sb*. **S:** *Vg Hrj TL*. Otherwise scattered in arctic-alpine parts of the Northern Hemisphere.

Note. This is a species of the critical *Collema tenax* group, one which is difficult to recognize when sterile. Fortunately it often (particularly in var. *bachmanianum*) has numerous apothecia with their characteristic multilobulate, crenulate thalline margins, and the spores are slightly larger and more regular in form than in other taxa of this group, as well as faintly brownish. Var. *millegranum*, which is usually found in the mountains, is rarely fertile and quite difficult to recognize. It is covered by swollen, granuliform isidia, and therefore resembles *C. fuscovirens*, but has normally a more greenish, non-pustulate thallus. The thallus of *C. glebulentum*, another alpine species, is more membranaceous and the isidia are more coralloid and not swollen.

3. **Collema callopismum** A.Massal.

Misc. Lichenol.: 23 (1856). – TYPE: Germany, Franconiae superioris (=Upper Franconia in Bavaria), Arnold (VER holotype).

N: dvergglye **S:** navlad gelélav

Red-listed in: **N**

Literature: Degelius 1954: 238–245; Botnen, Graphis Scripta 8: 9–10 (1997).

Figs: Degelius 1954, pl. II c,d; Puntillo 1996, pl. XIV; Nash et al. 2004, colour-plate 14.

var. **callopismum**

THALLUS subcrustose to squamulose, small, to 0.5 cm diam., becoming pulvinate or scutelliform, sometimes forming areolate covers on the rock. Lobes to 0.3 mm wide, plane to teretiform, to 0.45 mm thick, sometimes partly ascending and crowded, dark olive-green to blackish. APOTHECIA infrequent, 0.3–0.7 mm diam., flat or concave with thin thalline margin; proper exciple distinct, paraplectenchymatous, to 110 µm wide. Spores colourless, submuriform or rarely 3-septate, ovoid to ellipsoid, 17–26 × 9–11 µm. CONIDIOMATA common but easily overlooked, immersed, colourless or pale yellowish; conidia simple, bacilliform, colourless, 4–5 × 1–2 µm, which tend to have swollen apices. PHOTOBIONT *Nostoc* in short chains or clusters, individual cells 5–7 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Saxicolous on bare calciferous rocks, mainly in the lowlands.

Distribution. Rare and southern with scattered records. **Gr. N:** *Ho*. **S:** *Öl Gtl Srm Upl Jmt LyL*. Scattered records throughout Europe, as well as in North America and Japan.

Note. A small, nearly crustose lichen, easily recognized on the reduced (but variable) thallus, often occurring just as a rim around the apothecia, which is unique in the genus. Some forms may remind of *Leptogium aquale* which grows wetter and has a cortex, as well as larger spores. Perhaps it is best characterized as a saxicolous equivalent to *C. occultatum*, but with quite different (non-cuboid) spores and ecology.

var. **rhyparodes** (Nyl.) Degel.

Symb. Bot. Ups. 13 (2): 241 (1954). – *Leptogium rhyparodes* Nyl., Flora 48: 210 (1865). – TYPE: Scotland, Ben Lawers, Jones (H-NYL 41140 holotype).

Syn. *Collema psorellum* Nyl.

More distinctly squamulose than var. *callopismum*, with markedly larger spores, 30–40 × 12–15 µm.

Habitat. Saxicolous on calcareous rocks in the mountains.

Distribution. Very rare arctic-alpine taxon. **N:** *SNo.* **S:** *TL*. Otherwise only known with certainty from the Highlands of Scotland.

Note. A remarkable variety which combines a distinctly squamulose thallus with larger spores, thus needing taxonomic recognition.

4. **Collema ceraniscum** Nyl.

Flora 48: 353 (1865). – TYPE: Scotland, Ben Lawers, Jones (H-NYL 41951 holotype).

Syn. *Collema arcticum* Lynge

F: tunturihyytelöjäkälä **I:** túndruslembra **N:** fjellglye **S:** fjällgelélav

Red-listed in: **F**

Literature: Degelius 1954: 184–189.

Figs: Krog 1982: 162.

THALLUS squamulose to subfruticose, forming small cushions, to 3 cm diam.; lobes to 2 mm wide, more or less erect and densely packed, to 0.2 mm thick, somewhat verrucose, dark brownish black. APOTHECIA usually common, 0.4–0.8 mm diam. with plane to convex, brownish disc and entire to lobulate thalline margin; proper exciple often visible, thin, to 70 µm wide. Spores only 4 (rarely 2) in asci, colourless to pale yellowish, muriform, subglobose to subcuboid, 20–40 × 13–20 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc* in chains, individual cells globose to oblong, 3–8 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Terricolous on debris or on bare soil, often on calciferous ground.

Distribution. Arctic-alpine; scattered, though locally common, particularly in the Arctic. **Gr. F:** *Ks EnL*. **I:** *ISu IMi IAu INo*. **N:** *Op Ho SNo Tr VFi ØFi*. **AI:** *Bi Sb*. **S:** *Hrj Jmt LyL TL*. Circumarctic, also present in the Alps and the mountains of Scotland.

Note. Remarkable soil species, best recognized on the richly branched, ascending lobes which are apically thickened and isidia-like. In the field easily mistaken for *Leciophysma finmarkicum* Th.Fr., which often grows in similar habitats, but is a smaller species with lecideine apothecia and simple spores.

5. **Collema coccophorum** Tuck.

Proc. Am. Acad. Arts & Sci. 5: 385 (1862). – TYPE: USA, Texas, valley of Rio Grande, 1852, Wright (FH lectotype, Degelius, Symb. Bot. Ups. 13(2): 184, 1954).

N: småjordglye **S:** smågelélav

Red-listed in: **N**

Literature: Degelius 1954: 184–189; Alstrup, Graphis Scripta 3: 60 (1984); Tønsberg et al. 1996: 61–62.

Figs: Degelius 1954: 185 (spores); Brodo et al. 2001: 284; Nash et al. 2004, colour-plate 15.

THALLUS squamulose to subcrustose, forming cushions to 2.5 cm wide. Lobes at margin flat and radiating, to 3 mm wide, in central part more irregular and partly adscending and coccoid, to 0.35 mm thick. Upper surface smooth and glossy, blackish brown. APOTHECIA common, to 2.5 mm diam., with plane to convex, reddish brown disc and thin, entire thalline margin. Spores simple, narrowly ellipsoid, 1–2(–3)-septate, 15–25 × 5–9 µm. CONIDIOMATA scarce, marginal, immersed; conidia bacilliform, slightly swollen apically, 4–6 × 1.5–2 µm. PHOTOBIONT *Nostoc* in chains, individual cells 2–6 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On naked calcareous soil among small mosses (Phascion-community).

Distribution. Very rare, from few scattered localities in continental Scandinavia, though easily overlooked and not collected in Norway since 1863. **N:** (*Op*) **S:** *TL*. Otherwise scattered but widespread in the drier parts of Europe, Africa, the Americas, Australia and New Zealand.

Note. A small species in the difficult *Collema tenax* group, best recognized by its smooth, shiny, coccoid thallus and the 1-septate spores. The Nordic material matches exactly material from Central Europe.

6. **Collema conglomeratum** Hoffm.

Deutschl. Fl. 2: 102 (1796). – TYPE: Germany, Ehrhart Pl. Crypt. Linn. no. 256 (UPS lectotype, Jørgensen, Nordic Lichen Flora 3: 143, 2007).

N: Knappglye

Red-listed in: **N**

Literature: Degelius 1954: 212–218; Haugan, Graphis Scripta 7: 94–96 (1996).

Figs: Degelius 1954, pl. Ih; Nash et al. 2004, colour-plate16.

THALLUS squamulose to subcrustose, small, to 1 cm diam., forming rounded cushions with radiating marginal lobes, to 2 mm wide, swollen and thick when wet, to 0.5 mm thick. Upper surface smooth to sometimes rugose, dark olivaceous brown. APOTHECIA numerous, often crowded, to 2 mm diam., with glossy, red-brown, flat to convex disc and narrow, entire, paler thalline margin. Spores colourless, narrowly ellipsoid to fusiform with pointed apices, 1–3-septate, 15–25 × 3–5 µm. CONIDIOMATA rather common, immersed, globose; conidia bacilliform with slightly swollen apices, 3–4 × 1 µm. PHOTOBIONT *Nostoc* in chains, individual cells 5–7 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Corticolous on coarse-barked, nutrient-rich trees (*Fraxinus*, *Ulmus* etc.), often along roads etc.

Distribution. Rare, southern element, only once found in our region. **N:** *Bu*. Otherwise widespread in the Northern Hemisphere; in Europe commonest in the southern parts.

Note. A cushion-forming species with short, fusiform, one-septate spores, which is smaller than *C. fasciculare* and unlike any of the other subsimilar species.

7. **Collema crispum** (Huds.) F.H.Wigg.

Prim. Fl. Hols.: 89 (1780). – *Lichen crispus* Huds., Fl. Angl.: 447 (1762). – TYPE: England, Icon in Dillenius, Historia Muscorum, tab. 19, fig. 23, 1742 (lectotype, Jørgensen, Nordic Lichen Flora 3: 143, 2007); corresponding specimen in herb. Dillenius (OXF epitype, Jørgensen, Nordic Lichen Flora 3: 143, 2007).

Syn. *Collema cheileum* (Ach.) Ach.

D: kruset bævrelav **N:** kalkglye **S:** krusig gelélav

Red-listed in: **D N**

Literature: Degelius 1954: 280–298; Tønsberg et al. 1996: 62–63.

Figs: Degelius 1954, Pl.III b; Wirth 1995: 354; Dobson 2000: 140; Nash et al. 2004: 71.

THALLUS foliose, forming rosettes to 5 cm diam. with radiating, often imbricating lobes to 2 mm wide, thin to 0.2 mm thick, rounded, often ear-shaped. Upper surface smooth, dark greenish, with globose to often scale-like isidia. APOTHECIA uncommon, appressed, to 2 mm diam., with thin, granulose thalline margin. Spores colourless, broadly oblong to subellipsoid, 3–4-septate, with rounded ends, 26–24 × 13–15 µm. CONIDIOMATA uncommon, laminal or marginal, appearing as rather prominent pale dots; conidia colourless, slightly swollen at the apices, 5–6 × 1.5–2 µm. PHOTOBIONT *Nostoc* in chains, individual cells globose, 5–7 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Calciferous soils or rocks, preferably rather moist, hemerophilous (on walls, road-cuts etc.).

Distribution. Scattered in the southern lowlands, with its northernmost European locality at Vega in Norway. **D:** *NJy ØJy SJy Fyn Sjæ*. **Fa. I:** *ISu INo*. **N:** *Op Ro SNo*. **S:** *Sk Bl Öl Gtl Klm Bh Vg Ög Upl*. Otherwise quite common and widespread in Europe and North Africa, also in North America and New Zealand.

Note. A unique species, not closely related to any other in our region, having an unusual, nearly membranaceous thallus with wavy margins, beset with squamule-like, often crowded isidia. The spores are mostly 4-septate (or rarely submuriform).

8. **Collema cristatum** (L.) F.H.Wigg.

Prim. Fl. Holsat.: 89 (1780). – *Lichen cristatus* L., Sp. Plant. I**I:** 1152 (1753). – TYPE (cons.): Italy, Trentino, Cortina d'Ampezzo, Pocol, 1948 Degelius (UPS).

Syn. *Collema melaenum* (Ach.) Ach.

F: liuskahyytelöjäkälä **N:** fingerglye **S:** kamgelélav

var. **cristatum**

Literature: Degelius 1954: 308–329.

Figs: Brodo et al. 2001: 284; Degelius 1954, pl. IIc; Dobson 2000: 140; Krog et al. 1990: 162; Wirth 1995: 355.

THALLUS foliose, forming rounded, semicircular, closely appressed rosettes, to 10 cm diam., often dying away centrally. Lobes to 3 mm wide, strongly concave, with raised, dentate or small-lobulate, sinuose margins, rather thin, about 0.2 mm thick (rarely to 0.45 mm); upper surface dark olivaceous brown, occasionally with isidia; lower surface often with tufts of white hapters. APOTHECIA not uncommon, but sometimes absent; usually crowded, to 3 mm diam., mainly marginal, with

red-brown, flat disc and entire, distinct thalline margin. Spores colourless, ellipsoid, with acute apices, usually submuriform, 18–32 × 8–12 µm. CONIDIOMATA common, mostly marginal in isidioid verrucae; conidia bacilliform, colourless, slightly swollen apically, 4–5 × 1–2 µm. PHOTOBIONT *Nostoc* in chains, individual cells globose, 5–7 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Saxicolous, usually growing directly on calcareous rocks.

Distribution. Rather common and widespread in calcareous areas, becoming rarer towards the north. **Gr. F:** *A V U PK Ks SoL EnL*. **I:** *ISu*. **N:** *Øf Ak He Op Bu Vf Te Ro Ho MR ST NT SNo NNo Tr VFi ØFi*. **AI:** *Bi Sb*. **S:** *Sk Öl Gtl Dls Vg Ög Vsm Srm Upl Hrj Jmt LyL LuL TL*. Otherwise in all of Europe and adjacent North Africa and Middle East, through Asia to the Bering Strait.

var. **marginale** (Huds.) Degel.

Symb. Bot. Ups. 13(2): 316 (1954). – *Lichen marginalis* Huds., Fl. Angl.: Ed 2(2): 534 (1778). – TYPE: England, Icon in Dillenius, Historia Muscorum, tab. 19, fig. 25, 1742 (lectotype, Jørgensen, Nordic Lichen Flora 3: 143, 2007); corresponding specimen in herb. Dillenius (OXF epitype, Jørgensen, Nordic Lichen Flora 3: 143, 2007).

Syn. *Collema multifidum* (Scop.) Rabenh.

Literature: Degelius 1954: 316–324.

Figs: Degelius 1954: 317 and Pl. IIIe.

Like var. *cristatum*, but with extended, very narrow (less than 0.5 mm wide), furcate lobes, often with globose isidia marginally.

Habitat. Saxicolous as var. *cristatum*.

Distribution. Rare and more southern than var. *cristatum*. **N:** *Ak Ho SNo*. **S:** *Öl Gtl Ög Srm*.

Note. A very variable species, which is normally easily recognizable by the narrow, concave, often radiating lobes, which are closely attached to the rock. Densely isidiate, broad-lobed forms of var. *marginale* are superficially rather similar to *C. auriforme*, but are non-striate with distinctly branched lobes.

9. **Collema curtisporum** Degel.

Symb. Bot. Ups. 13(2): 437 (1954). – TYPE: Sweden, Jämtland, Nedre Handölsfallet, 1913 Du Rietz (UPS holotype).

F: pohjanhyytelöjäkälä **N:** småblæreglye **S:** liten aspgelélav

Red-listed in: **F N S**

Literature: Degelius 1954: 437–438; Halonen et al., Suomen Ympäristö 73: 7–18 (1997); Thor & Arvidsson (eds) 1999: 131–132; Tønsberg et al. 1996: 63–64.

Figs: Thor & Arvidsson (eds) 1999: 253.

THALLUS foliose, to 4 cm diam., with broad, rounded lobes, to 1 cm wide; upper surface pustulate to ridged, olivaceous black, rather thin, to 0.1 mm thick. APOTHECIA quite common but scattered, to 1.5 mm diam., with brown, flat to convex disc and thin thalline margin. Spores colourless, fusiform, often curved, usually 3-septate, 26–34 × 3–5 µm. CONIDIOMATA rare, laminal pale dots; conidia bacilliform, colourless, apically slightly swollen, 4–5 × 1(–1.5) µm. PHOTOBIONT *Nostoc* in chains, individual cells globose, 5–7 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Corticolous, predominantly on *Populus tremula* in mixed forests in cool, damp habitats.

Distribution. In damp, boreal forests in northern Fennoscandia, becoming rarer. **F:** *OP PeP Ks KiL*. **N:** *Op Bu*. **S:** *Hls Mpd Ång Jmt Vb Nb ÅsL LyL PL LuL*. Otherwise in Russia and northern Italy in Europe, and in western North America.

Note. Easily distinguished from the other ridged members of the *Collema nigrescens* complex by its small size and special ecology. In cases of doubt the small spores are always diagnostic.

10. **Collema fasciculare** (L.) F.H.Wigg.

Prim. Fl. Holsat.: 89 (1780). – *Lichen fascicularis* L., Mantissa I: 133 (1767). – TYPE: Sweden, Småland, Stenbrohult, Linnaeus fil. (LINN 1273.141 lectotype, Degelius, Symb. Bot. Ups. 13(2): 451, 1954)

Syn. *Collema ascaridosporum* (A.Massal.) Degel., *Collema aggregatum* auct.

N: puteglye **S:** kuddgelélav

Red-listed in: **S**

Literature: Degelius 1954: 451–458; Thor & Arvidsson (eds) 1999: 133.

Figs: Degelius 1954: pl. Vf; Thor & Arvidsson (eds) 1999: 253; Holien & Tønsberg 2006: 128.

THALLUS subfoliose, forming 1 cm high, round cushions to 2–3 cm diam., membranaceous and fenestrate, swelling much when wetted, to 1 mm thick, with numerous accessory, erect lobules, which contributes to the pulvinate shape of the thallus. APOTHECIA common and numerous, often crowded, to 2 mm diam., with plane, dark brown disc and very thick, rugose thalline margin; proper exciple poorly developed or lacking. Spores colourless, 10–15-septate, vermiform and often spirally twisted, 50–95 × 5–6 µm. CONIDIOMATA rare, usually poorly developed and without conidia. PHOTOBIONT *Nostoc* in chains, individual cells globose, 5–7 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Corticolous on mossy trunks of old deciduous trees, such as *Fraxinus*, *Populus*, *Salix*, and *Sorbus*, very rarely on rocks in some northwestern localities.

Distribution. Southern with oceanic tendencies, commonest in the western lowlands (below 500 m), and there locally common. **N:** *Te VA Ro Ho SF MR ST NT SNo NNo*. **S:** (*Sml*) *Dls Vrm* (*Jmt*). Otherwise widespread in suboceanic parts of Europe and adjacent parts of Africa and Asia.

Note. Very different from all other European species in the genus, and perhaps in need of higher taxonomic status. In the field easily recognized by the cushion-formed, usually richly fertile thallus, which swells considerably when wet; the vermiform spores are unique in being 10–15-septate and to 95 µm long. The only other similar corticolous species is the rare *C. leptaleum*, which has more distinctive marginal lobes with smaller, few-septate spores. *Staurolemma omphalarioides* is also superficially similar, but with a more granular thallus and simple spores.

11. **Collema flaccidum** (Ach.) Ach.

Lichenogr. Universalis: 647 (1810). – *Lichen flaccidus* Ach., Kongl. Vetensk. Acad. Nya Handl. 1795: 14 (1795), *nom. nov.* for *Lichen rupestris* Sw., Meth. Musc.: 37 (1781), *nom. illeg.* – TYPE: Germany, Hannover, Ehrhart (in herb. Swartz, S holotype – the neotype designated by Degelius 1974: 142 is no longer operational since the original material has been located).

D: slatten bævrelav **F:** kalliohyytelöjäkälä **N: s**kjellglye **I:** hreisturslembra **S:** slanklav

Red-listed in: **D**

Literature: Degelius 1954: 384–400.

Figs: Degelius 1954, pl. Va; Krog et al. 1990: 163; Moberg & Holmåsen 1990: 69; Purvis et al. 1993: 222 (isidia); Wirth 1995: 351; Dobson 2000: 141; Holien & Tønsberg 2006: 128.

THALLUS foliose, to 6 cm diam., often forming extensive colonies; lobes rounded, to 0.2 mm thick, often partly ascending and irregularly folded. Upper surface olivaceous black with numerous, often crowded, mainly flattened, squamule-like isidia (globose as young!). APOTHECIA rare, laminal, 1.5–2.5 mm diam. with flat, brown disc which may be pruinose when young, and distinct, entire thalline margin. Spores colourless, 3–5-septate, fusiform, 25–35 × 6–7 µm. CONIDIOMATA common, laminal, visible as pale "bumps" conidia bacilliform, colourless, slightly swollen apically, 4–6 × 1–2 µm. PHOTOBIONT *Nostoc* in chains, individual cells globose, 5–7 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Corticolous on coarse-barked trees (mainly *Populus* and *Fraxinus*) or saxicolous on moist, mossy, mainly siliceous rocks, occasionally terricolous.

Distribution. Widespread but scattered, though locally common, rarer towards the north. **D:** *ØJy Fyn Sjæ Brn*. **Fa. F:** *A V U St EH ES PH PS PK Kn OP PeP Ks SoL EnL InL*. **I:** *ISu IVe IAu INv INo*. **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **S:** *Sk Bl Öl Gtl SmI Hl Bh Dls Vg Ög Vrm Nrk Srm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb ÅsL LyL Lul TL*. Otherwise widespread in temperate regions of Eurasia and North America.

Note. Easily recognized by the large, irregularly lobed, membranaceous thallus with squamiform isidia. Thalli from fairly dry substrate may resemble *C. subflaccidum*, a more regularly lobed species with constantly globular isidia and longer, fusiform spores. Sometimes confused with *Leptogium cyanescens*, which is a more bluish, thinner species with cortex.

12. **Collema fragrans** (Sm.) Ach.

Syn. Meth. Lich.: 303 (1814). – *Lichen fragrans* Sm. in Sm. & Sowerby, Engl. Bot.: 27 (1808). – TYPE: England: "Kent, Surrey and Sussex", 1804 Borrer (BM lectotype, Degelius, Symb. Bot. Ups. 13(2): 298, 1954).

Syn. *Collema microphyllum* Ach.

D: skov-bævrelav **F:** täplähyytelöjäkälä **N:** almeglye **S:** rosettgelélav

Red-listed in: **D F N S**

Literature: Degelius 1954: 298–307.

Figs: Thor & Arvidsson (eds) 1999: 254.

THALLUS squamulose, to 0.5 cm diam., forming rounded (often crowded) rosettes; lobes to 1.5 mm wide, often imbricate, flat, crenate, to 0.4 mm thick (when wet). Upper surface smooth, sometimes with granuliform papillae, olivaceous brown. APOTHECIA common, numerous and crowded, to 0.7 mm diam., initially immersed and globular, later becoming flat, with brown disc and prominent, papillose thalline margin and visible, pale, paraplectenchymatous proper exciple. Spores colourless, submuriform, ellipsoid, 16–30 × 9–17 µm. CONIDIOMATA common, globose; conidia bacilliform, colourless, apically slightly swollen, 4–6 × 1 µm. PHOTOBIONT *Nostoc* in chains, individual cells globose, 4–7 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Corticolous on old trunks of deciduous trees such as *Fagus*, *Populus* and *Ulmus*.

Distribution. Rare and disappearing. **D:** *NJy VJy Sjæ*. **F** (*U*) *OP*. **N:** *SF*. **S** (*Sk*) (*Gtl*) *SmI Bh Vg Ög Vsm Srm Upl Hls Jmt Nb LyL LuL*. Widespread in Europe and North Africa, but avoiding the northern parts; also in North America.

Note. A most distinctive species, forming neat, thalline rosettes around the numerous apothecia. Among the corticolous species it may remind of *C. occultatum* which, however, is a smaller, more crustose species with poorly developed thallus and different, cubic spores.

13. **Collema furfuraceum** (Arnold) Du Rietz

Ark. Bot. 22A(13): 3 (1929). – *Synechoblastus nigrescens* var. *furfuraceus* Olivier ex Arnold, Flora 64: 115 (1881). – TYPE: France (Gallia), Orne et Calvados, Olivier Herb. Lich. Orne Calvadis no. 122 (M lectotype, Degelius, Symb. Bot. Ups. 13(2): 443, 1954).

D: grynet bævrelav **F:** raidanhyytelöjäkälä **I:** hrukkuslembra **N:** fløyelsglye **S:** stiftgelélav

Red-listed in: **D I S**

Literature: Degelius 1954: 443–451; Kristinsson 1981; Thor & Arvidsson (eds) 1999: 135.

Figs: Brodo et al. 2001: 285; Degelius 1954, Pl. Vf; Dobson 2000: 26; Krog et al. 1990: 163; Moberg & Holmåsen 1990: 70; Thor & Arvidsson (eds) 1999: 254; Holien & Tønsberg 2006: 127.

THALLUS foliose, to 10 cm diam., spreading membrane-like, to 0.1 mm thick and 1 cm wide lobes, which are pustulose or ridged (in central parts). Upper surface olivaceous to brownish black, with globular (when young) to terete (rarely squamiform) isidia, usually concentrated on the pustules/ridges. APOTHECIA very rare, laminal, 0.5–1.5 mm diam. with flat, brown disc, sometimes pruinose when young, and thin, isidiate thalline margin. Spores colourless, fusiform, slightly curved, 4–5-septate, 40–80 × 3–6 µm. CONIDIOMATA common, appearing as pale "bumps" on the surface; conidia bacilliform, colourless, slightly swollen apically, 4–6 × 1–1.5 µm. PHOTOBIONT *Nostoc* in chains, individual cells globose, 5–7 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Corticolous on deciduous trees, mainly *Populus* and *Salix* in humid forests or on *Fraxinus* (particularly in western Norway) in old agricultural landscapes; very rarely on mossy rocks, in the lowlands up to c. 800 m; in Iceland on bird cliffs, indicating some nitrophily.

Distribution. Widespread and locally common, commoner towards the west, avoiding the extreme north and high altitudes. **D:** (*Brn*). **F:** *A V U EK EH ES EP PH PS PK KP Kn OP PeP Ks InL*. **I:** *ISu*. **N:** *Øf Ak Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi*. **S:** (*Sk*) (*Gtl*) *SmI Bh Dls Vg Ög* (*Srm*) *Vrm Vsm Upl Dlr Gst Hls Mpd Ång Jmt Vb Nb ÅsL LyL PL LuL TL*.

Otherwise widespread in the Northern Hemisphere, avoiding the most continental parts, e.g. Central Europe.

Note. Characteristic species by its pustulose, broad-lobed, "bat-wing"-like thallus, covered in globular to terete isidia. This latter character definitely separates it from the closely related *C. subnigrescens*. *C. nigrescens* differs in its much more irregular thallus and granular isidia as well as longer spores. *C. subflaccidum* is also densely isidiate, but is less membranaceous and not pustulate.

14. **Collema fuscovirens** (With.) J.R.Laundon

Lichenologist 16: 219 (1984). – *Lichen fuscovirens* With., Bot. Arr. Veg. Gr. Br. I: 717 (1776). – TYPE: England, Oxfordshire, Marston, Dillenius, Icon in Dillenius Historia Muscorum, tab. 19, fig 22, 1742 (holotype); corresponding specimen in herb. Dillenius (OXF epitype, Jørgensen, Nordic Lichen Flora 3: 143, 2007).

Syn. *Collema tuniforme* (as "*tunaeforme"*) (Ach.) Ach., *Collema furvum* (Ach.) Sw.

F: ryynihyytelöjäkälä **N:** bølgeglye **S:** kalkgelélav

Red-listed in: **D**

Literature: Degelius 1954: 330–346; Laundon, Lichenologist 16: 219 (1984).

Figs: Degelius 1954, Pl.IIIf; Dobson 2000: 142; Krog et al. 1990: 167; Nash et al. 2004: 73; Wirth 1995: 347.

THALLUS foliose, forming irregular, broadly lobate thalli, to 5 cm diam., with rounded, undulating lobes, 2–5 mm wide, 0.1–0.25 mm thick. Upper surface olivaceous black, somewhat (irregularly) pustulate, partly isidiate of globular or clavate isidia, giving the surface a scurfy appearance. Lower surface markedly paler, often bluish grey, frequently with bundles of white hapters. APOTHECIA not common, 0.5–1.5 mm diam., with flat, brown disc and thick, isidiate thalline margin. Spores colourless, submuriform, broadly ellipsoid, 15–25 × 7–15 µm. CONIDIOMATA often present but sparse, laminal or marginal, immersed to protruding; conidia bacilliform colourless, , slightly swollen apically, 5–6 × 1.5 µm. PHOTOBIONT *Nostoc* in chains, individual cells globose, 4–7 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Saxicolous, predominantly on bare, calcareous rocks, very rarely on trunks of trees incrusted with calcareous dust.

Distribution. Common and widespread. **Gr. D:** *NJy Sjæ*. **F:** *A V U EH ES PH PS PK KP Kn OP PeP Ks KiL SoL EnL*. **I:** *ISu IVe INv*. **N:** *Ak He Op Bu Vf Te Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **S:** *Öl Gtl Klm Bh Dls Vg Ög Nrk Srm Vsm Upl Dlr Gst Hls Hrj Jmt Nb LyL LuL TL*. Otherwise widely distributed in the temperate and arctic parts of the Northern Hemisphere.

Note. Resembles the closely related *C. auriforme*, but with a thinner, darker (olivaceous black, not brownish) thallus which is not much swollen when wet and wrinkled when dry. In some forms also reminding of *C. undulatum* var. *granulosum* which has a thicker, more broad-lobed thallus and different (fusiform) spores.

15. **Collema glebulentum** (Crombie) Degel.

Symb. Bot. Ups. 13(2): 406 (1954). – *Leptogium glebulentum* Nyl. ex Cromb., J. Bot. 20: 272 (1882). – TYPE: Scotland, Aberdeenshire, Braemar, Craig Guie, 1870 Crombie (BM lectotype, Degelius, Symb. Bot. Ups. 13(2): 406, 1954).

Syn. *Collema coralliferum* Degel., *Collema furvellum* Räsänen

F: pahtahyytelöjäkälä **I:** klappaslembra **N:** vassglye **S:** bäckgelélav

Red-listed in: **F**

Literature: Degelius 1954: 406–413; Svensk Bot. Tidskr. 62: 406 (1968).

Figs: Degelius 1954: pl Vb; Krog et al. 1990: 163.

THALLUS foliose, membranaceous, 3–6 cm diam., with irregular, rounded lobes, 5–8 mm wide, with wavy margins, to 0.15 mm thick. Upper surface olivaceous black, folded, with terete (globose when young) isidia, forming a dense, areolate crust in older parts of the thallus. APOTHECIA and CONIDIOMATA unknown in ripe condition. PHOTOBIONT *Nostoc* in chains, individual cells globose, 5–7 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Exclusively saxicolous on siliceous rocks, often in the inundation zones of rivers and lakes.

Distribution. Widespread and locally common, arctic-alpine species. **Gr. Fa. F:** *EnL InL*. **I:** *ISu IVe IAu INv INo*. **N:** *Øf He Op Bu Te AA Ro Ho SF MR ST NT SNo NNo Tr ØFi*. **S:** *SmI Bh Dls Vg Ög Nrk Dlr Hrj Jmt ÅsL LyL LuL TL*. Otherwise found in arctic Europe and the mountains of Great Britain and the Alps.

Note. One of the difficult, sterile, isidiate species, previously much misunderstood. It is closely related to *C. flaccidum*, but has a thinner, much more adnate, irregular, folded thallus covered by terete isidia (not flat squamules), which form a crust-like structure.

16. **Collema leptaleum** Tuck.

Proc. Amer. Acad. Arts 6: 263 (1864). – TYPE: USA, New England, "in Montis albis" (=White Mountains), 1852 E. Tuckerman (FH lectotype, Degelius, Symb. Bot. Ups. 20(2): 101, 1974).

N: askeglye

Red-listed in: **N**

Literature: Degelius 1974: 101–108; Tønsberg, Graphis **S**cripta 5: 22–23 (1993); Tønsberg et al. 1996: 65–66.

THALLUS subcrustose to foliose, rather small, to 5 cm diam., often forming cushions; lobes irregular, to 1 cm wide, rounded, adnate, with somewhat acending margin, membranaceous, partly fenestrate, to 0.35 mm thick. Upper surface dark olivaceous brown, smooth to glossy. APOTHECIA common and numerous, often dense and crowded and partly covering the thallus, 1–2 mm diam., shortly stipitate with plane, reddish brown disc and rather thin thalline margin which occasionally is excluded; indistinct proper exciple. Spores colourless, 3–4-septate, bacillar, often somewhat curved, 25–50 × 2–4 µm. CONIDIOMATA rather common, laminal or marginal, visible as prominent, pale, globose dots; conidia bacilliform, colourless, apically somewhat swollen, 4–5 × 1–2 µm. PHOTOBIONT *Nostoc* in chains, individual cells globose, 4–5 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On trunk of *Fraxinus* in broad-leaved deciduous forest.

Distribution. Very rare, only known from one locality in Norden (the only one in Europe). **N:** *SF*. Widespread in warm-temperate to subtropical parts of both hemispheres.

Note. Superficially rather like *C. fasciculare*, but with larger, more distinct marginal lobes and smaller, curved spores.

17. **Collema limosum** (Ach.) Ach.

Lichenogr. Universalis: 629 (1810). – *Lichen limosus* Ach., Lichenogr. Suec. Prodr.: 126 (1799). – TYPE: Sweden [Stockholm, Carlberg, Swartz] (H-ACH 1903 lectotype, Degelius, Symb. Bot. Ups. 13(2): 199, 1954).

Syn. *Collema glaucescens* Hoffm. sensu Körber

D: dynd-bævrelav **F:** savihyytelöjäkälä **N:** leirglye **S:** lergelélav

Red-listed in: **D N S**

Literature: Degelius 1954: 198–207; Nash et al. 2004: colour-plate 18; Wirth 1995: 351.

Figs: Degelius 1954: pl. Ig; Krog et al. 1990: 164; Moberg & Holmåsen 1990: 70.

THALLUS crustose, membranaceous and best developed around the apothecia, to 5 cm diam., dark blue-green to black, swelling much when wetted, to 0.5 mm thick, wrinkled and rugose when dry. APOTHECIA common and often numerous, innate, to 3 mm diam., with plane to convex, red-brown disc, surrounded by a thick verrucose or lobulate thalline margin; proper exciple poorly developed or lacking. Spores colourless, muriform, ellipsoid to subovoid with obtuse apices, 25–35 × 10–15 µm. CONIDIOMATA scarce, immersed or protruding, especially on the margins of the apothecia, pale; conidia bacilliform, colourless, 5–6 × 1–1.5 µm. PHOTOBIONT *Nostoc* in chains, individual cells globose, 5–6 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Terricolous pioneer, mainly on moist, calciferous clays or sands, often in man-made habitats, declining due to modern agriculture etc.

Distribution. Rare and scattered in the lowlands; a southern element in the Nordic lichen flora. **D:** *NJy ØJy* (*Fyn*) *Sjæ Brn*. **Fa. F:** *V*. **N:** *Ak Ho ST SNo ØFi*. **S:** *Sk* (*Öl*) (*Gtl*) (*Sml*) (*Bh*) (*Dls*) (*Vg*) (*Ög*) (*Srm*) *Upl* (*Dlr*) *Jmt*. Otherwise widespread, but scattered in warm-temperate parts of the Northern Hemisphere.

Note. The most crustose, strikingly greenish species of the *C. tenax* group. Since there are superficially very

similar forms (with reduced thallus) of *C. tenax*, it is reliably identified only by its 2–4 spored asci containing large (30–35 µm long), muriform spores.

18. **Collema multipartitum** Sm.

in Sowerby & Sm., Engl. Bot. 36: tab. 2582 (1814). – TYPE: Ireland, Killarney, Gage (BM, lectotype, as "holotype" in, Degelius, Symb. Bot. Ups. 13(2): 376, 1954).

F: risahyytelöjäkälä **N:** vifteglye **S:** mångflikig gelélav

Red-listed in: **F N**

Literature: Degelius 1954: 379–384; Halonen et al., Suomen Ympäristö 73: 25–28 (1997); Tønsberg et al. 1996: 66–68; Laundon, Bot. J. Linn. Soc. 147: 490 (2005).

Figs: Degelius 1954: pl. IVe; Krog et al. 1990: 164.

THALLUS foliose, to 5 cm diam. with irregularly, deeply and repeatedly branched lobes, 0.5–1.5 mm wide. Upper surface convex, dark olive brown to black, often minutely striated, swelling much when wet, to 0.35 mm thick. APOTHECIA conspicuous, rather common, scattered, to 2 mm diam., with flat, blackish brown disc and entire, crenulate thalline margin and prominent, paraplectenchymatous proper exciple. Spores colouless, fusiform, 3–4-septate, 25–45 × 5–6 µm. CONIDIOMATA common, usually laminal, immersed; conidia colourless, bacilliform, slightly swollen apically, 5–7 × 1–1.5 µm. PHOTOBIONT *Nostoc* in chains, individual cells globose, 5–7 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Calcareous rocks, usually exposed, close to the sea or near lakes.

Distribution. Southern lowlands. **F:** *V*. **N:** *Ak Bu Vf Te*. **S:** *Öl Gtl Vg Srm Vsm Upl*. Otherwise widespread in Europe and North Africa, avoiding the northern parts; also rarely in North America.

Note. Easily recognizable species by the much branched lobes and the numerous, thick apothecia with curved, ellipsoid-fusiform spores.

19. **Collema nigrescens** (Huds.) DC.

in Lamarck & De Candolle, Fl. Franç., ed. 3, 2: 384 (1805). – *Lichen nigrescens* Huds., Fl. Angl.: 450 (1762). – TYPE: England "in Cambria" or "in sylva Bagley-Wood prope Oxonium", Icon in Dillenius Historia Muscorum: tab. 19, fig. 20 p.p., 1742 (lectotype, as 'holotype', Degelius, Symb. Bot. Ups. 13(2): 425, 1954); corresponding specimen in herb. Dillenius (OXF epitype, Jørgensen, Nordic Lichen Flora 3: 143. 2007).

Syn. *Collema vespertilio* (Lightf.) Hoffm.

F: lännenhyytelöjäkälä **N:** brun blæreglye **S:** läderlappslav

Red-listed in: **F S**

Literature: Degelius 1954: 425–436; Thor & Arvidsson (eds) 1999: 136.

Figs: Brodo et al. 2001: 285; Degelius 1954, Pl. Ve; Krog et al. 1990: 164; Thor & Arvidsson (eds) 1999: 253; Wirth 1995: 349; Holien & Tønsberg 2006: 127.

THALLUS foliose, rather large, to 5(–10) cm diam., adnate, often stunted and convoluted; lobes pustulate and ridged in older parts, to 1 cm wide and 0.15 mm thick. Upper surface olivaceous brown with granular isidia. APOTHECIA common and numerous, often crowded, to 1 mm diam., disc flat to convex, brown with a narrow, smooth thalline margin. Spores colourless, 4–12-septate, acicular, often twisted, 50–90 × 3–4 µm. CONIDIOMATA rather common, visible as protuberances on both sides of the thallus; conidia bacilliform, colourless, slightly swollen apically, 5–6 × 1–2 µm. PHOTOBIONT *Nostoc* in chains, individual cells globose, 5–7 µm.

Chemistry. No secondary substances (by TLC).

Habitat. Corticolous, mostly on mossy trunks of old deciduous trees, mainly *Acer* and *Sorbus* in moist, lowland habitats (very rarely above 750 m), rarely on rocks towards the north.

Distribution. Widespread and locally common, commonest towards the west. **F:** *V EP OP Ks*. **N:** *Ak He Op Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **S:** *Öl* (*Gtl*) *SmI Hl Bh Dls Vg Ög Nrk Srm Vsm Upl Dlr Gst Hls Mpd Hrj Jmt Nb ÅsL LyL LuL*. Otherwise widespread in the Northern Hemisphere, particularly in its temperate, oceanic parts.

Note. Easily recognized by the plicate-rugulose thallus which often gives the appearance of being stunted, since it usually is convoluted with indistinct marginal lobes and develops isidioid structures. Its acicular spores are

most characteristic, 4–12-septate and among the longest in the genus in temperate regions.

20. **Collema occultatum** Bagl.

Comment. Soc. Crittog. Ital. 1(1): 23 (1861). – TYPE: Italia, Serravalle alla Scrivia nell'apennino Ligustico, Ferrari (UPS lectotype, Degelius, Symb. Bot. Ups. 13(2): 248, 1954).

Syn. *Collema quadratum* J.Lahm ex Körb., *Collema byssinum* var. *juniperinum* Sommerf.

F: kätköhyytelöjäkälä **N:** skorpeglye **S:** skorpgelélav

Red-listed in: **N S**

var. **occultatum**

Literature: Degelius 1954: 248–254; Thor & Arvidsson (eds) 1999: 137–138.

THALLUS small, subcrustose, to 3 mm diam., to 0.2 mm thick, the initial rosettes merging into an effuse crust. Upper surface olivaceous black, smooth, but erect lobules sometimes isidioid, lower surface paler. APOTHECIA usually crowded, 0.2–0.5 mm diam., globose; disc initially punctiform, later concave or flat, red-brown, darkening towards blackish; thalline margin distinct and smooth, concolourous with thallus, finally excluded. Spores colourless, muriform, cuboid, 13–22 × 10–15 µm. CONIDIOMATA not uncommon, immersed, globose, pale; conidia bacilliform, colourless, 4–5 × 1 µm. PHOTOBIONT *Nostoc* in chains, individual cells globose, 5–7 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Corticolous on trees or shrubs in dense deciduous forests, mainly on *Salix* and *Sorbus*.

Distribution. Widespread, but commonest in the south and in the lowlands. **F:** *V U EK St EH ES PH PS PK Kn OP PeP Ks SoL InL*. **N:** *Ak He Bu Te AA VA SF ST SNo Tr* (*ØFi*). **S:** (*Sk*) *Bl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt VbNb ÅsL LyL PL LuL TL*. Widespread in Europe and adjacent North Africa.

var. **populinum** (Th.Fr.) Degel.

Symb. Bot. Ups. 13(2): 245 (1954). – *Collema verruciforme b. populinum* Th. Fries, Lich. Arct.: 279 (1860). – TYPE: Norway ("Norvegiae septentrionalis"), Nordland(iae), Saltdal, Sommerfelt (UPS holotype).

Syn. *Collema coccophylloides* Hepp ex Müll.Arg.

Literature: Degelius 1954: 245–248.

Figs: Degelius 1954: figs 35, 36; Thor & Arvidsson (eds) 1999: 255; Nash et al. 2004: 75.

Similar to var. *occultatum* but differs in the more discrete wart-like thalli, usually not forming a continuous crust, which gives it a quite different habitus.

Habitat. Corticolous, mainly on trunks of *Populus*, in moist boreal forests.

Distribution. Boreal, rather common in northern parts in suitable habitats, extending southwards to the nemoral zone where it is rarer. **F:** *U InL*. **N:** *NT SNo*. **S:** *Sk* (*Klm*) (*Sml*) *Dls Vg Ög* (*Nrk*) (*Srm*) *Vrm Upl Dlr Jmt LyL LuL*. Northern Europe, France and Switzerland, as well as North America.

Note. This is the smallest, most crustose, corticolous species of the genus in our region, and it can hardly be confused with any other, except small *Leptogium* species, which have different, non-cuboid spores. The distinction between the two varieties is sometimes difficult since they tend to merge morphologically, but they are kept separate here because of their different ecogeographical patterns.

21. **Collema parvum** Degel.

Symb. Bot. Ups. 13(2): 273 (1954). – TYPE: Sweden, Oelandia (=Öland), Vickleby, Alvaret, ad terminum par. Stensåsa, 1947 Degelius (UPS holotype).

Syn. *Collema leptogioides* auct. (non Anzi).

F: pikkuhyytelöjäkälä **N:** småglye **S:** dvärggelélav

Red-listed in: **F**

Literature: Degelius 1954: 273–277.

Figs: Degelius 1954: pl. IIe.

THALLUS squamulose, small, to 1.5 cm diam., forming circular colonies with rounded, radiating, appressed, usually flat lobes, to 0.5 mm wide, to 150 µm thick. Upper surface blackish with isidia which are variable in shape from globular to coralloid. APOTHECIA and CONIDIOMATA unknown. PHOTOBIONT *Nostoc* in chains, individual cells globose to somewhat oblong, 4–7 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Saxicolous, particularly on limestone.

Distribution. Mainly montane species with scattered distribution. **F:** *Ks*. **N:** *Bu Ho NT SNo Tr ØFi*. **S:** *Öl Gtl Srm Vrm Vsm Upl LyL LuL TL*. Otherwise scattered in the mountains of Europe.

Note. A most characteristic, small species, forming small, circular thalli on the rocks, often tending to die centrally. The strongly appressed lobes and growthform, reminds much of *Leptogium diffractum* which is shinier, non-isidiate and cellular throughout.

22. **Collema polycarpon** Hoffm.

Deutschl. Fl. 2: 102 (1796). – TYPE: Switzerland, "ad rupes saxaque in Alpibus calcariis", Schaerer, Lich. Helv. Exc. no. 421 (as *Collema multifidum* var. *polycarpon* Schaer.) (G-Schaerer, neotype, Jørgensen, Nordic Lichen Flora 3: 143, 2007).

F: nappihyytelöjäkälä **I:** gróparslembra **N:** skålglye **S:** rikfruktig gelélav

Literature: Degelius 1954: 220–238.

Figs: Degelius 1954, pl.IIa, b; Krog et al. 1990: 166; Moberg & Holmåsen 1990: 71; Wirth 1995: 361; Brodo et al. 2001: 286.

THALLUS foliose, forming rosette-like cushions, to 6 cm diam., with numerous, rounded lobes, 1–2.5 mm wide, rather thick, to 0.45 mm thick, radiating at the circumference, often ascending at the centre of the thallus, with raised margins. Upper surface smooth to plicate towards apices, olivaceous black, epruinose; lower surface paler. APOTHECIA common, crowded towards the centre of the thallus, large, to 1.5 mm diam., stipitate, often apically on ascending lobules, disc glossy brown, flat to convex, with thin, entire, smooth thalline margin. Spores colourless, fusiform, with acute apices, 3–4-septate, 15–30 × 5–8 µm. CONIDIOMATA rather common, laminal or marginal, immersed, globose, appearing as pale "bumps"; conidia simple, bacilliform, colourless, apically somewhat swollen, 5–7 × 1–1.5 µm. PHOTOBIONT *Nostoc* in chains or clusters, individual cells globose, 4–7 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Saxicolous, usually on limestone, extending into the alpine zone (to 1400 m).

Distribution. Widespread, locally common. **Gr. F:** *V EH PK Kn OP Ks EnL InL*. **N:** *Öf Ak He Op Bu Vf Te VA Ro Ho ST NT SNo NNo Tr VFi ØFi*. **AI:** *Sb*. **S:** *Öl Gtl Bh Vg Ög Srm Upl Mpd Ång Hrj Jmt Vb ÅsL LyL LuL TL*. Otherwise widespread in arctic to temperate parts of the Northern Hemisphere.

Note. Easily recognized by the thick, often raised lobes with terminal apothecia, usually so numerous that they appear to cover the central part of the thallus. It may occasionally be confused with richly fertile specimens of *C. cristatum*, which, however, have canaliculate lobes and quite different, submuriform spores.

23. **Collema subflaccidum** Degel.

Symb. Bot. Ups. 20 (2): 140 (1974). – TYPE: USA, Maine, Togue Pond Camps near Mt. Katahdin, 1939 Degelius (UPS holotype).

Syn. *Collema subfurvum* sensu Degel. 1954

I: víkurslembra **N:** stiftglye **S:** grynig gelélav

Red-listed in: **I S**

Literature: Degelius 1954: 400–406; 1974: 140–145; Kristinsson 1972; Thor & Arvidsson 1996: 139.

Figs: Brodo et al. 2001: 287; Thor & Arvidsson 1996: 256

THALLUS foliose, to 6 cm diam., to 0.13 mm thick, not swollen when wet; upper surface smooth, occasionally small-pustulose, olivaceous brown-black, with globular isidia, becoming teretiform with age. APOTHECIA very rare (unknown in our region), laminal, scattered, to 2 mm diam., disc reddish brown, mainly flat with inconspicuous, isidiate thalline margin. Spores colourless, 5–7-septate, broadly fusiform, 40–55 × 5–7 µm. CONIDIOMATA very rare, laminal and visible as pale "bumps";conidia bacilliform, colourless, slightly swollen apically, 4–6 × 1–2 µm. PHOTOBIONT *Nostoc* in chains, individual cells globose, 4–6 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Mainly corticolous on trunks of broad-leaved, deciduous trees, particularly *Fraxinus* in humid habitats, very rarely on rocks.

Distribution. Western, and there locally rather common **I:** *ISu*. **N:** *Øf Ak Bu Vf Te AA VA Ro Ho MR ST SNo*. **S:** (*Sk*) *Gtl Hl Bh Dls Vg Nrk Srm Vrm Vsm Upl Dlr Gst Hls Hrj Jmt*. Otherwise widespread in moist (warm) temperate parts of the Northern Hemisphere, also in South Africa, Australia and New Zealand.

Note. Closely related to *C. flaccidum* and sometimes (particularly young or poorly developed, sterile specimens) rather difficult to distinguish from that species. The isidia are never flattened and squamiform as in that species, and the thallus is generally more brownish.

24. **Collema subnigrescens** Degel.

Symb. Bot. Ups. 13(2): 413 (1954). – TYPE: Sweden, Smolandia (=Småland), Aneboda, prope Sandbäcken, 1932 Degelius (UPS holotype).

F: haavanhyytelöjäkälä **N:** ospeblæreglye **S:** aspgelélav

Red-listed in: **F S**

Literature: Degelius 1954: 413–425; Thor & Arvidsson (eds) 1999: 140.

Figs: Degelius 1954: pl. Vc; Moberg & Holmåsen 1990: 71; Thor & Arvidsson (eds) 1999: 256; Nash et al. 2004, colour pl. 19.

THALLUS foliose, to 10 cm diam. with rounded, membranaceous lobes, to 1.5 cm wide, thin, to 0.1 mm thick, usually appressed, often folded; upper surface olivaceous black, strongly ridged and pustulate, paler in the depressions. APOTHECIA common and numerous on the ridges, often crowded, to 1.5 mm diam.; disc concave to flat at maturity, brown; thalline margin thin, smooth, eventually often excluded. Spores colourless, broadly fusiform, with tail-like upper (or lower) cells, 4–5-septate, 40–75 × 6–7 µm. CONIDIOMATA often numerous, immersed, appearing as pale dots on both sides of the thallus; conidia bacilliform, colourless, slightly swollen apically, 5–6 × 1–2 µm. PHOTOBIONT *Nostoc* in chains, individual cells globose, 5–7 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Corticolous, mainly on *Populus* in humid deciduous carrs or "lövängar" (wooded meadows), often high up in the trees, in the lowlands (hardly above 400 m).

Distribution. Widespread with western tendencies, locally common. **F:** *A V U EK St EH ES EP PH KP*. **N:** *Øf Ak He Op Bu Vf Te AA Ro Ho SF MR ST NT SNo NNo Tr*. **S:** (*Sk*) (*Gtl*) *SmI* (*Hl*) *Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb LuL*. In moist, humid temperate parts of Europe and adjacent North-Africa and Pacific North America.

Note. Superficially rather similar to *Collema nigrescens* due to its rugose-plicate thallus, but the lobes are better developed and more distinct, lacking the isidioid, gnarled surface, so the thallus has a "healthier" appearance. The best distinguishing character is the difference in the spores, which, however, requires some experience, since there is an overlap in size, though the spores of *C. nigrescens* usually are longer. The spores of *C. subnigrescens*, however, are always broader and less distinctly fusiform than those of *C. nigrescens*, and they have fewer septa (less than five, while those of *C. nigrescens* usually have more than six).

25. **Collema tenax** (Sw.) Ach.

Lichenogr. Universalis: 635 (1810). – *Lichen tenax* Sw., Nova Acta Regiae Soc. Sci. Ups., ser. 3, 4: 249 (1784). – TYPE: Sweden, Oelandia (=Öland), S. Möckleby, Degerhamn, 1944 Degelius (UPS neotype, Degelius, Symb. Bot. Ups. 13(2): 150, 1954).

Syn. *Collema pulposum* (Bernh.) Ach.; *Collema subcorallinum* Degel.

D: tyk bævrelav **F:** nahkahyytelöjäkälä **I:** jarðslembra **N:** jordglye **S:** seg gelélav

Red-listed in: **D F**

Literature: Degelius 1954: 150–180.

Figs: Brodo et al. 2001: 287; Degelius 1954, Pl.Ia-e; Dobson 2000: 143; Krog et al. 1990: 166; Nash et al. 2004: 79.

THALLUS small-foliose to subcrustose, forming small rosettes, to 4 cm diam., of irregular, closely attached, rather thick, often more than 0.5 mm thick, and swelling lobes, to 3 mm wide, sometimes ascending and cylindrical, with thickened, often knotted margins. Upper surface greenish black, rugulose or wrinkled (when dry), sometimes with globose isidia and/or secondary lobules; lower surface paler, often with bundles of white hapters. APOTHECIA common, sessile or immersed, to 3 mm diam.; disc flat, brown, surrounded by a conspicuous, wrinkled, crenulate

thalline margin. Spores colourless, narrowly ellipsoid to ovoid, 3-septate to submuriform, 17–26 × 7–10 µm. CONIDIOMATA quite common, mostly appearing as pale dots on the thallus; conidia bacilliform, colourless, 4–6 × 1.5–2 µm. PHOTOBIONT *Nostoc* in chains, individual cells globose, of variable size, usually 4–5 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Terricolous on calciferous soil, sand or clay, mainly in the lowlands.

Distribution. Fairly common and widespread, particularly in the south. **D:** *NJy ØJy Fyn Sjæ Brn*. **Gr. Fa. F:** *A V U ES PS Ks*. **I:** *ISu IAu INo*. **N:** *Øf Ak He Op Bu Vf Te AA Ro Ho MR ST NT SNo NNo Tr VFi ØFi*. **S:** *Sk Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Vsm Srm Upl Dlr Gst Hrj Jmt LyL PL TL*. Otherwise widespread throughout the Northern Hemisphere, though rare in the Arctic parts.

Note. A most variable species which is difficult to come to terms with. For differences with *C. bachmanianum* and *C. limosum*, two related, terricolous species, see their Notes.

Degelius finally (1974) accepted nine varieties, of which the following six occur in Norden:

1a Thallus small (<2 cm diam.), with small lobes (to 2 mm wide)
2a Thallus dark olive-green or brownish; lobes mostly entire and smooth, not forming clusters ..... var. *crustaceum* (Kremp.) Degel.
2b Thallus usually blackish, lobes more or less incised and knotty, forming erect clusters ..... var. *corallinum* (A.Massal.) Degel.
1b Thallus larger with broader (more than 2 mm wide) lobes
3a Lobes inconspicuous or nearly lacking ..... var. *tenax*
3b Lobes always distinct
4a Lobes with mostly erect, branched lobules ..... var. *ceranoides* (Borrer) Degel.
4b Lobes without such structures
5a Lobes usually not glossy, with rather narrow lobules ..... var. *vulgare* (Schaer.) Degel.
5b Lobes usually with a silky gloss, with large, broad lobules ..... var. *expansum* Degel.

Their taxonomic status needs further study, as some appear to be so distinct that they may deserve a higher rank (e.g. var. *expansum*, described from Dovre in Norway and clearly arctic-alpine, also noted from Greenland, Iceland and northern Sweden), while others (e.g. var. *ceranoides*) may just represent more insignificant variations/modifications.

26. **Collema undulatum** Laurer ex Flotow

Linnaea 23: 161 (1850). – TYPE: Switzerland, Riesengrund, Flotow, Deutsche Lich. no. 148 (UPS, lectotype, Degelius, Symb. Bot. Ups. 13(2): 366, 1954).

N: krusglye **S:** vågig gelélav

var. **undulatum**

Literature: Degelius 1954: 366–376.

Figs: Degelius 1954: pl. IVc.

THALLUS foliose, to 5 cm diam., in irregular, deeply lobed rosettes; lobes 3–4 mm wide, to 0.3 mm thick, rounded, with ascending, entire, wavy margins. Upper surface flat, olivaceous black, smooth. APOTHECIA common, usually numerous, to 1.5 mm diam.; disc flat or finally convex; thalline margin thin, often crenulate, becoming excluded at maturity; proper margin often visible, to 130 µm thick, paraplectenchymatous. Spores colourless, 3-septate, linear-oblong, 17–30 × 7–9 µm. CONIDIOMATA common, mostly in marginal verrucae; conidia bacilliform, colourless, slightly swollen apically, 4–4.5 × 1–1.5 µm. PHOTOBIONT *Nostoc* in short chains or clusters, individual cells globose, 4–6 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Saxicolous on calciferous rocks, mainly limestone.

Distribution. Uncommon and scattered. **N:** *Ak Op Bu Te Ho MR ST SNo NNo Tr VFi ØFi*. **S:** *Öl Gtl SmI Vsm Upl Hrj Jmt LyL LuL TL*. Otherwise scattered through Europe; also Alaska.

Note. Characteristic species due to the dark, often densely compacted, concave, wavy lobes, the convex apothecia with depressed thalline margine and the three-septate spores.

var. **granulosum** Degel.

Symb. Bot. Ups. 13(2): 369 (1954). – TYPE: Iceland, Rangarvallasysla, Mulakot, 2 July 1937 B. Lynge (O upper left specimen lectotype, Jørgensen, Nordic Lichen Flora 3: 143, 2007).

I: hosuslembra

Literature: Degelius 1954: 369–373.

Figs: Krog et al. 1990: 167; Brodo et al. 2001: 288.

Like var. *undulatum*, but with, often densely compacted, laminal, globose to squamulose isidia.

Habitat. Usually terricolous or bryophilous, rarely on rocks.

Distribution. More arctic-alpine than var. *undulatum*, though occasionally also found in the lowlands in northern parts. **Gr. Fa. I:** *ISu IVe IMi IAu INo*. **N:** *Ak Op Ho ST SNo NNo Tr ØFi*. **AI:** *Sb*. **S:** *Öl Gtl Hrj Jmt LuL.*

Note. Remarkable because of the numerous, globular, often squamiform isidia. It differs from the other isidiate, terricolous taxa by the thick thallus and wavy lobe-margins. C. *fuscovirens* is usually not quite as dark and has a small-pustulose thallus and different (submuriform) spores. It is not morphologically sharply distinguished from var. *undulatum*, but is still maintained as a taxon here, because it is ecogeographically different.

Leciophysma Th.Fr.

Bot. Not. 1865: 102 (1865). – TYPE: *Leciophysma finmarkicum* Th.Fr.

F: ruijanjäkälät

Literature: Henssen, Lichenologist 3: 30–34 (1965).

THALLUS small-squamulose to subfruticose, dark olive to blackish, without cortex, but with a reticulate pattern of hyphae. APOTHECIA sessile with distinct proper margin of radially arranged hyphae with gelatinised walls. Hymenium I+ blue with asci which are apically thickened. Spores simple, colourless, ellipsoid. CONIDIOMATA pycnidia with short-celled conidiophores producing bacilliform conidia laterally and apically. PHOTOBIONT *Nostoc* in chains.

Chemistry. No secondary substances (by TLC).

1 Thallus blackish, cushion-forming, with lobes to 1 mm long ..... 1. *L. finmarkicum*
– Thallus olivaceous, granulose, with small lobes, to 0.2 mm long ..... 2. *L. furfurascens*

1. **Leciophysma finmarkicum** Th.Fr.

Bot. Not. 1865: 112 (1865). – TYPE: Norway, Finnmark, Nesseby, 1864 Th. M. Fries (UPS lectotype, Henssen, Lichenologist 3: 31 1965).

F: ruijanjäkälä

Red-listed in: **I**

Literature: see genus.

Figs: Henssen 1965: pls. 1a, 2d, g (anatomy).

THALLUS cushion-shaped, of partly ascending, blackish lobes to 1 mm long and to 1.5 mm wide. APOTHECIA common and well-developed, often larger than the lobes, to 1 mm diam., blackish brown, becoming convex and excluding the exciple. Hymenium with brownish gelatine in upper parts, with variable I-reaction. Spores simple, colourless, subglobose, with pointed apices, 15–20 × 10–15 µm. CONIDIOMATA appearing as black spots, to 0.1 mm diam., partly immersed in the thallus; conidia bacilliform, 2–3 × 1 µm. PHOTOBIONT *Nostoc*, individual cells 4–5(–7) µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Bryophilous on calcareous ground which does not dry out completely.

Distribution. Arctic-alpine species, rare and easily overlooked. **Gr. F:** *EnL*. **I:** *IMi INo*. **N:** *Ho ST NT Tr ØFi*. **AI:** *Bi Sb*. **S:** *Hrj Jmt LyL LuL TL*. Circumarctic, though avoiding the drier, continental parts.

Note. When sterile difficult to distinguish from young specimens of bryophilous *Collema* species, but usually fertile. For differences from *L. furfurascens*, see that species.

2. **Leciophysma furfurascens** (Nyl.) Gyeln.

Ann. Mus. Nat. Hung. 32: 176 (1939). – *Pannaria furfurascens* Nyl., Flora 56: 17 (1873). – TYPE: Russia, Karelia onegensis, Walkiamäki (Belaya Gora), 1872 Norrlin (H-NYL 31209 holotype).

Syn. *Leciophysma occidentale* E.Dahl

Literature: Henssen 1965; Jørgensen, Graphis Scripta 2: 56 (1988).

Figs: Henssen 1965: pls. 1b, 1c, 2c, e, f (sections).

THALLUS olivaceous, in small granulose patches, sometimes spreading irregularly over the substrate, lobes only 0.1–0.2 mm wide with a distinct pseudocortex. APOTHECIA rare, sessile, to 1 mm diam., blackish brown with distinct proper exciple which become excluded as the apothecia become convex. Spores simple, colourless, ellipsoid, 11–20 × 7–10 µm with slightly pointed ends. CONIDIOMATA not observed. PHOTOBIONT *Nostoc*, individual cells 4–6 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On soil in tundras, or on moist debris.

Distribution. Mainly arctic species, rare and poorly known. **Gr. N:** *NT Tr ØFi*. **S:** *Jmt LyL TL*. Also present in Russia and North America and there less arctic in distribution.

Note. Best recognized by the granulose thallus, but also distinguishable from the larger *L. finmarkicum* on the more ellipsoid spores and the rounded hyphal cells of the thallus.

Leptogium (Ach.) Gray

Nat. Arr. Br. Pl. 1: 400 (1821). – *Collema* **Leptogium* Ach., Lichenogr. Universalis: 654 (1810). – TYPE: *Leptogium lacerum* (Retz.) Gray (=*Leptogium lichenoides*).

F: kesijäkälät **S:** skinnlavar

Literature: Bjelland, Nova Hedwigia 72: 1–44 (2001); Jørgensen, Lichenologist 26: 1–29 (1994); Jørgensen & James, Lichenologist 15: 109–125 (1983); Sierk, Bryologist 67: 245–317 (1964).

THALLUS mostly foliose or squamulose, rarely crustose or shrubby, gelatinous, blue-grey to brown or blackish, homoiomerous, with upper and lower cortex or cellular throughout (in sect. *Homodium*), sometimes regularly hairy below (sect. *Mallotium*) or with irregular bundles of hapters. Upper surface smooth or wrinkled, sometimes with isidia. APOTHECIA laminal, sessile, with distinct thalline margin. Asci with 4–8 muriform, colourless, ellipsoid spores. CONIDIOMATA pycnidia, laminal or marginal, globose, partly immersed; conidia bacilliform, simple, colourless. PHOTOBIONT *Nostoc*.

Chemistry. No secondary substances (by TLC).

1 Thallus crustose to small-squamulose or shrubby, with cylindrical lobes, hardly exceeding 2 mm 2
– Thallus foliose, with broader lobes, more than 2 mm wide 12
2 Thallus crustose to areolate 3
– Thallus small-squamulose or shrubby 4
3 Thallus placoid-areolate, blackish; on hard limestone, only Gotland ..... 8. *L. diffractum*
– Thallus crustose, filmy to granular; on wet, calcareous rocks, Lapland ..... 1. *L. aquale*
4. Thallus mostly with cylindrical lobes 5
– Thallus mostly small-squamulose 6
5 Branches coarse, shiny, distinctly furrowed; on calcareous ground ..... 19. *L. schraderi*
– Branches finer, not shiny, smooth; on bark, rarely moist rocks ..... 22. *L. teretiusculum*
6 Thallus smooth, without distinct wrinkles, paraplectenchymatous throughout 7
– Thallus distinctly wrinkled, not paraplectenchymatous 11
7 Thallus with coralloid or lacerated margins 8
– Thallus entire or incised without such structures 10
8 Apothecia globose, to 0.5 mm diam., often gregarious; thallus minute, often stellately arranged around apothecia, lobes very fine, to 0.1 mm wide; on debris or rotting bark ..... 20. *L. subtile*
– Apothecia concave, to 1.2 mm diam., single; lobes to 2 mm wide, margin usually fimbriate; on the ground 9
9 Asci 8-spored, lobes usually broad, to 2 mm wide; amongst bryophytes on calcareous ground ..... 21. *L. tenuissimum*
– Asci 4-spored, lobes reduced, at most 0.5 mm wide; on bare, meagre soil ..... 23. *L. tetrasporum*
10 Squamules flat, imbricated in dense cushions, apothecia very rare; in calcareous, often alpine grasslands ..... 11. *L. imbricatum*
– Squamules convex, discrete, sometimes reduced to granules, apothecia frequent; on calcareous soil, rocks or walls in the lowlands ..... 3. *L. biatorinum*
11 Thallus heavily wrinkled, medulla voluminose when wet; saxicolous on seepage rock ..... 16. *L. plicatile*
– Thallus weakly wrinkled when dry, not swelling much when wet; bryophilous ..... 12. *L. intermedium*
12 Thallus tomentose on lower surface 13
– Thallus not tomentose, but occasionally with scattered anchoring hyphae 16
13 Thallus greyish, with widespreading, isidiate lobes 14
– Thallus brownish, caespitose, without isidia 15
14 Thallus wrinkled with scattered, grey-blue isidia and short hairs; rare, oceanic ..... 10. *L. hibernicum*
– Thallus smooth with blackish isidia and long hairs; widespread ..... 18. *L. saturninum*
15. Thallus of crisped, overlapping lobules, short-haired below, apothecia common, with lobulate margins; oceanic, bryophilous ..... 5. *L. burgessii*

– Thallus of spreading lobes with undulating margins, long-haired below, apothecia rare, non-lobulate on the margins; arctic tundra.....2. *L. arcticum*
16. Thallus blue-grey with widespreading lobes about 3 mm wide or more 17
– Thallus brown-grey, often cushion-forming, lobes often less than 3 mm wide 20
17. Thallus isidiate ..... 7. *L. cyanescens*
– Thallus not isidiate, usually with apothecia 18
18. Lobes not more than 3 mm wide, thallus thin (not more than 50 µm), spores 4/ascus, less than 20 µm long; on inundated roots or rocks by rivers .. 17. *L. rivulare*
– Lobes usually 5 mm or more, thicker (100 µm or more), spores 8/ascus, longer than 20 µm; bryophilous on trees or rocks 19
19. Thallus shiny, rather thick, to 200 µm, striate, apothecia sessile, with paraplectenchymatous layer beneath the subhymenium; bryophilous in woodlands ..... 6. *L. cochleatum*
– Thallus matt, papery thin, to 100 µm, bullate, often contorted, apothecia shortly stalked, without paraplectenchymatous layer; amongst grass on maritime cliffs ..... 4. *L. britannicum*
20. Thallus with revolute, often tube-formed lobes ..... 15. *L. palmatum*
– Thallus with flat, not tube-formed lobes 21
21. Lobe margins fimbriately torn, with raised rib-like wrinkles ..... 13. *L. lichenoides*
– Lobe margins not torn, though often incised, if wrinkled not rib-like 22
22. Thallus with dark, marginal and laminal isidia, not swelling much when wet; slightly nitrophilous ..... 14. *L. magnussonii*
– Thallus without isidia, swelling when wet; slightly calciphilous ..... 9. *L. gelatinosum*

1. **Leptogium aquale** (Arnold) P.M.Jørg.

Lichenologist 26: 1(1994). – *Leptogium pusillum* var. *aquale* Arnold, Verh. K.K. Zool.-Bot. Ges. Wien 23: 489 (1873). – TYPE: Austria, Tirol, Matrei, unterhalb Waldrast, 1872 Arnold, Lich. Exs. no. 481 (M lectotype, Jørgensen, Lichenologist 26: 1, 1994).

S: bäckskinnlav

Literature: Jørgensen 1994: 2, Nordin, Thunbergia 32: 17 (2002).

Figs: Jørgensen 1994: 2.

THALLUS crustose, mainly a film over the rock which is partly granular, paraplectenchymatous throughout, to 70 µm thick. APOTHECIA common, to 0.5 mm diam., globose, with prominent cellular proper margin and brownish, concave disc, sometimes surrounded by a crenulate thalline collar. Spores colourless, broadly ellipsoid, submuriform, (25–)30–45(–50) × 10–14 µm. CONIDIOMATA rare, more or less immersed; conidia dumb-bell shaped, 3.5–4 × 1.2–1.5 µm. PHOTOBIONT *Nostoc* in chains, individual cells c. 4–5 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. In the inundation zone of lakes and streams, on calcareous ground.

Distribution. Rare, possibly overlooked, alpine species, recently discovered in our region. **S:** *LyL*. Otherwise only known from the Alps.

Note. Unique taxon in the *L. biatorinum* complex, easily recognized on the filmy thallus and the collared apothecia, as well as the habitat. Possibly identical with the arctic *L. parculum* Nyl., which appears to have smaller spores (only known from poor type specimen).

2. **Leptogium arcticum** P.M.Jørg.

Herzogia 2: 454 (1973). – TYPE: Alaska, Ogoturuk Creek Drainage, Snowbank Creek, 1969 Krog (O holotype).

Literature: Jørgensen, Herzogia 2: 454–455 (1973).

THALLUS foliose, in cushions to 5 cm diam., individual lobes rounded, undulating marginally, to 1 cm wide and 150 µm thick. Upper surface smooth, brownish; lower surface with hairs, to 100 µm long, with cylindrical cells. APOTHECIA and CONIDIOMATA unknown. PHOTOBIONT *Nostoc* in clusters, individual cells 4–6 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Terricolous in wet tundra.

Distribution. Arctic species, widespread but uncommon or overlooked. **Gr**. Otherwise in northern Canada, Alaska and northern Russia. To be expected in Svalbard.

Note. Superficially rather like a *Collema* due to the quite thin, often transparent, brownish thallus, but with distinct cortex. Closely related to the corticolous *L. saturninum* from which it differs morphologically in the absence of isidia as well as in ecology.

3. **Leptogium biatorinum** (Nyl.) Leight.

Lich. Fl. Gr. Brit., ed. 3: 25 (1879). – *Collema biatorinum* Nyl., Acta Soc. Linn. Bordeaux 21: 268 (1857). – TYPE: France, Normandie, Vire, Lenormand (PC? syntype).

Syn. (?)*Leptogium cretaceum* (Sm.) Nyl., *Leptogium pusillum* Nyl.

F: pikkukesijäkälä **S:** kalkskinnlav

Red-listed in: **D F**

Literature: Degelius, Svensk Bot. Tidskr. 38: 183–184 (1944); Jørgensen, Lichenologist 26: 3, 28 (1994).

Figs: Jørgensen 1994: 4.

THALLUS squamulose-crustose, forming blackish covers on the ground, individual squamules 0.3–0.5 mm diam., with crenulate margins, 50–120 µm thick, sometimes reduced to granules. APOTHECIA common, to 0.5 mm diam., with dark, distinct, paraplectenchymatous proper margin; disc concave to flat, dark brown. Spores colourless, submuriform, broadly ellipsoid, 25–30 × 10–14 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc* in clusters, individual cells 4–6 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Growing directly on calcareous soil, rocks or walls.

Distribution. A southern element. **D:** *NJy Sjæ*. **F:** *V U EH KiL*. **S:** *Sk Bl Öl Gtl SmI Bh Dls Vg Nrk Upl Gst*. Otherwise widespread in warm-temperate parts of the Northern Hemisphere, but avoiding the colder regions.

Note. A variable species, the variation of which is not well understood. Specimens from rather dry, calcareous rocks and soil tend to be granulose (quite rare in our region), just as the type of *L. cretaceum* (older name) from chalk in southern England, while those from mossy soil are more squamulose. The taxonomic value of this variation is in need of further studies.

4. **Leptogium britannicum** P.M.Jørg. & P.James

Lichenologist 15: 110 (1983). – TYPE: Scotland, Mid Ebudes, Island of Mull, south side of Ardemeanach Peninsula, Scobull Point, 1968 James (BM holotype).

N: papirhinnelav

Red-listed in: **N**

Literature: Jørgensen & James, Lichenologist 15: 110–112 (1983); Jørgensen, Graphis Scripta 2(2): 57–58 (1988); Tønsberg et al., Sommerfeltia 23: 91 (1996); Tønsberg, Johnsen & Øvstedal, Graphis Scripta 17: 39–40 (2005).

Figs: Dobson 2000: 217; Jørgensen & James 1983: 114.

THALLUS foliose, to 10 cm diam., with irregular lobes, papyraceous, 0.5–1.5 cm wide, 50–70 µm thick, pale grey-blue, upper surface undulate, corrugate-crumpled, bullate, often convoluted. APOTHECIA unknown in Nordic material, 0.8–1.2 mm diam., top-shaped with short, pale, terete stalk; disc red-brown; thalline margin distinct, often closed in old apothecia. Spores colourless, submuriform, narrowly ellipsoid, 20–30 × 6–7 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc* in clusters, individual cells 4–6 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. In short-grass grasslands on maritime cliffs.

Distribution. Rare, western. First discovered locality in Norway destroyed, but recently rediscovered in others. **Fa. N:** *Ro Ho*. Otherwise known in western Europe: British Isles; one locality in SW Chile.

5. **Leptogium burgessii** (L.) Mont.

in Webb & Berthelot, Hist. Nat. Iles Canaries 3: 129 (1840). – *Lichen burgessii* L., Syst. Nat., ed. 13: 807 (1774). – TYPE: Scotland, Burgess (LINN 1273.91 lectotype, left-hand specimen, Jørgensen et al., Bot. J. Linn. Soc. 115: 372, 1994).

N: kranshinnelav

Red-listed in: **N**

Literature: Bjelland, Nova Hedwigia 72: 10, etc. (2001); Degelius, Kongel. Norske Vidensk. Selsk. Forh. 9(29): 114–116 (1936); Jørgensen, Symb. Bot. Upsal. 31(3): 301 (1996); Tønsberg et al., Sommerfeltia 23: 91–93 (1996); Wallace, Sporevariasjon hos arter av *Leptogium* sect. *Mallotium*. Unpublished Cand. Scient. thesis, Univ. Bergen (1983).

Figs: Krog et al. 1980: 180; Holien & Tønsberg 2006: 129.

THALLUS foliose, forming tufts, to 8 cm diam., of numerous rounded crisped lobes, to 5 mm wide, 100–120 µm thick, usually convoluted and overlapping with numerous folioles, dark brownish on upper surface; lower surface grey-blue, densely covered with short, short-celled hairs. APOTHECIA common, brownish, to 3 mm diam., with numerous folioles. Spores colourless,

ellipsoid, muriform, 30–40 × 15–17 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc* in clusters, individual cells 4–6 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Bryophilous on mossy rocks or trunks of coarse-barked trees (mostly pollarded *Fraxinus*) in sheltered, damp, lowland localities (to c. 200 m).

Distribution. Oceanic, only known from western Norway in our region, locally quite common, but scattered. **N:** *Ro Ho SF MR*. Otherwise confined to western Europe, but widespread in tropical montane forests and wet, warm temperate parts of the world, also in the Southern Hemisphere (New Zealand).

Note. Easily recognised by the many brownish, convoluted, lobulate lobules, forming cushions, and the short-haired, nearly pruinose lower surface. It is not very variable in our region. The other short-haired species of this genus in our region, the rarer *L. hibernicum*, has a flatter, more bluish, wrinkled thallus which swells much in moisture, with isidia on the upper surface, lacking the characteristic, lobulate apothecia of *L. burgessii*.

6. **Leptogium cochleatum** (Dicks.) P.M.Jørg. & P.James

Lichenologist 15: 113 (1983). – *Lichen cochleatus* Dicks., Fasc. Pl. Crypt. Brit. 1: 13 (1785). – TYPE: England, 1784 Dickson (LINN-Sm. lectotype, Jørgensen & James, Lichenologist 15: 113, 1983).

Syn. *Leptogium azureum* auct., *Leptogium tremelloides* L.f., *nom. illeg*.

N: prakthinnelav

Red-listed in: **N**

Literature: Jørgensen & James: Lichenologist 15: 113–116 (1983); Tønsberg et al., Sommerfeltia 23: 94–95 (1996); Bjelland 2001: 10.

Figs: Jørgensen & James 1983: 114 (Fig 1B).

THALLUS foliose, to 10 cm diam., of often overlapping, rounded and entire lobes to 1 cm wide; 120–150 (200) µm thick; upper surface often rather shiny, dark leaden grey, uneven, finely striate. APOTHECIA usually present, to 2.5 mm diam., sessile, with distinct, to 150 µm wide, thalline margin, obscuring the cellular proper margin; disc brown. Spores colourless, ellipsoid, muriform, (20–) 25–30(–35) × (5–)6–7(–8) µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc* in chains, individual cells 2–4 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. A species of old woodlands, now restricted to mossy trunks of pollarded *Fraxinus* in the agricultural landscapes of the Norwegian lowlands (below 100 m).

Distribution. Very rare, oceanic, only known from few localitites. **N:** *Ro Ho*. Atlantic-mediterranean in Europe, also in Macaronesia, East Africa and India.

Note. Characteristic species which for long was confused with the tropical, thinner, smoother, bluer *L. azureum* (Ach.) Mont., a species which is barely present in Europe (one locality only known, in South Spain). *L. cochleatum* cannot be confused with any other species in our region, but in its juvenile and compacted sterile forms, looking like flat, blue roses, it may be difficult to distinguish from similarly stunted forms of *L. cyanescens*, which then has few true isidia, a character normally distinguishing the two easily. However, *L. cyanescens* is always thinner and smoother, and has *Nostoc* in clusters (individual cell 4–6 µm diam.) while *L. cochleatum* has chains of this cyanobiont with smaller cells (2–4 µm diam.).

7. **Leptogium cyanescens** (Rabenh.) Körb.

Syst. Lich. Germ.: 420 (1855). – *Collema cyanescens* Rabenh., Deutschl. Krypt-Fl.: 50 (1845). – TYPE: Switzerland, Ticino, Schaerer, Lich. Helv. no. 409 (BM lectotype, Jørgensen & James, Lichenologist 15: 119, 1983).

Syn. "*Leptogium caesium* (Ach.) Vain."

F: sinikesijäkälä **N:** blyhinnelav **S:** gråblå skinnlav

Red-listed in: **F S**

Literature: Degelius, Acta Phytogeogr. Suec. 7: 52–62 (1935); Jørgensen & James, Lichenologist 15: 109, 112, 119 (1983); Thor & Arvidsson (eds) 1999: 206–207 (1999); Bjelland 2001: 11.

Figs: Krog et al. 1980: 180; Thor & Arvidsson (eds) 1999: 278; Holien & Tønsberg 2006: 129.

THALLUS blue-grey, foliose, irregularly spreading to 10 cm diam., of entire, rounded, thin (to 100 µm thick) lobes, to 1 cm wide; upper surface often covered with

coralloid isidia mixed with lobules; lower surface paler, naked and smooth. APOTHECIA rare, initially sessile, later shortly stalked, to 2 mm diam., with brown disc and isidiate grey-blue thalline margin, obscuring the proper exciple of periclinal hyphae. Spores colourless ellipsoid, submuriform, 18–23(–25) × (6–)7–9(–10) µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc* in clusters, individual cells 4–6 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On moist, mossy rocks or on boles of coarse-barked trees in lowland deciduous forests.

Distribution. Suboceanic, mainly coastal and western, but present as far east as Karelia and Komi Republic, Russia. Locally rather common. **Fa**? **F:** *V U EK St EH ES PH PS PK KP Kn Ks KiL*. **N:** *Øf Ak He Op Bu Te AA VA Ro Ho SF MR ST SNo*. **S:** (*Sk*) *Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Jmt Nb LuL*. Also in Asia and North America.

8. **Leptogium diffractum** Kremp. ex Körb.

Parerga Lichenol.: 424 (1865). – TYPE: Germany, Prunn unweit Riedenburg im Altmülthal, 1863 Arnold, Lich. Exs. no. 156b (L lectotype, Guttová & Jørgensen, Mycotaxon 93: 375, 2005).

S: skorpskinnlav

Red-listed in: **S**

Literature: Degelius, Svensk Bot. Tidsskr. 37: 65–72 (1943); Guttová & Jørgensen, Mycotaxon 93: 373–378 (2005); Thor & Arvidsson (eds) 1999: 208; Nygren, Examensarbete naturvårdsbiologi, SLU, 82: 1–30 (2002); Guttova & Jørgensen, Mycotaxon 93: 373–378 (2005).

Figs: Thor & Arvidsson (eds) 1999: 279.

THALLUS placoid-squamulose, forming blackish circles to 1 cm diam. on the rock; marginal squamules flat to convex and fingerlike elongated, to c. 1 mm long and 0.5 mm wide, cellular throughout; middle squamules more reduced, often eroding, leaving areas of radiating marginal lobes; upper surface wrinkled and glossy, particularly towards the lobe-ends, APOTHECIA very rare (unknown in our region), to 0.5 mm diam., with olivaceous brown disc. Spores colourless, ellipsoid, muriform 15–30 × 8–10 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc* in clusters, individual cells 4–6 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Saxicolous on hard, well-lit calcareous rocks.

Distribution. Very rare, southern, only known from a few localities in a restricted area. **S:** *Gtl*. Otherwise known mainly from Central Europe, though reaching as far west as the southern parts of the British Isles.

Note. Unique species in the genus, superficially rather like a small *Collema* (particularly *C. parvum*), from which it differs mainly in the cellular thallus.

9. **Leptogium gelatinosum** (With.) J.R.Laundon

Lichenologist 16: 219 (1984). – *Lichen gelatinosus* With., Bot. Arr. Veg. Gr. Brit. 1: 710 (1776). – TYPE: England, Herefordshire, Wigmore, Dillenius, Icon in Dillenius, Historia Muscorum: tab. 19, Fig. 33, 1742 (holotype); corresponding specimen in herb. Dillenius (OXF epitype, Jørgensen, Nordic Lichen Flora 3: 143, 2007).

Syn. *Leptogium sinuatum* (Huds.) A.Massal., *Leptogium scotinum* (Ach.) Fr.

F: ruskokesijäkälä **I:** bylgjutjása **N:** tuehinnelav **S:** flikig skinnlav

Red-listed in: **D**

Literature: Arup & Ekman, Skyddsvärda lavar i sydvästra Sverige: 204–25 (1997); Thor & Arvidsson (eds) 1999: 209–210.

Figs: Brodo et al. 2001: 406; Dobson 2000: 218; Krog et al. 1980: 182; Ozenda & Clauzade 1970: 318 (Fig. 253); Thor & Arvidsson (eds) 1999: 279; Wirth 1995: 549; Holien & Tønsberg 2006: 130.

THALLUS squamulose, consisting of rounded lobes to 3(–5) mm wide and to 130 µm thick, entire or crenate, occasionally indented (but never fimbriately sliced), forming cushions to 5 cm diam.; upper surface dark brown, often glossy and distinctly wrinkled. APOTHECIA common, to 2 mm diam., with brown, mostly flat disc and raised, paler proper exciple. Spores colourless, muriform, ellipsoid, 25–40 × 11–15(–17) µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc* in short chains, individual cells 4–6 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Bryophilous or terricolous, on somewhat calciferous ground, rarely at bases of old trees.

Distribution. Widespread and rather common, rare in the arctic. **D:** *NJy VJy SJy Fyn Sjæ Brn*. **Gr. Fa. F:** *A V U EH PS PK KP Kn OP PeP Ks KiL EnL InL*. **I:** *ISu IVe IAu INo*. **N:** *Øf Ak He Op Bu Vf Te Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **AI:** *Sb*. **S:** *Sk Bl Öl Gtl SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hrj Jmt Vb ÅsL LyL PL LuL TL*. Widespread in the Northern Hemisphere.

Note. Very variable species, the typical form of which has shiny, rounded, broad, fertile lobes and cannot be confused with any other species, but forms on meagre substrates (sand) may often be deeply incised with secondary lobules and approach *L. lichenoides*, which, however, have fimbriate lobe-margins and a prominent ribbed pattern on the lobe-surface.

10. **Leptogium hibernicum** P.M.Jørg.

Herzogia 2: 462 (1973). – TYPE: Ireland, Killarney, Torc Cascades, 1933 Degelius (UPS holotype).

N: irsk hinnelav

Red-listed in: **N**

Literature: Bjelland 2001: 11.

Figs: Bjelland 2001: 24 (fig. 17, details of hairs); Krog et al. 1980: 181.

THALLUS foliose, with auriform lobes to 1 cm wide., swelling considerably when wet, 250–400 µm thick; upper surface bluish grey, sometimes browned, wrinkled, with nodular isidia and coarse lobules in marginal parts; lower surface paler, covered by short hairs, to 20 µm long with globose cells. These are sometimes also partly present on the upper surface, and evidently act as thalloconidia. APOTHECIA unknown in Norwegian material. CONIDIOMATA unknown. PHOTOBIONT *Nostoc* in chains, individual cells 3–4 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Bryophilous or corticolous on trunks of pollarded *Fraxinus* in moist lowland, agricultural landscapes.

Distribution. Rare, extremely oceanic, only in SW Norway. **N:** *Ro Ho*. Also in the British Isles.

Note. Easily recognized species by the wrinkled, strongly swelling thallus and the short hairs which superficially look like pruina.

11. **Leptogium imbricatum** P.M.Jørg.

Lichenologist 26: 7 (1994). – TYPE: Russia, Karelia ladogensis, Lumivaara, Kalksalo, Loukiosaaret, ad rupes litoris prope lacu Laatokka (Ladoga), 1934 Räsänen (H holotype).

F: limikesijäkälä **N:** skjellhinnelav **S:** fjällskinnlav

Literature: Jørgensen, Lichenologist 26: 7–12 (1994).

Figs: Jørgensen 1994: 8 (fig. 4).

THALLUS of imbricate squamules, forming cushions to 3 cm diam.; individual squamules 0.2–0.5(–1.0) mm wide and 50–80 µm thick, paraplectenchymatous throughout; upper surface brown, smooth; lower surface blue-grey with occasional, irregular tufts of hairs (hapters). APOTHECIA rare, with elevated, prominent, cellular proper margin; disc brown, concave to convex. Spores colourless, muriform, ellipsoid, 20–35 × 7–15 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc* in short chains, individual cells 4–5 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Terricolous or bryophilous on somewhat calciferous ground.

Distribution. Mainly arctic-alpine, though with many lowland localities in boreal regions. **F:** *V EK Kn OP Ks EnL*. **N:** *Øf Ak Op Te Ro Ho ST NT SNo NNo Tr VFi ØFi*. **AI:** *Sb*. **S:** *Öl Gtl Bh Vg Ög Srm Vrm Upl Gst Hls Hrj Vb ÅsL LyL LuL TL*. Otherwise known from adjacent Russia and Estonia, as well as from the Alps and the Scottish mountains, probably circumarctic.

Note. Rather easily recognized by the imbricate lobes, but sometimes difficult to distinguish from stunted forms of *L. lichenoides* or *L. gelatinosum* (so called var. *pulvinatum*), from which it is best distinguished on the completely cellular thallus.

12. **Leptogium intermedium** (Arnold) Arnold

Flora 68: 212 (1885). – *Leptogium minutissimum* var. *intermedium* Arnold, Flora 50: 122 (1867). – TYPE: Switzerland, near Zürich, Hepp, Flechten Eur. no. 212 (M lectotype, Jørgensen, Lichenologist 26: 2, 1994).

Syn. *Leptogium minutissimum* auct.

F: tannerkesijäkälä **N:** putehinnelav **S:** kuddskinnlav

Literature: Jørgensen 1994: 12–14.

Figs: Jørgensen 1994: 10 (fig. 5, anatomy of thallus); Ozenda & Clauzade 1970: 320 (fig. 255, as "*Leptogium subtile*").

THALLUS of spreading squamules, often forming colonies to 3 cm diam., to 100 µm thick; individual squamules shallowly incised, to 1 mm wide, not swelling much when wet due to its mainly cellular structure; upper surface grey-brown, indistinctly wrinkled; lower surface paler, with scattered tufts of anchoring hyphae (hapters). APOTHECIA common, laminal, to 0.5 mm diam., with distinct thalline margin, 40–60 µm wide, and concave, brown disc. Spores colourless, muriform, ellipsoid, 20–35 × 8–12 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc* in short chains, individual cells 4–5 µm.

Chemistry. No secondary substances (by TLC).

Habitat. Bryophilous on somewhat calciferous ground or on bases of old trees.

Distribution. Widespread but scattered. **F:** *V U EH EnL InL*. **I:** *INo*. **N:** *Øf Op Te Ro Ho SNo*. **AI:** *Sb*? **S:** *Sk Gtl Bh Dls Ög Upl Dlr Hls Hrj Jmt LuL TL*. Otherwise in the Northern Hemisphere, reaching as far north as the Arctic (where it is rare).

Note. *L. intermedium* looks like a diminutive *L. gelatinosum*, and can be distinguished from small forms of this on the anatomy, the much firmer organized thallus without a loose medulla.

13. **Leptogium lichenoides** (L.) Zahlbr.

Catal. Lichenogr. Universalis 3: 136 (1924). – *Tremella lichenoides* L., Sp. Pl. 2: 1157 (1753). – TYPE: Sweden (without locality), Linnaeus 1020 (LINN 1276.9 lectotype, Jørgensen et al., Bot. J. Linn. Soc. 115: 383, 1994).

Syn. *Leptogium atrocaeruleum* (Schaer.) A.Massal., *Leptogium lacerum* (Retz.) Gray; *Leptogium pulvinatum* (Hoffm.) Flagey, *Lichen tremelloides* Weiss.

D: frynset hindelav **F:** risakesijäkälä **I:** larfatjása **N:** flishinnelav **S:** traslav

Red-listed in: **D**

Literature: Sierk, Bryologist 67: 286–289 (1964).

Figs: Brodo et al. 2001: 406; Dobson 2000: 218; Moberg & Holmåsen 1982: 72; Krog et al. 1980: 181; Ozenda & Clauzade 1970: 318 (fig. 253); Wirth 1995: 549; Holien & Tønsberg 2006: 130.

THALLUS forming loosely attached cushions to 6 cm diam., with squamulose, spreading lobes, to 150 µm thick, which are fimbriately torn at the margins, appearing partly isidioid in some specimens; upper surface often shiny brown or more rarely grey-blue, wrinkled, often with some coarse ridges across; lower surface grey-blue, ridged, often with bundles of hapters. APOTHECIA laminal, rare, sessile, to 1 mm diam., with isidiate/lobulate thalline margin. Spores colourless, muriform, ellipsoid, 30–45 × 12–15 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc* in short chains, individual cells 4–6 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Bryophilous and basiphilous on rocks or tree trunks, preferably in damp situations, usually woodlands, though also in tundra.

Distribution. Rather common and widespread, rare in the Arctic. **D:** *ØJy Brn*. **Gr. Fa. F:** *A V U EH EP PK KP OP PeP Ks EnL InL*. **I:** *ISu IVe IMi IAu INv INo*. **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **AI:** *Sb*. **S:** *Sk Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. A widespread species in the world.

Note. A very variable species, which is normally easily recognized on the fimbriate lobe-margins and ridged wrinkles on the thallus, though the colour, size and growthform of the thallus is most changeable (by the environment). In the mountains and in exposed habitats it is often reduced to dense cushions of a dark brown colour (sometimes regarded as a separate species, *L. pulvinatum*, a matter which requires further studies); in shaded, damp localities it is broader lobed and bluish.

14. **Leptogium magnussonii** Degel. & P.M.Jørg.

Lichenologist 26: 14 (1994). – TYPE: Sweden, Västergötland, Otterstad, Kållandsö, Läckö peninsula opposite the castle, 1961 Degelius (UPS holotype).

F: lännenkesijäkälä **N:** strandhinnelav **S:** kustskinnlav

Red-listed in: **F N S**

Literature: Jørgensen 1994: 14–18; Thor & Arvidsson: 1999: 211–212; Tønsberg et al., Sommerfeltia 23: 97 (1996).

Figs: Jørgensen 1994: 15.

THALLUS foliose, to 5 cm diam. Lobes rounded, irregular, 2–3 mm wide, 100–125 µm thick; upper surface dark blue-grey, often browned, smooth, partially finely striate with blackish brown, coralloid, often clustered isidia. Lower surface usually blue-grey. APOTHECIA very rare, laminal, shortly pedicellate, only known as immature. CONIDIOMATA unknown. PHOTOBIONT *Nostoc* in short chains, individual cells 4–6 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On seepages, at seeshores or on rocks in pastures, somewhat nitrophilous, often directly on the rocks.

Distribution. Quite uncommon, though overlooked until recently. **F:** *V*. **N:** *Øf Ro Ho*. **S:** *Sk Klm Hl Bh Vg Ög Vrm Vsm*. Otherwise known from Central Europe and the Iberian Peninsula.

Note. Though previously confused with *L. lichenoides*, it is probably closer related to *L. palmatum*. From the former it is clearly distinguished by the lack of marginally torn lobes, the presence of dark isidia also laminally, and a different anatomy (compacter medulla).

15. **Leptogium palmatum** (Huds.) Mont.

in Durieu, Expl. Sci. Algerie 6: 209 (1846). – *Lichen palmatus* Huds., Fl. Angl., ed. 2, 2: 536 (1778). – TYPE: Icon in Dillenius, Historia Muscorum: tab. 19, fig. 30, 1742 (lectotype, Jørgensen, Nordic Lichen Flora 3: 144, 2007); corresponding specimen in herb. Dillenius (OXF epitype, Jørgensen, Nordic Lichen Flora 3: 144, 2007).

Syn. *Leptogium corniculatum* auct. (= (Hoffm.)Minks?)

N: kysthinnelav **S:** strutskinnlav

Red-listed in: **D S**

Literature: Degelius, Acta Phytogeogr. Suec. 7: 62–68 (1935); Nordén, Svensk Bot. Tidskr. 88: 75–81 (1993); Thor & Arvidsson (eds) 1999: 204–205.

Figs: Brodo et al. 2001: 403; Ozenda & Clauzade 1970: 318 (Fig. 253); Thor & Arvidsson (eds) 1999: 277.

THALLUS forming tufts to 3 cm diam. of revolute lobes, to 3 mm wide and c. 100 µm thick, which often are more or less erect, forming tube-like structures; upper surface brownish, smooth or faintly wrinkled. APOTHECIA unknown in Nordic material. CONIDIOMATA unknown. PHOTOBIONT *Nostoc* in short chains, individual cells 3–4 µm.

Chemistry. No secondary substances (by TLC).

Habitat. Bryophilous on wet rocks in pastures, or on non-exposed walls.

Distribution. Western, quite rare and reported as retreating in most of the countries. **D:** *NJy VJy Fyn Sjæ Brn*. **N:** *AA VA Ro Ho SF MR ST SNo NNo*. **S:** *Sk Bl SmI Hl Bh Dls Vg Ög Srm*. Otherwise known from coastal Europe, N America and NE Asia.

Note. Unmistakable when typically developed because of the inwardly curled margins. In broad-lobed specimens this character may be poorly developed and the species is then best distinguished from the other tufted species (e.g. *L. lichenoides*) by the smooth, non-shiny upper surface.

16. **Leptogium plicatile** (Ach.) Leight.

Lich. Fl. Gr. Brit., ed. 3: 30 (1879). – *Lichen plicatilis* Ach., Kongl. Vetensk. Akad. Nya Handl. 16: 11 (1795). – TYPE: Sweden, Vättern,'ad littora lacus', Acharius (UPS-ACH lectotype, Jørgensen, Nordic Lichen Flora 3: 144, 2007)

Syn. *Leptogium hydrocharum* (Ach.) Zahlbr.

F: poimukesijäkälä **N:** foldhinnelav **S:** smal skinnlav

Literature: Albertsson, Acta Phytogeogr. Suec. 20: 219 (1946); Degelius, Acta Horti Gotob. 20: 48 (1955).

Figs: Dobson 2000: 219; van Herk & Aptroot 2004: 239; Wirth 1995: 553.

THALLUS forming closely appressed rosettes, to 5 cm diam., of rounded, very tough, rigid, swelling, thick (to 350 µm) lobes, to 3 mm wide; upper surface dark brown-black, uneven, often ridged and with isidia-like warts; cortex poorly developed. APOTHECIA fairly common, marginal or laminal, to 1.5 mm diam., with prominent thalline margin and concave brown disc. Spores colourless, muriform, ellipsoid 20–25(–30) × 8–16 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc* in chains, individual cells 3–4 µm.

Chemistry. No secondary substances (by TLC).

Habitat. On calcareous rocks in the submersion zone of lakes or on seepages.

Distribution. Widespread but scattered. **F:** *V*. **N:** *Øf Ak Vf Ro Ho ST NT SNo NNo Tr ØFi*. **S:** *Sk Bh Vg Ög Srm Upl Dlr LyL TL*. Otherwise known scattered throughout the temperate parts of the Northern Hemisphere, and also recorded from New Zealand.

Note. Unique species in the genus, but easily confused with a *Collema* due to the dark colour and texture of the thallus and the poorly developed cortex. It is quite variable in the lobe development, the lowland lakeside forms being broad- and smooth-lobed, while seapage specimens of the mountains and in the north are narrow-lobed, with nearly isidiate surfaces. These forms may belong to distinct taxa as the variation is poorly understood and in need of further studies.

17. **Leptogium rivulare** (Ach.) Mont.

in Gaudichaud, Voy. Bonite, Bot. 2: 117 (1846), *nom. sed non specimen*. – *Lichen rivularis* Ach., Lichenogr. Suec. Prodr.: 131 (1799). – TYPE: Sweden (Suecia) (H-ACH 1915B holotype).

Syn. *Leptogium sernanderi* Du Rietz

F: purokesijäkälä **S:** strandskinnlav

Red-listed in: **S**

Literature: Du Rietz, Bot. Not. 1922: 317–322; Jørgensen & James 1983: 109, 112, 118, 120–122; Rossi et al., Suomen uhanal. kasvit: 369 (1985); Jørgensen 1994: 21–22; Thor & Arvidsson (eds) 1999: 213–214.

Figs: Jørgensen & James 1983: 118 (fig. 3B); Thor & Arvidsson (eds) 1999: 280.

THALLUS foliose, appressed to substrate, blue-grey, lobes 2–3 mm wide, to 50 µm thick; upper surface matt, smooth. APOTHECIA common, laminal, sessile, to 1 mm diam., with narrow margin, often excluded at maturity; proper exciple of periclinal hyphae. Spores 4/ascus, colourless, sparingly muriform, 15–20 × 7–8 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc* in clusters, individual cells 4–6 µm.

Chemistry. No secondary substances (by TLC).

Habitat. On partially inundated roots or bases of trees (particularly *Alnus glutinosa* and *Populus tremula* along rivers), or on rocks.

Distribution. Scattered, rather eastern, now very rare and threatened. **F:** (*KiL*). **S:** *Ög Vsm Upl Dlr Gst*. Otherwise known from NW Russia, Belarus, Estonia, France and NE North America only.

Note. Rather similar to *L. cyanescens*, but smaller and without true isidia, also much thinner and with four-spored asci.

18. **Leptogium saturninum** (Dicks.) Nyl.

Actes Soc. Linn. Bordeaux 21: 272 (1857). – *Lichen saturninus* Dicks., Fasc. Pl. Crypt. Brit. 2: 22 (1790). – TYPE: Icon, Ibid., Tab. 6, fig. 8 (holotype); Scotland, Perthshire, Glen Lovhay, J.M. Crombie, Lich. Brit. Exs. no. 5 (BM epitype, Nordic Lichen Flora 3: 144, 2007).

F: samettikesijäkälä **I:** loðtjása **N:** filthinnelav **S:** skinnlav

Literature: Sierk 1964: 268–270; Jørgensen, Herzogia 2: 453–468 (1973), 3: 433-460 (1975).

Figs: Brodo et al. 2001: 411; Krog et al. 1980: 181; Moberg & Holmåsen 1982: 72; Wirth 1995: 547, 554; Holien & Tønsberg 2006: 131.

THALLUS foliose, often orbicular, to 8 cm diam., lobes regularly rounded, to 2 cm wide, 150–250 µm thick, often orbicular; upper surface olivaceous grey-brown, usually appearing darker due to the numerous, blackish, granular to shortly cylindrical, laminal isidia; lower surface paler, covered with white tomental hairs, to 100 µm long with cylindrically cells. APOTHECIA very rare, to 2 mm diam., with isidiate margin, brownish. Spores colourless, submuriform, ellipsoid, 20–25 × 8–10 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc* in clusters, individual cells 4–6 µm.

Chemistry. No secondary substances (by TLC).

Habitat. Corticolous, mainly on coarse-barked trees, such as *Populus* and *Salix*, more rarely on mossy calcareous rocks and soil (e.g. *Dryas* heaths in mountains).

Distribution. Widespread and locally common. **Gr. Fa. F:** *A V U EK St EH ES LK EP PH PS PK KP Kn OP PeP Ks KiL SoL EnL InL*. **I:** *ISu IAu INo*. **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **S:** *Sk Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb ÅsL LyL LuL TL*. Otherwise widespread in cool-temperate parts of the Northern Hemisphere.

Note. Easily separated from the other broad-lobed species by the long-hairy lower surface and the granular, blackish isidia. *L. hibernicum*, which is also hairy below, has short-celled, nearly papillose hairs, globular, bluish isidia, and swells much when wetted.

19. **Leptogium schraderi** (Bernh.) Nyl.

Actes Soc. Linn. Bordeaux 21: 272 (1857). – *Lichen schraderi* Bernh., J. Bot. 1: 22 (1799). – TYPE: Icon, Ibid., Tab. II, fig. 5 (lectotypus, Jørgensen, Lichenologist 26: 22, 1994); Germany, Rheinland, Südost Eiffel, Elzthal, Pyremonter Mühle, 1960 Th. Müller (UPS epitype, Jørgensen, Nordic Lichen Flora 3: 144, 2007).

Syn. *Leptogium turgidum* (Ach.) Cromb.

D: grubet hindelav **N:** rynkehinnelav **S:** skrynklig skinnlav

Red-listed in: **D N S**

Literature: Albertson, Svensk Bot. Tidskr. 44: 115, 295 (1950); Christiansen et al., Bot. Tidsskr. 74: 100–101 (1979); Jørgensen 1994: 22–25; Thor & Arvidsson: 215–216; Tønsberg, Graphis Scripta 9: 27–31 (1998).

Figs: van Herk & Aptroot 2004: 241.

THALLUS glossy brown, forming small tufts of ascending cylindrical lobes, to 1 mm diam., strongly wrinkled, originating from a squamulose primary thallus. APOTHECIA very rare, to 1.5 mm diam., with granular thalline margin and brown disc. Spores colourless, ellipsoid, submuriform, 25–30 × 10–12 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc* in chains, scattered in the loose medulla, individual cells 3–4 µm.

Chemistry. No secondary substances (by TLC).

Habitat. Terricolous on rather dry, calcareous soil in short vegetation, or on stonewalls.

Distribution. Rare southern element, becoming rarer and threatened. **D:** *NJy ØJy Fyn Sjæ Brn*. **F:** *V*? **N:** *Øf Ro*. **S:** (*Sk*) (*Öl*) *Gtl Bh* (*Dls*) (*Vg*). Otherwise confined to the steppes of Central and southern Europe and the prairies of North America.

Note. A variable species which sometimes only develop a squamulose primary thallus; normally small-fruticose with knobby, wrinkled, cylindrical secondary lobes, and then unmistakable. The first form may be confused with forms of *L. plicatile*, which usually grows in wetter habitats, is less shiny and has a different anatomy. Both forms are known in the Nordic countries.

20. **Leptogium subtile** (Schrad.) Torss.

Enum. Lich. Byss. Scand.: 54 (1853). – *Lichen subtilis* Schrader, Spic. Fl. Germ. I: 95 (1794). – TYPE: Germania, Schrader (H-ACH 1920, lectotype, Jørgensen, Lichenologist 26: 25, 1994).

Syn. *Lichen byssinus* Hoffm., *nom. illeg*., *Collema minutissimum* Flörke, *nom. illeg*.

F: hentokesijäkälä **N:** dverghinnelav **S:** dvärgskinnlav

Literature: Albertson, Svensk Bot. Tidskr. 39: 120 (1945); Jørgensen 1994: 25–26.

Figs: van Herk & Aptroot 2004: 241; Jørgensen 1994: 26 (Fig. 13a); Thor & Arvidsson (eds) 1999: 281.

THALLUS small-squamulose of small, 0.5–1.5 mm wide, blue-grey squamules, 50–90 µm thick, cellular throughout, with nearly cylindrical, spreading lobes, stellately arranged around the apothecia. APOTHECIA numerous, globose, orange, with a distinct pale proper margin. Spores colourless, muriform, ellipsoid, 20–30 × 10–12 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc* in clusters, individual cells 4–6 µm.

Chemistry. No secondary substances (by TLC).

Habitat. On debris on the ground or on rotting bark.

Distribution. Scattered, uncommon or overlooked. **F:** (*V*) *U EK St EH PH PS PK KP Kn Ks KiL*. **I:** *ISu*. **N:** *He Op Ho SF ST SNo Tr*. **S:** *Sk Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt LyL*. European species.

Note. Easily recognized but often overlooked small species. Its most characteristic trait is the globular, fish-eye-like apothecia, which readily distinguish it from the larger *L. tenuissimum* which has larger, urceolate apothecia and marginally lacerated squamules.

21. **Leptogium tenuissimum** (Dicks.) Körb.

Syst. Lich. Germ.**:** 419 (1855).– *Lichen tenuissimus* Dicks., Fasc. Pl. Crypt. Brit. 1: 12 (1785). – TYPE: England, Norwich, 1782 Crowe (BM ?holotype).

Syn. *Leptogium spongiosum* (Sm.) Nyl., (?) *Leptogium humosum* Nyl.

F: korallikesijäkälä **N:** frynsehinnelav **S:** späd skinnlav

Red-listed in: **D**

Literature: Albertson, Acta Phytogeogr. Suec. 20: 219 (1946); Jørgensen 1994: 25.

Figs: Jørgensen 1994: 26 (Fig. 13B).

THALLUS small-squamulose, forming blue-grey to brown cushions; lobes to 2 mm wide and 80–100 µm thick, cellular throughout, crenate to deeply incised and fimbriate. APOTHECIA to 1.5 mm diam.; disc strongly concave, reddish brown, giving the apothecia an urceolate appearance; exciple distinct, often with attached lobules. Spores colourless, muriform, ellipsoid, 20–30 × 9–10 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc* in clusters, individual cells 4–6 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Calciferous soil or clay, often among mosses.

Distribution. Scattered, becoming rarer. **D:** (*ØJy*) (*Fyn*) (*Brn*). **Fa. F:** *V U EH ES PS PK KP Kn PeP Ks KiL EnL*. **I:** *ISu*. **N:** *Ak Op Bu Ho SF ST SNo Tr ØFi*. **S:** *Sk Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*(?). Widespread in temperate parts of the Northern Hemisphere.

22. **Leptogium teretiusculum** (Wallr.) Arnold

Ber. Bayer. Bot. Ges. 2, Anhang: 26 (1892). – *Lichen teretiusculus* Wallr., Fl. Crypt. Germ. 1: 551 (1831). – TYPE: Germany, Westfalen, near Höchster, 1877 Backhaus ex Lahm (UPS).

Syn. ?*Leptogium filiforme* (Arn.) Malbr.

F: sormikesijäkälä **N:** buskhinnelav **S:** dvärgtufs

Red-listed in: **D**

Literature: Jørgensen, Blyttia 30: 154 (1972); Magnusson, Bot. Not. 1934: 459–462.

Figs: Dobson 2000: 219.

THALLUS initially squamulose to cylindrical, with marginal isidia or branchlets which eventually form subfruticose cushions with dense clusters of brownish black, cylindrical branches, to 1 mm in length and 150 µm diam., cellular throughout. APOTHECIA rare, either laminal on squamules or terminal on branchlets, 0.5–1.5 mm diam., with concave to flat, brown disc and nodular exciple. Spores colourless, ellipsoid, submuriform, 20–30 × 10–12 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc* in clusters, individual cells 4–6 µm.

Chemistry. No secondary substances (by TLC).

Habitat. Corticolous on coarse-barked trees, especially *Populus tremula* or *Juniperus*, rarely on wet schistose rocks or soil.

Distribution. Widespread, commonest in the south, locally abundant. **D:** (*Fyn*). **F:** *V U EK St EH EP PS Kn OP PeP Ks SoL EnL*. **N:** *Øf Ak He Bu Vf Te AA VA Ho SF MR ST SNo*. **S:** *Sk Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Jmt ÅsL LyL TL*.

Note. A variable species, which – particularly when growing on wet rocks – is mainly squamulose with mostly clavate, marginal isidia (as in the type specimen). On bark it usually forms subfruticose cushions, originating from a cylindrical primary thallus. Intermediates between these two extremes are known, so they are generally considered as growth-forms of the same species. This is, however, in need of further studies, particularly since the squamulose form appears to have a different distribution (only known in W Norway in the Nordic countries).

23. **Leptogium tetrasporum** Th.Fr.

Öfvers. Förh. Kongl. Svenska Vetensk.-Akad. 21: 276 (1864). – TYPE: Sweden, Hälsingland, Bjuråkers socken, Stråsjöbys ägor, 1863 Hartman (UPS holotype).

N: leirhinnelav **S:** mo-traslav

Red-listed in: **N**

Literature: Fries 1864: 276; Jørgensen, Lichenologist 26: 28 (1994).

THALLUS small-squamulose to crustose, brownish, cellular throughout, to 100 µm thick, covering the substrate in small patches to 1 mm diam. APOTHECIA scattered, to 0.5 mm diam., with brown, flat disc and distinct proper exciple. Spores 4/ascus, colourless, muriform, 22–35 × 10–15 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc* in clusters, individual cells 4–6 µm.

Chemistry. No secondary substances (by TLC).

Habitat. Terricolous on meagre, clayey soil.

Distribution. Very rare, probably extinct (not recorded since the late 1800's). **N:** (*Op*). **S:** (*Hls*). Also known from a few collections in adjacent Russian Karelia as well as in North America (a recent find) and Central Europe(?).

Note. Insignificant species in the *L. biatorinum* group, best recognized on the spore number (4) in the asci.

Staurolemma Körb.

Verh. K.K. Zool.-Bot. Ges. Wien 17: 706 (1867). – TYPE: *Staurolemma omphalarioides* (Anzi) P.M.Jørg. & Henssen

Literature: Henssen, Lichenologist 3: 29–41 (1965); Bot. Not. 132: 257–282 (1979); Jørgensen & Henssen, Graphis Scripta 5: 12–17 (1993).

THALLUS blackish blue-green, squamulose to foliose, gelatinose, homoimerous, without proper cortex. APOTHECIA with distinct thalline margin; hymenium I–, or I+ blue in lower part only; asci without amyloid apical structures. Spores thick-walled, simple, subglobose to ellipsoid. CONIDIOMATA rare; conidia bacilliform. PHOTOBIONT *Nostoc* in chains.

Chemistry. No secondary substances (by TLC).

Note. Closely related to the Southern Hemisphere genus *Ramalodium* but with thalline margin on the apothecia. More often confused with *Collema*, from which it differs by the I– or only partly I+ blue hymenium, the lack of an amyloid apical ring-structure, and the simple spores.

1. **Staurolemma omphalarioides** (Anzi) P.M.Jørg. & Henssen

Graphis Scripta 5: 13 (1993). – *Collema omphalarioides* Anzi, Comm. Soc. Critt. Ital. 1 (3): 131 (1862). – TYPE: Italy, Fiesole, Monte S. Giuliano, Anzi Lich. Etrur. Rar. Exs. no. 46 (BM lectotype, Jørgensen & Henssen, Graphis Scripta 5: 13, 1993).

Syn. *Physma omphalorioides* (Anzi) Arnold

N: narreglye

Red-listed in: **N**

*Literature***:** Degelius, Svensk Bot. Tidskr. 49: 136–142 (1955); Jørgensen & Henssen, Graphis Scripta 5: 13 (1993); Tønsberg et al., Sommerfeltia 23: 191 (1996).

Figs: Jørgensen & Henssen 1993: 13.

THALLUS olivaceous black, forming cushions, to 3 cm diam., of more or less ligulate, mostly ascending lobules, which swell and become gelatinous when wet, to 400 µm thick; upper surface with granular, isidia-like structures. APOTHECIA marginal, with distinct, granular thalline exiple obscuring the paraplechtenchymatous proper exciple. Hymenium brown-pigmented in upper parts, I+ blue in lower parts only. Spores simple, colourless, rather thick-walled, globular (7–10 µm) to oblong (12–15 × 7–10 µm). CONIDIOMATA rare, immersed, with branched fairly short-celled conidiophores; conidia bacilliform, 3 × 1 µm. PHOTOBIONT *Nostoc* in chains, individual cells 4–5 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Corticolous on *Populus* and *Sorbus*.

Distribution. Very rare, coastal in central Norway. Highly threatened, only known from one locality at the moment. **N:** *NT* (*SNo*). Otherwise mediterranean-atlantic with the nearest localities in northern Italy.

Note. Superficially rather like *Collema fasciculare*, though more granular and with simple spores.

Heppiaceae

P. M. Jørgensen

Mainly squamulose, dark-coloured (mostly olivaceous) lichens with quite thick, swelling, mostly homoiomerous, partly corticate thallus. ASCOMATA apothecia, immersed in the thallus, containing prototunicate asci with I+ blue mucilage around the tips, 8-spored. Spores simple (though frequently with plasma bridges), colourless, ellipsoid to fusiform. CONIDIOMATA immersed in thallus with short-celled conidiophores, producing terminal bacilliform conidia. PHOTOBIONT cyanobacteria, mainly filamentous, *Scytonema*-like.

Chemistry. No secondary substances (by TLC).

Note. Though recognized by Zahlbruckner in 1907, long regarded also to include polysporous species (now in Peltulaceae). Henssen (1994) restricted the family only to the genus *Heppia*, a view that was confirmed by molecular methods by Schultz & Büdel (2003). The family was regarded by Henssen as having a rather isolated position, but Schultz & Büdel included it in the Lichinaceae, a matter in need of further studies.

Literature: Henssen, Acta Bot. Fenn. 150: 57–73 (1994); Schultz & Büdel, Lichenologist 35 : 151–156 (2003).

1 Apothecia deeply urceolate, immersed, with simple spores; thallus with irregular upper cortex, if any ..... *Heppia*
– Apothecia flat, sessile, with muriform spores; thallus with regular, multilayered upper cortex, or cellular throughout ..... *Epiphloea*

Epiphloea Trevis.

Rendiconti Reale Ist. Lombardo Sci. 13: 73 (1880). – TYPE: *Epiphloea terrena* (Nyl.)Trevis.

Syn. *Amphineum* Nyl., *nom. rejic*., *Latzelia* Zahlbr.

Literature: Gyelnik in Rabenh. Krypt.-Fl. Ed. 2, 9, Abt. 2(2): 112–114 (1940).

THALLUS crustose, areolate to squamulose, olivaceous grey, with cellular, multilayered upper cortex, partly cellular throughout; fastened to substrate by hyphae. APOTHECIA sessile, flat, rounded, red-brown, with narrow proper margin often obscured by thalline margin element. Asci prototunicate with external, amyloid cap, usually 8-spored. Spores colourless, ellipsoid, muriform. CONIDIOMATA unknown. PHOTOBIONT *Nostoc* or *Scytonema*.

Chemistry. No secondary substances (by TLC).

Note. Forgotten, not well understood genus which is characteristized by its special thallus (paraplectenchymatous throughout) and prototunicate asci containing muriform spores.

1. Epiphloea byssina (Hoffm.) Henssen & P.M.Jørg.

Nord. Lich. Fl. 3: 144 (2007). – *Collema byssinum* Hoffm., Deutschl. Fl.: 105 (1796). – TYPE: Germany, Zwackh- Holzhausen Exs. 174 (UPS neotype, Jørgensen 1994: 3).

Syn. *Leptogium byssinum* (Hoffm.) Nyl., *Leptogium anomalum* (Nyl.) Harm., *Leptogium amphineum* Ach. ex Nyl.

F: savikesijäkälä **S:** lerskinnlav

Red-listed in: **D**

Literature: Du Rietz, Svensk Bot. Tidskr. 17: 88–92 (1923); Jørgensen, Lichenologist 26: 3–5 (1994), Sierk, Bryologist 67: 271 (1964).

Figs: Jørgensen 1994: 4.

THALLUS crustose-areolate; areoles to 3 mm wide, brownish grey to blue-green, to 150 µm thick, partly (centrally) paraplectenchymatous throughout; marginal granules present, sometimes totally covering the areoles. APOTHECIA common, sessile, brown, with narrow proper margin often obscured by the thicker (to 100 µm), often granular, thalline margin. Spores colourless, ellipsoid, muriform, 16–28 × 7–15 µm. PHOTOBIONT *Nostoc* in clusters, individual cells 4–5 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Pioneer on naked soil, preferably clay, most probably rather short-lived and seasonal.

Distribution. Rare and scattered in southern and eastern parts, becoming rarer and extinct in most of its former

localities, mainly due to modern, more intensive agriculture, nowadays more often found on recently established roadbanks, etc. On the verge of being extinct in our region, but generally neglected since it grows in habitats not frequently studied by lichenologists. **D:** *Sjæ*. **F:** (*EH*) (*PK*). **S:** (*Bl*) (*Bh*) (*Vg*) (*Nrk*) *Vrm* (*Upl*) (*Hls*) *TL*?. Widespread in the Northern Hemisphere, commonest in regions with Mediterranean and continental climates.

Note. Though the close similarity of this species and *Epiphloea terrena* has been known for quite some time, no one has formally transferred it into this genus. It differs from all *Leptogium* species in its apothecia and the nearly crustose thallus, which is more similar to that of *Moelleropsis* with which it often grows, a species with a more pulverulent, noncellular bluish thallus and more superficial, convex apothecia with simple spores. It is closely related to the type species, *E. terrena*, but generally smaller with less well developed thallus and more broadly ellipsoid spores. *E. byssina* is a quite variable species, basically being a filmy, grey-brown cover on naked soil which breaks up irregularly in areoles developing granules marginally. The granulosity as well as the colour varies, as pointed out by Du Rietz (1923) who studied some populations in detail. The characteristic apothecia which fortunately nearly always is present, readily reveals the identity.

Heppia Nägeli ex A.Massal.

Geneac. Lich.: 7 (1854). – TYPE: *Heppia adglutinata* (Kremp.) A.Massal.

S: heppior

Literature: Büdel, Biblioth. Lichenol. 23: 1–105 (1987); Egea, Biblioth. Lichenol. 31: 1–122 (1989); Gyelnik, in Rabenh. Krypt.-Fl. Ed. 2, 9, Abt. 2(2): 111–134 (1940); Henssen, Acta Bot. Fenn. 150: 57–73 (1994); Swinscow & Krog, Norweg. J. Bot. 26: 213–224 (1979); Wetmore, Ann. Missouri Bot. Garden 57: 158–209 (1971); Thor & Arvidsson (eds) 1999: 187–188, 271.

THALLUS squamulose, sometimes nearly crustose or peltate, usually gelatinous, olivaceous to blackish olive, attached by rhizoid hyphae; homoiomerous or with cortex. APOTHECIA immersed with reddish brown disc; asci prototunicate, sometimes with I+ blue outer cap; hymenium usually I+ red-brown. Asci prototunicate, 8-spored. Spores colourless, ellipsoid, simple. CONIDIOMATA immersed, with short-celled conidiophores, producing terminal bacilliform conidia, c. 2.5–3.5 × 1–1.5 µm. PHOTOBIONT scytonemoid in chains.

Chemistry. No secondary substances (by TLC).

Note. *Heppia* are here understood to contain only 8-spored species, as defined by Henssen (1994).

1 Thallus granulose to squamulose, blackish, without continuous cortex, mostly homoiomerous; ascus-walls I+ intensively blue ..... 2. *H. lutosa*
– Thallus squamulose to peltate with a continuous lower cortex; hymenium and asci I+ reddish-brown ..... 1. *H. adglutinata*

1. **Heppia adglutinata** (Kremp.) A.Massal.

Geneac. Lich.: 8 (1854). – *Lecanora adglutinata* Kremp., Flora 24: 675 (1851). – TYPE: Germany, Wettstein, Sept. 1850 (M lectotype, Henssen, Acta Bot. Fenn. 150: 61, 1994).

S: rosettheppia

Red-listed in: **S**

Literature: Henssen 1994: 63–65.

Figs: Henssen 1994: 62; Thor & Arvidsson (eds) 1999: 271 (1999) (“*H. lutosa”*).

THALLUS olivaceous brown, lobes to 6 mm wide., adnate with raised margins, to 250 µm thick, with distinct lower cortex of enlarged cells, 15–40 µm thick; upper cortex only partly developed. APOTHECIA common, urceolate, to 2 mm diam. with red-brown disc. Hymenium and ascus-walls I+ red-brown; asci prototunicate, 8-spored. Spores simple, colourless, ellipsoid, 18–25 × 7–12 µm. CONIDIOMATA as in genus. PHOTOBIONT *Scytonema* in short chains, individual cells 6–12 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On calcareous soil or rocks, in warm and rather arid, but temporarily moist habitats.

Distribution. Rare, only known from Gotland, where it may be extinct (not collected after 1948). **S:** (*Gtl*). Otherwise present in South Europe, Macaronesia and North America.

Note. Though often confused with *H. lutosa* and taken as a growthform of that species, it is quite easy to recognize even habitually on the more leafy, olive

(rather than black) thallus. In cases of doubt the anatomy (cortex) and hymenial reaction are reliable distinguishing characters.

2. **Heppia lutosa** (Ach.) Nyl.

Syn. Meth. Lich. 2**:** 45 (1863). – *Collema lutosum* Ach., Syn. Meth. Lich.: 309 (1814). – TYPE: Germania (H-ACH 1901 lectotype, Henssen, Acta Bot. Fenn. 150: 61, 1994).

S: heppia

Red-listed in: **N S**

Literature: Albertsson 1950: 113–124; Henssen 1994: 61–63; Pettersson, Bot. Not. 1946: 94–102 (incl. both species); Thor & Arvidsson (eds) 1999: 187–188 (*ditto*).

Figs: Henssen 1994: 62.

THALLUS squamulose to crusose and granular, individual squamules to 4 mm diam., blackish, gelatinous, homoiomerous, to 200 µm thick. APOTHECIA common, urceolate, to 2 mm diam., with red-brown disc; hymenium I+ red-brown, though ascus-walls staining deep blue. Spores simple, colourless, ellipsoid, 15–25 × 6–10 µm. CONIDIOMATA as in genus. PHOTOBIONT *Scytonema* in short chains, individual cells 6–12 µm.

Chemistry. No secondary substances (by TLC).

Habitat. On dry, temporarily moist, calcareous soil and rocks.

Distribution. A steppe-element in our flora, only present in the dry valleys in Eastern Norway and the alvar of Öland, where it has recently been recollected (Westberg & Fröberg 2003). **N:** *Op*. **S:** *Öl*. Otherwise widespread in dry regions of Europe and North America, possibly more northern than *H. adglutinata*.

Note. For long understood in a very wide sense, but easily separated in its strict sence by the characters pointed out here.

Excluded species

Heppia gotlandica Du Rietz = *Hymenelia rhodopis* (Sommerf.) Lutzoni (see Pettersson 1946). Also type of the genus *Durietzia* Gyeln. (Gyelnik 1935).

Lichinaceae

P. M. Jørgensen

Syn. Ephebaceae, Pyrenopsidaceae

THALLUS mostly small, crustose, more rarely small-squamulose or fruticulose, often blackish (the crustose members often nick-named "the small black ones"), often more or less gelatinous and homoiomerous. ASCOMATA often pycnoascocarps with punctiform openings, but sometimes true apothecia with open discs are formed (see Henssen 1963 for details of the variation of the mainly hemiangiocarpous ontogeny, Fig. 3). The asci are primarily thin-walled, prototunicate, usually with eight spores, but polysporous and/or different asci found in some genera. The spores are ovoid, colourless, and simple, though plasma-bridges often occur, giving the impression of being septae (though dissolving in K). CONIDIOMATA pycnidia of *Lecanactis* or *Roccella*-type (Vobis 1980), usually globose or pyriform, with convoluted walls and weakly branched conidiophores; conidia small, bacilliform to ellipsoid, colourless. PHOTOBIONT mostly coccoid (Chroococcales) with brownish sheaths, more rarely filamentous species of *Scytonema*, *Stigonema* or Rivulariaceae, a few with *Nostoc* in clusters; an additional green algal photobiont (*Trebouxia*) is found in *Euopsis* (*granatina*).

Chemistry. No secondary substances (by TLC).

Note. This family as presently understood contains a number of groups which until recently were regarded as separate families mainly because of their diverse morphology. The present circumscription of the family emerged as a result of ontogenetic and molecular work which has shown that the high number of small families hitherto recognized in this part of the lichen system is untenable. As a result, however, it is difficult to present a clearcut morphological characterization of the family. It is generally recognizable on the specialized ascomata (pycnoascocarps) and the haustoria which are formed in the cyanobiont-cells.

The members of the Lichinaceae are often inconspicuous but ecologically important pioneers on inhospitable substrates in maritime or littoral zones, in the Arctic or in desert regions.

Literature: Henssen, Symb. Bot. Ups. 18(1) (1963); Ber. Deutsch. Bot. Ges. 92: 483–506 (1980); Schultz & Büdel, Lichenologist 34: 39–42 (2002).

1. Thallus filamentous or subfruticose 2
– Thallus crustose or squamulose 8
2. Marine, shrubby species with terminal, globose apothecia, with *Calothrix* ..... *Lichina*
– Non-marine, mostly procumbent species, apothecia variable, mostly lateral, with other cyanobionts 3
3. Epiphytic or on other lichens, dwarf-fruticose, with *Scytonema* ..... *Lichinodium*
– Saxicolous, mostly carpet-forming, rarely dwarf-fruticose, then with *Gloeocapsa* 4
4. Thallus little-branched, with rather thick branchlets, often in dense cushions, with clusters of *Gloeocapsa* or *Nostoc* 5
– Thallus abundantly branched with much thinner branchlets, mostly carpet-forming, with chains of *Scytonema* or *Stigonema* 6
5. Thallus shrubby, erect, forming dense cushions, with central hyphal core, semigelatinous, containing *Gloeocapsa*; on dry calcareous rocks with or on squamulose lichens ..... *Synalissa*
– Thallus cushion-forming, without central hyphal core, gelatinous, containing *Nostoc*; on moist mossy rocks ..... *Lempholemma* p. p.
6. Thallus forming large patches with spreading branchlets more than 20 µm wide, containing *Stigonema* ..... *Ephebe*
– Thallus smaller, branchlets less than 20 µm wide, containing *Scytonema* 7
7. Thallus dwarf-fruticulose, with paired, often parallel branches with central hyphal strand; apothecia with thalline margin ..... *Zahlbrucknerella*
– Thallus carpeting, branches diverging, without central strand; apothecia without thalline margin *Thermutis*
8. Thallus squamulose to small-foliose, forming blackish, gelatinous cushions 9
– Thallus crustose, forming blackish or red-brown crusts 12
9. Thallus mostly squamulose with sessile, open apothecia with broad margin ..... *Anema*
– Thallus predominantly foliose; apothecia mostly immersed 10

10. Thallus containing *Nostoc;* apothecia immersed, finally opening, hormocysts present in some species ..... *Lempholemma* p. p.
– Thallus with chroococcalean cyanobiont; apothecia pycnoascocarps or thallinocarps 11
11. Thallus with thick, olivaceous-black, rough squamules and pycnoascocarps ..... *Thyrea*
– Thallus thinner, smooth, partly translucent with thallinocarps ..... *Thallinocarpon*
12. Thallus small-squamulose, partly hollow with sunken ascomata without periphyses ..... *Phylliscum*
– Thallus crustose-areolate, never hollow, mostly with protruding pycnoascocarps, usually with periphyses, or sessile apothecia 13
13. Ascomata finally with clearly visible disc, with sterile central part or hyphal bands 14
– Apothecial disc narrowly open, or if widely with no sterile hyphal elements 16
14. Apothecia small, not exceeding 0.3 mm, "epihymenium" blue-green or dark brown ..... *Thelignya*
– Apothecia usually larger, to 0.5 mm, "epihymenium" not coloured or pale brownish 15
15. Thallus densely paraplectenchymatous with vertical rows of small-celled cyanobiont; thalline margin often separated by a slit ..... *Metamelanea*
– Thallus with fan-shaped cellular pattern, cyanobiont less orderly arranged; thalline margin never separated by a slit ..... *Pterygiopsis*
16. Ascomata with distinct proper margin, thalline margin excluded early in the apothecial development 17
– Ascomata without or with poorly developed proper margin, thalline margin usually persistent 19
17. Proper exciple distinctly widened in upper part, apothecia "fish-eye"-like ..... *Pyrenocarpon*
– Proper exciple not markedly widened in upper part 18
18. Thallus crustose-areolate with filamentous cyanobiont (*Calothrix*) ..... *Porocyphus*
– Thallus granulose-crustose with clustered nostocoid cyanobiont ..... *Lemmopsis*
19. Apothecial disc widely open, thallus distinctly squamulose 20
– Apothecial disc usually poriform, if widely open thallus not squamulose 21
20. Ascomata never open, disc always poriform with periphyses at ostiole; conidia acicular ..... *Cryptothele*
– Ascomata finally opening somewhat, no periphyses; conidia punctiform or bacilliform ..... *Pyrenopsis*
21. Apothecial disc glossy brown, asci thick-walled, I+ blue; true exciple cupular; thallus sometimes with areas of green photobiont ..... *Euopsis*
– Apothecial disc not glossy, usually red-brown or blackish; asci thin-walled, I–; true exciple open below; thallus entirely with blue-green (chroococcoid) photobiont ..... *Psorotichia*

Anema Nyl. ex Forssell, *nom. cons.*

Beitr. Gloeolich.: 91 (1885). – TYPE: *Anema decipiens* (A.Massal.) Forssell

Literature: Forssell, Beitr. Gloeolich.: 91–93 (1885); Henssen, Ber. Deutsch. Bot. Ges. 92: 483–506 (1979); Jørgensen & Santesson, Taxon 38: 303–304 (1989); Henssen & Jørgensen, Lichenologist 22: 137–139 (1990); Moreno & Egea, Acta Bot. Barcinon. 41: 11–28 (1992).

THALLUS mainly squamulose, broadly umbilicate, rosette-like and effigurate, more rarely aggregated in crustose structures, blackish brown, to 8 mm diam., when wet to 2 mm thick, homoiomerous, with loosely reticulate pattern of thin hyphae enclosing groups of cyanobacterial cells, giving it a paraplectenchymatous appearance. ASCOMATA pycnoascocarps, immersed and closed when young, later opening with distinct disc. Thalline margin prominent, to 250 µm wide; proper exciple suppressed. Hymenium brownish in upper part, otherwise hyaline, partly I+ deep blue (only the gelatin of the hymenium and the ascus-walls), with both straight, unbranched, long-celled paraphyses and branched, pearlstring-like, transformed conidiophores. Asci subcylindrical, thin-walled, with I+ blue external cap, usually 8-spored. Spores colourless, simple, ovoid to ellipsoid. CONIDIOMATA small, immersed, rounded pycnidia of the *Lecanactis*-type; conidia ellipsoid, simple, 2–4 × 1–1.5 µm. PHOTOBIONT chroococcoid, individual cells 6–10 µm diam., surrounded by brownish sheaths, often in condensed aggregations towards the upper surface.

Chemistry. No secondary substances (by TLC).

Note. Somewhat resembling *Psorotichia*, but with different ascomata and better developed and organized thallus.

1. Thallus usually with blue-grey pruina, surface dissolving into granules, not caespitose ..... 1. *A. decipiens*
– Thallus lacking pruina, surface smooth, often shiny, caespitose 2
2. Thallus in more or less convex, well-delimited, button-like rosettes ..... 2. *A. nummularium*
– Thallus with ascending isidioid lobes, effuse ..... 3. *A. tumidulum*

1. Anema decipiens (A.Massal.) Forssell

Beitr. Gloeolich.: 92 (1885). – *Omphalaria decipiens* A.Massal., Framm. Lichenogr.: 14 (1855). – TYPE: Italy, Prov.

Verona, "in vico Grezzana ad lapides calcareas loco dicto Grotto Fallasco", 1849 Massalongo (VER lectotype, Moreno & Egea, Acta Bot. Barcinon. 41: 27, 1992).

Red-listed in: **N**

Literature: Forssell 1885: 92; Jørgensen, Graphis Scripta 2: 55–59 (1988); Moreno & Egea 1992: 27–28.

Figs: Moreno & Egea 1992: tab. I, figs 1–2.

THALLUS irregularly squamulose, individual squamules 1–2 mm wide, effigurate when well developed; sometimes more or less confluent in a crust-like, granular structure, homoiomerous, to 500 µm thick. Upper surface uneven, usually pruinose, dissolving into soredia-like granules. ASCOMATA rare, pycnoascocarps, finally opening with flat, brown disc, to 0.5 mm diam.; thalline margin prominent, rugose, to 200 µm wide; hymenium I+ deep blue, with 8-spored, thin-walled, subcylindrical asci. Spores colourless, simple, subglobose to ellipsoid, 9–15 × 7–10 µm. CONIDIOMATA pycnidia; conidia ellipsoid to bacilliform, 2.5–4 × 1.5–2 µm (not observed in Norwegian material). PHOTOBIONT chroococcoid, occuring singly or often in condensed aggregates at the surface, individual cells 5–9 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On calcareous rocks in warm, sheltered habitats in the lowlands.

Distribution. A very rare southern element, only known from a few localities. **N:** (*Ak*) *He*. Otherwise known in Southern and Central Europe.

Note. In our region initially confused with *A. nummularium* which is a much more distinctly squamulose-caespitose, umbilicate species with smooth, non-pruinose thallus.

2. **Anema nummularium** (Dufour ex Durieu & Mont.) Nyl. ex Forssell

Beitr. Gloeolich.: 93 (1885). – *Collema nummularium* Dufour ex Durieu & Mont. in Durieu, Expl. Sci. Algérie 1: 200 (1846). – TYPE: Spain ("Hispania"), Dufour (H-NYL 42443 lectotype, Moreno & Egea, Acta Bot. Barcinon. 41: 22, 1992).

Syn. *Omphalaria notarisii* A.Massal., *Anema notarisii* (A.Massal.) Forssell, *Anema decipiens* sensu Th.Fr.

Red-listed in: **N**

Literature: Forssell 1885: 93; Henssen & Jørgensen 1990: 138–139; Moreno & Egea 1992: 22–24.

Figs: Moreno & Egea 1992: tab. II, figs 1–3; tab. III, figs 2–4 (thallus anatomy); tab. IV, figs 2, 4–6 (fruitbody anatomy).

THALLUS squamulose, blackish brown, rosette-like, forming more or less hemispherical, button-like structures, to 1.2 cm diam., with peripheral, contiguous, simple, smooth-surfaced lobes, to 1 mm wide. and 400 µm thick. ASCOMATA common, pycnoascocarps opening to 2 mm diam., with flat brown disc and prominent, smooth thalline margin, to 250 µm wide. Hymenial gelatin I+ blue, paraphyses and ascus walls I+ red-brown (takes the colour of the iodine). Asci subcylindrical, thin-walled, 8-spored. Spores colourless, simple, ellipsoid, 9–15 × 5–10 µm. CONIDIOMATA pycnidia immersed in thallus; conidia simple, ellipsoid, colourless, 3–4 × 0.5–1.5 µm. PHOTOBIONT chroococcoid, usually filling the thallus, but becoming aggregated and denser towards the surface, individual cells 4–10 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On periodically wetted, xerothermic, calcareous rocks.

Distribution. Rare, Mediterranean element. **N:** (*Ak*) *Bu Te.* **S:** *Öl.* Otherwise in the mediterranean region of Europe and Africa, extending into southern parts of Central Europe.

Note. The Norwegian material belongs to the pronounced globuliform morphotype which is represented by the type of *Anema notarisii.* Moreno & Egea (1992) have, however, in field-studies shown that this form is just part of the variation of *Anema nummularium.*

3. **Anema tumidulum** Henssen ined.

Anema cernohorskyi (Servít) Henssen sensu Henssen & Jørgensen (1990). (q.e.a species of *Peccania* in its original sense).

Red-listed in: **N**

Literature: Henssen & Jørgensen 1990: 137–138; Czeika et al., Preslia 76: 188 (2004); Henssen, Graphis Scripta ined.

Figs: Schultz & Büdel 2002: fig. 4b.

THALLUS squamulose, squamules to 2 mm diam., to 450 µm thick, forming an effuse, more or less continuous crust; upper surface blackish, smooth, often shiny, with isidia-like outgrowths, which aggregate to form a dense bushy structure surrounding the ascomata. ASCOMATA rare in Norwegian material, pycnoascocarps to 0.5 mm diam., with brown disc and prominent, smooth thalline margin, to 200 µm wide. Hymenium I+ blue with subcylindrical, thin-walled asci, 4(–8) spored. Spores colourless, simple, globular, 8–10(–15) × 9–12 µm. CONIDIOMATA producing conidia not observed. PHOTOBIONT chroococcoid, single to aggregating cells, 4–10 µm diam., particularly towards the surface.

Chemistry. No secondary substances (by TLC).

Habitat. On calcareous rocks by lakes or rivers in the lowlands.

Distribution. Rare and scattered, but the most widespread species of the genus in our region, though as yet only recorded from Norway. **N:** *Ak He Bu Te NT SNo*. Otherwise known from Central Europe, where it is fairly common and widespread.

Note. Easily recognized by the rather "bushy" habit and the effuse thallus. Young specimens may be difficult to distinguish from *Anema decipiens* but have a shiny thallus and are never pruinose.

Cryptothele Th.Fr.

Bot. Not. 1866: 59 (1866) – TYPE: *Cryptothele permiscens* (Nyl.) Hellb.

Syn. *Pyrenopsidium* (Nyl.) Forssell, *Malmgrenia* Vain. ex Räsänen, *nom. illeg*.

Literature: Henssen, Ber. Deutsch. Bot. Ges. 92: 483–506 (1979); Henssen & Büdel, Nova Hedwigia Beih. 79: 381–398 (1984); Henssen & Jørgensen, Lichenologist 22: 139–140 (1990); Jørgensen & Henssen, Taxon 39: 344–345 (1990).

THALLUS crustose to small-squamulose, dark reddish brown to black (when dry), without proper cortex, internally with a reticulate pattern of hyphae enclosing the photobiont. ASCOMATA pseudoangiocarpic apothecia evolving from pycnidia, immersed in thallus (hence the generic name), opening by a narrow pore, with periphyses in upper part, but no true paraphyses developed, though sometimes with branched, partly anastomosing paraphysoids. Proper exciple well developed, gelatinous. Asci narrowly cylindrical, with attenuated, often acuminate apices, I–, thin-walled, 8 to multispored. Spores simple, sometimes with "false" septa (plasma-bridges, disappearing in K), ellipsoid to cylindrical, colourless. CONIDIOMATA immersed pycnidia of *Sticta*-type; conidia acicular, colourless. PHOTOBIONT *Gloeocapsa*-like, aggregated in groups, encapsuled by complex reddish brown gelatinous sheaths.

Chemistry. No secondary substances (by TLC).

Note. Species of the genus *Cryptothele* are superficially often very similar to those of *Pyrenopsis* Nyl. They have, however, quite characteristic asci with attenuated, often acute apices without any amyloid, apical structures, while they are rounded with I+ amyloid tholus in *Pyrenopsis*. The conidia are acicular rather than cylindrical to ellipsoid as in *Pyrenopsis.*

1. Asci 16–24-spored, excipulum to 50 µm thick ..... 2. *C. neglecta*
– Asci 8-spored, excipulum at most 25 µm 2
2. Thallus granulose, usually with effigurate peripheral lobes, spores 6–8 × 4–5 µm ..... 1.*C. granuliformis*
– Thallus smooth, usually with indistinct lobation, spores larger 3
3. Spores cylindrical, often appearing 1-septate, 8–10 × 3–4 µm, slightly bent, hymenium I–; widespread ..... 3. *C. permiscens*
– Spores simple, ovoid, 7–10 × 5–8 µm, straight, hymenium I+ blue; southwestern..... 4. *C. rhodosticta*

1. Cryptothele granuliformis (Nyl.) Henssen

in Henssen & Büdel, Nova Hedwigia Beih. 79: 384 (1984). – *Collema granuliforme* Nyl., Not. Sällsk. Fauna Fl. Fenn. Förh. 4: 230 (1859). – TYPE: Finland, Nylandia, Helsingfors, 1858 Nylander (H holotype).

Syn. ?*Pyrenopsidium extendens* (Nyl.) Forssell

Literature: Forssell, Beitr. Gloeolich.: 60–61 (1885); Henssen & Büdel 1984: 382; Henssen & Jørgensen 1990: 139; Nordin, Graphis Scripta 32: 15 (2002).

THALLUS small-squamulose, blackish brown, forming effuse structures to 1.5 cm diam., inner parts areolate, granulose, but with distinct, elongated peripheral lobes to 2 mm long, to 250 µm thick when wet (then somewhat gelatinous). ASCOMATA perithecioid, immersed, 0.3 mm diam.; proper exciple 30–35 µm wide, of irregularly arranged gelatinous hyphae, in upper parts with periphyses. Asci narrowly cylindrical, apically attenuated, 8-spored. Spores colourless, ellipsoid,

simple (usually without false septa), 6–8 × 4–5 µm. CONIDIOMATA immersed; conidia acicular, slightly bent, 8–10 × 1–2 µm. PHOTOBIONT *Gloeocapsa*-like with large individual cells, 10–15 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On moist, irrigated, siliceous or schistose rocks in the lowlands.

Distribution. Fairly widespread and locally common, but not frequently collected. **Gr. F:** *U EH PK Kn Ks InL.* **N:** *NNo.* **S:** *Bl Bh Dls Vg Vrm Upl Nb PL.* Also in the Scottish mountains and Arctic North America.

Note. The most easily recognizable species in the genus, as it often has quite well-developed peripheral lobes.

2. Cryptothele neglecta Henssen

Ber. Deutsch. Bot. Ges. 92: 486 (1979). – TYPE: Sweden, Närke, Götlunda, Sjömo, 1867 Blomberg (UPS holotype).

Literature: Henssen 1979: 486.

THALLUS crustose, blackish red-brown, forming effuse structures to 5 mm ´diam., when wetted to 150 µm thick. ASCOMATA perithecioid, immersed, 0.2–0.3 mm diam.; proper exciple prominent, 40–50 µm wide, of gelatinous, often parallel hyphae. Asci cylindrical, apically attenuated, 16–24-spored. Spores simple, colourless oblong, simple, 7–8 × 2.5–3 µm. CONIDIOMATA immersed; conidia acicular, 8–10 × 1–1.5 µm. PHOTOBIONT *Gloeocapsa*-like, with small cells, 3.5–5 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On wet, partly submersed siliceous rocks.

Distribution. Very rare, only known from two old collections from **S:** *Nrk*. Probably overlooked, and not recorded from outside Norden.

Note. Easily recognized only under the microscope by the polysporous asci and prominent exciple. Note, however, that there is another polysporous species in this genus, *Cryptothele laatokkaënsis* (Vain.) Henssen, described from Russian Karelia. It has only 12–16-spored asci with ellipsoid spores 7–9 × 4.5–5 µm and a narrow (to 15 µm) proper exciple. It is possibly a not fully developed form of *C. neglecta,* which is the younger name. However, the relationship between these two species needs further study, and above all more material is needed to understand the variation. Care should also be taken not to confuse these species with the multispored *Pyrenopsis grumulifera*, which has typical, rounded *Pyrenopsis*-asci (see further p. 69).

3. Cryptothele permiscens (Nyl.) Hellb.

Kongl. Svenska Vetensk. Acad. Handl., ser. 2, 9 (11): 141 (1871). – *Pyrenopsis permiscens* Nyl., Lich. Scand.: 288 (1861). – TYPE: Sweden, "ad saxa granitosa", Zetterstedt (H-NYL 42856 lectotype, Henssen Ber. Deutsch. Bot. Ges. 92: 484, 1980).

Literature: Henssen & Jørgensen 1990: 139.

Figs: Henssen 1980: fig. 2 a, b, j (internal structure of ascocarp).

THALLUS predominantly crustose, often somewhat granular, blackish brown, forming effuse structures, to 1 cm diam. ASCOMATA perithecioid, immersed, 0.2–0.3 mm diam. Proper exciple 30–35 µm wide with irregularly arranged, gelatinous hyphae, in upper part with distinct periphyses. Asci narrowly cylindrical, apically attenuated, I–, 8-spored. Spores colourless, narrowly ellipsoid, 8–10 × 3–4 µm, often with false septa and slightly bent. CONIDIOMATA immersed with colourless walls; conidia acicular 8–10 × 1–2 µm. PHOTOBIONT *Gloeocapsa*-like, with variable cell-size, the largest cells to 15 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On wet, siliceous or schistose rocks in the lowlands.

Distribution. Uncommon, probably overlooked. **Gr. N:** *NNo*. **S:** *Bh Vg Ög Nrk Upl LuL*. Not recorded outside Norden.

Note. Easiest recognized on the large, slightly bent spores which often appear to be septate.

4. Cryptothele rhodosticta (Taylor) Henssen

in Henssen & Jørgensen, Lichenologist 22: 140 (1990). – *Verrucaria rhodosticta* Taylor in Hooker, London J. Bot. 6: 154 (1847). – TYPE: Ireland, on wet rocks between Greenane and Sheen Bridge, Taylor (FH holotype).

Syn. *Pyrenopsis rhodosticta* (Taylor) Müll. Arg.

Literature: Henssen & Jørgensen 1990: 140; Schultz, Graphis Scripta 18: 49–51 (2006).

Figs: Schultz & Büdel, Lichenologist 34: 54 (2002) fig. 8i (young ascus).

THALLUS crustose, areolate, dark reddish brown, effuse, to 200 µm thick. ASCOMATA pycnoascocarps, immersed, perithecioid, 0.2–0.3 mm diam. Hymenium I+ blue; asci cylindrical, attenuated, 8-spored. Spores colourless, simple, ellipsoid, 8–10(–15) × 4–7 µm. CONIDIOMATA immersed pycnidia; conidia bacilliform, 1–2 × 1 µm. PHOTOBIONT *Gloeocapsa*, individual cells 10–15 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Periodically wet (submerged) acidic rocks by lakes.

Distribution. Rare, western, possibly oceanic element. **N:** *Ho.* Otherwise only known with certainty from The British Isles. Records from Greenland (Dahl 1950) are most probably incorrect, the recorded spore size indicating *Pyrenopsis impolita*.

Note. A much misunderstood species, the generic placement of which is difficult. The asci, however, are typically those of *Cryptothele*, but the conidia are not acicular and the hymenium reacts I+ blue. It can not be confused with any other species in the genus, but it is superficially very similar to *Pyrenopsis subareolata*, with which it in the past was often confused, and from which it above all differs in the different, acuminate asci, as also from *P. impolita,* another *Pyrenopsis* species with I+ blue hymenium.

Ephebe Fr.

Syst. Orb. Veg.: 256 (1825). – TYPE: *Conferva atrovirens* Dill. (*Ephebe lanata* (L.) Vain.).

Syn. *Ephebeia* Nyl., *Spilonematopsis* E.Dahl

F: karvajäkälät **S:** trådlavar

Literature: Henssen, Symb. Bot. Upsal. 18(1): 37–57 (1963).

THALLUS small-fruticose, often carpet-forming of strongly branched, blackish threads, fastened to the substrate by a distinct basal disc, without rhizoids. Thallus containing *Stigonema* in chains, surrounded by a net of hyphae. ASCOMATA pycnoascocarps, inconspicuous, usually rare, with prominent exciple; disc brown, punctiform to flat. Hymenium with secondary paraphyses, I+ blue-green. Asci thin-walled, without amyloid apical structures, 8–16-spored. Spores simple, colourless, mostly round. CONIDIOMATA containing thin, long-celled conidiophores, which produce terminal, bacilliform, simple, colourless conidia. PHOTOBIONT *Stigonema*.

Chemistry. No secondary substances (by TLC).

1 Thallus small, to 2 mm diam.; individual branches less than 40 µm diam. ..... 3. *E. multispora*
– Thallus larger, more than 2 mm diam.; individual branches more than 40 µm diam. 2
2 Branches smooth, without spine-like branchlets; thallus carpet-formed ..... 2. *E. lanata*
– Branches with numerous, short, spine-like branchlets; thallus subfruticose 3
3 Thallus smallish, to 5 mm diam.; ascomata with poorly developed proper exciple, asci with eight round spores ..... 4. *E. perspinulosa*
– Thallus larger, to 3 cm diam.; ascomata with distinct proper exciple; asci with sixteen ovate spores ..... 1. *E. hispidula*

1. **Ephebe hispidula** (Ach.) Horw.

Hand-list lich. Great Britain: 5 (1913). – *Cornicularia hispidula* Ach., Lichenogr. Universalis: 617 (1810). – TYPE: Sweden, Dalarna, från stenar vid Österdalälfven, 1807 Swartz (UPS lectotype ("holotype"), Henssen, Symb. Bot. Upsal. 18(1): 49, 1963)

Syn. *Ephebeia hispidula* (Ach.) Nyl., *Ephebe spinulosa* Th.Fr.

D: mørk uldlav **F:** koskikarvajäkälä **S:** grov trådlav

Literature: Dahl, Meddel. Grønland 150(2): 35 (1950); Henssen, Symb. Bot. Upsal. 18(1): 49–50 (1963).

Figs: Henssen 1963, Taf. 4a, 6c, 7a, 8c, 10c, 11a.

THALLUS in filamentous, blackish rosettes to 3 cm diam.; branches with short, spine-like branchlets. ASCOMATA rare, prominent and terminal, to 0.25 mm diam. with distinct blackish green proper exciple, to 50 µm wide. Spores normally 16, ovoid, simple, colourless, 7–9 × 4–5 µm. CONIDIOMATA rare; conidia bacilliform, 2–3 × 1–2 µm. PHOTOBIONT *Stigonema* in chains, individual cells 7–12 × 7–11 µm.

Chemistry. No secondary substances (by TLC).

Habitat. At river- and lake-sides, often submerged by water.

Distribution. Widespread, particularly common in northern regions. Circumpolar in the Northern Hemisphere. **D:** *Brn*. **Gr. Fa. F:** *V U St EH ES PH PS PK Kn PeP EnL InL*. **I:** *ISu IVe IAu INv INo*. **N:** *Øf He Op Bu Ho SF SNo NNo Tr ØFi*. **S:** *Sk Bh Vrm Upl Dlr Gst Jmt LyL LuL TL*.

Note. Easily distinguished by the short spinulose branchlets, only found in one other species in our region viz., the smaller *E. perspinulosa*, which grows in drier habitats and has different ascomata, normally containing 8 spores. Old branches of that species show a typical paraplectenchymatous cell-structure, not found in *E. hispidula*, where the cells are oblong (or round). Young, sterile specimens may, however, be difficult to separate with certainty.

2. **Ephebe lanata** (L.) Vain.

Meddel. Soc. Fauna Fl. Fenn. 14: 20 (1888). – *Lichen lanatus* L., Sp. Pl. 2**:** 1155 (1753). – TYPE: Sweden(?) (LINN 1273.284 lectotype, Howe, Bull. Torrey Bot. Club 39: 201, 1912).

Syn. *Ephebe lapponica* Nyl., *Ephebe pubescens* var. *complicata* Vain.

F: kalliokarvajäkälä **I:** vætulýja **N:** vanlig trådlav **S:** trådlav

Literature: Henssen, Symb. Bot. Upsal. 18(1): 42–45 (1963).

Figs: Brodo et al. 2001: 309; Wirth 1995: 387.

THALLUS blackish, beard-like, forming carpets to 3(–5) cm diam., with irregularly branched, smooth branchlets, at the base to 200 µm wide. ASCOMATA rare, insignificant, lateral, to 0.2 mm diam., with thalline margin, to 40 µm wide. Spores usually eight, simple, colourless, ovoid, 10–20 × 4–7 µm. CONIDIOMATA rare; conidia bacilliform, 3–5 × 1–2 µm. PHOTOBIONT *Stigonema* in chains, individual cells 10–20 × 4–10 µm.

Chemistry. No secondary substances (by TLC).

Habitat. Mainly on seepage rocks or in the inundation zone of streams.

Distribution. Widespread, but rarer towards the north; in the Northern Hemisphere only. **Gr. Fa. F:** *A V U EK St EH ES PH PS PK KP Kn PeP Ks KiL SoL EnL InL*. **I:** *ISu IVe IAu INv*. **N:** *Øf Ak Op Bu Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **S:** *Sk Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*.

Note. The most widespread and variable of the species, usually easily recognized by the carpet-like habit. However, small specimens from extreme habitats (of which the types of the two synonyms are examples) may approach the smaller species, particularly *E. hispidula*, but lack the spinulose side-branchlets. Larger specimens are sometimes mistaken for *Spilonema* spp., but are easily separated by the lack of rhizines.

3. **Ephebe multispora** (E.Dahl) Henssen

Symb. Bot. Upsal. 18(1): 46 (1963). – *Spilonematopsis multispora* E.Dahl, Meddel. Grønland 150(2): 34 (1950). – TYPE: Greenland, Julianehåb, Tunugdliarflik, W-side of Narssaqfjell, 1937 Dahl (O holotype!).

S: liten trådlav

Literature: Dahl, Meddel. Grønland 150(2): 34–35 (1950), Henssen, Symb. Bot. Upsal. 18(1): 46–47 (1963).

Figs: Dahl 1950: 34; Henssen 1963: Taf. 1b, 9g, 12b.

THALLUS brownish, finely filamentous, forming small, loose cushions, only to 2 mm diam., branchlets fine, 15–20(–40) µm wide, partly ascending, mostly branching from the base, poorly lichenized with thin hyphae of angular cells. ASCOMATA terminal, 0.1 mm diam., with thalline margin only. Spores to 16 in asci, simple, colourless, nearly round, 4–6 × 3–5 µm. CONIDIOMATA rare; conidia bacilliform, 2–3 × 1 µm. PHOTOBIONT *Stigonema* in chains, individual cells 4–7 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On seepage rocks.

Distribution. Arctic, rare, probably much overlooked, only known from Greenland and two localities in alpine northern Sweden. **Gr. S:** *LyL LuL*.

Note. The smallest of all species of *Ephebe*, with so fine branchlets that it may be mistaken for an unlichenized *Stigonema*, from which it is best distinguished by the ascomata.

4. **Ephebe perspinulosa** Nyl.

in Norrlin, Meddel. Soc. Fauna Fl. Fenn. 1: 7 (1876). – TYPE: Russia, Karelia onegensis, Suunu (Suna), 1870 Norrlin (H-NYL 42906 holotype!).

Syn. *Ephebeia perspinulosa* (Nyl.) Räsänen, *Ephebe trachytera* (Nyl.) Henssen, *Ephebeia hispidula* subsp. *trachytera* (Nyl.) Vain., *Ephebe pubescens* f. *trachytera* Nyl., *Ephebe papillata* H.Magn.

F: okakarvajäkälä **S:** späd trådlav

THALLUS blackish, subfruticose, forming rosettes to 5 mm diam., with rather thick, stiff branchlets with spinulose side-branchlets; hyphae forming a loose, paraplectenchymatic pattern of angular cells. ASCOMATA rare, apical or lateral, only with thalline margin. Spores eight, simple, colourless, globose, 4–6 µm diam. CONIDIOMATA rare; conidia bacilliform, 3–4 × 1–2 µm. PHOTOBIONT *Stigonema* in chains, individual cells 7–10 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Seepages of rocks in forests, or in the upper zone of river-banks etc., often growing on other lichens.

Distribution. Boreal and Arctic-alpine in the Northern Hemisphere, probably circumpolar. **F:** *EH PH PS PK Kn PeP Ks KiL EnL InL*. **N:** *MR ST ØFi*. **S:** *Srm Upl LuL TL*.

Note. Can only be confused with the only other *Ephebe* species with spinulose side-branchlets, viz., *E. hispidula*, which is larger and grows in wetter habitats. For further distinguishing details see the notes under that species.

Euopsis Nyl.

Flora 58: 363 (1875). – TYPE: *Euopsis granatina* (Sommerf.) Nyl.

S: granatlavar

Literature: Hafellner, Nova Hedwigia Beih. 79: 284–285 (1984); Henssen, Büdel & Titze, Bot. Acta 101: 49–55 (1987).

THALLUS granulose to small-squamulose, dark reddish brown, homoiomerous, without cortices, internally with a reticulate pattern of hyphae enclosing the blue-green photobiont; paraplectenchymatous in green parts. ASCOMATA apothecia with glossy, brown disc and well developed thalline margin. Proper exciple narrow, hymenium colourless, I–, paraphyses narrow, sparingly branched. Asci cylindrical, thick-walled, I+ blue externally, internally with I+ blue collar around the protoplast, 8-spored, spores discharging rostrately. Spores simple, ellipsoid, colourless. CONIDIOMATA immersed pycnidia of *Sticta*-type, rare. PHOTOBIONT *Gloeocapsa* in clusters and *Trebouxia*.

Chemistry. No secondary substances (by TLC).

Note. Distinguished from *Pyrenopsis* in which it was formerly included, by the disciform apothecia with different, thick-walled asci.

1. Apothecia with uneven, whitish thalline margin, containing green photobiont, to 0.5 mm diam., thallus mainly granulose, white-dotted ..... 1. *E. granatina*
– Apothecia without such margin, but with crenulate squamules, containing cyanobacteria, to 1 mm diam., thallus small-squamulose, uniformly coloured ..... 2. *E. pulvinata*

1. Euopsis granatina (Sommerf.) Nyl.

Flora 58: 363 (1875). – *Lecanora granatina* Sommerf., Suppl. Fl. Lapp.: 90 (1826). – TYPE: Norway, Nordland, Saltdal, Sommerfelt (O holotype).

Syn. *Pyrenopsis granatina* (Sommerf.) Nyl., *Pyrenopsis rufescens* Nyl.

S: vitprickig granatlav

Literature: Fries, Lich. Arct.: 77 (1860); Henssen et al. 1987: 49–55.

Figs: Henssen et al. 1987: 49–55.

THALLUS reddish brown, white-spotted, crustose, effuse, broken up in granulose small cushions, to 1 cm diam.; homoiomerous, to 200 µm thick, with hyphae forming a large-celled reticulum around the cyanobacteria; the part with green photobiont partly resting on the former, paraplectenchymatous throughout. ASCOMATA immersed apothecia with glossy disc, convex at maturity, to 0.5 mm diam., numerous, often aggregated, with irregular whitish margin containing green algae. Thalline margin paraplectenchymatous, to 100 µm wide; proper exciple narrow, 10–25 µm wide; hymenium colourless except in upper parts which have a brown gelatin, I–, paraphyses sparingly branched. Asci cylindrical, walls I+ blue, 8-spored. Spores colourless, ellipsoid, simple, 9–12 × 5–7 µm. CONIDIOMATA pycnidia, wart-like, immersed; conidia bacilliform, 4–5 × 1 µm. PHOTOBIONT *Gloeocapsa,* individual cells 10–20 µm diam., in main thallus, with additional *Trebouxia,* individual cells 7–10 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On moist, exposed, mostly siliceous rocks, up to about 1000 m.

Distribution. Widespread but scattered, commonest in the north. **Gr. F:** *U St EH PK OP PeP Ks KiL SoL EnL InL.* **N:** *Op Ro Ho MR NT NNo Tr VFi ØFi.* **AI:** *Sb*. **S:** *Bh Dls Vg Ög Nrk Srm Vrm Upl Dlr Mpd Ång Hrj Jmt Vb Nb LyL LuL TL.* In Europe also in Scotland. Probably circumpolar.

Note. Generally smaller than the following species, with which it sometimes has been confused in the past, although easily distinguished by the smaller apothecia with whitish margin containing green algae and the white-dotted thallus (also containing green algae).

2. Euopsis pulvinata (Schaer.) Vain.

Meddel. Soc. Fauna Fl. Fenn. 6: 85 (1881). – *Lecidea pulvinata* Schaer., Naturwiss. Anz. Allg. Schweiz. Ges. Naturwiss. 2: 11 (1818). – TYPE: Switzerland, M. Susten, 1814 Schaerer (G holotype).

Syn. *Pyrenopsis pulvinata* (Schaer.) Th.Fr., *Pyrenopsis haemalea* (Sommerf.) Norrl., *Pyrenopsis macrocarpa* E.Dahl., *Thyrea pulvinata* (Schaer.) A.Massal.

S: mörk granatlav

Literature: Forssell, Beitr. Gloeolich.: 97–98 (1885); Henssen et al. 1987: 49–55.

Figs: Henssen et al. 1987: 49–55.

THALLUS small-squamulose, dark reddish brown, to 2 cm diam., homoiomerous, to 300(–500) µm thick, hyphae forming a large-celled reticulum around the cyanobacteria. ASCOMATA apothecia with shining disc, to 1 mm diam., with crenulate thalline squamules. Thalline margin to 150 µm wide, of same structure as thallus, proper exciple narrow, 10–25 µm wide. Hymenium colourless except in upper part where it is coloured by a brown gelatin, I–. Ascus cylindrical with I+ blue walls, 8-spored. Spores colourless, simple (though often with false septa), ellipsoid, 10–15 (17) × 5–8 µm. CONIDIOMATA pycnidia (sometimes produced below the apothecia), wart-like, immersed; conidia bacilliform, 4–5 × 1 µm. PHOTOBIONT *Gloeocapsa,* individual cells 10–20 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On moist acidic rocks or on sand and soil as well as over mosses, often in snow-beds, to 1500 m.

Distribution. Mainly arctic-alpine, but reaching sea-level in the north. **Gr. Fa. F:** *Kn KiL EnL InL.* **I:** *ISu IVe IMi IAu INo*. **N:** *Op Ho SF ST SNo NNo Tr VFi.* **AI:** *Sb*. **S:** *Vg Srm Vrm Dlr Mpd Ång Hrj Jmt Vb ÅsL LyL LuL TL.* Otherwise circumarctic, reaching as far south as the Alps in Europe.

Note. Somewhat similar to a *Fuscopannaria*, because of the squamulose thallus and apothecia, but none of them have a reddish brown thallus and shining brown apothecial disc. May be difficult to distinguish from specimens of *E. granatina* with poorly developed green-algal thalline margin without microscopic examination. Saxicolous specimens from high altitudes tend to develop very thick thalli with marbled, rose-brownish colour and apothecia with conspicuous thalline margins. Such specimens have been named *Pyrenopsis macrocarpa.* Since there are no basic differences in anatomy, spore size, etc., these are here regarded just as extreme expressions of *E. pulvinata*.

Lemmopsis (Vain.) Zahlbr.

in Engler, Nat. Pflanzenfam. 1(1): 171 (1906). – *Leptogium* sect. *Lemmopsis* Vain., Acta Soc. Fauna Fl. Fenn. 7(1): 221 (1890). – TYPE: *Lemmopsis arnoldiana* (Hepp) Zahlbr.

Literature: Ellis, Lichenologist 13: 123–139 (1981).

THALLUS granular-crustose, blackish, gelatinous; homoiomerous, hyphae forming a paraplechtenchymatous structure around the photobiont. ASCOMATA apothecia, urceolate, discoid, often with poorly developed thalline margin but with distinct proper exciple of anastomosing hyphae. Hymenium I+ blue with simple, conglutinate paraphyses and clavate asci with I+ blue ascus. Spores simple, colourless, ellipsoid. CONIDIOMATA not observed. PHOTOBIONT nostocoid in clusters.

Chemistry. No secondary substances (by TLC).

1. Thallus saxicolous; apothecia perithecioid, dark reddish, spores ovoid, 13–25 × 8–12 µm ..... 1. *L. arnoldiana*
– Thallus terricolous; apothecia finally opening, showing the orange disc, spores larger, ellipsoid, 17–35 × 8–15 µm..... 2. *L. pelodes*

1. **Lemmopsis arnoldiana** (Hepp) Zahlbr.

in Engler, Nat. Pflanzenfam. 1: 171 (1906). – *Physma arnoldianum* Hepp in Arnold, Flora 41: 94 (1858). – TYPE: Germany, near Eichstätt above Wasserzell, 1857 Hepp 569c (G lectotype, Ellis, Lichenologist 13: 129, 1981).

Syn. *Psorotichia heterothallina* Vain.

Literature: Ellis 1981: 129; Jørgensen, Graphis Scripta 2: 55-59 (1988).

THALLUS crustose-granular, areolate, effuse, with blackish, gelatinose areoles to 0.6 mm wide., homoiomerous with polygonal cell-pattern. ASCOMATA common, sessile, globose perithecioid apothecia, to 0.7 mm diam., with pore-like, reddish-brown disc and prominent proper exciple, to 50 µm wide. Hymenium I+ blue, with slender paraphyses. Asci clavate, 8-spored. Spores colourless, simple, ovoid, 13–25 × 8–12 µm. CONIDIOMATA not observed. PHOTOBIONT *Nostoc*-like, clustered, individual cells globose to ovate, 5–8 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On moist, shaded calcareous rocks.

Distribution. Rare and local with scattered, old records. **F:** (*EH*) *PeP.* **N:** (*SNo*). **S:** (*Klm*). Otherwise scattered throughout Europe.

Note. Usually easily recognized on the minute reddish fruit-bodies. The type of *Psorotichia heterothallina* appears to be an exceptionally well-developed specimen of *L. arnoldiana* with unusual, widely opening fruit-bodies. Vainio was right in pointing out the exceptional photobiont, but placed the lichen in *Psorotichia*.

2. **Lemmopsis pelodes** (Körb. ex Stein) T.L.Ellis

Lichenologist 13: 132 (1981). – *Psorotichia pelodes* Körb. ex Stein, Jahresber. Schles. Ges. Vaterl. Cult. 50: 173 (1873). – TYPE: [Poland] Schlesien, Obernigk, Oct. 1872 Stein (Körber, Lich. Sel. Germ. Exs. no. 415, WRSL lectotype, as 'holotype', Ellis, Lichenologist 13: 132, 1981).

Literature: Degelius, Svensk Bot. Tidskr. 42: 71 (1948); Ellis 1981: 132; Jørgensen, Graphis Scripta 2: 55–59 (1988); Jørgensen & Motiejunaite, Graphis Scripta 17: 17–19 (2005).

Figs: Jørgensen & Motiejunaite 2005: 18.

THALLUS small-squamulose, diffuse, partly granular, gelatinous when wet, blackish brown, homoiomerous with anastomosing hyphae. ASCOMATA numerous, immersed apothecia which finally excludes the thalline margin and open, exposing the orange disc, to 1 mm diam. Spores colourless, simple, ellipsoid, 17–35 × 8–15 µm. CONIDIOMATA not observed. PHOTOBIONT nostocoid in clusters, individual cells 5–8 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On clay in man-made habitats (along dirt-roads, etc.).

Distribution. Very rare, on the verge of extinction. **F:** *V.* **S:** (*Upl*). Otherwise mostly in the old agricultural landscape of eastern Europe, where it appears to be retreating, though recently collected in Lithuania and Finland. Unknown outside Europe.

Note. Easily overlooked for a badly developed, terricolous *Collema*, from which it is easiest distinguished by the simple spores.

Excluded species

Lemmopsis suomiensis Räsänen = *Placynthiella icmalea* (Ach.) Coppins & P.James

Lempholemma Körb.

Syst. Lich. Germ.: 400 (1855). – TYPE: *Lempholemma compactum* Körb. (=*Lempholemma polyanthes*).

Syn. *Arnoldia* A.Massal., *Schizoma* Nyl. ex Cromb., *Spilonemella* Nyl. ex Cromb.

F: limajäkälät **S:** svartlingar

Literature: Henssen, Ber. Deutsch. Bot. Ges. 81: 176–182 (1968); Schiman-Czeika, Plant Syst. Evol. 158: 283–288 (1988).

THALLUS gelatinous, blackish, variable in form, crustose-squamulose to dwarf fruticose or filamentous, homoiomerous, without distinct cortex. ASCOMATA variable, globose, usually immersed, often pycnoascocarps with expanding pore-like disc. Hymenium I+ reddish brown. Asci thin-walled, prototunicate, without apical amyloid structures, 8-spored. Spores simple, colourless, ellipsoid. CONIDIOMATA pycnidia, immersed, usually laminal; conidia bacilliform to ellipsoid. PHOTOBIONT *Nostoc,* mostly in chains, individual cells 4–5 µm diam.

Chemistry. No secondary substances (by TLC).

Note. The genus is very heterogeneous and needs revision, also at species level. The flat, foliose species have been mistaken for *Collema* species, from which they differ in the totally different, immersed ascomata, which are pycnoascocarps with simple spores. They belong to *Lempholemma* s. str. The fruticose species may resemble *Ephebe*, but contain *Nostoc,* and have apical, swollen fruitbodies or hormocystangia. They have hemiangiocarpic apothecia and are perhaps better included in a separate genus, *Spilonemella* Nyl.

1. Thallus *Collema*-like, membranaceous or strap-like 2
– Thallus crustose or cushion-formed 4
2. Thallus thick, strap-like with clustered, globose isidia ..... 9. *L. radiatum*
– Thallus thin, membranaceous, not isidiate 3
3. Thallus rather small, to 1 cm diam., smooth, spores ellipsoid, 20–30 × 9–15 µm; southern ..... 2. *L. chalazanum*
– Thallus usually larger, spreading to several cm, often ridged, spores ovoid 9–16 × 8–12 µm; widespread ..... 8. *L. polyanthes*
4. Thallus minutely shrubby with cylindrical lobes, to 5 mm long 5
– Thallus crustose to squamulose, often cushion-like, lobes flattened, less than 1 mm long 7
5. Thallus mostly horizontal, regularly branched, mostly carpeting, blackish 6
– Thallus finally shrubby with erect, irregular branches, olivaceous brown ..... 4. *L. degelianum*
6. Thallus mostly filamentous, sometimes with swollen apices containing pycnoascocarps . 6. *L. intricatum*
– Thallus mostly shrubby, in spreading cushions, with swollen apices containing hormocysts ..... 3. *L. cladodes*
7. Marginal lobes appressed, centrally with imbricate, often isidioid lobes ..... 7 *L. isidioides*
– Marginal lobes free, often umbilicate, not isidioid 8
8. Thallus of aggregated, imbricate cylindrical lobes in button-like structures ..... 1. *L. botryosum*
– Thallus of imbricate squamules, forming flattened cushions ..... 5. *L. dispansum*

1. Lempholemma botryosum (A.Massal.) Zahlbr.

Catal. Lich. Univ. 3: 20 (1924). – *Arnoldia botryosa* A.Massal., Misc. Lich.: 20 (1856). – TYPE: Germany, Franconiae sup. (Upper Franconia), Muggendorf in Wiesenthal, Arnold (VER holotype).

Red-listed in: **N**

Literature: Massalongo, Misc. Lich.: 20 (1856).

THALLUS of aggregated, intertwined, cylindrical lobes, forming small, olivaceous black, umbilicate cushions, to 3 mm diam. ASCOMATA immersed apothecia with pore-like disc, not found in Nordic material. Spores 7–9 × 5–7 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc* in short chains, individual cells 4–5 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On periodically wet, hard, calciferous rocks.

Distribution. Rare, rather southern. **N:** *Ak Bu Te SNo NNo.* **S:** *Öl Gtl Dls Vsm*. Otherwise widespread in the mountains of Central Europe, reaching as far west as the British Isles.

Note. Superficially rather similar to *L. dispansum*, which forms similar small cushions on the rock, but these are flatter and consist of flat, imbricate squamules. Very reduced forms of *L. intricatum* approach *L. botryosum*, but are never umbilicate and always have some decumbent branches.

2. Lempholemma chalazanum (Ach.) de Lesd.

Rech. Lich. Dunkerque: 261 (1910). – *Collema chalazanum* Ach., Lichenogr. Universalis: 630 (1810). – TYPE: Switzerland (Helvetia), Schleicher 867 (H-ACH 1904 holotype).

Syn. *Physma chalazanum* (Ach.) Arnold

F: sammallimajäkälä

Literature: Jørgensen, Graphis Scripta 2: 57 (1988).

THALLUS blackish, membranaceous, spreading with marginal lobation, to 2 cm diam. Upper surface smooth to small-squamulose. ASCOMATA immersed, laminal pycnoascocarps with widening brown disc, to 0.5 mm diam. Hymenium I+ reddish brown. Spores simple, colourless, broadly ellipsoid, 20–33 × 10–13 µm. CONIDIOMATA laminal, immersed, pale, pyriform pycnidia; conidia simple, bacilliform, colourless, 2–3 × 1–1.5 µm. PHOTOBIONT *Nostoc* in chains, individual cells 4–5 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Bryophilous, on fairly dry calcareous ground.

Distribution. Rare, southern. **F:** *V U PeP*?. **S:** *Gtl Vg*. Otherwise widespread in lowlands of Europe, commoner towards the south.

Note. Usually separable from *L. polyanthes* by the smaller, smoother thalli with fewer, larger fruitbodies and the drier habitat. In cases of doubt the larger spores of *L. chalazanum* are diagnostic.

3. Lempholemma cladodes (Tuck.) Zahlbr.

Catal. Lich. Univ. 3**:** 23 (1924). – *Collema cladodes* Tuck., Gen. Lich.: 89 (1872). – TYPE: USA, New York, Trenton Falls, 1872 Tuckerman (FH holotype).

Syn. *Lempholemma albonigrum* H.Magn.

Figs: Purvis et al., Lich. Fl. Gr Brit. Irel.: 343, fig. 17 (1992).

Literature: Degelius, Svensk Bot. Tidskr. 39: 419–430 (1945); Henssen, Lichenologist 4: 99–104 (1988).

THALLUS blackish, dwarf fruticose, forming low cushions to 3 cm diam.; lobes terete, decumbent and appressed or ascending, mostly dichotomously branched, to 2 mm long, with apical swellings, sometimes whitish, forming hormocystangia, to 0.3 mm diam., containing hormocysts, 25–35 × 10–15 µm, finally bursting open and becoming cup-like. ASCOMATA terminal, globose, pycnoascocarpia, to 0.4 mm diam. with blackish convex disc, not found in Nordic material. Spores simple, colourless, globose, 15–20 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc* in chains, individual cells 4–5 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On calciferous rocks.

Distribution. Rare, but widespread, commoner towards the north. **F:** *EnL.* **I:** *ISu IVe INv INo.* **N:** *Øf Bu Te SNo VFi.* **S:** *Öl SmI Vg Srm Vsm Upl Dlr LyL TL.* Otherwise on the British Isles and in cold temperate North America.

Note. One of the easiest recognized species in the genus because of the hormocystangia in the swollen apices of the branches, not found in the other dwarf fruticose species in the region. These may be of the same colour as the thallus or often rather whitish, a variation of little taxonomic importance.

4. Lempholemma degelianum P.M.Jørg.

Graphis Scripta 9: 5 (1998). – TYPE: Sweden, Öland, Vickleby, Alvaret, N of stone-fence, karst area, 1947 Degelius B100 (UPS holotype).

Literature: Jørgensen, Graphis Scripta 9: 5–7 (1998).

Figs: Jørgensen 1998: 6.

THALLUS olivaceous brown, initially squamulose, to 200 µm thick, subsequently becoming dwarf fruticose in loose cushions, to 1 cm diam., with flattened, more or less dentate, phyllidiate branches. ASCOMATA scattered, apical on branches, pycnoascocarpia, globose, with olivaceous brown disc, to 1 mm diam. Hymenium I+ reddish brown. Spores simple, colourless, subglobose, 15–20(–23) × 15–19(–22) µm. CONIDIOMATA not observed. PHOTOBIONT *Nostoc* in chains, individual cells 4–5 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On margins of temporary pools in calcareous alvar, more or less submerged in winter-time but dry in the summer.

Distribution. Rare and local. **S:** *Öl Gtl Vg Ög.* Unknown outside Sweden, and probably a Baltic endemic.

Note. A most unusual species, unique in the genus by the phyllidiate, subfruticose thallus and the very special habitat.

5. Lempholemma dispansum H.Magn.

Bot. Not. 1939: 302 (1939). – TYPE: Sweden, Dalsland, Bäcke, Kårud, 1938 Bergström & Magnusson (UPS holotype).

Literature: Magnusson, Bot. Not. 1939: 302–303 (1939).

THALLUS blackish, forming flattened, more or less umbilicate cushions of imbricate squamules, to 300 µm thick and 5 mm wide. ASCOMATA and CONIDIOMATA not observed. PHOTOBIONT *Nostoc* in chains, individual cells 3–4 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Irrigated, sun-exposed, calcareous rocks.

Distribution. Rare and scattered. **N:** *Ak.* **S:** *Dls Vg Dlr Jmt LyL TL.* Otherwise only known from northern Germany.

Note. An enigmatic species which superficially resembles *L. botryosum,* but forming flatter cushions of dense squamules, rather than twisted cylindrical lobes. Henssen (pers. comm.) has found pycnidia in one specimen, which indicates that this species does not belong to *Lempholemma,* but rather is a member of the

Collemataceae. Henssen (1969: 103), however, also reports to have found hormocystangia, neither observed by me, nor by Magnusson. Hopefully fertile material will eventually turn up and throw some light on the taxonomic position of this rather rare, mostly poorly developed species.

6. Lempholemma intricatum (Arnold) Zahlbr.

Catal. Lich. Univ. 3**:** 23 (1924). – *Omphalaria intricata* Arnold, Flora 52: 254 (1869). – TYPE: Germany, Bavaria, "Bayerische Alpen, unweit der Weitalm an den Hochgern ober Wesser", 1869 Arnold, Lich. Exs. no. 399 (M lectotype, Jørgensen, Nordic Lichen Flora 3: 144, 2007).

Syn. *Lempholemma fennicum* (Räsänen) Degel.

F: liuskelimajäkälä

Litterature: Degelius, Bot. Not. 109: 355 (1956); Jørgensen, Graphis Scripta 2: 57 (1988).

THALLUS blackish brown, shrubby to filamentous, forming small carpets or flattened cushions, to 3 cm diam., with cylindrical lobes which are decumbent and entangled, to 5 mm long. ASCOMATA rare, laminal, pycnoascocarpia, to 0.2 mm diam., globose, partly immersed, with expanding brownish disc. Hymenium I+ reddish brown. Spores colourless, simple, subglobose, 10–14 × 8–11 µm. CONIDIOMATA rare, immersed, pyriform; conidia simple, bacilliform,colourless, 4–5 × 1–1.5 µm. PHOTOBIONT *Nostoc* in chains, individual cells 4–5 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On calciferous or siliceous rocks.

Distribution. Rare but widespread. **F:** *EnL.* **N:** *Øf Bu AA SNo.* Otherwise in the Central European mountains, reaching as far west as the British Isles.

Note. When forming small cushions this variable species is separable from *L. cladodes* by the lack of terminal globular hormocystangia. Large, well-developed specimens may resemble *Ephebe* which, however, contains *Stigonema*.

7. Lempholemma isidiodes (Nyl. ex Arnold) H.Magn.

Bot. Not. 1939: 303 (1939). – *Collema isidiodes* Nyl. ex Arnold, Flora 53: 253 (1870). – TYPE: Germany, Bavaria, an feuchten Stellen der kleineren Kalkhorn, 1869 Arnold (M holotype).

Syn. *Collema alpinum* Th.Fr. p.p., *Lempholemma silicicola* H.Magn.

Literature: Degelius, Svensk Bot. Tidskr. 33: 427 (1939); Magnusson, Bot. Not. 1939: 303 (1939); Havaas, Bergens Univ. Årb. 1954: 12 (1954).

THALLUS blackish, small-squamulose, forming irregular rosettes, to 3 mm diam. with ascending, cylindrical, isidia-like lobes 0.1–0.2 mm long. ASCOMATA rare, laminal, subimmersed, pycnoascocarpia, with expanding brownish disc, to 0.5 mm diam. Hymenium I+ reddish brown. Spores simple, colourless, broadly ellipsoid, 10–13 × 7–8 µm. CONIDIOMATA rare, immersed pycnidia; conidia simple, bacilliform, colourless, 1–2 × 1 µm. PHOTOBIONT *Nostoc* in chains, individual cells 4–6 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On irrigated, sun-exposed calciferous or siliceous rocks.

Distribution. Rather common and widespread, commonest in the north and at high altitudes. **N:** *Op Bu Ho SF ST NT SNo NNo Tr ØFi.* **S:** *Öl Gtl Klm Dls Vg Ög Srm Upl Dlr LyL TL.* Otherwise known from the Central European mountains.

Note. A long misunderstood species which is generally more rosette-like and less cushion-formed than *L. botryosum* and has erect cylindrical lobes, which look like isidia rather than intertwining lobes.

8. Lempholemma polyanthes (Bernh.) Malme

Schedae Lich. Suec. Exs. no. 883 (1924). – *Collema polyanthes* Bernh., J. Bot. (Schrader) 1**:** 12 (1799). – TYPE: Icon in op. cit., tab. 1 fig. 4 (holotype); Sweden, Västmanland, Nora, Fåsjön, St. Holmen, 1916 Vrang (Malme, Lich. Exs. Suec. no. 883, UPS epitype, Jørgensen, Nordic Lichen Flora 3: 144, 2007).

Syn. *Lempholemma myriococcum* (Ach.) Th.Fr., *Lempholemma chalazanodes* (Nyl.) Zahlbr.

F: kalkkilimijäkälä **I:** mosagroppa **S:** moss-svartling

Literature: Jørgensen, Graphis Scripta 2: 56–57 (1988), Kantvilas & Jørgensen, Muelleria 11: 45–50 (1998).

Figs: Kantvilas & Jørgensen 1998: 47; Schultz & Büdel, Lichenologist 34: 46, 52 (2002) fig. 4c, fig. 7h (cross-section of ascogones).

THALLUS membranaceous, dark olivaceous to blackish, gelatinous when wet, to 5 cm diam., with distinct marginal lobes, to 3 mm wide. Upper surface irregular, with ridges and warts, occasionally fenestrate. ASCOMATA usually with numerous, often aggregated pycnoascocarps, to 0.3 mm diam., immersed, when young with porelike disc, gradually widening and exposing the brown disc. Hymenium I+ reddish brown. Spores simple, colourless, globose to broadly ellipsoid, 10–15(–20) × 8–12(–15) µm, with swelling, gelatinous epispore. CONIDIOMATA common, immersed pycnidia; conidia bacilliform, colourless, 2–3 × 0.5–1 µm. PHOTOBIONT *Nostoc* in chains, individual cells 4–5 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Among mosses on calcareous ground.

Distribution. Widespread and locally common, mostly in the lowlands, rarely above 1000 m. **Gr. Fa. F:** *V EH PK Kn PeP Ks SoL EnL InL.* **I:** *ISu IVe IMi IAu INv INo.* **N:** *Øf Ak He Op Bu Vf AA Ro Ho SF MR ST SNo NNo VFi ØFi.* **S:** *Sk Bl Öl Gtl Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb ÅsL LyL PL LuL TL?*. Otherwise widespread in temperate parts of the Northern Hemisphere, as well as in SW Australia.

Note. Often confused with non-lichenized *Nostoc* overgrowing bryophytes, which, however, does not produce ascomata and contain fungal mycelium. Quite variable in size, colour and spore size. As there appears to be no correlation in these characters, I regard this as part of the variation of one species, often influenced by the growth conditions.

9. Lempholemma radiatum (Sommerf.) Henssen

Ber. Deutsch. Bot. Ges. 81: 179 (1968). – *Collema radiatum* Sommerf., Suppl. Fl. Lapp.: 121 (1826). – TYPE: Norway, Nordland, Saltdalen, 1823 Sommerfelt (O holotype).

Syn. *Collema lichinodeum* Nyl. ex Cromb., *Omphalaria radiata* (Sommerf.) Forssell, *Thyrea radiata* (Sommerf.) Zahlbr.

I: geislagroppa

Red-listed in: **N**

Literature: Henssen, Ber. Deutsch. Bot. Ges. 81: 176–182 (1968).

Figs: Henssen 1968: Taf. IIIa.

THALLUS forming rosettes, to 3 cm diam., dark green when wet, black and licorice-like when dry; lobes strap-like, radiating, channelled or angular, repeatedly dichotomous, to 1 mm wide. Upper surface with clusters of globose to clavate isidia, particularly in central parts, where also globose hormocystangia are found, containing hormocysts to 30 × 10 µm. ASCOMATA unknown in Nordic material, but recorded from Alaskan material as immersed, with colourless, simple, broadly ellipsoid spores, 14–23 × 8–12 µm. CONIDIOMATA not rare, immersed pycnidia; conidia simple, bacilliform, colourless, 3.5–5.5 × 1 µm. PHOTOBIONT *Nostoc* in disintegrating chains, mainly at the surface, individual cells 4.5–5.5 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On moist calciferous rocks, often on mosses.

Distribution. Arctic-alpine, restricted to the northern parts, not common. **Gr. F:** *Ks*. **I:** *IAu INv*. **N:** *Op Ho SF ST SNo NNo Tr*. **S:** *Mpd Hrj Jmt Vb ÅsL LyL LuL TL*. Probably circumarctic, reaching as far south as the Scottish mountains and the Alps, known also from Alaska and northern Canada.

Note. Unmistakable species, due to its compact, licorice-like, strappy thallus. Its generic position is uncertain as it differs very much in thallus organization from the rest of the genus. It is perhaps better placed in the genus *Schizoma* Nyl. ex Cromb., but further research on the structure of the genus *Lempholemma* is needed to settle the matter.

Lichina C.Agardh, *nom. cons.*

Syn. Alg. Scand.: xii, 9 (1817). – TYPE: *Lichina pygmaea* (Lightf.) C.Agardh

F: nuijajäkälät **S:** tånglavar

Literature: Fægri, Nytt Mag. Naturv. 78: 141–151 (1938); Henssen, Symb. Bot. Ups. 18(1): 36–37 (1963); Lichenologist 4: 88–98 (1969); Schultz & Büdel, Lichenologist 34: 39–62 (2002).

THALLUS fruticulose, with rounded to flattened branches (lobes), blackish brown, gelatinous when wet, forming carpets or cushions attached to the substrate by a disc-like holdfast, resembling minute brown seaweeds; hyphae arranged in a characteristic fountain-like pattern with the photobiont in the outer parts and a central hyphal strand, cortex lacking. ASCOMATA terminal, sphaerical apothecia with conspicuous thalline margin and suppressed proper exciple; disc small, punctiform, brown. Hymenium hyaline, gelatinous; primary paraphyses narrow, branched, anastomosing, secondary paraphyses thicker, apically enlarged. Asci narrow cylindrical, apically pointed, with I+ blue coat and thin, soon disintegrating walls, 8-spored. Spores colourless, simple, though often with plasma-bridges disappearing in K, ovate. CONIDIOMATA pycnidia, similar to apothecia, into which they sometime transform (pycnoascocarps); conidia ovate to cylindrical produced terminally on long-celled conidiophores. PHOTOBIONT *Calothrix* in tapering chains, individual cells 7–10 µm diam.

Chemistry. No secondary substances (by TLC).

Note. Unmistakable genus due to its seaweed-like appearance and maritime habitat.

1. Thallus to 5 mm high, branches cylindrical, to 0.2 mm diam.; in littoral, upper *Verrucaria*-zone, common..... 1. *L. confinis*
– Thallus to 1 cm high, branches flattened, to 0.5 mm diam.; in littoral, lower *Verrucaria*-zone, restricted to the southwest..... 2. *L. pygmaea*

1. Lichina confinis (O.F.Müll.) C.Agardh

Syn. Alg. Scand.: 105 (1817). – *Lichen confinis* O.F.Müll., Fl. Dan. 5: 5 (1782). – TYPE: Icon in O. F. Müller, Fl. Dan. 5: fig. 1279, 1782 (lectotype, Jørgensen, Nordic Lichen Flora 3: 144, 2007); Norway, Hordaland ("Søndre Bergenhus amt"), ad Mosterhavn, 1914 Havaas, Lich. Exs. Norv. Occ. no. 68 (BG epitype, Jørgensen, Nordic Lichen Flora 3: 144, 2007).

D: liden tanglav **F:** nuijajäkälä **I:** fjörukregða **N:** liten tanglav **S:** tånglav

Literature: Fægri 1938: 143–146; Degelius, Svensk Bot. Tidskr. 40: 447–448 (1946); Litterski, Herzogia 9: 151 (1992).

Figs: Müller, Fl. Dan. 5: 5, fig. 1279 (1782); Krog et al., Norsk lavflora: 183 (1980); Schultz & Büdel: 2002: fig. 1b; Holien & Tønsberg 2006: 205.

THALLUS fruticulose and richly, more or less dichotomously branched, shining olive brown to blackish, gelatinous when wet, forming densely interwoven tufts, 3–5 mm high; branches coralloid, to 0.2 mm diam. ASCOMATA terminal, perithecioid apothecia, spherical, appearing swollen, finally with visible, poriform, brown discs, 0.2 mm diam., common. Hymenium I–, with narrowly cylindrical 8-spored asci. Spores simple, colourless, ovate, 15–20 × 10–15 µm. CONIDIOMATA pycnidia, externally like the apothecia, common; conidia simple, bacilliform, hyaline, 3–5 × 1 µm. PHOTOBIONT *Calothrix* in tapering chains, concentrated towards the surface.

Chemistry. No secondary substances (by TLC).

Habitat. Maritime rocks, at the high-water mark in the upper *Verrucaria maura*-zone.

Distribution. Widespread and common along the west coasts, but also in southern parts of the Baltic. **D:** *NJy ØJy SJy Sjæ Brn*. **Fa. I:** *ISu IVe IAu INv INo.* **F:** *A V U.* **N:** *Øf Ak Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi.* **S:** *Sk Bl Öl Gtl Klm Hl Bh Ög Srm Upl.* Otherwise along the Atlantic coasts of Europe (from Madeira northwards to Scandinavia) and North America.

2. Lichina pygmaea (Lightf.) C.Agardh

Syn. Alg. Scand.: 274 (1817). – *Fucus pygmaeus* Lightf., Fl. Scot. 2**:** 964 (1777). – TYPE: Icon in Lightfoot, Fl. Scot. 2**:** fig. 32e, 1777 (lectotype, Jørgensen, Nordic Lich. Flora 3: 144, 2007); Scotland, East Lothian, Firth of Forth, North Berwick, The Leithies, 2006 Coppins 21797 (E epitype, Jørgensen, Nordic Lich. Flora 3: 144, 2007).

N stor tanglav

Literature: Fægri 1938: 146–149; Raven et al., New Phytol. 114: 407–417 (1990).

Figs: Fægri 1938: 143; Krog et al. 1980: 183; Schultz & Büdel 2002: fig. 1a.

THALLUS fruticulose, shining olive brown to blackish, gelatinous when wet, 8–10 mm high, forming extensive, loose carpets; branchlets flattened and palmately divided, to 0.5 mm diam. ASCOMATA terminal, perithecioid apothecia, appearing swollen, finally with visible pale brown, punctiform disc, to 0.5 mm diam., common. Hymenium I–, with narrowly cylindrical 8-spored asci. Spores colourless, simple, ovate, 22–25 ×

12–15 µm. CONIDIOMATA superficially like apothecia, common; conidia simple, bacilliform, colourless, 3–5 × 1 µm. PHOTOBIONT *Calothrix* in tapering chains, concentrated towards the surface.

Chemistry. No secondary substances (by TLC).

Habitat. On sunny, exposed shores, in the lower part of the *Verrucaria*-zone, thermophilous.

Distribution. Uncommon but locally abundant, southwestern. **N:** *Ro Ho SF MR SNo*. Otherwise along the Atlantic coast of Europe from Madeira and the Azores, north to Norway.

Note. Easily distinguished from *L. confinis* by the larger size, flattened branches and the tendency to form carpets rather than tufts.

Lichinodium Nyl.

Flora 58: 297 (1875). – TYPE: *Lichinodium sirosiphoideum* Nyl.

Literature: Henssen, Symb. Bot. Ups. 18(1): 83–85 (1963); Lichenologist 6: 106–108 (1974).

THALLUS fruticulose, sparsely branched, brownish blue-green, forming tiny cushions, to 2 mm high; branches terete, translucent, with parallel round-celled hyphae enclosing the photobiont. ASCOMATA apothecia, to 0.1 mm diam., formed between the thalli, gelatinous, brownish, without exciple, rare. Hymenium of basically branched paraphyses, I– with 8-spored, thin-walled asci. Spores simple, colourless, ovoid. CONIDIOMATA lateral, pale brown, 0.1 mm diam., loosely associated with thallus, rare; conidia acicular, 15–25 × 0.5 µm. PHOTOBIONT S*cytonema* in clustered chains.

Chemistry. No secondary substances (by TLC).

Note. Unlike other members of the Lichinaceae most species of this genus are epiphytic.

1. Thallus very small, branchlets 0.2–0.3 mm long; on branches of spruce in very humid habitats, rare ..... 1. *L. ahlneri*
– Thallus larger, branchlets 1–2 mm long; overgrowing mosses or other lichens, widespread ..... 2. *L. sirosiphoideum*

1. Lichinodium ahlneri Henssen

Symb. Bot. Ups. 18(1): 84 (1963). – TYPE: Norway, Nord-Trøndelag, Overhalla, Lilleøren, 1938 Ahlner (S holotype).

N: trøndertufslav

Literature: Henssen 1963: 84–85; Holien & Tønsberg, Blyttia 54: 157–177 (1996).

Figs: Henssen 1963: Taf. 24b (habitus), Taf. 23a (thallus anatomy), Taf 23f (pycnidium); Holien & Tønsberg 2006: 205.

Red-listed in: **N**

THALLUS granular to fruticulose, forming small greenish brown rosettes, to 2 mm diam.; branches 0.2–0.3 mm long, 15–30 µm thick, with parallel, round-celled hyphae. ASCOMATA pale brown, gelatinose apothecia without exciple, rare, to 0.1 mm diam. Hymenium I–, with 8-spored, thin-walled, cylindrical asci. Spores colourless, simple, ovoid, 6.5–7 × 5.5–7 µm. CONIDIOMATA acicular, 15–25 × 0.5 µm. PHOTOBIONT *Scytonema* in paired chains, individual cells 11–16 × 7–11 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On thin branchlets of spruce (*Picea abies*) in very humid forests.

Distribution. Rare, confined to the cool, oceanic boreal forests of central Scandinavia. **N:** *ST SNo.* **S:** *Vrm.*

Note. This tiny lichen is often not discovered until under the dissecting microscope but cannot be confused with any other in our flora. In North America, however, there are similar, closely related taxa.

2. Lichinodium sirosiphoideum Nyl.

Flora 58: 297 (1875). – TYPE: Finland, Tavastia australis, Hollola, Enonsaari, 1871 Vainio (H holotype).

S: kuddlav

Literature: Henssen 1963: 83–84 (1963); Arvidsson, Lichenologist 11: 187–190 (1979).

Figs: Henssen 1963: taf. 24a (habitus); taf. 23b (thallus anatomy).

THALLUS fruticolose, brown, forming 1–2 mm high cushions; branches centrally erect, 30–80 µm diam., at the margins procumbent and thicker, to 150 µm,

internally with parallel, round-celled hyphae. ASCOMATA and CONIDIOMATA unknown. PHOTOBIONT *Scytonema* in clusters of 4–5, individual cells 6–9 × 6–7 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Over mosses or lichens (especially *Parmelia saxatilis*) on rocks.

Distribution. Rare and scattered but widespread. **Fa. F:** *EH PK Kn InL.* **N:** *Op Bu ST ØFi.* **S:** *Vsm Dlr Hrj Jmt LyL LuL TL.* Outside the Nordic countries known from Scotland, Pacific North America and adjacent SE Asia.

Note. Differs from the other fruticulose species in the Lichinaceae by the ecology.

Metamelanea Henssen

Lichenologist 21: 101 (1989). – TYPE: *Metamelanea umbonata* Henssen

Literature: Henssen, Lichenologist 21: 101–118 (1989).

THALLUS crustose-subfruticose, areolate, blackish brown (rarely grey pruinose), of densely aggregated rows of poorly lichenized colonies of single-celled cyanobionts. ASCOMATA more or less immersed apothecia, with strong (false) thalline margin, separated from thallus by a slit and sometimes multidivided with thalline elements in between, darkly pigmented. Hymenium I+ blue, with cylindrical 8-spored asci. Spores simple, colourless, ellipsoid. CONIDIOMATA immersed pycnidia; conidia rod-shaped, simple, colourless PHOTOBIONT chroococcoid in clusters with brown sheaths.

Chemistry. No secondary substances (by TLC).

Note. A recently described genus related to *Psorotichia,* which is similar but has different kind of apothecia and thallus of different structure.

1. Thallus grey-pruinose; apothecia without central thalline structures ..... 1. *M. caesiella*
– Thallus blackish brown; apothecia with central thalline structures ..... 2. *M. umbonata*

1. Metamelanea caesiella (Th.Fr.) Henssen

in Henssen & Jørgensen, Lichenologist 22: 141 (1990). – *Pyrenopsis caesiella* Th.Fr., Bot. Not. 1866: 58 (1866). – TYPE: Norway, Dovre, Drivstuen, 1864 Th. Fries (UPS holotype).

Literature: Henssen, Lichenologist 21: 101–118 (1989).

Figs: Schultz & Büdel, Lichenologist 34: 46 (2002), fig. 4 j.

THALLUS nodulose-areolate, with subpulverulent, grey-pruinose surface, forming effuse structures, to 300 µm thick, homoiomerous. ASCOMATA very rare, 0.5–1 mm diam., adnate apothecia, with distinct conspicuous thalline margin and black, flat disc, sometimes with thalline elements inspersed. Asci cylindrical, 8-spored. Spores simple, colourless, 10–12 × 7–8 µm. CONIDIOMATA immersed in thallus; conidia rod-shaped, simple, colourless, 3–4 × 1 µm. PHOTOBIONT chroococcoid, in densely packed clusters surrounded by brown sheaths, individual cells 4–6 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On steep calciferous rocks.

Distribution. Continental and rare. **N:** (*Ak*) *ST.* Otherwise only known in a few collections from Central Europe.

Note. Characteristic grey-pruinose species, which may be difficult to recognize when sterile as it usually is, but unmistakable in section due to the characteristic densely aggregated, poorly lichenized cyanobiont colonies.

2. Metamelanea umbonata Henssen

Lichenologist 21: 105–106 (1989). – TYPE: Switzerland, Unterwalden, Oberrickenbach, Bannalp, 1964 Henssen 17682a (MB holotype).

Literature: Henssen 1989: 105–109.

Figs: Henssen 1989: 104–107.

THALLUS crustose, somewhat shining, blackish brown, to 5 cm diam., of strongly adglutinated areoles, 0.3–0.6 mm wide, homoiomerous, with rather weakly lichenized cyanobiont colonies, often roughened by ascending lobetips which appear to function as dispersal units. ASCOMATA adnate apothecia, common, 0.6 mm diam., with strongly developed coronate thalline margin, to 200 µm wide; disc brown, in central parts with thalline elements, sometimes with distinct thalline squamules. Hymenium brownish in upper parts, I+ blue, with cylindrical asci. Spores usually poorly developed, but recorded to be ellipsoid, 11–13.5 × 8–9.5 µm, in Swiss

material. CONIDIOMATA pycnidia, rare, not observed in the Finnish material, but recorded to be immersed, elongate, in section 110–140 µm long and 40–65 µm wide; conidia rod-shaped, 2–3.5 × 1–1.5 µm. PHOTOBIONT chroococcoid, with clusters of cells, 5–7 µm diam., surrounded by brown gelatinous sheaths.

Chemistry. No secondary substances (by TLC).

Habitat. Wet (seepage), calcareous rocks.

Distribution. Very rare. **F:** *PeP*. Otherwise only known from the type collection in Switzerland and recently recorded from North America (Fryday, Bryologist 109: 572, 2006).

Note. A most characteristic species with a very strong thalline margin on the apothecia and "umbilicate" disc with central thalline squamules. The only other species in the family which sometimes develop such structures in the apothecia is *Thelignya lignyota*, an entirely different species, which has blue-green pigmentation in the upper part of the hymenium and different cyanobiont in chains (*Calothrix*).

Phylliscum Nyl.

Ann. Sci. Nat., Bot., Sér. 3, 20: 320 (1853). – TYPE: *Phylliscum endocarpoides* Nyl. (=*P. demangeonii*).

Literature: Forssell, Beitr. Gloeolich.: 62–63 (1885); Henssen, Symb. Bot. Ups. 18(1): 24 (1963); Svensk Bot. Tidskr. 57: 145–160 (1963); Ber. Deutsch. Bot. Ges. 92: 483–506 (1979).

THALLUS squamulose, hollow, with a network of angular-celled hyphae surrounding the photobiont in the outer parts, umbilicate, aggregating and forming more or less continuous blackish grey areas on the rocks, gelatinous when wet. ASCOMATA perithecioid, laminal, usually immersed and only visible as dark-centred depressions on the thallus; exciple distinct (in section), surrounding the hymenium, which is I+ blue, but without paraphyses, though filled with anastomosing hyphae. Asci thin-walled and acuminate, with ovoid to ellipsoid spores often appearing one-septate by plasma-bridges (dissolving in K). CONIDIOMATA pycnidia; conidia cylindrical to acicular. PHOTOBIONT chroococcoid (*Gloeocapsa*), with large cells, to 40 µm diam., surrounded by 1–2 red-brown-pigmented sheaths.

Chemistry. No secondary substances (by TLC).

Note. The genus as circumscribed by Henssen (1963) is not uniform, but the only species in our region is the type-species. The warm-temperate/subtropical species of the Americas should at least be placed in a separate subgenus because of their different ascomata.

1. Phylliscum demangeonii (Moug. & Mont.) Nyl.

Mém. Soc. Imp. Sci. Nat. Cherbourg sér. 2, 3: 166 (1855). – *Collema demangeonii* Moug. & Mont. in Montagne, Pl. Cell. Nouv.: 291 (1849). – TYPE: France(?): near Romarimonte, Demangeon, Mougeot & Nestler, Stirp. Crypt. Vogeso-Rhen. no. 1340 (UPS lectotype, Jørgensen, Nordic Lichen Flora 3: 144, 2007).

Syn. *Endocarpon phylliscum* Wahlenb., *Phylliscum endocarpoides* Nyl., *Phylliscum silesiacum* Stein.

F: ruusukemustaaja **S:** navelskorplav

Literature: Forssell, Beitr. Gloeolich.: 62–63 (1885); Henssen, Svensk Bot. Tidskr. 57: 145–160 (1963); Hansen, Mycotaxon 38: 134 (1990).

Figs: Henssen 1963: 155, fig. 6, 12, 22; Schultz & Büdel, Lichenologist 34: 44 (2002) fig. 3a.

THALLUS squamulose, greyish black, gelatinous when wet, individual squamules somewhat inflated, centrally hollow, umbilicate, to 5 mm wide, with incised margins and partly areolate upper surface. ASCOMATA laminal, mostly visible as depressions on the surface, without paraphyses. Asci acuminate, thin-walled, polysporous, usually containing 16 spores. Spores colourless, simple, though often appearing septate by plasma-bridges (dissolving in K), ellipsoid, 7–10 × 4–5 µm. CONIDIOMATA immersed pycnidia; conidia acicular, curved, 4–7 × 1–2 µm. PHOTOBIONT chroococcalean, with large cells, 15–35 µm diam. enclosed in 1–2 brownish sheaths.

Chemistry. No secondary substances (by TLC).

Habitat. On moist, acidic rocks, often seepages.

Distribution. Widespread, locally common, particularly towards the north. **Gr. F:** *A V U EH PS PK Ks KiL EnL InL.* **I:** *ISu.* **N:** *Øf Ak Bu Vf Te Ho SF ST SNo Tr VFi ØFi.* **S:** *Sk Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb ÅsL LyL LuL TL.* Otherwise in temperate parts of the Northern Hemisphere.

Note. An easily recognised species by the somewhat inflated, umbilicate squamules with punctiform, often central ascomata.

Porocyphus Körb.

Syst. Lich. Germ.: 425–426 (1855). – TYPE: *Porocyphus coccodes* (Flot.) Körb.

Syn. *Lichiniza* Nyl.

Literature: Henssen, Symb. Bot. Ups. 18(1): 61–71 (1963); Lichenologist 6: 108–110 (1974).

THALLUS crustose, areolate, sometimes with effigurate margin; areoles often granular, isidioid or vermiform with fountain-like paraplectenchymatous structure, to 500 µm wide. ASCOMATA normally immersed pycnoascocarps with soon excluded thalline margin; primary paraphyses anastomosing, secondary paraphyses thicker, unbranched. Iodine reaction variable, usually I+ blue but not persistently. Asci prototunicate, cylindrical. Spores ovoid, simple, colourless. CONIDIOMATA pycnidia; conidia simple, ovoid, colourless, 2–3 × 1–2 µm. PHOTOBIONT *Calothrix* in chains, individual cells 6–9 × 3–6 µm diam.

Chemistry. No secondary substances (by TLC).

1. Thallus areolate, granular to coralloid, blackish, hymenium thin, about 100 µm; on seepage rocks, widespread ..... 1. *P. coccodes*
– Thallus placodioid with vermiform, smooth areoles, brownish; hymenium thicker, about 200 µm; in inundation-zones of lakes, rare, south-western ..... 2. *P. kenmorensis*

1. Porocyphus coccodes (Flot.) Körb.

Syst. Lich. Germ.: 426 (1855). – *Collema coccodes* Flot., Linnaea 23: 152 (1850). – TYPE: [Poland] Silesia, Flotow (UPS lectotype, Nordic Lichen Flora 3: 145, 2007).

Syn. *Porocyphus areolatus* (Flot.) Körb., *Porocyphus furfurellus* (Nyl.) Forssell

Literature: Henssen 1963: 63–64.

Figs: Henssen 1963: Taf. 2a, 8a (thallus anatomy); Taf. 8a (pycnoascocarp); Schultz & Büdel, Lichenologist 34: 50, 54 (2002), fig. 6g (cross-section of mature apothecium), fig. 8a (section of pycnoascocarp).

THALLUS areolate, granular to coralloid; areoles blackish, to 2.5 mm wide and 1 mm high (then appearing coralloid), confluent and sometimes indistinct, often granular. ASCOMATA immersed to rarely sessile pycnoascocarps, to 0.3 mm diam., at first with distinct thalline margin, which eventually recedes to expose a pale, thin, to 20 µm wide, proper exciple; disc poriform, expanding to expose a reddish brown disc. Hymenium about 100 µm thick, I+ bluish, often turning red-brown. Asci thin-walled, cylindrical, 8-spored. Spores simple, colourless, ovoid, 10–18 × 7–12 µm. CONIDIOMATA immersed pycnidia; conidia simple, ellipsoid, colourless, 2–3 × 1–1.5 µm. PHOTOBIONT *Calothrix* in disrupted chains, individual cells 6–8 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Moist siliceous rocks by streams or seepages.

Distribution. Scattered but widespread, locally common. **D:** (*Brn*). **F:** *V U EH PeP Ks.* **N:** *Ak Ro Ho ST NT SNo*. **S:** *Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång ÅsL LyL TL.* Otherwise scattered in temperate parts of the Northern Hemisphere as far south as the North African mountains.

Note. A most variable species, easily overlooked as it often appears just as a colour-flush on the rocks, then with poorly developed and poorly lichenized thallus. Sometimes the thallus is nearly coralloid, with structures ranging to 1 mm high. This variation appears mainly to be a result of varying growth-conditions and cannot be correlated with the variable hymenial reactions. These reactions may be a result of the developmental stage of the ascomata, which according to Henssen (1963) may develop in several different ways, sometimes being pycnoascocarps, sometimes evolving directly from the ascogonal tangle of hyphae. This variation is poorly understood and may obscure the taxonomy.

2. Porocyphus kenmorensis (H.B.Holl ex Nyl.) Henssen

Lichenologist 6: 108 (1974). – *Synalissa kenmorensis* H.B.Holl ex Nyl., Flora 64: 6 (1881). – TYPE: Scotland, Kenmore, Loch Tay, 1869 Holl (H-NYL 42813 holotype).

Literature: Henssen 1974: 109.

Figs: Henssen 1974: 108; Schultz & Büdel, Lichenologist 34: 46 (2002) fig. 4f.

THALLUS crustose-placodioid with brownish, vermiform convex areoles, forming cracked, circular patches to 5

cm diam.; marginal lobes distinct, to 1 mm wide. ASCOMATA common, pycnoascocarps, mostly visible as brown swellings on the surface, 0.4 mm diam., finally opening, exposing the glossy, orange-brown disc, surrounded by a thin whitish proper exciple. Asci cylindrical, thin-walled, 8-spored. Spores simple, colourless, ellipsoid, 11–20 × 8–10 µm. CONIDIOMATA pycnidia, common; conidia bacilliform, colourless, 3–4 × 1 µm. PHOTOBIONT *Calothrix* in disrupted chains, individual cells 6–7 µm.

Chemistry. No secondary substances (by TLC).

Habitat. Saxicolous in the inundation zone of lakes.

Distribution. Southwestern, though surprisingly absent from Norway. **F:** *St*. **S:** (*Bl*) *Hl Gst.* Otherwise scattered along the Atlantic coasts of Europe from the Azores and northwards.

Note. A most characteristic species with smooth, rounded, vermiform areoles forming a net-like pattern. The ascomata remain more or less immersed, appearing as brown swellings on the surface.

Excluded species

Porocyphus populicola Räsänen
It is based on an algal cover interspersed with young fruitbodies of a *Gyalecta* (?*truncigena*).

Psorotichia A.Massal.

Framm. Lichenogr.: 15 (1855). – TYPE: *Psorotichia murorum* A.Massal.

Syn. *Collemopsis* Nyl.

Literature: Forssell, Beitr. Gloeolich.: 66–87 (1885).

THALLUS small-squamulose, squamules sometimes nearly granular, to 0.7 mm wide, olivaceous brown when dry, gelatinous, homoiomerous, paraplectenchymatous throughout. ASCOMATA apothecioid, more or less immersed, urceolate, finally flat with brownish disc and distinct thalline margin, sometimes with pale proper margin which is discontinuous below the subhymenium. Hymenium I+ blue. Asci cylindrical, thin-walled, without apical amyloid structures, 8-spored. Spores simple, colourless, ellipsoid, without epispore. CONIDIOMATA immersed pycnidia; conidia simple, bacilliform colourless,. PHOTOBIONT *Chroococcidiopsis* occurring in groups, surrounded by brownish sheaths, individual cells to 10 µm diam.

Chemistry. No secondary substances (by TLC).

Note. A poorly understood genus, which differs from *Lemmopsis* mainly in details of the apothecial anatomy (exciple open in lower parts). The species are also poorly understood. Two Nordic species only known from their type specimens and (incorrectly?) referred to this genus, *Psorotichia incavata* H.Magn. (Sweden) and *Psorotichia fuliginascens* Nyl. (Finland), are not included here since their status cannot be evaluated at the moment as the type specimens are either scrappy or not available for study.

1. **Psorotichia schaereri** (A.Massal.) Arnold

Flora 52: 265 (1869). – *Pannaria schaereri* A.Massal., Lich. Crost.: 114 (1852). – TYPE: Italy, Massalongo, Lich. Exs. Ital. no. 338 (UPS lectotype, Jørgensen, Nordic Lichen Flora 3: 145, 2007).

Syn. *Collema subbadium* Nyl.

Literature: Forssell 1885: 82–84.

THALLUS areolate-crustose to subsquamulose, greenish black to brown, effuse, to 100 µm thick, often with granular margins and then appearing verrucose. ASCOMATA common, apothecioid, partly immersed, but emergent, with distinct brown disc; thalline margin granular, eventually excluded, exposing the proper margin which is to 50 µm wide, narrowing and disappearing towards the basis. Asci cylindrical, thin-walled, 8-spored. Spores colourless, simple, broadly ellipsoid, 15–25 × 6–10 µm. CONIDIOMATA immersed pycnidia, rare; conidia simple, bacilliform, colourless, 3–4 × 1 µm. PHOTOBIONT *Chroococcidiopsis*, often occurring in aggregates enclosed by a brownish sheath, individual cells 5–9 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Seepages on shaded calciferous rocks or walls.

Distribution. Scattered but widespread. **D:** *ØJy.* **F:** *V U EH KiL.* **I:** *IVe IMi.* **N:** *Ak Bu SNo.* **S:** *Öl Ög Nrk Srm Upl Dlr Hrj Jmt LyL LuL.* Otherwise scattered throughout the temperate parts of the Northern Hemisphere.

Note. A variable and somewhat nondescript species which is difficult to characterize. It has the look of a poorly developed *Fuscopannaria leucophaea*, but is more crustose with different cyanobiont and internal characters of the apothecia. The form of the areoles varies considerably, most possibly as a result of the environment, a matter which requires further studies. Some strongly pruinose specimens from S: Ög and Fi: EH are provisionally included here, but may prove to belong in a different taxon.

Pterygiopsis Vain.

Acta Soc. Fauna Fl. Fenn. 7(1): 238 (1890). – TYPE: *Pterygiopsis atra* Vain.

Literature: Henssen, Symb. Bot. Ups. 18(1): 75–77 (1963); Henssen, Büdel & Wessels, Mycotaxon 22: 169–195 (1985); Henssen & Jørgensen, Lichenologist 22: 143–144 (1990).

THALLUS crustose, appressed, with short-celled hyphae arranged in a fan-like way, effuse. ASCOMATA immersed to sessile apothecia with brown disc and distinct thalline margin. Asci prototunicate, thin-walled, without internal amyloid structures, 8-spored. Spores colourless, simple, subglobose. CONIDIOMATA rare, with terminally produced narrowly cylindrical conidia (not observed in Nordic material). PHOTOBIONT chroococcoid with clusters of cells within a brownish sheath, present throughout the thallus, individual cells 3–6 µm diam.

Chemistry. No secondary substances (by TLC).

Note. The delimitation of this genus is somewhat uncertain but is here treated in a wide sense, as it appears to contain at least two entities, the status of which is in need of further studies. Only *P. concordatula* belongs to the genus in the strict sense.

1. Thallus blackish brown, areolate and furfuraceous, apothecia finally protruding, with prominent margin; on irrigated rocks ..... 1. *P. concordatula*
– Thallus olivaceous brown, continuous and smooth, apothecia immersed; in the inundation zone of lakes ..... 2. *P. lacustris*

1. Pterygiopsis concordatula (Nyl.) P.M.Jørg.

Nordic Lichen Flora 3: 145 (2007). – *Pyrenopsis concordatula* Nyl., Flora 58: 440 (1875). – TYPE: Finland, Korpilahti, 1874 Lang (=Vainio) (H-NYL 42920 holotype).

Syn. *Pterygiopsis coracodiza* (Nyl.) Henssen, ?*Pyrenopsis assimulans* Nyl.

Literature: Magnusson, Bot. Not. 1937: 127–128 (1937); Henssen & Jørgensen 1990: 143; Jørgensen, Lichenologist 22: 214–216 (1990); Nordin, Thunbergia 32: 22 (2002).

Figs: Jørgensen 1990: 215, fig. 1a.

THALLUS blackish brown, crustose areolate, furfuraceous, effuse, to 5 cm diam., 150 µm thick, appearing paraplectenchymatous. ASCOMATA immersed to finally protruding apothecia, to 0.5 mm diam., with conspicuous, to 100 µm wide, thalline margin and distinct shiny blackish brown disc. Hymenium I+ blue, with simple paraphyses with enlarged brown apical cells. Asci irregular, often poorly developed, subcylindrical, apically thickened, but without internal amyloid structures, 8-spored. Spores colourless, simple, broadly ellipsoid, 8–14 × 6–10 µm. CONIDIOMATA not observed. PHOTOBIONT chroococcoid, present throughout the thallus as single or clustered cells enclosed by a brownish sheath, individual cells 5–6 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Saxicolous on irrigated, acidic rocks or margins of rivers.

Distribution. Rare and scattered, with western tendency. **F:** *EH PK.* **N:** *Op ST.* **S:** *Bh Vg LyL.* Otherwise scattered through western Europe.

Note. P. assimulans appears mainly to differ in the cyanobiont which does not have brown sheaths, thus giving the thallus a more blackish colour. The type material and the few other specimens so named are rather poorly developed, and the evaluation of the other characters is accordingly uncertain.

2. Pterygiopsis lacustris P.M.Jørg. & R.Sant.

in Jørgensen, Lichenologist 22: 214 (1990). – TYPE: Sweden, Småland, Moheda, Fiolen, Skogön, 1938 Santesson (UPS holotype).

Literature: Santesson, Meddel. Lunds Univ. Limnol. Inst. 1: 10–11 (1939); Jørgensen, Lichenologist 22: 214–217 (1990).

Figs: Jørgensen 1990: 215, fig. 1b.

THALLUS olivaceous brown, greenish when wet, filmy crustose, effuse, to 3 cm diam., 100–125 µm thick, appearing paraplectenchymatous. ASCOMATA numerous, immersed apothecia with blackish disc, to 0.3 mm diam. Hymenium I– (red-brown taking the colour of iodine), with partly branched, anastomosing paraphyses without

enlarged apices. Asci subcylindrical, apically thickened, but without internal amyloid structures, 8-spored. Spores colourless, simple (though sometimes with plasma-bridges), broadly ellipsoid, 8–12 × 7–8 µm. CONIDIOMATA not observed. PHOTOBIONT chroococcoid, present throughout the thallus as single or clustered cells within a brownish sheath, individual cells 3–5 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. The inundation zone of lakes, often submerged.

Distribution. Rare southwestern element, though curiously absent from Norway. **S:** *Sm Hl Gst*. Otherwise known from the British Isles.

Note. Most characteristic species, easily recognized by the filmy thallus and the "sunk" fruitbodies, having the appearance of fingerprints in dough.

Pyrenocarpon Trevis.

Riv. Period. Lav. Reg. Acad. Sci. Padova 3: 49 (1855). – TYPE: *Pyrenocarpon flotowianum* (Hepp) Trevis.

Syn. *Montinia* A.Massal., *nom. illeg*., *Thelochroa* A.Massal.

Literature: Jørgensen & Henssen, Taxon 39: 345 (1990).

THALLUS brownish, crustose-areolate, homoiomerous, gelatinous. ASCOMATA immersed apothecia which eventually expose the reddish brown disc and the whitish, widened proper exciple. Hymenium of branched anastomosing hyphae, I–; asci narrowly clavate, thin-walled, without internal amyloid structures, 8-spored. Spores colourless, simple, ellipsoid. CONIDIOMATA not observed. PHOTOBIONT chroococcoid, single or clustered cells, 5–7 µm diam., enclosed in pale brown sheaths.

Chemistry. No secondary substances (by TLC).

Note. This genus is rather similar to, and often confused with *Porocyphus,* from which it differs significantly in the different apothecia which open to expose the strongly widened proper exciple. This also sets it apart from *Psorotichia*, which has a poorly developed proper exciple not enclosing the whole hymenial region (open below). *Pyrenocarpon* appears to be closest related to *Lemmopsis*.

1. Pyrenocarpon flotowianum (Hepp) Trevis.

Riv. Period. Lav. Reg. Acad. Sci. Padova 3: 49 (1855). – *Verrucaria flotowiana* Hepp, Flecht. Eur. no. 92 (1853). – TYPE: Switzerland, Zürich, "Alpenfindling n. Nagelfluhblöckchen am Ufer der Sihl", Flotow (BM lectotype, as 'holotype', Ellis, Lichenologist 13: 136, 1981).

Syn. ?*Thrombium thelostomum* (Ach. ex J.Harriman) A.L.Sm.

Literature: Ellis, Lichenologist 13: 136–138 (1981); Jørgensen & Henssen, Taxon 39: 345 (1990).

Figs: Ellis 1981: 137.

THALLUS brownish, crustose, areolate and granular, to 200 µm thick, homoiomerous, gelatinous when wet. ASCOMATA common, immersed apothecia, to 0.3 mm diam., finally exposing the red-brown disc surrounded by the whitish proper exciple, in upper part to nearly 100 µm wide, inside the prominent thalline margin, which eventually is excluded. Hymenium of anastomosing paraphyses, I–. Asci narrowly clavate, thin-walled, without internal amyloid structures, 8-spored. Spores colourless, simple, ellipsoid, 13–18 × 5–10 µm. CONIDIOMATA not observed. PHOTOBIONT chroococcoid single or clustered cells, individual cells 5–7 µm diam., enclosed in pale brown sheaths.

Chemistry. No secondary substances (by TLC).

Habitat. On wet acidic rocks on seepages or in the inundation zone.

Distribution. Rare and scattered with western tendency. **F:** *V PeP*. **N:** *Vf Ro*. **S:** *Vg Ög Jmt.* Otherwise in the mountains of Central Europe, as well as the British Isles.

Note. Easily recognized by the fisheye-like apothecia, caused by the exposed, prominent, whitish true exciple. The status of the name *Thrombium thelostomum* is difficult to decide due to imperfections of the type specimen, which may well be a stage of the present species, even it differs somewhat, as recorded by Ellis (1981). I am inclined to accept his view that it repesents a morphotype of *P. flotowianum* (a view first expressed by Th. Fries already in 1866) but hesitate to make a formal synonymization here because of the nomenclatural consequences. The older name is better rejected by formal action elsewhere. The correct name is now *Pyrenocarpon thelostomum* (Ach. ex J. Harriman) Coppins & Aptroot as the proposal to conserve flotowianum failed.

Pyrenopsis (Nyl.) Nyl., *nom. cons.*

Syn. Meth. Lich. 1: 97 (1858). – *Synalissa* sect. *Pyrenopsis* Nyl., Mém. Soc. Sci. Nat. Cherbourg 3: 164 (1855). – TYPE: *Pyrenopsis fuscatula* Nyl.

Literature: Forssell, Beitr. Gloeolich.: 42–54 (1885); Henssen & Jørgensen, Lichenologist 22: 144–145 (1990), Jørgensen & Henssen, Taxon 39: 343–347 (1990).

THALLUS crustose, granular-areolate to small-squamulose, blackish brown, when wet often reddish and somewhat gelatinous, homoiomerous, appearing paraplectenchymatous throughout. ASCOMATA apothecia, often perithecioid, with pore-like disc or rarely urceolate, brown to blackish, with distinct thalline margin; true exciple very thin and often hard to observe, to 0.5 mm diam. Hymenium I– (red-brown, only taking the colour of iodine) or I+ blue; paraphyses simple or branched, often moniliform in upper parts. Asci clavate, thin- to thick-walled, with or without apical amyloid structures, usually 8-spored. Spores simple, colourless, ellipsoid to globose. CONIDIOMATA immersed, with colourless wall; conidia simple, ellipsoid colourless,. PHOTOBIONT chroococcoid (*Gloeocapsa*); cells single or in clusters, enclosed in brownish sheaths.

Chemistry. No secondary substances (by TLC).

Note. Insufficiently understood genus at all levels, partly because of the often poorly developed material, the variation of which is hard to grasp. Even after the removal of *Cryptothele*, *Euopsis* and others the genus is far from uniform, and appears to be in need of further division.

This treatment must be regarded as provisional, and understood as a guide to a complex group in need of much more study. A particular problem is caused by the scanty or unavailable types, in several cases the only material of the species. Surely far too many taxa have been described at species level. Only well-delimited species are recognized here, but some are rather broadly defined.

1. Ascomata finally opening and apothecia-like 2
– Ascomata remaining closed and perithecioid 4
2. Thallus squamulose, often with elongate, finger-like lobes; on soil or mosses ..... 1. *P. furfurea*
– Thallus crustose, areolate; on rocks 3
3. Thallus granular-coralloid with small, immersed apothecia ..... 4. *P. haematina*
– Thallus squamulose-areolate with finally protruding, open apothecia ..... 3. *P. haemaleella*
4. Asci mostly polysporous 5
– Asci 8-spored 6
5. Thallus blackish, continuously cracked areolate, paraphyses present, spores to 64, ellipsoid, 5–8(–14) × 2–4 µm ..... 2. *P. grumulifera*
– Thallus of scattered, shining brown, hemispherical areoles, paraphyses absent, spores to 32, subglobose 3–5 × 2–3 µm ..... 6. *P. pleiobola*
6. Hymenium I+ deep blue 7
– Hymenium I+ red-brown turning blue-green ..... 8. *P. subareolata*
7. Thallus minutely granular, "epithecium" brownish, spores ellipsoid ..... 7. *P. reducta*
– Thallus smoothly areolate, "epithecium" colourless, spores subglobose ..... 5. *P. impolita*

1. **Pyrenopsis furfurea** (Nyl.) Leight.

Lich. Fl. Gr Brit., ed. 3: 14 (1865). – *Collema furfureum* Nyl. in Carroll, J. Bot. 3: 286 (1865). – TYPE: Scotland, Ben Lawers, 1864 Jones (H-NYL 42916 lectoptype, Henssen & Jørgensen, Lichenologist 22: 144, 1990).

Syn. *Pyrenopsis homoeopsis* Nyl., *Pyrenopsidium iivarense* (Th.Fr.) Forssell, *Pyrenopsidium terrigenum* (Th.Fr.) Forssell, *Pyrenopsis squamulosa* Vain., *nom.nud*.

Literature: Magnusson, Bot. Not. 1951: 65–67 (1951), Henssen & Jørgensen, Lichenologist 22: 144 (1990).

Figs: Schultz & Büdel, Lichenologist 34: 54 (2002) fig. 8j (detail of hymenium with asci).

THALLUS small-squamulose, to 1.5 mm diam., often with extending fingerlike lobes, brownish, to 400 µm thick. ASCOMATA common, with chestnut-brown disc, to 0.5 mm diam. Hymenium I+ red-brown, turning blue-green. Asci clavate, prototunicate-rostrate, without amyloid apical structures, 8-spored. Spores colourless, simple, broadly ellipsoid, 12–16 × 6–10 µm. CONIDIOMATA not observed. PHOTOBIONT chroococcoid, single or pairs of cells enclosed in voluminous brownish sheaths, individual cells 7–10(–20) µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On mosses or soil, preferably in wet tundra.

Distribution. Arctic-alpine. **Gr F:** *Ks.* **N:** *Op Ho NT SNo ØFi.* **AI:** *Sb.* **S:** *Jmt Vb ÅsL LyL LuL TL.* Also known from the Scottish Mountains.

Note. The synonomy reflects the considerable variation in the thallus development which is not matched with

internal, ascomatal characters and appears to be environmentally induced.

2. Pyrenopsis grumulifera Nyl.

Lich. Scand: 26 (1861). – TYPE: Finland, Ostrobottnia australis, Jurva, 1859 Malmgren (H-NYL 42947 holotype).

Syn. *Malmgrenia acarosporoides* Räsänen, *Pyrenopsis myriospora* E.Dahl, *Pyrenopsis multispora* Coppins, ?*Pyrenopsis picina* (Nyl.) Forssell, ?*Pyrenopsis subfuliginea* Nyl.

Literature: Dahl, Meddel. Grønland 150: 39–40 (1950); Jørgensen & Henssen, Taxon 39: 344–345 (1990); Nordin, Thunbergia 32: 22 (2002).

THALLUS, crustose, areolate, sometimes granular, blackish brown, to 200 µm thick, effuse. ASCOMATA immersed apothecia with punctiform, blackish brown discs, to 0.5 mm diam. Hymenium of partly branched, anastomosing paraphyses. Asci clavate with strongly amyloid cap, polyspored (8–64). Spores colourless, simple, ellipsoid, 5–8(–14) × 2–4 µm. CONIDIOMATA not observed. PHOTOBIONT chroococcoid (*Gloeocapsa*) with single or paired cells, enclosed in reddish brown sheaths, individual cells 10–15(–20) µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On moist siliceous rocks or mica schist.

Distribution. Scattered and widespread, commoner towards the north; particularly common in Finland. **Gr. F:** *V U St EH ES EP PH PS PK KP Kn PeP EnL InL.* **N:** *Ho MR ST VFi.* **S:** *Dls Nrk LyL.* Also known from the Scottish mountains.

Note. The polyspored taxa of this genus have caused much difficulty as reflected in the synonomy. This was partly caused by the fact that Forssell's reexamination of Nylander's type specimen of *P. grumulifera* showed this to have 8-spored asci, leaving the multispored species without a name, a fact that later proved to be dubious since the type-collection actually contains both types of asci. Variation in spore number and spore size lead to unnecessary naming, clearly only reflecting developmental stages and being of little taxonomic importance. This may also apply to the mixed 8-spored and polysporous asci found in the type, but if these belong to different species growing mixed, the name according to the diagnosis is to be retained for the multispored taxon. For the 8-spored taxon the name *Pyrenopsis subfuliginea* Nyl. would be available, a taxon which anyway is in need of further clarification, since also its spore size varies. However, as both kind of asci are reported to occur within one fruitbody, there is most probably only one species at hand with variable spore-numbers in the asci. Anyhow, the matter needs more detailed studies to be fully solved.

3. Pyrenopsis haemaleella (Nyl.) Blomb. & Forssell

Enum. Pl. Scand. 4, Lichenes: 110 (1880). – *Euopsis haemaleella* Nyl., Flora 60: 457 (1877). – TYPE: Finland, Tavastia australis, Iitti, Silén (H-NYL 42981 holotype).

Syn. *Pyrenopsis sphinctotricha* Vain., *Pyrenopsis conjugens* Norman, *nom. inval*.

Literature: Magnusson, Bot. Not. 1924: 386 (1924).

THALLUS small-squamulose, granular, brownish, effuse. ASCOMATA common, urceolate with brownish disc, finally fully opened, to 0.3 mm diam. Hymenium I+ red-brown turning blue-green. Asci clavate, prototunicate-rostrate, without amyloid structures, 8-spored. Spores simple, colourless, broadly ellipsdoid, 7–11 × 5–7 µm. CONIDIOMATA not observed. PHOTOBIONT chroococcoid, single or clustered cells enclosed in red-brown sheaths, individual cells 5–7 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On irrigated granitic rocks.

Distribution. Rare and scattered. **I:** *IMi.* **F:** *EH.* **N:** *ST Tr VFi.* **S:** *Bh Vg Vrm Dlr*. Not reliably recorded outside Norden.

Note. Characteristic species which – when well developed – resembles a small *Leptogium*, but with simple spores and different cyanobiont.

4. Pyrenopsis haematina P.M.Jørg. & Henssen

Lichenologist 22: 145 (1990). – TYPE: Norway, Nordland, Saltdalen, Sommerfelt (UPS holotype).

Syn. *Pyrenospis haematopis* (Sommer.) Th.Fr., *nom. illeg*.

Literature: Fries, Lich. Arct. 1860: 284–285; Henssen & Jørgensen, Lichenologist 22: 144 (1990).

THALLUS brownish, distinctly red-brown when wet, effuse, with scattered granulose to coralloid squamulate areoles to 0.5 mm wide ASCOMATA scarce, immersed, urceolate and finally opening with blackish disc and

marked, flexuos thalline margin, to 0.5 mm diam. Hymenium I– (only giving the red-brown colour of the iodine). Asci cylindrical, thin-walled, prototunicate-rostrate, 8-spored. Spores colourless, simple, ellipsoid, 10–12 × 5–8 µm. CONIDIOMATA not observed. PHOTOBIONT chroococcoid, single or clustered cells enclosed in red-brown sheaths, individual cells 5–7(–10) µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Irrigated calciferous rocks.

Distribution. Widespread but scattered, commonest towards the north. **F:** *EH Kn KiL.* **N:** *Ak Op Ho SF ST SNo NNo Tr VFi ØFi.* **S:** *Bl Öl Gtl SmI Bh Dls Vg Ög Nrk Srm Vrm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb ÅsL LyL LuL TL.* Also known from the Scottish Mountains.

Note. Easily recognized species by the bright red-brown (when wet) squamules, hence the epithet.

5. Pyrenopsis impolita (Th.Fr.) Forssell

Beitr. Gloeolich.: 48 (1885). – *Pyrenopsis subareolata* var. *impolita* Th.Fr., Bot. Not. 1866: 57 (1866). – TYPE: Sweden, Närke, Götlunda, Hellbom (UPS holotype).

Literature: Forssell 1885: 48–49.

THALLUS brownish black, crustose, areolate to nearly squamulose, smooth, to 150 µm thick. ASCOMATA common, immersed, with finally expanding disc, to 0.2 mm diam. Hymenium I+ blue. Asci subcylindrical, with external amyloid cap, 8-spored. Spores colourless, simple, subglobose, 5–10 × 7–8 µm. CONIDIOMATA rare, immersed; conidia bacilliform 1–2 × 1 µm. PHOTOBIONT chroococcoid, single or clustered cells, individual cells 5–7 µm diam., enclosed in brown sheaths.

Chemistry. No secondary substances (by TLC).

Habitat. On irrigated rocks.

Distribution. Widespread and scattered, poorly known, mainly inland, probably a southern element. **Gr? F:** *EH InL.* **N:** *Ak.* **S:** *Bl SmI Bh Dls Vg Ög Nrk Upl Gst Vb.* Not reliably recorded outside Norden.

Note. This species has mainly been mistaken for the externally very similar, coastal *Pyrenopsis subareolata* (or its double *Cryptothele rhodosticta*), but it differs in several internal characters, such as asci, spores and hymenium reaction, and is certainly a separate non-related species.

6. Pyrenopsis pleiobola Nyl.

Flora 56: 17 (1873). – TYPE: Russia, Karelia onegensis, Norrlin (H-NYL 42924 holotype).

Syn. *Pyrenopsis separans* Hulting

Literature: Forssell 1885: 45.

THALLUS crustose, of scattered shining brown, hemispherical areoles, to 250 µm thick, effuse. ASCOMATA common, immersed apothecia, to 0.2 mm diam. Paraphyses absent; asci cylindrical without amyloid apical structures, walls I+ red-brown turning blue-green, 16–32-spored. Spores colourless, simple, subglobose, 3–5 × 2–3 µm. CONIDIOMATA not observed. PHOTOBIONT chroococcoid, single or clustered cells enclosed in red-brown sheets, individual cells 5–7 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On wet acidic rocks.

Distribution. Rare and scattered, perhaps an eastern element. **F:** *EH.* **S:** *Dls*. Otherwise only known from adjacent parts of Russia.

Note. This is the most outstanding of the polysporous taxa described, even recognizable on the morphology of the thallus which consists of scattered, shining brown areoles. The lack of paraphyses, the ascus type and the small "drop-like" spores also separates this clearly from the complex *Pyrenopsis grumulifera* s. lat., and keeps it out of the perplexing problems related to the variation of that species.

7. Pyrenopsis reducta Th.Fr.

Bot. Not. 1866: 57 (1866). – TYPE: Norway, Tromsø, Fløjfjellet, 1860 Th. Fries (UPS holotype).

Literature: Forssell 1885: 52.

THALLUS blackish brown, crustose, granulose, effuse, often poorly developed. ASCOMATA immersed apothecia, eventually widening to show the brownish disc, to 0.2 mm diam. Hymenium I+ blue with indistinct paraphyses. Asci cylindrical, thin-walled, without apical thickening and amyloid structures, 8-spored. Spores

colourless, simple, ellipsoid, 9–12 × 5–7 µm. CONIDIOMATA not observed. PHOTOBIONT chroococcoid, single or clustered cells, 5–7 µm diam., enclosed in brownish sheaths.

Chemistry. No secondary substances (by TLC).

Habitat. On steep, calciferous rocks.

Distribution. Very rare or overlooked. **N:** *Tr.* Not recorded outside Norden.

Note. Though reminiscent of a poorly developed *Pyrenopsis haematina*, and only known with certainty from the type collection, it appears to be a distinct species since it has different asci without apical thickening and amyloid cap.

8. Pyrenopsis subareolata Nyl.

Lich. Scand: 27 (1861). – TYPE: [France] "Gallia occidentalis", Normandie, Pelvet (H-NYL 42935 holotype).

Syn. *Pyrenopsis rhodosticta* auct. scand. (e.g. Havaas, Lich. Exs. Norv. no. 44).

Literature: Magnusson, Bot. Not. 1924: 386 (1924).

THALLUS brownish black, crustose-areolate, smooth and thin, to 100 µm thick. ASCOMATA common, immersed apothecia, to 0.2 mm diam. Hymenium I+ blue-green turning red-brown. Asci subcylindrical without apical amyloid structures, 8-spored. Spores colourless, simple, ellipsoid, 10–15 × 7–8 µm. CONIDIOMATA not observed. PHOTOBIONT chroococcoid, single or clustered cells, individual cells 5–7 µm diam., enclosed in brownish sheaths.

Chemistry. No secondary substances (by TLC).

Habitat. Irrigated, coastal granitic rocks.

Distribution. Mainly in coastal, western parts, not well known. **N:** *Ho SF MR SNo.* **S:** *Sk Bl Sm Bh Vg Nb PL.* Otherwise west-coast of Europe.

Note. This is the species which has mainly been misunderstood as *Cryptothele rhodosticta*. It forms extensive covers on coastal seapage rocks. It has generally (e.g. in Zahlbruckner's Catalogus) been regarded as a synonym of *Pyrenopsis fuscatula*, which grows in similar habitats in southwest Europe. The type specimens are indeed superficially quite similar, but the thallus of *P. subareolata* is smoother and the internal characters of the ascomata show that the two are not even closely related and belong to different parts of the genus as presently understood.

Synalissa Fr.

Syst. Orb. Veg.: 297 (1825). – TYPE: *Synalissa ramulosa* (Hoffm. ex Bernh.) Fr.

F: rupujäkälät **S:** synalissor

Literature: Forssell, Beitr. Gloeolich.: 54–58 (1885); Henssen, Ber. Deutsch. Bot. Ges. 92: 483–496 (1979).

THALLUS shrubby, with erect, coralloid branches forming small blackish cushions, gelatinous when wet, homoiomerous; hyphae forming an angular pattern, with central hyphal core. ASCOMATA terminal apothecia, initially globose, with prominent thalline margin and expanding poroid disc, 0.3–0.5 mm diam. Hymenium I– with thin, slender paraphyses. Asci cylindrical, thin-walled, 8-spored. Spores colourless, simple, ellipsoid. CONIDIOMATA pycnidia, terminal, immersed, with colourless wall; conidia simple, bacilliform colourless,. PHOTOBIONT *Gloeocapsa* in clusters.

Chemistry. No secondary substances (by TLC).

1. Synalissa ramulosa (Hoffm. ex Bernh.) Fr.

Syst. Orb. Veg.: 297 (1825). – *Collema ramulosum* Hoffm. ex Bernh., J. Bot. (Schrader) 1: 24 (1799). – TYPE: France, Savoyischen Alpen, Argentière, Schmidt in Migula, Krypt. Germ. Exs. no. 264 (O neotype, Jørgensen, Nordic Lichen Flora 3: 145, 2007).

Syn. ?*Collema botrytis* Hoffm., *nom. inval.*; *Synalissa symphorea* s. auct.

F: rupujäkälä **S:** synalissa

Literature: Th. Fries, Öfvers. Kongl. Vetensk.-Akad. Förhandl. 1856: 129–130 (1856).

THALLUS forming dense, blackish cushions to 3 mm high and wide; branches stout (to 400–500 µm diam.), erect or decumbent, simple, in lower parts granular and coarse, apically often with globose structures. ASCOMATA common, terminal, globose, with thick thalline margin, to 150 µm wide. Hymenium of interwoven hyphae, I–. Asci cylindrical, thin-walled, 8–24-spored. Spores colourless, simple, ellipsoid, 7–12 × 6–9 µm. CONIDIOMATA not uncommon, immersed and

pale; conidia simple, bacilliform, colourless, 3–4 × 1–2 µm. PHOTOBIONT *Gloeocapsa*, in outer part of thallus (internally only with medullary hyphae); cells clustered in groups of 2–3 surrounded by red-brown sheath, individual cells 5–7 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On calcareous rocks, often growing closely associated with squamulose lichens (*Endocarpon*, *Psora*, *Psorula* and *Toninia*).

Distribution. Uncommon, scattered southern element. **F:** *V Kn Ks.* **N:** *Ak He Op Bu Te AA Ro Ho ST SNo ØFi.* **S:** *Öl Gtl Ög Srm Vrm Upl Dlr Hrj.* Otherwise scattered throughout temperate parts of the Northern Hemisphere, reaching as far south as the North-African mountains.

Note. An often misunderstood species, which is easily mistaken for one of the subfruticose species of *Lempholemma*, a genus containing *Nostoc* and with hormocystangia terminally, not apothecia.

Thallinocarpon E.Dahl

Meddel. Grønland 150: 140 (1950). – TYPE: *Thallinocarpon pulvinatum* E.Dahl

Syn. *Gonohymenia* p.p., *Lichinella* p.p.

Literature: Dahl, Meddel. Grønland 150: 140–142 (1950).

THALLUS squamulose to subfruticulose, blackish, without proper cortex. ASCOMATA thallinocarps, sunk in thallus and difficult to recognize from the thallus unless wetted (then appearing as duller bodies) with thalline elements interspersed in the hymenium, often appearing as a checkered grid-like pattern. Paraphyses sparse in the I+ vinose hymenium; asci irregular, often tapering apically, with varying number of simple, mostly globose spores. CONIDIOMATA pycnidia, immersed; conidia bacilliform. PHOTOBIONT *Chroococcidiopsis* in dense rows perpendicular to the surface.

Chemistry. No secondary substances (by TLC).

Note. The type species of this genus has been included in *Gonohymenia* (Henssen 1986) but is not closely related to its type species *Gonohymenia algerica* Steiner, and not at all to species of *Lichinella* Nyl., in which some recent authors have included *Gonohymenia* (Moreno & Egea 1992). Obviously the generic limits between these genera need adjustments, but to merge them completely is too drastic. Although further research into this complex matter is needed (Schultz 2005), I have on the basis of the unusual fruitbodies decided to keep *Thallinocarpon* as a separate genus, and to include the only other species of this complex in our region into this genus, which definitely represents a different (non-mediterranean) ecogeographical element than *Lichinella,* as already pointed out by Dahl (1950).

1. Thallus small, to 1 cm diam., forming subfruticose cushions of smooth lobes, asci multispored; only in Greenland ..... 2. *T. pulvinatum*
– Thallus larger, to 2 cm, lobes ligulate, partly flat-spreading, rough to isidiate, asci 8-spored; Scandinavia ..... 1. *T. nigritellum*

1. Thallinocarpon nigritellum (Lettau) P.M.Jørg.

Nordic Lichen Flora 3: 145 (2007). – *Thyrea nigritella* Lettau, Rep. Spec. Nov. Regni Veg., Beih. 119: 276 (1942). – TYPE: Germany, Allgäu, Blaibach bei Sonthofen, auf stark kalkhaltigen Molassesandstein, 1918 Lettau (B lectotype, as 'holotype', Henssen, Lichenologist 18: 52, 1986).

Syn. *Gonohymenia nigritella* (Lettau) Henssen, *Lichinella nigritella* (Lettau) Moreno & Egea

Red-listed in: **N**

Literature: Lettau, Rep. Spec. Nov. Regni Veg., Beih. 119: 276–277 (1942); Henssen, Lichenologist 18: 52–53 (1988).

Figs: Schultz & Büdel, Lichenologist 34: 42 (2002) fig. 2f.

THALLUS squamulose, forming blackish cushions to 2 cm diam.; individual lobes spreading or ascending, often ligulate, 1–2 mm wide, with distinctly thicker margins, 400 µm thick. Upper surface roughly granular to isidiate, rarely with pruina, centrally often with numerous secondary lobules. ASCOMATA not observed in Norden, but reported from other regions to be thallinocarps formed on expanded lobe-ends, producing hymenia with a distinct grid of thalline elements; asci 8-spored with simple, colourless, ellipsoid spores. CONIDIOMATA not observed. PHOTOBIONT *Chroococcidiopsis*, often in clusters, individual cells 5–10 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On exposed, irrigated, mostly calcareous rocks.

Distribution. Rare in central parts of Scandinavia. **N:** (*Ak*) *He Op.* **S:** *Ög Srm.* Otherwise scattered in Central Europe, Pacific North America and Mexico.

Note. Rather like *Thyrea confusa* but easily recognized on the thick ligulate lobes, which are rugulose with thickened, often shiny margins. Although often sterile, easily distinguished from *Collema* by the different cyanobiont.

2. Thallinocarpon pulvinatum E.Dahl

Meddel. Grønland 150: 142 (1950). – TYPE: Greenland, Julianehaab Distr., Agdluitsoq, Quagdlumiut, 1937 E. Dahl (O holotype).

THALLUS subfruticose, forming small, olivaceous black cushions, to 1 cm diam. with erect, more or less branched, canaliculate lobes, to 0.5 mm thick, spathulately widened to 1.5 mm apically, where the thallinocarps are situated. ASCOMATA common but hardly visible, with ingrown thalline elements. Hymenium I+ vinose without (or with poorly developed) paraphyses and irregular, saccate asci, fingerlike elongated in apical parts. Spores numerous, simple, colourless, broadly ellipsoid to globose, 6–10 × 4–6 µm. CONIDIOMATA rare, immersed, globular; conidia bacilliform, colourless, 1 × 2–3 µm. PHOTOBIONT *Chroococcidiopsis*, in dense layer, to 100 µm wide, at the surfaces, individual cells 4–10 µm diam., often aggregated.

Chemistry. No secondary substances (by TLC).

Habitat. Saxicolous, on steep, irrigated (calcareous?) rocks.

Distribution. Very rare, as yet only known from the type collection in SW Greenland. **Gr**.

Note. Distinguished from all other species of the genus (the *Thallinocarpon iodopulchrum*-group) by the growth-form.

Thelignya A.Massal.

Framm. Lichenogr.: 18 (1855). – TYPE: *Thelignya lignyota* (Wahlenb.) P.M.Jørg. & Henssen

Syn. *Arctoheppia* Lynge, *Fernaldia* Lynge non Woodson, *nom. illeg*.

Literature: Henssen, Symb. Bot. Ups. 18(1): 69 (1963); Henssen & Jørgensen, Lichenologist 22: 145–146 (1990), Jørgensen & Henssen, Taxon 39: 344–346 (1990).

THALLUS dark, blackish green, crustose-squamulose, individual squamules with slightly upturned margins, with loosely arranged, round-celled hyphae surrounding the cyanobiont, weakly lichenized. ASCOMATA immersed apothecia with cupular opening, at the bottom of which the punctiform disc is discernable, sometimes with thalline elements, 0.2–0.5 mm diam. Hymenium of net-like, anastomosing paraphyses, I–. Asci cylindrical, thin-walled, without apical amyloid structures, 8(–16)-spored. Spores simple, colourless, ovoid. CONIDIOMATA pycnidia, immersed in thallus; conidia simple, cylindrical colourless,. PHOTOBIONT *Calothrix,* the trichomes usually with distinctly visible basal heterocysts.

Chemistry. No secondary substances (by TLC).

Note. Superficially rather like *Pyrenopsis* because of the sunk pycnoascocarps and the growth-form, but easily separated by the different, dark greenish colour when wet, rather than reddish brown. Easily distinguished from *Porocyphus* by the immersed, poriform ascomata, and the looser, weaker lichenized thallus.

1. Hymenium red-brown in upper parts, asci 16-spored.....1. *T. groenlandica*
– Hymenium blue-green in upper parts, asci 8-spored.....2. *T. lignyota*

1. Thelignya groenlandica (E.Dahl) Henssen & P.M.Jørg.

Henssen & Jørgensen, Lichenologist 22: 145 (1990). – *Porocyphus groenlandicus* E.Dahl, Meddel. Grønland 150: 53 (1950). – TYPE: Greenland, Julianehaab Distr., Kangerdluarssuk, Eqalugarssuit, 1937 E. Dahl (O holotype).

THALLUS crustose-squamulose, forming irregular, papillate, blackish green patches on the rocks, 150 µm thick, compact, with aggregations of the cyanobiont. ASCOMATA with visible disc, common; hymenium to 100 µm, I–, brown in upper part. Asci multispored. Spores colourless, simple, ovoid, 5–6 × 4–5 µm. CONIDIOMATA pycnidia; conidia simple, cylindrical to ovoid, colourless, 1–3 × 1–2 µm. PHOTOBIONT agglomerated chains of weakly lichenized *Calothrix*, individual cells 5–10 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On seepage rocks.

Distribution. As yet only known from the type-collection in Greenland, but probably overlooked. **Gr**.

2. Thelignya lignyota (Wahlenb.) P.M.Jørg. & Henssen

in Henssen & Jørgensen, Lichenologist 22: 145 (1990). – *Verrucaria lignyota* Wahlenb. in Acharius, Methodus: 301 (1803). – TYPE: Norway, Finnmark, ad Refsbotten sinus Altensis (=Altafjord), 1802 Wahlenberg (UPS lectotype, Henssen & Jørgensen, Lichenologist 22: 145, 1990).

Syn. *Verrucaria fuliginea* Ach., *Pyrenopsis ocellata* Th.Fr., ?*Pyrenopsis umbilicata* Vain., *Arctoheppia scholanderi* Lynge, *Porocyphus dispersus* E.Dahl

Figs: Schultz & Büdel, Lichenologist 34: 44, 52 (2002) fig. 3b, 7a (section of apothecium).

THALLUS crustose-squamulose, forming irregular, areolate blackish green patches of 1–2 mm wide squamules, resting on colonies of cyanobacteria. Thallus to 250 µm thick of loosely organized hyphae surrounding the photobiont. ASCOMATA with visible punctiform disc, common; hymenium to 100 µm high, dark green in upper part, I–. Asci 8-spored. Spores simple, colourless ovoid, 8–10 × 6–7 µm. CONIDIOMATA pycnidia; conidia simple, cylindrical, colourless, 2–3 × 1–2 µm. PHOTOBIONT chains of weakly lichenized *Calothrix,* individual cells 4–9 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On wet, shaded rocks.

Distribution. Arctic-alpine, reacing sea-level in northern Norway and western Sweden. **Gr. F:** *EH PeP Ks*?. **N:** *MR ST SNo Tr VFi ØFi.* **S:** *Bh Jmt LyL LuL TL.* Otherwise widespread but scattered in the northern parts of the Northern Hemisphere, reaching as far south as Honshu in Japan (Jørgensen 1995).

Thermutis Fr.

Syst. Orb. Veg.: 302 (1825). – TYPE: *Thermutis velutina* (Ach.) Flot.

THALLUS filamentous, carpet-forming; filaments of thin, undifferentiated hyphae, without rhizines. ASCOMATA lateral pycnoascocarps, with proper exciple only; asci thin-walled and mostly with eight, simple, colourless, ovoid spores. CONIDIOMATA lateral; conidia globular, formed terminally on the conidiophores. PHOTOBIONT *Scytonema*.

Note. One of the most primitive representatives of the family, which in the sterile state is difficult to distinguish from non-lichenized *Scytonema* since it is so weakly lichenized.

1. Thermutis velutina (Ach.) Flot.

Linnaea 23: 170 (1850). – *Lichen velutinus* Ach., Lichenogr. Suec. Prodr.: 218 (1799). – TYPE: Suecia (H-ACH 1925A lectotype, Jørgensen, Nordic Lichen Flora 3: 145, 2007).

S: tovlav

Literature: Henssen, Symb. Bot. Ups. 18: 81–82 (1963).

Figs: Henssen op.cit. Taf. 22 a-e.

THALLUS brownish, filamentous, forming carpets to 1 cm diam., of fairly thin, to 12 µm wide filaments, in which the cyanobiont is partly surrounded by fungal hyphae. ASCOMATA lateral pycnoascocarps, to 0.5 mm diam., redbrown; only with proper exciple, to 60 µm wide. Spores eight, rarely more, in ascus, simple, colourless, ovate, 9–15 × 6–7 µm. CONIDIOMATA lateral, redbrown; conidia globular 1–2 µm diam. PHOTOBIONT *Scytonema* in chains, individual cells 5–15 × 4–7 µm.

Chemistry. No secondary substances (by TLC).

Habitat. On fairly dry rocks, preferably calcareous or basic rocks.

Distribution. Widespread in the Northern Hemisphere. **F:** *PS PK Ks*? **N:** *Ak Op Bu Ho SF ST SNo NNo Tr.* **S:** *Bh Dls Vg Ög Srm Vrm Vsm Upl Gst Hrj Jmt LyL LuL TL.*

Note. When sterile only with difficulty separated from non-lichenized *Scytonema*, due to the poor differentation and unorganized structure of the fungal hyphae. Otherwise easily recognized, though large specimens are superficially somewhat similar to *Ephebe lanata*, a species of different habitats, which contains *Stigonema* and has coarser, clearly lichenized branches.

Thyrea A.Massal.

Sched. Crit. 4: 75 (1856). – TYPE: *Thyrea plectopsora* A.Massal.

Literature: Henssen & Jørgensen, Lichenologist 22: 146 (1990); Moreno & Egea, Acta Bot. Barcinon. 41: 41–51 (1992).

THALLUS squamulose to small-foliose, forming blackish, umbilicate cushions, heteromerous, centrally with a loosely reticulate pattern of hyphae. ASCOMATA immersed pycnoascocarps with 8-spored, cylindrical asci with external, I+ blue cap. Spores simple, colourless, ovoid. CONIDIOMATA immersed pycnidia of *Lecanactis*-type; conidia bacilliform, simple, colourless. PHOTOBIONT chroococcoid, with aggregations of round cells, 4–7 µm diam. surrounded, by brownish sheaths.

Chemistry. No secondary substances (by TLC).

Note. The genus has undergone major redefinitions, based on ascomata characters, which has reduced the number of species in the genus to one in our region.

1. Thyrea confusa Henssen

in Henssen & Jørgensen, Lichenologist 22: 146 (1990). – TYPE: France, Provence, Vaucluse, Les Baumettes, Collet de Brousse, 1976 Henssen (MB holotype).

Syn. *Thyrea pulvinata* auct. non (Schaer.) A.Massal. [q.e. *Thallinocarpon iodopulchrum* (Crozals) P.M.Jørg., ined.].

S: navelgelélav

Red-listed in: **N**

Literature: Degelius, Svensk Bot. Tidskr. 62: 406 (1968); Henssen & Jørgensen, Lichenologist 22: 146 (1990).

Figs: Moreno & Egea 1992: 10(1–2).

THALLUS subfoliose, forming polyphyllous, umbilicate, gelatinous, blackish cushions, to 2 cm diam. Upper surface dull, often granular and occasionally pruinose, except on the thick margins; lower surface partly folded, paler. In section to 500 µm thick with a loose medullary section, to 250 µm thick, of loosely reticulate hyphae, in the upper and lower layers enclosing aggregations of the cyanobiont. ASCOMATA pycnoascocarps, unknown in our region. Spores simple, colourless, ovoid, 10–15 × 8–10 µm. CONIDIOMATA immersed pycnidia, to 150 µm wide, rare; conidia simple, ellipsoid, colourless, 2–3 × 1.5 µm. PHOTOBIONT chroococcoid, with 2–8 cells, each 8–10 µm diam., aggregated in clusters within brownish sheaths.

Chemistry. No secondary substances (by TLC).

Habitat. On periodically wet, calcareous rocks, xerothermic.

Distribution. Rare and scattered in southern parts, reaching as far north as the valleys of central Norway. **N:** *Ak He Op Bu Te.* **S:** *Öl Gtl Dls Srm.* Scattered through Europe, though mainly (northern) Mediterranean; also in temperate North America.

Note. A variable species, the narrow-lobed forms of which have an appearance of a small, terrestrial *Chondrus crispus* (a red alga). Broad-lobed forms may approach *Thallinocarpon nigritellum* with which it has often been confused further south, but the thallus is thinner, less shiny and does not form apothecia-like foldings along the margins, and the fruitbodies are different (pycnoascocarps).

Zahlbrucknerella Herre

J. Wash. Acad. Sci. 2: 384 (1912), *nom. nov*. for *Zahlbrucknera* Herre (1910), non Reichenb. (1832). – TYPE: *Zahlbrucknerella calcarea* (Herre) Zahlbr.

Syn. *Lecanephebe* Frey, *Leptopterygium* Zahlbr.

Literature: Henssen, Symb. Bot. Upsal. 18(1): 77–78 (1963); Henssen, Lichenologist 9: 17–46 (1977).

THALLUS olivaceous brown to black, filamentous, with radially arranged filaments in rosettes, filaments with central string and rounded hyphal cells, appressed to the substrate, without rhizines. ASCOMATA lateral pycnoascocarps with thalline margin only; asci 8-spored or multispored. CONIDIOMATA producing globular conidia (sub)apically. PHOTOBIONT *Scytonema* in chains.

1. Thallus in wide rosettes, to 2 cm diam., asci multispored, spores ovate ..... 1. *Z. calcarea*
– Thallus smaller, to 5 mm diam., asci 8-spored, spores bean-shaped ..... *Z. fabispora*

1. Zahlbrucknerella calcarea (Herre) Zahlbr.

Catal. Lichenogr. Universalis 2: 762 (1924). – *Zahlbrucknera calcarea* Herre, J. Wash. Acad. Sci. 1: 129 (1910). – TYPE: USA, California, Santa Cruz Pen., Santa Clara Co., Black Mountain, on limestone at the summit, 2787 feet, 1908 Herre 1287 (F holotype!).

Syn. *Lecanephebe meylanii* Frey, *Ephebe lanata* f. *tenuis* H.Magn.

S: falsk trådlav

Literature: Henssen 1977: 36–38.

Figs: Henssen 1977 Plate 1B, 2C, 4A–D, Fig. 1E–G, 5A–D.

THALLUS olivaceous black, filamentous, forming rosettes to 2 cm diam., centrally areolate and dying off; individual filaments appressed, radially arranged, about 100 µm diam., at least at basis, with a central string, without rhizines. APOTHECIA rare in Scandinavian material, lateral, to 0.5 mm diam., only with thalline margin; asci with up to 24 spores. Spores simple, colourless, ovate, 6–10 × 5–6 µm. CONIDIOMATA rather common; conidia bacilliform, 3–5 × 1–2 µm. PHOTOBIONT *Scytonema* in chains, individual cells 7–15 × 4–9 µm.

Chemistry. No secondary substances (by TLC).

Habitat. On seepages of calcareous rocks.

Distribution. Scattered in montane regions of the Northern Hemisphere (Europe, Asia, North America). Rare in Scandinavia, mainly in the mountains of regions north of the Arctic Circle. **N:** *Op SNo NNo Tr ØFi*. **S:** *TL*.

Note. When Herre replaced the illegitimate *Zahlbrucknera*, he did not combine the species epithet with his new generic name, as recorded by most authors (Zahlbruckner 1924, Henssen 1956, Santesson 1993), but this was actually done by Zahlbruckner in Catalogus.

Easily overlooked but characteristic species, not similar to any of the other filamentous species, due to the areolate, dying central parts of the thallus and the multispored asci.

2. Zahlbrucknerella fabispora Henssen

Lichenologist 9: 38 (1977). – TYPE: Iceland, Árnessýsla, Gullfoss, 1972 A. Henssen 23177a (MB holotype).

Literature: Henssen 1977: 38–39.

Figs: Henssen, 1977 Plate 1F, 2A, B; 1A–D, 4 E–F, 6 B, 7B, E, Fig. 1A–D, 6C.

THALLUS blackish, filamentous, forming rosettes to 5 mm diam., individual filaments incurved, apically about 20 µm diam., basically at most 80 µm, firmly attached by holdfasts. ASCOMATA lateral, with brown disc and distinct thalline margin; proper margin poorly developed; asci with eight bean-shaped spores with median plasmabridge, 10–13 × 4–7 µm. CONIDIOMATA lateral, immersed, to 0.1 mm diam.; conidia bacilliform, 1–2 × 1 µm. PHOTOBIONT *Scytonema* in chains, individual cells 7–10 × 3–5 µm.

Chemistry. No secondary substances (by TLC).

Habitat. Periodically wetted, basaltic rocks.

Distribution. Arctic-alpine; very rare, only known from a few collections in N. Europe (Iceland and Russian Karelia). Otherwise known from the Rocky Mts. (USA) only; probably circumarctic. **I:** *ISu*.

Note. This species is easily overlooked but not difficult to recognize as it is the tiniest of all the filamentous taxa with highly characteristic spores.

Lobariaceae

P.M. Jørgensen & T. Tønsberg

Syn. Stictaceae

THALLUS foliose (fruticose), with well-developed cortex on both sides, sometimes with ridged upper surface, and with isidia or soredia; lower surface mostly tomentose, often with cyphellae or pseudocyphellae. ASCOMATA apothecia, laminal, sessile, with thalline margin as well as proper exciple. Hymenium I+ blue with clavate asci with internal, amyloid, apical sheets. Spores fusiform to elongate, septate, colourless or pale brown. CONIDIOMATA pycnidia, immersed, with black ostiole; conidia produced terminally or laterally on branched, short-celled conidiophores, bacilliform, slightly enlarged apically colourless,. PHOTOBIONT green algae, and/or cyanobacteria (*Nostoc*).

Chemistry. Depsides, depsidones, terpenoids, dibenzofuranes, and pulvinic acid derivatives.

Literature: Yoshimura & Hurutani, Bull. Kochi Gakuen College 18: 345–359 (1987); Yoshimura, in: Marcelli & Seaward (eds): Lichenology in Latin America: history, current knowledge and application: 129–134 (1998); Thomas, Ryan & Galloway, in: The Fourth IAL Symposium, Progress and Problems in Lichenology at the Turn of the Millennium. Universitat de Barcelona, Barcelona: 95 (2000); Galloway, Fl. Austr. 58A, Lichens 3: 37 (2001); Thomas, Ryan, Farnden & Galloway, Biblioth. Lichenol. 82: 123–138 (2002); Wiklund & Wedin, Cladistics 19: 419–431 (2003); Eriksson, Baral, Currah, Hansen, Kurtzman, Laessoe & Rambold, Myconet 9: 91–103 (2003); Miadlikowska & Lutzoni, Amer. J. Bot. 91: 449–464 (2004).

Key to genera

1. Lower side without cyphellae or pseudocyphellae . *Lobaria*
– Lower side with cyphellae or pseudocyphellae 2
2. Lower side with cyphellae; without secondary substances ..... *Sticta*
– Lower side with pseudocyphellae; with secondary substances ..... *Pseudocyphellaria*

Lobaria

T. Tønsberg & P.M. Jørgensen

Lobaria (Schreb.) Hoffm.

Deutschl. Fl. 2: 138 (1796). − *Lichen* ["Sect."] *Lobaria* Screb., in Linnaeus: Genera Plantarum, ed. 8 (1791). − TYPE: *Lobaria pulmonaria* (L.) Hoffm. (lectotype, Clements & Shear 1931: 322).

Syn. *Dendriscocaulon* Nyl., *Lobarina* Nyl. ex Cromb.

D: lungelav **F:** keuhkojäkälät **N:** neverlav **S:** lunglavar

Literature: Yoshimura, J. Hattori Bot. Lab. 34: 231–364 (1971); Hakulinen, Ann. Bot. Fenn. 1: 202–213 (1964); James & Henssen, in Lichenology: Progress and Problems (ed. Brown et al.): 27-77 (1976); Krog, Østhagen & Tønsberg 1994: 203–206; Elix, Fl. Austr. 58A, Lichens 3: 39–47 (2001); Galloway, Fl. Austr. 58A, Lichens 3: 38–39 (2001); Brodo, Sharnoff & Sharnoff, Lich. North America (2001); Elix & Tønsberg, Graphis Scripta 18 ["17"]: 27-28 (2006).

THALLUS foliose, irregularly spreading, with branched, dorsiventral, heteromerous lobes, usually rounded or truncate. Upper side smooth, but sometimes lacunose or scrobiculate, isidia or soredia sometimes present. Lower side tomentose with simple or squarrose rhizines. ASCOMATA apothecia, common to very rare, laminal, sessile, with brownish disc and distinct thalline margin obscuring the proper exciple. Hymenium I– blue, with clavate, 8-spored asci, apically with internal amyloid sheets. Spores colourless or pale brown, fusiform to elongate, 1–7-septate. CONIDIOMATA pycnidia, immersed, with black ostiole, containing branched, short-celled conidiomata producing conidia terminally or laterally; conidia cylindrical, apically slightly enlarged, colourless. PHOTOBIONT variable, *Dictyochloropsis* or *Trebouxia* and/or *Nostoc* or *Scytonema,* the latter two genera in internal or external (wartlike or fruticose) cephalodia, sometimes free-living.

Chemistry. Depsides, depsidones, dibenzofuranes, unidentified diagnostic substances.

Note. The *Lobaria* species are among the largest foliose lichens in our region and often cover extensive parts of tree trunks and rocks, but as they are sensitive to pollution and drought they are retreating at present. The genus is not uniform, but attemps to divide it have not been successful. (Herbarium specimens of species with a blue-green photobiont may change colour permanently if wetted and re-dried for curatorial purposes.)

1. Photobiont cyanobacteria 2
– Photobiont green algae 3
2. Lower side without distinct veins; medulla usually P+ orange ..... 5. *L. scrobiculata*
– Lower side with veins; medulla always P– ..... 2. *L. hallii*
3. Lower side without naked spots 4
– Lower side with naked spots 5
4. Upper side silvery grey (when dry), often with fruticose, external cephalodia; spores 6–7 µm wide ..... 1. *L. amplissima*
– Upper side brownish and/or greenish (when dry), without external cephalodia; spores 8–11 µm wide ..... 6. *L. virens*
5. With isidia; corticolous or rarely on acidic rocks; widespread ..... 4. *L. pulmonaria*
– Without isidia; on calcareous ground; arctic-alpine ..... 3. *L. linita*

1. **Lobaria amplissima** (Scop.) Forssell

Bih. Kong. Svenska Vetensk.-Akad. Handl. 8(3): 111 (1883). – *Lichen amplissimus* Scop., Fl. Carniol. Ed. 2, 2: 386 (1772). – TYPE: Italian Alps, beech forest, Icon in Michelius, Genera Plantarum, tab. 46, 1729 (lectotype, Tønsberg & Jørgensen, Nordic Lichen Flora 3: 145, 2007); corresponding specimen in herb. Micheli (FI epitype, Tønsberg & Jørgensen, Nordic Lichen Flora 3: 145, 2007).

Syn. *Dendriscocaulon umhausense* (Auersw.) Degel., *Lobaria laciniata* (Huds.) Vain., *nom. illeg*. (non Trevis.).

D: sølvgrå lungelav **F:** tupsalejäkälä **N:** sølvnever **S:** jättelav

Red-listed in: **S**

Literature: Degelius, Acta Phytogeogr. Suec. 7: 68–79 (1935); James & Henssen, in Lichenology: Progress and Problems (ed. Brown et al.): 39-40 (1976); Hallingbäck & Thor, Svensk Bot. Tidskr. 82: 125–139 (1988); Hultengren et al., Graphis Scripta 5: 24–38 (1993); Tønsberg & Goward, Bryologist 104: 12–23 (2001); Elix & Tønsberg, Graphis Scripta 18 ["17"]: 27 (2006).

Figs: Holien & Tønsberg 2006: 112; Krog et al. 1994: 94; Thor & Arvidsson (eds) 1999: 282–283; Wirth 1995: 560.

THALLUS to several dm diam., to 490(–645) µm thick, often forming rosettes. Lobes to 10(–15) mm wide, rounded at apices, minutely indented to sinuate-indented. Upper side grey when dry, greenish when wet, sometimes with distinct ridges. Lower side tomentose, brown, without naked spots. Soredia and isidia lacking. Cephalodia (with *Nostoc*) internal, and often also external; external cephalodia globose when occurring on the lower surface of lobes, fruticose on the upper surface. Fruticose cephalodia usually present, dark grey- to brown-black, may occur independent (free-living) from the foliose thallus. Secondary foliose thalli are sometimes attached to branches of the cephalodia. ASCOMATA not rare but usually not present on specimens with external cephalodia, to 7 mm diam., with red-brown disc; thallus margin inflexed. Spores fusiform, straight to ± sigmoid, 1–3-septate, 36–65 × 3.5–6 µm, colourless at first, becoming pale yellowish brown. CONIDIOMATA common, convex; ostiole black, inner part and the tube below lined with a dark grey or blackish, K+ aeruginose pigmented tissue, surrounded laterally by a brown, K– tissue (as seen in the microscope); conidia simple, bacilliform, 4–5 × 1–1.5 µm. PHOTOBIONT green algae.

Chemistry. ± Scrobiculin with 2 satellites, ± atranorin (scrobiculin-deficient specimens probably rare). Elix & Tønsberg (2006): m-scrobiculin (major), p-scrobiculin (submajor), pseudocyphellarin A (minor), unknown scrobiculin derivative (trace). Upper surface K+ yellow; medulla P–, K+ pale yellow or K–, KC–.

Habitat. On bark of deciduous trees and on mossy, acidic rocks in moist forests.

Distribution. Widespread in Scandinavia, rather western (suboceanic). **D:** (*ØJy*) (*Sjæ*). **F:** *EnL* (only blue-green morph). **N:** *Øf Ak He Op Bu Vf Te AA VA Ho SF MR ST NT SNo NNo Tr VFi*. **S:** (*Sk*) (*Bl*) *Öl Gtl Bh Dls Vg Nrk Srm Vrm Upl Dlr Gst Ång Jmt.* Otherwise widespread in Europe, especially in the west, and in the Mediterranean region with North Africa.

Note. Characterized by the grey upper side with rounded lobes, and in particular, by the fruticose cephalodia. The free-growing cephalodia, often referred to as the blue-green morphtype, have been known as *Dendriscocaulon umhausense.*

2. Lobaria hallii (Tuck.) Zahlbr.

Catal. Lich. Univ. 3(3): 321 (1925). – *Sticta hallii* Tuck., Proc. Am. Acad. Arts 12: 168 (1877). – TYPE: USA, Oregon, 1871 Hall (FH holotype).

N: fossenever **S:** hårig skrovellav

Red-listed in: **N S**

Literature: Ahlner, Acta Phytogeogr. Suec. 22: 60–62 (1948); Krog, Norsk Polarinst. Skr. 144: 35 (1968); Bjerke, Graphis Scripta 14: 27–31 (2003). Hallingbäck, Svensk Bot. Tidskr. 97: 26–32 (2003); Elix & Tønsberg, Graphis Scripta 18 ["17"]: 27 (2006).

Figs: Thor & Arvidsson (eds) 1999: 283; Brodo, Sharnoff & Sharnoff 2001: 416; Hallingbäck, Svensk Bot. Tidskr. 97: 26, 31 (2003); Holien & Tønsberg 2006: 113.

THALLUS to 1.5 dm diam., to 200 µm thick, often forming rosettes. Lobes to 3.5 cm wide, rounded, entire. Upper side matt, pale greyish when dry (without yellowish tinge), when wet dark blue-grey with a characteristic violet tinge, glabrous to scabrous, or even indistinctly ridged and with shallow depressions; young lobes with glassy hairs, especially towards the margin. Soralia present, laminal, punctiform, almost flat to convex, greyish brown to bluish; thallus sometimes becoming perforated at the centre by the soralia. Soredia mostly in consoredia to 95(–155) µm diam.; exposed parts with a brown, K– pigment; isidia absent. Lower side pale brown with a pink tinge, tomentose, with naked spots, usually with distinct veins. Rhizines squarrose, whitish grey to brownish. ASCOMATA and CONIDIOMATA not observed in Nordic material. PHOTOBIONT cyanobacteria.

Chemistry. ± unidentified substances. Elix & Tønsberg (2006): pseudocyphellarin A (major), unknown pigment SV-1 (minor), atranorin (minor), ± lobaric acid (traces), ± protocetraric and gyrophoric acids (traces). Cortex K+ distinctly yellow.

Habitat. Swampy, deciduous forests with *Alnus incana* (main habitat) and moist boreal *Picea* forests, often in the spray-zone at water-falls.

Distribution. **Gr. N:** *ST NT SNo NNo Tr.* **S:** *Dlr Jmt ÅsL LyL.* Otherwise in cool-temperate Western North America and Russia, Komi Republic.

Note. Distinct from *L. scrobiculata* by the pale greyish thallus lacking a yellowish tinge, the characteristic shade of violaceous blue-grey when wet, the presence of distinct veins on the lower side, and by the chemistry.

3. Lobaria linita (Ach.) Rabenh.

Deutschl. Krypt.-Fl. 2(1): 65 (1845). – *Sticta linita* Ach., Syn. Meth. Lich.: 234 (1814). – TYPE: Switzerland ['Helvetia Syn. Pag. 234'] (UPS-ACH lectotype, Tønsberg & Jørgensen, Nordic Lichen Flora 3: 145, 2007).

F: tunturikeuhkojäkälä **N:** fjellnever **S:** rundflikig lunglav

Literature: Yoshimura, J. Hattori Bot. Lab. 34: 288–290 (1971); Hakulinen, Ann. Bot. Fenn. 1: 205–206, 210 (1964); Krog, Norsk Polarinst. Skr. 144: 36–38 (1968); Elix & Tønsberg, Graphis Scripta 18 ["17"]: 28 (2006).

Figs: Brodo, Sharnoff & Sharnoff 2001: 416–417; Holien & Tønsberg 2006: 114.

THALLUS to one dm diam., 170–285 µm thick. Lobes to 2(–3) cm wide., rounded, sometimes undulate; margin entire or with lobules. Upper side glossy, with distinct depressions; ridges indistinct or absent; soredia and isidia absent. Lower side pale to medium brown, hairy/tomentose, with naked spots; rhizines scattered, squarrose, becoming simple by age. Cephalodia common, internal (in the medulla) and as small warts on the lower side. ASCOMATA unknown in Nordic material. CONIDIOMATA immersed, visible as black dots, with 1–2 chambers; conidia ± rod-shaped, thickened at one or both ends, 5–6 × 1 µm. PHOTOBIONT green algae.

Chemistry. Elix & Tønsberg (2006): methyl gyrophorate (major), tenuiorin (minor), gyrophoric acid (minor), methyl lecanorate (trace), unknown steroid (major), unknown steroid (trace). Colour reactions negative.

Habitat. On calcareous ground.

Distribution. In arctic and alpine regions, northern. **F:** *EnL InL*. **N:** *NT SNo NNo Tr VFi ØFi*. **AI:** *Sb*. **S:** *Dlr Hrj Jmt ÅsL LyL PL LuL TL*. In cold-temperate to arctic parts of the Northern Hemisphere.

Note. Similar to *L. pulmonaria*, but smaller and lacking isidia and soralia-like patches. The presence of tenuiorin and methyl gyrophorate is particularly diagnostic; no other Nordic species of *Lobaria* has these constituents. As pointed out by Krog (1968), the type specimen from

Switzerland differs morphologically from the specimens in Norden. Though we disagree in her assumption that the type may be linked to large specimens on the Pacific coast of North America, we agree that it is different from the northern populations also since there is a clear chemical difference. Further research is necessary, but we strongly suspect that our Nordic population represents a distinct taxon which needs a new name.

4. **Lobaria pulmonaria** (L.) Hoffm.

Deutschl. Fl. 2: 146 (1796). – *Lichen pulmonarius* L., Sp. Pl. 2: 1145 (1753). – TYPE: Sweden(?), Linnaeus (LINN 1273.103, lower specimen; lectotype, Yoshimura & Hawksworth, J. Jap. Bot: 45: 33-41 1970).

D: almindelig lungelav **F:** raidankeuhkojäkälä **N:** lungelav **S:** lunglav

Red-listed in: **S**

Literature: Hakulinen, Ann. Bot. Fenn. 1: 202–204, 207–210 (1964); Krog, Norsk Polarinst. Skr. 144: 38 (1968); Yoshimura, J. Hattori Bot. Lab. 34: 286–287 (1971); Hällingbäck & Olsson, Svensk Bot. Tidskr. 81: 103–108 (1987); Elix & Tønsberg, Graphis Scripta 18 ["17"]: 28 (2006).

Figs: Wirth 1995: 561; Brodo, Sharnoff & Sharnoff 2001: 419; Holien & Tønsberg 2006: 114.

THALLUS to several dm diam., 265–455 µm thick. Lobes to 2(–5) cm wide, variable, often deeply and ± dichotomously divided, with narrow to wide sinuate axils; lobe ends truncated or rounded. Upper side yellowish brown, mostly dull, rarely distinctly glossy, smooth, with distinct reticulate ridges. Isidia and soredia present, mainly along ridges and margins. Isidia variable, mostly cylindrical, sometimes club-shaped or flattened (forming lobules constricted at base), branched (branches simple to coralloid), to 0.4(–2) mm long when terete, more or less concolorous with upper thallus surface or darker brown. Laminal soralia developed where the isidia have been shed, discrete to patchily confluent; marginal soralia punctiform to linear. Soredia mostly coarse, globose, 20–70 µm diam.; consoredia to 80 µm diam. Lower side usually pale tan to pale yellowish brown, sometimes dark brown, especially towards centre, tomentose, with naked, pale tan to pale yellowish brown, rounded to elongate, ± flat to markedly convex patches (corresponding to the depressions on the upper side); rhizines squarrose, becoming simple by age; hairs simple to shaving-brush like, usually colourless, occasionally with a violet, K+ aeruginose pigment. Cephalodia common, internal, but sometimes visible as rounded thickenings of thallus on the lower and/or upper side. ASCOMATA not common, near margin and on the ridges, to 4 mm diam.; disc reddish brown, flat, sometimes becoming convex, thalline margin thin, sometimes becoming excluded, entire to somewhat crenulate, with minute hairs (at least when young). Spores 1–3(–5)-septate, fusiform, 16–37 × (5–)6–9 µm. CONIDIOMATA not observed. PHOTOBIONT green algae (*Dictyochloropsis*).

Chemistry. Stictic acid with satellites, including norstictic and connorstictic acids. Elix & Tønsberg (2006): constictic acid (major or submajor), stictic acid (major), norstictic acid (minor), cryptostictic acid (minor), salazinic acid (trace), peristictic acid (trace), 3-O-methylconsalazinic acid (trace), substictic acid (trace), lusitanic acid (trace), and methyl lusitanate (trace). Medulla P+ orange, K+ yellow to orange, C–, KC–.

Habitat. On bark of broad-leaved trees, especially *Populus*, *Salix caprea* and *Sorbus*, and on mossy rocks. Sometimes also on *Picea* in oldgrowth forest.

Distribution. Widespread but rarer towards the north and east. Populations decreased in recent decades. **D:** *ØJy Sjæ Brn.* **Fa. F:** *A V U EK St EH ES EP PH PS PK KP Kn OP PeP Ks KiL SoL EnL InL.* **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi.* **S:** *Sk Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL.* Otherwise in temperate parts of both Hemispheres.

5. **Lobaria scrobiculata** (Scop.) DC

Fl. Franç. ed. 3, 2: 402 (1805). – *Lichen scrobiculatus* Scop., Fl. Carniol. Ed. 2, 2: 384 (1772). – TYPE: Wales, Dolgelley, Icon in Dillenius Historia Muscorum, tab. 29, fig. 114, 1742 (lectotype, Yoshimura & Isoviita, Ann. Bot. Fenn. 6(4): 350, 1969); corresponding, large, right hand specimen in herb. Dillenius (OXF epitype, Tønsberg & Jørgensen, Nordic Lichen Flora 3: 145, 2007).

Syn. *Lobaria verrucosa* (Huds.) Hoffm., *nom. illeg.*, *Lobaria verrucosa* (Huds.) Gyeln.

D: bredfliget lungelav **F:** kalliokeuhkojäkälä **I:** gígnæfra **N:** skrubbenever **S:** skrovellav

Red-listed in: **D I S**

Literature: Hakulinen, Ann. Bot. Fenn. 1: 206–207, 210–212 (1964); Krog, Norsk Polarinst. Skr. 144: 39–40 (1968); Yoshimura, J. Hattori Bot. Lab. 34: 302–304 (1971); Hallingbäck, Lichenologist 21: 331–341 (1989); Hultengren et al., Graphis Scripta 5: 24–38 (1993); Elix & Tønsberg, Graphis Scripta 18 ["17"]: 28 (2006).

Figs: Wirth 1995: 561; Brodo, Sharnoff & Sharnoff 2001: 421; Hallingbäck, Svensk Bot. Tidskr. 97: 31 (2003); Holien & Tønsberg 2006: 113.

THALLUS to 1(–2) dm diam., to 340 µm thick. Lobes to 3(–4.5) cm wide, rounded, sometimes divided. Upper side mat, often scabrose, yellowish grey to grey-blue when dry, sometimes with a brownish tinge towards the lobe ends, dark grey-blue when wet, usually with shallow depressions and with ridges, sometimes with glassy hairs near the margin of young lobes, with soralia. Soralia or soralia-like structures grey-brown to bluish grey, marginal and laminal, linear to punctiform along margins and on ridges, otherwise ± punctiform, mostly convex, containing a coralloid mass of diaspores. Diaspores soredia-like at first, coarse, soon tending to form ± elongated, isidioid, irregular, terete to flattened, ± opuntioid, easily detached, ± brownish structures, to 0.2(–0.4) × 0.3(–0.5) mm, perhaps best characterized as isidioid consoredia; bluish white, medullary tissue sometimes present, especially on the lower side of flattened diaspores. True isidia possibly absent. Lower surface pale to medium brown (cortex), tomentose, with naked, whitish, rarely pale violet, rounded to elongate, flat to elevated patches; tomentum pale to dark brown; rhizines simple to ± shaving-brush-like, sometimes flattened. ASCOMATA rare, to 3 mm diam.; disc brown, rough; thalline margin thick. Spores elongate to ± elliposid, with obtuse apices, often widest in upper half, (1–)3-septate, 17–22 × (3.5–)5–6(–7) µm, colourless. CONIDIOMATA not observed. PHOTOBIONT cyanobacteria (*Nostoc*?).

Chemistry. Chemotype I: Usnic acid, stictic acid with satellites including norstictic acid, scrobiculin with 2 satellites; cortex K–; medulla P+ orange, K+ yellow to orange, C– KC–. Chemotype II: Usnic acid, scrobiculin with 2 satellites; P–, K–, C–, KC–. Elix & Tønsberg (2006): m-scrobiculin (major), p-scrobiculin (submajor), stictic acid (major or minor), constictic acid (minor), usnic acid (minor), norstictic acid (minor), cryptostictic acid (trace), substictic acid (trace), peristictic acid (trace), unknown scrobiculin derivative (trace), ± atranorin (trace).

Habitat. On bare and mossy, acidic to calcareous rocks and on bark.

Distribution. Widespread, uncommon but locally frequent. Decreased in recent decades. **Gr. I:** *IVe*. **D:** *ØJy Sjæ Brn*. **F:** *A V U EK St EH ES LK EP PH PS PK KP Kn OP PeP Ks KiL SoL EnL InL*. **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **S:** *Sk Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Otherwise in Europe, North America, and Australasia.

Note. Distinct from *L. hallii* by the yellowish tinge (usnic acid) when dry and the lack of veins on the lower side. Also differing in chemical characters and ecology.

6. **Lobaria virens** (With.) J.R.Laundon

Lichenologist 16: 227(1984). – *Lichen virens* With., Bot. Arr. Veg. Gr. Brit.: 710 (1776). – TYPE: Icon in Dillenius Historia. Muscorum: tab. 25, fig. 98A, 1742 (lectotype, Laundon, Lichenologist 16: 227, 1984); corresponding, the middle specimen, in herb. Dillenius (OXF epitype, Tønsberg & Jørgensen, Nordic Lichen Flora 3: 145, 2007).

Syn. *Lobaria laetevirens* (Lightf.) Zahlbr., *Lobaria herbacea* (Huds.) DC.

D: lysegrønn lungelav **I:** hraunnæfra **N:** kystnever **S:** örtlav

Red-listed in: **D S**

Literature: Degelius, Acta Phytogeogr. Suec. 7: 79–88 (1935); Hultengren et al., Graphis Scripta 5: 24–38 (1993); Thor & Arvidsson (eds) 1999: 223–224.

Figs: Thor & Arvidsson (eds) 1999: 284; Holien & Tønsberg 2006: 115.

THALLUS to several (5–6) dm diam., to 300 µm thick. Upper side green to pale greyish brown when dry, green when wet, smooth to wrinkled, glabrous, usually matt, sometimes glossy, especially towards the margin, without soredia and isidia. Lower side brown, tomentose, without naked spots. Lobes to 2 cm wide, often overlapping, sometimes with lobules along margin. ASCOMATA common, to 11 mm diam.; disc brown; thalline margin inflexed. Spores 1–3-septate, 32–47 × (6–)8–10 µm, straight to somewhat sigmoid,

colourless, becoming pale yellowish brown by age. CONIDIOMATA frequent; ostiole dark brown to blackish, brown in microscopic preparations; conidia widening at both ends, 4–5 × c. 1.5 µm. PHOTOBIONT green algae.

Chemistry. No secondary secondary substances identified. Medulla K± pale yellow, other spot test reactions negative.

Habitat. Sheltered cliffs and coarse-barked tree trunks in coastal, deciduous, broad-leaved forests (main habitat), on deciduous trees (*Salix caprea*, *Sorbus aucuparia*) in moist *Picea abies* forests, and on mossy, coastal rocks.

Distribution. Widespread with a western tendency. **D:** *ØJy Sjæ.* **Fa. I:** *ISu*. **N:** *Øf Ak Bu Vf Te AA VA Ro Ho SF MR ST NT SNo.* **S:** *Sk* (*Bl*) *Öl Hl Bh Dls Vg Ög Vrm.* Otherwise in western and southern Europe.

Pseudocyphellaria

P.M. Jørgensen & T. Tønsberg

Pseudocyphellaria Vain.

Pseudocyphellaria Vain., *nom. cons*. Acta Soc. Fauna Fl. Fenn. 7(1): 182 (1890). − TYPE: *Pseudocyphellaria aurata* (Ach.) Vain., *cons*.

Syn. *Cyanosticta* Gyeln.?

N: prikklav

Literature: Coppins & James, Lichenologist 11: 172–175 (1979); Galloway, Bull. Brit. Mus. Bot. Ser. 17 (1988), Biblioth. Lichenol. 46: 1–275 (1992); Purvis in Lich. Fl. Gr. Brit. & Ireland: 506–508 (1992); Krog, Østhagen & Tønsberg 1994: 259–260.

THALLUS foliose, dorsiventral, often rosette-forming or irregularly spreading with rounded lobes. Upper side smooth or wrinkled, matt, sometimes sorediate and/or with coarse, isidioid lobules, particularly at the margins. Lower side tomentose, dotted by scattered pseudocyphellae; medulla white or yellow. ASCOMATA apothecia, rare, hemiangiocarpic, sessile to shortly stalked, with brown disc and thalline margin. Hymenium I+ blue, with clavate, 8-spored asci, apically with internal, amyloid sheets. Spores brownish, fusiform-ellipsoid, 1–3-septate. CONIDIOMATA pycnidia, very rare, immersed, with blackish ostiole, globose to ovoid, 0.1–0.5 mm diam.; conidia bacilliform, produced apically or laterally on branched, short-celled conidiophores, 3–5 × 0.7–1 µm. PHOTOBIONT variable, green algae (?*Chlorella*) or cyanobacteria (*Nostoc*).

Chemistry. Orcinol derivates, terpenoids, quinons, and pulvinic acid derivates.

Note. Should not be confused with *Sticta*, which has true cyphellae and lacks secondary substances. *Pseudocyphellaria* is not a uniform genus, and the species in our region do not belong to *Pseudocyphellaria* s. str., which is a pantropical genus, but the division is pending on further research.

1. Soralia and pseudocyphellae yellow ..... 1. *P. crocata*
– Soralia variously coloured, but never yellow; pseudocyphellae white 2
2. Soralia mainly marginal; lobes elongate; medulla C– ..... 2. *P. intricata*
– Soralia mainly laminal; lobes rounded; medulla C+ red ..... 3. *P. norvegica*

1. Pseudocyphellaria crocata (L.) Vain.

Hedwigia 37: 34 (1898). – *Lichen crocatus* L., Mant. Pl.: 310 (1771). – TYPE: India, König (LINN 1273.137 holotype).

I: gulrenda **N:** gullprikklav

Red-listed in: **N**

Literature: Degelius, Acta Phytogeogr. Suec. 7: 145–150, 362–363 (1935); Ahlner, Nytt Mag. Naturv. 78: 333–337 (1938), Acta Phytogeogr. Suec. 22: 70–73, 196 (1948); Galloway, Biblioth. Lichenol. 46: 92–95 (1992); Purvis 1992: 507; Jørgensen, Symb. Bot. Ups. 31(3): 303 (1996); Holien & Tønsberg, Blyttia 54: 157–177 (1996); Tønsberg et al., Sommerfeltia 23: 151–160 (1996).

Figs: Brodo, Sharnoff & Sharnoff 2001: 594; Holien & Tønsberg 2006: 116.

THALLUS foliose, rosette-forming, to 10 cm diam.; lobes 5–15 mm wide, to 250 µm thick, rounded or elongated. Upper side grey-brown to brown, smooth or with ridges. Soralia yellow to ± brownish, punctiform at first, but often becoming confluent, mainly along the ridges and the margins. Soredia simple and globose and to 60 µm diam., or in ± coralloid, consoredia to 140(-240) µm long, yellow or, in exposed surfaces, brown. Medulla white. Lower side pale brown, darker towards the centre, densely tomentose, with conspicuous emergent, yellow pseudocyphellae. ASCOMATA very rare, 1–2 mm wide, with reddish brown disc and thin brown thalline

margin. Spores (not observed in Nordic material) brownish, 1(–3)-septate, fusiform, 20–30 × 5–10 µm. CONIDIOMATA very rare, as in genus. PHOTOBIONT *Nostoc* in chains, individual cells 4–5 µm diam.

Chemistry. Pulvinic acid, pulvinic lactone, calycin, tenuiorin, methylgyrophorate, stictic acid, constictic acid, and hopane 6α, 7β, 22-triol, and norstictic acid (the latter substance in apothecia). Medulla and soralia PD+ orange, K+ yellow, C–, KC–.

Habitat. On twigs of *Picea abies* in boreal rainforests (main habitat), on mossy rocks and on deciduous trees.

Distribution. Not common but rather widespread in humid, western parts of the region. **I:** *ISu* (*IVe*). **N:** *Ro Ho SF MR ST NT SNo*. Along the westernmost coast of Norway and in southern Iceland; otherwise widespread in cool-temperate regions of both hemispheres.

Note. Unmistakable species due to the yellow soralia and pseudocyphellae, not found in any other species in the region. Only one specimen with apothecia was observed.

2. Pseudocyphellaria intricata (Delise) Vain.

Hedwigia 37: 35 (1898). – *Sticta intricata* Delise, Mém. Soc. Linn. Calvados 2: 96 (1825). – TYPE: Reunion (Isle de Borbon), Bory de St. Vincent (PC-LENORM. lectotype, Galloway & James, Nova Hedwigia 42: 437, 1986).

Syn. *Pseudocyphellaria thouarsii* (Delise) Degel., *Cyanosticta normalis* Gyeln.

N: randprikklav

Red-listed in: **N**

Literature: Coppins & James, Lichenologist 11: 173–175 (1979); Galloway, Biblioth. Lichenol. 46: 161–164 (1992); Purvis 1992: 507–508; Jørgensen 1996: 303; Tønsberg et al., Sommerfeltia 23: 160–162 (1996).

Figs: Galloway 1988: 170.

THALLUS foliose, to 410 µm thick, rosette-forming to irregularly spreading, to 10 cm diam., with lobes to 10 mm wide, elongated and often deeply incised with rounded apical parts. Upper side in shades of brown, smooth to shiny with predominantly marginal soralia. Soredia usually in consoredia; consoredia often forming ± terete to flattened, ± coralloid, lobule-like structures to 240(–370) µm diam.; lobules brownish above, sometimes with whitish blue pruina, whitish to bluish white below. Medulla white. Lower side pale brown, darker towards the centre, densely tomentose, with projecting, scattered white pseudocyphellae. ASCOMATA and CONIDIOMATA unknown. PHOTOBIONT *Nostoc* in chains, individual cells 4–5 µm diam.

Chemistry. 7β-acetoxyhopan 22-ol, and hopane-15α,22-diol, ± tenuiorin, ± methylgyrophorate. Medulla and soralia P–, K+ yellow, C–, KC–.

Habitat. On mossy tree trunks and on mossy rocks in sheltered, coastal sites.

Distribution. Rare; western, oceanic. **Fa. N:** *Ro Ho SF*. Otherwise in cool temperate parts in both hemispheres.

Note. Specimens which grow in extreme habitats show a tendency to form marginal lobules from the soralia. Because of that specimens from the Faeroes, like material from the British Isles, have been wrongly identified as *Pseudocyphellaria lacerata* Degel. (Galloway 1992), a species from the Azores, which has quite different lobes and coralloid isidia.

3. Pseudocyphellaria norvegica (Gyeln.) P.James

in Coppins & James, Lichenologist 11: 172 (1979). – *Cyanosticta norvegica* Gyeln., Rep. Spec. Nov. Regni Veg. 29: 296 (1931). – TYPE: Norway, Hordaland, Tysnes, Loksund, 1910 Havaas (BG holotype).

Syn. *Cyanosticta aberrans* (Hav. ex Lynge) Gyeln., *Cyanosticta ecyphellata* (Hav.) Gyeln.

N: kystprikklav

Red-listed in: **N**

Literature: Coppins & James, Lichenologist 11: 172–175 (1979); Galloway, Biblioth. Lichenol. 46: 192–195 (1992); Purvis 1992: 508; Jørgensen 1996: 303; Tønsberg et al., Sommerfeltia 23: 163–165 (1996).

Figs: Holien & Tønsberg 2006: 116.

THALLUS foliose, 240–410 µm thick, rosette-forming to irregularly spreading, to 10 cm diam.; lobes to 15 mm wide, rounded to elongate. Upper side in shades of brown with predominantly laminal, punctiform soralia, which may form a reticulate pattern, sometimes also with marginal soralia. Soredia usually in consoredia, consoredia often forming ± terete to flattened, ± coralloid, lobule-like structures, to 220(-380) µm diam.;

lobules brownish above, sometimes with whitish blue pruina, whitish to bluish white below. Medulla white. Lower side pale brown, darker towards the centre, densely tomentose with projecting white pseudocyhellae. ASCOMATA and CONIDIOMATA very rare (unknown?). PHOTOBIONT *Nostoc* in chains, individual cells 4–5 µm diam.

Chemistry. 2'-O-methylnorbarbatic and 2'-O-methylnorobtusatic acids, and other substances in the barbatic acid complex, 7β-acetoxyhopan 22-ol, and hopane-15α,22-diol. Medulla P–, K–, C+ red, KC+ orange.

Habitat. On mossy tree trunks and on mossy rocks in sheltered, coastal sites.

Distribution. **N:** *Ro Ho SF*. Western oceanic; otherwise cool-temperate in both hemispheres.

Note. Long confused with *P. intricata* and included in it under the name *Pseudocyphellaria thouarsii* (e.g. by Degelius 1935). There are difficult forms which morphologically approach *P. intricata*, but these are always distinguishable by the different C and KC reactions.

Sticta

P.M. Jørgensen & T. Tønsberg

Sticta (Schreb.) Ach.

Sticta (Schreb.) Ach., Methodus: 275 (1803). − *Lichen* ["Sect."] *Sticta* Schreb., in Linnaeus Genera Plantarum ed. 8: 768 (1791). − TYPE: *Sticta sylvatica* (Huds.) Ach. (lectotype Eschweiler, Syst. Lich.: 20, 1824).

Syn. *Stictina* Nyl., *nom. illeg*.

N: porelav **S:** ärrlavar

Literature: Purvis in Lich. Fl. Gr. Brit. & Ireland: 582–584 (1992); Galloway, Lichenologist 26: 223–282 (1994); Krog, Østhagen & Tønsberg 1994: 285–287; Galloway, Lichenologist 29: 105–168 (1997); Brodo, Sharnoff & Sharnoff 2001: 670–672; Galloway, Fl. Austr. 58A, Lichens 3: 78–97 (2001).

THALLUS foliose in often rosette-like, multilobed thalli with rounded lobes. Upper side smooth, rarely wrinkled, matt, sometimes with isidia or soralia. Lower surface tomentose, pitted by scattered cyphellae. ASCOMATA apothecia, rare, sessile, disc brownish with thalline margin. Hymenium I+ blue with clavate, 8-spored asci, apically with internal amyloid sheets. Spores pale brownish, fusiform to ellipsoid, 1–3-septate. CONIDIOMATA pycnidia, immersed, with red-brown ostiole and short-celled, branched conidiophores; conidia bacilliform, colourless produced apically or laterally. PHOTOBIONT variable, green algae (?*Chlorella*) or cyanobacteria (*Nostoc*).

Chemistry. No secondary substances (by TLC) in Nordic material.

Notes: Only confusable with *Pseudocyphellaria* which, however, has pseudocyphellae on the lower surface and contains secondary substances.

1. Thallus with soredia ..... 3. *S. limbata*
– Thallus with isidia and/or folioles 2
2. Thallus blue-grey to brown; margin and/or upper side with dissected folioles ..... 1. *S. canariensis*
– Thallus brown; margin ± entire; folioles absent or with entire margin 3
3. Lobes rounded, not sinuate-indented; isidia evenly distributed ..... 2. *S. fuliginosa*
– Lobes rounded to blunt, sinuate-indented; isidia in groups ..... 4. *S. sylvatica*

1. **Sticta canariensis** (Flörke) Delise

Mém. Soc. Linn. Calvados 2: 114 (1825). – *Pulmonaria canariensis* Bory ex Flörke, Mag. Ges. Naturf. Fr. Berlin 2: 127 (1809). – TYPE: Canary Islands, Tenerifa, Forêt de Laguna, Bory de St. Vincent (BM lectotype, Galloway, Nova Hedwigia 61: 152 (1995)).

Syn. *Sticta dufourii* Delise (the blue-green morph).

N: skjellporelav

Red-listed in: **N**

Literature: James & Henssen 1969: 50–52; Purvis 1992: 583; Tønsberg et al., Sommerfeltia 23: 163–165 (1996); Jørgensen Nova Hedwigia 18: 331-340 (1970).

THALLUS foliose; lobes either with blue-green cyanobacteria or with green algae. The cyanobacterial morph forming extensive tufts, to 10 cm diam.; lobes rounded, to 1 cm wide, thin, to 240 µm thick (in non-cyphellate parts), brittle, with dissected margins. Upper side pale grey to brownish, white-marbled, with scattered coralloid to flattened, imbricate isidia. Lower surface pale brown, whitish tomentose, with scattered white cyphellae. Lobes with green algae sometimes attached to margins of the cyanobacterial lobes, rounded, to 0.5

cm wide, easily distinguished when wet. ASCOMATA and CONIDIOMATA unknown in Nordic material, but apothecia may be present on the green algal morph in southern parts of its range (see note below). PHOTOBIONT: the cyanobacterial morph with *Nostoc* in chains, individual cells 4–5 µm diam.; the green algal morph with *Trebouxia*?

Chemistry. No secondary substances (by TLC).

Habitat. On shaded, mossy rocks, rarely on bark, in humid situation near the sea.

Distribution. Rare, western, oceanic. **N:** *Ho.* Known from the westernmost coast of Europe as far north as Norway, and the Canary Islands.

Note. The blue-green morph, previously called *Sticta dufourii*, is dominating in the northern part of the range, but in some populations the small green lobules, easily seen when wet, are quite common. The free-living green morph, which is a larger, thicker lichen, surprisingly dissimilar to its blue-green counterpart, has not been recorded in Norden. This blue-green morph differs from *Sticta fuliginosa* and *S. sylvatica* in the thin, fringed thallus.

2. Sticta fuliginosa (Hoffm.) Ach.

Methodus: 280 (1803). – *Lobaria fuliginosa* Hoffm., Deutschl. Fl. 2: 109 (1796). – TYPE: Wales, Cader Idris, Icon in Dillenius Historia muscorum: tab. 26, fig. 100A, 1742 (lectotype, Laundon, Lichenologist 16: 218–219, 1984); corresponding specimen in herb. Dillenius (OXF epitype, Jørgensen & Tønsberg, Nordic Lichen Flora 3: 145, 2007).

N: rund porelav **S:** stiftärrlav

Red-listed in: **S**

Literature: Degelius, Acta Phytogeogr. Suec. 7: 162–171, 364–365 (1935); Purvis 1992: 583–584; Thor & Arvidsson (eds) 1999: 490–491.

Figs: Wirth 1995: 885; Thor & Arvidsson (eds) 1999: 328; Brodo, Sharnoff & Sharnoff 2001: 672; Holien & Tønsberg 2006: 117.

THALLUS foliose, orbicular, mostly ± single-lobed, to 3 cm wide; margin down-turned, often with cilia, 215–340 µm thick (in non-cyphellate parts). Upper side brown to dark brown, sometimes whitish brown in patches, rarely partly with a bluish tinge, smooth to slightly wrinkled, with evenly scattered, dark brown, coralloid isidia, often in clusters. Lower side beige, densely tomentose, with distinct white cyphellae, often variable in size. ASCOMATA very rare, to 3 mm diam., with plane to convex, dark brown to red-brown disc; thalline margin c. 0.1 mm wide, sometimes ciliate; cilia to 0.5 mm long. Spores colourless, straight, mostly 3-septate, rarely 1-septate (in exceptional cases 2 or 6-septate), (25–)28–37(–46) × 6–9 µm; apices usually ± pointed. CONIDIOMATA unknown. PHOTOBIONT *Nostoc* in chains, individual cells 4–5 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On mossy trees and rocks in humid situations.

Distribution. Widespread, but oceanic, with western tendency. **N:** *Ak Bu He Op VA Ro Ho SF MR ST NT SNo.* **S:** (*Sk*) (*Bl*) (*Sml*) (*Hl*) (*Bh*) *Dls Ög Vrm* (*Dlr*). Otherwise in cool-temperate parts of both hemispheres.

3. Sticta limbata (Sm.) Ach.

Methodus: 280 (1803). – *Lichen limbatus* Sm. in Sowerby & Sm., Engl. Bot. 16: 1104 (1802). – TYPE: England, Sm. (BM lectotype as 'holotype', Laundon, Journ. Linn. Soc. 147: 493, 2005, specimen associated with the original drawing of the table).

N: grynporelav **S:** grynig ärrlav

Red-listed in: **S**

Literature: Degelius, Acta Phytogeogr. Suec. 7: 172–178, 365–367 (1935); Purvis et al. 1992: 584; Thor & Arvidsson (eds) 1999: 492.

Figs: Thor & Arvidsson (eds) 1999: 329; Brodo, Sharnoff & Sharnoff 2001: 673; Holien & Tønsberg 2006: 117.

THALLUS foliose, orbicular, single-lobed, irregularly incised or not, 130–215 µm thick (in non-cyphellate parts), with marginal and linear to laminal and punctiform, bluish grey soralia; soredia farinose, to 30 µm diam., surrounded by hyphae with isodiametric cells. Upper side grey-brown, smooth. Lower side beige, densely tomentose, with distinct, scattered, white cyphellae. ASCOMATA very rare, only once reported from Norden, laminal, shortly stalked, to 3 mm diam., with red-brown disc and downy thalline margin. Spores colourless, 1-septate, fusiform, 25–40 × 7–10 µm. CONIDIOMATA unkown. PHOTOBIONT *Nostoc* in chains, individual cells 4–5 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On shaded, mossy rocks and tree trunks.

Distribution. Uncommon, western oceanic. **N:** *VA Ro Ho SF MR ST*. **S:** (*SmI*) (*Bh*) (*Dls*). Otherwise in cool-temperate parts of both Hemispheres.

Note. The only sorediate *Sticta* in our region.

4. Sticta sylvatica (Huds.) Ach.

Methodus: 281 (1803). – *Lichen sylvaticus* Huds., Fl. Angl. 2: 721 (1778). – TYPE: Icon in Dillenius, Historia Muscorum, tab. 27, fig. 101, 1742 (lectotype, Jørgensen & Tønsberg, Nordic Lichen Flora 3: 146, 2007); corresponding specimen in herb. Dillenius (OXF epitype, Jørgensen & Tønsberg, Nordic Lichen Flora 3: 146, 2007).

N: buktporelav **S:** ärrlav

Red-listed in: **S**

Literature: Degelius, Acta Phytogeogr. Suec. 7: 186–178, 367–370 (1935); Purvis 1992: 584; Thor & Arvidsson (eds) 1999: 493–494.

Figs: Wirth 1995: 885; Thor & Arvidsson (eds) 1999: 330.

Thallus foliose, irregularly spreading, often multilobed, to 10 cm diam., 120–145 µm thick (in non-cyphellate parts); apices often incised and markedly truncated. Upper side uneven, brown, with clusters of isidia scattered on the surface. Lower side beige, whitish tomentose, with scattered, small, regular-sized, white cyphellae. ASCOMATA and CONIDIOMATA unknown. PHOTOBIONT *Nostoc* in chains, individual cells 4–5 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. On shaded mossy rocks and on tree trunks.

Distribution. Uncommon, western oceanic. **N:** *Ak Te VA Ro Ho SF MR*. **S:** (*Sk*) (*Bl*) *SmI* (*Bh*) (*Dls*) (*Vg*) *Ög Vrm.* Otherwise in western Europe and in the Canary Islands.

Note. Sometimes rather difficult to distinguish from *S. fuliginosa*, particularly when young, but differs mainly in the more unevenly distributed isidia, the small and regular-sized cyphellae, and the shape of the lobes.

Massalongiaceae

P. M. Jørgensen

THALLUS variable from squamulose-subfoliose to fruticulose, sometimes gelatinous, usually corticate. ASCOMATA hemiangiocarpic apothecia, finally rather flat with distinct true exciple; hymenium of straight, dense paraphyses, I+ blue, with clavate asci which have internal, amyloid, apical sheet(s). Spores colourless, narrowly ellipsoid to spindle-shaped and 1–2-septate. PHOTOBIONT *Nostoc.*

Chemistry. No secondary substances (by TLC).

Note. The three genera included in this recently recognized family have always been difficult to place, and several positions have been suggested. They have often been scattered in different families due to their different habitus. However, molecular evidence has confirmed that they are closely related and constitute a well-defined unit.

1. Thallus fruticose of terete branched filaments, brownish.....*Polychidium*
– Thallus squamulose, greenish 2
2. Thallus homoiomerous with imperfect cortex, sometimes with glassy marginal hairs .....*Leptochidium*
– Thallus heteromerous with distinct upper cortex, never with glassy marginal hairs..... *Massalongia*

Leptochidium M.Choisy

Bull. Mens. Soc. Linn. Lyon 21: 165 (1952). – TYPE: *Leptochidium albociliatum* (Desm.) M.Choisy

Literature: Wedin et al., Lichenologist 39: 61-67 (2007).

THALLUS squamulose to foliose, dark blackish green, gelatinous, mostly homoiomerous, without (or rarely in parts with) proper cortex, in one species with short glassy hairs along the margin. ASCOMATA apothecia (not seen in Nordic material) laminal, hemiangiocarpic, reddish brown, convex at maturity, often with hairy margin. Spores colourless, narrowly ellipsoid, one-septate. CONIDIOMATA pycnidia, rare (not seen in Nordic material) semiimmersed, punctiform; conidia bacilliform, simple. PHOTOBIONT nostocoid, in short chains, individual cells 4–6 µm diam.

Chemistry. No secondary substances (by TLC).

Note. *Leptochidium* is otherwise superficially similar to *Leptogium*, though without regular upper cortex, and with totally different apothecia and spores.

Literature: Henssen, Can. J. Bot. (1963); Wedin et al. Lichenologist 39: 63 (2007).

1. Thallus mainly foliose with spreading, quite broad (to 2 mm wide), isidiate lobes, with short glassy hairs marginally on entire, undulating margins; widespread, mainly subalpine.....1. *L. albociliatum*
– Thallus squamulose, often forming cushions of more or less ascending, non-isidiate, dull lobes, with incised, notched margins; less than 1 mm wide, without marginal hairs; arctic-alpine ....2. *L. crenatulum*

1. Leptochidium albociliatum (Desm.) M.Choisy

Bull. Mens. Soc. Linn Lyon 21: 165 (1952). – *Leptogium albociliatum* Desm., Ann. Sci. Nat. Bot., ser. 4, 58: 132 (1855). – TYPE: France (Ain), near Saint-Benoit in Beaujolais, Desmazière, Pl. Crypt. Fr. no. 233 (UPS lectotype, Jørgensen, Nordic Lichen Flora 3: 146, 2007).

I: hærutjása **F:** ripsikesijäkäla **N:** glasshårlav **S:** glashårslav

Figs: Brodo et al.: 399 (Fig. 449, 2000); Holien & Tønsberg 2006: 131

THALLUS squamo-foliose, forming cushions to 5 cm diam., with loosely adnate, usually elongate, undulating lobes with glassy hairs at the margin. Upper surface dark greenish black, smooth to uneven, with isidia; lower surface paler, often with long white, fasciculate hapters. Lobes 150–200 µm thick, partly corticate on both surfaces and often with an internal cellular pattern. APOTHECIA unkown in Norden, otherwise rare (except in the Iberian Peninsula), laminal, to 1.5 mm diam., often convex, reddish-brown, with paler proper exiple beset with short hairs. Spores colourless, one-septate, 15–22 × 7–8 µm. PYCNIDIA unknown. PHOTOBIONT nostocoid in short chains, individual cells 4–6 µm.

Chemistry. No secondary substances (by TLC).

Habitat. Mossy, moist ground.

Distribution. Scattered but widespread, commonest in mountain forests (regio subalpina). **Gr. F:** *EnL*. **I:** *ISu IVe IAu INo*. **N:** *Op SF ST SNo Tr VFi*. **S:** *SmI TL*. Widespread, but scattered in the Northern Hemisphere, commonest in the mountains of southwestern Europe, but absent in the British Isles.

Note. Variable species, from foliose, broad-loabed specimens (in our region only seen from western Iceland) to caespitose, squamulose ones, though usually easily recognizable on the presence of short, glassy hairs on the lobe-margins, not to be confused with hairs of some *Leptogium* species which are different and usually not confined to lobe-margins. For differences from the next species, see below.

2. Leptochidium crenatulum (Nyl.) P.M.Jørg.

Graphis Scripta 18: 19 (2006) – *Leptogium rivulare* var. *crenatulum* Nyl., Flora 58: 106 (1875). – *Leptogium crenatulum* (Nyl.) Vain., nomen sed non spec. – TYPE: Finland, Kilpiskoski, 1869 J. P. Norrlin (H-NYL 41119 lectotype, Jørgensen 1994: 11); epitype the same collection ex herb. Norrlin (H, Jørgensen, Graphis Scripta 18: 19, 2006).

Syn. *Leptogium albociliatum* var. *eciliatum* Degel.

Literature: Degelius 1982; Jørgensen 2006: 19.

Figs: Jørgensen 2006.

THALLUS squamulose, olivaceous brown, forming flat cushions to 2 cm diam., individual squamules to 1 mm wide, rounded or elongate with notched, thickened margins, often with isidioid secondary lobules. Upper surface uneven, without isidia. Lobes 80–120 µm thick, with incomplete upper and lower cortex enclosing a medulla of loose hyphae. APOTHECIA and PYCNIDIA unknown. PHOTOBIONT scattered short chains, nostocoid, individual cells 4–6 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Mossy, wet rocks, often by waterfalls; rarely on sand by rivers or in wet tundra.

Distribution. Rare and scattered, mainly arctic-alpine, but descending to sea-level in northern Norway. **Gr. I:** *IAu*. **F:** *EnL*. **N:** *He Op SF ST SNo NNo Tr*. **S:** *Jmt LuL TL*. Also known from Baffin Island in Canada.

Note. Originally taken for one of the small-lobed *Leptogium* species because of its appearance and its anatomy, but certainly, though unknown with apothecia, a taxon closely related to *L. albociliatum*, as pointed out by Degelius 1982, though usually lacking the glassy hairs and being none-isidiate and more small- and thick-lobed.

Massalongia Körb.

Syst. Lich. Germ.: 109 (1855).

Literature: Gyelnik in Rabenhorst Krypt. Fl. 9,2,2: 151–157 (1940); Henssen. Canad. J. Bot. 41: 1331–1346 (1963); Wedin et al. Lichenologist 38 (2006, ined.).

THALLUS squamulose, forming rosettes, upper surface corticate, lower surface without cortex but with densely interwoven, longitudinally oriented hyphae. ASCOMATA apothecial, laminal, with I+ blue hymenium, of coherent, simple paraphyses, in upper part brown. Asci cylindrical, apically thickened, with internal amyloid sheets, 8-spored. Spores colourless, ellipsoid, 1–2-septate. CONIDIOMATA pycnidia, protruding as brownish warts, with short-celled, branched conidiophores; conidia colourless, bacilliform, produced apically or laterally. PHOTOBIONT *Nostoc* in clusters.

Chemistry. No secondary substances (by TLC).

Note. This genus, which because of its apothecia for a long time was believed to belong to the Pannariaceae (e.g. by Gyelnik 1940), clearly because of its apothecia must be placed in the Peltigerinae, a conclusion with molecular support.

1. Massalongia carnosa (Dicks.) Körb.

Syst. Lich. Germ.: 109 (1855). – *Lichen carnosus* Dicks., Pl. Crypt. Brit.: 21 (1785). – TYPE: Scotland, Highlands, J. Dickson (BM holotype).

Syn. *Pannaria muscorum* (Ach.) Duby, *Massalongia carnosa* f. *compacta* H.Magn.

D: brun skællav **F:** sammaljäkälä **N:** moseskjell **S:** **f**liklav

Literature: Gyelnik in Rabenhorst Krypt. Fl. 9,2,2: 151–160 (1940); Henssen, Can. J. Bot. 41: 1331–1342 (1963).

Figs: Brodo et al. 2000: 200 (Fig. 489); Wirth 1995: 569.

THALLUS squamulose; squamules round to elongate, rather irregularly branched, often with isidioid

outgrowths marginally, to 1 mm wide and 200 µm thick, often aggregated in brownish rosettes, to 2–3 cm diam., with cellular upper cortex, to 30 µm thick. Upper surface smooth, sometimes shiny, brown when dry, dark greenish when wet; lower surface cream-coloured with sparse, brownish rhizines. APOTHECIA infrequent, laminal, shortly stipitate with flat, brown disc, to 2 mm diam., and disctinct proper exciple, but with algal cells penetrating into the subhymenium (as in *Leioderma*). Spores colourless, often irregular, mostly 1-septate, narrowly ellipsoid, 15–35 × 5–7(–8) µm. CONIDIOMATA very rare, brown, to 0.6 mm diam.; conidia dumbbell-shaped, colourless, 4–6 × 1 mm. PHOTOBIONT *Nostoc* in clusters, individual cells 3–5 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Mossy, moist, acidic rocks, rarely on peaty soil or bases of old trees.

Distribution. Widespread and rather common, mainly lowland (to subalpine). **D:** (*NJy*) (*Brn*). **Gr. Fa. I:** *ISu IVe IMi IAu INv INo*. **F:** *A V U EK St EH ES EP PH PS PK Kn PeP Ks KiL InL*. **N:** *Øf Ak He Op Bu Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **S:** *Sk Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Widespread in cool-temperate regions of both hemispheres.

Note. Variable species which is easily confused with members of the Pannariaceae, particularly when sterile, though not closely related to them. It has frequently been confused with *Fuscopannaria praetermissa* which is calcicolous and grows in drier habitats, mostly on soil, but *M. carnosa* is generally more leafy, with smooth, often glossy upper surface with larger, thin-walled cells. They are easiest separated on chemistry as terpene needles are often seen on herbarium specimens of *F. praetermissa*,

The squamules which are mostly rounded, may elongate, following the moss-stems, and the margins are variously incised and nodulose, sometimes developing isidia-like outgrowths. These variations appear not to be of taxonomic importance.

Polychidium (Ach.) S.F.Gray

Nat. Arr. Br. Pl.: 401 (1821). – *Collema* subg. *Polychidium* Ach., Lich. Univ.: 658 (1810).

Syn. *Leptogidium* Nyl.

Literature: Henssen, Symb. Bot. Ups. 18(1): 99–109 (1963).

THALLUS fruticose of essentially dichotomously branched filaments forming small, brownish, flat to hemispaeric tufts. The mainly cylindrical branches have a distinct layer of cellular cortex surrounding the central medullary hyphae. ASCOMATA apothecia, common, lateral on branches, discoid, with distinct proper exciple. Hymenium of simple hyphae, I+ blue; asci broadly cylindrical, apices thickened with internal, amyloid sheets. CONIDIOMATA pycnidia, lateral, quite common. PHOTOBIONT *Nostoc* in short chains.

1. Polychidium muscicola (Sw.) Gray

Nat. Arr. Br. Pl.: 402 (1821). – *Lichen muscicola* Sw., Nov. Act. Reg. Soc. Sci. Ups. 4: 248 (1784). – TYPE: Sweden ('Suecia'), 'ex herb. cl. Swartz' (in Wahlenberg's handwriting) (UPS lectotype, Henssen Symb. Bot. Ups. 18(1): 104, 1963).

Syn. *Polychidium kalkuense* Räsänen

F: sammalkarvajäkälä **I:** mosakrekla **N:**? **S:** korallkuddlav

Red-listed in: **D**

Literature: Henssen, Symb. Bot. Ups. 18(1): 99–109 (1963).

Figs: Brodo et al.: 580 (Fig. 702, 2000); Henssen 1963 (Fig. 14, anatomy; 28b, apothecium).

THALLUS fruticose of intricately branched, decumbent filaments, 60–125 µm diam., forming brown cushions to 3 cm diam. and at most 1 cm high. Filaments cylindrical but sometimes slightly flattened and with depressions, branching basically dichotomous, apically sometimes hand-like. Cortex distinctly cellular, 1–3 layered, cells round to angular, particuarly at the base. APOTHECIA lateral on the filaments, common, with flat, brown disc and distinct proper exciple, to 2 mm diam. Spores colourless, 1-septate, variable in shape, of two main kinds, either spindle-shaped, 22–29 × 5–6 µm, or ellipsoid, 15–17 × 7–11 µm. CONIDIOMATA uncommon, brown, protruding, to 0.2 mm diam.; conidia bacilliform, colourless, 1.5–3.5 × 1 µm. PHOTOBIONT *Nostoc* in short chains, individual cells 3–6 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Moist mossy rocks, occasionally on wet ground or bases of old ash-trees.

Distribution. Widespread but scattered, quite common locally, mainly lowland, becoming rarer, particularly in Denmark. **D:** (*NJy*) (*Fyn*) (*Sjæ*) (*Brn*). **Gr. Fa. F:** *A V U St EH ES PH PS PK KP Kn OP PeP Ks KiL SoL EnL InL*. **I:** *ISu IVe IMi IAu INv INo*. **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **S:** *Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*.

Note. Though reminding of species in the Ephebaceae, easily distinguished even on the much clearly browner, coarser thallus, often with large apothecia (not pycno-ascocarps!). Actually superficially more similar to *Pseudephebe*, which has green algae.

The species is quite variable and in northern and exposed habitats the apical point of the filaments appear to be affected to produce several branchlets and give up the usual dichotomy, which surpresses the elongation-growth. Such specimens also tend to have flattened, pitted main branches, and is then more easily mistaken for a *Leptogium*, which has quite different spores and apothecia. This variation appears not to be of taxonomic importance.

Nephromataceae

O. Vitikainen

Monogeneric family; description as for *Nephroma.*

Literature: Eriksson & Strand, Syst. Ascomycetum 14: 33–39 (1995); Lohtander, Oksanen & Rikkinen, Mycol. Res. 106: 777–787 (2002); Wedin & Wiklund, Symb. Bot. Ups. 34(1): 469–475 (2004).

Nephroma Ach.

in Lyuken, Tent. Hist. Lich.: 92 (1809). – TYPE: *Nephroma arcticum* (L.) Torss.

D: nyrelav **F:** munuaisjäkälät **I:** hverfa **N:** vrengelav **S:** njurlavar

Literature: Wetmore, Publ. Mich. State. Univ., Biol. Ser. 1 (11): 369–452 (1960); James & White, Lichenologist 19: 215–268 (1987); Burgaz & Martínez, Flora Liquenol. Ibérica. Peltigerales: 19–23 (2003).

THALLUS foliose, dorsiventral, loosely attached, forming rosettes, lobes elongate to rounded, entire, with often ascending margins; upper surface greenish brown or blue-grey to black or yellowish green, smooth, mat or shining; soredia and isidia sometimes present; cortex pseudoparenchymatous; medulla white or yellow; lower surface corticate, whitish, brown or black, smooth to pubescent or tomentose. ASCOMATA apothecia, sessile, rounded to reniform, marginal on lower surface but visible above due to the recurving of lobes; disc pale brown to red-brown or black; thalline margin present. Asci IKI–, 8-spored. Spores pale brown, fusiform, 3-septate. CONIDIOMATA pycnidia, marginal, in semi-immersed warts, rare; conidia bacilliform. PHOTOBIONT cyanobacteria (*Nostoc*), or rarely green algae (*Coccomyxa*) and with *Nostoc* in internal cephalodia.

Chemistry. Hopane triterpenoids, including zeorin (hopan-6*α*,22-diol), peltidactylin (7*β*-acetoxyhopan-22-ol), dolichorrhizin (15*α*-acetoxyhopan-22-ol), hopan-15*α*,22-diol, hopan-7*β*,22-diol, hopan-6*α*,7*β*,22-triol; usnic acid, nephroarctin, phenarctin, pigments (anthraquinones); methyl gyrophorate. Spot tests negative except K+ purple in *N. laevigatum.*

1 Photobiont green, thallus yellow-green when wet, cephalodia present 2
– Photobiont blue-green to olive-green, thallus blue-black when wet, cephalodia absent 3
2 Upper surface glabrous, yellow-green, cephalodia visible as darker swellings on the upper surface only, apothecia frequent ..... 1. *N. arcticum*
– Upper surface scabrid or slightly pubescent, matt, greenish brown, internal cephalodia visible on both upper and lower surface, apothecia rare ..... 3. *N. expallidum*
3 Soredia or isidia present, apothecia absent or rare 4
– Soredia and isidia absent, apothecia usually frequent 5
4 Granular soredia present, upper surface smooth or sparingly faveolate-reticulate, apothecia rare, lower surface rarely tomentose ..... 7. *N. parile*
– Laminal terete or coralloid isidia present, upper surface reticulate-sulcate, lower surface tomentose ..... 4. *N. isidiosum*
5 Lower surface tomentose, with pale raised papillae, upper surface pubescent to finely tomentose ..... 8. *N. resupinatum*
– Lower surface smooth, or if tomentose, lacking papillae, upper surface smooth or thinly pubescent 6
6 Lower surface densely pubescent, darkening towards centre, apothecial margin and stalk pectinate, upper surface smooth to slightly pubescent, with marginal and laminal phyllidia ..... 4. *N. helveticum*
– Lower surface smooth or rarely finely tomentose, pale 7
7 Medulla yellow, K+ purple, containing anthraquinones and hopane triterpenoid hopan-6α,7β,22-triol ..... 6. *N. laevigatum*
– Medulla white, K– or K+ yellow, other hopane triterpenoids (e.g. dolichorrhizin and zeorin) ... 2. *N. bellum*

1. **Nephroma arcticum** (L.) Torss.

Enum. Lich. Byssac. Scand. 7 (1843). – *Lichen arcticus* L., Sp. Pl. 2: 1148 (1753). – TYPE: Without locality (LINN 1273.183, lectotype, Howe, Bull. Torrey Bot. Club 39: 201, 1912).

Syn. *Opisteria arctica* (L.) Vain.

D: stor nyrelav **F:** pohjankorvajäkälä **I:** kuldahverfa **N:** storvrenge **S:** norrlandslav

Literature: Hasselrot, Acta Phytogeogr. Suec. 33: 67–71 (1953); Kujala, Metsäntutkimuslait. Julk. 59: 104, Karte 186

(1964); Tønsberg & Holtan-Hartwig, Nord. J. Bot. 3: 682–683 (1983).

Figs: Moberg & Holmåsen 1990: 170; Holien & Tønsberg 2006: 118.

THALLUS to 20(–40) cm diam., lobes to 3 cm wide, upper surface smooth or undulate, glabrous, usually yellow-green, with bluish-green cephalodial warts (see also the Note); margins entire; medulla white; lower surface matt, pale at margins, with black tomentum towards the centre. APOTHECIA frequent, 1–3 cm diam. Spores 23–30 × 4–5 µm. CONIDIOMATA 3–4 × 1–2 µm. PHOTOBIONT green (*Coccomyxa*), with *Nostoc* in internal cephalodia (but see Note).

Chemistry. Zeorin, nephroarctin, phenarctin, methyl gyrophorate (trace), usnic acid.

Habitat. Common terricolous lichen in northern boreal mesic spruce forests, also in mountain birch woodland and in alpine and arctic heaths. On mossy rocks in more southern areas.

Distribution. Southern boreal to arctic, rarer in the south, extinct in Denmark. **D:** (*Brn*). **Gr. F:** *A V U EK St EH ES EP PH PS PK KP Kn OP PeP Ks KiL SoL EnL InL*. **I:** *IVe IAu INv INo*. **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **AI:** *JM Sb*. **S:** *Gtl Klm SmI Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Europe, Asia, North America, circumpolar, boreal – arctic; rare in central Europe and Scotland.

Note. Distinguished by the wide lobes and yellow-green colour. However, a blue-green phototype rarely occurs in Central Norway. Its upper surface is greyish-blue to brown with a reticulate pattern of paler spots (maculae), and the margins bear numerous flattened or somewhat branched isidioid lobules. Small stalked lobelets of the green phototype are attached mainly to the margins of the thallus. It contains a greater amount of methyl-gyrophorate than the green phototype and differs from the other blue-green species of the genus by the black tomentose lower surface in the thallus centre and by the presence of green lobuli along the margins.

2. **Nephroma bellum** (Sprengel) Tuck.

Boston J. Nat. Hist. 3: 293 (1841). – *Peltigera bella* Sprengel, Syst. Veg. (ed. 16) 4(1): 306 (1827). – TYPE: America borealis, Torrey (FH isotype, Wetmore, Publ. Michigan State Univ., Biol. Ser. 1(11): 415, 1960).

Syn. *Nephroma laevigatum* s. auct. (before 1960), *Nephroma subtomentellum* (Nyl.) Gyeln.

F: silomunuaisjäkälä **I:** brókarhverfa **N:** glattvrenge **S:** stuplav

Red-listed in: **I**

Literature: Hasselrot, Acta Phytogeogr. Suec. 33: 71–76 (1953).

Figs: Brodo et al. 2001: 284; Moberg & Holmåsen 1990: 170; Holien & Tønsberg 2006: 119.

THALLUS to 10 cm diam., lobes to 1 cm wide, partly overlapping; upper surface smooth, glabrous to slightly scabrid or pubescent, grey-brown to brown; margins entire to lobulate; medulla white; lower surface pale and smooth at margins to dark brown and very shortly pubescent towards the centre. APOTHECIA frequent, to 1 cm diam., dorsal surface minutely scabrid, sometimes ridged. Spores 15–23 × 4–5 µm. CONIDIOMATA rare; conidia bacilliform, 5.5 × 1.5–2 µm. PHOTOBIONT *Nostoc*.

Chemistry. Dolichorrhizin, zeorin, hopane-15*α*,22-diol and traces of hopane-7*β*,22-diol in variable concentrations, and unidentified UV+ substances.

Habitat. On mossy boulders and on bases and lower part of trunks of especially deciduous trees such as *Salix caprea* or *Populus tremula*, and *Juniperus*, usually in shady habitats.

Distribution. Widespread, hemiboreal to arctic. **Gr. F:** *A V U EK St EH ES EP PH PS PK KP Kn OP PeP Ks KiL SoL EnL InL*. **I:** *IVe*. **N:** *Op AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **AI:** *Sb*. **S:** *Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Europe, Asia, North America, circumpolar, continental.

Note. Variable species, recognized by its white medulla and lack of true isidia.

3. **Nephroma expallidum** (Nyl.) Nyl.

Flora 48: 428 (1865). – *Nephromium expallidum* Nyl., Kongl. Vetensk. Akad. Förh. 17: 295 (1860). – TYPE: Norway, Dovre, Kongsvold, Schimper (H-NYL 32938 lectotype, Renner et al., Z. Naturforsch. 37C: 740 (1982).

Syn. *Opisteria expallida* (Nyl.) Vain.

F: tunturikorvajäkälä **I:** holtahverfa **N:** fjellvrenge **S:** grön njurlav

Literature: Hakulinen, Aquilo, Ser. Bot. 3: 44–46 (1965); Holien & Tønsberg 2006: 120.

THALLUS to 15 cm diam., lobes to 2 cm wide; upper surface grey-brown to dark brown, smooth to somewhat scabrid, smooth, with cephalodial warts, mat or rarely shiny, often pruinose or minutely pubescent; margins entire to crisped, often lobulate; medulla white; lower surface smooth to corrugate, pale near margins but with a darker brown and tomentose centre and small rounded cephalodial warts. APOTHECIA rare, to 1.5 cm diam. Spores 17–21 × 5–6 µm. CONIDIOMATA 3–4 × 1–2 µm. PHOTOBIONT *Coccomyxa*.

Chemistry. Dolichorrhizin, zeorin, hopane-15*α*,22-diol, and unidentified UV+ substances (the same as in *N. bellum*).

Habitat. Among mosses and on soil in heaths, grasslands and forests, especially in subalpine to alpine sites.

Distribution. Scattered, northern boreal to arctic. **Gr. F:** *Ks KiL SoL EnL InL*. **I:** *ISu IVe IMi IAu INv INo*. **N:** *He Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **AI:** *Sb*. **S:** *Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Europe, Asia, North America, circumpolar; very rare in central Europe.

Note. Recognized by its brownish colour and scabrid, non-reticulate upper surface.

4. **Nephroma helveticum** Ach.

Lichenogr. Universalis: 523 (1810). – TYPE: Helvetia, Schleicher (H-ACH 1470B lectotype, James & White, Lichenologist 19: 238, 1987).

F: kalliomunuaisjäkälä

Red-listed in: **F**

Literature: Vitikainen, Graphis Scripta 2: 9–10 (1988); Halonen in Kotiranta et al. (eds), Red Data Book of East Fennoscandia: 166–167 (1998).

Figs: James & White 1987: 239.

THALLUS to 10 cm diam., lobes to 0.5 cm wide; upper surface smooth, thinly pubescent, grey-brown to dark-brown; margins entire, or phyllidiate, or with isidia-like outgrowths which sometimes spread to the lamina; medulla white; lower surface smooth, dark brown to black, densely pubescent or tomentose. APOTHECIA common, to 8 mm diam., with pectinate margins, dorsal surface scabrid to pubescent, faveolate, sometimes lobulate. Spores 21–27 × 6–8 µm. CONIDIOMATA 3–4 × 1–2 µm. PHOTOBIONT *Nostoc*.

Chemistry. Peltidactylin (±), hopane-7*β*,22-diol, 2–3 unidentified accessory substances.

Habitat. Saxicolous, rarely muscicolous, outside Norden also epiphyte on trees.

Distribution. Rare, found only in Finland; the locality of the old Norwegian find not known. **F:** *U EH Ks*. **N:** ? ("S of Norway"). Cosmopolitan (if conspecific with *N. tropicum*) but rare species aggregate. Disjunct circumpolar (northern boreal to temperate), Europe (very rare), Asia and North America, elsewhere (if conspecific with *N. tropicum*) Africa, Australia, New Zealand.

Note. Distinguished by dark tomentose lower surface, pectinate to phyllidiate margins and upper surface, and chemistry. The old supposed Norwegian material is enigmatic: its locality is not known and its medulla reacts K+ pink.

5. **Nephroma isidiosum** (Nyl.) Gyeln.

Ann. Cryptog. Exot. 4: 126 (1941). – *Nephromiun tomentosum* var. *isidiosum* Nyl., Not. Sällsk. Fauna Fl. Fenn. Förh. 8: 179–180 (1866 [1882]). – TYPE: [Russia] Karelia onegensis, ad Onegam, Pertnavolok, 1863, Simming (H-NYL 33039 lectotype, James & White, Lichenologist 19: 245, 1987).

S: stiftnjurlav

Figs: Brodo et al. 2001: 284; James & White 1987: 246.

THALLUS to 10 cm diam., lobes 0.5 cm wide; upper surface smooth and shiny or slightly scabrid, reticulate, with low rounded ridges; margins entire or subcrenulate; flattened to terete, sometimes coralloid isidia present marginally and especially on ridges of the lamina; medulla white; lower surface brown to blackish, densely pubescent to tomentose. APOTHECIA unknown. CONIDIOMATA 3–4 × 1–2 µm. PHOTOBIONT *Nostoc*.

Chemistry. Peltidactylin (±), hopane-7*β*,22-diol, unidentified accessory substances (pigments) as in *N. helveticum*, methyl gyrophorate, and gyrophoric acid (± or traces).

Habitat. Saxicolous on phyllitic schist (elsewhere known also epiphytic and muscicolous).

Distribution. Very rare; no recent records from other parts of Europe but earlier found in Russian Karelia. **S:** *TL* (S of Paktajaure, 420 m, 1984 Alstrup). Europe, Asia, North America, Africa; circumpolar, disjunct boreal to arctic, rare or overlooked.

Note. Recognized by the isidia on the lobe margins and the laminal ridges, the dark, tomentose lower surface, and the chemistry.

6. **Nephroma laevigatum** Ach.

Syn. Lich.: 242 (1814). – TYPE: Suecia (H-ACH 1469B lectotype, James & White, Lichenologist 19: 249, 1987).

Syn. *Nephroma lusitanicum* Schaer.

D: rødbrun nyrelav **F:** lännenmunuaisjäkälä **I:** strandhverfa **N:** kystvrenge **S:** västlig njurlav

Red-listed in: **D F S**.

Literature: Degelius, Acta Phytogeogr. Suec. 7: 88–99 (1935).

Figs: Moberg & Holmåsen 1990: 171; Wirth 1995: 606.

THALLUS to 15 cm diam., lobes to 1.5 cm wide; upper surface smooth, grey-brown to brown; margins entire or phyllidiate; medulla yellow, K+ purple-red; lower surface smooth, pale at the margins but brown to blackened in the centre. APOTHECIA common, to 10 mm diam. Spores 17–20 × 5–7 µm. CONIDIOMATA 4–5 × 1–2 µm. PHOTOBIONT *Nostoc*.

Chemistry. Hopane-6*α*,7*β*,22-triol, a range of anthraquinones (K+ purple-red), and unidentified substances as in *N. bellum*.

Habitat. Corticolous and muscicolous on deciduous trees and rocks or boulders, often in sheltered habitats.

Distribution. Scattered, temperate to (southern) boreal. **D:** *NJy ØJy VJy SJy Fyn Sjæ Brn*. **Gr. Fa. F:** *A V U EK St EH EP PS*. **I:** *ISu IVe IAu*. **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr*. **S:** (*Sk*) (*Bl*) *Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Jmt Vb ÅsL LyL*. Europe, Asia, Africa and North America; circumpolar, (sub)oceanic.

Note. Distinguished from *Nehroma bellum* by the yellow colour and K+ reddish reaction of medulla.

7. **Nephroma parile** (Ach.) Ach.

Lichenogr. Universalis: 522 (1810). – *Lichen parilis* Ach., Lichenogr. Suec. Prodr.: 164 (1799 "1798"). – TYPE: Without locality (H-ACH 1468B lectotype, BM-ACH 669 isolectotype, James & White, Lichenologist 19: 252, 1987).

D: rand-nyrelav **F:** jauhemunuaisjäkälä **I:** hraufuhverfa **N:** grynvrenge **S:** bårdlav

Figs: Moberg & Holmåsen 1990: 171; Wirth 1995: 607; Holien & Tønsberg 2006: 120.

THALLUS to 10 cm diam., lobes to 1 cm wide; upper surface smooth to slightly faveolate, bluish-grey to dark brown, with laminal and marginal soralia; soredia granular, often corticate; margins entire, subcrenulate, sorediate; medulla white; lower surface smooth or rugulose, naked to pubescent or rarely tomentose. APOTHECIA rare, dorsal surface and margins sorediate. Spores 8–20 × 6–7 µm. CONIDIOMATA 4–5 × 1 µm. PHOTOBIONT *Nostoc*.

Chemistry. Two chemotypes in the study area: (I) dolichorrhizin, zeorin, hopane-15*α*,22-diol, (II) peltidactylin, zeorin, hopane-7*β*,22-diol and hopane-6*α*,7*β*,22-triol; unidentified accessory substances.

Habitat. Among mosses on rocks and boulders, and on bases of mainly deciduous trees, favouring old woodlands.

Distribution. Circumpolar, widespread, temperate to arctic, usually the most common brown *Nephroma*. **D:** *NJy ØJy Sjæ*. **Gr. F:** *A V U EK St EH ES EP PH PS PK KP Kn OP PeP Ks KiL SoL EnL InL*. **I:** *ISu IVe IMi IAu INv INo*. **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **AI:** *Sb*. **S:** *Sk Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Europe, Asia, North America, Africa, South America, widespread.

Note. Recognized by its marginal and laminal soralia. Sometimes confused with *Peltigera collina*, which, however, is non-corticate and veined below. In the

chemotype II the soredia tend to be dark, corticate and concentrated on the ridges of the reticulate upper surface, and the lower surface is covered by short blackish tomentum. Its taxonomic status deserves further studies. It has been found in Greenland, northern Norway and Finland, and also in Switzerland and Canada.

8. **Nephroma resupinatum** (L.) Ach.

Lichenogr. Universalis: 522 (1810). – *Lichen resupinatus* L., Sp. Pl. 2: 1148 (1753). – TYPE: Without locality (LINN 1273.169 lectotype, Howe, Bull. Torrey Bot. Club 39: 201, 1912).

Syn. *Nephroma norrlini* Gyeln., *Nephroma tomentosum* (Hoffm.) Flot.

D: lodden nyrelav **F:** nukkamunuaisjäkälä **I:** loðhverfa **N:** lodnevrenge **S:** luddlav

Figs: Moberg & Holmåsen 1990: 172; Wirth 1995: 608; Holien & Tønsberg 2006: 119.

THALLUS to 10 cm diam., lobes to 1.5 cm wide; upper surface pubescent, greyish brown to brown, with marginal and sometimes laminal phyllidia; medulla white; lower surface pale, distinctly tomentose, and with scattered, white, raised papillae. APOTHECIA frequent, to 1(–1.5) cm diam., dorsal surface reticulate, tomentose, scabrid. Spores 21–24 × 4–6 µm. CONIDIOMATA 4–5 × 1–2 µm. PHOTOBIONT *Nostoc*.

Chemistry. No secondary substances (by TLC).

Habitat. On mosses over rocks and tree bases.

Distribution. Widespread and fairly common, hemiboreal to arctic; extinct in Denmark. **D:** (*Fyn*). **Gr. Fa. F:** *A V U EK St EH ES EP PH PS PK KP Kn OP PeP Ks KiL SoL EnL InL*. **I:** *IAu INv*. **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **AI:** *Sb*. **S:** *Sk Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Europe, Asia, North America, widespread, circumpolar.

Note. Recognized by the pubescent upper surface and the whitish tomentose and tuberculate lower surface, and the absence of chemistry.

Pannariaceae

P. M. Jørgensen

THALLUS squamulose to foliose, mainly grey-blue, corticate only on upper surface, medulla on lower surface gradually merging into rhizohyphae below, which sometimes are well-developed and form a blackish blue prothallus. ASCOMATA apothecia, usually laminal, with proper exciple, sometimes obscured by secondarily developed thalline squamules. Hymenium amyloid or hemiamyloid; asci with variable apical structures (see generic descriptions). Spores colourless, simple, mostly ellipsoid, often with distinct, ornamented exospore and apical appendices. CONIDIOMATA pycnidia, usually marginal, blackish, wart-like, of *Sticta* type; conidia straight, rod-shaped produced laterally or terminally on short-celled conidiophores. PHOTOBIONT cyanobacteria, mainly *Nostoc*, but in the cephalodiate genus *Psoroma* green algae (*Myrmecia*?) in main thallus.

Chemistry. Predominantly pannarin and related substances (argopsin, eriodermin etc.) giving a PD+ orange reaction, rarely with fatty acids and/or terpenoids or without any secondary substances, and in those cases PD–.

Note. A family of predominantly squamulose, blue-grey lichens, containing pannarin and related substances, with apothecia of special ontogeny, particularly of the thalline margin, which may be lacking. The delimitation of the family is uncertain, and recent molecular work suggests a narrower circumscription of it than the traditional view here followed, excluding *Degelia*, *Erioderma* and *Fuscopannaria* subg. *Micropannaria*, a matter in need of further studies.

Literature: Ekman & Jørgensen, Canad. J. Bot. 80: 625–634 (2002); Henssen, Ber. Deutsch. Bot. Ges. 82: 235–248 (1969); Henssen & Jahns, Lichens: 322–327 (1973); Jørgensen, Bot. Not. 45: 1–123 (1978); Malme, Ark. Bot. 20A(3): 1–23 (1925).

Key to genera

1 Thallus totally dissolved into blue-grey granules ..... *Moelleropsis*
– Thallus with distinct lobes 2
2 Upper surface hairy, apothecia with cyanobacteria in subhymenium ..... *Erioderma*
– Upper surface smooth or pruinose, apothecia without cyanobacteria in subhymenium 3
3 Apothecia without thalline margin 4
– Apothecia with thalline margin 6
4 Thallus semigelatinous, mostly homoiomerous, hymenium I+ red-brown ..... *Santessoniella*
– Thallus non-gelatinous, heteromerous, hymenium I+ blue 5
5 Thallus squamulose, with loose medulla of intricate hyphae, asci with apical amyloid ring-structure ..... *Parmeliella*
– Thallus placodioid, with dense medulla of parallel hyphae, asci with sheet-like amyloid apical structures ..... *Degelia*
6. Thallus subfoliose to squamulose, PD+ orange, predominantly grey-blue ..... *Pannaria*
– Thallus small-squamulose, PD–, not grey-blue 7
7. Thallus crustose-squamulose, grey-brown, apothecia with variable thalline margin, hymenium hemiamyloid, spores smooth (or uneven) ..... *Fuscopannaria*
– Thallus squamulose, greenish/bluish-brown, apothecia with distinct, squamulose thalline margin, hymenium I+ blue or blackish, spores warted 8
8. Thallus greenish, with *Myrmecia*?, asci with apical amyloid ring-structure ..... *Psoroma*
– Thallus brownish, with *Nostoc*, asci without apical amyloid ring-structure ..... *Protopannaria*

Degelia Arv. & D.J.Galloway

Lichenologist 13: 28 (1981). – TYPE: *Degelia gayana* (Mont.) Arv. & D.J.Galloway

Literature: Arvidsson & Galloway, Lichenologist 11: 139–179 (1981); Jørgensen & James, Biblioth. Lichenol. 38: 253–276 (1990); Jørgensen, Biblioth. Lichenol. 88: 232-235 (2003).

THALLUS placodioid, bluish, with irregular upper cortex and compacted, horizontally aligned medullary hyphae, gradually merging into plentiful blue-black rhizohyphae. APOTHECIA biatorine, sometimes with coronate, secondarily developed thalline margin. Hymenium I+ deep blue; asci with sheet-like apical amyloid structures. Spores colourless, simple, usually ellipsoid. CONIDIOMATA wart-like; conidia bacilliform. PHOTOBIONT *Nostoc* or *Scytonema* (in Southern Hemisphere).

Chemistry. No secondary substances (by TLC).

Note. The inclusion of this rather *Coccocarpia*-like genus in the Pannariaceae is uncertain according to recent molecular studies, though its exact position has not been determined yet.

It is bitemperate with most species in the Southern Hemisphere (sections *Frigidae* P.M.Jørg. and *Degelia*) and a few amphiatlantic species in the Northern Hemisphere (sect. *Amphiloma* (Fr.) P.M.Jørg. & P.James), two of which occur in our region.

1 Thallus with terete, coralloid isidia, apothecia rare ..... 1. *D. atlantica*
– Thallus without isidia, occasoinally lobulate, usually with apothecia ..... 2. *D. plumbea*

1. **Degelia atlantica** (Degel.) P.M.Jørg. & P.James

Biblioth. Lichenol. 38: 255 (1990). – *Parmeliella atlantica* Degel., Acta Phytogeogr. Suec. 7: 131 (1935). – TYPE: Ireland, Killarney, near Muckross Lake, 1933 Degelius (UPS holotype).

N: kystblåfiltlav

Red-listed in: **N**

Literature: Degelius, Acta Phytogeogr. Suec. 7: 131–135 (1935); Jørgensen, Opera Bot. 45: 18–21 (1978); Tønsberg et al., Sommerfeltia 23: 69–72 (1996).

Figs: Degelius 1935: Taf. 1; Gyelnik in Rabenh. Krypt.-Fl. Ed. 2, 9, Abt. 2(2) (1940) Taf. 23, Fig. 2; Jørgensen 1978: 18.

THALLUS as in *D. plumbea* (see below), but with marginal as well as laminal, terete, coralloid isidia, to 0.2 mm wide, sometimes totally covering the surface. APOTHECIA as in *D. plumbea*, very rare, usually poorly developed. CONIDIOMATA rare. PHOTOBIONT *Nostoc* in clusters, individual cells 6–8 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Mainly moist, mossy, non-calcareous, sheltered rocks; occasionally on trees, preferably *Populus* and *Fraxinus*.

Distribution. Distinctively western, oceanic, in our region only known from western Norway. **N:** *Ro Ho SF MR*. Atlantic-mediterranean; outside Europe only in adjacent North Africa with Macaronesia.

Note. Sometimes difficult to distinguish from lobulate forms of *D. plumbea*, but the isidia are always terete coralloid and not flattened. One should also be aware of the close relative *Degelia ligulata* P.M.Jørg. & P.James, a smaller, maritime species with ligulate, blackened lobules, which is not yet known further north than Scotland.

2. **Degelia plumbea** (Lightf.) P.M.Jørg. & P.James

Biblioth. Lichenol. 38: 264 (1990). – *Lichen plumbeus* Lightf., Fl. Scot. 2: 826 (1777). – TYPE: Great Britain, Dillenius (OXF-DILL 179.73 p. p. lectotype, Jørgensen, Opera Bot. 45: 54, 1978).

Syn. *Parmeliella plumbea* (Lightf.) Vain.

D: stor blåfiltlav **N:** vanlig blåfiltlav **S:** blylav

Red-listed in: **D S**.

Literature: Degelius, Acta Phytogeogr. Suec. 7: 135–145 (1935); Hultengren & Nordén, Svensk Bot. Tidskr. 90: 1–9 (1996); Jørgensen, Opera Bot. 45: 54–57 (1978); Thor & Arvidsson (eds) 1999: 154–155.

Figs: Jørgensen 1978: 54, 56; Moberg & Holmåsen 1990: 167; Ozenda & Clauzade 1970: 331; Thor & Arvidsson (eds) 1999: 261; Wirth 1995: 369; Holien & Tønsberg 2006: 106.

THALLUS placodioid to monophyllous, appearing very thick and rigid, usually in orbicular patches to 5 cm diam.; upper surface blue-grey, with longitudinal ridges and concentric curves towards the circumference, forming a scallop-like pattern; the margins thickened and ascending, with protruding, blue-black, beard-like, rhizohyphae which covers the otherwise naked (noncorticate) lower surface, 150–220 µm thick; upper cortex 25–40 µm thick, paraplectenchymatous; lower cortex absent, the medulla gradually merging into blue-black rhizohyphae. APOTHECIA usually numerous, especially centrally, biatorine, to 1 mm diam., usually with red-brown disc, becoming convex and darkening with age, and pale proper margin, to 100 µm wide. Spores simple, colourless, ellipsoid, 17–25 × 7–10 µm. CONIDIOMATA common. PHOTOBIONT *Nostoc* in clusters, individual cells 6–8 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Usually in humid localities. Corticolous, mostly on rough-barked trees, preferably *Fraxinus* and

Populus, but also saxicolous on moist rocks, particularly towards the north.

Distribution. Predominantly coastal, suboceanic, also in damp valleys further inland, commonest in the South-west Norway and Sweden. **D:** *ØJy*. **Fa. N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **S:** (*Sk*) (*Bl*) *Gtl Klm Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Gst Jmt LyL LuL TL*. Mainly mediterranean-atlantic (Azores to Norway and Crimea), also present in atlantic North America (Labrador to Maine).

Note. Easily recognized species by the thick, rather stiff, bluish placodiod thallus, though previously often confused with the thinner, more squamulose, likewise bluish *Pannaria rubiginosa* (Ach.) Bory, which has larger apothecia with thalline margin and is PD+ orange. For the possible confusion with *Degelia atlantica*, see above.

Erioderma Fée

Essai Crypt. Écorc-: 146 (1825). – TYPE: *Erioderma polycarpum* Fée (=*E. groendalianum* (Ach.) Vain.).

Literature: Jørgensen, Taxon 50: 525–542 (2001); Jørgensen, & Arvidsson, Nord. J. Bot. 22: 87–114 (2002); Keuck, Biblioth. Lichenol. 6: 1–175 (1977).

THALLUS foliose, often orbicular and monophyllous, with hairy upper surfaces (one exception), and well developed rhizohyphae on the lower surface; upper cortex paraplectenchymatous, no lower cortex. APOTHECIA usually marginal, superficially lecidein, but with cyanobacteria in the subhymenium. Asci amyloid with internal amyloid sheets. Spores simple, colourless, subglobose, thick-walled. CONIDIOMATA mostly marginal; conidia bacilliform. PHOTOBIONT *Scytonema*.

Chemistry. Mostly with pannarin and related depsides (argopsin, eriodermin, vicanicin etc.), rarely with depsidones or without secondary substances.

Note. A genus mainly of the Southern Hemisphere, with one species in our region, which is unlike any other lichen in our flora though superficially reminding of *Lobaria*, from which it differs in anatomy and chemistry.

1. Erioderma pedicellatum (Hue) P.M.Jørg.

Bryologist 75: 369 (1979). – *Pannaria pedicellata* Hue, Mém. Soc. Sci. Nat. Cherbourg 38: 54 (1911). – TYPE: Canada, New Brunswick, Campobello Island, 1902 Farlow (FH holotype).

Syn. *Erioderma boreale* Ahlner

N: trønderlav **S:** värmlandslav

Red-listed in: **N S**

Literature: Ahlner, Acta Phytogeogr. Suec. 22: 39–43 (1948); Natur i Värmland: 99–102 (1954); Holien et al., Graphis Scripta 7: 79–84 (1995). Jørgensen, Bryologist 75: 378–381 (1972); Blyttia 48: 119–123 (1990); Maass, Proc. Nova Scotian Inst. Sci. 30: 69–87 (1980); Thor & Arvidsson (eds) 1999: 167–168; Tønsberg et al., Sommerfeltia 23: 72–74 (1996); Reiso & Hofton Blyttia 64: 83–88 (2006).

Figs: Ahlner 1948: Pl. 6, 7A; Jørgensen 1972: 378; Keuck 1977: Figs 204, 205; Moberg & Holmåsen 1990: 165; Thor & Arvidsson (eds) 1999: 265; Holien & Tønsberg 2006: 106.

THALLUS foliose, almost circular, to 4 cm diam., shallowly incised, 300–400 µm thick; upper surface grey-brown, holosericeous by minute hairs, particularly in younger parts; lower surface whitish, with bluish or pale rhizohyphae; upper cortex sclerenchymatous, 30–50 µm thick; no lower cortex. APOTHECIA usually plentiful, particularly submarginally, small (to 1 mm diam.), sessile, convex at maturity, with reddish brown disc. Spores simple, colourless, thick-walled, subglobose, 7–10(1–4) × 3–6 µm. CONIDIOMATA rare, appearing as blackish warts on the surface, to 200 µm wide; conidia bacilliform, 4–6 × 1 µm. PHOTOBIONT *Scytonema* in chains, photobiont layer to 100 µm wide.

Chemistry. C–, K–, KC–, PD+ orange. Eriodermin.

Habitat. On thin branchlets of spruce in humid forests.

Distribution. In Norden only known from two oceanic, boreal regions; extinct in its Swedish localities and in the previously known localities in Norway, but recently rediscovered in three localities in Nord-Trøndelag and one in Hedmark, Norway. Red-listed on world scale. **N:** *He NT*. **S:** (*Vrm*). Otherwise only known in the St. Lawrence region of Atlantic North America.

Note. One of the most remarkable lichens in our region, easily recognized by the round thallus with arachnoid hairs on the upper surface and with numerous small, convex apothecia. The first lichen to be protected, but still strongly threatened and for many years believed to be extinct, until small, single specimens were recently rediscovered in the boreal rainforests of Nord-Trøndelag.

Fuscopannaria P.M.Jørg.

J. Hattori Bot. Lab. 76: 202 (1994). – TYPE: *Fuscopannaria leucosticta* (Tuck.) P.M.Jørg.

S: brungytterlavar

Literature: Ekman & Jørgensen, Canad. J. Bot. 20: 625–634 (2002); Jørgensen, J. Hattori Bot. Lab. 76: 202 (1994); Bryologist 103: 674–689 (2001).

THALLUS squamulose-crustose, brownish grey with sclerenchymatous upper cortex and no lower cortex. APOTHECIA variously margined, usually with at least some thalline squamules. Hymenium hemiamyloid; asci with apical amyloid structures (either ring-structure or sheets). Spores simple, colourless, ellipsoid. CONIDIOMATA wart-like; conidia bacilliform. PHOTOBIONT *Nostoc* (in our region).

Chemistry. Fatty acids with terpenoids or no secondary substances (by TLC).

Note. A difficult, long misunderstood genus. Due to the varying development of the apothecial thalline margin, related species were intermittently placed in *Pannaria* or *Parmeliella*, but differs from both by the sclerenchymatous upper cortex, the chemistry (fatty acids/terpenoids) and the hemiamyloid hymenium. Its distinctiveness has been confirmed by molecular studies (Ekman & Jørgensen 2002), which surprisingly also showed that subg. *Micropannaria* P.M.Jørg. (type *F. leucophaea*), which has apical, amyloid sheets in the asci instead of ring-structure, differs so much from the rest that it ought to be excluded even from the Pannariaceae. This matter needs further studies.

1 Thallus sorediate 2
– Thallus not sorediate, often with apothecia 5
2 Thallus with distinctly enlarged marginal lobes, soredia with tendency to aggregate in hemisphaeric soralia ..... 2. *F. ahlneri*
– Thallus without distinct marginal lobes, soralia not hemisphaeric, usually limbiform 3
3 Thallus "swollen", olivaceous, with contrasting, lead-grey, "woolly" soralia. ..... 8. *F. mediterranea*
– Thallus flat, brownish, with paler, "non-woolly" soralia 4
4 Thallus dull chestnut-brown, prothallus distinct, soralia cream-coloured, granular, without secondary substances; temperate, south-western, on deciduous trees or mossy rocks..... 10. *F. sampaiana*
– Thallus shiny, greyish red-brown, prothallus indistinct, soralia grey-blue, coarse-grained, with fatty acids and terpenoids; oceanic boreal, saxicolous or on trees by waterfalls ..... 4. *F. confusa*
5 Thallus subfruticose with apothecia hidden within the coralloid structures; Svalbard ..... 1. *F. abscondita*
– Thallus squamulose with apothecia visible on the surface; mostly non-arctic 6
6 Thallus terricolous, forming a dense crust over the substratum, often with outgrowths 7
– Thallus saxicolous or corticolous, squamules flat, often imbricate 8
7 Thallus uniformly grey, isidioid, without secondary substances; on maritime, stabilized soil, southwestern ..... 3. *F. atlantica*
– Thallus brown, with frosted, ascending lobes, with fatty acids and terpenoids; over mosses in arctic-alpine regions ..... 9. *F. praetermissa*
8 Thallus grey, crustose, usually with numerous convex reddish brown apothecia, spores with attenuated apices; corticolous ..... 6. *F. ignobilis*
– Thallus brownish, squamulose, apothecia sparse, often dark brown, spores with blunt apices; saxicolous 9
9 Apothecia with blackish disc and strong thalline margin, spores small, 10–12 × 6–7 µm; arctic-alpine ..... 5. *F. hookerioides*
– Apothecia with brown disc and variable thalline margin, spores larger, 13–15 × 5–6 µm; widespread, non-arctic ..... 7. *F. leucophaea*

1. **Fuscopannaria abscondita** P.M.Jørg.

Bryologist 105: 465 (2002). – TYPE: Svalbard, Barents Isl., north side of Steinbeisen, 1936 E. Dahl (O holotype).

Literature: Jørgensen & Zhurbenko, Bryologist 105: 465–467 (2002).

Thallus subfruticose, cushion-formed, to 3 cm diam., centrally 1 cm high, of mostly erect, claviform squamules, apically thickened, to 2 mm wide, dark brown towards the apices, paler below, to 300 µm thick, with sclerenchymatous cortex. APOTHECIA common, to 5 mm diam., hidden by thallus, and often diffuse and complex, with brown, convex disc and excluded proper margin surrounded by claviform side-branches. Asci with apical amyloid ring-structure. Spores simple, ellipsoid, colourless, with oil-droplets, 20–22 × 10–11 µm. CONIDIOMATA not observed. PHOTOBIONT *Nostoc* in clusters.

Chemistry. No secondary substances (by TLC).

Habitat. In snowbeds or moist tundra.

Distribution. Arctic, rare or overlooked. **AI:** *Sb*.

Note. Unique, being the only subfruticose species of the genus with hidden apothecia, though closely related to *F. praetermissa* (see that species).

2. **Fuscopannaria ahlneri** (P.M.Jørg.) P.M.Jørg.

J. Hattori Bot. Lab. 76: 205 (1994). – *Pannaria ahlneri* P.M.Jørg., Opera Bot. 45: 15 (1978). – TYPE: Norway, Nord-Trøndelag, Fosnes, Salen, above Storevannsvik, 1939 Ahlner (S holotype).

N: granfiltlav **S:** grangytterlav

Red-listed in: **N S**

Literature: Alstrup, Int. J. Mycol. Lichenol. 3: 1–16 (1986); Jørgensen, Opera Bot. 45 (1978); Graphis Scripta 2: 55–59 (1988); Thor & Arvidsson (eds) 1999: 386–387; Tønsberg et al., Sommerfeltia 23: 121–124 (1996).

Figs: Jørgensen 1978: 15; 2001: 676; Thor & Arvidsson (eds) 1999: 295; Holien & Tønsberg 2006: 107.

THALLUS squamulose-foliose, rosette-forming, to 2 cm diam., with an undulating general appearance; lobes often convex, the upper surface being pale brown and scabrid with coarsely granular soredia marginally, sometimes limbiform, but usually in almost capitate structures, 150–200 µm thick; upper cortex sclerenchymatous, 30–45 µm thick. APOTHECIA unknown in Nordic material, but in Japanese material to 2 mm diam., with brown disc and thick nodulose thalline margin. Asci with apical amyloid ring-structure. Spores simple, colourless, ellipsoid, 20–25 × 10–11 µm including a distinct, apiculate exospore. CONIDIOMATA not observed. PHOTOBIONT *Nostoc* in clusters.

Chemistry. C–, K–, KC–, PD–. Fatty acids and terpenoids.

Habitat. Mostly on twigs of spruce in moist, undisturbed spruce forests; rarely on mossy rocks by waterfalls. Extremely hygrophilous, mainly confined to gorges.

Distribution. Central Scandinavia, oceanic boreal, confined to the most humid regions, retreating. **Gr. N:** (*Op*) (*ST*) *NT SNo*. **S:** (*Jmt*) *LyL PL*. Disjunctively circumboreal in North Asia (Korea to Kamchatka) and North America (Northern Pacific, as well as Atlantic coastal regions).

Note. The most easily recognized species of the genus by the large, pruinose marginal lobes. It is easiest confused with *Pannaria conoplea*, but is browner with true, hemisphaerical soralia and has no PD– reaction.

3. **Fuscopannaria atlantica** P.M.Jørg. & P.James

Lichenologist 37: 221 (2005). – TYPE: The Azores, Santa Maria, 1 km W of Arrebentao, 1977 P. James (BM holotype).

Literature: Jørgensen 2005: 221–225; Jørgensen & Johnsen, Graphis scripta 18: 16-18 (2006).

Figs : Jørgensen 2005: 222.

THALLUS dark grey, spreading irregularly, forming an effuse crust on the substratum, partly isidioid, to 5 cm diam., 100–150 µm thick, with distinct upper cortex of short, thick-walled cells in 2–3 layers; lower cortex lacking. APOTHECIA unknown in Nordic material, to 2 mm diam., often proliferating, with brown, finally convex disc and variable, granular, blue-grey thalline margin which often obscures the narrow, to 40 µm wide, cellular, proper exciple. Asci with apical, amyloid sheets. Spores colourless, simple, smooth-walled, ellipsoid, 15–25(–30) × 6–8 µm. CONIDIOMATA not observed. PHOTOBIONT *Nostoc* in clusters.

Chemistry. No secondary substances (by TLC).

Habitat. On undisturbed soil near the sea.

Distribution. Very rare, recently discovered, maritime species, only known from the southwestern parts of Norway and Sweden. **S:** *Bh*. **N:** *Ro*. Otherwise along the western coasts of Europe from the Azores, and Ligurian coast of Italy.

4. **Fuscopannaria confusa** (P.M.Jørg.) P.M.Jørg.

J. Hattori Bot. Lab. 76: 205 (1994). – *Pannaria confusa* P.M.Jørg., Ann. Bot. Fenn. 28: 87 (1991). – TYPE: Finland, Satakunta, Kullaa, Joutsjärvi, 1938 Laurila (H holotype).

F: haavanlimijäkälä **N:** fossefiltlav **S:** forsgytterlav

Red-listed in: **F S**

Literature: Jørgensen, Ann. Bot. Fenn. 28 (1991); Thor & Arvidsson (eds) 1999: 388–389 (1999); Tønsberg et al.,

Sommerfeltia 23: 125 (1996); Reiso & Hofton Blyttia 64: 83–88 (2006).

Figs: Jørgensen 1991: 88; Thor & Arvidsson (eds) 1999: 295.

THALLUS squamulose, small, of 1–2 mm wide squamules, rounded to slightly elongate, incised with marginal, coarse-grained, blue-grey soralia, usually with crystal needles in the herbarium (terpenoids), 100–150 µm thick; upper surface blue-grey to reddish brown, often shiny, with sclerenchymatous upper cortex, 25–40 µm thick; prothallus thin, blackish. APOTHECIA very rare, to 1 mm diam., with distinct sorediate thalline margin and concave, brown disc. Asci with apical amyloid ring-structure. Spores simple, colourless, ellipsoid, 12–15 × 5–8 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc* in clusters.

Chemistry. C–, K–, KC–, PD–. Fatty acids and terpenoids.

Habitat. Very hygrophilous, mostly found near waterfalls, either on mossy rocks or branchlets of trees and bushes (*Alnus*, *Betula*, *Juniperus*, *Picea*, *Salix* or *Sorbus*).

Distribution. Scattered in the boreal zone. **F:** *V St PK EnL*. **N:** *He Op NT SNo*. **S:** *Vrm Dlr Hls Jmt ÅsL LyL LuL*. Disjunctively circumboreal with a few localities in the Alps.

Note. As indicated by the epithet, this is a difficult species to come to terms with. In its palest bluish forms easily mistaken for *Parmeliella parvula*, which is found in the same kind of habitat, but which is usually smaller, has isidioid soralia, and lacks secondary substances. *F. confusa* is also similar to the palest forms of *F. mediterranea*, which is chemically identical but has a more uneven, duller, "succulent" thallus and "woolly" soralia, and has never been found in such very humid habitats – towards the north it prefers southfacing slopes.

In its typical form *F. confusa* mostly reminds of *Parmeliella triptophylla*, which has coralloid isidia instead of soralia and lacks secondary substances.

5. **Fuscopannaria hookerioides** P.M.Jørg.

Bryologist 103: 682 (2001). – TYPE: USA, Colorado, Larimer Co, Rocky Mountain National Park, near Chiquita Creek, just N of Endovalley Campground, 1963 Anderson 3996 (COLO holotype).

Literature: Jørgensen, Bryologist 103: 682 (2001).

Figs: Jørgensen 2001: 680.

THALLUS squamulose, olive brown, forming small cushions to 2 cm diam. and 150–200 µm thick, with sclerenchymatous upper cortex, 20–30 µm thick. APOTHECIA common, to 2 mm diam., with black disc and squamulose thalline margin. Asci with apical amyloid sheets. Spores simple, colourless, ellipsoid, 10–12 × 6–7 µm. CONIDIOMATA bacilliform. PHOTOBIONT *Nostoc* in clusters.

Chemistry. No secondary substances (by TLC).

Habitat. Saxicolous in cold, alpine, slightly calciferous, open habitats.

Distribution. Rare and scattered, but widespread and probably overlooked or undercollected. **Gr. Fa. I:** *IVe* **N:** *Op ST NNo ØFi*. **AI:** *Sb*? **S:** *Hrj Jmt LyL LuL TL*. Probably circumarctic, present in Russia (as well as North America).

Note. For long confused with *Pannaria hookeri* due to the blackish apothecia and the habitat. *F. hookerioides* has, however, smaller squamules of a darker olive-brown colour, without the whitish marbling of *P. hookeri*, and with different anatomy (upper cortex of sclerenchymatous cells) and chemistry (no pannarin). Furthermore the hymenium is hemiamyloid and the asci have amyloid internal structures not found in *P. hookeri*. Sterile specimens (like those known from Spitsbergen) may, however, be difficult to distinguish with certainty from the closely related, essentially non-arctic *F. leucophaea*.

6. **Fuscopannaria ignobilis** (Anzi) P.M.Jørg.

J. Hattori Bot. Lab. 76: 205 (1994). – *Pannaria ignobilis* Anzi, Comment. Soc. Crittog. Ital. 1: 138–139 (1862). – TYPE: Italy, Toscana, Monte Pisano, Anzi (TO lectotype, Tavares, Portugaliae Acta Biol., Sér. B, 8: 4 (1965).

N: skorpefiltlav

Red-listed in: **N**

Literature: Jørgensen, Opera Bot. 45: 32–34 (1978); Tønsberg et al., Sommerfeltia 23: 126–130 (1996).

Figs: Gyelnik in Rabenh. Krypt.-Fl. Ed. 2, 9, Abt. 2(2) (1940) Taf. 28, Fig. 1 (as *Pannaria servitiana*); Jørgensen 1978: 32; Holien & Tønsberg 2006: 107.

THALLUS crustose-squamulose, of small, grey closely appressed, verrucose squamules, to 1 mm diam., resting on a thin, black prothallus, giving the impression of a cracked crust, 100–150 µm thick, with a sclerenchymatous upper cortex, 15–20 µm thick. APOTHECIA usually numerous, small, to 0.9 mm diam., convex, red-brown with excluded margin. Asci with apical amyloid ring-structure. Spores colourless, simple, ellipsoid, 20–28 × 9–11 µm, including the long, acutely apiculate exospore. CONIDIOMATA bacilliform. PHOTOBIONT *Nostoc* in clusters.

Chemistry. No secondary substances (by TLC).

Habitat. Corticolous on rough-barked trees, mainly *Populus* and *Fraxinus*, often in open, rather dry habitats. Towards the north also on *Sorbus* in denser, darker and moister spruce forests.

Distribution. Coastal and fjord regions in the west. **N:** *VA Ro Ho SF MR ST NT SNo*. Atlantic-mediterranean in Europe, with a few records also in Africa, as far south as Kenya.

Note. The most clearly crustose of all species in the genus present in our region, easily recognized on the grey thallus and the numerous, strongly convex, reddish brown apothecia. Possible to confuse only with shade-forms of *F. leucophaea*, though these are usually saxicolous, and always distinguishable by the different spores (no attenuated apices), and the apical apparatus of the asci.

7. **Fuscopannaria leucophaea** (Vahl) P.M.Jørg.

J. Hattori Bot. Lab. 76: 205 (1994). – *Lichen leucophaeus* Vahl, Fl. Dan. 6(16): 8 (1787). – TYPE: Icon. in Fl. Dan. 6(16) (1787): Pl. 955,2 (lectotype, Jørgensen, Bryologist 103: 684, 2001); Norway, Hordaland, Granvin, 1903 Havaas, Lich. Exs. Norv. 161 (BG epitype).

Syn. *Pannaria microphylla* Del. ex Bory

D: skællet nettfiltlav **F:** suomolimijäkälä **I:** hreisturlurfa **N:** småfiltlav **S:** fjällig gytterlav

Red-listed in: **D**

Literature: Jørgensen, Opera Bot. 45: 38–42 (1978); Bryologist 103: 684 (2001).

Figs: Brodo et al. 2001: 322; Jørgensen 1978: 40; Moberg & Holmåsen 1990: 166; Wirth 1995: 322.

THALLUS squamulose, forming a crust-like cover on a thin blackish prothallus; individual squamules grey-brown to blackish, rounded, indented, mostly convex, to 2 mm diam. and 150 µm thick, with sclerenchymatous upper cortex, 15–20 µm thick. APOTHECIA frequent, to 1 mm diam., frequently in contiguous aggregates, with brown-black, often convex disc and varying thalline margin, often only partially developed, if at all. Asci with apical amyloid sheets. Spores simple, colourless, ellipsoid, 13–15 × 5–6 µm. CONIDIOMATA bacilliform. PHOTOBIONT *Nostoc* in clusters.

Chemistry. No secondary substances (by TLC).

Habitat. Mostly saxicolous on wet, more or less basic rocks, rarely at bases of trees; mainly in the lowlands, up to the timber line.

Distribution. Widespread, rarer towards the north, not in arctic-alpine regions. **D:** (*NJy*). **Fa. F:** *A V U EK St EH ES EP PH PS PK KP Kn OP PeP Ks KiL SoL EnL InL*. **I:** *ISu IVe*. **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **S:** *Sk Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*.

Note. A variable species. When growing in moist and shaded habitats, the squamules are greyish and dispersed on a distinct blackish prothallus; while in exposed habitats they are browner with denser squamules and indistinct prothallus. Also the colour of the apothecial disc varies from pale to dark brown, as well as the development of the thalline margin of the apothecia. Several forms and varieties have been described based on this variation, but they are not accepted here as taxa. In spite of the variation it is fairly easily recognizable, though forms with poorly developed thalline apothecial margine may in the field be mistaken for a *Parmeliella*, which shows quite different microscopic apothecial characters (amyloid hymenium and ring-structure in asci). The only possible species of that genus in our region, *P. triptophylla*, usually have distinct isidia.

Another common source of confusion is the terricolous *F. praetermissa*, particularly in the sterile state. But this is a much more arctic-alpine species forming thick crusts on the ground, with thalli containing fatty acids and terpenoids. For comparison with the arctic-alpine *F. hookerioides*, see under that species.

8. **Fuscopannaria mediterranea** (Tav.) P.M.Jørg.

J. Hattori Bot. Lab. 76: 205 (1994). – *Pannaria mediterranea* Tav., Portugaliae Acta Biol., Sér. B, 8: 5 (1965). – TYPE: Portugal, Alto Alentejo, between Castelo de Vide and Marvao, 1959 Tavares 6546a (LISU holotype).

F: etelänlimijäkälä **N:** olivenlav **S:** olivbrun gytterlav

Red-listed in: **F N S**

Literature: Hultengren et al., Graphis Scripta 5: 24–38 (1993); Jørgensen, Opera Bot. 45: 44–49 (1978); Bryologist 103: 686 (2001); Rassi et al., Suomen uhanal. kasvit: 382 (1986); Thor & Arvidsson (eds) 1999: 392.

Figs: Jørgensen 1978: 44; 2001: 676; Thor & Arvidsson (eds) 1999: 296; Holien & Tønsberg 2006: 108.

THALLUS squamulose, consisting of 2–3 mm wide, rounded irregularly incised, "swollen", coalescent squamules, 120–180 µm thick; upper surface olive to grey-blue, white-felted to tomentose, marginally sorediate, with limbiform, granular, lead-grey soredia, in the herbarium often with needle-like crystals (terpenoids); upper cortex sclerenchymatous, 30–40 µm thick. APOTHECIA very rare, 0.5–1.5 mm diam.; disc brown, appearing sunk in the thallus and obscured by the sorediate thalline margin. Asci with apical amyloid ring-structure. Spores usually poorly developed (only seen in Portugese specimens), colourless, simple, ellipsoid, 17–23 × 8–9 µm, including the exospore, which is broadly attenuate at apices. CONIDIOMATA bacilliform. PHOTOBIONT *Nostoc* in clusters.

Chemistry. C–, K–, KC–, PD–. Fatty acids and terpenoids.

Habitat. Mostly corticolous on rough-barked trees, particularly *Populus* and *Fraxinus* in open positions, inland and towards the north often on *Salix*, occasionally on slightly calcareous rocks facing south ("sydväxtberg").

Distribution. Mainly western, but also in sheltered valleys further inland, suboceanic. **F:** (*V*) *EH*. **N:** *Øf He Op Bu Ro Ho SF MR ST NT Tr*. **S:** *Sk SmI Hl Bh Dls Vg Ög Vrm Dlr Mpd Ång Jmt ÅsL LyL LuL TL*. Atlantic-mediterranean in Europe; also recorded from North Africa and Macaronesia, as well as Pacific North America and Tierra del Fuego in South America.

Note. A most charcteristic species due to its strongly plumbeous blue, "wooly" soralia, which may cover most of the thallus. Previously confused with *Pannaria conoplea* which is a larger, paler species containing pannarin (PD+ orange). For difficulties with *F. confusa*, see under that species.

9. **Fuscopannaria praetermissa** (Nyl.) P.M.Jørg.

J. Hattori Bot. Lab. 76: 205 (1994). – *Pannaria praetermissa* Nyl. in Chydenius & Furuhjelm, Not. Sällsk. Fauna Fl. Fenn. Förh. 4: 97 (1858). – TYPE: Russia ('Finland'), Karelia ladogensis, Kirjavalahti (Kirjavalaks), 1856 Chydenius (H lectotype, Jørgensen, Opera Bot. 45: 57, 1978).

Syn. *Pannaria lepidiota* (Sommerf.) Th.Fr., *Parmeliella praetermissa* (Nyl.) P.James

D: kalk-netfiltlav **F:** sinilimijäkälä **I:** stúflurfa **N:** kalkfiltlav **S:** kalkgytterlav

Literature: Albertsson, Svensk Bot. Tidskr. 35: 121–130 (1941); Jørgensen, Opera Bot. 45: 57–61 (1978); Bryologist 103: 687 (2001).

Figs: Gyelnik in Rabenh. Krypt.-Fl. Ed. 2, 9, Abt. 2(2) (1940) Taf. 20, Fig. 2; Jørgensen 1972: 378; 2001: 678.

THALLUS squamulose, forming thick crusts, individual squamules 1–3 mm wide, rounded, indented, often imbricate; upper surface brown, usually dark, often white-tomentose, due to presence of terpenoid crystals. Lobes often ascending as digitate protuberances, showing the naked lower surface, 180–300 µm thick, with sclerenchymatous upper cortex, 30–50 µm thick. APOTHECIA common in certain populations, to 1.5 mm diam., brown, with convex disc and often excluded thalline margin. Asci with apical amyloid ring-structure. Spores simple, colourless, ovoid, 18–22 × 9–11 µm, often with one large oil-droplet. CONIDIOMATA bacilliform. PHOTOBIONT *Nostoc* in clusters.

Chemistry. C–, K–, KC–, PD–. Fatty acids and terpenoids.

Habitat. Terricolous or bryophilous on more or less calcareous ground in open situations; rarely on rotting logs or bases of trees.

Distribution. Throughout most of the area, but most common in arctic-alpine regions and on rock outcrops in the northern boreal region, rare or absent in the south. **D:** (*Brn*?) **Gr. Fa. F:** *V St EH ES PS PK Kn OP PeP Ks KiL EnL InL*. **I:** *ISu IVe IMi IAu INv INo*. **N:** *Ak He Op*

Bu Te AA Ro Ho SF ST NT SNo NNo Tr VFi ØFi. **AI:** *Bi JM Sb*. **S:** *Gtl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb ÅsL LyL PL LuL TL*. Circumarctic with isolated occurrence on Mt. Kenya in Africa at high altitude (4300 m). Also at similarly high altitudes in the Himalayas.

Note. An easily overlooked species, though characteristic by forming dense, crust-like patches on the ground unlike any of the other species in the Pannariaceae except for *Protopannaria pezizoides*, which is a paler, more richly fruiting species with warted spores and no secondary substances.

F. praetermissa is a rather variable species. In some forms the lobes tend to be erect and "frosted", showing the naked lower surface and thus appearing to be sorediate, and mistakenly discribed as such. Some populations are richly fertile, and lack these features.

The related, recently described Arctic species, *F. viridescens* P.M.Jørg. & Zhurb., is easily recognized by its greenish colour and photobiont, and may prove to be present in Arctic parts of our region, as it is quite common in northern Russian Asia (Siberia).

10. **Fuscopannaria sampaiana** (Tav.) P.M.Jørg.

J. Hattori Bot. Lab. 76: 205 (1994). – *Pannaria sampaiana* Tav., Portugaliae Acta Biol., Sér. B, 3: 76–77 (1950). – TYPE: Portugal, Minho, Serra do Gerês, between S. Bento do Porta Alberta and Freitas, 1948 Tavares 2829 (LISU holotype).

Syn. *Pannaria craspedia* Körb. var. *isidiata* Harm.

N: kastanjelav **S:** kastanjegytterlav

Red-listed in: **N S**

Literature: Degelius, Svensk Bot. Tidskr. 62: 406–407 (1968); Holien & Hilmo, Gunneria 65: 31 (1991); Jørgensen, Opera Bot. 45: 64–66 (1978); Thor & Arvidsson (eds) 1999: 395; Tønsberg et al., Sommerfeltia 23: 130–133 (1996).

Figs: Jørgensen 1978: 64; Thor & Arvidsson (eds) 1999: 298; Holien & Tønsberg 2006: 108.

THALLUS crust-like, consisting of appressed rounded squamules, 0.5–1 mm wide, in the periphery often enlarged and elongated to 3–4 mm, 150–200 µm thick; upper surface chestnut-brown with paler margins, often with cream-yellow, coarsely granular soralia and sclerenchymatous upper cortex, 50–60 µm thick; prothallus distinct, blackish. APOTHECIA unknown. CONIDIOMATA bacilliform. PHOTOBIONT *Nostoc* in clusters.

Chemistry. No secondary substances (by TLC).

Habitat. Corticolous on rough-barked trees, mainly *Fraxinus* and *Quercus*, rarely on rocks, then often overhangs.

Distribution. Fjordregions in western parts. **N:** *VA Ro Ho SF MR ST NT SNo*. **S:** (*Bh*) (*Vg*). An atlantic-mediterranean species, only found in North Africa outside Europe.

Note. Easily recognized species, characterized by the chestnut-brown colour and the cream-yellow soredia, which are unlike those of the other species of this genus. For possible confusion with *Parmeliella testacea*, see that species.

Moelleropsis Gyeln.

in Rabenh. Krypt.-Fl. Ed. 2, 9, Abt. 2(2): 257 (1940). – TYPE: *Moelleropsis nebulosa* (Hoffm.) Gyeln.

S: blågryn

Literature: Ekman & Jørgensen, Canad. J. Bot. 80: 625–634 (2002); Gyelnik, Rabenh. Krypt.-Fl. Ed. 2, 9, Abt. 2(2): 257–265; Henssen, Ber. Deutsch. Bot. Ges. 82: 235–248 (1969); Jørgensen, Opera Bot. 45: 112 (1978).

THALLUS effuse, dissolved in corticate granules. APOTHECIA biatorine, sessile or sunk inbetween the granules which adhere to the exciple. Hymenium hemiamyloid; asci with apical amyloid structures. Spores simple, colourless, ellipsoid. CONIDIOMATA unknown. PHOTOBIONT *Nostoc*.

Chemistry. No secondary substances (by TLC).

Note. This genus will probably soon disappear as an independant taxon since molecular studies indicates that the type species is nothing but a very specialized *Fuscopannaria*, and the other species presently referred to *Moelleropsis* are not closely related to it.

1 Thallus gelatinous, isidioid-granular, olive-brown, apothecia small (<1 mm) without granular margin ..... *Gregorella humida*
– Thallus not gelatinous, pulverulent, bluish grey, apothecia larger (to 1.5 mm) with granular thalline margin ..... *M. nebulosa*

1. **Moelleropsis nebulosa** (Hoffm.) Gyeln.

in Rabenh. Krypt.-Fl. Ed. 2, 9, Abt. 2(2): 257 (1940). – *Psora nebulosa* Hoffm., Descr. Pl. Cl. Crypt. 2(3): 55 (1794). – TYPE: Austria, ad terram schistosam viarum silvaticarum circum villam "Thalhof" prope Reichenau, Eggerth (Fl. Exc. Austro-Hung. 2735, W neotype, Jørgensen, Bryologist 103: 689, 2001).

S: blågryn

Red-listed in: **D N S**

Literature: Almborn, Bot. Not. Suppl. 1 (2): 205–206 (1948); Thor & Arvidsson (eds) 1999: 370; Ekman et al., Graphis Scripta 12: 15–18 (1999); Jørgensen, Bryologist 103: 689–690 (2001); Malme, Svensk Bot. Tidskr. 18: 314 (1924).

Figs: Gyelnik in Rabenh. Krypt.-Fl. Ed. 2, 9, Abt. 2(2) (1940) Taf. 30, Fig. 2; Jørgensen 2001: 690; Thor & Arvidsson (eds) 1999: 289.

THALLUS grey-blue, dissolved in granules to 0.1 mm diam., containing clusters of *Nostoc*, enclosed in fungal hyphae, the outer short-celled, forming a primitive cortex. APOTHECIA to 1 mm diam., pinkish brown, finally convex, but with distinct proper exciple, to 100 µm wide, often with thalline grains. Spores simple, colourless, ellipsoid, 10–15 × 5–8 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc*.

Chemistry. No secondary substances (by TLC).

Habitat. Naked, well-drained soil, preferably sand or mineral soil in open habitats, e. g. riverbanks, road cuttings or cliffs. A pioneer lichen, often quite ephemeral.

Distribution. Southern element in our region, though retreating. **D:** *NJy ØJy Fyn Sjæ Brn*. **Fa. F:** *V*. **N:** (*VA*) *Ho SF*. **S:** *Sk* (*Sml*) (*Bh*) (*Vg*) (*Ög*) (*Nrk*) (*Vrm*) (*Dlr*). Common in Central and Southern Europe, reaching Macaronesia and North Africa with a widely disjunctive occurrence in South Africa. Also present in the prairie-region of North America.

Note. Hardly mistaken for any other species due to the granular structure of the thallus, though the early lichenologists tended to regard it as a stage of *Protopannaria pezizoides* which has true squamules, quite different apothecia and warted spores.

The so-called *M. nebulosa* ssp. *frullaniae* Maass, a sterile lichen associated with *Frullania*, has recently been discovered in SW Europe and may turn up on our west coast.

Pannaria Delise

in Bory, Dict. Class. Hist. Nat. 13: 20 (1828). – TYPE: *Pannaria rubiginosa* (Ach.) Bory

S: gytterlavar

Literature: Gyelnik in Rabenh. Krypt.-Fl. Ed. 2, 9, Abt. 2(2): 135–272 (1940); Henssen, Ber. Deutsch. Bot. Ges. 82: 235–248 (1969); Jørgensen, Opera Bot. 45 (1978); J. Hattori Bot. Lab. 76: 197–206 (1994); Tavares, Portugaliae Acta Biol., Sér. B, 8: 1–16 (1965).

THALLUS squamulose-foliose, often forming distinct rosettes; rhizohyphae well-developed, blackish; upper surface grey-blue, sometimes pruinose, to 250 µm thick, with paraplectenchymatous upper cortex. APOTHECIA squamulose with thalline margin, mostly with reddish brown disc (except in subg. *Cryopannaria* where it is dark brown to blackish). Hymenium I+ blue only in the region around the asci which have no internal amyloid apical structures. Spores simple, colourless, ellipsoid. CONIDIOMATA rare, as in family. PHOTOBIONT *Nostoc*.

Chemistry. Usually pannarin, rarely no secondary substances or terpenoids in extra-european taxa.

1 Thallus with decorticate lobules ("soredia") at the margins, rarely with apothecia ..... 1. *P. conoplea*
– Thallus not sorediate, usually with apothecia 2
2 Thallus broad-lobed (to 4 mm wide), uniformly grey-blue, apothecia orange-brown; usually corticolous, coastal ..... 3. *P. rubiginosa*
– Thallus narrow-lobed (<2 mm wide), white marmo-rated, grey-brown; apothecia black; invariably saxicolous, arctic-alpine ..... 2 *P. hookeri*

1. **Pannaria conoplea** (Ach.) Bory

Dict. Class. Hist. Nat. 13: 20 (1828). – *Parmelia conoplea* Ach., Lichenogr. Universalis: 467 (1810). – TYPE: France ('Gallia'), Persoon (H-ACH 1409B lectotype, Jørgensen, Opera Bot. 45: 21, 1978).

Syn. *Pannaria pityrea* auct., non s. orig. (q. e. *Physconia grisea* (Lam.) Poelt).

D: gryn-filtlav **N:** grynfiltlav **S:** grynlav

Red-listed in: **D S**

Literature: Degelius, Acta Phytogeogr. Suec. 7: 105–115 (1935); Hultengren et al., Graphis Scripta 5: 24–38 (1993); Jørgensen, Opera Bot. 45: 21–23 (1978); Thor & Arvidsson (eds) 1999: 390–391.

Figs: Brodo et al. 2001: 477; Gyelnik in Rabenh. Krypt.-Fl. Ed. 2, 9, Abt. 2(2) (1940) Taf. 25, Fig. 1; Jørgensen 2001: 691; Moberg & Holmåsen 1990: 165; Ozenda & Clauzade 1980: 330; Thor & Arvidsson (eds) 1999: 265; Holien & Tønsberg 2006: 109.

THALLUS foliose, in rosettes, to 2–3 cm diam., 150–200 µm thick; upper surface blue-grey to fawn, scabrid-pruinose, especially towards the margins, which has abraded knob- or squamule-like, decorticated lobules (gymnidia), occasionally obscuring the whole thallus. Lower surface white with blue-black rhizohyphae, sometimes extending beyond the lobe-margins to form a prothallus. Upper cortex paraplectenchymatous, 40–50 µm thick. APOTHECIA rare, 0.5–1.5 mm diam., with red-brown disc and thalline margin, often dissolved in gymnidia. Spores simple, colourless, ellipsoid, 20–24 × 10–12 µm, including exospore.

Chemistry. C–, K–, KC–, PD+ orange. Pannarin.

Habitat. Mostly corticolous, mainly on coarse-barked trees, occasionally on mossy rocks, particularly towards the north.

Distribution. Western, suboceanic, rare in the north. **D:** (*ØJy*) (*Sjæ*). **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **S:** *Sk* (*Bl*) (*Sml*) *Hl Bh Dls Vg Ög Nrk Srm Vrm Dlr Gst Mpd Hrj Jmt ÅsL LyL PL LuL TL*. Widespread in cool temperate regions of both Hemispheres.

Note. Somewhat variable in colour, and in the degree of development of gymnidia, but otherwise easily recognized, though sometimes mistaken for *Fuscopannaria mediterranea*, which has darker, olive-brown, PD– thallus. For possible confusion with *F. ahlneri*, see that species.

2. **Pannaria hookeri** (Sm.) Nyl.

Mém. Soc. Sci. Nat. Cherbourg 5: 109 (1858). – *Lichen hookeri* Borr. ex Sm. in Engl. Bot. 32: 2283 (1811). – TYPE: Scotland, Ben Lawers and Mael Greadha (=Meall Greigh?), Borrer (BM lectotype, Jørgensen, Opera Bot. 45: 23, 1978).

Syn. *Pannaria leucolepis* (Wahlenb.) Nyl.

F: tunturilimijäkälä **I:** grábrydda **N:** fjellfiltlav **S:** fjällgytterlav

Red-listed in: **F**

Literature: Fries, Lich. Arct.: 73 (1860); Jørgensen, Opera Bot. 45: 23–26 (1978).

Figs: Jørgensen 1978: 23; 2001: 691.

THALLUS crustose to squamulose in appressed rosettes to 3 cm diam., with enlarged, radiating marginal lobes to 3 mm wide and 0.2–0.3(–0.5) mm thick, centrally often verrucosely fragmented and partially detached; prothallus thin, blackish; upper surface grey-brown, though whitish striate, with small-celled paraplectenchymatous upper cortex, 40–60 µm thick. APOTHECIA common centrally, to 2 mm diam., with black to rarely dark brown disc and prominent, crenulate, whitish thalline margin. Spores simple, colourless, subglobose, 12–15 × 8–11 µm.

Chemistry. C–, K–, KC–, PD+ faintly orange or PD–. Pannarin in small, variable amounts.

Habitat. Saxicolous on moist, schistose, rarely granitic rocks.

Distribution. Arctic-alpine, commonest in the north. **Gr. Fa. F:** *EnL*. **I:** *ISu IVe IMi IAu INv INo*. **N:** *Op Ro Ho SF MR ST NT SNo NNo Tr ØFi*. **AI:** *Sb*. **S:** *Jmt LyL PL LuL TL*. Circumarctic, bipolar, though present at high altitude on Mt. Kenya in Africa.

Note. An aberrant, *Lecanora*-like species, now placed in the subgenus *Cryopannaria* P.M.Jørg., with its closest relatives in the subantarctic region. Easily separated from placodioid *Lecanora* species on the cyanobiont and the chemistry.

3. **Pannaria rubiginosa** (Ach.) Bory

Dict. Class. Hist. Nat. 13: 20 (1828). – *Lichen rubiginosus* Ach., Lichenogr. Suec. Prodr.: 99 (1799). – TYPE: South Africa, Cape of Good Hope, Thunberg (H-ACH 1371D lectotype, Jørgensen, Opera Bot. 45: 62, 1978).

D: blågrå filtlav **N:** kystfiltlav **S:** västlig gytterlav

Red-listed in: **D S**

Literature: Degelius, Acta Phytogeogr. Suec. 7: 115–124 (1935); Jørgensen, Opera Bot. 45: 62–66 (1978); Jørgensen & Sipman, Nova Hedwigia 78: 324–325 (2004); Thor & Arvidsson (eds) 1999: 393–394.

Figs: Jørgensen 1978: 62; Jørgensen & Sipman 2004: 325; Thor & Arvidsson (eds) 1999: 297; Holien & Tønsberg 2006: 109.

THALLUS foliose-squamulose, forming orbicular rosettes to 3–5 cm diam., lobes to 4 mm wide, 200 µm thick, mostly concave with ascending margins; upper surface bluish grey to fawn, partly scabrid-pruinose; lower surface white with blackish blue rhizohyphae, often extending beyond the lobe-margins; upper cortex paraplectenchymatous, 40–50 µm thick. APOTHECIA frequent, 0,5-1,5 mm diam., with red-brown disc and squamulose thalline margin. Spores simple, colourless, ellipsoid 20–24 × 10–12 µm.

Chemistry. C–, K–, KC–, PD+ orange. Pannarin.

Habitat. Corticolous, preferably on rough-barked trees (*Fraxinus* etc.), very rarely on rocks.

Distribution. Western and oceanic, probably retreating in Norden. **D:** (*ØJy*). **N:** *Øf Ak Vf AA VA Ro Ho SF MR ST NT SNo NNo*. **S:** (*Sk*) *SmI* (*Hl*) *Dls Vg Ög Jmt*. Widespread but scattered in temperate regions of both hemispheres.

Note. Easily recognized species due to the bluish rosettes with contrasting red-brown apothecia, though previously sometimes confused with *Degelia plumbea* (see under that species), with which it often grows.

Parmeliella Müll.Arg.

Mém. Soc. Phys. Genève 16: 376 (1862). – TYPE: *Parmeliella triptophylla* (Ach.) Müll. Arg.

F: karstajäkälät **S:** blylavar

Literature: Gyelnik in Rabenh. Krypt.-Fl. Ed. 2, 9, Abt. 2(2): 167–209 (1940); Henssen, Ber. Deutsch. Bot. Ges. 82: 235–248 (1969); Jørgensen, Opera Bot. 45: 12–15, 100 (1978); Biblioth. Lichenol. 88: 243–246 (2004).

THALLUS squamulose, grey-blue to brownish, often forming distinct rosettes, prothallus distinct, blackish. APOTHECIA mostly biatorine (always in our region); hymenium I+ blue and asci with internal amyloid ring-structure.

Chemistry. No secondary substances (by TLC) in Nordic material. In tropical regions occasionally with terpenoids or pigments.

1 Thallus small (to 2 mm), lobes elongated, grey-blue, with granular soralia..... 1. *P. parvula*
– Thallus larger (more than 2 mm), lobes rounded, brownish grey, with isidia/lobules 2

2 Thallus often with enlarged marginal lobes with knobby isidia, eventually breaking up into soredia, southwestern .....2. *P. testacea*
– Thallus without enlarged marginal lobes, with coralloid isidia, not developing soredia; widespread .....3. *P. triptophylla*

1. **Parmeliella parvula** P.M.Jørg.

Skr. Norske Vidensk.-Akad. Oslo, Mat.-Naturvidensk. Kl. 36: 19 (1977). – TYPE: Tristan da Cunha, Inaccessible Island, Blenden Hall, 1938 Christophersen 2315i (O holotype).

Syn. *Parmeliella jamesii* Ahlner & P.M.Jørg.

N: dvergfiltlav **S:** dvärgblylav

Red-listed in: **S**

Literature: Ahlner, Acta Phytogeogr. Suec. 22: 100 (1948); Jørgensen, Opera Bot. 45: 35–38 (1978); Thor & Arvidsson (eds) 1999: 397–398.

Figs: Jørgensen 1977: 19; 1978: 35; 2001: 697; Thor & Arvidsson (eds) 1999: 298; Holien & Tønsberg 2006: 110.

THALLUS squamulose, of small, elongated, incised, blue-grey squamules, 1–2 mm wide and 100–150 µm thick, with marginal, discrete, coarse-grained soralia and paraplectenchymatous upper cortex, 30–40 µm thick. APOTHECIA very rare, biatorine, small, to 0.5 mm diam., with flat to convex, red-brown disc, blackening with age, and paler proper exciple. Spores simple, colourless, ellipsoid, 15–18 × 10–12 µm.

Chemistry. No secondary substances (by TLC).

Habitat. Mainly corticolous, on a range of trees, often on thin branchlets, usually spruce, undoubtedly a pioneer and a week competitor; rarely saxicolous on acidic, wet rock faces.

Distribution. Oceanic boreal. **N:** *Ro Ho SF MR ST SNo*. **S:** *Vrm Jmt*. Widespread but scattered in cool temperate parts of both Hemispheres.

Note. The smallest of all *Parmeliella* species, and the only really sorediate one in our region, though sometimes difficult to separate from shade forms of *Fuscopannaria confusa* and *F. mediterranea*, both of which are chemically different (with fatty acids and terpenoids) and with a different (sclerenchymatous) upper cortex.

2. **Parmeliella testacea** P.M.Jørg.

Opera Bot. 45: 70 (1978). – TYPE: Ireland, Killarney, Torc Waterfall, near lake below the road, 1971 Jørgensen (BG holotype).

N: kornfiltlav

Red-listed in: **N**

Literature: Arvidsson, Windahlia 16: 150–151 (1986); Jørgensen, Opera Bot. 45: 70–72 (1978); Tønsberg et al., Sommerfeltia 23: 133–134 (1996).

Figs: Jørgensen 1978: 70.

THALLUS squamulose with enlarged, red-brown, marginal lobes, to 3 mm wide and 150–200 µm thick; prothallus distinct, blackish. Lobes with knobby marginal isidia, with age breaking down into blue-grey soredia, with paraplectenchymatous upper cortex, 40–50 µm thick. APOTHECIA unknown in Nordic material, but in the type from Ireland biatorine, brown, to 1.5 mm diam. Spores simple, colourless, ellipsoid, 16–20 × 9–10 µm.

Chemistry. No secondary substances (by TLC).

Habitat. In moist localities, on mossy rough-barked trees (esp. *Fraxinus*) or sheltered rocks in woodlands.

Distribution. Western, extremely oceanic and rare. **N:** *Ro Ho*. Restricted to western Europe and Macaronesia, rare in northern Italy.

Note. Because of the colour and thallus form easily mistaken for *Fuscopannaria sampaiana*, which has different, cream-coloured soralia. When young difficult to separate from *Parmeliella triptophylla*, which usually has more slender, coralloid isidia and lacks enlarged marginal lobes. Closest related to the much larger South American *P. conopleoides* P.M.Jørg.

3. **Parmeliella triptophylla** (Ach.) Müll.Arg.

Soc. Phys. Mém. Genève 16: 376 (1862). – *Lecidea triptophylla* Ach., Kongl. Vetensk.-Akad. Nya Handl. 29: 272 (1808). – TYPE: Sweden(?), Acharius (BM lectotype, Jørgensen, Opera Bot. 45: 72, 1978).

Syn. *Parmeliella corallinoides* s. Zahlbr., non s. orig. (q. e. *Placynthium nigrum* (Huds.) Gray), *Parmeliella corallinoides* var. *onegensis* Räs., and var. *pulvinata* H.Magn.

D: stift-blåfiltlav **F:** karstajäkälä **I:** blálurfa **N:** stiftfiltlav **S:** korallblylav

Red-listed in: **D**

Literature: Gyelnik, Rabenh. Krypt.-Fl. Ed. 2, 9, Abt. 2(2): 180–190 (1940); Jørgensen, Opera Bot. 45: 72–76 (1978).

Figs: Brodo et al. 2001: 167; Jørgensen 1978: 74; 2001: 697; Moberg & Holmåsen 1990: 167; Holien & Tønsberg 2006: 110.

THALLUS small-squamulose, squamules rarely more than 1 mm wide, blue-grey to brownish, thin, 75–100 µm thick, flat, scattered or contiguous over a conspicuous blackish prothallus; margins with terete, coralloid to digitate isidia, often interspersed with flattened lobules, sometimes completely covering the thallus; upper cortex paraplectenchymatous, 25–35 µm thick. APOTHECIA infrequent, rarely more than 1 mm diam., biatorine, redbrown, often becoming blackish and convex. Spores simple, colourless, 10–17 × 5–8 µm.

Chemistry. No secondary substances (by TLC).

Habitat. On mossy trees, especially *Populus*, *Sorbus* and *Salix*, rarely, but more commonly towards the north, on wet rocks or on debris.

Distribution. Widespread, cool-temperate suboceanic, fairly common in western Norway, infrequent in Finland and rarer towards the north, absent in the Arctic. **D:** (*ØJy*). **F:** *A V U EK St EH ES EP PH PS PK Kn OP Ks SoL EnL InL*. **I:** *ISu IVe IMi IAu INv INo*. **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **S:** *Sk Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Circumtemperate in the Northern Hemisphere.

Note. A variable species with colour varying from the usual grey-blue to brownish depending on exposition. The isidia are sometimes rather sparse, but may in some cases completely cover the thallus; saxicolous forms from shaded overhangs ("var. *onegensis"*) mainly consist of long isidia, and terricolous specimens from Iceland and northern Fennoscandia ("var. *pulvinata*"), mainly consist of clusters of blackish isidia. These appear only to be growth-forms not worth taxonomic recognition.

P. triptophylla is in spite of this large variation, rather easily recognized by the small, isidiate squamules

and by the blackish prothallus, which is more prominent than in any other species of this and related genera. Brownish, saxicolous specimens with few isidia are often mistaken for *Fuscopannaria leucophaea*, which has thicker, rounder squamules with different cortex and is usually fertile, having apothecia with hemiamyloid hymenium.

For distinguishing characters towards *Parmeliella testacea*, see that species.

Protopannaria (Gyeln.) P.M.Jørg. & S.Ekman

Bryologist 103: 699 (2001). – *Pannaria* subg. *Protopannaria* Gyeln. in Rabenh. Krypt.-Fl. Ed. 2, 9, Abt. 2(2): 216 (1940). – TYPE: *Protopannaria pezizoide*s (Weber) P.M.Jørg. & S.Ekman

Literature: Ekman & Jørgensen, Canad. J. Bot. 20: 625–634 (2002); Jørgensen, Bryologist 103: 699 (2001); Jørgensen, Cryptog. Mycol. 22: 67–72 (2001).

THALLUS small-squamulose to granular-crustose, often of imbricate squamules forming a dense cover on the substrate; prothallus indistinct. APOTHECIA with well-developed, often crenulate thalline margin; hymenium I+ deep blue, asci without internal amyloid structures. Spores simple, colourless, ellipsoid, often with distinct, warted exospore. PHOTOBIONT *Nostoc*.

Chemistry. No secondary substances (by TLC).

Note. Bipolar genus with one species in our region.

1. **Protopannaria pezizoides** (Weber) P.M.Jørg. & S.Ekman

Bryologist 103: 699 (2001). – *Lichen pezizoides* Weber, Spic. Fl. Goett.: 200 (1778). – TYPE: Germany, Göttingen, Meyer (UPS neotype, Jørgensen, Opera Bot. 45: 52, 1978).

Syn. *Pannaria brunnea* (Sw.) Mass., *Pannaria pezizoides* (Weber) Trevis.

D: småskællet filtlav **F:** sammalimijäkälä **I:** móbrydda **N:** skålfiltlav **S:** gytterlav

Literature: Gyelnik, Rabenh. Krypt.-Fl. Ed. 2, 9, Abt. 2(2): 216–225 (1940); Jørgensen, Opera Bot. 45: 52–53 (1978).

Figs: Brodo et al. 2001: 478; Jørgensen 1978: 52; 2001: 699; Moberg & Holmåsen 1990: 166; Ozenda & Clauzade 1980: 327, Figs 731 and 732; Wirth 1995: 635; Holien & Tønsberg 2006: 111.

THALLUS squamulose, of imbricate, hand-like squamules, forming a dense cushion to 5 cm diam., individual squamules to 1 mm wide, grey-blue to brown, without a distinct prothallus. Thallus to 200 µm thick with paraplectenchymatous upper cortex, 40–50 µm thick, and a rather compact photobiont layer, packed with *Nostoc* clusters. APOTHECIA abundant, sessile to adnate, to 2 mm diam., with bright orange-brown to dark brown, flat to convex disc and distinctly crenulate thalline margin. Spores simple, colourless, ellipsoid, 25–30 × 9–12 µm, inclusive the prominent, warted exospore.

Chemistry. No secondary substances (by TLC).

Habitat. On humus-rich, peaty soil, detritus or moribund stems, rarely on living trees (only in very damp habitats).

Distribution. Rather frequent in the whole region, common in the north and the mountains, rarer towards the south. **D:** *SJy Sjæ Brn*. **Fa. F:** *A V U EK St EH ES EP PH PS PK KP Kn OP PeP Ks KiL SoL EnL InL*. **I:** *ISu IVe IMi IAu INv INo*. **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **AI:** *Bi JM Sb*. **S:** *Sk Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Widespread in the Northern Hemisphere with one disjunctive occurrence at high altitudes on Mt. Ruwenzori in East Africa.

Note. Rather variable species concerning colour, but otherwise easily recognized though still often confused with the greener, more leafy *Psoroma hypnorum*, which also differs in internal characters (see below). Some of the old lichenologists believed *P. pezizoides* to be a stage of *Moelleropsis nebulosa*, which is an entirely different lichen both externally (covered in blue grains) and internally, as well as in ecology.

Psoroma Michx.

Fl. Bor.-Amer.: 321 (1803). – TYPE: *Psoroma hypnorum* (Vahl) Gray

F: kulhojäkälät **S:** skållavar

Literature: James & Henssen, Lichenology: Progress and Problems: 27–77 (1976); Jørgensen, Opera Bot. 45: 26–32 (1978); Biblioth. Lichenol. 78: 109–139 (2001); Jørgensen & Wedin, Lichenologist 31: 341–347 (1999); Malme, Ark. Bot. 20A(3) (1925).

THALLUS consisting of small squamules. APOTHECIA with squamulose thalline margin; hymenium I+ dirty blue, asci with distinct internal amyloid ring-structure with a broad central "channel". Spores simple, colourless, with distinct, often warted epispore. CONIDIOMATA infrequent, brown verrucae to 0.2 mm diam.; conidia bacilliform, produced laterally or terminally on short-celled conidiophores. PHOTOBIONT usually green algae (?*Myrmecia*), though thallus mostly with cephalodia containing *Nostoc*

Chemistry. Usually C–, K–, KC–, PD–. Without secondary substances or rarely porphyrilic acid and related substances.

Note. Much misunderstood genus on world scale which should be restricted to the squamulose species with no chemistry (or porphyrilic acid) and asci containing apical amyloid ringstructure.

1 Apothecia with long, scattered hairs on upper thalline margin, spores less than 20 µm..... 2. *P. paleaceum*
– Apothecia if hairy, only in lower parts of the margin, then with short, tomentose hairs; spores more than 20 µm 2
2 Apothecia large (to 5 mm diam.), urceolate with squamulose margin, spores large (22–34 µm), thallus squamulose, without secondary substances; common..... 1. *P. hypnorum*
– Apothecia smaller (to 2 mm), flat with granular margin, spores smaller (<22 µm), thallus granular, with porphyrilic acid; rare arctic-alpine .....3. *P. tenue* var. *boreale*

1. **Psoroma hypnorum** (Vahl) Gray

Nat. Arr. Brit. Pl. 1**:** 445 (1821). – *Lichen hypnorum* Vahl, Fl. Dan. 6(16): 8 (1787). – TYPE: Icon in Fl. Dan. 6(16): 956 (1787) (lectotype, Jørgensen, Bryologist 103: 700, 2001); Norway, Vahl (C epitype).

Syn. *Psoroma femsionense* (Fr.) Trevis., *Pannaria porriginosa* Vain.

D: mos-grynkantlav **F:** kulhojäkälä **I:** barmbrydda **N:** skjellfiltlav **S:** skållav

Literature: Albertsson, Acta Phytogeogr. Suec. 20: 220 (1946); Forsell, Bih. Kongl. Svenska Vetenskapsakad. Handl. 8(3): 56–62 (1883); Hakulinen, Aquilo, Ser. Bot. 3: 46–48, 62–63 (1965); James & Henssen, Lichenology: Progress and Problems: 27–77 (1976); Jørgensen, Opera Bot. 45: 26–30 (1978); Jørgensen & Holien, Graphis Scripta 11: 49–52 (2000).

Figs: Brodo et al. 2001: 327; Jørgensen 1978: 28–30; 2001: 701; Moberg & Holmåsen 1990: 168; Ozenda & Clauzade 1980: 327; Holien & Tønsberg 2006: 111.

THALLUS small-squamulose; squamules to 0.5 mm wide and 100–200 µm thick, grey to yellowish green, rarely brownish; darker squamules containing *Nostoc* (the so-called cephalodia) usually present, very rarely forming the whole thallus; upper cortex paraplectenchymatous, 30–40 µm thick, lower cortex absent; hypothallus thin, indistinct, pale. APOTHECIA common, to 5 mm diam., with concave brown disc and irregularly squamulose thalline margin, lower side densely covered with short hairs. Spores simple, colourless, ellipsoid, 22–34 × 9–12 µm, warted. CONIDIOMATA infrequent, globose, to 0.2 mm diam.; conidia bacilliform, 5–6 × 1–2 µm.

Chemistry. No secondary substances (by TLC).

Habitat. Muscicolous or terricolous, usually where moisture is frequent and constant. Its favorite habitat in Scandinavia is in the mountain birch woodlands, though it is also found in moist habitats in the lowlands, as well as above and north of the timber-line, there often in snowbeds. In some cases also found on moribund, old trunks and logs, though in the most oceanic parts (particularly in the boreal rainforests of Central Norway) also on living trees.

Distribution. Widespread, but only frequent in the boreal-subalpine region. **D:** (*NJy*) (*Sjæ*) (*Brn*). **Gr. Fa. F:** *A V Kn PeP Ks KiL SoL EnL InL*. **I:** *ISu IVe IMi IAu INv INo*. **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **AI:** *JM Bi Sb*. **S:** *Sk Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Widespread in cool-temperate regions of both Hemispheres.

Note. Previously often confused with *Protopannaria pezizoides* which contains *Nostoc*, and has asci with distinct apical amyloid ring-structure. The latter serves to distinguish these species even when *P. hypnorum* appears in its very rare completely blue-green form as reported from NT (Norway) by Jørgensen & Holien (2000). This clearly refutes the suggestion, first promoted by Forsell (1883), that the two are just phototypes of the same species, i. e. differs only in the photobiont. For differences towards *P. tenue*, see key and below.

2. **Psoroma paleaceum** (Fr.) Timdal & Tønsberg

Graphis Scripta 18: 54–57 (2006). – *Parmelia paleacea* Fr. Lich. Ref. Eur.: 97 (1831). – TYPE: "*Lecanora ciliata*, Dania" (H-ACH 925 lectotype, Jørgensen 1978: 31); Sweden, Västergötland, Axvall. 1897 Stenholm (UPS epitype, Jørgensen, Nordic Lich. Flora 3: 146, 2007).

Syn. *Lecanora ciliata* Ach., *nom. nud*., *Psoroma hirsutulum* Nyl. ex Crombie, *Psoroma hypnorum* var. *paleaceum* (Fr.) Rostr.

I: hærubrydda

Literature: Jørgensen & Kristinsson, Graphis Scripta 14: 55–56 (2003); Tønsberg & Timdal, Graphis Scripta 18: 54-57 (2006).

Figs: Jørgensen & Kristinsson Graphis Scripta 14: 57 (2003).

THALLUS granular to small-squamulose (to 1 mm wide), grey-green, orbicular, to 5 cm diam., covered with long silky, white hairs. Cephalodia unknown in Nordic material. APOTHECIA numerous, often aggregated, to 2 mm wide, cupuliform with narrow, crenate thalline margin with silky, white hairs; disc concave, brown, epruinose. Spores simple, colourless, subglobose, 15–20 × 10–14 µm, rugulose. CONIDIOMATA unknown.

Chemistry. No secondary substances (by TLC).

Habitat. Terricolous on moist bryophytes or debris.

Distribution. Rare northern. **D:** (*Sjæ*). **Fa. I:** *ISu INv INo*. **N:** *NNo Tr VFi*. **S:** (*Vg*). Bipolar, also in Alaska in the Northern Hemisphere, and southern part of the Southern Hemisphere.

Note. A most characteristic species due to the strongly hairy thallus and apothecia, but could be mistaken for *P. hypnorum* which has a more distinctly squamulose, non-hairy thallus, and larger spores.

3. **Psoroma tenue** Henssen var. **boreale** Henssen

Mycotaxon 13: 441 (1981). – TYPE: USA, Colorado, Boulder Co., Niwot Ridge, on snowbank, between 3300–3750 m, 1961 Henssen 13030b (herb. Henssen holotype).

S: kastanjebrun skållav

Literature: Henssen & Renner, Mycotaxon 13: 433–449 (1981); Jørgensen, Graphis Scripta 15: 60–64 (2004).

THALLUS with globose, often aggregated squamules, grey-brown to reddish brown; squamules to 0.4 mm wide and 150–300 µm thick, dispersed over the substrate, with paraplectenchymatous upper cortex, 20–25 µm thick, occasionally also lower cortex. APOTHECIA common, often aggregated, dark brown, mostly flat, with nodulose thalline margin. Spores simple, colourless, ovoid, warted, 19–22 × 7–12 µm. CONIDIOMATA not observed in Scandinavian material. PHOTOBIONT green algae (*Myrmecia*?), individual cells 6–10 µm diam.; dark, granular cephalodia present, containing *Nostoc* in clusters.

Chemistry. C–, K–, KC–, PD–. Porphyrilic acid and two related substances.

Habitat. Bryophilous or terricolous in alpine heaths, preferably snowbeds.

Distribution. Arctic-alpine, rare, probably overlooked. **Gr. F:** *SoL*. **I:** *ISu IVe IMi IAu INv INo*. **N:** *Ho ST Tr VFi ØFi*. **AI:** *JM Bi Sb*. **S:** *Ög Jmt LuL TL*. Also in Murmansk Region and the Alps. The species is bipolar, the variety probably northern circumpolar.

Note. Previously confused with *P. hypnorum*, which is usually readily distinguished on the larger, urceolate apothecia and greener, flat, more leafy squamules. In cases of doubt (poorly developed material) the chemistry as well as the different spore-size serve as useful distinguishing characters.

Santessoniella Henssen

Symb. Bot. Upsal. 32(1): 76 (1997). – TYPE: *Santessoniella polychidoides* (Zahlbr.) Henssen

Literature: Ekman & Jørgensen, Canad. J. Bot. 20: 625–634 (2002); Henssen, Symb. Bot. Upsal. 32(1): 75–93 (1997).

THALLUS semigelatinous, granular to subfruticose, consisting of lobes surrounded by a cortical layer; internally homoiomerous with clusters of *Nostoc*. APOTHECIA biatorine, brown; proper exciple often excluded. Hymenium hemiamyloid; asci with internal amyloid structures. Spores simple, colourless, ellipsoid, often with distinct warted exospore. CONIDIOMATA wart-like, producing bacilliform conidia laterally on short-celled conidiophores.

Chemistry. No secondary substances (by TLC).

Note. A rather easily recognized genus, though often confused with *Parmeliella*, which has different non-

gelatinous thallus and amyloid hymenium. Recent molecular work has shown that the type species, *S. polychidioides* (Zahlbr.) Henssen, nests with *Psoroma* species, a matter in need of further study.

1. Santessoniella arctophila (Th.Fr.) Henssen

Symb. Bot. Upsal. 32(1): 80 (1997). – *Pannaria arctophila* Th.Fr., Bot. Not. 1863: 8 (1863). – TYPE: Canada, Labrador, Herrnhuter missionaries (UPS lectotype, Jørgensen, Opera Bot. 45: 111, 1978).

Syn. *Parmeliella arctophila* (Th.Fr.) Malme, *Pannaria deficiens* Nyl., *Parmeliella arctophila* var. *microspora* Lynge, *Santessoniella arctophila* var. *glomerulosa* (Th.Fr.) Henssen, *Santessoniella arctophila* var. *terricola* Henssen

S: fjällblylav

Literature: Henssen, Symb. Bot. Upsal. 32: 80–83 (1997); Malme, Svensk Bot. Tidskr. 9: 121 (1915).

Figs: Henssen 1997: 80; Jørgensen 2001: 699.

THALLUS as scattered granules over moss, occasionally aggregated and/or elongate, to 0.3 mm diam., often rather wrinkled, semigelatinous, greyish to dark brown, with cortex 8–16 µm thick, usually of a single layer of cells; internal hyphae forming a reticulate pattern around the clusters of *Nostoc* which fill the internal parts. APOTHECIA common, orange-brown, often convex, 0.3–1(–2) mm diam., with often excluded paler margin. Spores simple, colourless, ellipsoid, 15–20 × 8–10 µm, with slightly warted exospore. CONIDIOMATA rare, wart-like, brownish black; conidia bacilliform, 4–5 × 1 µm.

Chemistry. No secondary substances (by TLC).

Habitat. Terricolous on mosses or debris in alpine heaths.

Distribution. Arctic-alpine, circumpolar. **Gr. F:** *Kn EnL*. **I:** *IMi IAu INv INo*. **N:** *Ho SF ST Tr ØFi*. **AI:** *Bi Sb*. **S:** *Upl Jmt*, *ÅsL LyL PL LuL TL*.

Note. An easily ovelooked, but characteristic species, in the field easily mistaken for an *Arctomia* which has a less gelatinous thallus, and in the microscope is easily distinguished on its fusiform spores.

S. arctophila is a quite variable species, particularly in thallus development. The type specimen has a very poorly developed thallus, appearing as a patchy granular crust over the mosses. Henssen (1997) has separated two varieties, var. *glomerulosa* and var. *terricola*, both of which have better developed thalli than the typical form, the first with agglutinated lobes, the second with more elongate, partly branched lobes. Their status is in need of further evaluation when more material becomes available. Lynge (1926) distinguished a var. *microspora* Lynge on material from Bjørnøya. The small spores appear to be result of poorly developed apothecia, and this taxon is thus not worth maintaining.

The generic placement of this species has been difficult, and it does not fit into any of the genera it has been placed in. Even its recent transfer to *Santessoniella* is doubtful, as it is obviously not congeneric with the type of this genus. It may need to be placed in a separate genus.

Peltigeraceae

Orvo Vitikainen

THALLUS foliose, greenish, grey or brownish when dry, green to bluish grey to brown when moist, heteromereous, with upper cortex. ASCOMATA apothecia, on the upper side of thallus, laminal, or marginal and stalked, hemiangiocarpous. Asci cylindrical or clavate, with an IKI+ blue annulus and IKI+ gelatinized outer layer, of *Peltigera*-type. Spores hyaline or brown, one- to multiseptate. CONIDIOMATA, if present, pycnidia. PHOTOBIONT green algae (*Coccomyxa*) or cyanobacteria (*Nostoc*), external or internal cephalodia sometimes present.

Chemistry. Variable.

Literature: Wedin & Wiklund, Symb. Bot. Ups. 34(1): 469–475 (2004).

1. Photobiont cyanobacteria (*Nostoc*); lower surface mostly with a network of veins and centrally darkening, or photobiont green and external cephalodia with *Nostoc* present on upper or lower surface; apothecia, if present, terminal, flat or saddle-shaped ..... *Peltigera*
– Photobiont green (*Coccomyxa*); under surface indistinctly veined, pale to brown or orange; cephalodia with *Nostoc* internal, or external and around apothecia; apothecia common, laminal, concave ..... *Solorina*

Peltigera Willd.

Fl. Berol. Prodr.: 347 (1787), *nom. cons.* – TYPE: *Peltigera canina* (L.) Willd.

F: nahkajäkälät **N:** årenever **S:** filtlavar

Literature: Kristinsson, Flóra (Akureyri) 2: 65–76 (1964); Alstrup, Fl. & Fauna (Esbjerg) 92: 21–29 (1986); Carlin, Graphis Scripta 4: 5–17 (1992); Holtan-Hartwig, Sommerfeltia 15: 1–77 (1993); Goffinet, Sérusiaux & Diederich, Belg. J. Bot. 127 (2): 184–206 (1994); Vitikainen, Acta Bot. Fenn. 152: 1–96 (1994); Bergsten, Svensk Bot. Tidskr. 93: 279–285 (2000); Burgaz & Martínez, Flora Liquenol. Ibérica. Peltigerales: 24–50 (2003).

THALLUS foliose, forming small to wide-spreading rosettes, flat, wavy or sometimes bullate; lobes usually elongate, radial, contiguous or overlapping; blue-grey, bluish or yellowish green when dry, bright green, emerald green, brown-green to blue-grey when moist; margins entire, rarely schizidiate or sorediate. Cortex pseudoparenchymatous, smooth, mat or shiny, scabrous, arachnoid or erect-tomentose, sometimes pruinose or maculate. Lower surface non-corticate, densely arachnoid- or erect-tomentose and dark pigmented especially in the centre or with anastomosing pale or dark veins. Rhizines usually numerous, solitary or confluent, or a single holdfast present. Medulla white, paraplectenchymatous, hyphae loosely interwoven. ASCOMATA apothecia, saddle-shaped, tubular or flat, discs oval or round, red- or dark brown to (sometimes) black, often with reflexed or crenulate margins, on horizontal or vertical ascending lobes, development hemiangiocarpic. Hymenium hyaline, paraphyses simple, upper parts brownish. Asci eight-spored, cylindrical to clavate, fissitunicate, apex of the endoascus with a KI+ blue annulus, of *Peltigera*-type. Spores narrowly fusiform to acicular, straight or somewhat curved, 3-septate, colourless, 25–110 × 2.5–8 µm. CONIDIOMATA pycnidia, marginal, immersed to sessile, observed only in a few species; conidia simple, colourless 6–11 × 2–4 µm. PHOTOBIONT cyanobacterial (*Nostoc*) or chlorococcoid (*Coccomyxa*) with cephalodia containing *Nostoc* on upper or lower surface of thallus.

Chemistry. Tenuiorin, methyl gyrophorate and gyrophoric acid, and hopane triterpenoids, especially zeorin (hopane-6*α*,22-diol), peltidactylin (7*β*-acetoxyhopan-22-ol), dolichorrhizin (15*α*-acetoxyhopan-22-ol), 28-acetoxy-22-hydroxyhopan-23-oic acid, 22-hydroxyhopan-23-oic acid, hopane-15*α*,22-diol, hopane-7*β*,22-diol, hopane-6*α*,7*β*,22-triol, phlebic acids A, B, C.

Note. A cosmopolitan genus with several terricolous and muscicolous species in boreal and temperate forests, and in tundra. It also occurs in and above high-altitude forests of tropical and subtropical areas.

1 Photobiont green alga, thallus bright green when moist 2
– Photobiont blue-green (*Nostoc*), thallus emerald to blue-grey to brown-green when moist 6

2 Laminal cephalodia containing *Nostoc* present; rhizines numerous 3
– Cephalodia on dark fan-shaped veins on lower surface; thallus attached on one holdfast only, no rhizines present ..... 30. *P. venosa*
3 Lower surface neither veined nor foveate; rhizines diffuse, short; under side of apothecia with a continuous green cortex 4
– Lower surface veined or foveate; rhizines mostly separate; under side of apothecia with discontinuous cortex 5
4 Cephalodia adnate to sessile, flattened to convex, apothecia not uncommon ..... 1. *P. aphthosa*
– Cephalodia loosely attached, peltate, lobulate, thallus lacking apothecia ..... 2. *P. britannica*
5 Lower surface with a distinct network of pale or darkened veins; marginally erect-tomentose, centrally glabrescent ..... 15. *P. leucophlebia*
– Lower surface reticulately foveate; upper surface also centrally with erect or appressed tomentum ..... 13. *P. latiloba*
6 Upper surface tomentose at least at lobe margins 7
– Upper surface smooth or scabrous, not tomentose 20
7 Sorediate, isidiate or phyllidiate 8
– Soredia and isidia absent (but flattened marginal squamules may be present) 11
8 Sorediate; soralia orbicular and laminal 9
– Isidiate or phyllidiate; soralia absent 10
9 Rhizines becoming tufted and darkening, apothecia common, soralia C– and KC– ..... 6. *P. didactyla*
– Rhizines pale, flocculent, soralia C+ and KC+ pink ..... 8. *P. extenuata*
10 Isidia laminal and mainly peltate; lobes usually under 1 cm wide; apothecia rare ..... 14. *P. lepidophora*
– Isidia (phyllidia) squamulose or corallinoid, more or less vertical, marginal and laminal; lobes often over 1 cm wide; often with apothecia ..... 25. *P. praetextata*
11 Lower surface distinctly veined 13
– Lower surface not distinctly veined 12
12 Dense erect tomentum present at margins; bluish or brownish green when wet; under side in the centre soon darkened ..... 17. *P. malacea*
– Tomentum erect, sparse; thallus blue-grey when wet, maculate; margins often minutely lacerate; funnel-shaped or flattened green lobelets with dense tomentum often present. *Nostoc* photosymbiodeme of ..... 1. *P. aphthosa* or 2. *P. britannica*
13 Rhizines slender, simple and with few branches 14
– Rhizines conspicuously and richly branched 16
14 Coarse species with often browned lobes over 1 cm wide; rhizines in central parts of thallus scattered, soon darkened; veins brownish and flattened towards thallus centre ..... 25. *P. praetextata*
– Small to medium-sized, lobes usually under 1 cm wide 15
15 Veins elevated, long remaining pale, rhizines whitish, not blackened ..... 24. *P. ponojensis*
– Veins becoming rusty brown and flat towards thallus centre, rhizines blackening in the central parts ..... 19. *P. monticola*
16 Rhizines confluent; veins darkened towards thallus centre or smooth 17
– Rhizines separate; veins conspicuously erect-tomentose also in thallus centre 19
17 Coarse species with lobes over 1 cm wide and down-turned lobe ends; veins and rhizines near margins whitish, rhizines stout, bush-like ..... 3. *P. canina*
– Small to medium-sized with lobes usually under 1 cm wide; margins upturned; rhizines soon darkened 18
18 Upper surface with thick grey, mostly appressed tomentum; veins narrow, interstices angular; rhizines squarrosely branched, confluent ..... 27. *P. rufescens*
– Upper surface browned, marginal parts with erect tomentum and partly scabrous but becoming glabrescent and glossy towards centre, often with yellow-brown tinge; veins in the centre brown to black, coated with dark tomentum; interstices whitish and rounded ..... 23. *P. kristinssonii*
19 Lobe margins down-turned; veins raised, narrow (under 1 mm), interstices coarse; rhizines slender, with densely squarrose but short ramifications; lacking secondary substances ..... 18. *P. membranacea*
– Lobe margins up-turned or flattened; veins flattened (1–1.5 mm wide); under side in parts ochraceous; interstices pitted; rhizines partly bush-like; secondary substances present ..... 26. *P. retifoveata*
20 Thallus with marginal linear soralia ..... 4. *P. collina*
– Thallus without soralia 21
21 Upper surface distinctly scabrous, mat 22
– Upper surface smooth, usually glossy 24
22 Lower surface veined 23
– Lower surface veinless; rhizines short, thick, fasciculate ..... 15. *P. lyngei*
23 Rhizines fasciculate or fibrillose, soon blackened; lower side dark in the centre ..... 28. *P. scabrosa*
– Rhizines pale, simple or in loose bundles; lower side ochraceous in the centre ..... 29. *P. scabrosella*
24 Lower surface lacking veins, dark with small whitish spots; marginal and laminal schizidia present; apothecia rare, with flat discs ..... 6. *P. elisabethae*
– Lower surface with various veining patterns; upper part of medulla not scaling off as schizidia 25
25 Veins white and raised, at least near thallus margin; rhizines pale, simple; devoid of secondary substances. ..... 5. *P. degenii*

– Veins flattened or lacking; rhizines fasciculate, darkened; secondary substances present 26
26 Veins parallel or fan-shaped, weakly anastomosing, rhizines confluent and in rows, upper surface maculate, margins often inflexed; containing phlebic acids A and B ..... 9. *P. frippii*
– Veins anastomosing and reticulate, or diffuse and with indistinct interstices; not containing phlebic acids A and B 27
27 Rhizines separate, fasciculate, soon blackening, arranged in concentric lines; apothecia with flat discs; marginal parts of lower surface whitish ..... 10. *P. horizontalis*
– Rhizines not arranged in concentric lines; apothecia saddle-shaped to tubular 28
28 Rhizines mainly confluent 29
– Rhizines solitary and simple 30
29 Upper surface usually slate blue, sometimes with brownish cast, often pruinose at margins; venation diffuse or indistinctly reticulate, veins white at margins, becoming blackened in the centre; rhizines diffuse, blackened; apothecia dark brown to black, tubular ..... 20. *P. neckeri*
– Upper surface greyish brown to brown, margins often dilacerate and lobulate; veins reticulate, dark brown, with a brownish hue also at margins; apothecia brown, discs saddle-shaped .. 23. *P. polydactylon*
30 Upper surface mat, often maculate; rhizines rather thin, pale, usually under 5 mm long; lower surface mainly ochraceous, venation diffuse..... 11. *P. hymenina*
– Upper surface glossy, not maculate; rhizines darkening; lower surface darkening in the centre 31
31 Thallus thick, rigid, often emerald green when moist, veins brown to black in the centre; rhizines tufted and branched, usually not over 5 mm long ..... 22. *P. occidentalis*
– Thallus thin, greyish blue or brown, often wrinkled, veins mainly pale to dark brown; rhizines slender, little branched, often over 7 mm long ..... 21. *P. neopolydactyla*

1. **Peltigera aphthosa** (L.) Willd.

Fl. Berol. Prodr.: 347 (1787). – *Lichen aphtosus* L., Sp. Pl. 2: 1148 (1753), „aphtosus". – TYPE: [Sweden, Fl. Suec. no.] 963, [Sp. Pl. no.] 46 (LINN 1273.175 lectotype; Howe, Bull. Torrey Bot. Club 39: 201, 1912).

D: vortet skjoldlav **F:** pilkkunahkajäkälä **I:** flannaskóf **N:** grønnever **S:** torsklav

Literature: Kujala, Metsäntutkimuslait. Julk. 59: 104, Karte 187 (1964); Tønsberg & Holtan-Hartwig, Nord. J. Bot. 3: 684–685 (1983); Holtan-Hartwig, Sommerfeltia 15: 30–36 (1993); Vitikainen, Acta Bot. Fennica 152: 25–27 (1994).

Figs: Holtan-Hartwig 1993: 30; Moberg & Holmåsen 1990: 7; Vitikainen 1994: 152: 25; Holien & Tønsberg 2006: 121.

THALLUS to 20 cm diam., 0.3–1 mm thick, lobes 1.5–3(–5) cm wide, usually obtuse and boat-shaped; upper surface green when moist, greyish to brownish green when dry, erect-tomentose near margins but glabrescent in central parts; cephalodia flattened to warty, tightly attached, to 2 mm diam.; margins ascending, usually entire; lower surface pale in marginal parts, abruptly blackening towards the centre, with few, broad and diffuse veins or veinless; rhizines scattered, simple to fasciculate, often confluent, darkened or black, to 5 mm long. APOTHECIA not uncommon, 7–15 mm diam., saddle-shaped, with a continuous even or warty lower cortex. Spores fusiform, (47–)53–67(–75) × 4–5 µm. CONIDIOMATA unknown. PHOTOBIONT *Coccomyxa*, in cephalodia *Nostoc*.

Chemistry. Tenuiorin, methyl gyrophorate, gyrophoric acid; phlebic acids A (minor) and B, zeorin, dolichorrhizin, hopane-15*α*,22-diol, unidentified substances. At least five chemotypes recognized in Norway.

Habitat. Among bryophytes in mesic to dry oligotrophic heath forests and mountain heaths, on mossy siliceous rock outcrops, more rarely on bare and acidic mineral soils, and on moss-clad tree bases.

Distribution. Widespread and common in the north of the area, extinct in Denmark. **D:** (*NJy*) (*ØJy*) (*VJy*) (*Sjæ*). **Gr. Fa. F:** *A V U EK St EH ES EP PH PS PK KP Kn OP PeP Ks KiL SoL EnL InL*. **I:** *ISu IVe IMi IAu INv INo*. **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **AI:** *JM Bi Sb*. **S:** *Sk Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Europe, Asia, North America; circumpolar, arctic to hemiboreal, rare in temperate zone.

2. **Peltigera britannica** (Gyeln.) Holt.-Hartw. & Tønsberg

Nord. J. Bot. 3: 685 (1983). – *Peltigera variolosa* f. *britannica* Gyeln., Ann. Mycol. 30: 453 (1932). – TYPE: England, Durham, Teesdale, Mudd (UPS holotype).

I: bretaskóf **N:** kystgrønnever

Literature: Tønsberg & Holtan-Hartwig, Nord. J. Bot. 3: 685–687 (1983); Holtan-Hartwig, Sommerfeltia 15: 37–38 (1993); Vitikainen, Acta Bot. Fennica 152: 27–29 (1994).

Figs: Holtan-Hartwig 1993: 37; Vitikainen 1994: 28; Holien & Tønsberg 2006: 121.

THALLUS 10–20(–40) cm diam., lobes 2–3 cm wide, rounded, margins plane to involute; upper surface green when moist, greyish green or partly browned when dry; erect-tomentose near margins, glabrescent towards centre; cephalodia shell-shaped, concave or flat, often detaching; lower surface veinless or veins diffuse; rhizines darkened, simple to diffuse or fasciculate to confluent, to 5 mm long. APOTHECIA unknown in Europe. CONIDIOMATA unknown. PHOTOBIONT green (*Coccomyxa*), and *Nostoc* in cephalodia, or *Nostoc* dominant (in the blue-green phototype).

Chemistry. Tenuiorin, methyl gyrophorate, gyrophoric acid, phlebic acids, dolichorrhizin, hopane-15*α*,22-diol.

Habitat. Among mosses on vertical rock-faces in damp and sheltered non-calcareous sites, the green phototype tolerating drier conditions than the blue-green phototype.

Distribution. Along the western coast of Norway, and in Atlantic islands, oceanic. **Fa. I:** *ISu IVe IAu INv*. **N:** *AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi*. Otherwise in western and southern Europe, and North America.

Note. The squamulose cephalodia and the wrinkled and pitted upper surface of *P. britannica* distinguish it from *P. aphthosa*. Independent blue-green phototypes are evidently rare, but composite morphotypes are common in Norway.

3. **Peltigera canina** (L.) Willd.

Fl. Berol. Prodr.: 347 (1787). – *Lichen caninus* L., Sp. Pl. 2: 1149 (1753). – TYPE: Flörke, Deutsche Lich. no. 153 (UPS, typ. cons. provisionally prop., Vitikainen, Acta Bot. Fenn. 152: 29, 1994).

Syn. *Peltigera suomensis* Gyeln.

D: hunde-skjoldlav **F:** huopanahkajäkälä **I:** engjaskóf **N:** bikkjenever **S:** filtlav

Literature: Vitikainen, Acta Bot. Fennica 152: 29–32 (1994).

Figs: Vitikainen 1994: 29; Holien & Tønsberg 2006: 122.

THALLUS 15(–20) cm diam., lobes 1–2(–3) cm wide and 10 cm long; upper surface densely tomentose marginally, central parts often without tomentum, grey to brownish grey when dry; margins reflexed; lower surface whitish, with whitish (near margins) to brownish (towards the centre), flattened to somewhat raised smooth veins; rhizines white near margins, pale to dark brown towards the centre, to 4 mm long, richly and penicillately branched, bases usually confluent. APOTHECIA common, dark brown to black, disc saddle-shaped, 4–10 mm diam. Spores fusiform, (36–)42–53(–65) × 2.5–5 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc*.

Chemistry. No secondary substances (by TLC).

Habitat. Terricolous on oligotrophic and usually acidic soils on dunes, heaths and dry grasslands, among and on bryophytes on forest floor, rock faces, and tree bases.

Distribution. Widespread and common, arctic to temperate. **D:** *NJy ØJy VJy SJy Fyn Sjæ Brn*. **Gr. Fa. F:** *A V U EK St EH ES EP PH PS PK KP Kn OP PeP Ks KiL SoL EnL InL*. **I:** *ISu IVe IMi IAu INv INo*. **N:** *Ak Op Vf VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **AI:** *JM Bi Sb*. **S:** *Sk Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Europe, Asia, North America, South America, Africa, Australia; widespread and circumpolar in the Northern Hemisphere, arctic to temperate; scattered in the Southern Hemisphere.

Note. Characterized by large tomentose lobes with inflexed margins and richly branched, confluent rhizines.

4. **Peltigera collina** (Ach.) Schrad.

J. Bot. 1801: 78 (1803). – *Lichen collinus* Ach., Lichenogr. Suec. Prodr.: 162 (1799 "1798"). – TYPE: Sweden (H-ACH 1475 lectotype, Gyelnik, Magyar Bot. lapok 29: 50, 1930).

Syn. *Peltigera scutata* (Ach.) Duby, *Peltigera subscutata* Gyeln., *Peltigera subscutata* var. *spitsbergensis* Gyeln.

D: grynet skjoldlav **F:** varjonahkajäkälä **I:** klettaskóf **N:** kystårenever **S:** grynig filtlav

Literature: Holtan-Hartwig, Sommerfeltia 15: 38–39 (1993); Vitikainen, Acta Bot. Fennica 152: 32–35 (1994).

Figs: Moberg & Holmåsen 1990: 174; Wirth 1995: 681; Holien & Tønsberg 2006: 123.

THALLUS 10(–15) cm diam., lobes 0.5–1 cm wide and 3 cm long; upper surface bluish to brownish grey, smooth or slightly scabrous, often somewhat pruinose; laminal and marginal linear soralia present; margins raised, undulate; lower surface pale, veins diffuse, flat; rhizines simple or tufted, 3 mm long. APOTHECIA not common, 3.5–5 mm diam., disc rounded or saddle-shaped, dark brown to black. Spores fusiform, 37–64 × 3–5.5 µm. CONIDIOMATA not uncommon, conidia 6.5–10 × 2.5–3.5 µm. PHOTOBIONT *Nostoc*.

Chemistry. Tenuiorin, methyl gyrophorate, gyrophoric acid, zeorin and peltidactylin, with hopane-6*α*,7*β*,22-triol and additional unidentified triterpenoids as minor substances.

Habitat. Among bryophytes on rock faces and boulders.Also epiphytic on deciduous trees or rarely, in oceanic habitats and old woodlands, even on twigs of *Picea.*

Distribution. Scattered, northern temperate to southern boreal (rare in the Arctic). **D:** *NJy ØJy VJy SJy Sjæ Brn*. **Gr. F:** *A V U EK St EH ES EP PK EnL InL*. **I:** *ISu IVe IAu INo*. **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi*. **AI:** *Sb*. **S:** *Sk Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Europe, Asia, North America, South America, (sub)-oceanic, circumboreal to antiboreal.

Note. Recognized by the linear marginal soralia and non-tomentose cortex.

5. **Peltigera degenii** Gyeln.

Magyar Bot. Lapok 25: 253 (1927). – TYPE: Japan, Honshu ("Nippon"), Wakinosawa, 1902 Faurie 5326 (W 1914: 1214 lectotype, Vitikainen, Acta Bot. Fenn. 152: 35 (1994).

Syn. *Peltigera nitens* (Anders) Gyeln.

F: polkunahkajäkälä **N:** blank bikkjenever **S:** tunn trevarlav

Red-listed in: **D**

Literature Vitikainen, Acta Bot. Fenn. 152: 35–37 (1994).

Figs: Moberg & Holmåsen 1990: 174; Vitikainen 1994:35.

THALLUS to 10 cm diam., lobes 0.5–1 cm wide, 2–4 cm long; upper surface smooth, glossy, bluish-grey when dry, sometimes with a little tomentum in the lobe margins especially near young apothecia; margins flexuos, up-turned or flat, often phyllidiate; lower side white near margins, veins narrow, raised, whitish, becoming darker brown towards centre of thallus; rhizines pale, simple, discrete, to 5–7 mm long. APOTHECIA not uncommon, on elongated stalks, disc 4–9 mm diam., usually pale brown, saddle-shaped. Spores acicular, (40–)45–60(–68) × 2.5–5 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc*.

Chemistry. No secondary substances (by TLC).

Habitat. On bryophytes on stones and boulders, rock outcrops and tree bases (especially on deciduous trees), or on soil on pathsides, especially in old woodlands.

Distribution. Widespread but scattered, southern to middle (to northern) boreal. **D:** *ØJy Sjæ*. **F:** *A V U EK St EH ES EP PH PS PK Kn OP Ks InL*. **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi*. **S:** *Bl SmI Hl Vg Nrk Srm Vrm Upl Dlr Ång Hrj Jmt Vb Nb ÅsL LyL TL*. Europe, Asia, North America, incompletely circumpolar, temperate to boreal.

Note. Characterized by the narrow and raised pale veins and simple, unbranched and pale rhizines, and the lack of secondary substances.

6. **Peltigera didactyla** (With.) J.R.Laundon

Lichenologist 16: 217 (1984). – *Lichen didactylus* With., Bot. Arr. Veg. Gr. Brit. 1, 2: 718 (1776), '*Didactylos'*. – TYPE: Icon in Dillenius, Historia Muscorum.: tab. 28, fig. 108, 1742 (holotype; corresponding specimen in herb. Dillenius (OXF epitype; Nordic Lichen Flora 3: 146, 2007; in Laundon, Lichenologist: 16: 217, 1984 as 'typotype').

Syn. *Peltigera spuria* (Ach.) DC., *Peltigera erumpens* (Taylor) Elenkin, *Peltigera hazslinszkyi* Gyeln.

D: liden skjoldlav **F:** nuotionahkajäkälä **I:** lambaskóf **N:** smånever **S:** styverlav

Literature Vitikainen, Acta Bot. Fenn. 152: 37–41 (1994); Goffinet & Hastings, Lichenologist 27: 43–58 (1995); Bergsten, Svensk Bot. Tidskr. 93: 282–283 (1999); Goffinet, Miadlikowska & Goward, Bryologist 106: 349–364 (2003).

Figs: Vitikainen 1994: 38; Wirth 1995: 683.

THALLUS 1–4(–5) cm diam., lobes 0.5–1 cm wide and 1–2 cm long; upper surface grey to brown, tomentose especially near margins, with maculiform soralia 1–3(–

5) mm diam.; margins flat to elevated; lower surface with narrow whitish or darkening brownish veins; rhizines dense, pale or more solitary and browned, to 4 mm long. APOTHECIA 3–4(–7) mm diam., saddle-shaped. Spores fusiform, (36–)45–65(–80) × 3–5 µm. CONIDIOMATA infrequent, conidia 6.5–8 × 3–4 µm. PHOTOBIONT *Nostoc*.

Chemistry. No constant secondary substances (by TLC) but occasionally gyrophoric acid and methyl gyrophorate in soralia (C+ red and KC+ red).

Habitat. Bare, sandy soils on roadsides, recently burnt places, rock crevices, especially in calcareous or eutrophic soils, or on bryophytes on rock outcrops, stone walls and tree bases.

Distribution. Widely distributed, temperate to arctic. **D:** *NJy ØJy VJy SJy Fyn Sjæ Brn*. **Gr. F:** *A V U EK St EH ES EP PH PS PK KP Kn OP PeP Ks KiL SoL EnL InL*. **I:** *ISu IVe IMi IAu INv INo*. **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **AI:** *JM Sb*. **S:** *Sk Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Europe, Asia, North America, South America, Africa, Australia, Oceania, cosmopolitan.

Note. Characterized by the presence of laminal, orbicular, mostly C– soralia on a more or less tomentose, small-sized thallus. The relationship and status of this species and *P. extenuata* needs clarification.

7. **Peltigera elisabethae** Gyeln.

Bot. Közlemények 24: 135 (1927). – TYPE: Austria. Niederösterreich, Obersee bei Lunz, 1899 Keissler (W 1899: 6324 holotype).

Syn. *Peltigera mauritzii* Gyeln.

F: louhunahkajäkälä **N:** frynsenever **S:** nordlig filtlav

Red-listed in: **F**

Literature: Holtan-Hartwig, Sommerfeltia 15: 39–42 (1993); Vitikainen, Acta Bot. Fenn. 152: 42–44 (1994).

Figs: Holtan-Hartwig 1993: 39–42; Vitikainen 1994: 42.

THALLUS to 15 cm diam., lobes 0.5–2 cm wide and 5 cm long; upper surface shiny, grey to brown; margins crisped, often with isidioid schizidia and lobules; lower surface pale near margins but dark brown or black in the centre, essentially without veins but small pale or white interstices present; rhizines thick, black, fasciculate, rather short, in concentric rows, 2–3 mm long. APOTHECIA not common, disc oval to rounded, flat, to 9 mm diam. Spores fusiform, (24–)27–34(–44) × 3–7 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc*.

Chemistry. Two chemotypes (similar to those of *P. horizontalis*): (I) Tenuiorin, methyl gyrophorate, gyrophoric acid, zeorin and an unidentified triterpenoid; (II) those listed and additionally up to 8 unidentified triterpenoids. Chemotype I is more frequent; in Norway II occurs scattered, mainly in the south.

Habitat. On bryophytes over rocks in forests, occasionally on soil in dry grasslands, usually in calcareous regions, rarely on basal trunks of deciduous trees.

Distribution. Fairly rare, northern boreal to hemiboreal. **Fa. F:** *V U PH Kn*. **N:** *Øf Ak He Op Bu Te AA Ho SF MR ST NT Tr VFi*. **S:** *Dls Upl Dlr Gst Mpd Hrj Jmt ÅsL LyL TL*. Europe, Asia, North America, circumpolar.

Note. Probably much overlooked, but usually easily distinguished by schizidia-like propagules, veinless lower surface and occurrence in nutrient-rich or calcareous habitats.

8. **Peltigera extenuata** (Nyl. ex Vain.) Lojka

Lichenotheca universalis, Fasc. V, no. 222 (1886). – *Peltigera canina* var. *extenuata* Nyl. ex Vain., Meddel. Soc. Fauna Fl. Fenn. 2: 49 (1878). – TYPE: Finland, Tavastia australis, Asikkala, Kaitas, 1863 Silén & Norrlin (H lectotype, Vitikainen, Acta Bot. Fennica 152: 38, 1994).

Syn. *Peltigera didactyla* var. *extenuata* (Nyl. ex Vain.) Goffinet & Hastings

Literature: Goffinet & Hastings, Lichenologist 27: 43–58 (1995); Goffinet, Miadlikowska & Goward, Bryologist 106: 349–364 (2003).

Figs: Moberg & Holmåsen 1990: 178 (as *Peltigera spuria*).

THALLUS to 8 cm diam., lobes to 1–1.5 cm wide, flat or concave, margins sometimes wavy; upper surface pale to greyish brown with to 2 mm wide maculiform or confluent soralia, with thick appressed tomentum, glabrescent but dull towards centre; lower surface with whitish veins that may become darker towards centre; rhizines to 5 mm long, white, densely branched to

flocculent, becoming darker in the centre. APOTHECIA rare, 5 mm diam., on shortly elongated lobes, disc brown, saddle-shaped. Spores fusiform, 40–60 × 3–4 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc*.

Chemistry. Methyl gyrophorate and gyrophoric acid (less); medulla and soralia C+ red and KC+ red (but reaction often weak and quickly disappearing).

Habitat. Over mosses on soil, rock or tree bases, also on mineral soil.

Distribution. Apparently rather common in the whole area, perhaps less in the south. **Gr. F:** *A V U EK St EH ES EP PH PS PK KP Kn OP PeP Ks KiL SoL EnL InL*. **I:** *ISu IVe IMi IAu INv INo*. **N:** *Ak Op Bu Te VA Ro Ho SF MR ST SNo NNo Tr ØFi*. **S:** *Sk Öl Gtl SmI Bh Vg Ög Nrk Srm Vrm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Europe, Asia, North and South America, Africa, Australia, probably cosmopolite.

Note. Formerly treated as a chemotype or variety of *P. didactyla*, but due to recent phylogenetic studies accepted as species. However, the differences of these species in chemistry and morphology of rhizines are not always exclusive.

9. **Peltigera frippii** Holt.-Hartw.

Lichenologist 20: 11 (1988). – TYPE: Norway, Hedmark, Rendalen, south of the river Neka, east of the Country road, 1981 Gjerlaug 2233 (O holotype).

F: turjannahkajäkälä **N:** skjørnever

Literature: Holtan-Hartwig, Lichenologist 20: 11–15 (1988); Holtan-Hartwig, Sommerfeltia 15: 42–44 (1993); Vitikainen, Acta Bot. Fenn. 152: 44–45 (1994).

Figs: Holtan-Hartwig 1993: 43; Vitikainen 1994: 44.

THALLUS to 15 cm diam., fragile, lobes narrow, to 1 cm wide, often imbricate, irregular and frequently deeply incised; upper surface greyish brown to brown, dull to glossy, smooth, lacking tomentum, maculate when moist, often faintly pruinose towards the lobe tips; margins sinuous, ascending to involute; lower surface blackish brown centrally, pale brown to colourless towards margins, veins colourless to blackish brown, parallel to fan-shaped; rhizines medium brown to blackish brown, brush-shaped, frequently confluent, 1–2 mm long. APOTHECIA and CONIDIOMATA unknown in European material. PHOTOBIONT *Nostoc*.

Chemistry. Tenuiorin, methyl gyrophorate, zeorin, phlebic acids A (minor) and B, 2 unidentified triterpenoids.

Habitat. On bryophytes on open, sandy and humus-rich soil, in low dwarf-shrub vegetation and on riverbanks.

Distribution. Scattered or rare, arctic to northern boreal. **Gr. F:** *Ks InL*. **N:** *He Op Bu Te SF ST Tr VFi ØFi*. **AI:** *Sb*. **S:** *PL*? *LuL*. Europe, Asia, North America, disjunct circumpolar.

Note. Recognized by smooth, maculate upper surface, crisp appearance, and fan-shaped veins as well as by the combination of phlebic acid and triterpenoids as secondary substances.

10. **Peltigera horizontalis** (Huds.) Baumg.

Fl. Lips.: 562 (1790). – *Lichen horizontalis* Huds., Fl. Angl.: 453 (1762). – TYPE: [England] In sylva Enfieldensi", Icon in Dillenius, Historia Muscorum: tab. 28, fig. 104B, 1742 (holotype); corresponding specimen in herb Dillenius (OXF epitype, Vitikainen, Nordic Lichen Flora 3: 146, 2007).

D: blank skjoldlav **F:** nappinahkajäkälä **N:** blanknever **S:** sköldfiltlav

Red-listed in: **D**

Literature: Holtan-Hartwig, Sommerfeltia 15: 44–45 (1993); Vitikainen, Acta Bot. Fenn. 152: 45–47 (1994).

Figs: Holtan-Hartwig 1993: 44; Moberg & Holmåsen 1990: 175; Vitikainen 1994: 46; Wirth 1995: 683; Holien & Tønsberg 2006: 123.

THALLUS 10–20(–40) cm diam., lobes 1–1.5(–3) cm wide and 5 cm long; upper surface bluish-grey or brownish, smooth, shiny; margins entire to crisped, ascending to flat; lower surface pale towards margins, darker towards centre, veins brown to black, flat, with white interstices; rhizines dark, fasciculate, 2–3 mm long. APOTHECIA common, rounded to oval, discs flat, to 7 mm diam. Spores fusiform, (25–)33–41(–47) × 3–7 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc*.

Chemistry. Two chemotypes (similar to those in *P. elisabethae*): (I) tenuiorin, methyl gyrophorate, gyrophoric acid, zeorin, unidentified triterpenoid, hopane-7*ß*,22-diol (trace), (II) the same substances plus up to 7 unidentified terpenoids.

Habitat. Among mosses on trunks and stumps of old deciduous trees, often in the Lobarion communities, also on rotting logs and rock faces, often in shelter. Indicator of old woodlands.

Distribution. Common and widespread in oceanic parts, rarer northwards and in continental areas; temperate to southern boreal. **D:** *NJy ØJy Fyn Sjæ Brn*. **F:** *A V U EK St EH ES PH PS PK*. **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo*. **S:** *Sk Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Nb LyL*. Europe, Asia, North America, circumpolar.

Note. Recognized by its permanently flat apothecial discs, the characteristic pattern of flat dark veins with elongated pale interstices, and the characteristic blunt-tipped young rhizines occurring in concentrical rows.

11. **Peltigera hymenina** (Ach.) Delise

in Duby, Bot. Gall. 2: 597 (1830). – *Peltidea hymenina* Ach., Methodus: 284 (1803). – TYPE: Sweden (H-ACH 1478 lectotype, Vitikainen, Acta Bot. Fenn. 152: 47, 1994).

Syn. *Peltigera lactucifolia* s. auct., non (With.) Laundon, *Peltigera polydactyla* var. *crassoides* Gyeln.

D: hinde-skjoldlav **F:** lännennahkajäkälä **I:** hagaskóf **N:** papirnever **S:** sydlig filtlav

Literature: Holtan-Hartwig, Sommerfeltia 15: 47–50 (1993); Vitikainen, Acta Bot. Fenn. 152: 47–50 (1994).

Figs: Holtan-Hartwig 1993: 47; Vitikainen 1994: 48. Wirth 1995: 685; Holien & Tønsberg 2006: 124.

THALLUS to 20 cm diam., lobes 1–2 cm wide, linear to imbricate; upper surface smooth, mat to glossy, grey to brownish when dry, somewhat maculate; margins ascending; lower surface with diffuse ochraceous or browned venation; rhizines pale, simple or fasciculate, to 5 mm long, separate. APOTHECIA common, saddle-shaped, brown, to 6 mm diam. Spores fusiform, (47–)57–71(–90) × 3–5 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc*.

Chemistry. Tenuiorin, methyl gyrophorate, gyrophoric acid, peltidactylin, dolichorrhizin, zeorin (trace), hopane-7*β*,22-diol (minor), and unidentified (minor) triterpenoids.

Habitat. On bryophytes or on soil in grasslands, on dunes and lawns, rock faces and tree bases; favouring damp conditions.

Distribution. Common and widespread in the oceanic western and southern parts, rarer northwards and in continental areas; hemiboreal to southern boreal. **D:** *NJy ØJy VJy SJy Fyn Sjæ Brn*. **Gr. Fa. F:** *A V U St EP OP*. **I:** *ISu IVe IMi IAu INv INo*. **N:** *Øf Ak Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **AI:** *Sb*. **S:** *Sk Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl*. Europe, North Africa and North America; disjunct circumpolar.

Note. Distinguished by pale (often yellowish brown to ochraceous) lower surface; rather diffuse venation; maculate and mat upper surface; and thin, short and pale, mostly simple, sometimes somewhat branched, rhizines.

12. **Peltigera kristinssonii** Vitik.

Ann. Bot. Fenn. 22: 291 (1985). – TYPE: Iceland, Ísafjarðarsýsla, Jökulfirðir District, Hesteyri, 1968 Kristinsson 10159 (DUKE holotype, AMNH isotype).

Syn. *Peltigera occidentalis* sensu Kristinsson

F: pohjannahkajäkälä **I:** dældaskóf **N:** ru brunnever **S:** fjällfiltlav

Literature: Kristinsson, Bryologist 71: 38–40 (1968); Vitikainen, Ann. Bot. Fenn. 22: 291–294 (1985).

Figs: Vitikainen 1994: 50.

THALLUS to 10 cm diam., lobes 1–1.5 cm wide and 5–7 cm long; upper surface tomentose with erect hairs near the edge, somewhat scabrous and glabrescent towards the centre, grey-brown to brown, often with a yellowish tint; margins elevated or slightly inflexed; lower surface whitish in marginal parts, with a distinct network of flat, dark brown, tomentose veins in the centre, interstices white, rounded; rhizines fasciculate, tufted or slightly confluent, squarrosely branched, dark brown to black, to 3–4 mm long. APOTHECIA common, on ascending lobes, disc saddle-formed, to 8–10 mm diam. Spores fusiform, (40–)44–59(–73) × 3–4(–5) µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc*.

Chemistry. No secondary substances (by TLC).

Habitat. Terricolous and muscicolous, mesotrophic and slightly calciphilous.

Distribution. Northern boreal to arctic, widespread in Iceland. **Gr. F:** *KiL*, *SoL Enl InL*. **I:** *ISu IVe IMi IAu*

INv INo. **N:** *Op Ro Ho ST NT SNo NNo Tr VFi ØFi*. **AI:** *JM*. **S:** *Jmt Vb Nb ÅsL LyL PL LuL TL*. Europe, Asia, North America; circumpolar.

Note. Distinguished by its centrally glabrescent and brown thallus, the dark brown, reticulate and tomentose veins and the tufted rhizines.

13. Peltigera latiloba Holt.-Hartw.

Graphis Scripta 17: 34 (2005). – TYPE: Norway, Finnmark, Karasjok, just S of the river Njiv'lujågas, 1986 Timdal 4787 (O-L116343 holotype).

N: bred grønnever

Red-listed in: **N**

Literature: Holtan-Hartwig, Sommerfeltia 15: 71–72 (1993) [as *P.* sp. 1].

Figs: Holtan-Hartwig 1993: 71.

THALLUS large, to 30 cm diam., lobes 3–4 cm wide, flexuous; margins ascending, crenulate; upper surface greyish green, wrinkled, tomentose also towards centre; cephalodia convex to cerebriform, to 1 mm wide; lower surface reticulately foveate with a broad, pale zone marginally, dark brown to black towards centre; rhizines separate, bush-shaped, 1–3 mm long. APOTHECIA not uncommon, saddle-formed, disc to 10 mm diam., lower surface of apothecia with green corticate patches. Spores fusiform, 55–65 × 4–5 µm. CONIDIOMATA unknown. PHOTOBIONT *Coccomyxa*, cephalodia containing *Nostoc.*

Chemistry. Tenuiorin, methyl gyrophorate, gyrophoric acid, 2–5 unidentified hopane triterpenoids.

Habitat. On soil among mosses in riverine thickets, subalpine forests and low-alpine dwarf-shrub vegetation.

Distribution. Rare in central and northern Norway, Sweden and Finland but insufficiently known. **F:** *OP PeP Ks KiL SoL EnL InL.* **N:** *Op ST ØFi.* **S:** *Nb TL.* Scandinavia, North America (Alaska), Siberia (Sakha), circumpolar, boreal to arctic.

Note. Resembles *P. leucophlebia* but is characterized by its tomentose thallus centre and reticulately foveate lower surface.

14. Peltigera lepidophora (Vain.) Bitter

Ber. Deutsch. Bot. Ges. 22: 251 (1904). – *Peltigera canina* var. *lepidophora* Vain., Meddel. Soc. Fauna Fl. Fenn. 2: 49 (1878). – TYPE: Finland, Tavastia borealis, Jyväskylä, Lohikoski, 1874 Lang (TUR-V 9864 lectotype, Vitikainen, Acta Bot. Fenn. 152: 51, 1994).

F: kalkkinahkajäkälä **I:** hosuskóf **N:** skjoldnever **S:** kornig filtlav

Literature: Vitikainen, Acta Bot. Fenn. 152: 51–53 (1994).

Figs: Moberg & Holmåsen 1990: 175.

THALLUS 2–7 cm diam., lobes 5–10(–20) mm wide, to 35(–40) mm long; upper surface grey to brownish, tomentose and somewhat scabrous, with peltate or sometimes squamulose isidia to 1.5 mm wide; margins flattened to raised; lower surface pale, veins browned, narrow and flat; rhizines simple to confluent, brown, to 5(–10) mm long. APOTHECIA uncommon, on shortly elongated lobes, disc saddle-shaped, 3–7 mm diam. Spores fusiform, 49–59 × 5 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc*.

Chemistry. No secondary substances (by TLC).

Habitat. On soil on slightly calcareous or nutrient-rich substrata, seldom on bryophytes.

Distribution. Scattered, arctic to hemiboreal. **Gr. F:** *A V U St EH ES PH PS PK KP Kn OP PeP Ks KiL SoL EnL InL*. **I:** *ISu IVe IMi IAu INo*. **N:** *Øf Ak He Op Bu Vf Te Ho SF MR ST SNo NNo Tr VFi ØFi*. **AI:** *Sb*. **S:** *Sk Öl Gtl SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Europe, Asia, North America, South America, Australia, Oceania, widespread but scattered.

Note. Easily recognized by the laminal peltate isidia and the tomentose cortex.

15. Peltigera leucophlebia (Nyl.) Gyeln.

Magyar Bot. Lapok 24: 79 (1926). – *Peltigera aphthosa* 1. *leucophlebia* Nyl., Syn. Lich.: 323 (1860). – TYPE: Sweden. Göteborg, Lange (H-NYL 33285 lectotype, Vitikainen, Acta Bot. Fenn. 152: 53, 1994).

Syn. *Peltidea leucophlebia* (Nyl.) Räsänen, *Peltigera variolosa* (A.Massal.) Gyeln., *Peltigera aphthosa* var. *variolosa* A.Massal.

D: året skjoldlav **F:** ahonahkajäkälä **I:** dílaskóf **N:** åregrønnever **S:** ådrig torsklav

Red-listed in: **D**

Literature: Christiansen, Ramkær, Rose & Søchting, Bot. Tidsskr. 74: 108 (1979); Holtan-Hartwig, Sommerfeltia 15: 50–51 (1993); Vitikainen, Acta Bot. Fenn. 152: 53–56 (1994).

Figs: Holtan-Hartwig 1993: 50; Moberg & Holmåsen 1990: 173; Vitikainen 1994: 54; Wirth 1995: 687.

THALLUS to 20(–25) cm diam., thin, 0.2–0.4 mm thick, flexible; margins plane to somewhat ascending, curled; upper surface greyish green, partly browned, often wrinkled, erect-tomentose near margins, glabrescent towards centre; cephalodia convex to cerebriform to 1.2 mm wide; lower surface with reticulate, pale to dark brown or black veins; rhizines simple, tufted or fasciculate, pale to blackened, to 5 mm long. APOTHECIA common, saddle-shaped, 4–7(–15) mm diam., lower surface of apothecia with green corticate patches. Spores fusiform, 50–70 × 4–6 µm. CONIDIOMATA unknown. PHOTOBIONT *Coccomyxa*, cephalodia containing *Nostoc*.

Chemistry. Tenuiorin, methyl gyrophorate, gyrophoric acid, 2–4 unidentified hopane triterpenoids.

Habitat. On rock faces and tree bases, in dry meadows, also on soil and seepages, usually preferring basic and eutrophic habitats.

Distribution. Widespread and common except for the southern parts; arctic to hemiboreal, very rare in Denmark. **D:** *NJy Sjæ Brn*. **Gr. Fa. F:** *A V U EK St EH ES EP PH PS PK KP Kn OP PeP Ks KiL SoL EnL InL*. **I:** *ISu IVe IMi IAu INv INo*. **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **AI:** *JM Sb*. **S:** *Sk Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Europe, Asia, North America; circumpolar, (temperate) boreal to arctic.

Note. Recognized by its veined lower surface, centrally glabrous thallus surface, predominantly convex cephalodia and only patchily corticate lower side of the apothecia.

16. **Peltigera lyngei** Gyeln.

Ann. Mycol. 30: 453 (1932). – TYPE: Svalbard, Kobbebay, 1861 Malmgren (UPS holotype, S isotype).

Literature: Holtan-Hartwig, Lichenologist 20: 13 (1988), Vitikainen, Acta Bot. Fenn. 152: 56–57 (1994).

THALLUS to 10 cm diam., thickish, lobes 0.5–1 cm wide; margins plane to elevated; upper surface scabrous, greyish green to browned; lower surface veinless, blackened towards the centre, with small white spots; rhizines few, fasciculate, 1–2 mm long, thick, diffuse or scattered. APOTHECIA very rare (only immature ones seen), disc convex. Spores not seen. CONIDIOMATA unknown. PHOTOBIONT *Nostoc*.

Chemistry. Tenuiorin, methyl gyrophorate, gyrophoric acid, peltidactylin, dolichorrhizin, hopane-7*ß*,22-diol and hopane-15*α*,22-diol.

Habitat. On soil among mosses.

Distribution. Very rare, arctic. **I:** *IMi*. **AI:** *Sb*. Europe, Asia, North America; probably circumarctic.

Note. Poorly known (or overlooked) species; its non-veined lower surface with sparse, subsimple and short rhizines characterizes it against *P. scabrosa*. Careful observations in the field are needed to elucidate the relationships of these two species.

17. **Peltigera malacea** (Ach.) Funck

Cryptog. Gew. Fichtelgebirg., ed. 2, Fasc. 33: 5 (1827). – *Peltidea malacea* Ach., Syn. Meth. Lich.: 240 (1814). – TYPE: Switzerland („Helvetia"), Schleicher 341-a (H-ACH 1489 lectotype, Gyelnik, Magyar Bot. Lapok 29: 56, 1930).

D: mat skjoldlav **F:** anturanahkajäkälä **I:** mattaskóf **N:** mattnever **S:** matt filtlav

Red-listed in: **D**

Literature: Holtan-Hartwig, Sommerfeltia 15: 51–56 (1993); Vitikainen, Acta Bot. Fenn. 152: 57–61 (1994).

Figs: Wirth 1995: 687; Moberg & Holmåsen 1990: 176; Holtan-Hartwig 1993: 51; Vitikainen 1994: 59.

THALLUS 15(–20) cm diam., thick (to 1.5 mm); lobes to 1–2(–3) cm wide and 10 cm long, often imbricate; upper surface bluish, greenish or brownish grey, dark green but sometimes bluish when wet, erect-tomentose near margins, sometimes scabrous or pruinose, often glabrescent towards centre; margins plane to ascending, inrolled, undulate; lower surface veinless or with a few diffuse veins, pale brownish near margins, black in

central parts; rhizines sparse, bush-shaped or fasciculate, black, 3 mm long. APOTHECIA not common, on short stalks, saddle-shaped; discs brown-black, 4–8 mm diam. Spores acicular, (45–)52–70(–90) × 2.5–6.5 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc*.

Chemistry. Four chemotypes, with tenuiorin, methyl gyrophorate, gyrophoric acid, 3–5 hopane triterpenoids, zeorin, dolichorrhizin.

Habitat. Amongst mosses on soil on the forest floor, in dunes, heaths and dry rocky grasslands, also on bare soil and in subalpine-alpine sites; oligotrophic and acidophytic.

Distribution. Widespread, boreal to arctic, less common in temperate lowlands and rare in oceanic areas. **D:** *NJy ØJy VJy SJy Fyn Sjæ Brn*. **Gr. Fa. F:** *A V U EK St EH ES EP PH PS PK KP Kn OP PeP Ks KiL SoL EnL InL*. **I:** *ISu IVe IMi IAu INv INo*. **N:** *Øf Ak He Op Bu Vf Te AA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **AI:** *JM Sb*. **S:** *Sk Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Europe, Asia, North America, circumpolar, temperate to arctic.

Note. Characterized by erect-tomentose upper surface, at least marginally, and non-veined lower surface. A large-sized morph (var. *subpulverulenta* Gyeln.) with partly scabrid cortex, greyish blue cyanobacteria and perhaps differing chemistry deserves further attention.

18. **Peltigera membranacea** (Ach.) Nyl.

Bull. Soc. Linn. Normandie, sér. 4, 1: 74 (1887). – *Peltigera canina* γ *mebranacea* Ach., Lichenogr. Universalis: 518 (1810). – TYPE: Switzerland ("Helvetia"), Schleicher (H-ACH 1486, left-hand specimen, lectotype, Vitikainen, Acta Bot. Fennica 152: 62, 1994).

Syn. *Peltigera canina* var. *membranacea* (Ach.) Duby

D: tynd skjoldlav **F:** kelmunahkajäkälä **I:** himnuskóf **N:** hinnenever **S:** tunn filtlav

Literature: Vitikainen, Acta Bot. Fenn. 152: 62–63 (1994).

Figs: Vitikainen 1994: 62.

THALLUS 15–20(–30) cm diam.; lobes 1–2(–4) cm wide and to 10 cm long; upper surface grey to brownish grey when dry, bullate, thinly tomentose, glabrescent and shiny towards the centre; margins down-turned; lower surface whitish, veins pale to brown, downy, raised, 0.5–0.7 mm wide; rhizines simple, dispersed, 5–7(–13) mm long, with short squarrose ramifications (bottle-brush-like). APOTHECIA common, saddle-shaped, brown-reddish brown, 5–6 mm diam. Spores acicular, (40–)49–64(–80) × 2.5–5 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc*.

Chemistry. No secondary substances (by TLC).

Habitat. On and among bryophytes on rock faces and tree trunks, also on calcareous soils.

Distribution. Western, suboceanic, temperate to northern boreal. **D:** *NJy ØJy VJy SJy Sjæ Brn*. **Gr. Fa. F:** *A V U EK St EH ES EP PH PS Kn*. **I:** *ISu IVe IMi IAu INv INo*. **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **AI:** *JM Sb*?. **S:** *Sk Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL TL*. Europe, eastern Asia, North America, Macaronesia, disjunct circumpolar, temperate to boreal, suboceanic.

Note. Distinguished by the thin thallus, narrow, elevated veins, and slender, solitary, shortly branched rhizines. A strain of *P. canina* with thin thallus occurs especially in the western and northern (oceanic) parts of the area.

19. **Peltigera monticola** Vitik.

Acta Bot. Fenn. 152: 64 (1994). – TYPE: Austria, Tirol, Stubaier Alpen, Mt. Hammerspitze, 1973 Vitikainen 8884 (H holotype).

S: bergfiltlav

Literature:Vitikainen, Acta Bot. Fenn. 152: 64–65 (1994); Bergsten, Svensk Bot. Tidskr. 93: 279–285 (1999).

Figs: Bergsten, Svensk Bot. Tidskr. 93: 280 (1999); Vitikainen 1994: 64.

THALLUS to 10 cm diam.; lobes to 5 mm wide; upper surface grey to brownish grey when dry, margins upturned, often pruinose and lobulate, thinly tomentose but glabrescent and scabrid towards the centre; veins pale to brown, diffuse and flattened, rusty brownish towards thallus centre; rhizines pale and subsimple near margins, tufted and dark brown to black towards central parts of thallus, to 5 mm long. APOTHECIA not uncommon, saddle-shaped, brown–reddish brown, 5–6 mm diam. Spores fusiform, 40–50 × 4–5 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc*.

Chemistry. No secondary substances (by TLC).

Habitat. On mossy rocks and soil, especially in subalpine meadows.

Distribution. Mainly northern boreal zone, scattered. **F:** *Kn EnL.* **I:** *ISu IVe IMi IAu INv INo.* **N:** *Op ØFi.* **S:** *Upl Vb LyL TL.* Disjunct circumpolar, Europe, Asia, North America, South America.

Note. Probably much overlooked. Distinguished from *Peltigera ponojensis* by the flattened and often rusty-coloured veins and blackening rhizines; their relationship, especially in Iceland, needs clarification.

20. **Peltigera neckeri** Hepp ex Müll.Arg.

Mem. Soc. Phys. Genève 16: 370 (1862). – TYPE: France, Salève, an Piton, 1852 Müller Argoviensis (G lectotype; BM, M, UPS isolectotypes, Vitikainen, Acta Bot. Fenn. 152: 65, 1994).

Syn. *Peltigera polydactyloides* s. auct.

D: glinsende skjoldlav **F:** ketonahkajäkälä **I:** blikskóf **N:** jordnever **S:** styv filtlav

Literature: Holtan-Hartwig, Sommerfeltia 15: 56–57; Vitikainen, Acta Bot. Fenn. 152: 65–67 (1994).

Figs: Holtan-Hartwig 1993: 57; Sérusiaux et al. 2004: 126; Vitikainen 1994: 65.

THALLUS 10(–20) cm diam.; lobes 0.7–1(–1.5) cm wide and 3–4 cm long; upper surface bluish to brownish grey, shiny, marginal parts usually pruinose, sometimes maculate; margins up-turned; lower surface whitish near margins, veins reticulate, diffuse, soon blackening towards centre; rhizines diffuse or fasciculate, 3–6 mm long, dark brown to black. APOTHECIA common, saddle-like to finger-shaped, dark brown to black, 3–8 mm long, on short (3–5 mm) stalks. Spores fusiform, (31–) 49–61(–78) × 2.5–5 µm. CONIDIOMATA sometimes found. PHOTOBIONT *Nostoc*.

Chemistry. Tenuiorin, methyl gyrophorate, gyrophoric acid, dolichorrhizin (trace), zeorin, with up to 6 additional triterpenoids.

Habitat. On soil or among bryophytes in dry grasslands, pastures and dunes; on stones, bases of deciduous trees and hummocks in mires. Minerotrophic, calciphilous.

Distribution. Widespread, temperate to arctic. **D:** *NJy ØJy VJy SJy Fyn Sjæ Brn*. **Gr. Fa. F:** *A V U EK St EH ES EP PH PS PK KP Kn OP PeP Ks KiL SoL EnL InL*. **I:** *ISu IVe IMi IAu INv INo*. **N:** *Øf Ak He Op Bu Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **AI:** *Sb*. **S:** *Sk Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Mpd Hrj Jmt Vb Nb ÅsL LyL TL*. Europe, Asia, North America, Macaronesia; circumpolar, temperate to arctic.

Note. Characterized by its greyish thallus, up-turned, often pruinose margins, diffuse veining pattern and dark brown to blackish apothecia as well as the pattern of triterpenoids.

21. **Peltigera neopolydactyla** (Gyeln.) Gyeln.

Rev. Bryol. Lichenol. 5: 71 (1933). – *Peltigera polydactylon* var. *neopolydactyla* Gyeln., Magyar Bot. Lapok 31: 46 (1932). – TYPE: Sweden, Medelpad, Tuna, Allstakullarna, 1928 Eriksson (BP holotype, not found; S isotype, Vitikainen, Acta Bot. Fenn. 152: 67, 1994).

F: metsänahkajäkälä **N:** bred fingernever **S:** nordlig trevarlav

Literature: Holtan-Hartwig, Sommerfeltia 15: 57–62 (1993); Vitikainen 1994: 67–69; Bergsten, Svensk Bot. Tidskr. 93: 284 (1999).

Figs: Vitikainen 1994: 67; Holien & Tønsberg 2006: 124.

THALLUS 20(–40) cm diam., lobes 2–4 cm wide; upper surface grey, greyish blue, greenish grey or brownish, greyish blue or greenish when moist; margins flat to ascending; lower surface with brownish to blackened, flattened veins; rhizines brown to black, slender to fasciculate, to 7(–11) mm long. APOTHECIA common, saddle-formed, pale to dark brown, to 9 mm diam. Spores acicular, 50–90(–100) × 3–5 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc*.

Chemistry. Tenuiorin, methyl gyrophorate, gyrophoric acid; zeorin, peltidactylin, dolichorrhizin, hopane-6α,7β,22-triol (minor), and additonal unknown triterpenoids. Four chemotypes recognized.

Habitat. Among and over mosses in forests, and saxicolous or on bases of old deciduous trees.

Distribution. Widespread, probably southern to northern boreal but poorly studied. **Gr. F:** *V U EK St EH ES EP PH PS PK KP Kn OP PeP Ks KiL SoL EnL InL*. **N:** *Øf*

Ak He Op Bu Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi. **AI:** *Sb*. **S:** *SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Europe, Asia, North America; circumpolar, boreal.

Note. A variable species in chemistry and morphology. A morphotype with a rigid, moist greenish thallus is provisionally accepted here as *Peltigera occidentalis*, whereas *P. neopolydactyla* s. str. is characterized by thinner, wrinkled and moist bluish grey thallus and longer rhizines. However, still poorly understood and chemically and morphologically variable. The status of the "brown" morphotype, e.g., should be clarified.

22. **Peltigera occidentalis** (E.Dahl) Kristinsson

Bryologist 71: 38 (1968). – *Peltigera scabrosa* var. *occidentalis* E.Dahl, Meddel. Grønland 150(2): 68 (1950)ö. – TYPE: Greenland. Julianehaab District, Qordlortorssuaq, 1937 Dahl (O holotype).

Literature: Bergsten, Svensk Bot. Tidskr. 93: 284 (1999).

Figs: Holtan-Hartwig 1993: 58 (1993).

THALLUS to 20(–30) cm diam., greyish green when dry, emerald green when moist; lobes 1.5–2.5 cm wide; rigid, 0.3–0.5 mm thick, smooth above; margins plane to ascending; lower surface with brown to blackish veins with white, rounded or elongated interstices; rhizines solitary, fasciculate and branched, pale to dark brown-black, to 5 mm long. APOTHECIA common, saddle-shaped, reddish brown, stalks 0.5–1 cm diam. Spores acicular, 50–90(–100) × 3–5 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc*.

Chemistry. Tenuiorin, methyl gyrophorate, gyrophoric acid or zeorin, peltidactylin, dolichorrhizin and additonal unidentified triterpenoids.

Habitat. On and among bryophytes on rocks and in oligotrophic and mesic forests, subalpine and alpine heaths and meadows.

Distribution. Widespread in boreal and arctic zones. **Gr. F:** *V U St EH ES EP PH PS PK KP OP Ks KiL SoL EnL InL.* **N:** *Ak He Op Bu Te AA VA Ho SF MR ST NT SNo NNo Tr VFi ØFi.* **AI:** *Sb.* **S:** *Vsm Upl Dlr Mpd Ång Hrj Jmt Nb ÅsL LyL PL LuL TL.* Circumpolar, in Europe, Asia, North America and South America.

Note. Tentatively recognized here as species differing from *P. neopolydactyla* by thicker and moist green thallus, blackish diffuse veining and chemical properties; distribution and the affinities not yet fully clarified. *P. occidentalis* ranges higher in the mountains and farther north than *P. neopolydactyla* s. str.

23. **Peltigera polydactylon** (Neck.) Hoffm.

Descr. Adumbr. Lich. 1: 19 (1790). – *Lichen polydactylon* Neck., Meth. Musc.: 85 (1771). – TYPE: Germany, Baden-Württemberg, Schwäbisch Hall, Untersontheim, Kemmler, Rabenhorst, Lich. Eur. Exs. no. 559 (H neotype, Vitikainen, Acta Bot. Fenn. 152: 69, 1994).

D: finger-skjoldlav **F:** kiiltonahkajäkälä **I:** glitskóf **N:** fingernever **S:** trevarlav

Literature: Holtan-Hartwig, Sommerfeltia 15: 62–63 (1993); Vitikainen, Acta Bot. Fenn. 152: 69–72 (1994).

Figs: Holtan-Hartwig 1993: 62; Moberg & Holmåsen 1990: 176; Vitikainen 1994: 69.

THALLUS to 20(–30) cm diam.; lobes 10–15 mm wide and 40–50(–120) mm long; margins crisped, often phyllidiate; lower surface with distinct but flat, brown to blackish veins, with white, rounded or elongated interstices; rhizines often confluent when young, fasciculate, pale to dark brown, to 5 mm long. APOTHECIA common, saddle-shaped, pale to dark brown, stalks 0.5–1(–2) cm diam.,. Spores fusiform, (40–)51–66(–73) × 2.5–5 µm. CONIDIOMATA sometimes found. PHOTOBIONT *Nostoc*.

Chemistry. Tenuiorin, methyl gyrophorate, gyrophoric acid; peltidactylin, dolichorrhizin and zeorin as major; hopane-15*α*,22-diol, hopane-6*α*,7*ß*,22-triol, and unidentified triterpenoids.

Habitat. On bare soil on road sides, dry grasslands and shores, among mosses on stones, rock faces and tree bases.

Distribution. Widespread and common, temperate to middle boreal, rarer northwards. **D:** *NJy ØJy Fyn Sjæ Brn*. **Gr. Fa. F:** *A V U EK St EH ES EP PH PS PK KP OP Ks KiL EnL Inl*. **I:** *ISu IVe IMi IAu INv INo*. **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **AI:** *Sb*. **S:** *Sk Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Europe, Asia, North America, South America, Australia; widespread; cir-

cumpolar, temperate to boreal (subarctic) and continental in the Northern Hemisphere.

Note. Characterized by the wavy and crispy lobe margins, long-stalked apothecia and veins and rhizines long keeping their brown colour.

24. **Peltigera ponojensis** Gyeln.

Mem. Soc. Fauna Fl. Fennica 7: 143 (1931). – Russia, Murmansk Region, "Lapponia ponojensis, ad promontorium Orlov" [near Ponoj], 1889 Kihlman 258 (H holotype, C, LE isotypes).

D: østlig skjoldlav **F:** piennarnahkajäkälä **N:** gråneve **S:** grå filtlav

Literature: Vitikainen, Acta Bot. Fenn. 152: 72–74 (1994).

Figs: Vitikainen 1994: 72; Sérusiaux et al. 2004: 127.

THALLUS 8–10(–15) cm diam.; lobes 1 cm wide and 5–6 cm long; upper surface tomentose, whitish grey when dry, often more brownish and glossy in the centre; margins turned upwards, somewhat flexuos; lower surface pale or white; veins 0.5–1 mm wide, white or pale; rhizines 3–7(–12) mm long, simple or slightly branched, aggregated to scattered. APOTHECIA not uncommon, to 10(–15) mm diam., flat or moderately convex to saddle-shaped. Spores fusiform, (31–)47–63(–78) × 2.5–5 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc*.

Chemistry. No secondary substances (by TLC).

Habitat. On bare soil in pastures, on roadsides and rocks, somewhat calciphilous and eutrophic.

Distribution. Scattered, temperate to arctic, continental. **D:** *NJy ØJy Fyn Sjæ Brn*. **Gr. F:** *A V U St ES EP PS KP Kn OP PeP Ks KiL SoL EnL InL*. **I:** *IAu.* **N:** *Ak Op VA Ho ST NT NNo ØFi*. **AI:** *Sb*. **S:** *Sk Öl Bh Vg Vsm Upl Ång Hrj Jmt LyL TL*. Europe, Asia, North America, circumpolar, temperate to arctic.

Note. Characterized by the elevated and pale-coloured veins and whitish rhizines as well as the often large, flat and pale brown apothecial discs. See also *Note* under *P. monticola.*

25. **Peltigera praetextata** (Flörke ex Sommerf.) Zopf

Ann. Chem.: 364: 299 (1909). – *Peltidea ulorrhiza* β *praetextata* Flörke ex Sommerf., Suppl. Fl. Lapp.: 123 (1826). – TYPE: Norway, Nordland, Saltdalen, "in truncis muscosis", Sommerfelt (O lectotype, Vitikainen, Acta Bot. Fenn. 152: 74 1994).

Syn. *Peltigera subcanina* Gyeln.

D: kruset skjoldlav **F:** karstanahkajäkälä **I:** giljaskóf **N:** skjellnever **S:** fjällig filtlav

Literature: Vitikainen, Acta Bot. Fenn. 152: 74–77 (1994).

Figs: Moberg & Holmåsen 1990: 177; Serusiaux et al. 2004: 128, 129; Vitikainen 1994: 74; Wirth 1995: 689; Holien & Tønsberg 2006: 122.

THALLUS to 20(–30) cm diam.; lobes 10–15(–20) mm wide, 5–7 cm long; margins plane to upright; upper surface tomentose, becoming glabrous towards the centre and often with a brownish tint; phyllidia common, marginal and laminal, squamulose or coralloid; lower surface with 0.5–1 mm wide veins which are dark brown in the centre, rhizines 4–6 mm long, dark in central parts but pale and simple close to margins. APOTHECIA common, saddle-shaped, 4–7(–10) mm diam. Spores fusiform, (29–)38–58(–65) × 2.5–5 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc*.

Chemistry. No secondary substances (by TLC).

Habitat. On shaded, mossy outcrops or boulders of usually basic or calciferous rocks, often in or close to eutrophic forest vegetation, and also on decaying, fallen logs or mossy bases and trunks of deciduous trees.

Distribution. Common in temperate to middle boreal zones, in locally favourable sites also in more northern localities. **D:** *NJy ØJy VJy SJy Fyn Sjæ Brn*. **Gr. Fa. F:** *A V U EK St EH ES EP PH PS PK KP Kn OP PeP Ks KiL SoL EnL InL*. **I:** *ISu IVe IAu INv INo*. **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **S:** *Sk Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Europe, Asia, North America, Africa, disjunct circumpolar, temperate to boreal, suboceanic.

Note. Polymorphic (heterogeneous?) but easily recognized when richly phyllidiate, for identification of non-phyllidiate and juvenile morphs a careful study of the rhizines and venation is needed.

26. **Peltigera retifoveata** Vitik.

Ann. Bot. Fenn. 22: 296 (1985). – TYPE: Finland, Koillismaa, Kuusamo, Juuma, Jäkälävuoma, 1981 Vitikainen 10135 (H holotype).

F: vuomanahkajäkälä **N:** huldrenever **S:** uppländsk filtlav

Red-listed in: **F N**

Literature: Vitikainen, Ann. Bot. Fenn. 22: 296–298 (1985); Holtan-Hartwig, Sommerfeltia 15: 64–65 (1993); Vitikainen, Acta Bot. Fenn. 152: 77 (1994).

Figs: Vitikainen, Ann. Bot. Fenn. 22: 296 (1985); Holtan-Hartwig 1993: 64; Vitikainen 1994: 77.

THALLUS to 20 cm diam.; lobes 1.5–2(–3) cm wide; margins somewhat raised; thickly tomentose near margins, glabrescent towards centre; lower surface with distinctly tomentose veins and deep pit-like interstices; rhizines with dense and short branches, pale brown to blackish, separate, to 7 mm long. APOTHECIA not common, to 7 mm diam., saddle-shaped. Spores fusiform, (31–)42–47(–57) × 4–5 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc*.

Chemistry. Tenuiorin, methyl gyrophorate, ?gyrophoric acid, peltidactylin, dolichorrhizin, zeorin, unidentified terpenoid "24" by Holtan-Hartwig (1993).

Habitat. Bryicolous to terricolous in boreal to subalpine forests.

Distribution. Rare, northern boreal. **F:** *Ks*. **N:** *Op*. **S:** (*Upl*). Europe, Asia, North America; disjunct circumpolar, continental.

Note. Distinguished from other tomentose species of the genus by its reticulate-foveate venation and slender, richly and squarrosely branched rhizines as well as by the production of both triterpenoids and depsides.

27. **Peltigera rufescens** (Weiss) Humb.

Fl. Friberg.: 2 (1793). – *Lichen caninus* [var.] *rufescens* Weiss, Pl. Crypt. Fl. Gott.: 79 (1770). – TYPE: Without locality, Flörke, Deutsche Lich. no. 154, "*Peltidea ulorrhiza*" (B neotype, Vitikainen, Acta Bot. Fenn. 152: 77, 1994).

D: brun skjoldlav **F:** ruskonahkajäkälä **I:** fjallaskóf **N:** brunnever **S:** krusig filtlav

Literature: Vitikainen, Acta Bot. Fenn. 152: 77–80 (1994).

Figs: Moberg & Holmåsen 1990: 177; Serusiaux et al. 2004: 128; Vitikainen 1994: 78; Wirth 1995: 690.

THALLUS 6–10 cm diam.; lobes 5–10 mm wide and 40 mm long; margins crisped, elevated, often with adventitious lobules or squamules; lower surface with elevated and soon darkening veins; rhizines soon dark brown to blackish, richly branched, often with fused bases in dense rows along veins, c. 5 mm long. APOTHECIA rather common, saddle-shaped, with dark disc. Spores fusiform, (36–)49–63(–78) × 2.5–5 µm. CONIDIOMATA not uncommon, conidia 7.5–10.5 × 2.5–4.5 µm. PHOTOBIONT *Nostoc*.

Chemistry. No secondary substances (by TLC).

Habitat. On often calcareous or eutrophic soils in dry meadows, on dunes, and on boulders or rock faces, usually in open situations, seldom bryicolous at tree bases.

Distribution. Widespread and common, arctic to temperate. **D:** *NJy ØJy VJy SJy Fyn Sjæ Brn*. **Gr. Fa. F:** *A V U EK St EH ES EP PH PS PK KP Kn OP PeP Ks KiL SoL EnL InL*. **I:** *ISu IVe IMi IAu INv INo*. **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **AI:** *JM Bi Sb*. **S:** *Sk Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Europe, Asia, North America, South America, Africa, Australia, widespread; circumpolar in the Northern Hemisphere.

Note. Polymorphic species characterized by up-turned lobe margins and dark brown to blackish colour of veins and rhizines in central parts of thallus.

28. **Peltigera scabrosa** Th.Fr.

Lich. Arct.: 145 (1860, Nova Acta Regiae Soc. Sci. Upsal., ser. 3, preprint). – TYPE: Greenland, Breutel (Breutel, Flora Germ. Exs. no. 203, *"P. scutata"*) (UPS lectotype, Vitikainen, Acta Bot. Fenn. 152: 80, 1994).

F: himmeänahkajäkälä **I:** þéluskóf **N:** runever **S:** sträv filtlav

Literature: Hasselrot, Acta Phytogeogr. Suec. 33: 99–101 (1953); Holtan-Hartwig, Sommerfeltia 15: 66–68 (1993); Vitikainen, Acta Bot. Fenn. 152: 80–82 (1994).

Figs: Holtan-Hartwig 1993: 66; Moberg & Holmåsen 1990: 178; Vitikainen 1994: 81; Holien & Tønsberg 2006: 125.

THALLUS to 20 cm diam., scabrous, dark green when wet, grey when dry, often with a pale brownish cast; lobes 10–30 mm wide and to 10(–18) cm long; margins upturned to plane; lower surface distinctly veined, veins 0.8–1.2 mm wide, brown to blackened in central part, interstices 1–2 mm; rhizines 2–3(–5) mm long, fibrillose to fasciculate, dark brown to black. APOTHECIA rather common, saddle-shaped, 3–6 mm diam. Spores acicular, (52–)75–90(–95) × 3–5 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc*.

Chemistry. Tenuiorin, methyl gyrophorate, gyrophoric acid, peltidactylin, dolichorrhizin, zeorin, hopane-6*α*,7*ß*-22-triol, and the unidentified triterpenoids 37 and 41 (trace). Two chemotypes: chemotype II (rarer) containing zeorin as the only triterpenoid, and chemotype I containing this substance in trace amounts in addition to the other triterpenoids mentioned.

Habitat. On humus, bare soil and bryophytes in boreal forests, alpine and arctic heaths and dwarf-shrubs, in south mainly on shaded rocks and boulders.

Distribution. Widespread, arctic to hemiboreal, rare in the western and more oceanic parts. **Gr. Fa. F:** *A V U EK St EH ES EP PH PS PK KP Kn OP PeP Ks KiL SoL EnL InL*. **I:** *IMi INo*. **N:** *Øf Ak He Op Bu Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **AI:** *JM Sb*. **S:** *Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Europe, Asia, North America, circumpolar, boreal to arctic.

Note. The scabrous upper surface and reticulate-veined lower surface with dark, tufted rhizines distinguish this species. However, the relationship of this species and *P. lyngei* is in need of further study.

29. **Peltigera scabrosella** Holt.-Hartw.

Lichenologist 20: 15 (1988). – TYPE: Norway, Nord-Trøndelag, Grong, Sanddöldalen, Hansmoen, 1981 Holtan-Hartwig 1655 (O holotype).

F: sammalnahkajäkälä **N:** sildrenever **S:** sipperfiltlav

Literature: Holtan-Hartwig, Lichenologist 20: 15–17 (1988); Holtan-Hartwig, Sommerfeltia 15: 68-70 (1993); Vitikainen, Acta Bot. Fenn. 152: 83–84 (1994).

Figs: Holtan-Hartwig 1993: 68; Vitikainen 1994: 83.

THALLUS to 2 cm diam., closely attached; lobes usually imbricate, acute, relatively short and narrow; margins ascending, somewhat irregularly involute; upper surface grey to greyish brown, scabrous; lower surface pale, veins diffuse, ochraceous; rhizines simple, slender, white to pale brown, usually dissolved into mass of simple hyphae at the contact area with the substratum, 1–2 mm long. APOTHECIA not uncommon, isodiametrical, attached to shortly elongated lobes or directly to the main lobes. Spores acicular, 80–95 × 3.5–4 µm. CONIDIOMATA unknown. PHOTOBIONT *Nostoc*.

Chemistry. Tenuiorin, methyl gyrophorate, gyrophoric acid, dolichorrhizin, zeorin, two unidentified triterpenoids.

Habitat. Closely attached to mosses on steep vertical rock walls, especially where water is trickling; in alpine regions also among terricolous mosses in snow-beds.

Distribution. Scattered, somewhat oceanic, northern boreal to oroarctic. **Gr. F:** *Ks SoL*. **I:** *IMi INv.* **N:** *Op Bu AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **AI:** *Sb*. **S:** *Mpd ÅsL*. Northwestern Europe, Asia, North America, disjunct circumpolar, boreal to (sub)arctic.

Note. Recognized by the scabrous thallus and whitish, simple rhizines, as well as by the chemical properties.

30. **Peltigera venosa** (L.) Hoffm.

Descr. Adumb. Lich. 1: 31 (1789). – *Lichen venosus* L., Sp. Pl. 2: 1148 (1753). – TYPE: [Sweden, Lich. Suec. no.] "964" [Sp. Pl. no.] 45 (LINN 1273.172 lectotype, Vitikainen, Acta Bot. Fenn. 152: 84, 1994).

D: vifte-skjoldlav **F:** suoninahkajäkälä **I:** æðaskóf **N:** kalknever **S:** åderlav

Literature: Hasselrot, Acta Phytogeogr. Suec. 33: 101–104 (1953); Tønsberg & Holtan-Hartwig, Nord. J. Bot. 3: 687 (1983); Holtan-Hartwig, Sommerfeltia 15: 70–71 (1993); Vitikainen, Acta Bot. Fenn. 152: 84–86 (1994).

Figs: Holtan-Hartwig 1993: 70; Moberg & Holmåsen 1990: 179; Vitikainen 1994: 84; Wirth 1995: 690; Holien & Tønsberg 2006: 125.

THALLUS 2 cm diam.; lobes solitary, rounded, or many together in fan-shaped aggregations, to 30 mm wide; upper surface smooth, green when wet, grey-green when dry; lower surface with dark, fan-shaped and villose veins and small, grey, nodulose cephalodia attached to them, and one single stout excentric holdfast. APOTHECIA practically always present, one to several per lobe, discs reddish to dark brown, rounded or oval and flat. Spores fusiform, (29–)35–43 × 4–8 µm. CONIDIOMATA unknown. PHOTOBIONT *Coccomyxa*, in cephalodia *Nostoc*. The blue-green phototype has a squamulose and lobed thallus and a single-layered cortex both on upper and lower surface, surrounding a homoiomerous, paraplectenchymatic medulla.

Chemistry. Tenuiorin, gyrophoric acid, methyl gyrophorate, unidentified depside-like substance d1, phlebic acid B (and A?), peltidactylin, up to 4 unidentified triterpenoids. The blue-green phototype lacks secondary substances.

Habitat. On bare, calciferous or eutrophic soils in moist, shaded or open habitats.

Distribution. Widespread, arctic to hemiboreal (to temperate, rare), extinct in Denmark and rare in the south? **D:** (*ØJy*) (*Fyn*) (*Sjæ*). **Gr. Fa. F:** *A V U EK St EH ES EP PH PS PK KP Kn OP PeP Ks KiL SoL EnL InL*. **I:** *ISu IVe IMi IAu INv INo*. **N:** *Øf Ak He Op Bu Te AA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **AI:** *JM Sb*. **S:** (*Sk*) *Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Europe, Asia, North America, circumpolar, temperate to arctic.

Note. Easily recognized by flat, rounded apothecia and non-rhizinate, dark-veined lower surface. The blue-green phototype, on the other hand, rather resembles, and may be confused with, a small *Leptogium* species.

Solorina Ach.

Kongl. Vetensk. Akad. Nya Handl. 29: 228 (1808). – TYPE: *Solorina saccata* (L.) Ach.

Syn. *Neosolorina* Gyeln.

F: kuppijäkälät **S:** säcklavar

Literature: Burgaz & Martínez, Flora Liquenol. Ibérica: Peltigerales: 50–53 (2003); Krog & Swinscow, Lichenologist 18: 57–62 (1986); Eriksson & Strand, Syst. Ascomycetum 14: 33–39 (1995); Martínez & Burgaz, Ann. Bot. Fenn. 35: 137–142 (1998).

THALLUS foliose, dorsiventral, lobate, or reduced to a narrow collar around the apothecium; upper surface green-grey or brown, bright green when wet, without soredia and isidia; medulla white; lower surface ecorticate, except on underside of apothecia, not or indistinctly veined, tomentose. Rhizines simple or somewhat branched. APOTHECIA large, rounded, impressed or immersed in the upper surface, disc dark red-brown to blackish; thalline margin absent; paraphyses simple, conglutinate, not or little swollen at apex; asci clavate, (1–)2-, 4- or 8-spored. Spores brown, ellipsoid to fusiform, 1(–5)-septate, constricted in the middle, spore wall thickened, ornamented or warted. CONIDIOMATA unknown. PHOTOBIONT green (*Coccomyxa*), in internal or external cephalodia cyanobacterial (*Nostoc*).

Chemistry. Secondary substances mostly absent, or methyl gyrophorate or solorinic acid (orange pigment).

1 Under side orange with brown veins ..... 2. *S. crocea*
– Under side white or brownish 2
2 Thallus as a narrow collar around apothecia, surrounded by external cephalodia ..... 5. *S. spongiosa*
– Thallus lobed and more wide-spreading, cephalodia internal 3
3 Thallus narrow, under 1 cm diam., surrounding the solitary apothecia, asci 2-spored ..... 1. *S. bispora*
– Thallus 2–5 cm wide, asci 4- or 8-spored 4
4 Asci 4-spored, thallus to 5 cm diam., greenish to greyish, medulla KC– ..... 4. *S. saccata*
– Asci 8-spored, thallus to 10 cm diam., often brownish, medulla KC+ red (methyl gyrophorate) ..... 3. *S. octospora*

1. **Solorina bispora** Nyl.

Syn. Lich.: 331 (1860). – TYPE: France, Hautes-Pyrénées, Barèges, W. Nylander (H-NYL 32893 lectotype (as holotype), Burgaz & Martínez, Flora Liquenol. Ibérica, Peltigerales: 50 (2003).

D: grågrøn sæklav **F:** tunturikuppijäkälä **I:** flaggrýta **N:** liten skållav **S:** tvåsporig säcklav

Red-listed in: **D**

Literature: Malme, Svensk Bot. Tidskr. 7: 214–215 (1913); Burgaz & Martínez, Flora Liquenol. Ibérica. Peltigerales: 50–52 (2003).

THALLUS small, to 1 cm diam., as an 1–3 mm wide rim around ascomata; upper surface yellow-green to grey-brown, smooth or scabrous, often pruinose; cephalodia internal, rarely external, surrounding the ascomata; lower surface white or browned. APOTHECIA solitary, occasionally 2–3 together, urceolate, to 5 mm diam.; asci 2-spored (rarely 1-spored). Spores 1-septate, ellipsoid to spindle-shaped, (60–)90(–120) × (30–)40(–60) µm, reticulately ornamented. PHOTOBIONT *Coccomyxa.*

Chemistry. No secondary substances (by TLC).

Habitat. On calciferous soil, mainly above the timberline.

Distribution. Scattered, arctic to boreal (to temperate). **D:** *NJy*. **Gr. Fa. F:** *EnL*. **I:** *ISu IVe IMi IAu INv INo*. **N:** *Op Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **AI:** *JM Bi Sb*. **S:** *Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Europe, North America, circumpolar.

Note. 2-spored asci and larger spores distinguish this species from small-sized morphs of *S. saccata*. A rare variety with longer (95–140 µm) spores and more reduced thallus, var. *macrospora* (Harm.) H.Olivier (or subsp. *macrospora* (Harm.) Burgaz & Martínez), has been recorded for **S:** *Jmt TL* and **Fa**.

2. **Solorina crocea** (L.) Ach.

Kongl. Vetensk. Akad. Nya Handl. 29: 228 (1808). – *Lichen croceus* L., Sp. Pl. 2: 1149 (1753). – TYPE: Without locality (LINN 1273.137 holotype).

F: poronkuppijäkälä **I:** glóðargrýta **N:** safranlav **S:** saffranslav

Literature: Hasselrot, Acta Phytogeogr. Suec. 33: 104–107 (1953); Hakulinen, Ann. Bot. Fennici 3: 191–192, 197 (1966).

Figs: Brodo et al. 2001: 655; Moberg & Holmåsen 1990: 179; Holien & Tønsberg 2006: 126.

THALLUS to 10 cm diam., lobes 5–15 mm wide, with ascending margins; upper surface scabrid, olive green when moist, greyish green to reddish brown when dry; medulla white, with internal cephalodia; lower surface orange with brownish veins and scattered rhizines. APOTHECIA common, disc dark brown, flat or slightly convex, to 10 mm diam.; asci 6–8-spored. Spores 1-septate, 35–45 × 9–14 µm, finely papillate. PHOTOBIONT green alga (*Coccomyxa*) (above) and cyanobacteria (*Nostoc*) (below) in separate layers.

Chemistry. Solorinic and neolosolorinic acids; medulla and lower surface reacting K+ purple.

Habitat. On open, bare, oligotrophic and calciferous soils, especially in late snow beds.

Distribution. Widespread, middle boreal to arctic. **Gr. Fa. F:** *PH PS PK Kn OP PeP Ks KiL SoL EnL InL*. **I:** *ISu IVe IMi IAu INv INo*. **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **AI:** *JM Bi Sb*. **S:** *Vrm Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Europe, Asia, North America, circumpolar, arctic-alpine; New Zealand.

Note. The orange or reddish lower surface is a distinctive character of this species. However, a pigment deficient strain has been reported from *ØFi*.

3. **Solorina octospora** (Arnold) Arnold

Verh. K.K. Zool.-Bot. Ges. Wien 26: 371 (1876). – *Solorina saccata* var. *octospora* Arnold, Verh. K.K. Zool.-Bot. Ges. Wien 23: 103 (1873). – TYPE: [Austria, Tyrol] Kleiner Rettenstein, Arnold (M type, not seen).

F: pohjankuppijäkälä **I:** móagrýta **N:** stor skållav **S:** åttasporig säcklav

Red-listed in: **F N I**

Literature: Hakulinen, Archivum Soc. Vanamo 12(1): 39–40 (1957).

THALLUS to 12 cm diam., lobes 1–3 cm wide, rounded; upper surface yellow-brown to brown, scabrous. Lower surface whitish to brown; rhizines white, long. APOTHECIA frequent, 2–5 mm diam., cup-like; asci 8-spored. Spores 1-septate, 35–40 × 14–21 µm, reticulately ornamented. PHOTOBIONT *Coccomyxa* with *Nostoc* in internal cephalodia.

Chemistry. Methyl gyrophorate; medulla KC+ pink.

Habitat. Among mosses on calciferous soil in alpine and arctic areas.

Distribution. Rare, arctic to oroarctic. **Gr. F:** *EnL*. **I:** *IAu INo*. **N:** *Op Ho ST Tr*. **AI:** *Sb*. Europe, Asia, North America; circumpolar.

Note. The 8-spored asci, the darker, scabrous upper surface and the different chemistry distinguish this species from *S. saccata*.

4. **Solorina saccata** (L.) Ach.

Kongl. Vetensk. Akad. Nya Handl. 29: 228 (1808). – *Lichen saccatus* L., Fl. Suec. 2: 419 (1755). – TYPE: Norvegia, Tych. Holm (LINN 1273.197 lectotype, Almborn, Bot. Not. 119: 104, 1966; specified by Jørgensen et al., Bot. J. Linn. Soc. 115: 352, 1994).

D: stor sæklav **F:** kalkkikuppijäkälä **I:** skútagrýta **N:** vanlig skållav **S:** säcklav

Red-listed in: **D**

Literature: Krog & Swinscow, Lichenologist 18: 57–62 (1986).

Figs: Brodo et al. 2001: 656; Moberg & Holmåsen 1990: 180; Wirth 1995: 857; Holien & Tønsberg 2006: 126.

THALLUS to 5 cm diam., lobes rounded, short; upper surface greyish green to yellow-brown, smooth, usually pruinose near margins; cephalodia internal; lower surface white to brownish, with scattered whitish rhizines. APOTHECIA frequent, to 6 mm diam., cup-shaped; asci 4-spored. Spores ornamented with triangular structures, 1-septate, 32–50(–75) × 18–30 µm. PHOTOBIONT green alga.

Chemistry. No secondary substances (by TLC).

Habitat. Calcareous rocks and soils, often on mosses in shade.

Distribution. Widespread, temperate-boreal to arctic. **D:** *NJy Sjæ.* **Gr. Fa. F:** *A V EH ES PS PK KP Kn OP PeP Ks KiL SoL EnL InL*. **I:** *ISu IVe IMi IAu INv INo*. **N:** *Ak Op Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **AI:** *Sb*. **S:** *Sk Öl Gtl Klm SmI Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Europe, Asia, North America; circumpolar.

Note. The number and size of spores distinguish this species from certain morphs of *Solorina bispora* and *S. octospora*.

5. **Solorina spongiosa** (Ach.) Anzi

Lich. Lang. 2: 46 (1861). – *Collema spongiosum* Ach., Lichenogr. Universalis: 661 (1810), *nom. nov.* for *Lichen spogiosus* Sm., *nom. illeg.* – TYPE: England, Co. Durham, 1803 Harriman (BM holotype).

Syn. *Neosolorina spongiosa* (Ach.) Gyeln.

D: liden sæklav **F:** suomukuppijäkälä **I:** svampgrýta **N:** svampskållav **S:** smalkantad säcklav

Red-listed in: **D**

Literature: Albertson, Acta Phytogeogr. Suec. 20: 218–219 (1946).

Figs: Brodo et al. 2001: 656.

THALLUS squamulose to granular, as a narrow, 1–5 mm wide rim around ascomata, yellow-green; blue-grey cephalodial crust or warts around thallus and ascomata. APOTHECIA to 15 mm diam., cup-shaped; asci 4-spored. Spores ornamented, pitted, (20–)30–50 × 15–24 µm. PHOTOBIONT green alga with *Nostoc* in external cephalodia.

Chemistry. No secondary substances (by TLC).

Habitat. On mosses over damp, calcareous, sandy soils.

Distribution. Scattered, temperate to arctic. **D:** *NJy*. **Gr. Fa. F:** *A V U PS PeP KiL EnL*. **I:** *ISu IVe IMi IAu INv INo*. **N:** *Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **AI:** *Bi Sb*. **S:** *Öl Gtl Bh Vg Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Europe, Asia, North America; circumpolar, arctic-alpine; South America, New Zealand.

Note. The dark external cephalodia around the apothecia distinguish this from other species of the genus.

Peltulaceae

P. M. Jørgensen

THALLUS squamulose to subfruticulose, olivacous black, with or without cortex, mostly homoiomerous. ASCOMATA apothecia, immersed or sessile, with mostly punctiform disc; hymenium weakly I+ blue, except in the vicinity of the rostrate, polysporous asci. Spores simple, colourless, ellipsoid. CONIDIOMATA immersed, cerebriform, with unbranched conidiophores; conidia bacilliform to fusiform conidia. PHOTOBIONT varying taxa of Chrooccales.

Chemistry. No secondary substances (by TLC).

Literature: Büdel, Biblioth. Lichenol. 23 (1987); Egea, Biblioth. Lichenol. 31 (1989); Gyelnik, Repert. Spec. Nov. Regni Veg. 38: 153–157, 307–313 (1935); Schultz & Büdel, Lichenologist 35: 151–156 (2003); Schultz et al., Pl. Biol. 3: 11–123 (2001); Swinscow & Krog Norweg. J. Bot. 26: 213–224 (1979); Wetmore, Ann. Missouri Bot. Garden 57: 158–209 (1971).

Note. As expected from the special kind of asci, this family has in molecular work proven to be most distinctive and clearly separated from the Heppiaceae.

Peltula Nyl.

Ann. Sci. Nat., Bot., Sér. 3 : 316 (1853). – TYPE: *Peltula radicata* Nyl.

Literature: Büdel, Biblioth. Lichenol. 23 (1987); Egea, Biblioth. Lichenol. 31 (1989); Gyelnik, *Peltula* in Rabenh. Krypt.-Fl. Ed. 2, 9, Abt. 2(2): 124–130 (1940): Henssen, Bryologist 73: 617–623 (1970); Swinscow & Krog, Norweg. J. Bot. 26: 213–224 (1979); Wetmore, Ann. Missouri Bot. Garden 57: 158–209 (1971).

THALLUS squamulose to subfruticulose, olivaceous black, mostly homoiomerous with indistinct cortex. APOTHECIA immersed to sessile, usually with punctiform red-brown disc. Hymenium I+ weakly blue, more intensely around the polysporous, rostrate asci which have a distinct, fringed external tunica. Spores ellipsoid, simple, colourless. CONIDIOMATA immersed, cerebrifom, with simple conidiophores; conidia bacilliform to fusiform produced terminally. PHOTOBIONT chroococcoid (variable).

Chemistry. No secondary substances (by TLC).

1. **Peltula euploca** (Ach.) Poelt

in Pisut, Zborn. Slov. Nar. Muz., Přir. Vědy 13: 8 (1967). – *Lichen euplocus* Ach., Lichenogr. Suec. Prodr.: 141 (1799). – TYPE: Suecica, Westring (H-ACH 857 lectotype (as holotype), Büdel, Biblioth. Lichenol. 23: 56, 1987).

Syn. *Heppia euploca* (Ach.) Vain.

N: dvergskjold **S:** peltula

Red-listed in: **N S**

Literature: Büdel, Biblioth. Lichenol. 23: 56–60 (1987); Degelius, Bot. Not. 1946: 291–297 (1946); Egea, Biblioth. Lichenol. 31: 66–68 (1989); Thor & Arvidsson (eds) 1999: 401–402; Tønsberg et al. 1996: 140–142.

Figs: Brodo 2001: 524; Büdel op cit., figs. 125–136; Degelius 1946: 293; Krog et al. 1994: 243; Ozenda & Clauzade 1970: 324; Swinscow & Krog 1988: 206; Thor & Arvidsson (eds) 1999: 300; Wirth 1995: 692.

THALLUS squamulose, mostly orbicular, peltate, 5–15 mm diam., olivaceous grey-brown, umbilicate, with downcurved margin, or sorediate; 250 µm thick, with poorly developed cortex, particularly in upper part (mostly only a thin necral layer). Lower surface paler, often pinkish brown, usually corticate. APOTHECIA rare, immersed, with punctiform to circular, red-brown disc, sometimes expanded to 1 mm diam.; hymenium I+ weakly blue except in vicinity of the rostrate, polysporous asci which stain intensely blue. Spores simple, colourless, ellipsoid, 5–10 × 4–5 µm. CONIDIOMATA immersed, to 150 µm wide, cerebriform with unbranched conidiophores; conidia bacilliform, 3–4 × 1–2 µm. PHOTOBIONT chroococcoid, in two- or four-celled aggregates, individual cells 6–11 × 4–5 µm diam.

Chemistry. No secondary substances (by TLC).

Habitat. Mostly on calciferous schists on moist, sloping rocks (seepage, lakesides etc) in the lowlands.

Distribution. A southern element in our region, only known from a few, scattered localities, rarely collected recently. **N:** (*He*) *Op Bu Te Ro* **S:** (*Bh*) *Dls Vg Ög Nrk Jmt*. Otherwise widespread, particularly in mediterranean regions of Europe, America, Africa, Asia and Australia.

Note. Easily recognized on the peltate, sorediate squamules and the immersed apothecia. Sorediate taxa are rare among the squamulose 'bluegreens' – this being the only example in our region. By the early lichenologists, often confused with *Endocarpon* because of superficial similarity, but that is a genus with green photobiont and entirely different ascomata.

Placynthiaceae

P. M. Jørgensen

Mostly flat, rosette-forming, olivaceous lichens with a paraplectenchymatous thallus, often resting on a distinct blackish blue prothallus. ASCOMATA apothecia, hemiangiocarpic, laminal, with or without a thalline margin; hymenium I+ blue, asci with apical amyloid structures, containing colourless, ellipsoid to fusiform, simple to septate spores. CONIDIOMATA producing bacilliform conidia terminally on short-celled conidiophores. PHOTOBIONT cyanobacterial, *Dichothrix* (Rivulariaceae) or *Scytonema* (Scytonemataceae).

Chemistry. No secondary substances (by TLC).

Literature: Dahl, Meddel. Grønland 60(2): 54–55 (1950); Henssen, Canad. J. Bot. 41: 1331–1346 (1963); Henssen & Jahns, Flechten: 343–344 (1973).

1 Thallus crustose, thick (to 1 mm), amorphous, pulverulent; asci with apical amyloid ring-structure, spores elongate, multiseptate ..... *Collolechia*
– Thallus squamulose, thinner, well-defined; asci with apical amyloid cap and/or sheet, ellipsoid, spores 1–3-septate 2
2 Thallus with striate, narrow lobes (<0.5 mm wide), pale underneath; apothecia with thalline margin ..... *Vestergrenopsis*
– Thallus mostly smooth with broader lobes (usually >0.5 mm wide), dark underneath; apothecia mostly without thalline margin, if present secondary .. *Placynthium*

Collolechia A.Massal.

Geneac. Lich.: 6 (1854). – TYPE: *Collolechia caesia* (Fr.) A.Massal.

Literature: Jørgensen, Graphis Scripta 17: 3–7 (2005); Massalongo, Geneac. Lich.: 6 (1854).

THALLUS crustose, amorphous, without proper cortex and prothallus. APOTHECIA hemiangiocarpic, black, biatorine, with distinct proper exciple, initially immersed, finally sessile, sometimes pruinose. Hymenium I+ blue with asci having a amyloid ring-structure apically, 8-spored, containing multiseptate (3–6), elongate-fusiform spores. CONIDIOMATA unknown. PHOTOBIONT scytonemoid.

Chemistry. No secondary substances (by TLC), but crystals (calciumoxalate) are observed in thallus sections by microscope.

Note. A long forgotten genus which needed reintroduction since both thallus anatomy and apothecial characters (apical apparatus/spores) differ markedly from those in *Placynthium*. Monospecific genus.

1. Collolechia caesia (Fr.) A.Massal.

Geneac. Lich.: 6 (1854). – *Lecidea contigua* var. *caesia* Fr., Lichenogr. Eur. Reform.: 302 (1831). – TYPE: France ("Gallia merid."), Dufour (UPS, right hand specimen, lectotype, Jørgensen, Graphis Scripta 17: 5, 2005).

Syn. *Lecidea tryptophylla* var. *caesia* Schaer., *Placynthium caesium* auct., *Placynthium caesitium* (Nyl.) Hue, *Placynthium garovaglii* auct. scand.

S: daggbläcklav

Literature: Gyelnik in Rabenh. Krypt.-Fl. Ed. 2, 9, Abt. 2(2): 49–55 (1940); Keuck, Biblioth. Lichenol. 6: 90–91 (1978); Jørgensen 2005: 5–6.

THALLUS crustose, with obscure marginal lobes, to 2 cm diam. and about 1 mm thick, without prothallus; surface crumbling, tartareous, scurfy and partly pruinose with (calcium oxalate) crystals in the thallus. APOTHECIA rare, to 0.5 mm diam., blackish with distinct proper exciple; asci 8-spored. Spores colourless, 3–6-septate, fusiform, (18–)25–35(–53) × 4–7 µm. CONIDIOMATA unknown. PHOTOBIONT cyanobacteria, probably *Scytonema*.

Chemistry. No secondary substances (by TLC), but crystal plates (of calcium oxalate) visible in microscopic sections.

Habitat. Shaded, calcareous overhangs or caves.

Distribution. Rare, in Norden only known from a few localities in Gotland, where it persists at least in one (Torsburgen). **S:** *Gtl*. This is the northernmost outpost in Europe, where it has a rather southern distribution

(France, Switzerland, Italy), although reaching as far North as Scotland in the British Isles.

Note. Unique species, which has largely been misunderstood since it was confused right from the beginning with *Placynthium garovaglioi* (A.Massal.) Malme. It is, however, not even closely related to that species, though badly developed specimens of *P. garovaglioi* with poorly developed marginal lobes may superficially remind of *C. caesia*, which is easiest recognized on its spores, or, if sterile, on the thallus anatomy.

Placynthium (Ach.) Gray

Nat. Arr. Brit. Pl. 1: 395 (1821). – *Collema* **Placynthium* Ach., Lichenogr. Universalis: 628 (1810). – TYPE: *Placynthium nigrum* (Huds.) Gray

Syn. *Anziella* Gyeln., *Lecothecium* Trevis., *Pterygium* Nyl., *Racoblenna* A.Massal., *Wilmsia* Körber

F: mustejäkälät **N:** blekklav **S:** bläcklavar

Literature: Gyelnik in Rabenh. Krypt.-Fl. Ed. 2, 9, Abt. 2(2): 25–102 (1940); Henssen, Canad. J. Bot. 41: 1687–1718 (1963).

THALLUS squamulose, forming rosettes with stellate, radiating, greyblue to olivaceous brown lobes, closely adnate to the substratum though often resting on a well-developed prothallus. Thallus cellular throughout with scattered cyanobacterial chains. APOTHECIA laminal, hemiangiocarpic, biatorine in all species but one, *P. stenophyllum*, where a narrow thalline margin is developed; disc usually dark brown or blackish. Hymenium I+ blue; asci apically thickened, with amyloid caps and/or internal sheets. Spores colourless, simple to septate, usually ellipsoid and poorly developed. CONIDIOMATA as in family (see above). PHOTOBIONT cyanobacteria, either *Dichothrix* or *Scytonema*, not always possible to identify unless cultivated, and accordingly insufficiently known, and therefore mostly recorded as scytonemoid below (when not positively identified).

Chemistry. No secondary substances (by TLC).

Note. A rather easily recognized genus characterized by rosette-like, adnate thalli, unlike all others except *Vestergrenopsis*, which is best distinguished by the combination of distinctly lecanorine apothecia and narrow, striate lobes.

1 Thallus with weakly elongated marginal lobes 2
– Thallus with distinctly elongated marginal lobes 7
2 Thallus forming cushions, terricolous ..... 7. *P. pulvinatum*
– Thallus in flat patches or rosettes on rocks 3
3 Thallus shiny blackish, spores 3–5-septate, to 50 µm long ..... 2. *P. dolichoterum*
– Thallus if blackish, not shiny, usually olivaceous grey, spores 1–3-septate, to 25 µm 4
4 Thallus flat, smooth, with a thick, blue-green prothallus ..... 11. *P. tantaleum*
– Thallus more or less bulgy and uneven; prothallus thin or indistinct, if present 5
5 Marginal lobes mostly well developed, prothallus indistinct. Spores mainly 1-septate; on rather dry calciferous rocks, southern ..... 12. *P. tremniacum*
– Marginal lobes usually not differing from the central ones, with distinct prothallus, spores 1–3-septate; on moist rocks, not necessarily calcareous, widespread 6
6 Thallus olivaceous black with isidiate outgrowths, not in riverbeds ..... 5. *P. nigrum*
– Thallus brownish without outgrowths, in often flooded riverbeds ..... 8. *P. rosulans*
7 Thallus forming crescents with eroding central parts 8
– Thallus forming more or less complete rosettes 10
8 Thallus olivaceous brown with narrow, more or less cylindrical lobes ..... 9. *P. stenophyllum*
– Thallus blackish with flat lobes 9
9 Marginal lobes normally entire, central parts squamulose; on alpine over-hangs ..... 10. *P. subradiatum*
– Marginal lobes digitately divided; central parts granulose; on maritime seepage rocks ..... 4. *P. lismorense*
10 Thallus shining black with narrow, extended marginal lobes ..... 1. *P. asperellum*
– Thallus if blackish, not shining, marginal lobes broader 11
11 Marginal lobes flattened, smooth, appressed to the rock; inner parts covered with squamules, prothallus usually indistinct; in riverbeds . 3. *P. flabellosum*
– Marginal lobes convex, faintly grooved, loosely on prothallus, inner parts coralloid, on seepage rocks ..... 6. *P. pannariellum*

1. **Placynthium asperellum** (Ach.) Trevis.

Schedae Lich. Ven. no. 98 (1869). – *Collema asperellum* Ach., Lichenogr. Universalis: 629 (1810). – TYPE: Norway, Finnmark, "in petra montis ad Altenfjord", 18.V.1802, G. Wahlenberg (UPS holotype!).

Syn. *Placynthium aspratile* (Ach.) Henssen, *Catillaria subalpina* Th.Fr., ?*Placynthium diblastum* Gyeln. (type poor, containing two different taxa), *Placynthium vrangianum* Gyeln., *Placynthium lismorense* f. *boreale* Gyeln.

F: ryynimustejäkälä **I:** tvennuslyðra **S:** smallobig bläcklav

Literature: Th. Fries, Lich. Arct.: 285–286 (1860); Gyelnik in Rabenh. Krypt.-Fl. Ed. 2, 9, Abt. 2(2): 65–667 (1940); Henssen, Canad. J. Bot. 41: 1699–1702 (1963); Lynge, Lich. Nov. Zemlya: 53 (1928).

THALLUS forming shiny, black rosettes, to 2 cm diam., usually with narrow, radiating, canaliculate marginal lobes (or lacking these), which tend to turn upwards and become isidioid, central parts also isidioid and usually breaking up into granulose areoles; in section with parallel, longitudinal hyphae, forming a cellular pattern, to c. 100 µm thick. APOTHECIA rather common, laminal, urceolate to (later) flat, black, with distinct proper exciple. Spores colourless, ellipsoid, (1–)3-septate, (12–)15–20(–25) × 5–7 µm. CONIDIOMATA rather common, partially immersed, with dark green ostiolum; conidia dumbbell-shaped, 5–8 × 1 µm. PHOTOBIONT scytonemoid, presumably *Dichothrix*.

Chemistry. No secondary substances (by TLC).

Habitat. On moist calciferous, rarely siliceous, rocks in boreal to alpine situations.

Distribution. Widespread, boreal to arctic-alpine, circumpolar. (also recorded from the Southern Hemisphere, but these records need confirmation). **Gr. Fa. F:** *EH PS KP Ks EnL*. **I:** *ISu IVe IMi IAu INv INo*. **N:** *Ak He Op Bu Ho MR ST Tr VFi ØFi*. **AI:** *Bi Sb*. **S:** *Vg Dls Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*.

Note. Easily recognized species on the shiny thallus and the narrow, marginal lobes. Variable though, with some forms producing fingerlike protrutions from the thallus (mainly in shaded, moist habitats); in others the radiating marginal lobes are missing (in dry, exposed habitats). These latter may be mistaken for *P. dolichoterum*, but is easily distinguished on the shorter, less-septate spores. Varies also as to the development of isidioid lobes, which may sometimes totally cover the thallus, making it nearly fruticose, but always on closer inspection revieling a dorsiventral basal thallus. The taxonomic status of such forms are uncertain, and best not recognized for the time being, since similar trends are observed in other species, strongly indicating that they are ecologically induced. The major part of the type of *P. diblastum* is most probably just such an extreme form.

2. **Placynthium dolichoterum** (Nyl.) Trevis.

Schedae Lich. Ven. no. 98 (1869). – *Pannaria dolichotera* Nyl., Lich. Scand.: 126 (1861). – TYPE: Norway, Dovre, Torssell (H-NYL 31218 holotype).

Syn. *Pannaria nigra* var. *triseptata* Nyl., *Placynthium pluriseptatum* (Arnold) Arnold

S: silikatbläcklav

Literature: Degelius, Bot. Not. 1943: 88–89 (1943); Gyelnik in Rabenh. Krypt.-Fl. Ed. 2, 9, Abt. 2(2): 84–87 (1940).

THALLUS squamulose-crustose, blackish-brown, sometimes shining, forming areolate crusts to 2 cm diam. without distinct marginal lobes and prothallus, centrally with granular isidia. APOTHECIA common, laminal, to 1 mm diam., with flat to concave, shiny black disc and distinct proper exciple. Spores colourless, 3–5-septate, fusiform, 25–50 × 4–6 µm. CONIDIOMATA rare, immersed, blackish; conidia simple, bacilliform, colourless, 4 × 1 µm. PHOTOBIONT scytonemoid, presumably *Dichothrix*.

Chemistry. No secondary substances (by TLC).

Habitat. On well-lit, moist, schistose rocks, often overgrowing mosses.

Distribution. Rare, known only from Northern Europe and the Alps. **I:** *IMi IAu*. **N:** *ST SNo Tr VFi*. **S:** *LyL LuL TL*.

Note. May be confused with forms of *P. asperellum* where the marginal lobes are poorly developed or lacking, but easily separated from these on the longer, fusiform, multiseptate spores. These also serve to distinguish it from *P. nigrum*, the more crustose forms of which it may resemble.

3. **Placynthium flabellosum** (Tuck.) Zahlbr.

Catal. Lichenogr. Universalis 3: 227 (1925). – *Pannaria flabellosa* Tuck., Proc. Amer. Acad. Arts 5: 401 (May 1862). – TYPE: USA, Vermont, Frost (FH holotype).

Syn. *Placynthium adglutinatum* (Anzi) Trevis., *Anziella adglutinata* (Anzi) Gyeln., *Placynthium pannariellum* f. *sparsum* Gyeln.

F: liuskamustejäkälä **I:** flatslyðra **S:** strandbläcklav

Literature: Gyelnik in Rabenh. Krypt.-Fl. Ed. 2, 9, Abt. 2(2): 31–32 (1940); Henssen, Canad. J. Bot. 41: 1702–1704 (1963).

THALLUS squamulose with enlarged, flabellate marginal lobes, forming rosettes, to 4 cm diam., growing closely adnate to the substrate; upper surface smooth to shiny olivaceous blue-grey; central parts with imbricating, flat, secondary lobules, occasionally extending into tongue-like structures. APOTHECIA uncommon, often poorly developed, to 0.5 cm diam., disc brown, with distinct, paler proper exciple. Spores colourless, narrowly ellipsoid, 2–3-septate, 15–20 × 4–6 µm. CONIDIOMATA rare, immersed, with dark green ostiolum; conidia simple, bacilliform, colourless, 4–5 × 1 µm. PHOTOBIONT scytonemoid (*Dichothrix*?).

Habitat. Acid rocks along streams and lakes, often in the inundation zone, as well as in seepage tracks.

Distribution. Widespread and rather common. **Fa. F:** *V EH PS PeP Ks EnL InL*. **I:** *IVe IAu INv INo*. **N:** *Ak Op Bu Ro Ho SF MR ST NNo Tr ØFi*. **S:** *Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL*. Northern Europe, Alps and North America.

Note. Variable species which is best recognized on the closely appressed marginal lobes, giving the thallus an appearance rather like that of *Hyperphyscia adglutinata*. This and the smooth, flabellate lobes serve to distinguish it from the closely related *P. pannariellum* which normally grows in drier, basic habitats. The central squamules may (in shaded habitats) develop into tongue-like protrusions and such growth-forms have unnecessarily been recognized as taxa.

4. **Placynthium lismorense** (Cromb.) Vain.

Ark. Bot. 8 (4): 98 (1909). – *Pterygium lismorense* Cromb., Grevillea 5: 108 (1877). – TYPE: Scotland, Argyllshire, Lismore Island, ad saxa calcarea, Crombie (Crombie: Lich. Brit. Exs. no. 101, BM lectotype, Nordic Lichen Flora 3: 146, 2007).

Literature: Gyelnik in Rabenh. Krypt.-Fl. Ed. 2, 9, Abt. 2(2): 56–58 (1940).

THALLUS olivaceous, forming irregular patches, to 3 cm diam., usually with flat, radiating lobes, which are finely divided into narrow, digitate segments marginally; central parts with more or less nodular areoles, eventually eroding and leaving crescent-formed thalli without a visible prothallus. APOTHECIA in central parts, rare, unknown in Norwegian material, about 0.5 mm diam., black; disc flat to finally convex, with distinct proper exciple. Spores colourless, 1-septate, broadly ellipsoid, 10–15 × 5–6 µm. CONIDIOMATA unknown. PHOTOBIONT scytonemoid (*Dichothrix*).

Chemistry. No secondary substances (by TLC).

Habitat. Seepage tracks on marble or hard calciferous rocks in coastal localities.

Distribution. Western, **Fa. I:** *INo*. **N:** *Ho SNo*. Records from Sweden and Central Europe are erroneous or doubtful. This species appears to be restricted to the western coasts of France, the British Isles and Scandinavia.

Note. A difficult species to come to terms with, often mistaken for *P. subradiatum*. Easiest distinguished by the habitat, seepage tracks on coastal marble outcrops. *P. subradiatum* grows on dry overhangs in the mountains, is squamulose, but dying off, centrally and has entire (not digitately proliferating) marginal lobes. *P. lismorense* does not die off so easily in central parts, so the nodular central squamules are often partly present. Such specimens are likely to be mistaken for *P. nigrum* which normally has a well developed prothallus and no distinct marginal lobes. Specimens from non-maritime parts of Sweden named *P. lismorense* are *P. asperellum* (in the mountains) or *P. tremniacum* (in Öland and Gotland).

5. **Placynthium nigrum** (Huds.) Gray

Nat. Arr. Brit. Pl. 1**:** 395 (1821). – *Lichen niger* Huds., Fl. Angl. ed. 2, 2: 524 (1778). – TYPE: Great Britain, Cornwall, St. Ives, W. Hudson (BM holotype).

Syn. *Placynthium corallinoides* (Flörke) Jatta, *Placynthium rudetum* (Ach. ex Nyl.) Zahlbr., *Placynthium siliceum* Gyeln., ?*Spilonema proboscideum* Nyl., *Pannaria nigra* var. *psotina* Ach. ex Nyl., *Pannaria nigra* var. *triseptata* Nyl.

D: kalkstensblæklav **F:** isomustejäkälä **I:** bláslyðra **N:** kalkblekklav **S:** bläcklav

Figs: Brodo et al. 2001, Fig. 692; Wirth 1995: 747.

THALLUS squamulose, without enlarged marginal squamules, widespreading, sometimes more than 10 cm diam. (but usually smaller), dark brown, nearly blackish

(occasionally greyish pruinose), resting on a conspicuous blue-black prothallus, usually exceeding the squamules. Individual squamules to 1.5 mm wide, margins crenate to digitate, with granular to coralloid isidia (very rarely, in very wet habitats, with ligulate squamules), scattered over the prothallus, often forming areolate patterns. APOTHECIA biatorine, black, often shining, flat, with distinct proper exciple, to 1 mm diam. Spores colourless, 1–3-septate, ellipsoid, 10–15(–20) × 4–6 µm. CONIDIOMATA immersed, with greenish black ostiolum, to 0.1 mm diam.; conidia bacilliform, colourless, 4–6 × 1 µm. PHOTOBIONT scytonemoid cyanobacterium of the Rivulariaceae.

Chemistry. No secondary substances (by TLC).

Habitat. Mainly on temporarily wet, calcareous rocks, often in man-made localities, like walls, monuments etc., rarely on sand (mainly in the Arctic).

Distribution.Widespread, most common in the south; rare in the arctic-alpine regions. **D:** *NJy ØJy SJy Fyn Sjæ Brn*. **Gr. Fa. F:** *A V U EH ES PS PK Kn OP PeP Ks SoL EnL InL*. **I:** *ISu IVe IMi IAu INv*. **N:** *Ak Op Bu Ro Ho MR ST NT SNo NNo Tr VFi ØFi*. **AI:** *Sb*. **S:** *Sk Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Cosmopolitan outside the tropics.

Note. This species was in the past usually confused with *Parmeliella triptophylla* which clearly differs in having *Nostoc* and asci with an amyloid, internal ring-structure. It is the most variable and widespread *Placynthium* species, best recognized on the dark, squamulose, nodular-isidiate thallus which varies according to the habitat-conditions. In wet, humid places it is paler, with elongated protuberances and large prothallus (*Spilonema proboscideum* is most probably just such a form); in certain forms the prothallus is indistinct. The spores are also most variable from those without septa, up to three. This variation has led to establishment of several taxa which do not appear to be worth recognizing, since they are not constantly combined with other characters, including the ecological ones, and this appears to be part of the natural variation within one species. The Arctic material, particularly on sand or sandstone, is rather aberrant, being small-grained and without prothallus, and this may need some taxonomic recognition.

6. **Placynthium pannariellum** (Nyl.) H.Magn.

Förteckn. Skand. Växt., Lavar: 24 (1936). – *Pterygium pannariellum* Nyl., Not. Sällsk. Fauna Fl. Fenn. Förh. 1: 236 (1859). – TYPE: Finland, Savolax, 1852 E. Nylander (H lectotype, Nordic Lichen Flora 3: 146, 2007).

Syn. ?*Pterygium conferciens* Nyl. (type only central, leafy parts of larger thallus), *Placynthium pannariellum* f. *conferciens* (Nyl.) Räsänen

F: puromustejäkälä **S:** fårad bläcklav

THALLUS squamulose, olivaceous brown, to 5 cm diam. with elongated, radiating, narrow (0.5–1 mm) marginal lobes, to 200 µm thick, often with distinct bluish black prothallus, loosely attached to the substrate. Upper surface convex, faintly grooved, in central parts with isidioid or ligulate squamules. APOTHECIA rare, to 1 mm diam., with blackish brown disc. Spores colourless, 2–3-septate, ellipsoid, 15–20 × 5–7 µm. CONIDIOMATA not observed. PHOTOBIONT scytonemoid, in short chains.

Chemistry. No secondary substances (by TLC).

Habitat. On semi-inundated siliceous rocks near streams and lakes, often growing in rather dry positions (lower geolittoral).

Distribution. Rather uncommon, except in central Finland, widespread but rarer towards the North. **Fa. Gr. F:** *St EH ES EP PH PS PK KP PeP Ks KiL EnL InL*. **I:** *IVe IMi*. **N:** *Øf Ak Op Ro Ho MR ST NT SNo Tr VFi*. **S:** *Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Restricted to Northwest Europe, east to Finland and adjacent Russia, but also found as far south as the Pyrenées.

Note. One of the most characteristic species due to the convex, elongated, lightly grooved, marginal lobes. It may, however, be confused with *Placynthium flabellosum*, which grows directly appressed to the rock, with smooth, nearly shining, spreading, flat, grey-blue lobes, and have secondary lobules centrally rather than being granular isidiate. There is considerable variation, though, in the development of the isidia. In certain forms they are considerably elongated, resulting in description of separate taxa, which are hardly worth recognizing, even at varietal level (*P. conferciens* is probably just such a form). In the past also *P. rosulans* was often included here (see below). For possible

confusion with *Vestergrenopsis isidiata*, see that species.

7. **Placynthium pulvinatum** Øvst.

TYPE: Svalbard, Spitsbergen, Gipsdalen, 26 Aug. 1987, D.O. Øvstedal, Sommerfeltia 33: 285 (2009).

THALLUS squamulose, forming cushions, to 3 cm diam., of imbricating, smooth, olive-brown squamules. APOTHECIA scattered, to 1.5 mm diam., black, flat, with distinct, elevated proper exciple. Spores colourless, 4–5-septate, fusiform, 20–30 × 4–5 µm. CONIDIOMATA marginal black warts; conidia bacilliform, 3–4 × 1 µm. PHOTOBIONT scytonemoid.

Chemistry. No secondary substances (by TLC).

Habitat. On moist, calcareous sand and gravel.

Distribution. Rare, arctic alpine, though recently discovered, and may prove to be more widespread. **I:** *ISu*. **N:** *NNo*. **AI:** *Sb*.

Note. Most characteristic species because of the cushion-formed, terricolous thallus. Related to *P. nigrum*, but with indistinct prothallus and 4–5-septate, fusiform spores, and also differing in growthform and ecology. The only other species with such multiseptate spores is the morphologically very different, shiny black *Placynthium dolichoterum*, with which it is not likely to be confused, but is probably closely related.

8. **Placynthium rosulans** (Th.Fr.) Zahlbr.

Catal. Lichenogr. Universalis 3: 235 (1925). – *Lecothecium corallinoides* ssp. *rosulans* Th.Fr., Bot. Not. 1863: 12 (1863). – TYPE: Sweden, Närke, Göthlunda, Sjömo, 1863, O.G. Blomberg (UPS holotype!).

Syn. *Lecidea microphylla* var. *radiata* Wahlenb., *Placynthium pannariellum* var. *rosulans* (Th.Fr.) Degel., *Placynthium pannariellum* var. *squamulosum* Räsänen

I: lækjaslyðra **S:** rosettbläcklav

THALLUS squamulose, brownish, to 3 cm diam., appearing crustose-areolate, consisting of distinct small rosette formed squamules, to 3 mm wide, not enlarged marginally, to 400 µm thick; prothallus indistinct. Upper surface flat, uneven, but not grooved, mat. APOTHECIA not common, sessile, to 0.5 mm diam., disc dark brown with paler exciple. Spores colourless, 2–3-septate, ellipsoid, 15–20 × 5–6 µm. CONIDIOMATA unknown. PHOTOBIONT scytonemoid in short chains.

Chemistry. No secondary substances (by TLC).

Habitat. On more or less submerged siliceous rocks along rivers and lakes (inundation zone)

Distribution. Not common but widespread. **Gr. Fa. F:** *U St EH PH PK PeP Ks SoL EnL InL*. **I:** *ISu IMi IAu INv INo*. **N:** *Øf Ak Op Bu Ho MR ST SNo Tr ØFi*. **AI:** *Sb*. **S:** *Bh Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Little known, but certainly present in most montane regions of Europe; recently recorded from alpine parts of New Zealand.

Note. The status of this taxon has been under much doubt, though the typical taxon as defined by the type is a most characteristic species with distinctive, thick, brown squamules, often sanded over by running water. The uncertainty has been caused by subsimilar, but thinner specimens on alpine seepage rocks. These are in my opinion only expressions of the very variable *P. nigrum* as they tend to be somewhat isidiate and have a greenish black pigmentation in the apothecia. *P. rosulans* also occurs further North and in the Arctic.

9. **Placynthium stenophyllum** (Tuck.) Fink

Lich. Fl. US: 172 (1935). – *Pannaria stenophylla* Tuck., Proc. Amer. Acad. Arts 12: 169 (1877). – TYPE: USA, Alabama, 1874 Peters (FH holotype).

Syn. *Parmeliella stenophylla* (Tuck.) Zahlbr., *Placynthium subradiatum* auct. scand.

S: trådbläcklav

Figs: Henssen 1963, Fig. 53

THALLUS small-squamulose, forming crescents on the rocks, to 2 cm diam. Lobes filiform, convex to cylindrical with radially arranged hyphae, pale brown, appearing partly isidiod when ascending, without prothallus. APOTHECIA rare, to 0.5 mm diam., with brown disc and thalline margin. Spores colourless, 1-septate, narrowly ellipsoid, 12–15 × 4–5 µm. CONIDIOMATA rare; conidia rod-shaped, colourless, 4–6 × 1 µm. PHOTOBIONT scytonemoid in curved chains.

Chemistry. No secondary substances (by TLC).

Habitat. Sun-exposed calcareous overhangs.

Distribution. Rare and scattered, rather continental. **N:** *He Bu NNo Tr*. **S:** *LyL TL*. Elsewhere in the Alps and North America.

Note. In Scandinavia for long confused with *P. subradiatum*, another species which forms crescents on less exposed rocks, though normally much darker and with flat lobes of different anatomy. When fertile easily recognized on the secondarily formed thalline margins of the apothecia.

10. **Placynthium subradiatum** (Nyl.) Arnold

Flora 67: 240 (1884). – *Pannaria subradiata* Nyl., Actes Soc. Linn. Bordeaux 21: 314 (1856). – TYPE: France, [Hautes-Pyrenées] Bagnères de Bigorre, 1853 W. Nylander (H-NYL 42742 holotype).

S: ringbläcklav

Figs: Henssen 1963, Fig. 54; Schulz 2002, Fig. 80.

THALLUS squamulose, blackish brown, sometimes sparingly pruinose, forming crescents to 1.5 cm diam., with packed, flat, effigurate marginal squamules to 2 mm wide, with crenate tips, often regenerating centrally by imbricating lobules; prothallus inapparent. APOTHECIA very rare, 0.5 mm diam., disc blackish brown with dark proper margin only. Spores colourless, 1-septate, ellipsoid, 11–13 × 6–8 µm. CONIDIOMATA unknown. PHOTOBIONT scytonemoid in curved chains.

Chemistry. No secondary substances (by TLC).

Habitat. On steep limestone cliffs, often at drainage lines (or drier surfaces).

Distribution. Rare and rather northern **Gr. AI:** *Sb*. **S:** *LyL TL*. Elsewhere widespread in Central Europe, British Isles and western North America (Rocky Mts).

Note. Long misunderstood species in Norden, and confused with the more common *P. stenophyllum* (see above), as well as with *P. lismorense*, which has digitate marginal lobes and a more granular central part, not eroding as easily as the squamulose centres of *P. subradiatum*.

11. **Placynthium tantaleum** (Hepp) Hue

Bull. Soc. Linn. Normandie ser. 5, 9: 153 (1906). – *Biatora corallinoides* var. *tantalea* Hepp, Flecht. Eur. no. 276 (1857). – TYPE: Switzerland, Alpen Findlingen, am Ufer der Sihl, Hepp (L lectotype, Gyelnik in Rabenh. Krypt.-Fl. Ed. 2, 9, Abt. 2(2): 75 (1940).

Syn. *Placynthium nigrum* var. *tantaleum* (Hepp) Arnold

S: blågrön bläcklav

THALLUS squamulose, to 3 cm diam., resting on a voluminous blue-green prothallus, central parts cracked-areolate; individual squamules to 2 mm wide, surface glossy, mottled grey-brown. APOTHECIA uncommon, to 1 mm diam., black. Spores colourless, 1-septate, constricted at septa, thick-walled, broadly ellipsoid, 10–15 × 6–9 µm. CONIDIOMATA unknown.

Chemistry. No secondary substances (by TLC).

Habitat. In inundation zones of rivers, lakes etc., usually on basic rocks, occasionally on roots.

Distribution. Widespread and scattered, poorly known, mainly in northern Scandinavia (and North America). **N:** *ST SNo Tr VFi*. **S:** *Vg Ög Hrj Jmt LyL PL TL*.

Note. The status of this taxon has been much in doubt though the typical form is most distinctive with a flat, polished, grey-mottled thallus resting on a voluminous, blue-green prothallus; asci containing broad, thick-walled, 1-septate spores. These forms are nearly always found in the lower parts of riverbeds where they are frequently overrun by water, and are thus also ecologically distinctive. The uncertainty has been caused by subsimilar specimens being found on seepage rocks. These have incorrectly been referred to this taxon because of their 1-septate (but usually thin-walled), though narrower spores, but appear only to be part of the variation of *P. nigrum*, of which *P. tantaleum* has been regarded to be a variety. Its distinctness has also been confirmed by molecular studies (Wiklund & Wedin 2004).

12. **Placynthium tremniacum** (A.Massal.) Jatta

Sylloge Lich. Ital.: 38 (1900). – *Racoblenna tremniaca* A.Massal., Ric. Auton. Lich. Crost.: 140 (1852). – TYPE: Italy, Tregnago, A. Massalongo (VER holotype).

Syn. *Placynthium lismorense* f. *meridionale* Gyeln., *Placynthium tremniacum* f. *subeffiguratum* Gyeln.

THALLUS squamulose, to 3 cm diam., shining brown; prothallus indistinct, not reaching beyond the slightly

enlarged marginal squamules; centrally cracked-areolate and granular-isidioid. APOTHECIA rare, to 1 mm diam., dark brown, with often excluded proper exciple. Spores colourless, predominantly 1–septate, ellipsoid, 10–15 × 4–6 µm. CONIDIOMATA rare, immersed; conidia simple, bacilliform, colourless, 3–4 × 1 µm. PHOTOBIONT scytonemoid in short chains.

Chemistry. No secondary substances (by TLC).

Habitat. Periodically wet calcareous rocks, the typical form in shaded habitats.

Distribution. Poorly known with widely scattered rather different populations in the Baltic islands and Iceland. **I:** *ISu*. **S:** *Öl Gtl*. Widespread in southern and central Europe, North to the British Isles; records outside Europe are uncertain.

Note. As pointed out by Santesson et al. (2004: 253) previous records of this species in Norden are incorrect, while the Swedish material referred to it here has been called *P. lismorense*, though clearly differing from that species. Although sometimes difficult to separate with certainty from the variable *P. nigrum*, this is certainly a distinct entity, with areolate isidiate thallus with poorly developed prothallus and one-septate spores, which is found in the Icelandic material. The Baltic island material has a shinier brown thallus with somewhat enlarged marginal lobes (f. *subeffiguratum*) without any exceeding dark black thallus, clearly separating it morphologically from *P. nigrum*. The often recorded difference in septation of the spores are not as exclusive as previously claimed, though *P. tremniacum* tends to have a majority of one-septate spores, while these are fairly rare in *P. nigrum*.

The naming of this latter material has been most difficult, but I have finally decided to follow the traditional view on the continent, to regard this as a form of *P. tremniacum* from rather open, drier rocks. *P. tremniacum* s. str. is a species of shaded rocks which occasionally develop nearly subfruticose thalli of isidioid lobules, a form as yet only known from Iceland in our region. One should possibly transfer one of the form names to higher ranks (both published in the same year) to the Baltic material, but this requires closer studies, particularly in central Europe, to make it possible to decide whether it represents an unrecognized, distinct species.

Vestergrenopsis Gyelnik

In Rabenh. Krypt.-Fl. Ed. 2, 9, Abt. 2(2): 265–268 (1940). – TYPE: *Vestergrenopsis elaeina* (Wahlenb.) Gyeln.

Literature: Dahl, Meddel. Grønland 150(2): 55 (1950); Gyelnik in Rabenh. Krypt.-Fl. Ed. 2, 9, Abt. 2(2): 265–268 (1940); Henssen, Canad. J. Bot. 41: 1359–1366 (1963).

THALLUS squamulose forming stellate, closely appressed rosettes, without lower cortex. ASCOMATA apothecioid, sessile, hemioangocarpic, with prominent thalline margin and blackish brown disc. Hymenium I+ blue. Asci 8–16-spored without internal amyloid structures. Spores simple (sometimes with distinct plasma-bridges), colourless, ellipsoid. CONIDIOMATA unknown. PHOTOBIONT *Scytonema* in chains.

Chemistry. No secondary substances (by TLC).

Note. Species of *Vestergrenopsis* are easily confused with some in *Placynthium* and it is hard to point out one character that singles the genus out from *Placynthium*, except the strong thalline margin which is usually absent in *Placynthium*, and which when occasionally occurring there, is secondary. This difference in apothecial ontogeny indicates a more distant relationship than seemingly obvious superficially.

1 Thallus usually with apothecia, non-isidiate.... 1. *V. elaeina*
– Thallus usually without apothecia, isidiate.....2. *V. isidiata*

1. Vestergrenopsis elaeina (Wahlenb.) Gyeln.

in Rabenh. Krypt.-Fl. Ed. 2, 9, Abt. 2(2): 266 (1940). – *Parmelia elaeina* Wahlenb. in Acharius, Methodus Suppl.: 46 (1803). – TYPE: Norway, Finnmark, "Alpe Rossmollen [Rossmulen] vid Hammerfest", 1802 Wahlenberg (UPS holotype).

Syn. *Pannaria elaeina* (Wahlenb.) Nyl.

I: gljúfraglypja

Literature: Gyelnik in Rabenh. Krypt.-Fl. Ed. 2, 9, Abt. 2(2): 266–268 (1940); Degelius, Bot. Not. 1943: 93–94.

Figs: Henssen 1963: fig. 8.

THALLUS in olivaceous rosettes to 4 cm diam., with narrow, to 0.5 mm wide, radiating lobes which are striate to grooved on the upper surface, to 200 µm thick, with cellular pattern, without lower cortex. APOTHECIA to 1 mm diam., common, particularly centrally with distinct thalline margin, to 150 µm wide, and blackish

brown disc. Spores usually 16/ascus, simple (or with plasma-bridges), colourless, ellipsoid, 8–10 × 4–6 µm. CONIDIOMATA unknown. PHOTOBIONT *Scytonema* in chains, individual cells 5–12 × 4–10 µm.

Chemistry. No secondary substances (by TLC).

Habitat. On (partly) moist, alpine schists.

Distribution. Arctic–alpine, rare and scattered. **Gr. Fa. I:** *ISu IVe IMi IAu INv INo*. **N:** *Op Ro Ho SF MR ST SNo NNo Tr VFi ØFi*. **AI:** *Sb*. **S:** *LuL TL*. Circumarctic, reaching as far south as western Scotland and the mountains of Japan.

2. Vestergrenopsis isidiata (Degel.) E.Dahl

Meddel. Grønland 150(2): 55 (1950). – *Pannaria isidiata* Degel., Bot. Not. 1943: 90 (1943). – TYPE: Sweden, Jämtland, Åre, Handölsfallet, 1913 Du Rietz (UPS holotype).

F: seitajäkälä

Literature: Degelius, Bot. Not. 1943: 90–93 (1943); Magnusson, Ark. Bot. 33A(16): 14 (1948); Henssen, Canad. J. Bot. 41: 1362–1363 (1963).

Figs: Brodo 2001: fig. 898, Henssen 1963: figs 9–12.

THALLUS in olivaceous rosettes to 4 cm diam. with narrow, to 0.5 mm wide, radiating lobes with striate to grooved upper surface, centrally covered in granular to coralloid, laminal isidia, sometimes developing into ligulate lobules. APOTHECIA rare, often poorly developed, as in *V. elaeina*, but asci with irregular spore production, 8–16. Spores simple (or with plasma bridges), colourless, ellipsoid, 7–10 × 4–6 µm. CONIDIOMATA unknown. PHOTOBIONT *Scytonema*.

Chemistry. No secondary substances (by TLC).

Habitat. On seepages on schistose rocks.

Distribution. Arctic-alpine to boreal zone, widespread (locally more common, but more continental than *V. elaeina*). **Gr. F:** *InL*. **I:** *INo*. **N:** *Op Ho SF MR ST NT SNo Tr VFi ØFi*. **S:** *Hrj Jmt LyL PL LuL TL*. Circumarctic, not reaching as far south as *V. elaeina* (unknown in the British Isles).

Note. Usually easily distinguished from *V. elaeina* by the isidiate thallus; often more difficult to separate from extreme (isidio-lobulate) forms of some *Placynthium* species, particularly the likewise striate *P. pannariellum* which, however, has a dark lower surface.

APPENDIX
Nomenclatural novelties

Coccocarpiaceae

Spilonema Bornet
P. M. Jørgensen

Spilonema paradoxum Bornet

Mém. Soc. Sci. Nat. Cherbourg 4: 225 (1856). – TYPE: France, Cannes, 1856 Bornet (H-NYL 43040 lectotype, here designated).

Spilonema revertens Nyl.

Flora 48: 601 (1865). – Type: Finland, Tavastia australis, Asikkala, 1863 Norrlin (H-NYL-43046 lectotype, here designated).

Collemataceae

Collema F.H.Wigg.
P. M. Jørgensen

Collema auriforme (With.) Coppins & J.R.Laundon

Lichenologist 16: 228 (1984). – *Riccia auriformis* With., Bot. Arr. Veg. Gr. Brit. 1: 704 (1776). – TYPE: England, Oxford, on the paths of University botanic Gardens, Dillenius, Icon in Dillenius, Historia Muscorum, tab. 19, fig. 24, 1742 (holotype); corresponding specimen marked A in herb. Dillenius (OXF epitype, here designated).

Collema bachmanianum (Fink) Degel.

Symb. Bot. Ups. 13(2): 189 (1954). – *Collemodes bachmaniana* Fink, Mycologia 10: 237 (1918). – TYPE: USA, Iowa, Fayette Co., 1894 Fink 1127 (MICH lectotype, here designated).

Collema conglomeratum Hoffm.

Deutschl. Fl. 2: 102 (1796). – TYPE: Germany, Ehrhart Pl. Crypt. Linn. no. 256 (UPS lectotype, here designated).

Collema crispum (Huds.) F.H.Wigg.

Prim. Fl. Hols.: 89 (1780). – *Lichen crispus* Huds., Fl. Angl.: 447 (1762). – TYPE: England, Icon in Dillenius, Historia Muscorum, tab. 19, fig. 23, 1742 (lectotype, here designated); corresponding specimen in herb. Dillenius (OXF epitype, here designated).

Collema cristatum var. **marginale** (Huds.) Degel.

Symb. Bot. Ups. 13(2): 316 (1954). – *Lichen marginalis* Huds., Fl. Angl.: 534 (1862). – TYPE: England, Icon in Dillenius, Historia Muscorum, tab. 19, fig. 25, 1742 (lectotype, here designated); corresponding specimen in herb. Dillenius (OXF epitype, here designated).

Collema fuscovirens (With.) J.R.Laundon

Lichenologist 16: 219 (1984). – *Lichen fuscovirens* With., Bot. Arr. Veg. Gr. Br. I: 717 (1776). – TYPE: England, Oxfordshire, Marston, Dillenius, Icon in Dillenius Historia Muscorum, tab. 19, fig 22, 1742 (holotype); corresponding specimen in herb. Dillenius (OXF epitype, here designated).

Collema nigrescens (Huds.) DC.

in Lamarck & De Candolle, Fl. Franç., ed. 3, 2: 384 (1805). – *Lichen nigrescens* Huds., Fl. Angl.: 450 (1762). – TYPE: England "in Cambria" or "in sylva Bagley-Wood prope Oxonium", Icon in Dillenius Historia Muscorum: tab. 19, fig. 20 p.p., 1742 (lectotype, as 'holotype', Degelius, Symb. Bot. Ups. 13(2): 425, 1954); corresponding specimen in herb. Dillenius (OXF epitype, here designated).

Collema polycarpon Hoffm.

Deutschl. Fl. 2: 102 (1796). – TYPE: Switzerland, "ad rupes saxaque in Alpibus calcariis", Schaerer, Lich. Helv. Exc. no. 421 (as *Collema multifidum* var. *polycarpon* Schaer.) (G-Schaerer neotype, here designated).

Collema undulatum var. **granulosum** Degel.

Symb. Bot. Ups. 13(2): 369 (1954). – TYPE: Iceland, Rangarvallasysla, Mulakot, 2 July 1937 B. Lynge (O, upper left specimen, lectotype, here designated).

Leptogium (Ach.) S.F.Gray
P. M. Jørgensen

Leptogium gelatinosum (With.) J.R.Laundon

Lichenologist 16: 219 (1984). – *Lichen gelatinosus* With., Bot. Arr. Veg. Gr. Brit. 1: 710 (1776). – TYPE: England, Herefordshire, Wigmore, Dillenius, Icon in Dillenius, Historia Muscorum: tab. 19, Fig. 33, 1742 (holotype); corresponding specimen in herb. Dillenius (OXF epitype, here designated).

Leptogium palmatum (Huds.) Mont.

in Durieu, Expl. Sci. Algerie 6: 209 (1846). – *Lichen palmatus* Huds., Fl. Angl., ed. 2, 2: 536 (1778). – TYPE: Icon in Dillenius, Historia Muscorum: tab. 19, fig. 30, 1742 (lectotype, here designated); corresponding specimen in herb. Dillenius (OXF epitype, here designated).

Leptogium plicatile (Ach.) Leight.

Lich. Fl. Gr. Brit., ed. 3: 30 (1879). – *Lichen plicatilis* Ach., Kongl. Vetensk. Akad. Nya Handl. 16: 11 (1795). – TYPE: Sweden, Vättern, 'ad littora lacus', Acharius (UPS-ACH lectotype, here designated).

Leptogium saturninum (Dicks.) Nyl.

Actes Soc. Linn. Bordeaux 21: 272 (1857). – *Lichen saturninus* Dicks., Fasc. Pl. Crypt. Brit. 2: 22 (1790). – TYPE: Icon, Ibid., Tab. 6, fig. 8 (holotype); Scotland, Perthshire, Glen Lovhay, J.M. Crombie, Lich. Brit. Exs. no. 5 (BM epitype, here designated).

Leptogium schraderi (Bernh.) Nyl.

Actes Soc. Linn. Bordeaux 21: 272 (1857). – *Lichen schraderi* Bernh., J. Bot. 1: 22 (1799). – TYPE: Icon, Ibid., Tab. II, fig. 5 (lectotype, Jørgensen, Lichenologist 26: 22, 1994); Germany, Rheinland, Südost Eiffel, Elzthal, Pyremonter Mühle, 1960 Th. Müller (UPS epitype, here designated).

Leptogium teretiusculum (Wallr.) Arnold

Ber. Bayer. Bot. Ges. 2, Anhang: 26 (1892). – *Lichen teretiusculus* Wallr., Fl. Crypt. Germ. 1: 551 (1831). – TYPE: Germany, Westfalen, Bruchhausen near Höxter, 1877 Lahm (UPS neotype, here designated).

Heppiaceae

Epiphloea Trevis.
P. M. Jørgensen

Epiphloea byssina (Hoffm.) Henssen & P.M.Jørg. *comb. nov.*

Collema byssinum Hoffm., Deutschl. Fl.: 105 (1796). – TYPE: Germany, Zwackh-Holzhausen Exs. no. 174 (UPS neotype, Jørgensen 1994: 3).

Lichinaceae

Lempholemma Körb.
P. M. Jørgensen

Lempholemma intricatum (Arnold) Zahlbr.

Catal. Lich. Univ. 3**:** 23 (1924). – *Omphalaria intricata* Arnold, Flora 52: 254 (1869). – TYPE: Germany, Bavaria, "Bayerische Alpen, unweit der Weitalm an den Hochgern ober Wesser", 1869 Arnold, Lich. Exs. no. 399 (M lectotype, here designated).

8. Lempholemma polyanthes (Bernh.) Malme

Schedae Lich. Suec. Exs. no. 883 (1924). – *Collema polyanthes* Bernh., J. Bot. (Schrader) 1**:** 12 (1799). – TYPE: Icon in op. cit., tab. 1 fig. 4 (holotype); Sweden, Västmanland, Nora, Fåsjön, St. Holmen, 1916 Vrang (Malme, Lich. Exs. Suec. no. 883, UPS epitype, here designated).

Lichina C.Agardh
P. M. Jørgensen

Lichina confinis (O.F.Müll.) C.Agardh

Syn. Alg. Scand.: 105 (1817). – *Lichen confinis* O.F.Müll., Fl. Dan. 5: 5 (1782). – TYPE: Icon in O. F. Müller, Fl. Dan. 5: fig. 1279, 1782 (lectotype, here designated); Norway, Hordaland ("Søndre Bergenhus amt"), ad Mosterhavn, 1914 Havaas, Lich. Exs. Norv. Occ. no. 68 (BG epitype, here designated).

Lichina pygmaea (Lightf.) C.Agardh

Syn. Alg. Scand.: 274 (1817). – *Fucus pygmaeus* Lightf., Fl. Scot. 2: 964 (1777). – TYPE: Icon in Lightfoot, Fl. Scot. 2: fig. 32e, 1777 (lectotype, here designated); Scotland, East Lothian, Firth of Forth, North Berwick, The Leithies, 2006 Coppins 21797 (E epitype, here designated).

Phylliscum Nyl.
P. M. Jørgensen

Phylliscum demangeonii (Moug. & Mont.) Nyl.

Mém. Soc. Imp. Sci. Nat. Cherbourg sér. 2, 3: 166 (1855). – *Collema demangeonii* Moug. & Mont. in Montagne, Pl. Cell. Nouv.: 291 (1849). – TYPE: France(?), near Romarimonte, Demangeon, Mougeot & Nestler, Stirp. Crypt. Vogeso-Rhen. no. 1340 (UPS lectotype, here designated).

Porocyphus Körb.
P. M. Jørgensen

Porocyphus coccodes (Flot.) Körb.

Syst. Lich. Germ.: 426 (1855). – *Collema coccodes* Flot., Linnaea 23: 152 (1850). – TYPE: [Poland] Silesia, Flotow (UPS lectotype, here designated).

Psorotichia A.Massal.
P. M. Jørgensen

Psorotichia schaereri (A.Massal.) Arnold

Flora 52: 265 (1869). – *Pannaria schaereri* A.Massal., Lich. Crost.: 114 (1852). – TYPE: Italy, Massalongo, Lich. Exs. Ital. no. 338 (UPS lectotype, here designated).

Pterygiopsis Vain.
P. M. Jørgensen

Pterygiopsis concordatula (Nyl.) P.M.Jørg. *comb. nov.*

Pyrenopsis concordatula Nyl., Flora 58: 440 (1875). – TYPE: Finland, Korpilahti, 1874 Lang (=Vainio) (H-NYL 42920 holotype).

Synalissa Fr.
P. M. Jørgensen

Synalissa ramulosa (Hoffm. ex Bernh.) Fr.

Syst. Orb. Veg.: 297 (1825). – *Collema ramulosum* Hoffm. ex Bernh., J. Bot. (Schrader) 1: 24 (1799). – TYPE: France, Savoyischen Alpen, Argentière, Schmidt in Migula, Krypt. Germ. Exs. no. 264 (O neotype, here designated).

Thallinocarpon E.Dahl
P. M. Jørgensen

Thallinocarpon nigritellum (Lettau) P.M.Jørg. *comb. nov.*

Thyrea nigritella Lettau, Rep. Spec. Nov. Regni Veg., Beih. 119: 276 (1942). – TYPE: Germany, Allgäu, Blaibach bei Sonthofen, auf stark kalkhaltigen Molassesandstein, 1918, Lettau (B lectotype, as 'holotype', Henssen, Lichenologist 18: 52, 1986).

Thermutis Fr.
P. M. Jørgensen

Thermutis velutina (Fr.) Flot.

Linnaea 23: 170 (1850). – *Lichen velutinus* Ach., Lichenogr. Suec. Prodr.: 218 (1799). – TYPE: Suecia (H-ACH 1925A lectotype, here designated).

Lobariaceae

Lobaria (Schreb.) Hoffm.
T. Tønsberg & P. M. Jørgensen

Lobaria amplissima (Scop.) Forssell

Bih. Kong. Svenska Vetensk.-Akad. Handl. 8(3): 111 (1883). – *Lichen amplissimus* Scop., Fl. Carniol. Ed. 2, 2: 386 (1772). – TYPE: Italian Alps, beech forest, Icon in Michelius, Genera Plantarum, tab. 46, 1729 (lectotype, here designated); corresponding specimen in herb. Micheli (FI epitype, here designated).

Lobaria linita (Ach.) Rabenh.

Deutschl. Krypt.-Fl. 2(1): 65 (1845). – *Sticta linita* Ach., Syn. Meth. Lich.: 234 (1814). – TYPE: Switzerland ['Helvetia Syn. Pag. 234') (UPS-ACH lectotype, here designated).

Lobaria scrobiculata (Scop.) DC

Fl. Franç. ed. 3, 2: 402 (1805). – *Lichen scrobiculatus* Scop., Fl. Carniol. Ed. 2, 2: 384 (1772). – TYPE: Wales, Dolgelley; Icon in Dillenius Historia Muscorum, tab. 29, fig. 114, 1742 (lectotype, Yoshimura & Isoviita, Ann. Bot. Fenn. 6(4): 350, 1969); corresponding, large, right hand specimen in herb. Dillenius (OXF epitype, here designated).

Lobaria virens (With.) J.R.Laundon

Lichenologist 16: 227(1984). – *Lichen virens* With., Bot. Arr. Veg. Gr. Brit.: 710 (1776). – TYPE: Icon in Dillenius Historia. Muscorum: tab. 25, fig. 98A, 1742 (lectotype, Laundon, Lichenologist 16: 227, 1984); corresponding, the middle specimen, in herb. Dillenius (OXF epitype, here designated).

Sticta (Schreb.) Ach.
P. M. Jørgensen & T. Tønsberg

Sticta fuliginosa (Hoffm.) Ach.

Methodus: 280 (1803). – *Lobaria fuliginosa* Hoffm., Deutschl. Fl. 2: 109 (1796). – TYPE: Wales, Cader Idris, Icon in Dillenius Historia muscorum: tab. 26, fig. 100A, 1742 (lectotype, Laundon, Lichenologist 16: 218–219, 1984); corresponding specimen in herb. Dillenius (OXF epitype, here designated).

Sticta sylvatica (Huds.) Ach.

Methodus: 281 (1803). – *Lichen sylvaticus* Huds., Fl. Angl. 2: 721 (1778). – TYPE: Icon in Dillenius, Historia Muscorum, tab. 27, fig. 101, 1742 (lectotype, Jørgensen & Tønsberg, here designated); corresponding specimen in herb. Dillenius (OXF epitype, here designated).

Massalongiaceae

Leptochidium M.Choisy
P. M. Jørgensen

Leptochidium albociliatum (Desm.) M.Choisy

Bull. Mens. Soc. Linn Lyon 21: 165 (1952). – *Leptogium albociliatum* Desm., Ann. Sci. Nat. Bot., ser. 4, 58: 132 (1855). – TYPE: France (Ain), near Saint-Benoit in Beaujolais, Desmazière, Pl. Crypt. Fr. no. 233 (UPS lectotype, here designated).

Pannariaceae

Psoroma Michx.
P. M. Jørgensen

Psoroma paleaceum (Fr.) Timdal & Tønsberg

Graphis Scripta 18: 54–57 (2006). – Parmelia paleacea Fr. Lich. Ref. Eur.: 97 (1831). – TYPE: "*Lecanora ciliata*, Dania" (H-ACH 925 lectotype, Jørgensen 1978: 31); Sweden, Västergötland, Axvall. 1897 Stenholm (UPS epitype, Jørgensen, here designated).

Peltigeraceae

Peltigera Willd.
O. Vitikainen

Peltigera didactyla (With.) J.R.Laundon

Lichenologist 16: 217 (1984). – *Lichen didactylus* With., Bot. Arr. Veg. Gr. Brit. 1, 2: 718 (1776), '*Didactylos'*. – TYPE: Icon in Dillenius, Historia Muscorum.: tab. 28, fig. 108, 1742 (holotype); corresponding specimen in herb. Dillenius (OXF epitype, here designated; as 'typotype' in Laundon, Lichenologist: 16: 217, 1984).

Peltigera horizontalis (Huds.) Baumg.

Fl. Lips.: 562 (1790). – *Lichen horizontalis* Huds., Fl. Angl.: 453 (1762). – TYPE: [England] In sylva Enfieldensi", Icon in Dillenius, Historia Muscorum: tab. 28, fig. 104B, 1742 (holotype); corresponding specimen in herb Dillenius (OXF epitype, here designated).

Solorina Ach.
O. Vitikainen

Solorina bispora Nyl.

Syn. Lich. 331 (1860). – TYPE: France, "Pyren. Baréges", W. Nylander (H-NYL 32893 lectotype, here designated, as 'holotype', Burgaz & Martínez, Flora Liquenol. Ibérica. Peltigerales: 50 (2003).

Placynthiaceae

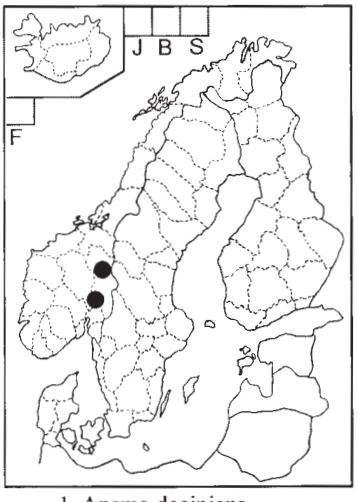
Placynthium (Ach.) Gray
P. M. Jørgensen

Placynthium lismorense (Cromb.) Vain.

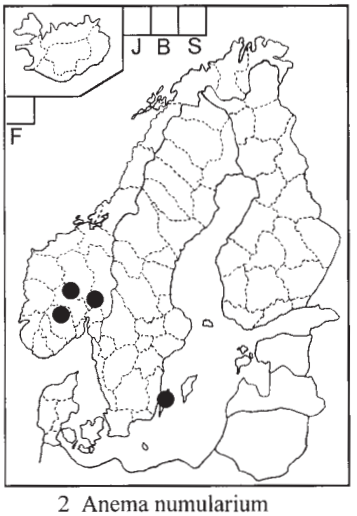
Ark. Bot. 8(4): 98 (1909). – *Pterygium lismorense* Cromb., Grevillea 5: 108 (1877). – TYPE: Scotland, Argyllshire, Lismore Island, ad saxa calcarea, Crombie, Lich. Brit. Exs. no. 101 (BM lectotype, here designated).

Placynthium pannariellum (Nyl.) H.Magn.

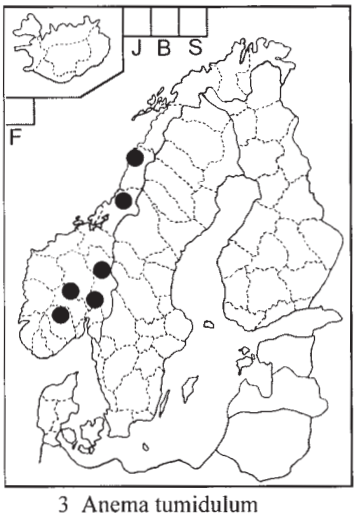
Förteckn. Skand. Växt., Lavar: 24 (1936). – *Pterygium pannariellum* Nyl., Not. Sällsk. Fauna Fl. Fenn. Förh. 1: 236 (1859). – TYPE: Finland, Savolax, 1852 E. Nylander (H lectotype, here designated).



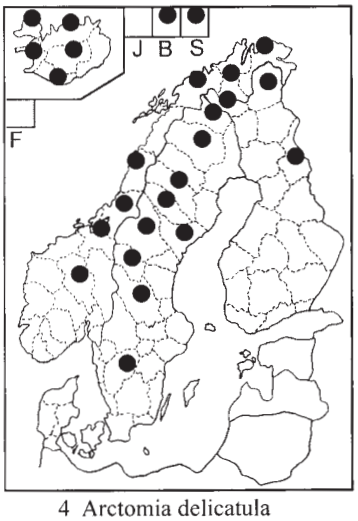
1 Anema decipiens



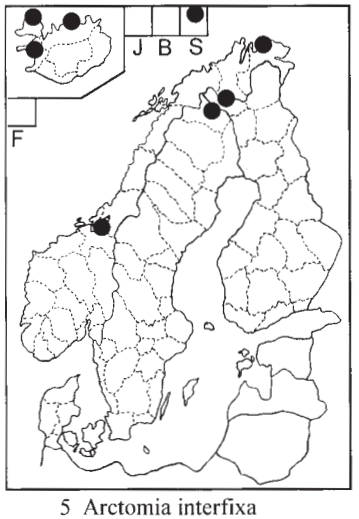
2 Anema numularium



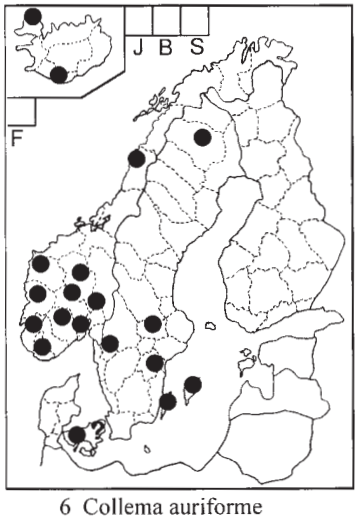
3 Anema tumidulum



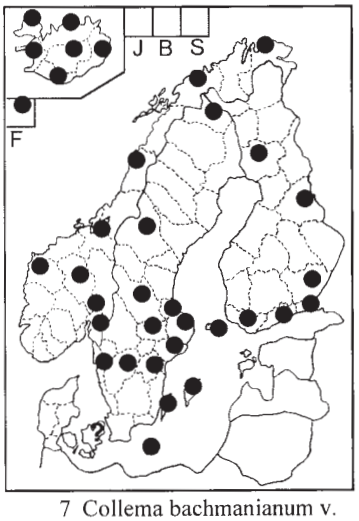
4 Arctomia delicatula



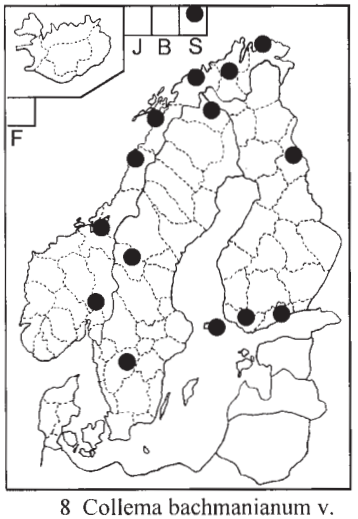
5 Arctomia interfixa



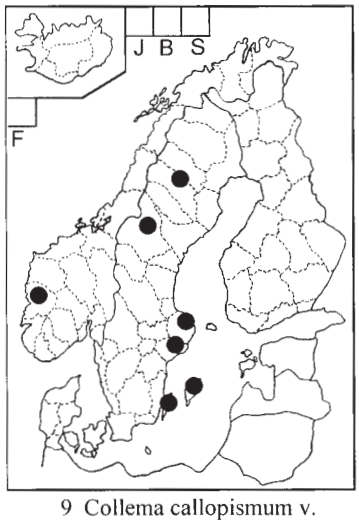
6 Collema auriforme



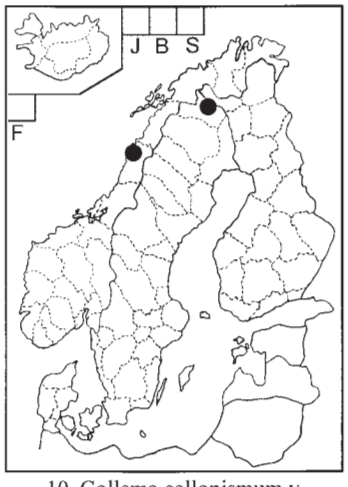
7 Collema bachmanianum v. bachmanianum



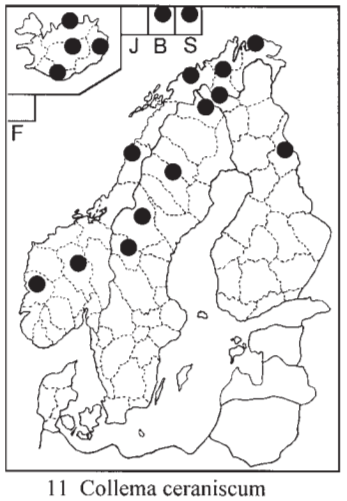
8 Collema bachmanianum v. millegranum



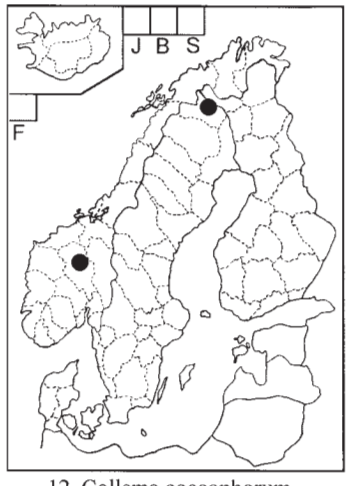
9 Collema callopismum v. callopismum



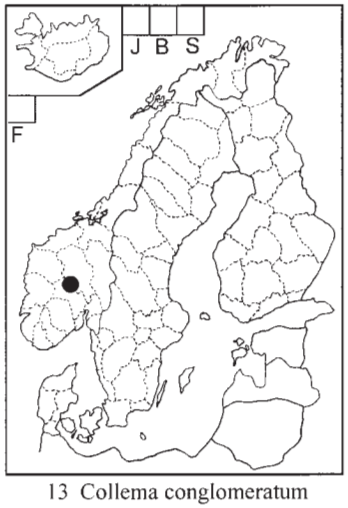
10 Collema callopismum v. rhyparodes



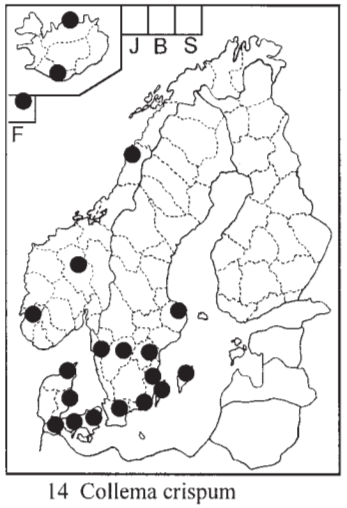
11 Collema ceraniscum



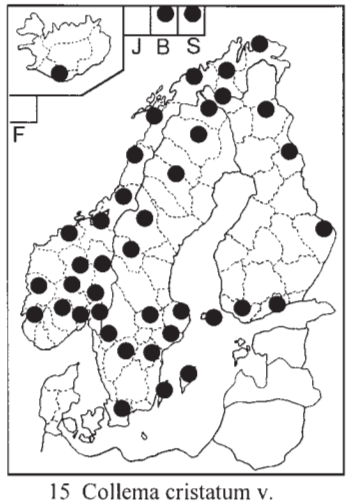
12 Collema coccophorum



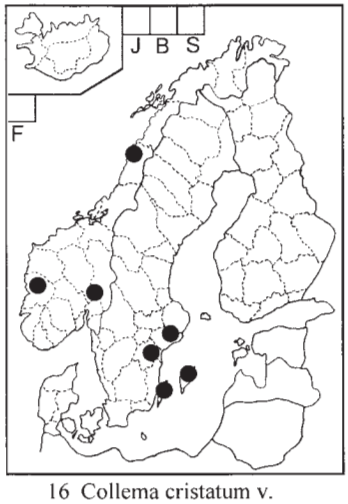
13 Collema conglomeratum



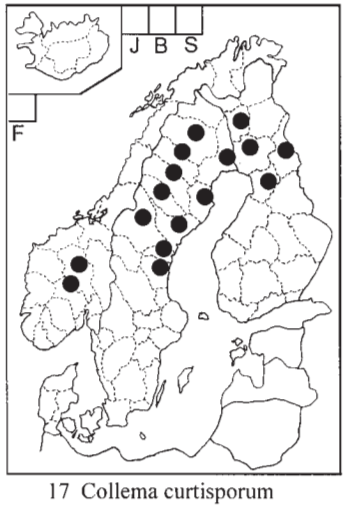
14 Collema crispum



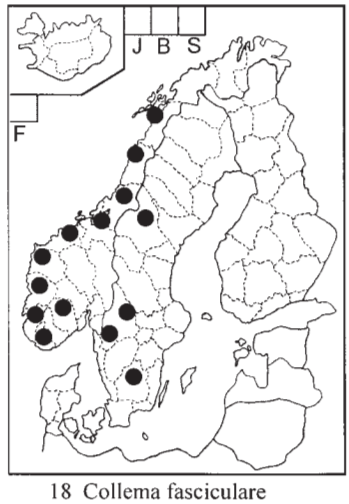
15 Collema cristatum v. cristatum



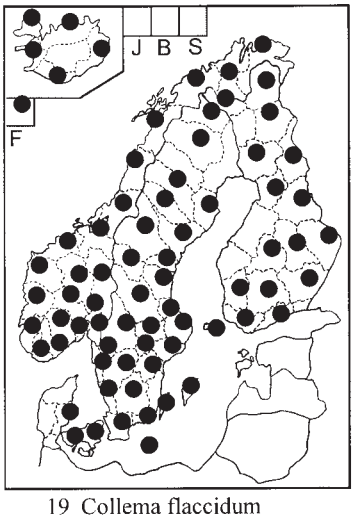
16 Collema cristatum v. marginale



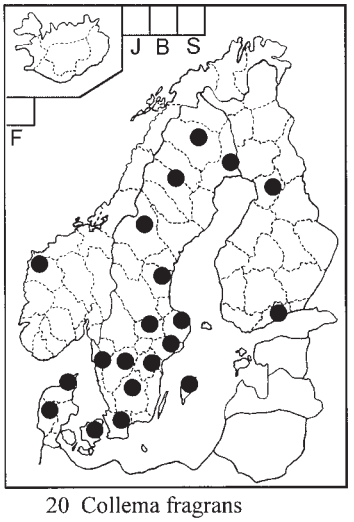
17 Collema curtisporum



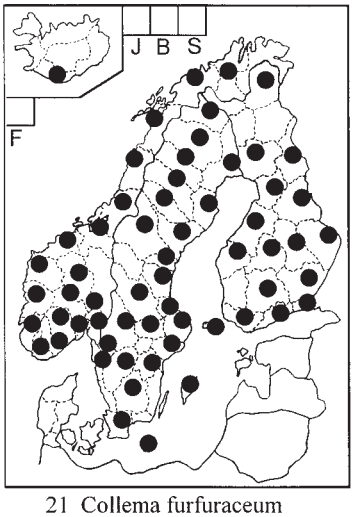
18 Collema fasciculare



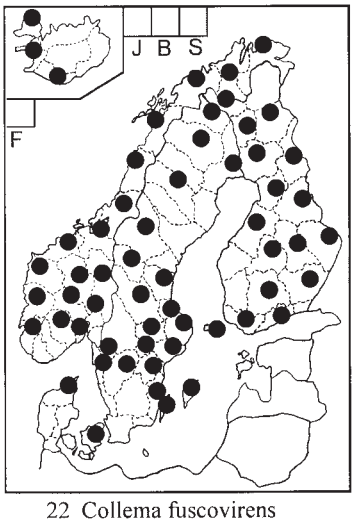
19 Collema flaccidum



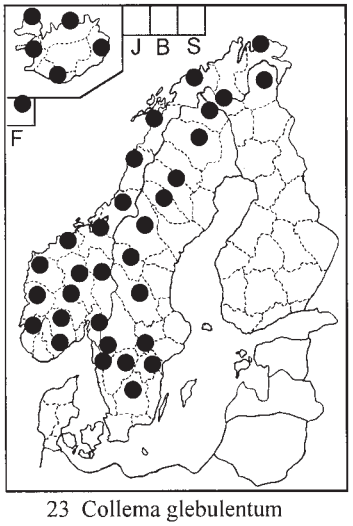
20 Collema fragrans



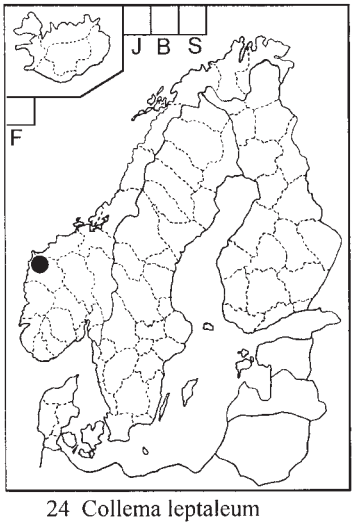
21 Collema furfuraceum



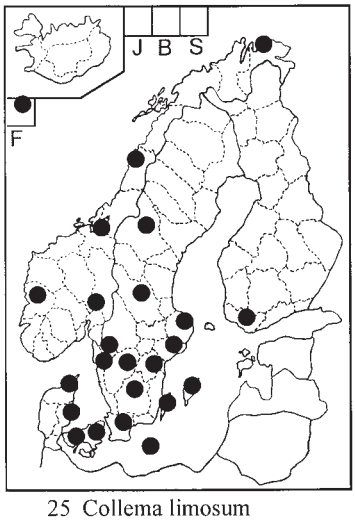
22 Collema fuscovirens



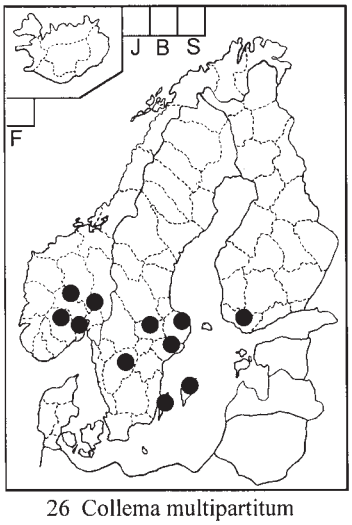
23 Collema glebulentum



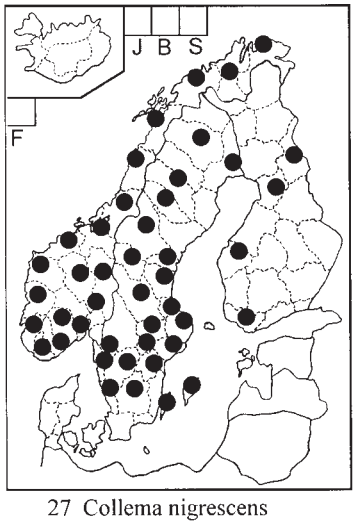
24 Collema leptaleum



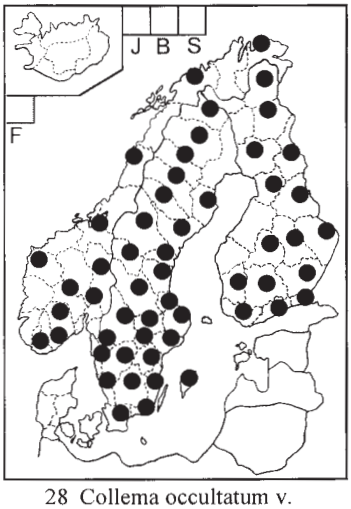
25 Collema limosum



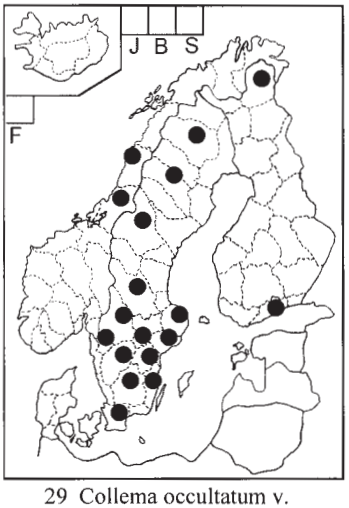
26 Collema multipartitum



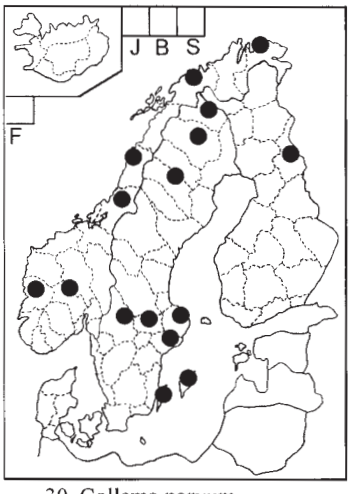
27 Collema nigrescens



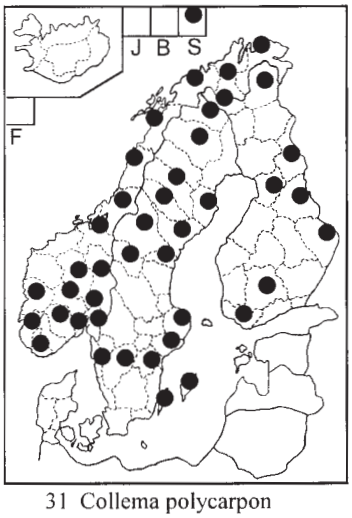
28 Collema occultatum v. occultatum



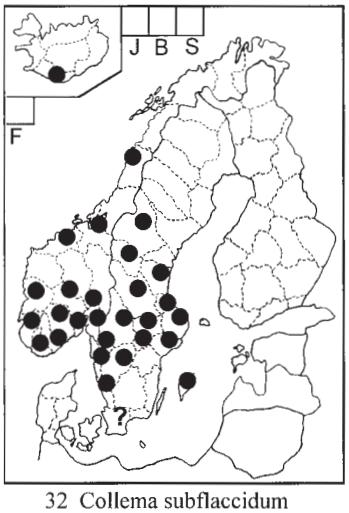
29 Collema occultatum v. populinum



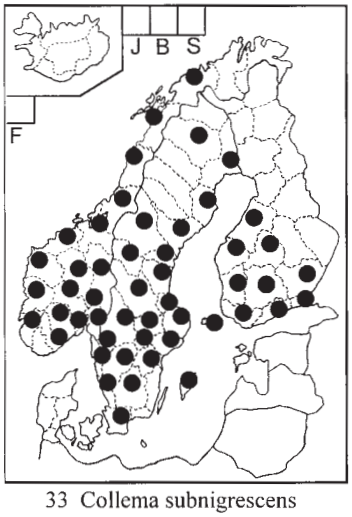
30 Collema parvum



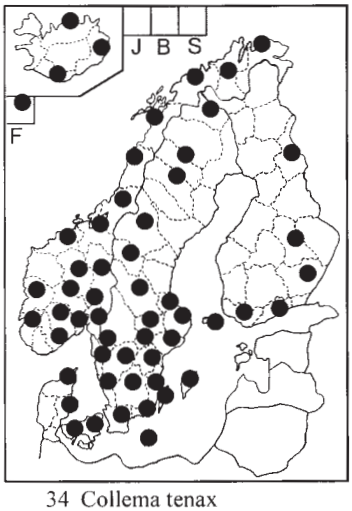
31 Collema polycarpon



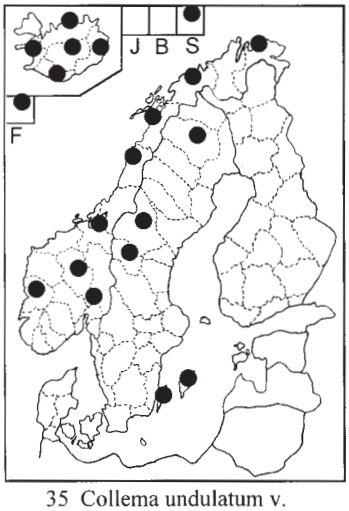
32 Collema subflaccidum



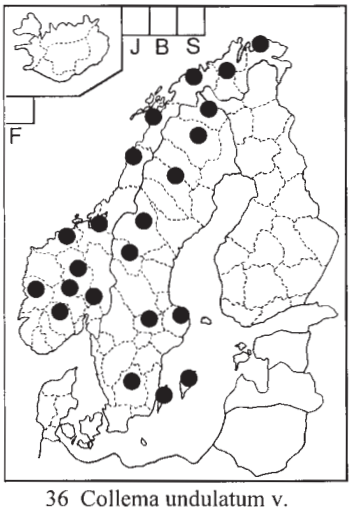
33 Collema subnigrescens



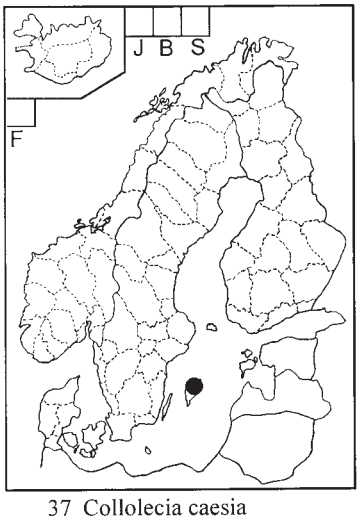
34 Collema tenax



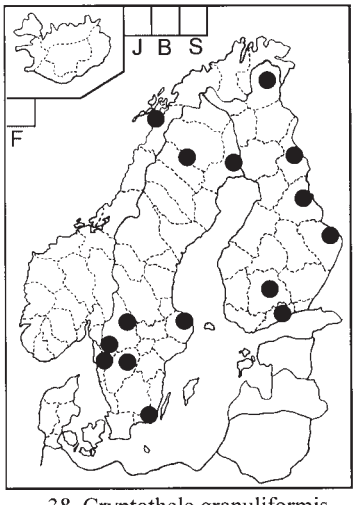
35 Collema undulatum v. granulosum



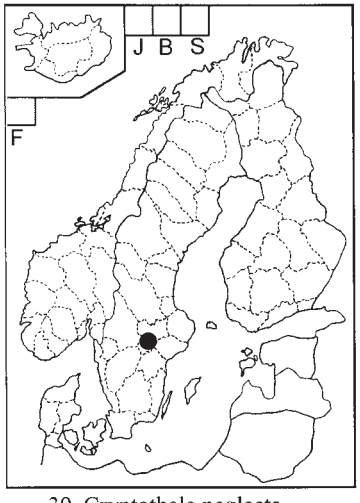
36 Collema undulatum v. undulatum



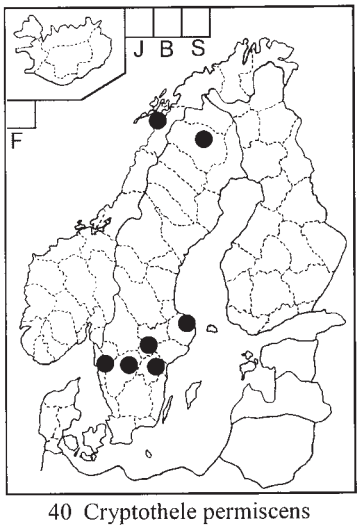
37 Collolecia caesia



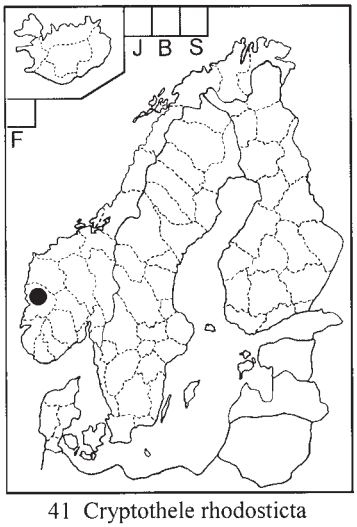
38 Cryptothele granuliformis



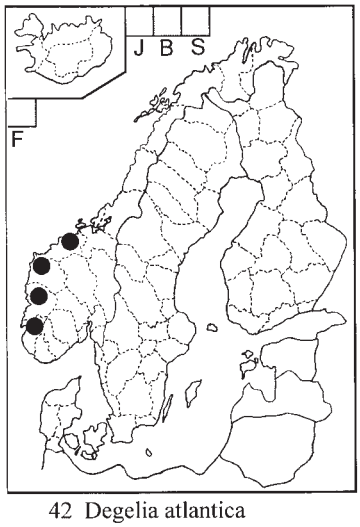
39 Cryptothele neglecta



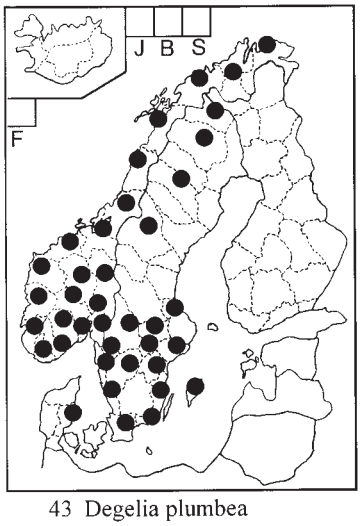
40 Cryptothele permiscens



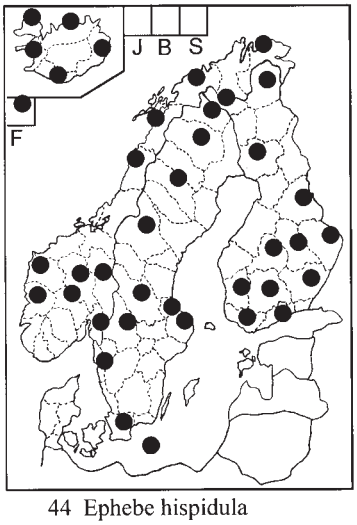
41 Cryptothele rhodosticta



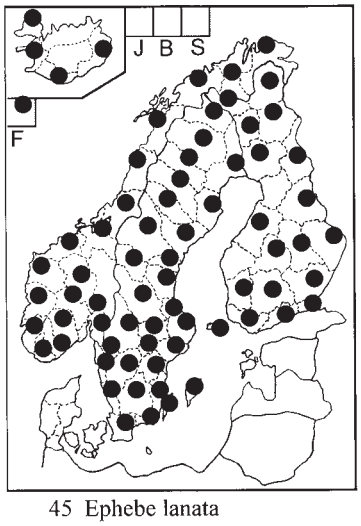
42 Degelia atlantica



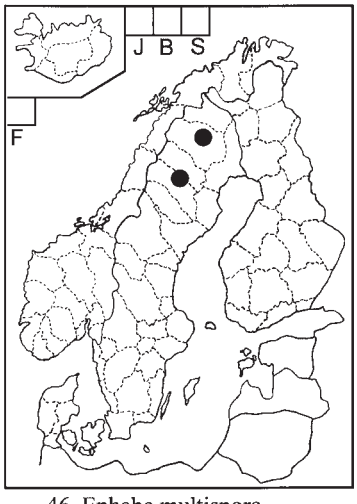
43 Degelia plumbea



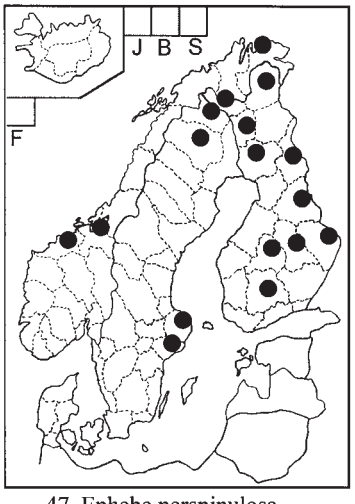
44 Ephebe hispidula



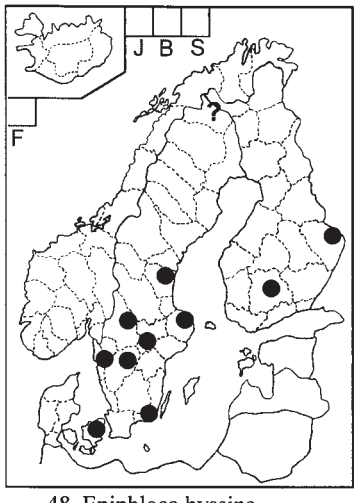
45 Ephebe lanata



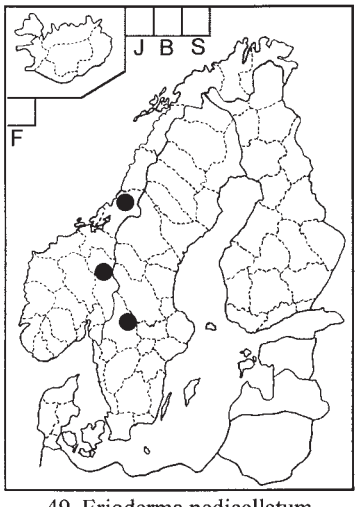
46 Ephebe multispora



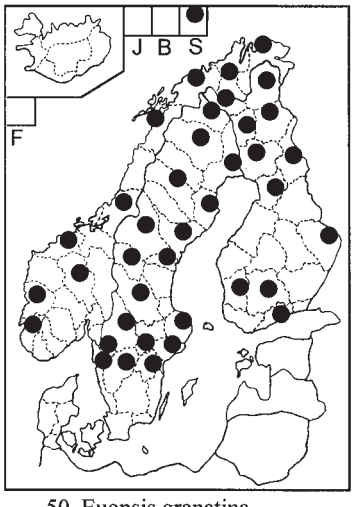
47 Ephebe perspinulosa



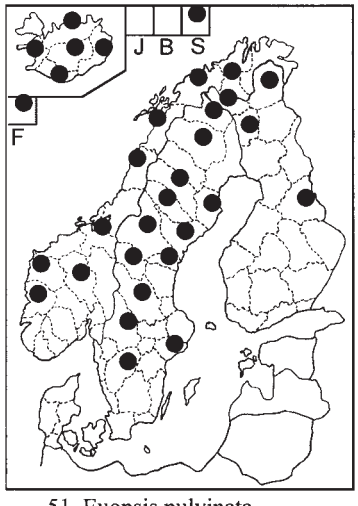
48 Epiphloea byssina



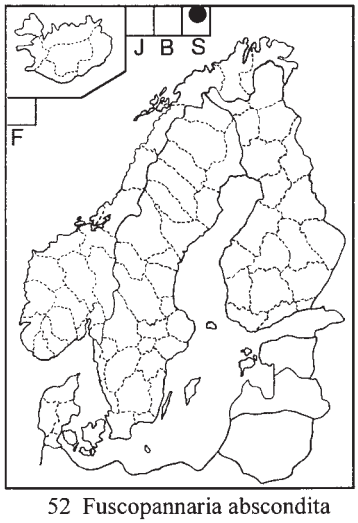
49 Erioderma pedicellatum



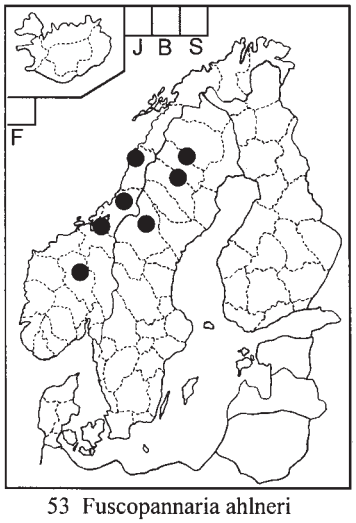
50 Euopsis granatina



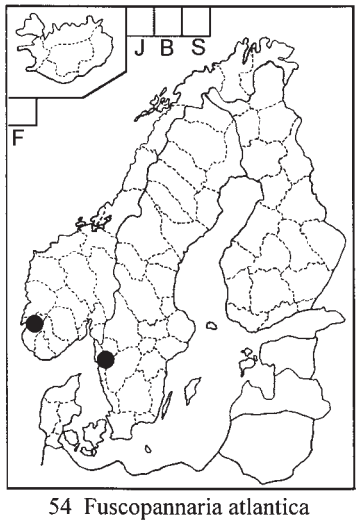
51 Euopsis pulvinata



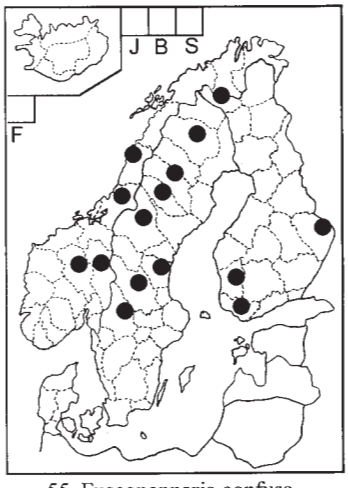
52 Fuscopannaria abscondita



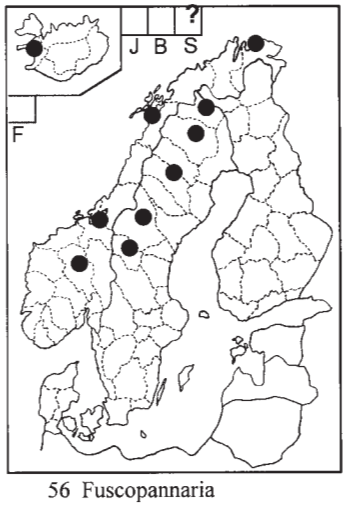
53 Fuscopannaria ahlneri



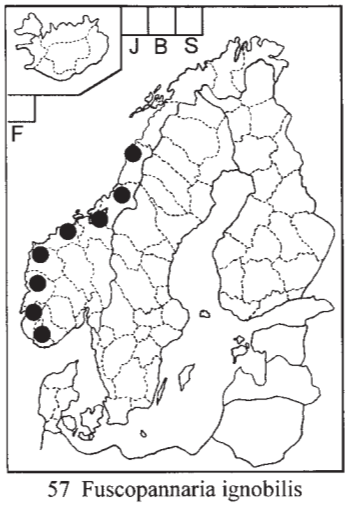
54 Fuscopannaria atlantica



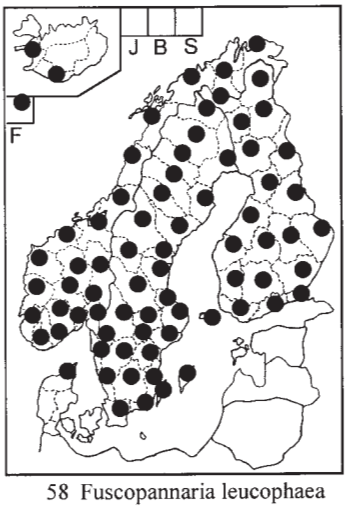
55 Fuscopannaria confusa



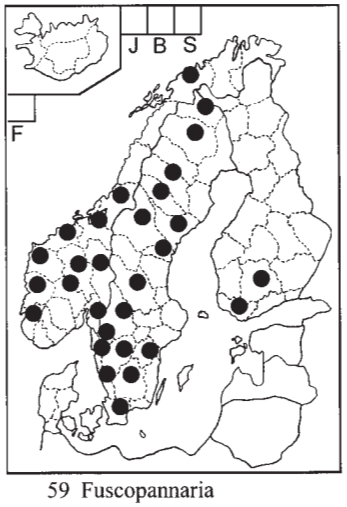
56 Fuscopannaria hookerioides



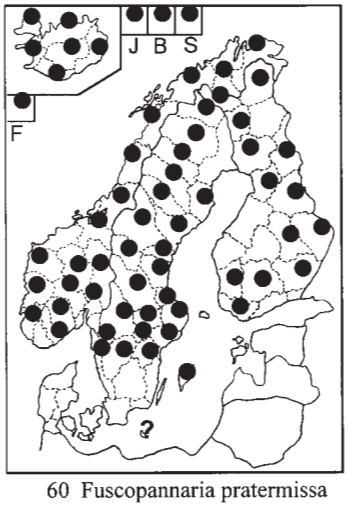
57 Fuscopannaria ignobilis



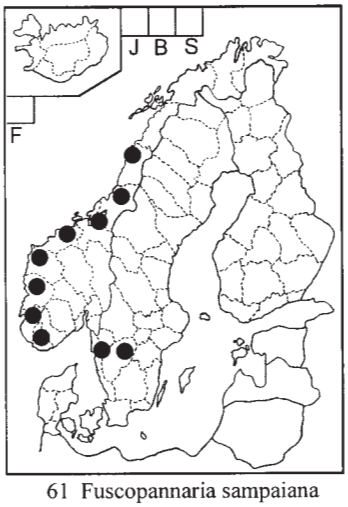
58 Fuscopannaria leucophaea



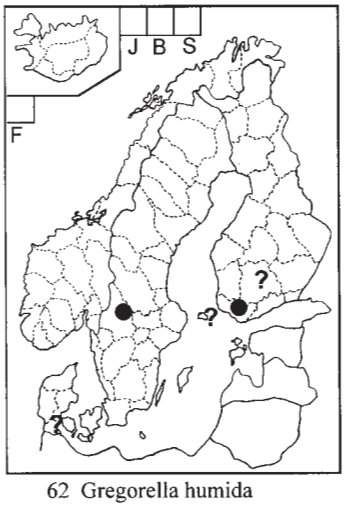
59 Fuscopannaria mediterranea



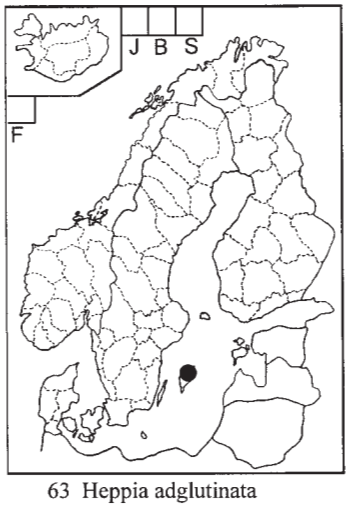
60 Fuscopannaria pratermissa



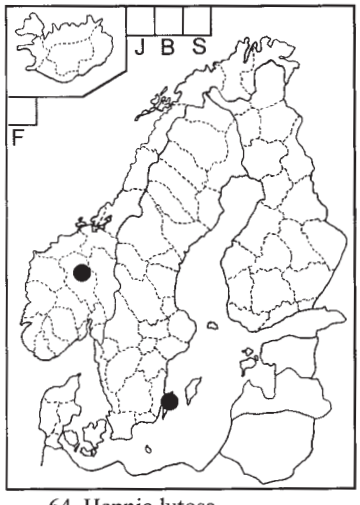
61 Fuscopannaria sampaiana



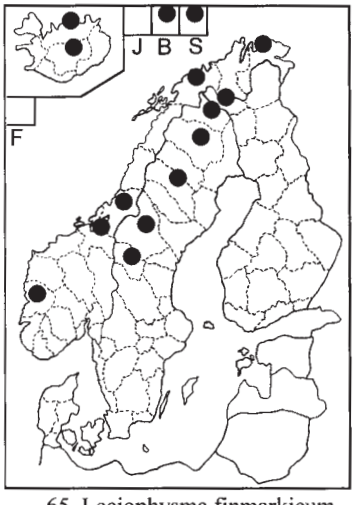
62 Gregorella humida



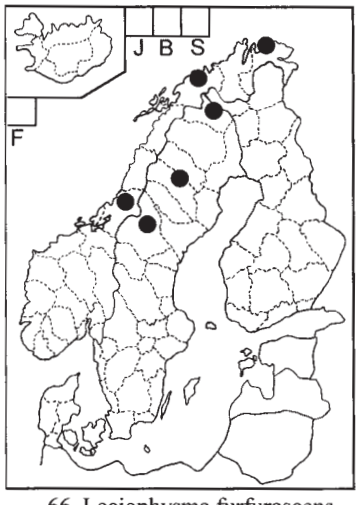
63 Heppia adglutinata



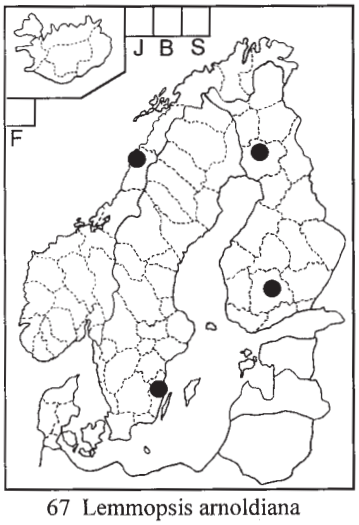
64 Heppia lutosa



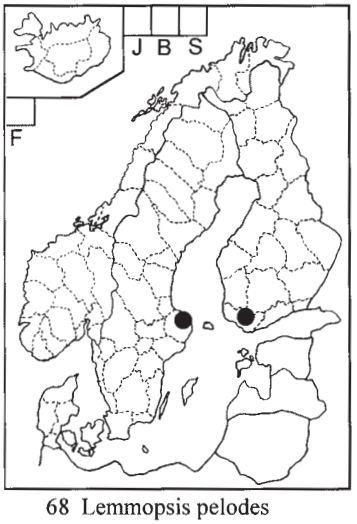
65 Leciophysma finmarkicum



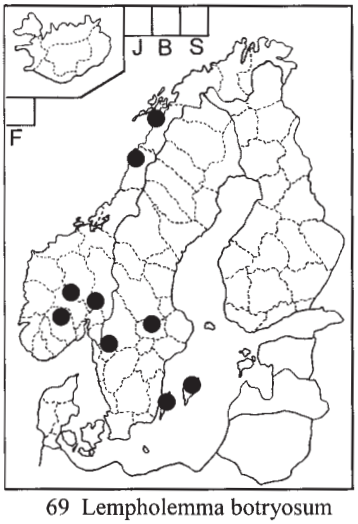
66 Leciophysma furfurascens



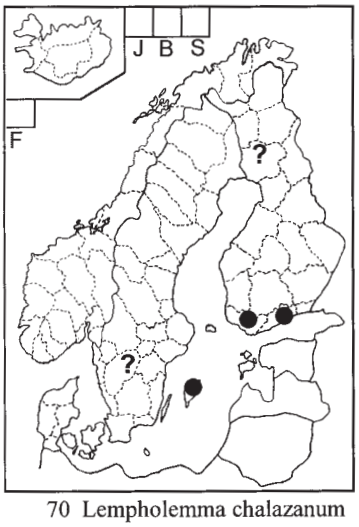
67 Lemmopsis arnoldiana



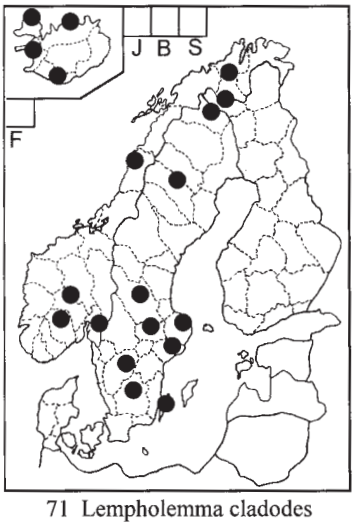
68 Lemmopsis pelodes



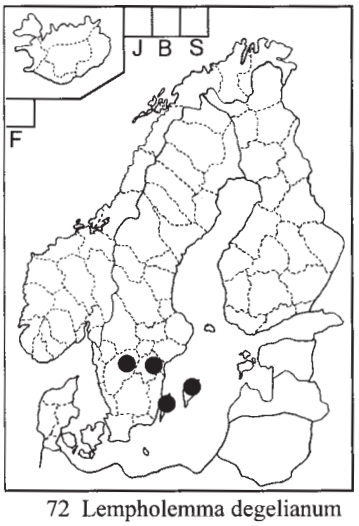
69 Lempholemma botryosum



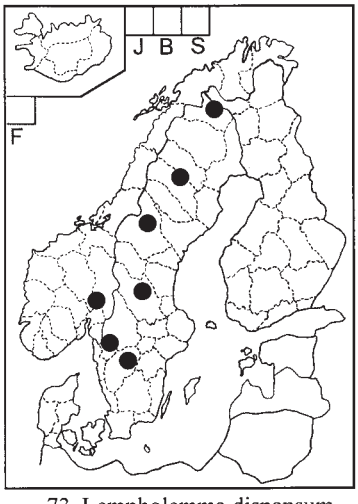
70 Lempholemma chalazanum



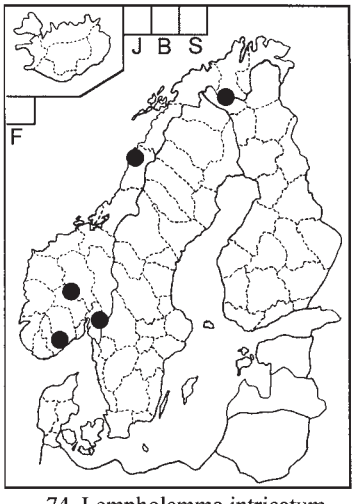
71 Lempholemma cladodes



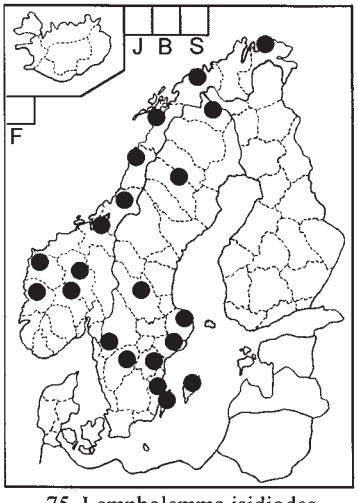
72 Lempholemma degelianum



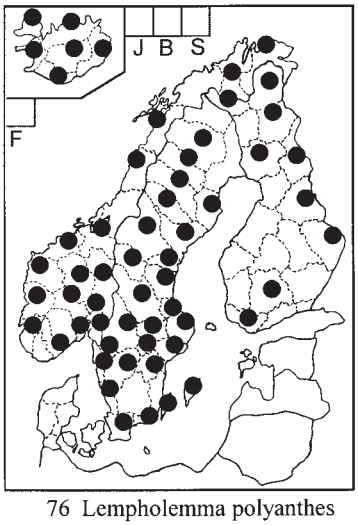
73 Lempholemma dispansum



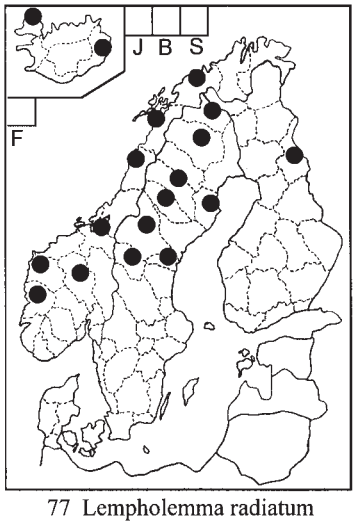
74 Lempholemma intricatum



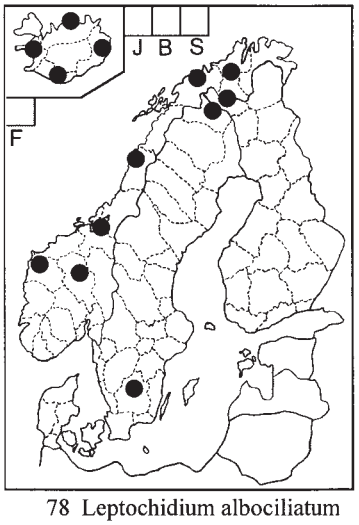
75 Lempholemma isidiodes



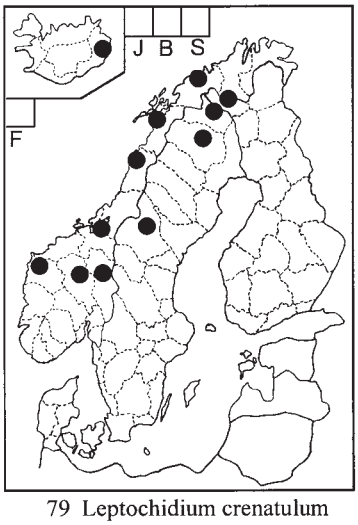
76 Lempholemma polyanthes



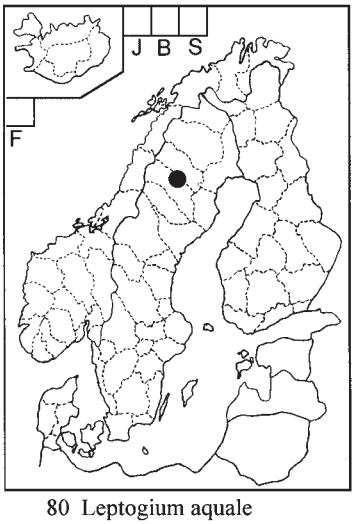
77 Lempholemma radiatum



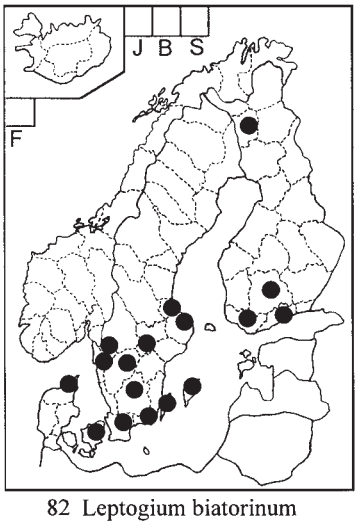
78 Leptochidium albociliatum



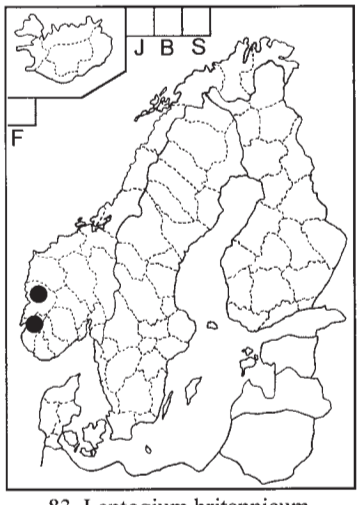
79 Leptochidium crenatulum



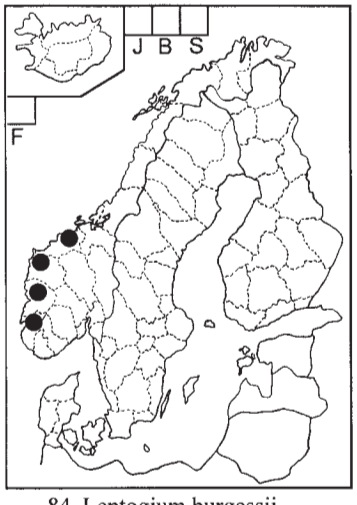
80 Leptogium aquale



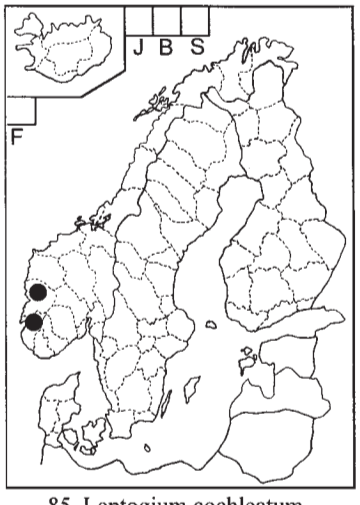
82 Leptogium biatorinum



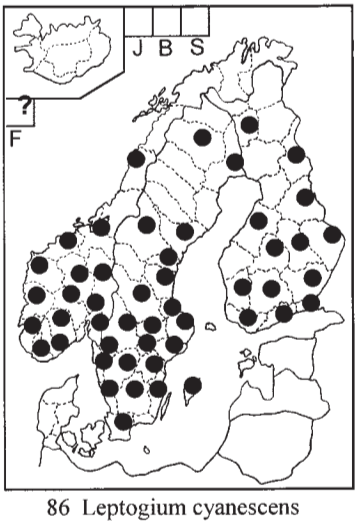
83 Leptogium britannicum



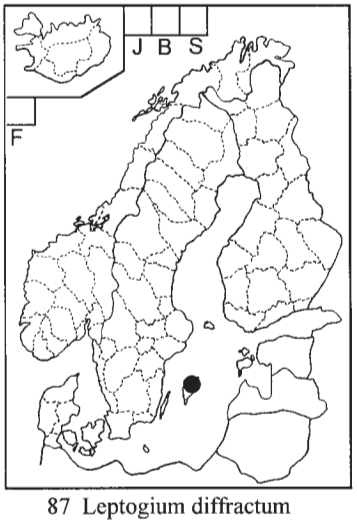
84 Leptogium burgessii



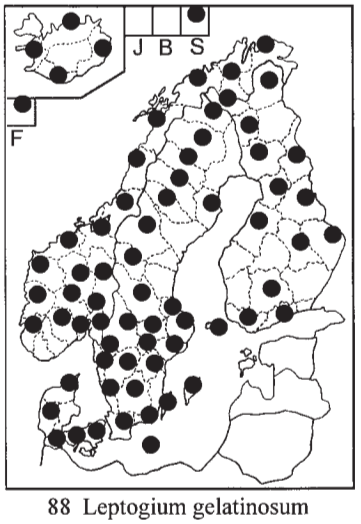
85 Leptogium cochleatum



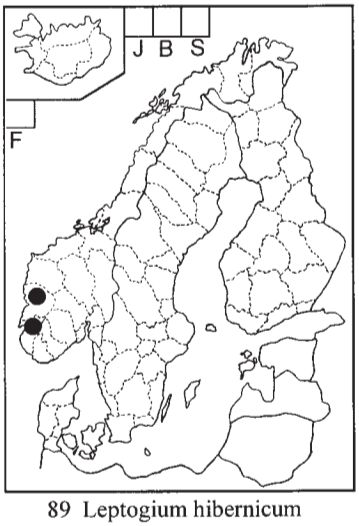
86 Leptogium cyanescens



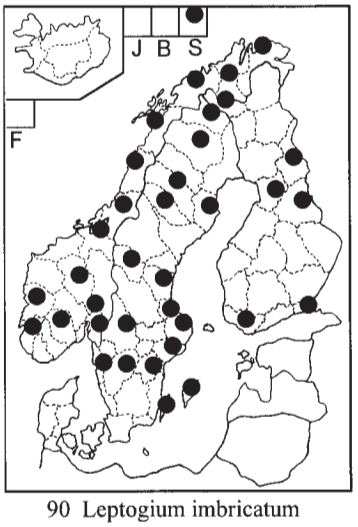
87 Leptogium diffractum



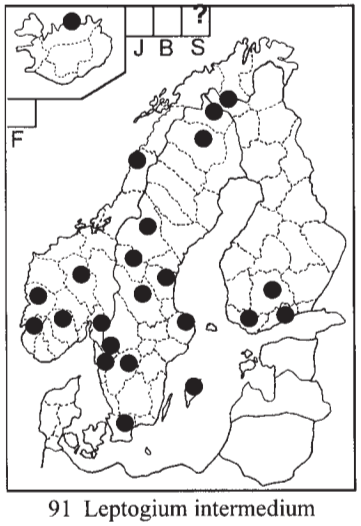
88 Leptogium gelatinosum



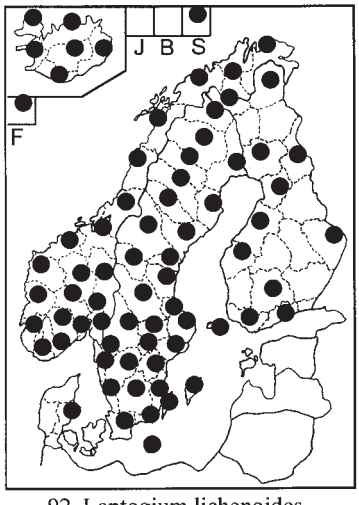
89 Leptogium hibernicum



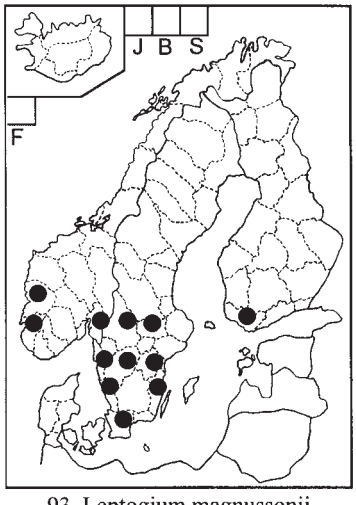
90 Leptogium imbricatum



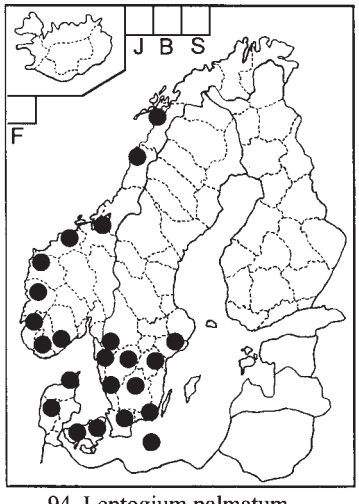
91 Leptogium intermedium



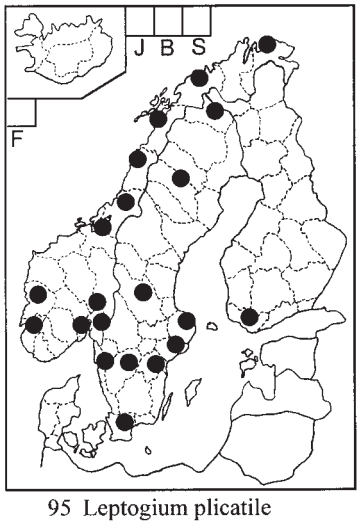
92 Leptogium lichenoides



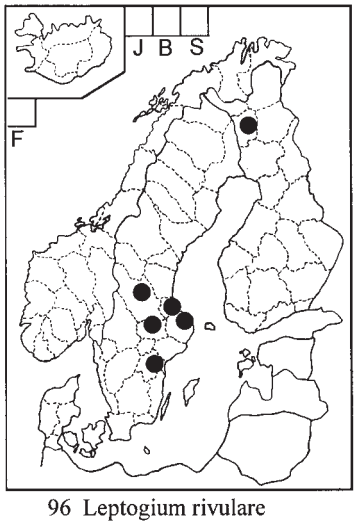
93 Leptogium magnussonii



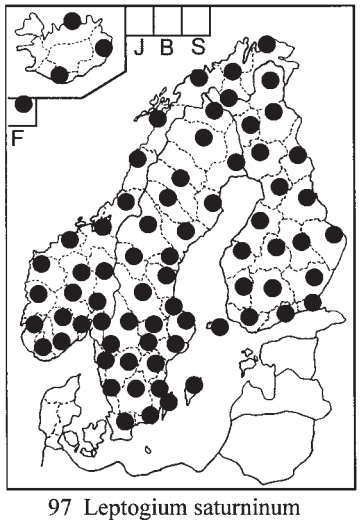
94 Leptogium palmatum



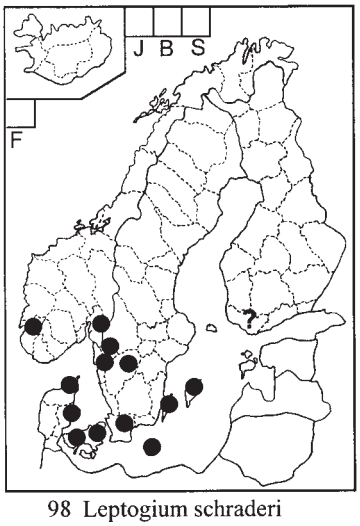
95 Leptogium plicatile



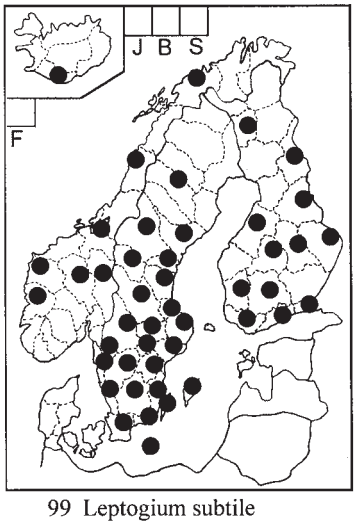
96 Leptogium rivulare



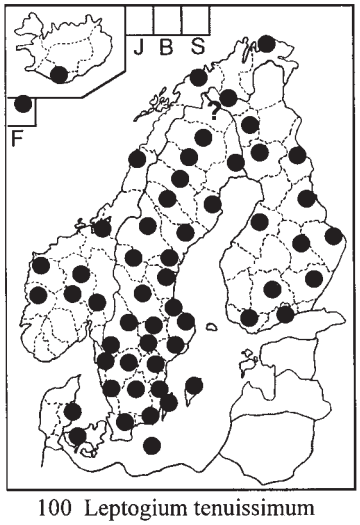
97 Leptogium saturninum



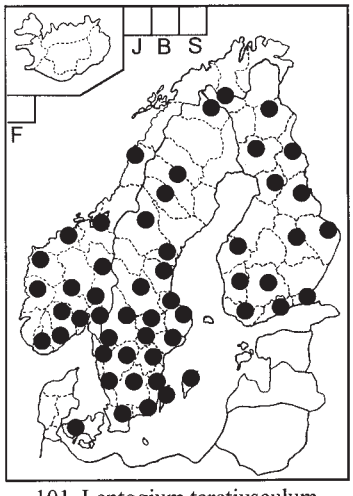
98 Leptogium schraderi



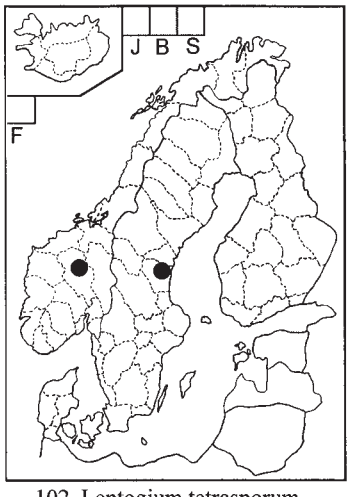
99 Leptogium subtile



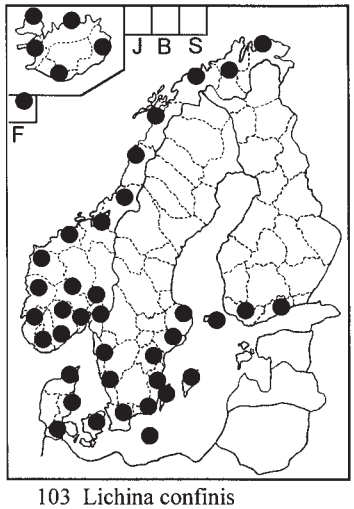
100 Leptogium tenuissimum



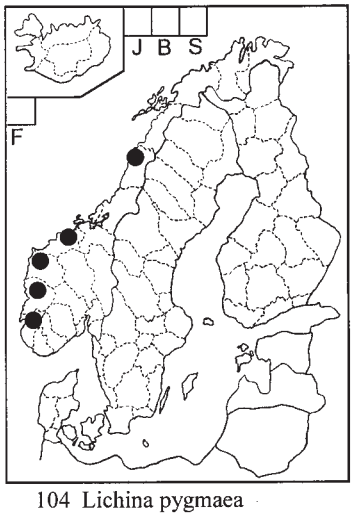
101 Leptogium teretiusculum



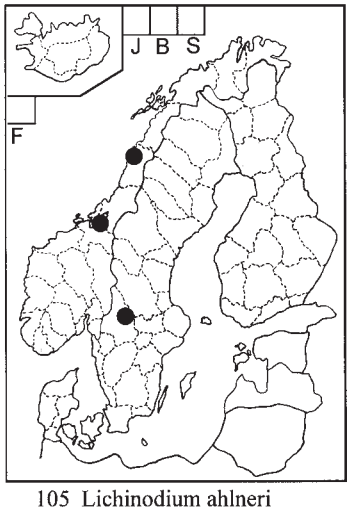
102 Leptogium tetrasporum



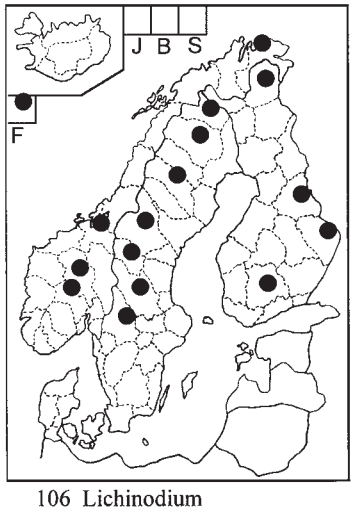
103 Lichina confinis



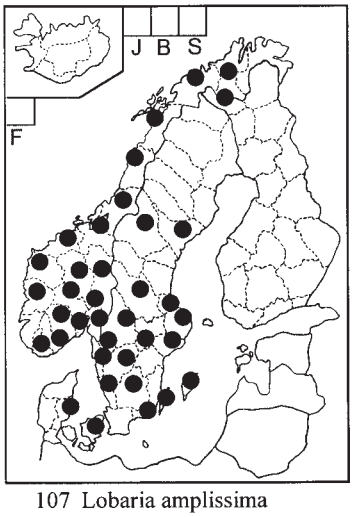
104 Lichina pygmaea



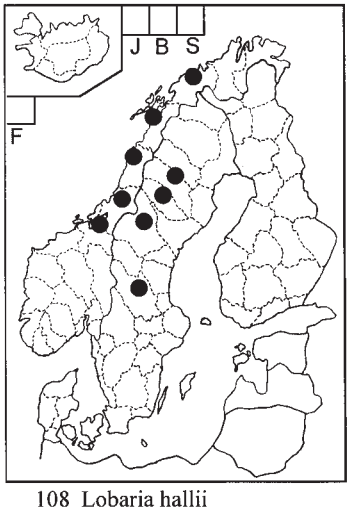
105 Lichinodium ahlneri



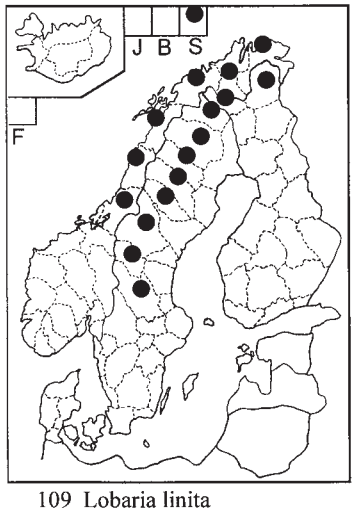
106 Lichinodium sirosiphoideum



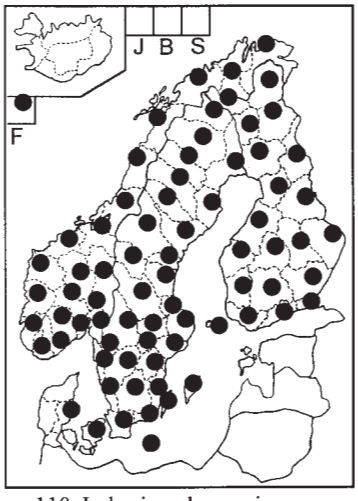
107 Lobaria amplissima



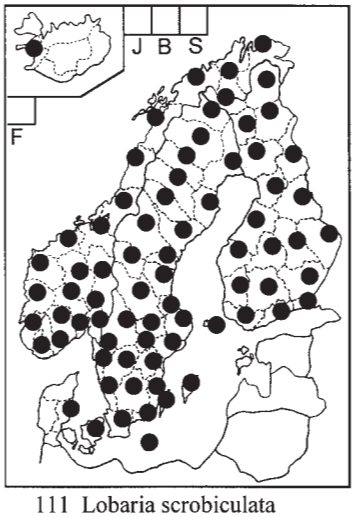
108 Lobaria hallii



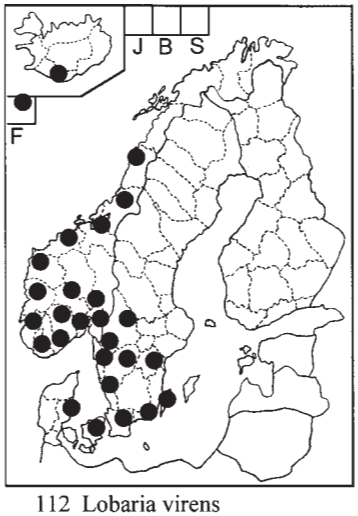
109 Lobaria linita



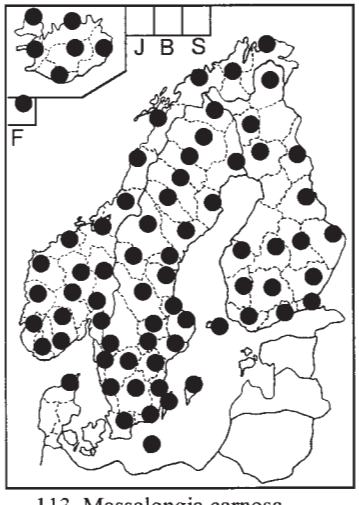
110 Lobaria pulmonaria



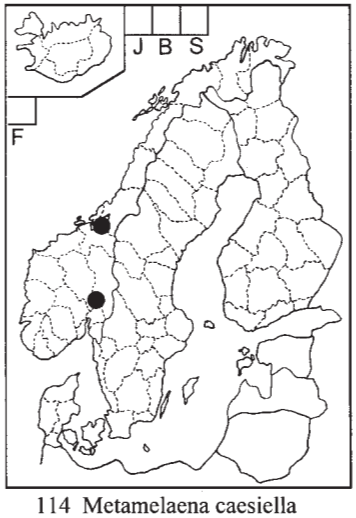
111 Lobaria scrobiculata



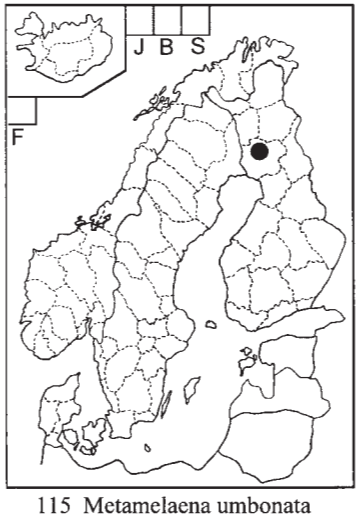
112 Lobaria virens



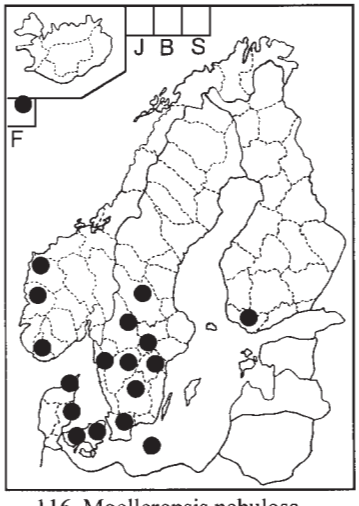
113 Massalongia carnosa



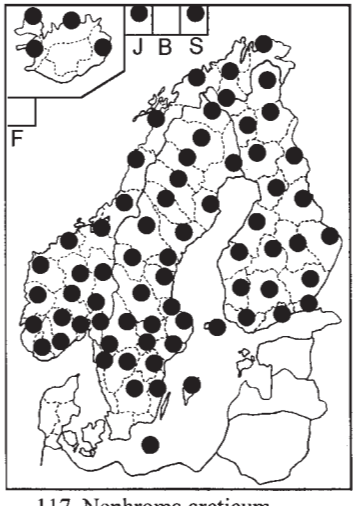
114 Metamelaena caesiella



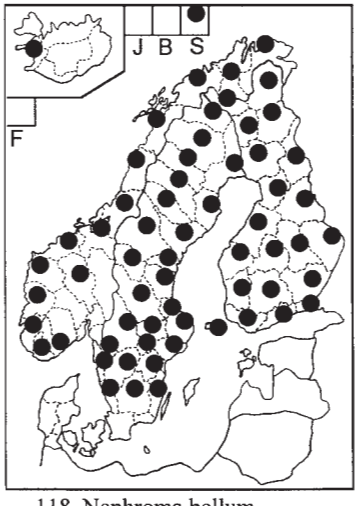
115 Metamelaena umbonata



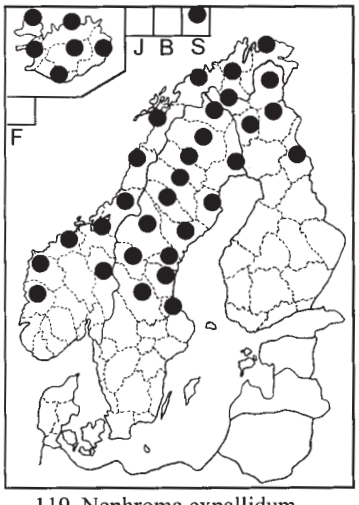
116 Moelleropsis nebulosa



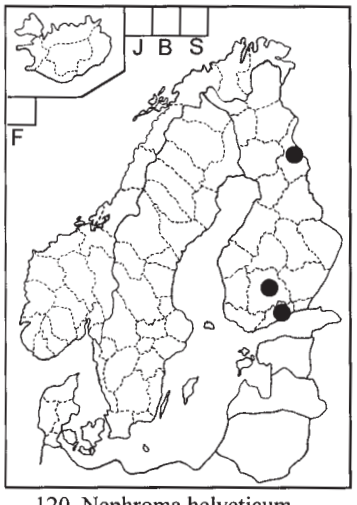
117 Nephroma arcticum



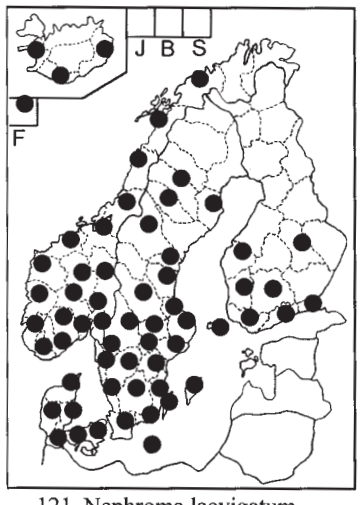
118 Nephroma bellum



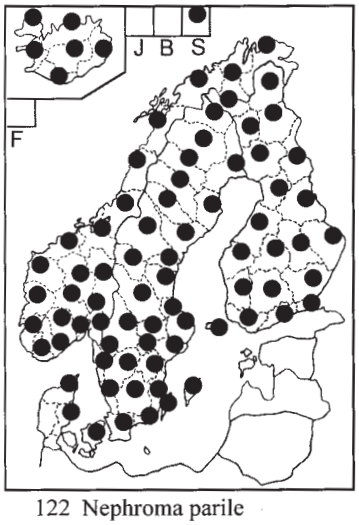
119 Nephroma expallidum



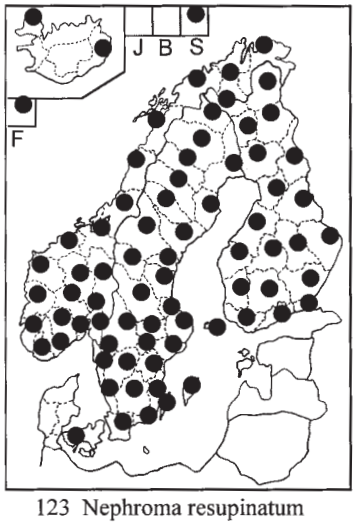
120 Nephroma helveticum



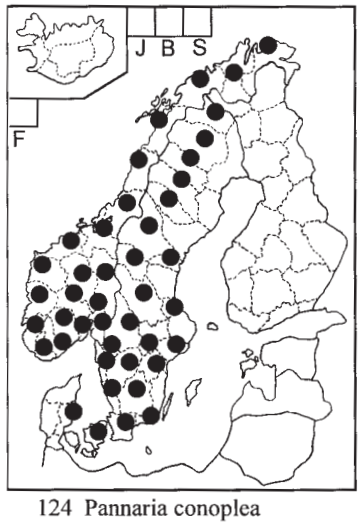
121 Nephroma laevigatum



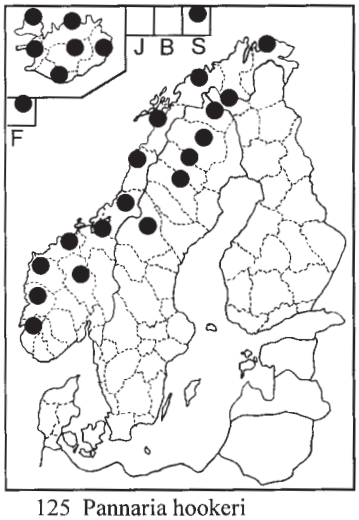
122 Nephroma parile



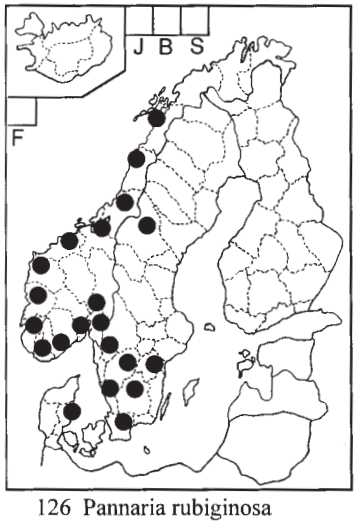
123 Nephroma resupinatum



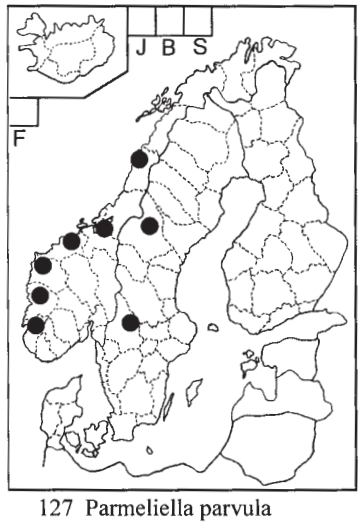
124 Pannaria conoplea



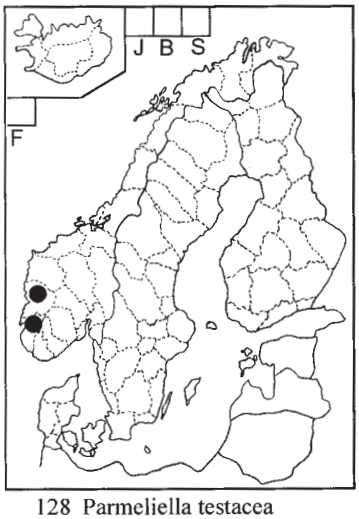
125 Pannaria hookeri



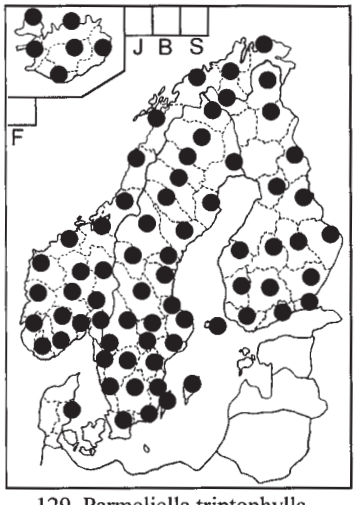
126 Pannaria rubiginosa



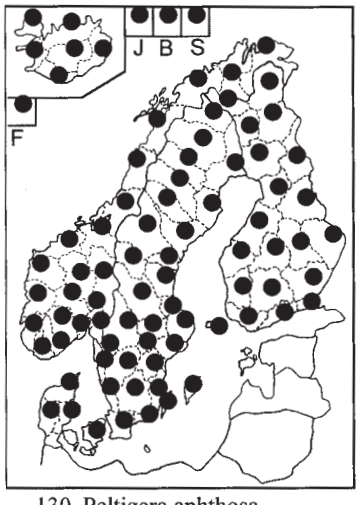
127 Parmeliella parvula



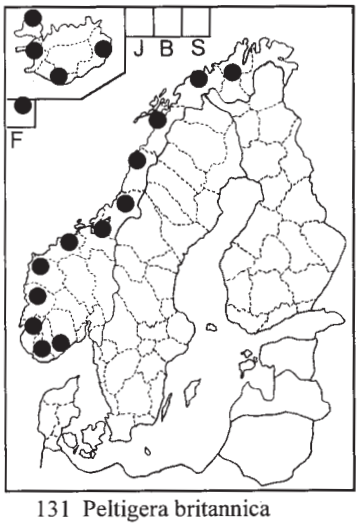
128 Parmeliella testacea



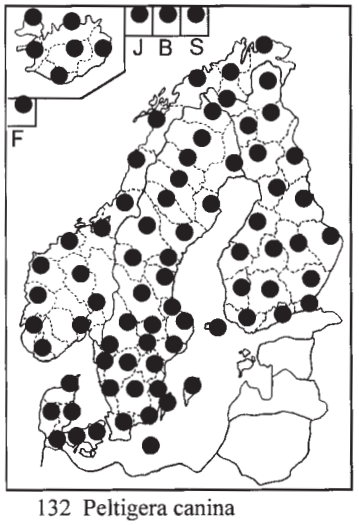
129 Parmeliella triptophylla



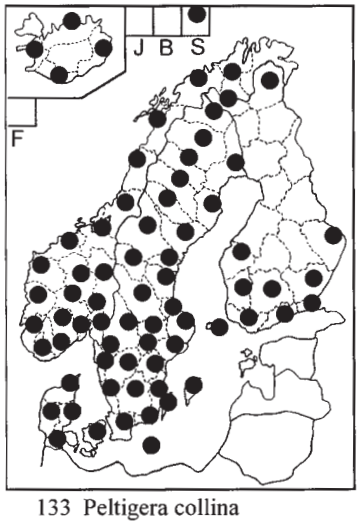
130 Peltigera aphthosa



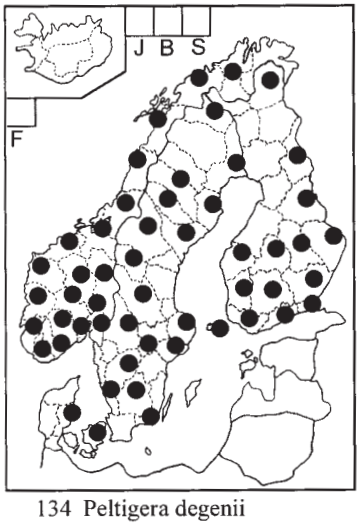
131 Peltigera britannica



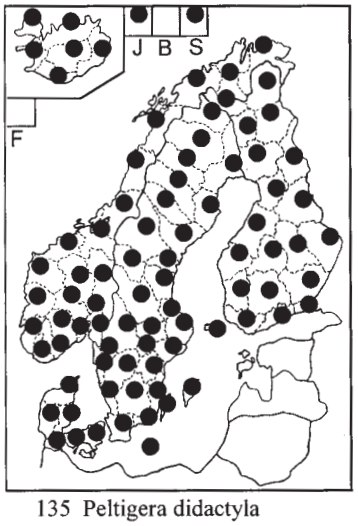
132 Peltigera canina



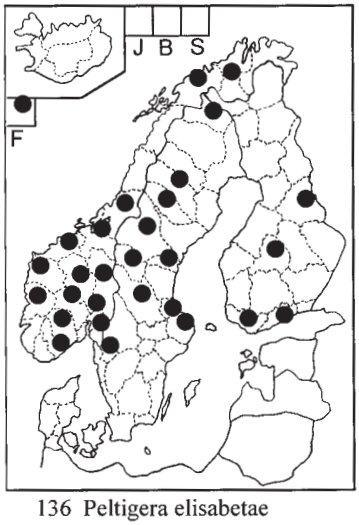
133 Peltigera collina



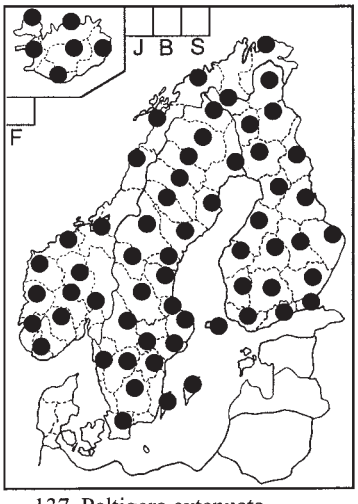
134 Peltigera degenii



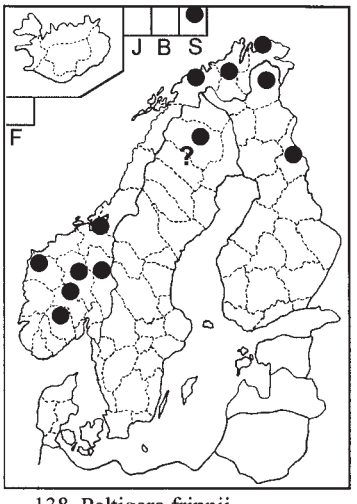
135 Peltigera didactyla



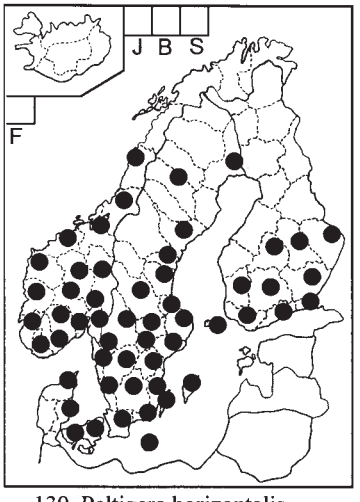
136 Peltigera elisabetae



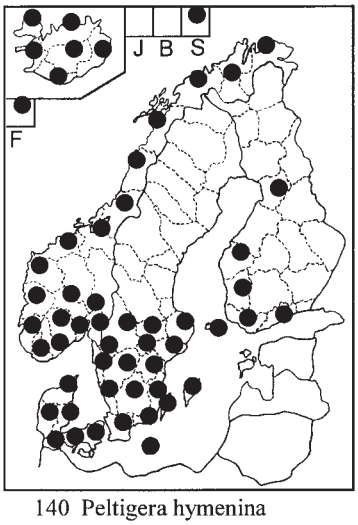
137 Peltigera extenuata



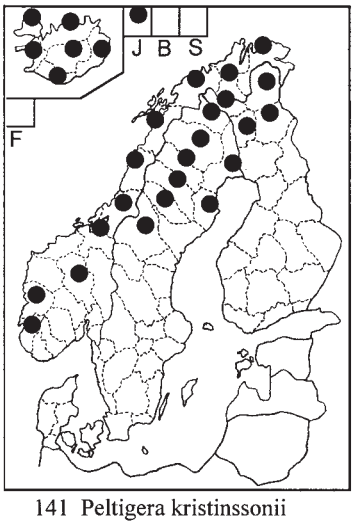
138 Peltigera frippii



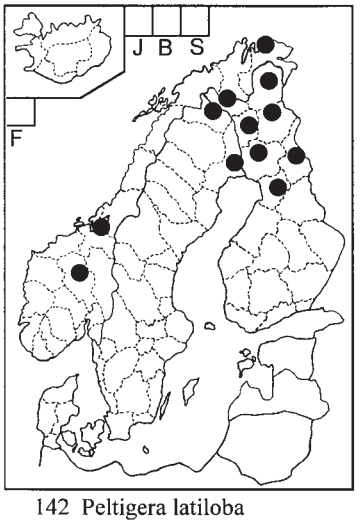
139 Peltigera horizontalis



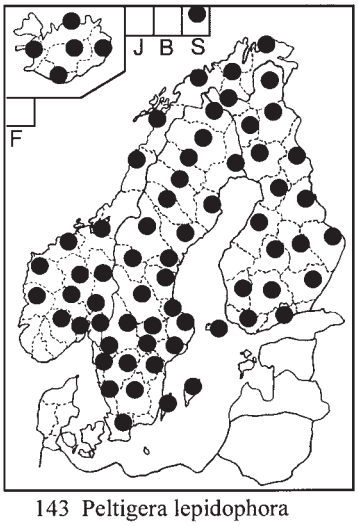
140 Peltigera hymenina



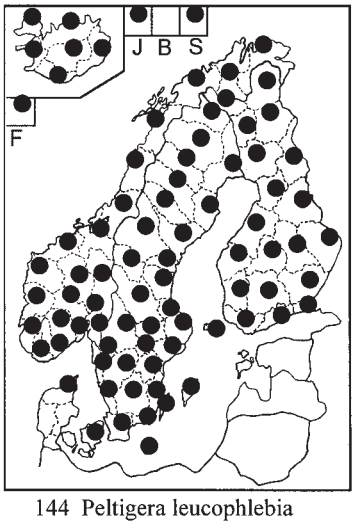
141 Peltigera kristinssonii



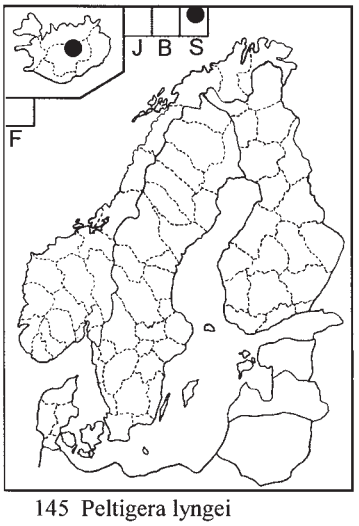
142 Peltigera latiloba



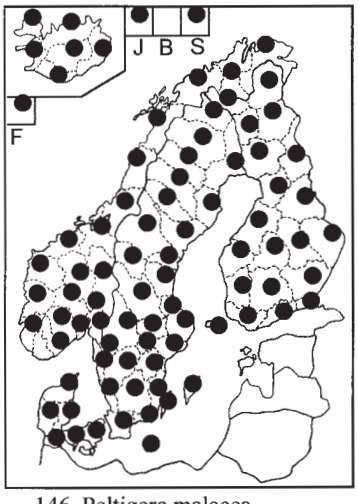
143 Peltigera lepidophora



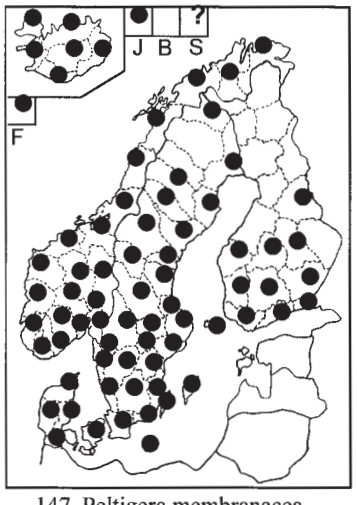
144 Peltigera leucophlebia



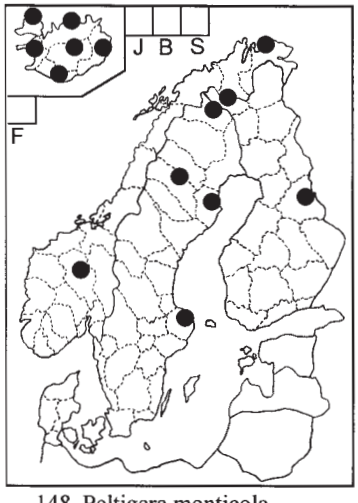
145 Peltigera lyngei



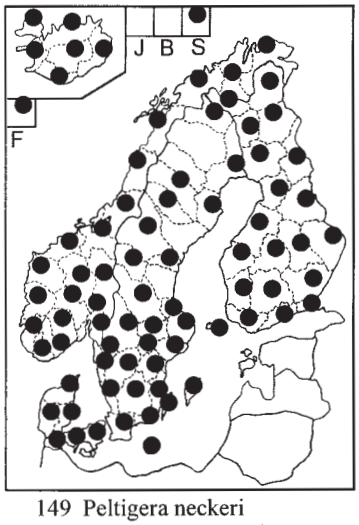
146 Peltigera malacea



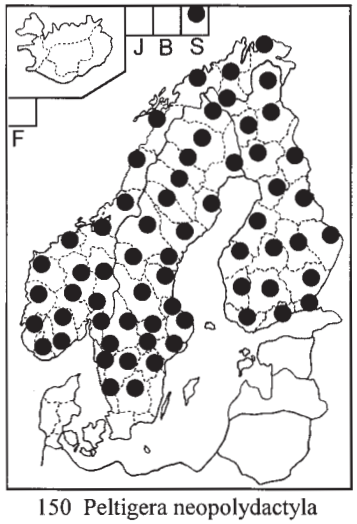
147 Peltigera membranacea



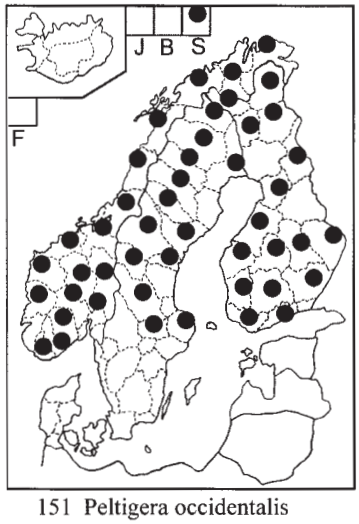
148 Peltigera monticola



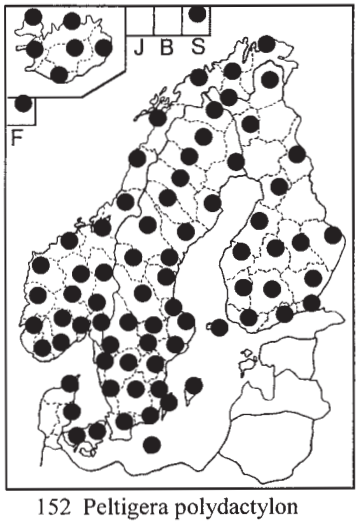
149 Peltigera neckeri



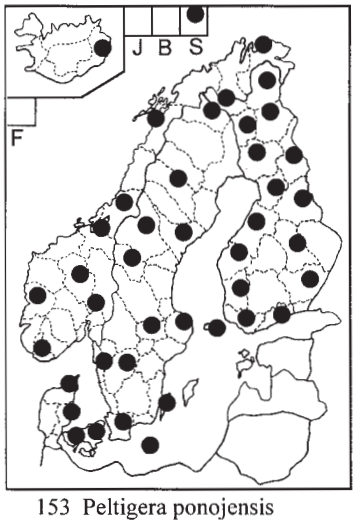
150 Peltigera neopolydactyla



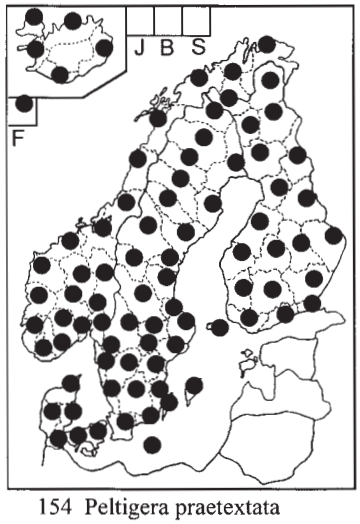
151 Peltigera occidentalis



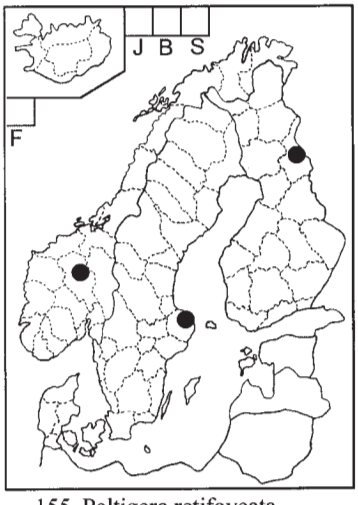
152 Peltigera polydactylon



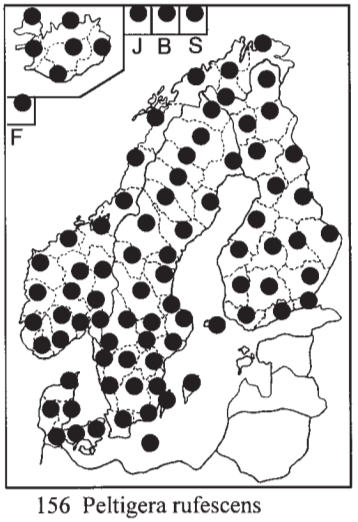
153 Peltigera ponojensis



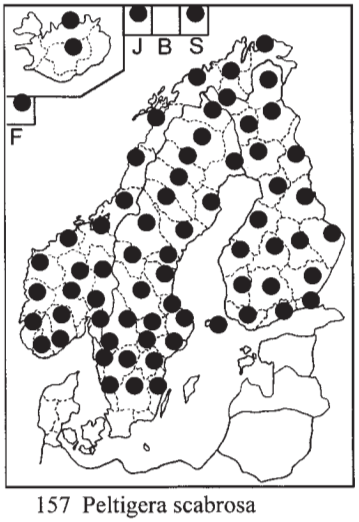
154 Peltigera praetextata



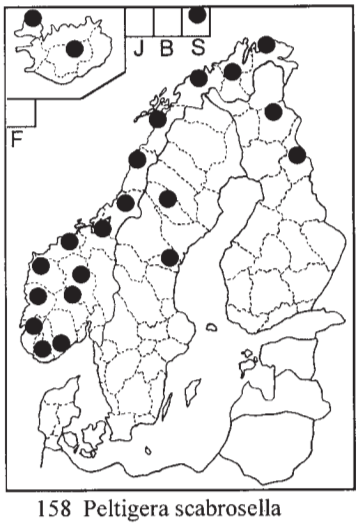
155 Peltigera retifoveata



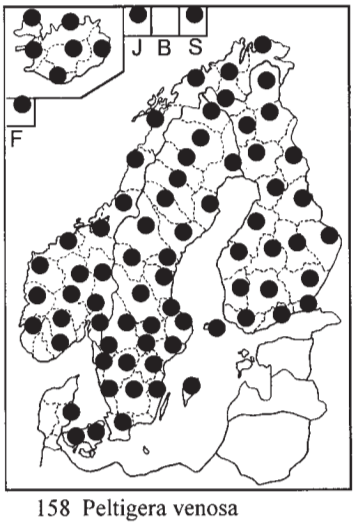
156 Peltigera rufescens



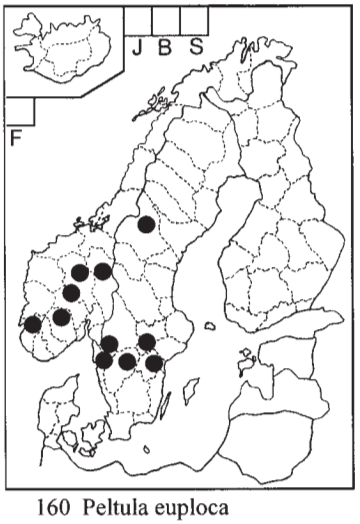
157 Peltigera scabrosa



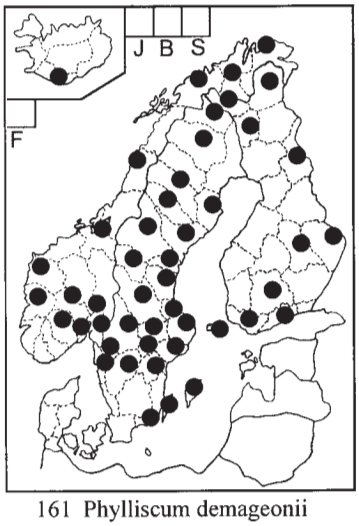
158 Peltigera scabrosella



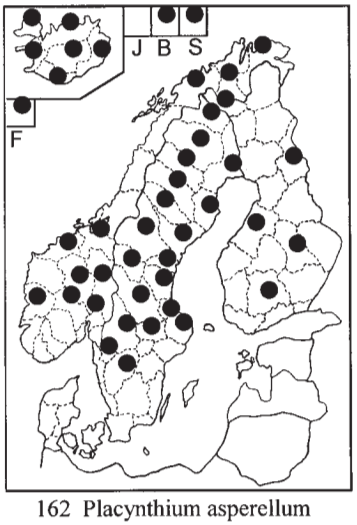
158 Peltigera venosa



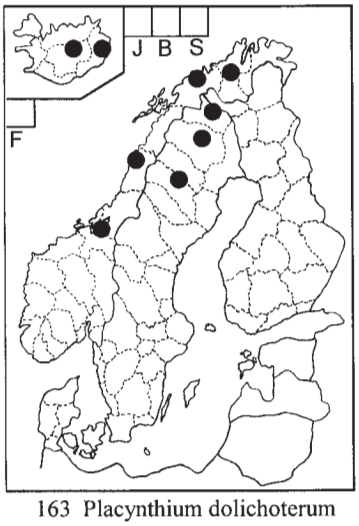
160 Peltula euploca



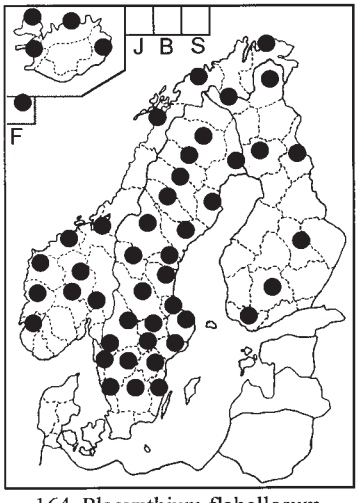
161 Phylliscum demageonii



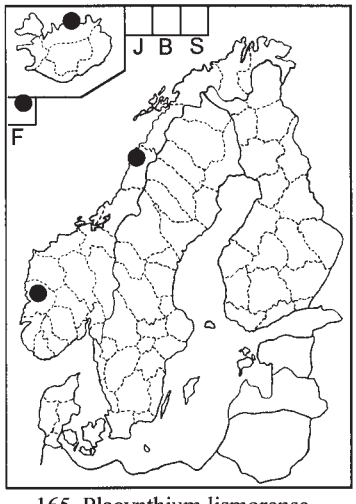
162 Placynthium asperellum



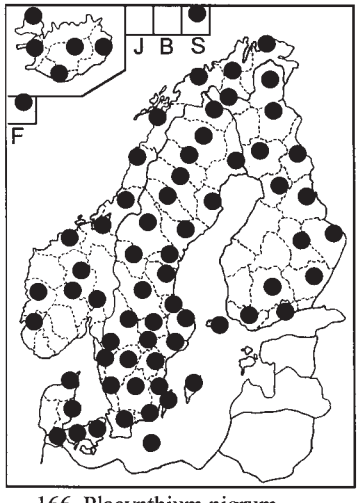
163 Placynthium dolichoterum



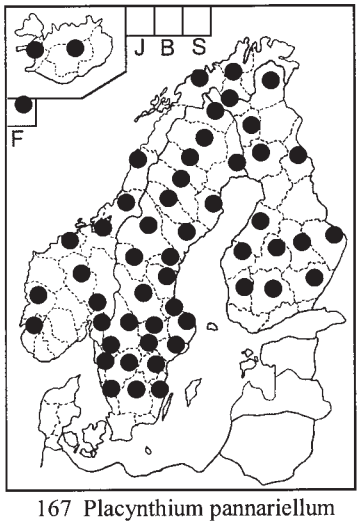
164 Placynthium flabellosum



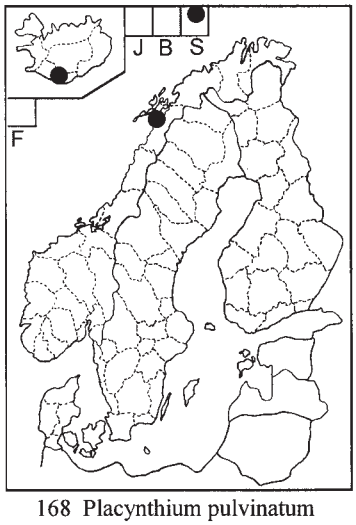
165 Placynthium lismorense



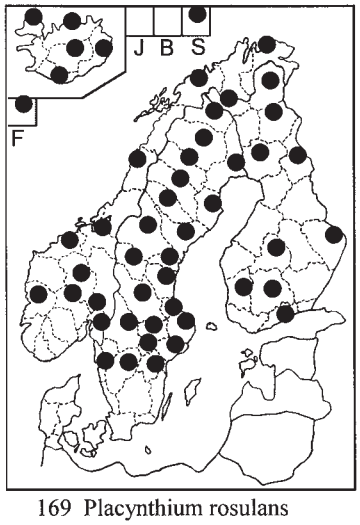
166 Placynthium nigrum



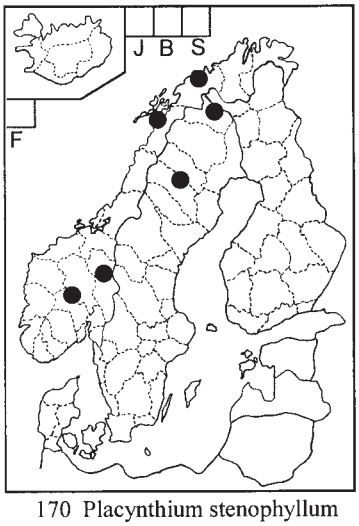
167 Placynthium pannariellum



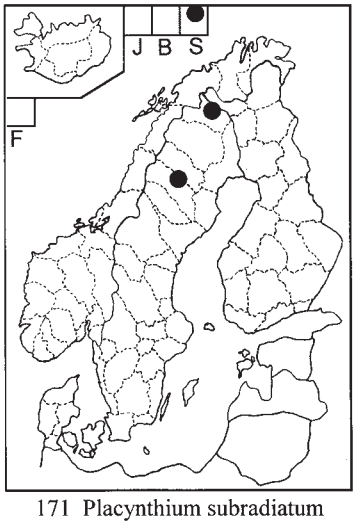
168 Placynthium pulvinatum



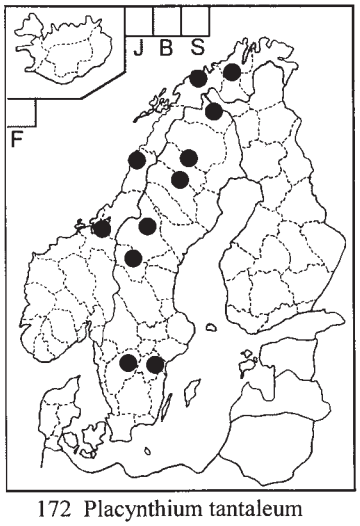
169 Placynthium rosulans



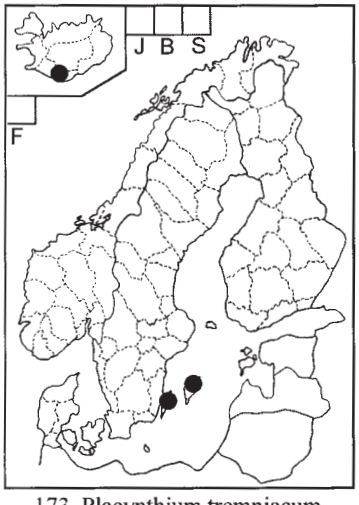
170 Placynthium stenophyllum



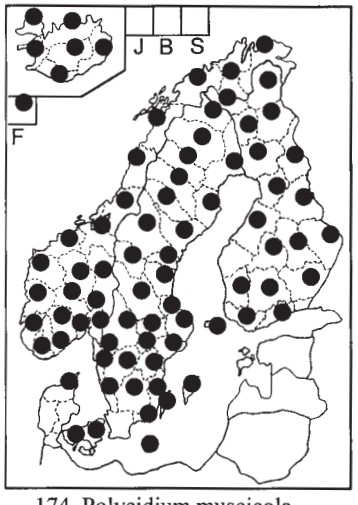
171 Placynthium subradiatum



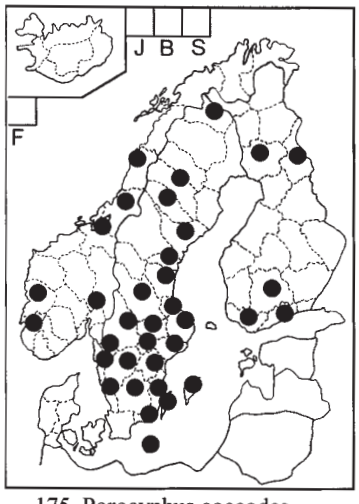
172 Placynthium tantaleum



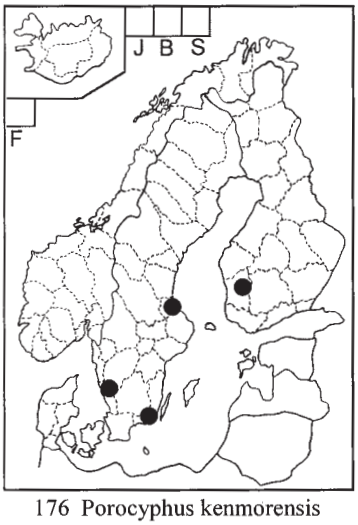
173 Placynthium tremniacum



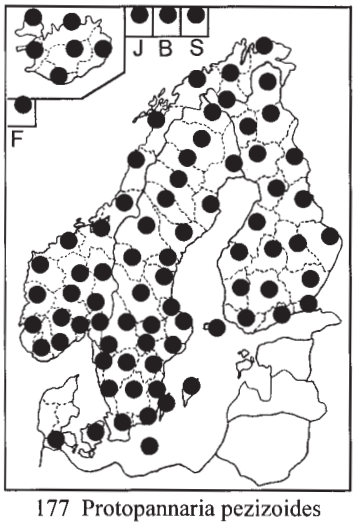
174 Polycidium muscicola



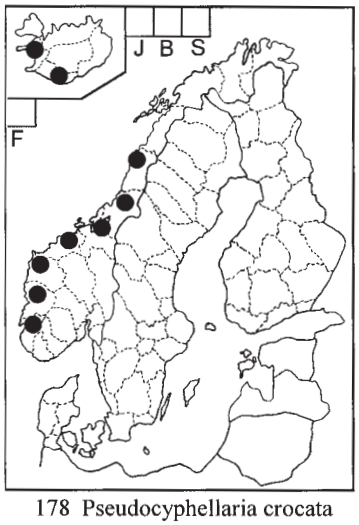
175 Porocyphus coccodes



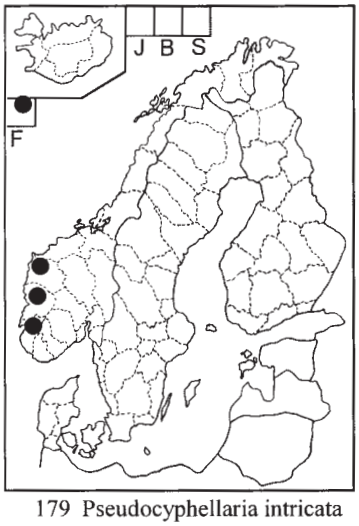
176 Porocyphus kenmorensis



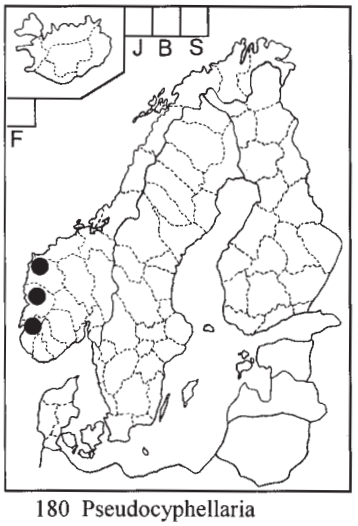
177 Protopannaria pezizoides



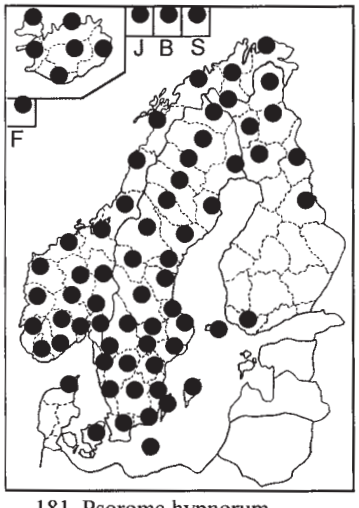
178 Pseudocyphellaria crocata



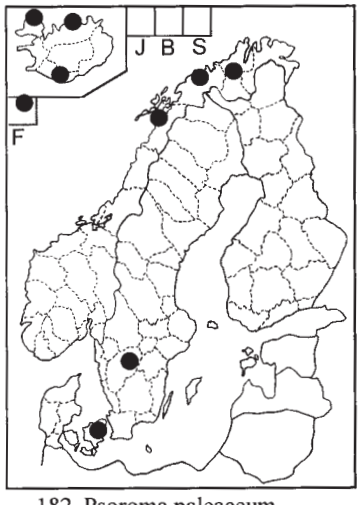
179 Pseudocyphellaria intricata



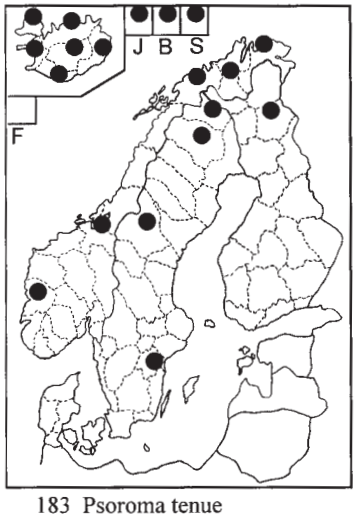
180 Pseudocyphellaria norvegica



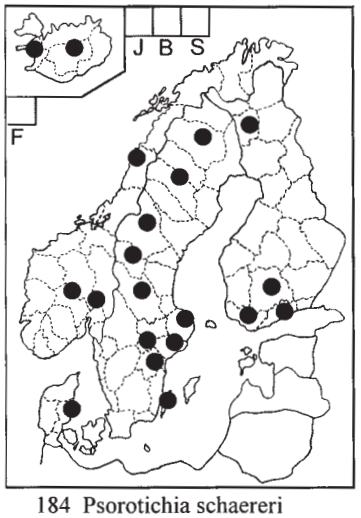
181 Psoroma hypnorum



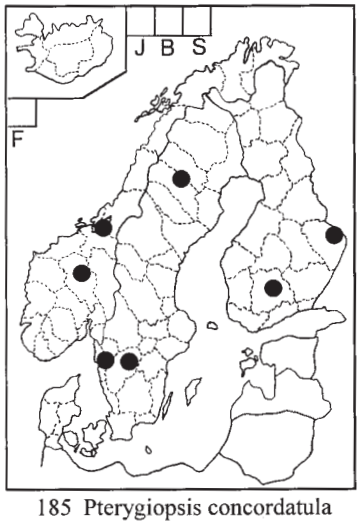
182 Psoroma paleaceum



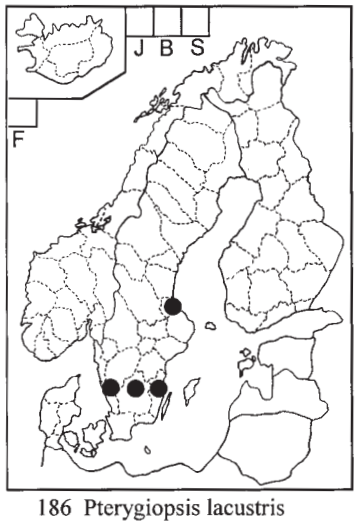
183 Psoroma tenue



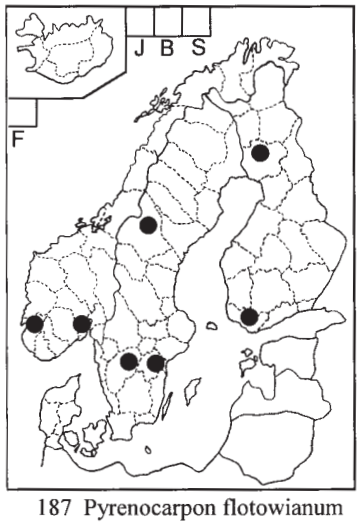
184 Psorotichia schaereri



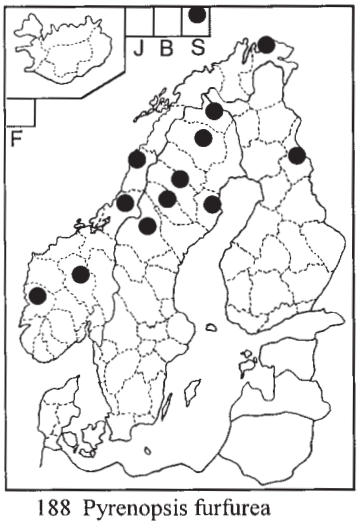
185 Pterygiopsis concordatula



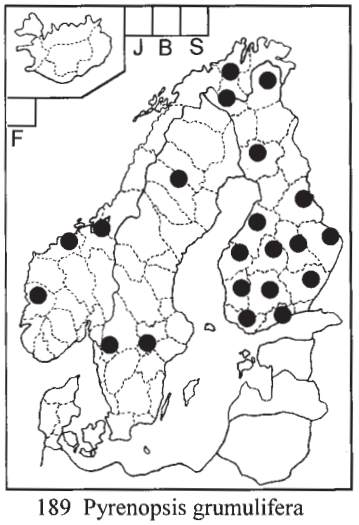
186 Pterygiopsis lacustris



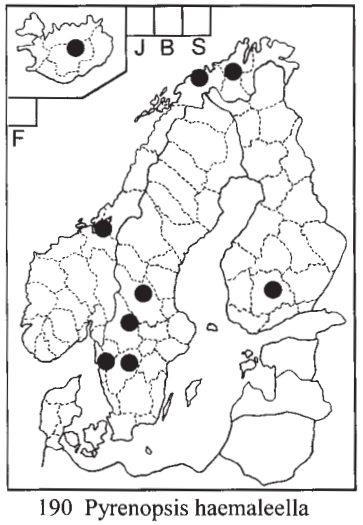
187 Pyrenocarpon flotowianum



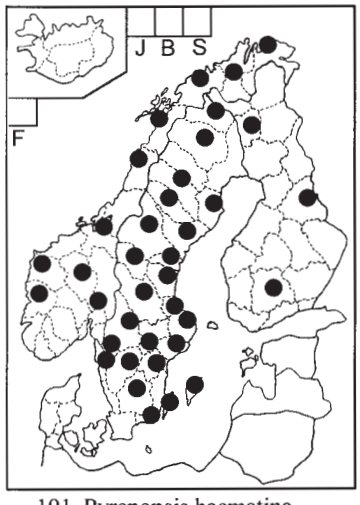
188 Pyrenopsis furfurea



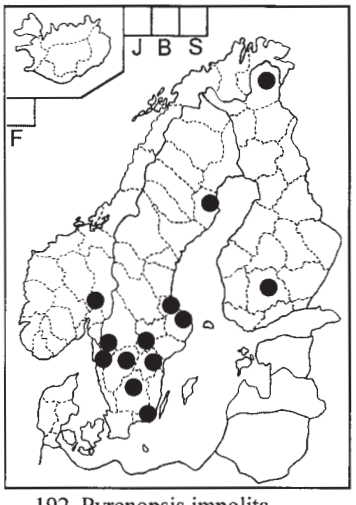
189 Pyrenopsis grumulifera



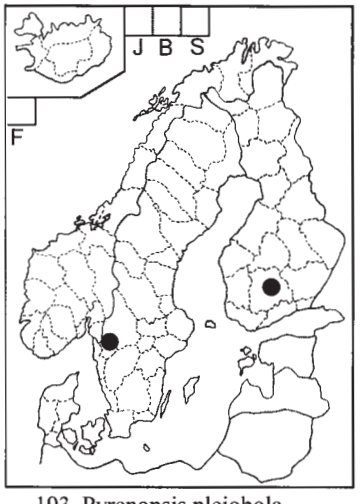
190 Pyrenopsis haemaleella



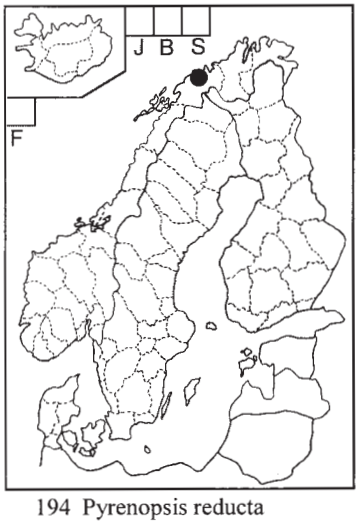
191 Pyrenopsis haematina



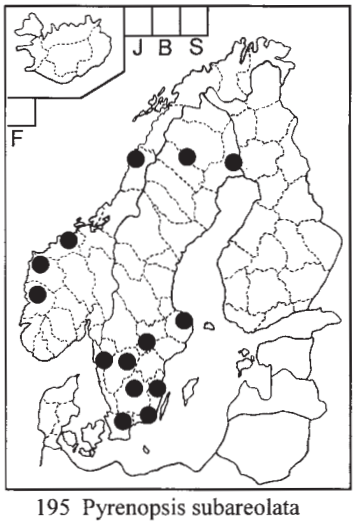
192 Pyrenopsis impolita



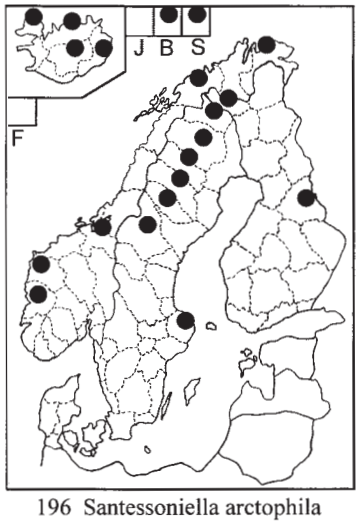
193 Pyrenopsis pleiobola



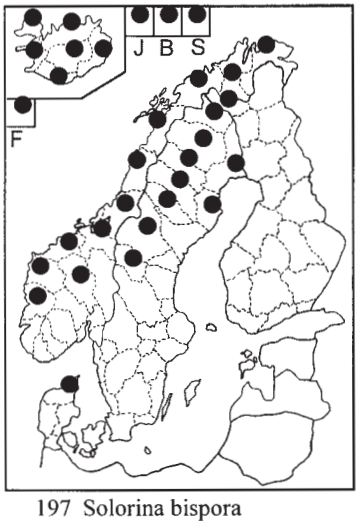
194 Pyrenopsis reducta



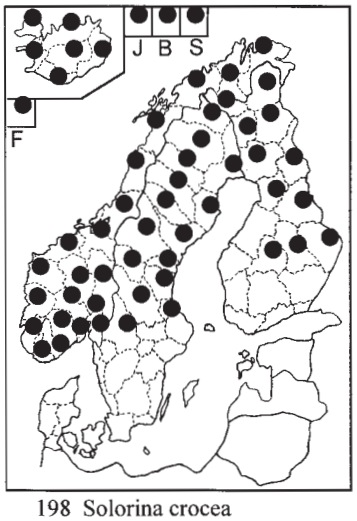
195 Pyrenopsis subareolata



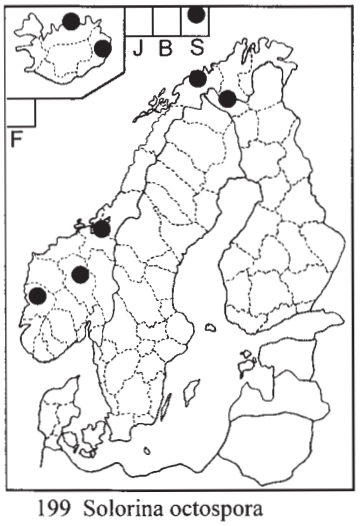
196 Santessoniella arctophila



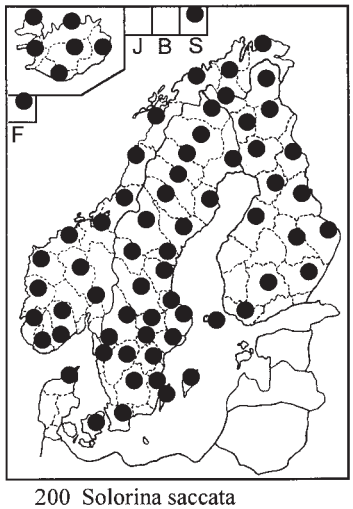
197 Solorina bispora



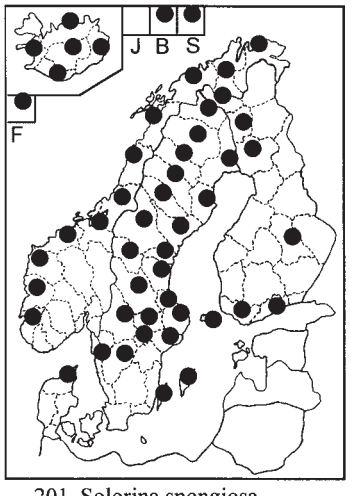
198 Solorina crocea



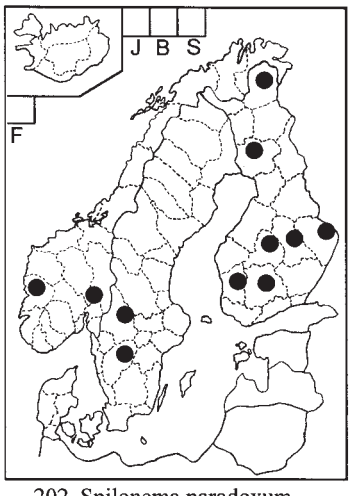
199 Solorina octospora



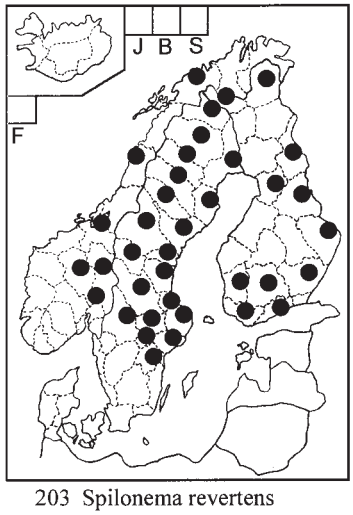
200 Solorina saccata



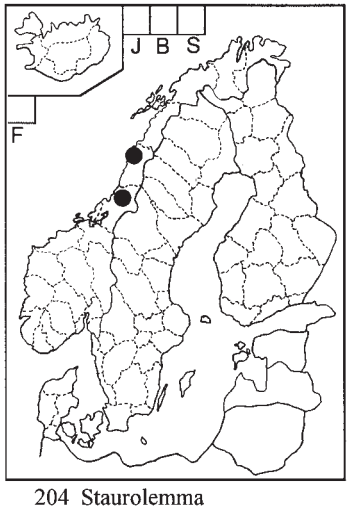
201 Solorina spongiosa



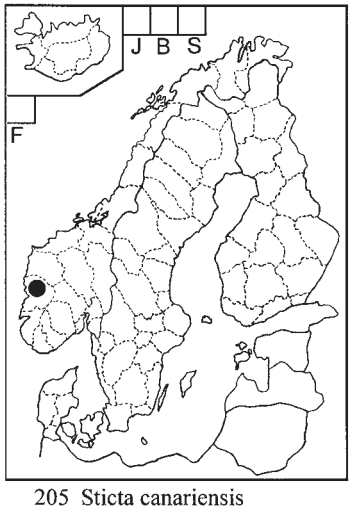
202 Spilonema paradoxum



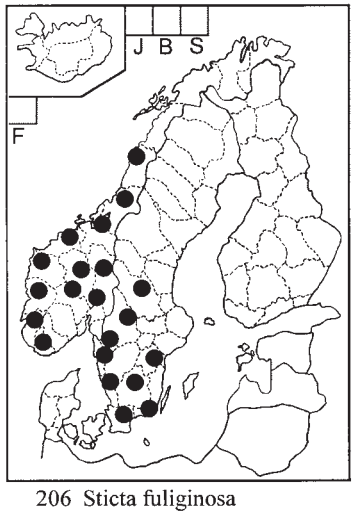
203 Spilonema revertens



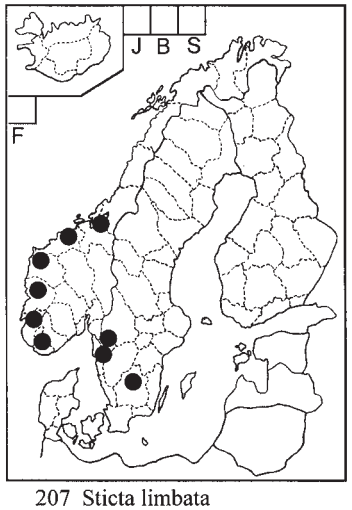
204 Staurolemma omphalarioides



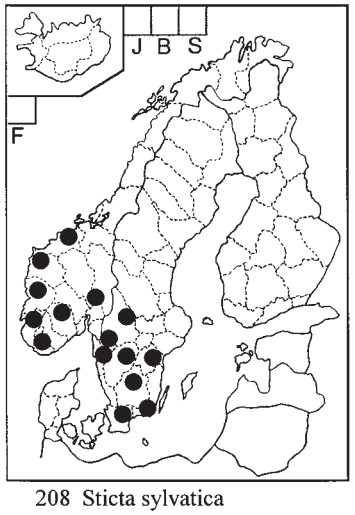
205 Sticta canariensis



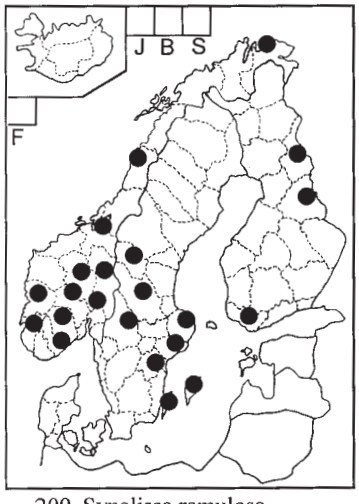
206 Sticta fuliginosa



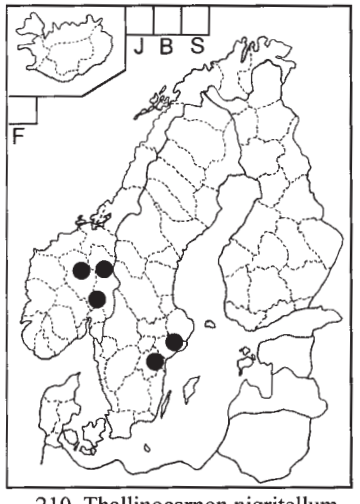
207 Sticta limbata



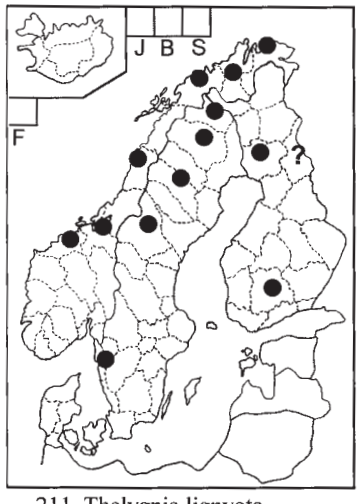
208 Sticta sylvatica



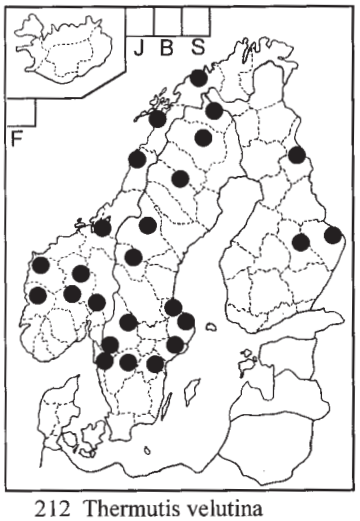
209 Synalissa ramulosa



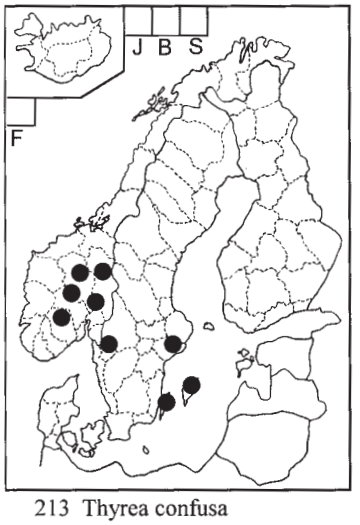
210 Thallinocarpon nigritellum



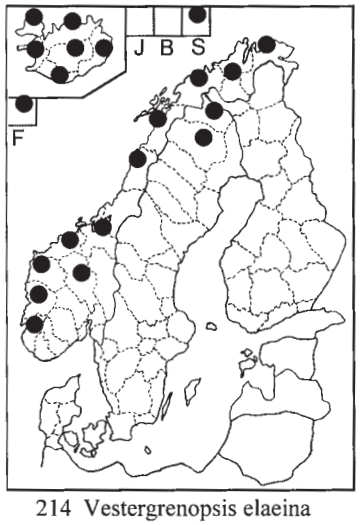
211 Thelygnia lignyota



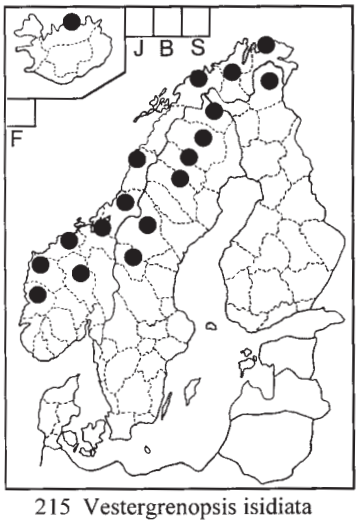
212 Thermutis velutina



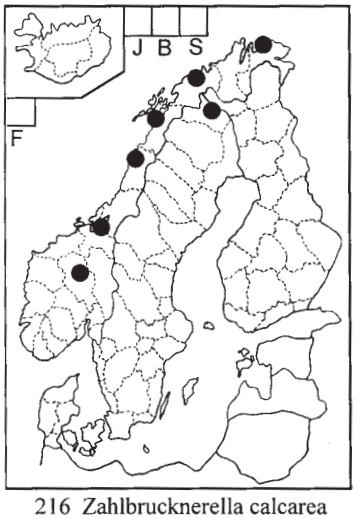
213 Thyrea confusa



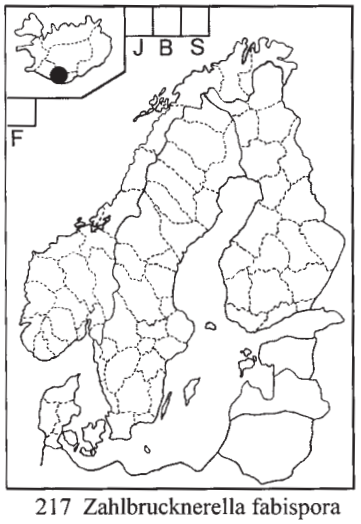
214 Vestergrenopsis elaeina



215 Vestergrenopsis isidiata

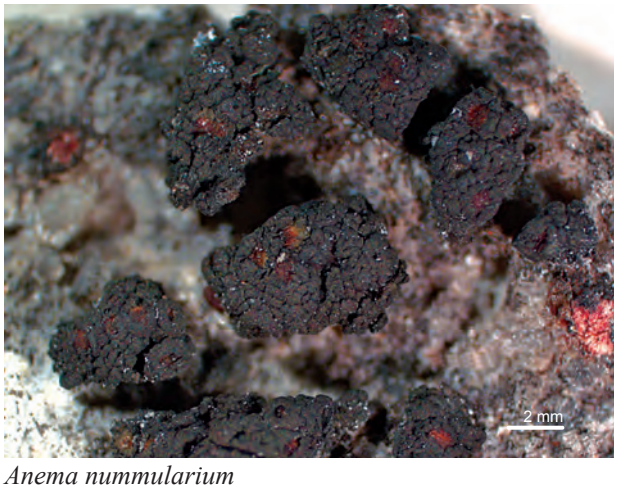


216 Zahlbrucknerella calcarea

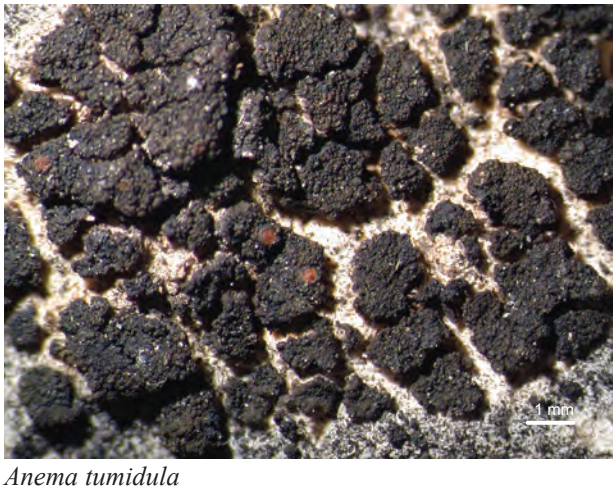


217 Zahlbrucknerella fabispora

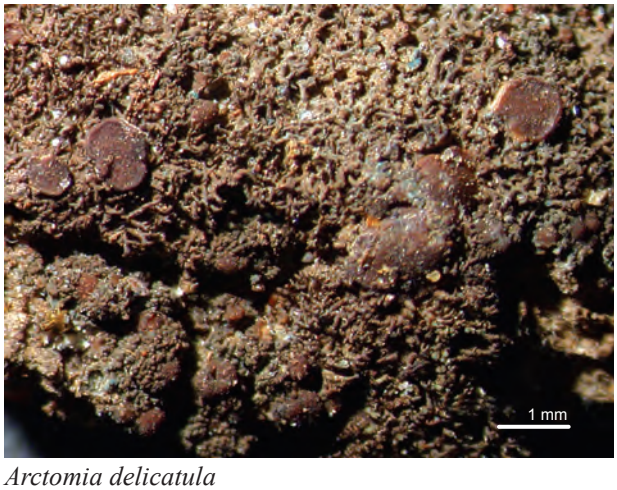
Anema decipiens



Anema nummularium



Anema tumidula



Arctomia delicatula

Arctomia interfixa

Collema auriforme

Collema bachmanianum

Collema callopismum

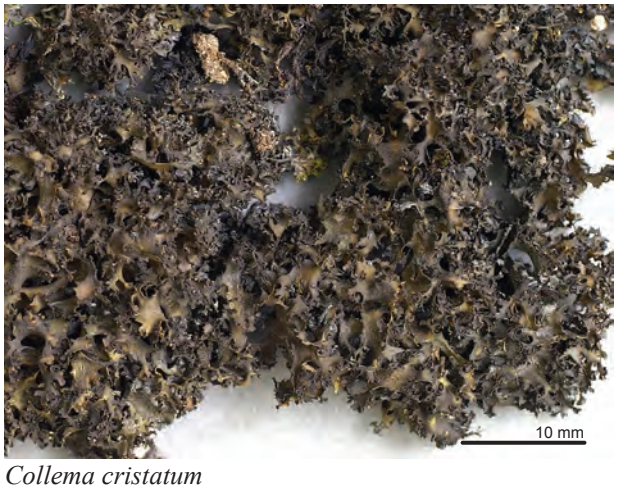
Collema ceraniscum

Collema coccophorum

Collema coccophorum

Collema conglomeratum

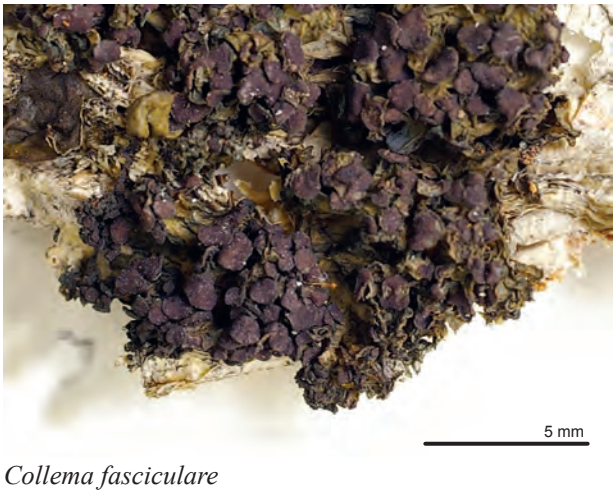
Collema crispum



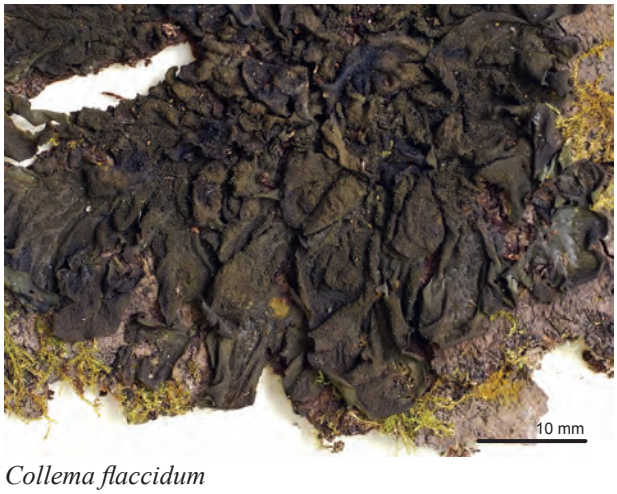
Collema cristatum

Collema cristatum

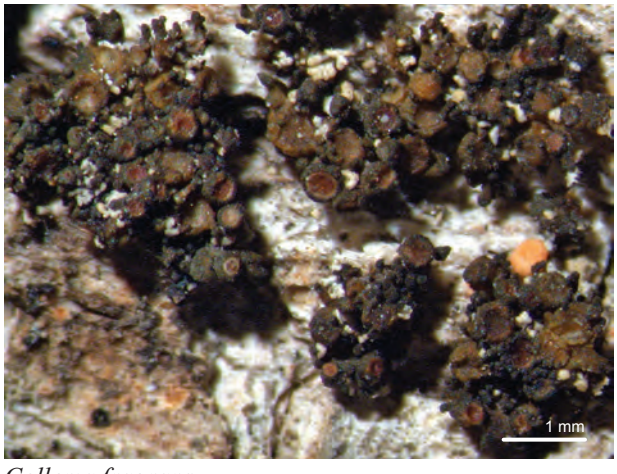
Collema curtisporum



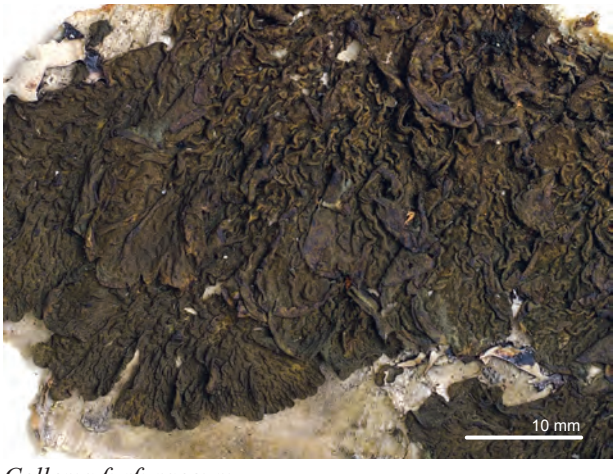
Collema fasciculare



Collema flaccidum



Collema fragrans

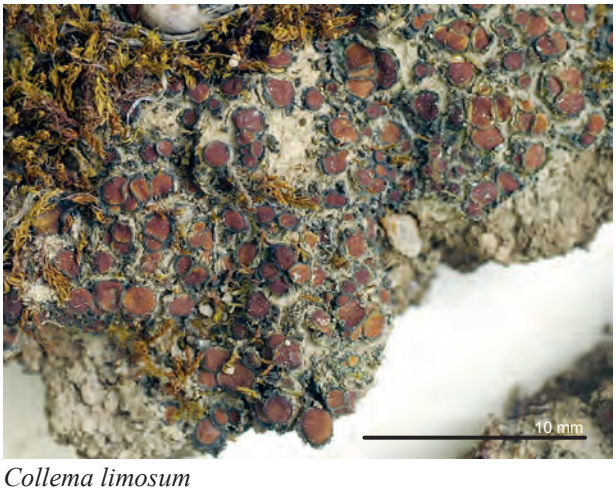


Collema furfuraceum

Collema fuscovirens

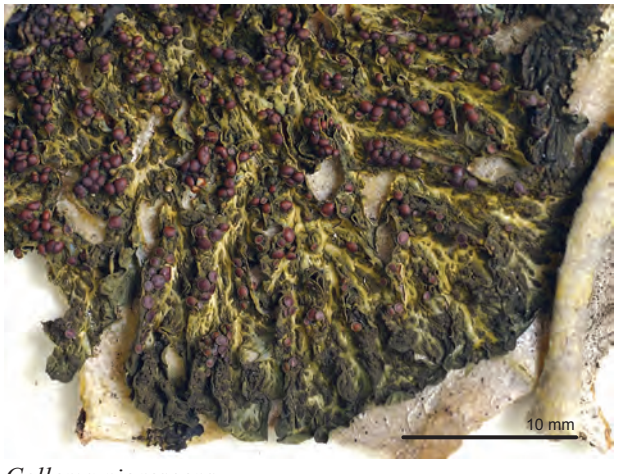
Collema glebulentum

Collema leptaleum



Collema limosum

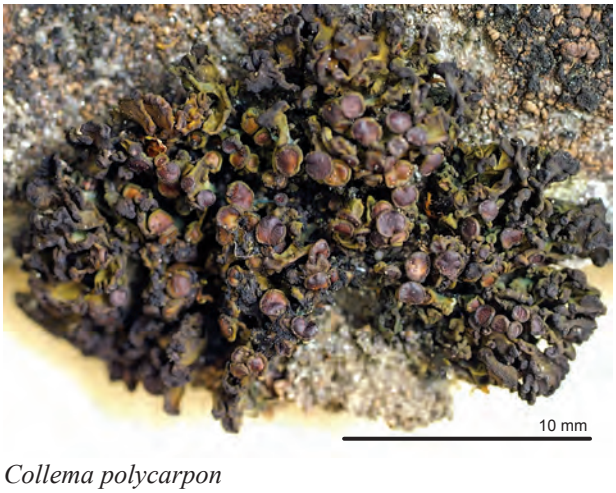
Collema multipartitum



Collema nigrescens

Collema occultatum

Collema parvum

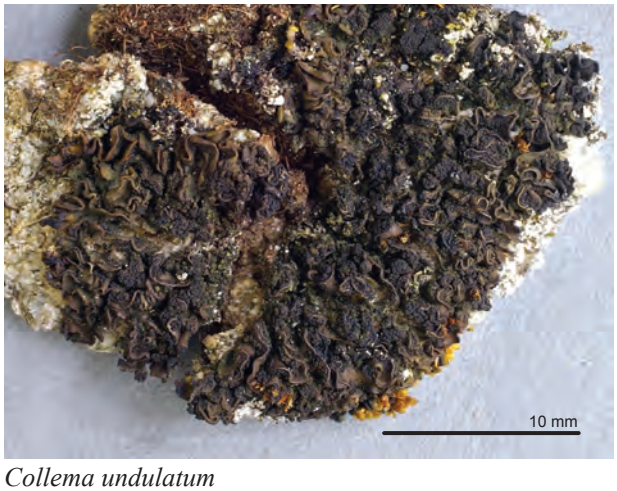


Collema polycarpon

Collema subflaccidum

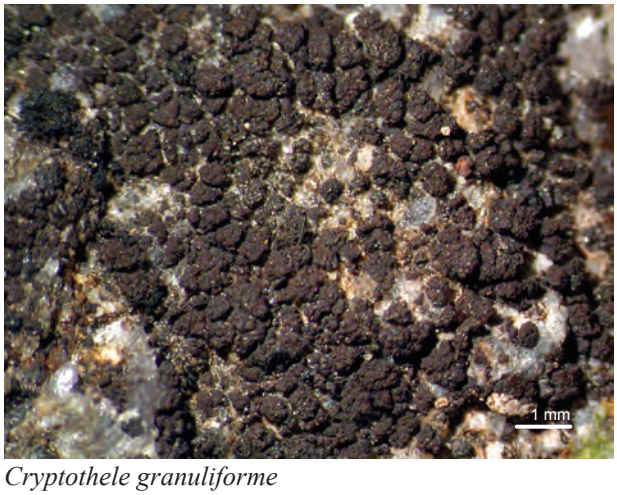
Collema subnigrescens

Collema tenax



Collema undulatum

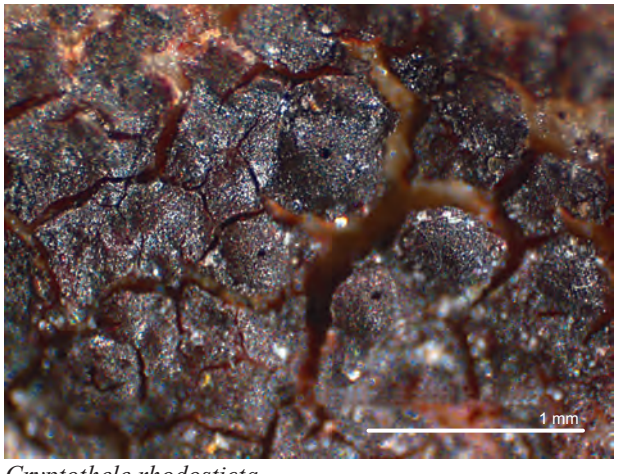
Collolechia caesia



Cryptothele granuliforme

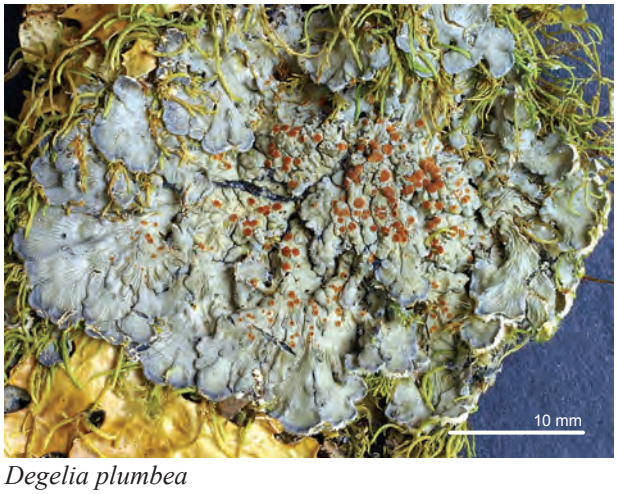
Cryptothele neglecta

Cryptothele permiscens



Cryptothele rhodosticta

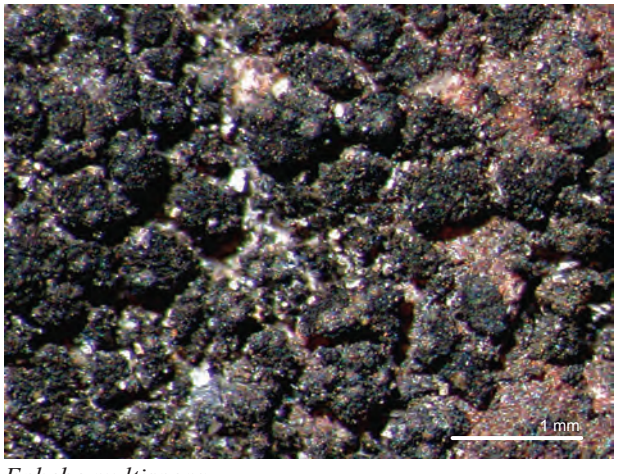
Degelia atlantica



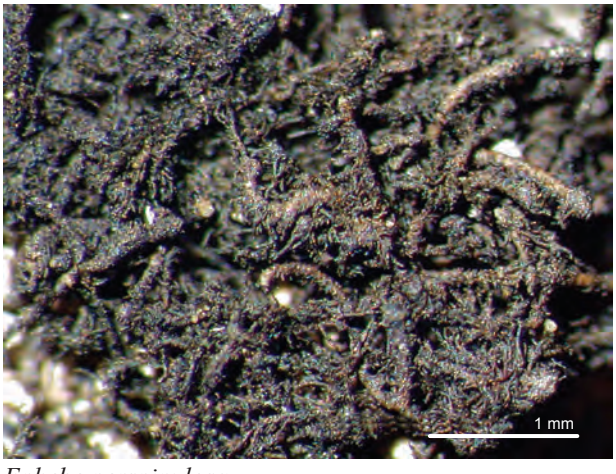
Degelia plumbea

Ephebe hispidula

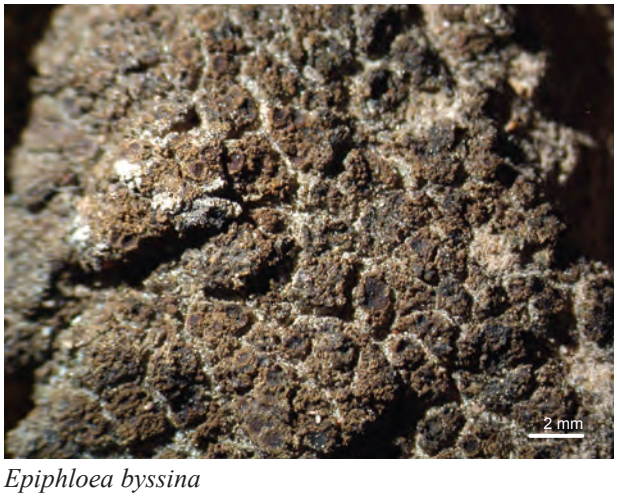
Ephebe lanata



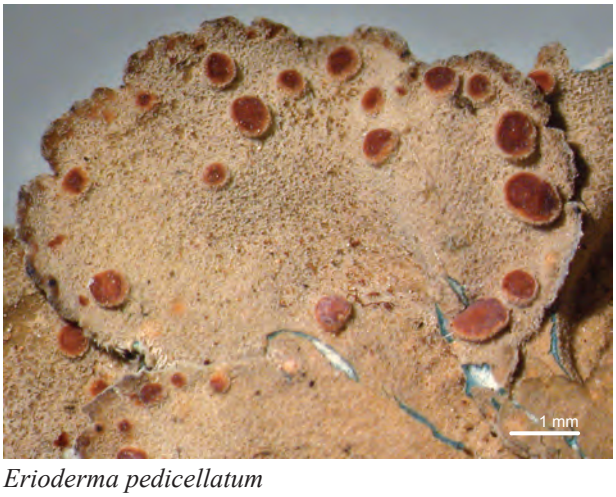
Ephebe multispora



Ephebe perspinulosa

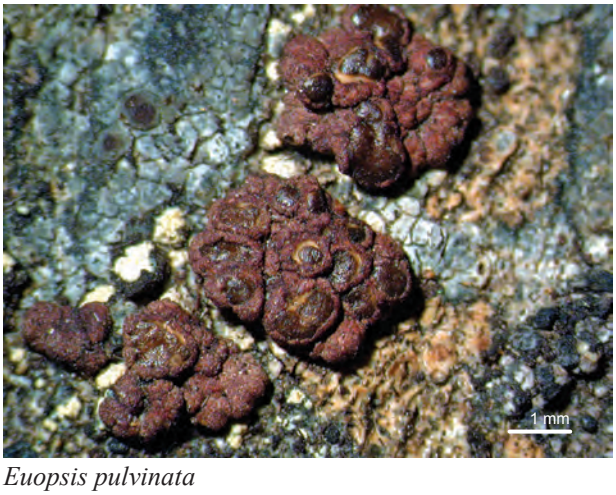


Epiphloea byssina

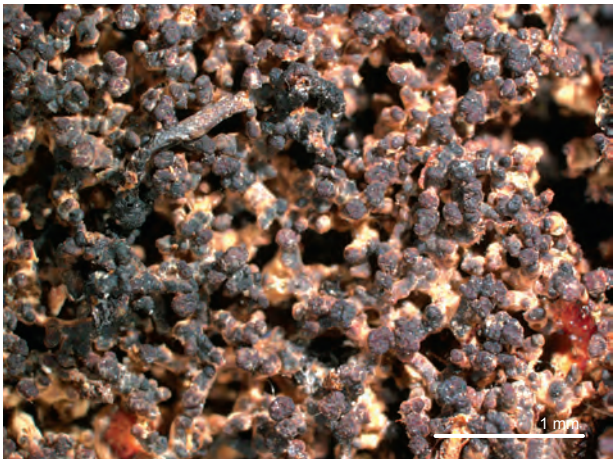


Erioderma pedicellatum

Euopsis granatina

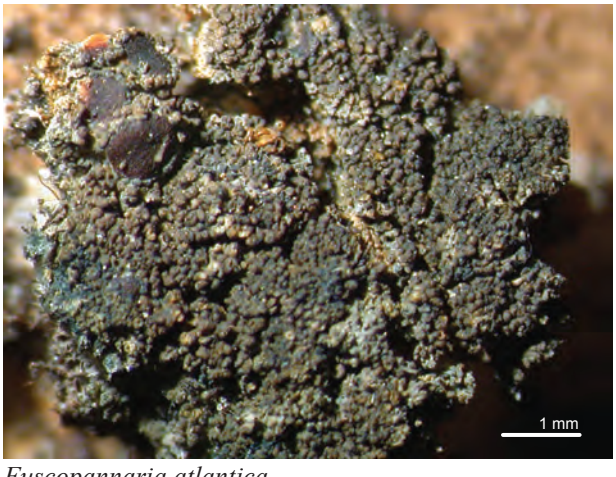


Euopsis pulvinata



Fuscopannaria abscondita

Fuscopannaria ahlneri



Fuscopannaria atlantica

Fuscopannaria confusa

Fuscopannaria hookerioides

Fuscopannaria ignobilis

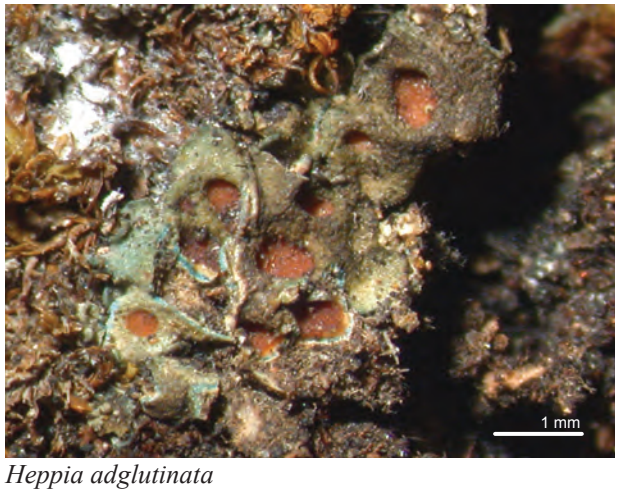
Fuscopannaria leucophaea

Fuscopannaria mediterranea

Fuscopannaria praetermissa

Fuscopannaria sampaiana

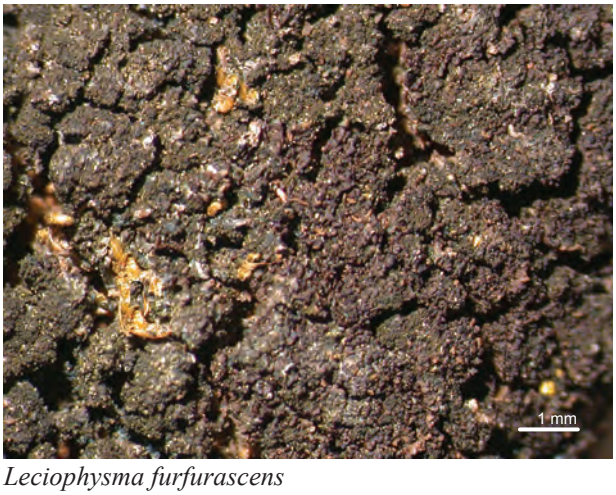
Gregorella humida



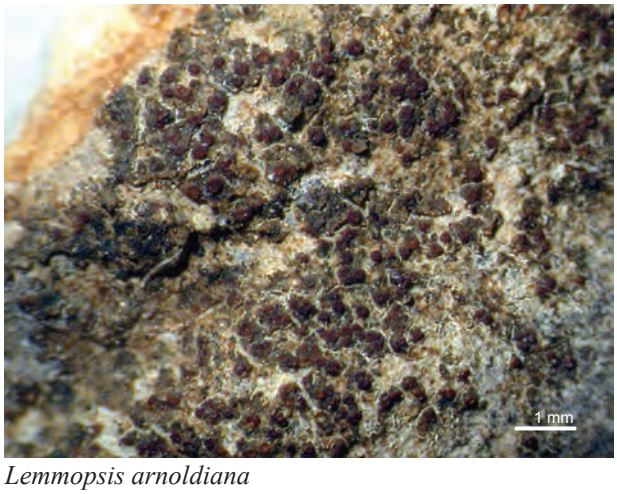
Heppia adglutinata

Heppia lutosa

Leciophysma finmarkicum

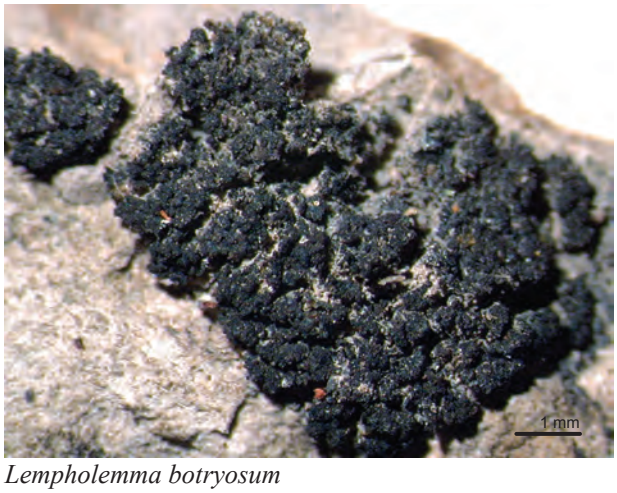


Leciophysma furfurascens



Lemmopsis arnoldiana

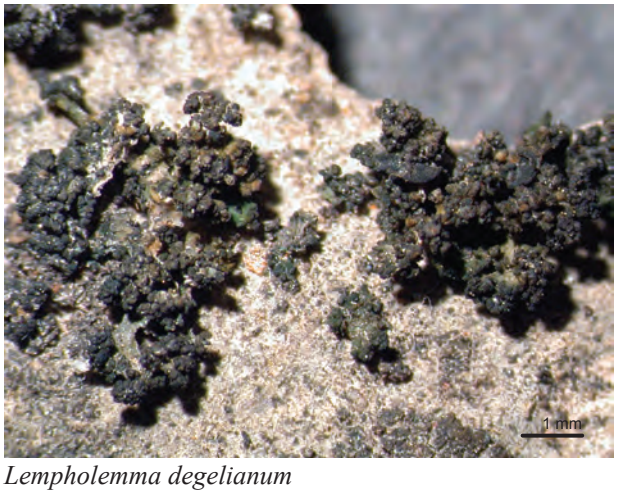
Lemmopsis pelodes



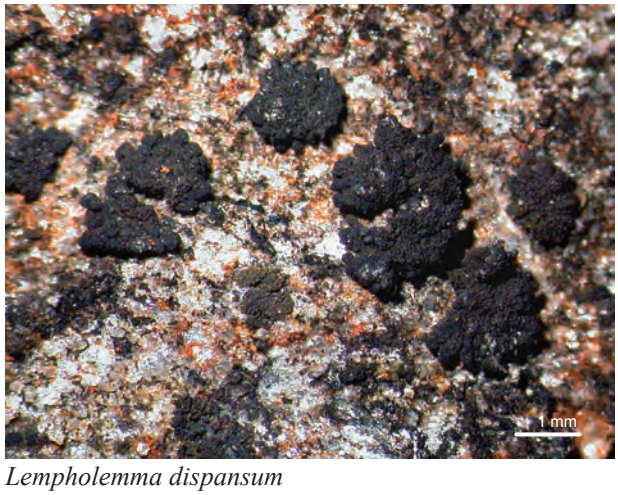
Lempholemma botryosum

Lempholemma chalazanum

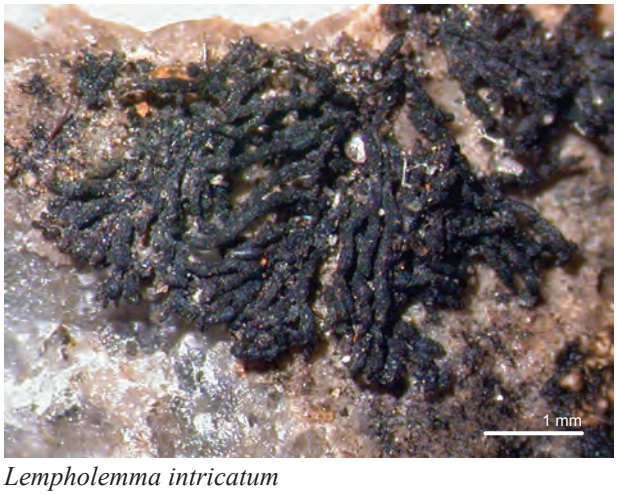
Lempholemma cladodes



Lempholemma degelianum



Lempholemma dispansum

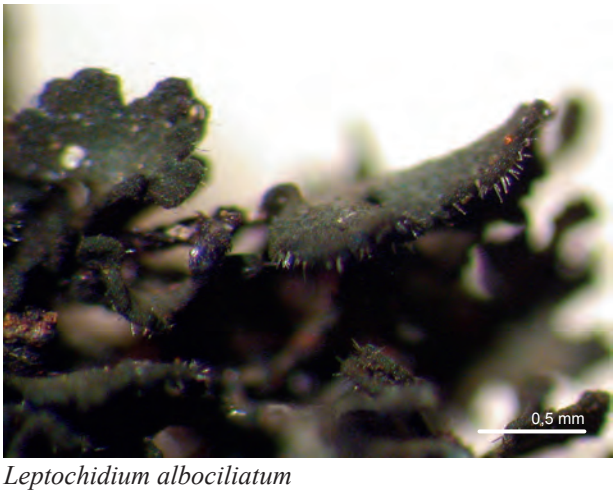


Lempholemma intricatum

Lempholemma isidioides

Lempholemma polyanthes

Lempholemma radiatum



Leptochidium albociliatum

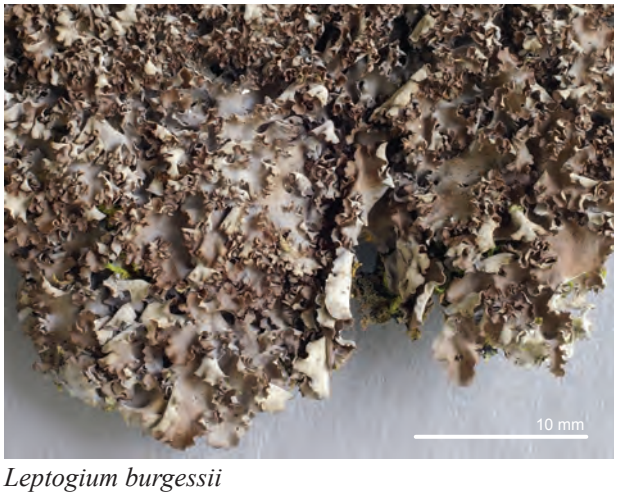
Leptochidium crenatulum

Leptogium aquale

Leptogium arcticum

Leptogium biatorinum

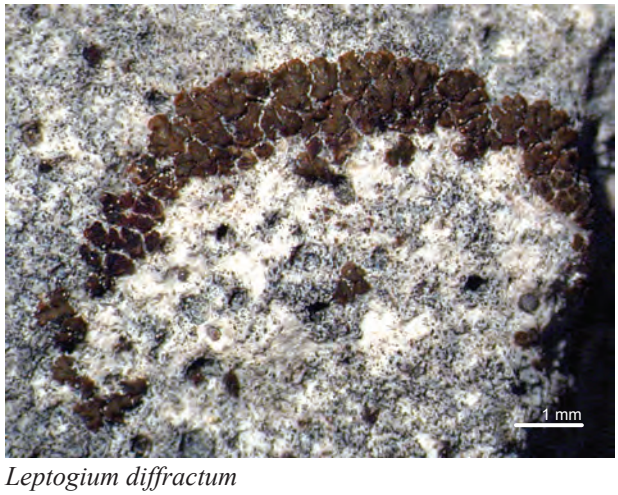
Leptogium britannicum



Leptogium burgessii

Leptogium cochleatum

Leptogium cyanescens



Leptogium diffractum

Leptogium gelatinosum

Leptogium hibernicum

Leptogium imbricatum

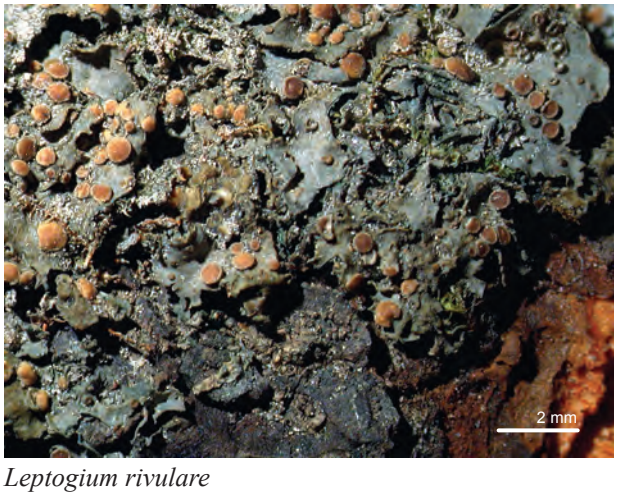
Leptogium intermedium

Leptogium lichenoides

Leptogium magnussonii

Leptogium palmatum

Leptogium plicatile



Leptogium rivulare

Leptogium saturninum

Leptogium schraderi

Leptogium subtile

Leptogium tenuissimum

Leptogium teretiusculum

Leptogium tetrasporum

Lichina confinis

Lichina pygmaea

Lichinodium ahlneri

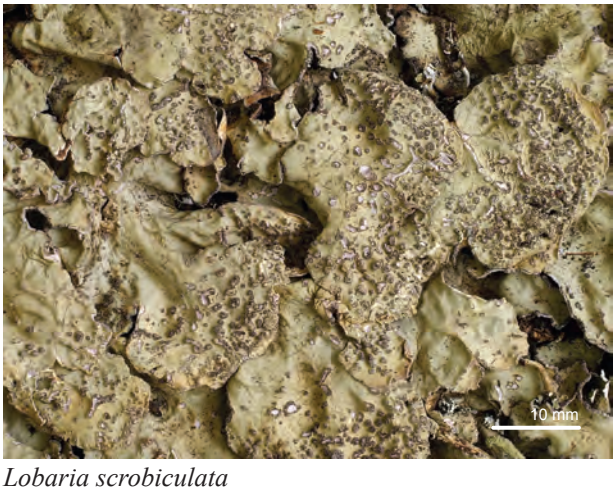
Lichinodium sirosiphoideum

Lobaria amplissima

Lobaria hallii

Lobaria linita

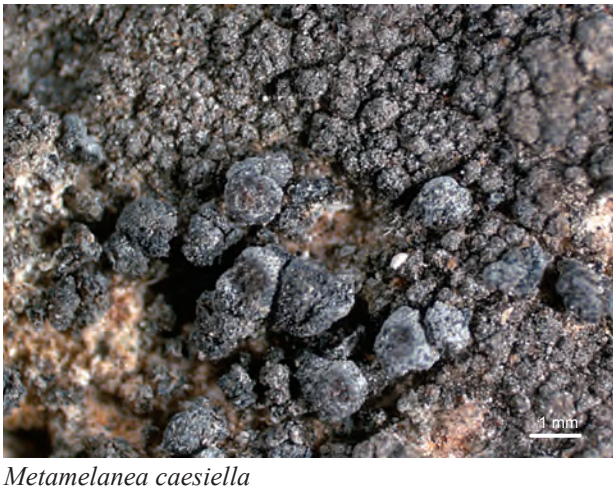
Lobaria pulmonaria



Lobaria scrobiculata

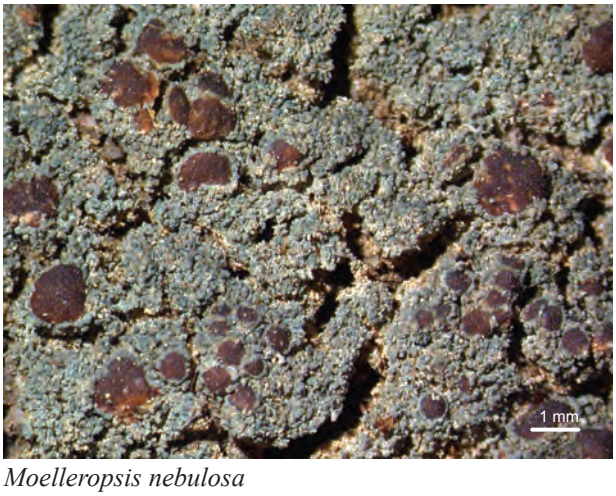
Lobaria virens

Massalongia carnosa



Metamelanea caesiella

Metamelanea umbonata



Moelleropsis nebulosa

Nephroma arcticum

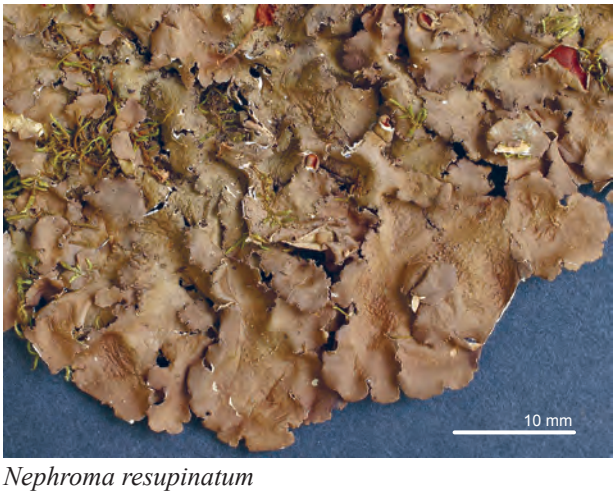
Nephroma arcticum

Nephroma bellum

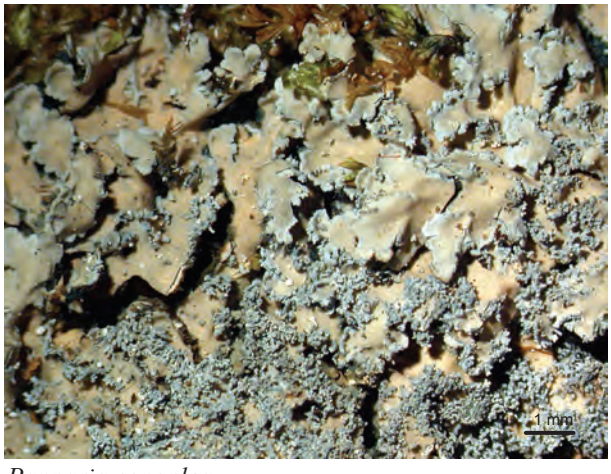
Nephroma expallidum

Nephroma laevigatum

Nephroma parile



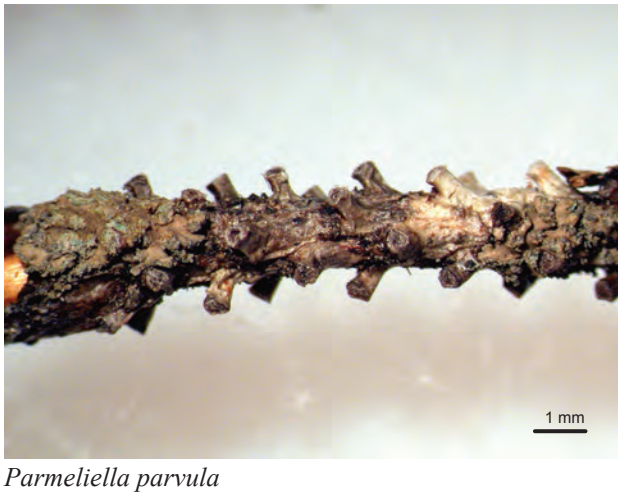
Nephroma resupinatum



Pannaria conoplea

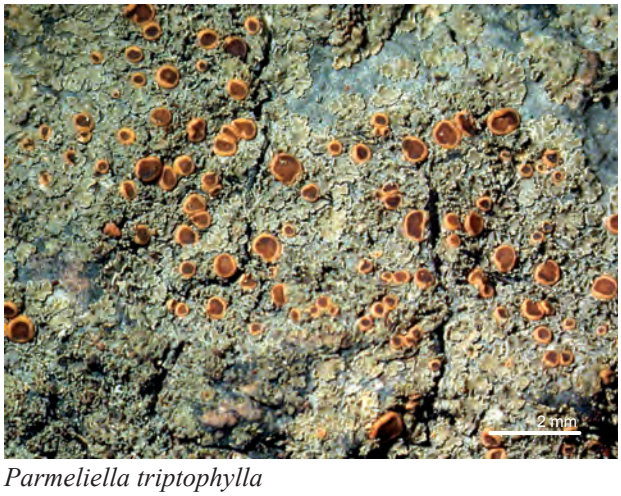
Pannaria hookeri

Pannaria rubiginosa

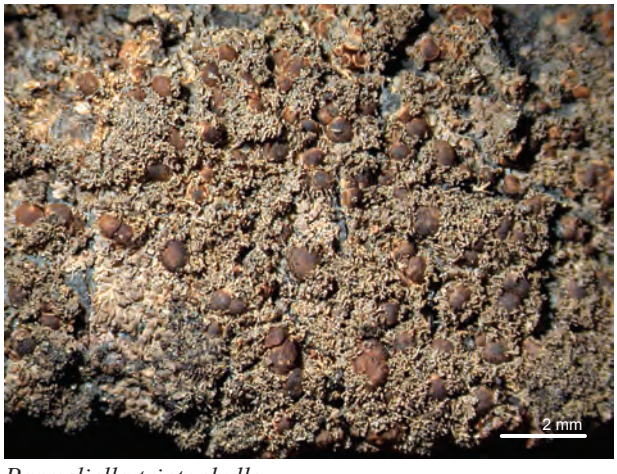


Parmeliella parvula

Parmeliella testacea



Parmeliella triptophylla



Parmeliella triptophylla

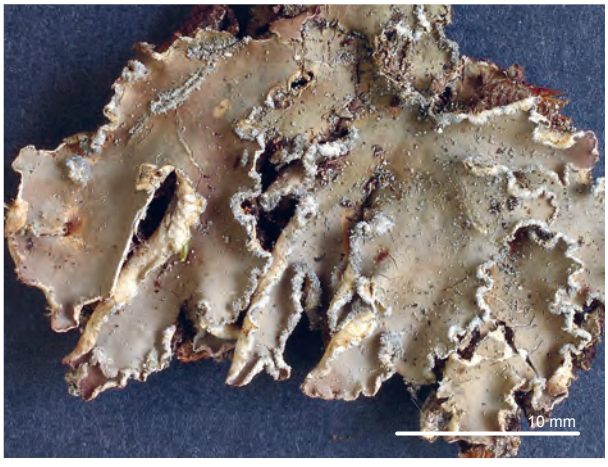
Peltigera aphtosa

Peltigera aphtosa

Peltigera britannica

Peltigera canina

Peltigera canina



Peltigera collina

Peltigera degenii

Peltigera degenii

Peltigera extenuata

Peltigera elisabethae

Peltigera elisabethae

Peltigera didactyla

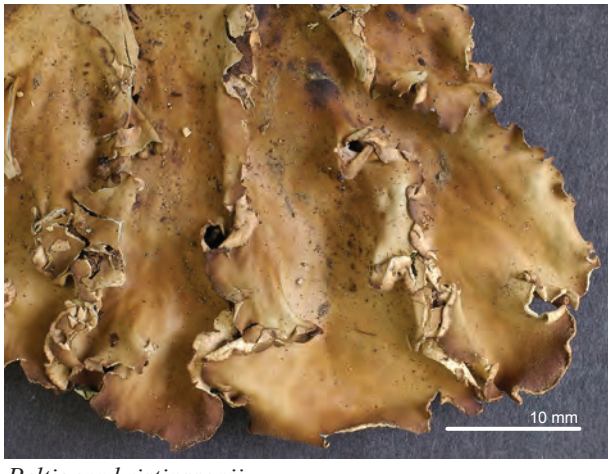
Peltigera frippii

Peltigera horizontalis

Peltigera horizontalis

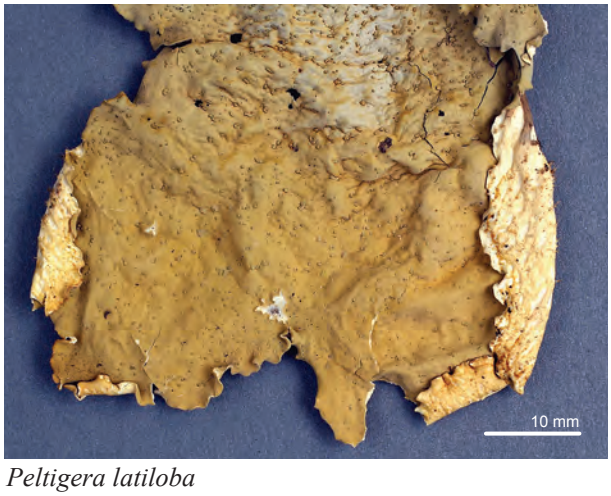
Peltigera hymenina

Peltigera hymenina



Peltigera kristinssonii

Peltigera kristinssonii



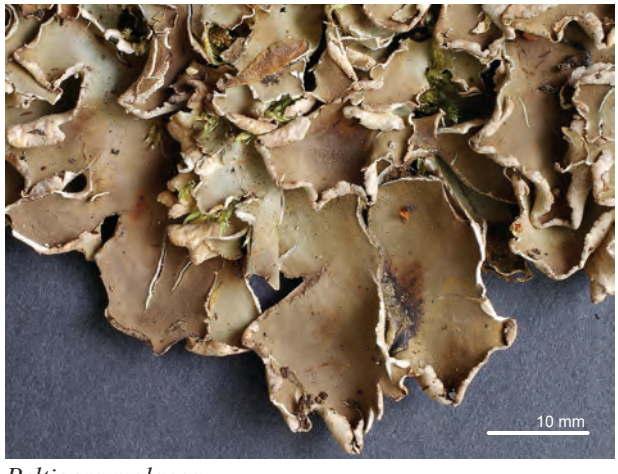
Peltigera latiloba

Peltigera latiloba

Peltigera lepidophora

Peltigera leucophlebia

Peltigera leucophlebia

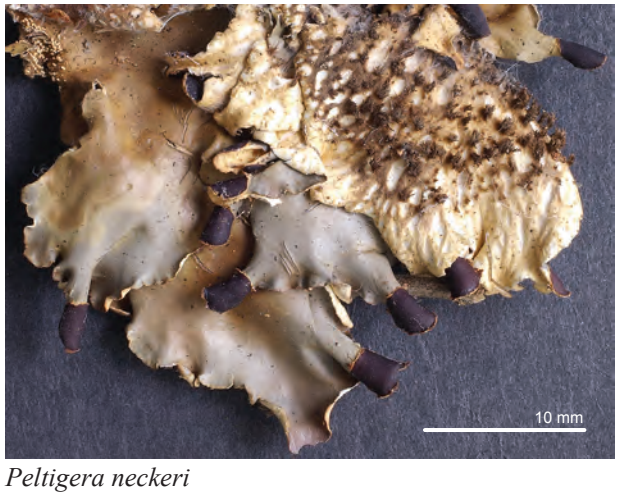


Peltigera malacea

Peltigera membranacea

Peltigera membranacea

Peltigera monticola



Peltigera neckeri

Peltigera neopolydactyla

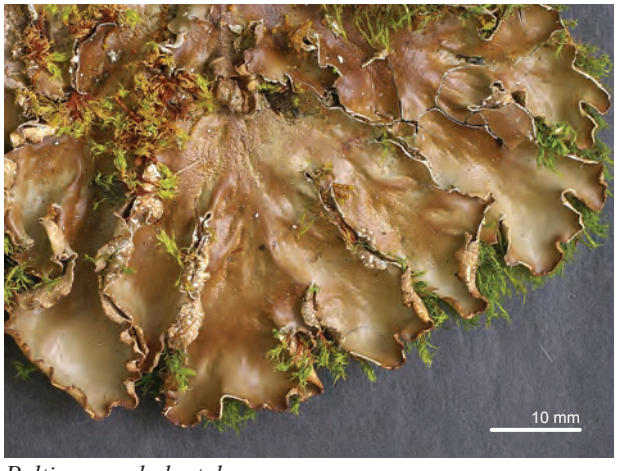
Peltigera neopolydactyla

Peltigera occidentalis

Peltigera occidentalis

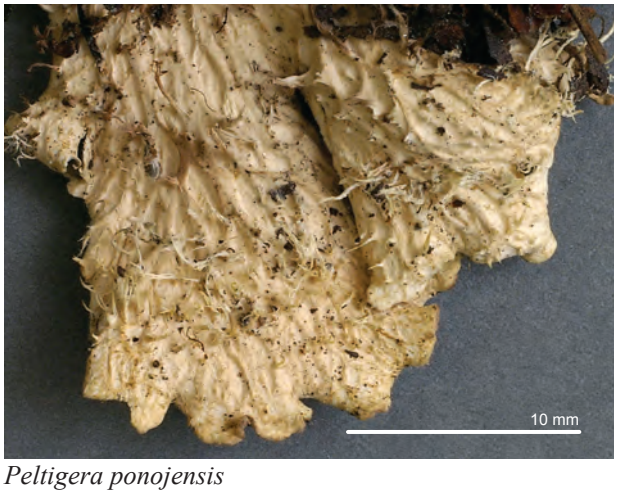
Peltigera polydactylon

Peltigera polydactylon



Peltigera polydactylon

Peltigera ponojensis

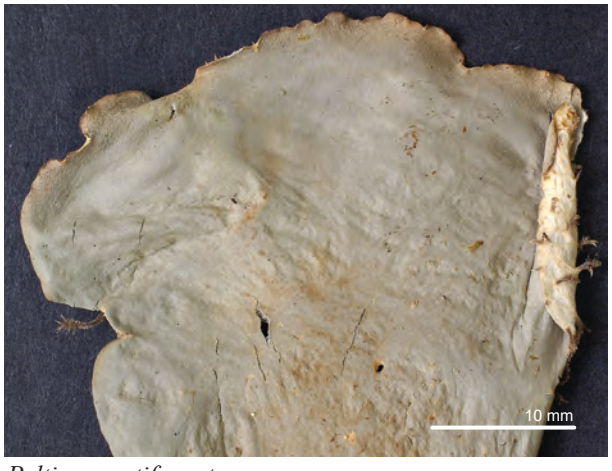


Peltigera ponojensis

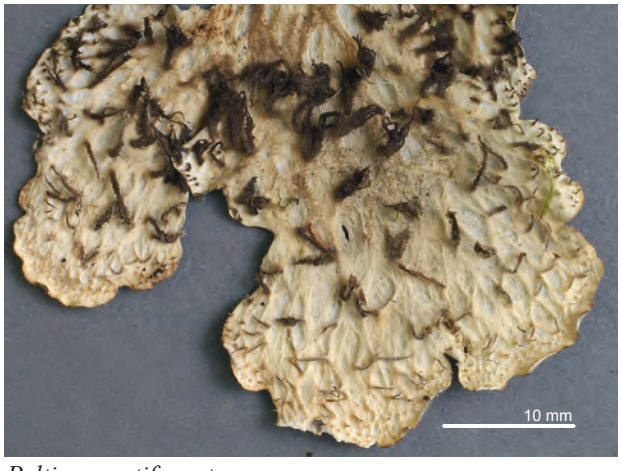
Peltigera praetextata

Peltigera praetextata

Peltigera praetextata



Peltigera retifoveata



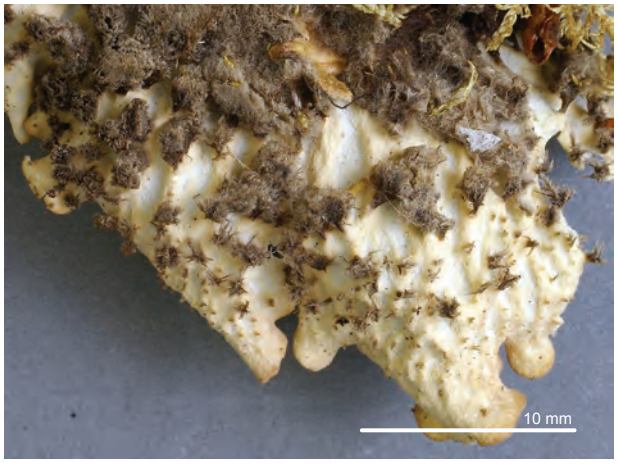
Peltigera retifoveata

Peltigera rufescens

Peltigera rufescens

Peltigera scabrosa

Peltigera scabrosa

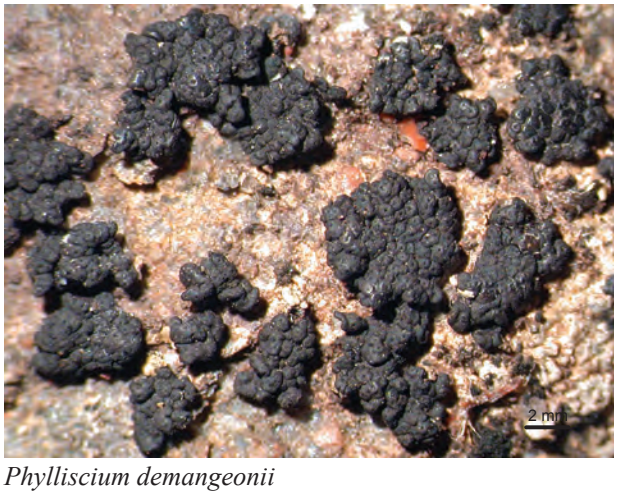


Peltigera scabrosa

Peltigera scabrosella

Peltigera venosa

Peltula euploca

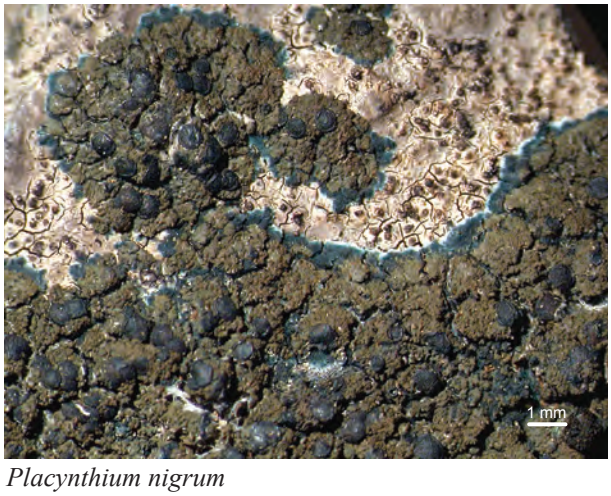


Phylliscium demangeonii

Placynthium asperellum

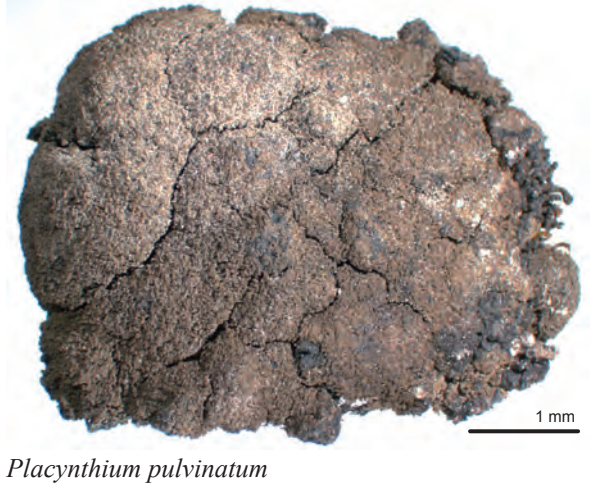
Placynthium flabellosum

Placynthium lismorense

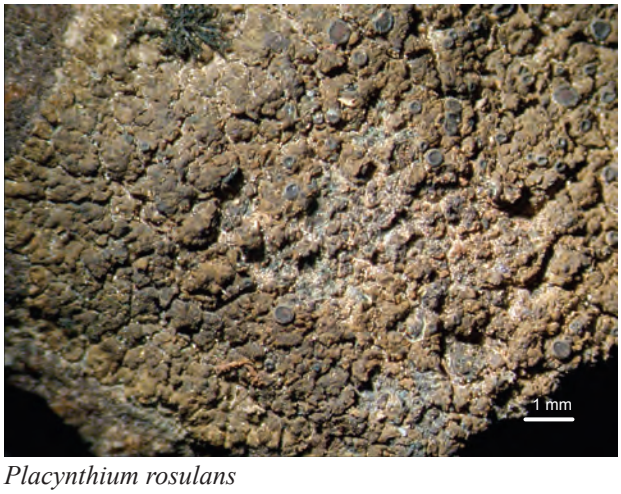


Placynthium nigrum

Placynthium pannariellum

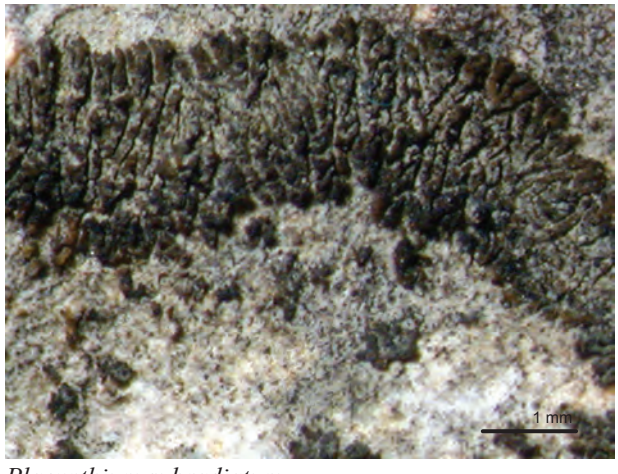


Placynthium pulvinatum



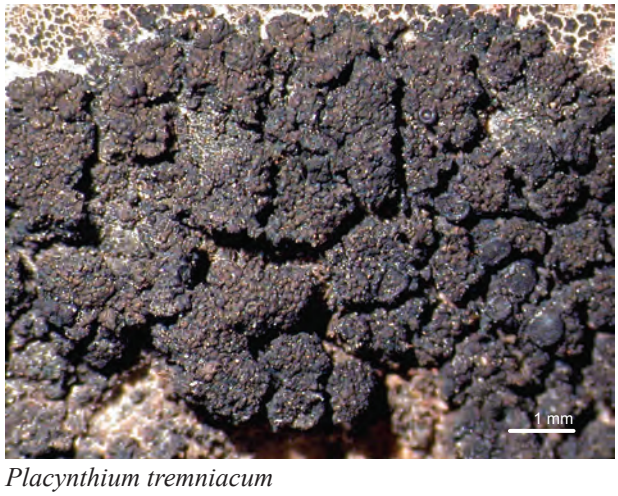
Placynthium rosulans

Placynthium stenophyllum



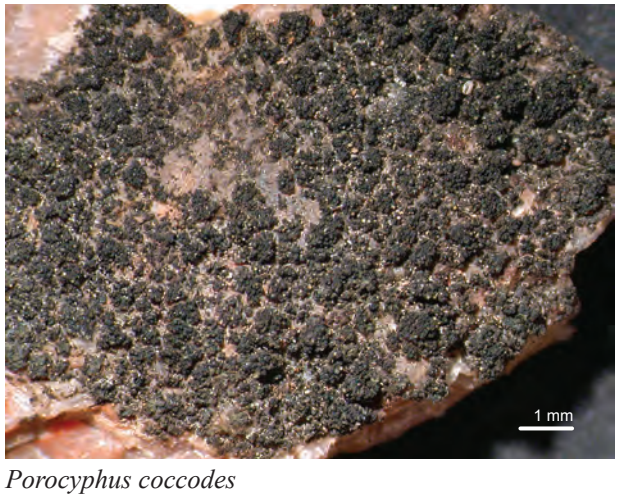
Placynthium subradiatum

Placynthium tantaleum



Placynthium tremniacum

Polychidium muscicola



Porocyphus coccodes

Porocyphus kenmorensis

Protopannaria pezizoides

Pseudocyphellaria crocata

Pseudocyphellaria intricata

Pseudocyphellaria norvegica

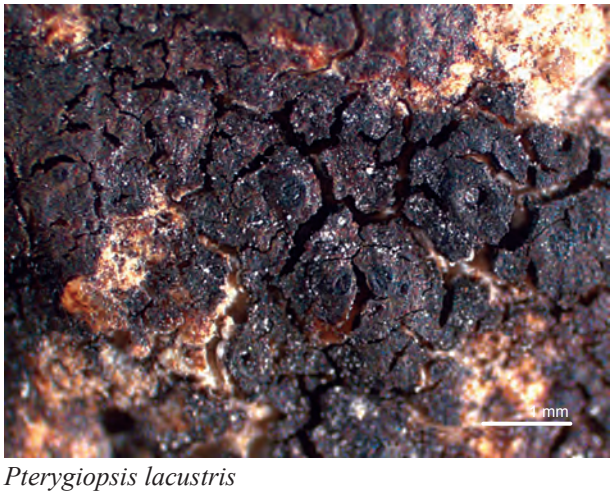
Psoroma hypnorum

Psoroma paleaceum

Psoroma tenue

Psorotichia schaereri

Pterygiopsis concordatula

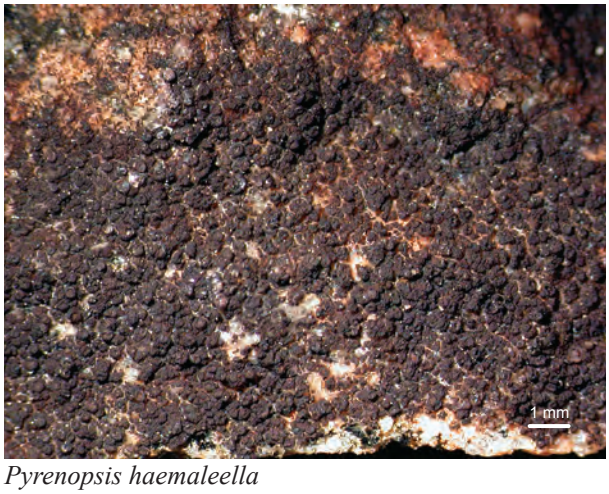


Pterygiopsis lacustris

Pyrenocarpon flotowianum

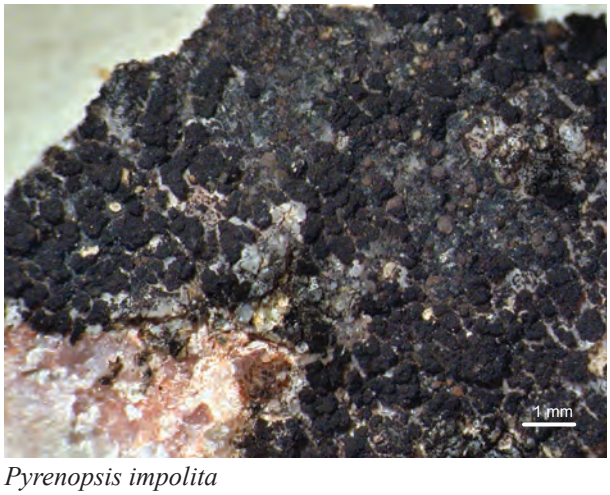
Pyrenopsis furfurea

Pyrenopsis grumulifera



Pyrenopsis haemaleella

Pyrenopsis haematina



Pyrenopsis impolita

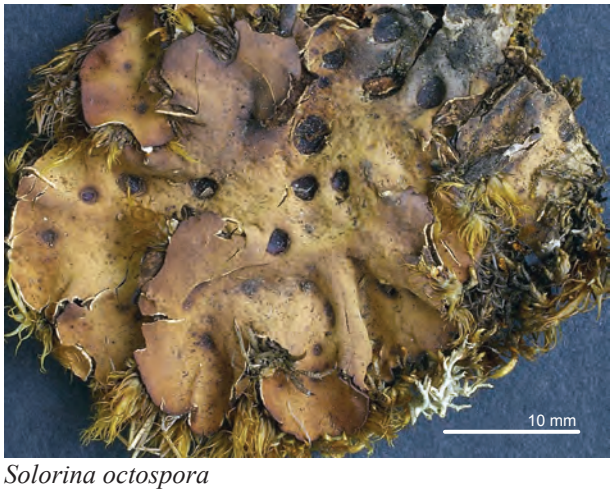
Pyrenopsis pleiobola

Pyrenopsis subareolata

Santessoniella arctophila

Solorina bispora

Solorina crocea



Solorina octospora

Solorina saccata

Solorina spongiosa

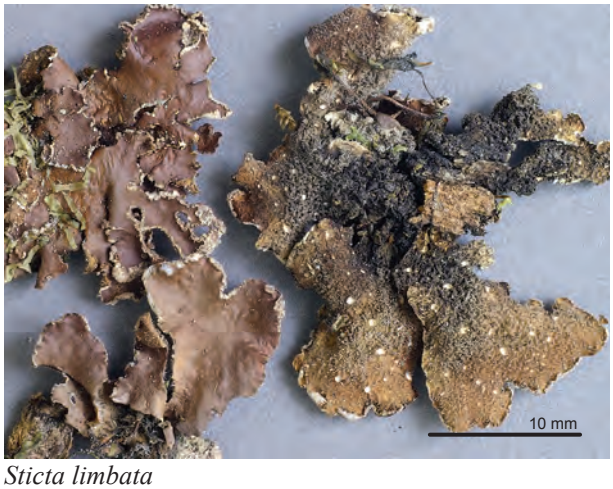
Spilonema paradoxum

Spilonema revertens

Staurolemma omphalarioides

Sticta canariensis

Sticta fuliginosa

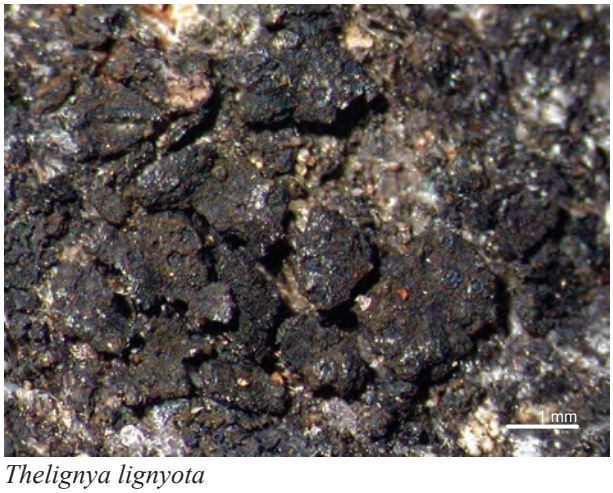


Sticta limbata

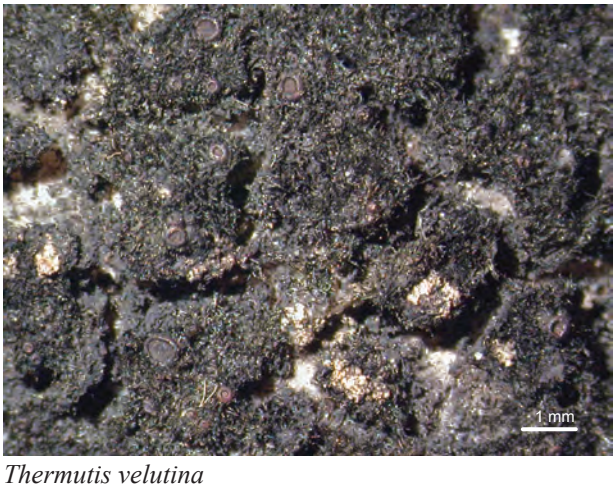
Sticta sylvatica

Synalissa ramulosa

Thallinocarpon nigritellum



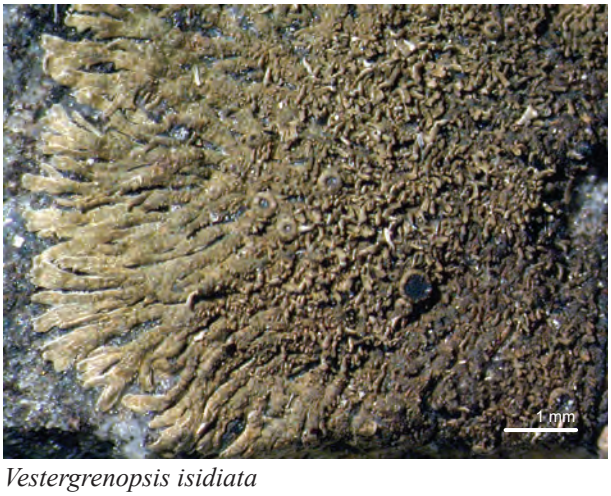
Thelignya lignyota



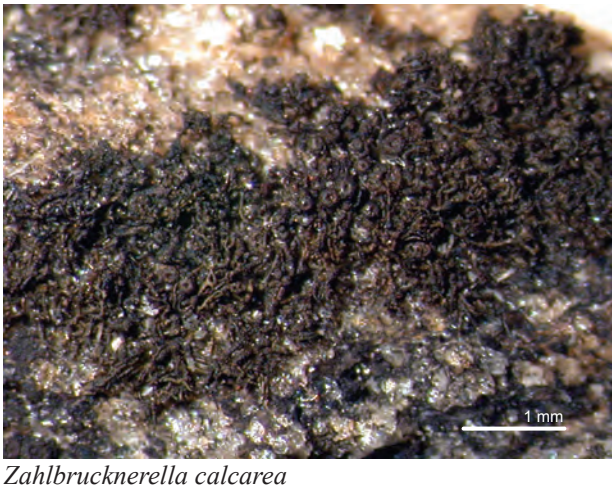
Thermutis velutina

Thyrea confusa

Vestergrenopsis elaeina



Vestergrenopsis isidiata



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Placynthium asperellum, Sweden, Jämtland, Gäddede, Gellvernokka, Sten, 1972 S.W. Sundell 8529 (UPS)
Placynthium dolichoterum, Sweden, Lycksele Lappmark, Tärna, Ume älv, Över-Umans sydvästligaste vik, 66º06-07'N 14º32-33'E, 530 m, 1960 G.E. Du Rietz 915 (UPS)
Placynthium flabellosum, Sweden, Härjedalen, Storsjö, c. 2 km SE of Småbodvallen (Between Kattuggleknallen and Tandåsen), 1962 R. Santesson 14928a (UPS)
Placynthium lismorense, Scotland, Argyll, Lismore Island, Achnacroich, 1980 L.-E. Muhr 3001 (UPS)
Placynthium nigrum, Sweden, Uppland, Estuna, Norr Malma, 2 km NNW of the parish church, between the pumping station and Kallvik, 59º50'N 18º38'E, 1989 R. Santesson 32716 (UPS)
Placynthium pannariellum, Sweden, Norrbotten, Älvsby, Pite älv, Åkerselforsens början (forsnacke), strax nedan flottnings-föreningens Åkerselekoja, 65º51'N 20º12'E, 160 m, 1962 G.E. Du Rietz 615 (UPS)
Placynthium pulvinatum, Svalbard, Spitsbergen, Gipsdalen, 1978 Øvstedal (BG)
Placynthium rosulans, Sweden, Västergötland, Edsvära, Lidafors, 1936 A.H. Magnusson 15313 (UPS)
Placynthium stenophyllum, Russia, Komi, Troitsko-Pechorskii, Pechoro-Ilych Zapovednik, Shizim, rock 500 m NE of the kardon, 62º05'N 58º25'E, 2001 J. Hermansson 11605 (UPS)
Placynthium subradiatum, Hungary, in rupibus calcareis montis Drevenyik in Scepensio (Zips), 1868 Lojka 75 (UPS)
Placynthium tantaleum, Sweden, Västergötland, Fullösa, Gössäter, 1942 A.H. Magnusson 18280 (UPS)
Placynthium tremniacum, Sweden, Öland, Resmo, Resmo alvar, NV om Möckelmossen, 1963 L. Tibell 1055 (UPS)

Polychidium muscicola, Norway, Finnmark, Varanger, Vestre Jakobselv, at River Jakobselv, 2-3 km N of its mouth, 30 m, 1966 R. Santesson 19049a (UPS)
Porocyphus kenmorensis, Ireland, Kerry (H 2), Ross Island, near Ross Castle, 1982 P.M. Jörgensen 9153 (UPS)
Porocyphus coccodes, Finland, Nylandia, Nådendal, 1932 A.H. Magnusson 13328 (UPS)
Protopannaria pezizoides, Norway, Sör-Tröndelag, Rissa, In the valley of the river Svartdalselv (C. 3 km E of the S end of Lake Vollavatn), 1961 R. Santesson 14327 (UPS)
Pseudocyphellaria crocata, Norway, Rogaland, Sokndal, Seljuåsen, the N slope, 1953 Rolf Santesson (UPS)
Pseudocyphellaria intricata, Norway, Hordaland, Os, Sörnes. Björnaåsen. In the steep nortern slope SE of the lake Björnavatn, 60º10'N 05º27'E, 1978 R. Moberg 3692 (UPS)
Pseudocyphellaria norvegica, Norway, Hordaland, Fitjar, Sandvikvåg. In the steep northern slope close to the ferry berth. 59º58'N 05º16'E, 1978 Roland Moberg 3700 (UPS)
Psoroma hirsutum, Iceland, Sudur-Island, Rang, Tindfjallagil Porsmörk, 63º42'N 19º29'E, 1979 H. Kristinsson L-21295 (UPS)
Psoroma hypnorum, Norway, Sogn Og Fjordane, Stryn, 1930 ? (BG)
Psoroma tenue, Norway, Vest-Finnmark, Alta, Bossekop, 1861 J.M. Norman (UPS)
Psorotichia schaereri, Norway, Nordland, Nord-Rana, Dunderland, kalkbranter V om stationen, 1951 G. Degelius (UPS)
Pterygiopsis concordatula, Finland, Tavastia Australis, Korpilahti, Jänissari, 1875 J.P. Norrlin (H)
Pterygiopsis lacustris, Scotland, W. Donegal, c. 3 km N of Church Hillº Lough Akibbon, 280 m, 1991 Brian Coppins 14735 (BG)
Pyrenocarpon flotowianum, Norway, Rogaland, Bokn, Ognøy, 1981 Skjolddal (BG)
Pyrenopsis furfurea, Sweden, Lule Lappmark, Jokkmokk, Jiegnáffo mountain crest c. 12 km SSW of Staloloukta, RN 7457408 1536824, 1600 m, 2004 A. Koffman 691 (UPS)
Pyrenopsis grumulifera, Russia, Karelia Ladogensis, Kirjavaöaks, Herb. Lich. Fenn., 102, 1874 J.P. Norrlin (UPS)
Pyrenopsis haemalella, Sweden, Värmland, Ullerud, Brännvinstorp, 1956 S.W. Sundell 939 (UPS)
Pyrenopsis haematina, Norway, Sör-Tröndelag, Dovre, Knudshöe, 1863 Th.M. Fries (UPS)
Pyrenopsis impolita, Sweden, Närke, Götlunda, Årängen, 1866 O.G. Blomberg (UPS)
Pyrenopsis pleiobola, Finland, Tavastia Australis, Tiantoali, 1873 E.A. Lang (H)
Pyrenopsis subareolata, Sweden, Västergötland, Västra Frölunda, Ad Göteborg, 1917 A.H. Magnusson (UPS)
Santessoniella arctophila, Norway, Sör-Tröndelag, Dovre fjell, Kongsvoll (887 m), 1500 m, 1959 A. Henssen, 4421 (UPS)
Solorina bispora, Sweden, Härjedalen, Tännäs, Ramundberget, the north-eastern slope, 850 m, 1958 R. Santesson 12437b (UPS)
Solorina crocea, Sweden, Jämtland, Rätan, c. 1 km SW of Klaxåsen, on cliffs along the southern shore of the river Hoan, just S Röhällan, 62º22'N 14º26'E, 400 m, 1988 M. Wedin 815 (UPS)
Solorina octospora, Norway, Sör-Tröndelag, Opdal, Dovre, Knudshö, vid Sprenbekken strax ovan skogsgränsen, 1926 G. Degelius (UPS)
Solorina saccata, Sweden, Härjedalen, Tännäs, 0.5 km E of southern and of the lake Malmagen, 1958 R. Santesson 12425a (UPS)
Solorina spongiosa, Sweden, Västergötland, Vänersnäs, Halleberg, Skytteklev, 1944 Rolf Santesson (UPS)
Spilonema paradoxum, Sweden, Värmland, Östra Ämtervik, SV om Bössviken, 1960 S.W. Sundell 1923 (UPS)
Spilonema revertens, Sweden, Lycksele Lappmark, Tärna, Ume älv, Rönnbäck, serpentinberget, 65º29'N 15º27'E, 390 m, 1960 G.E. Du Rietz, 2261 (UPS)
Staurolemma omphalarioides, Norway, Nordland, Tjötta, Offersöya, nordspetsen, 1951 G. Degelius (UPS)
Sticta canariensis, Norway, Hordaland, Austevoll, ön Mökster, södra sidan, 1968 N. Hakelier & Å. Björnstad (UPS)
Sticta fuliginosa, Norway, Vest-Agder, Lyngdal, Lyngdalsfjorden, near Sjunderaasen, 1953, Rolf Santesson (UPS)
Sticta limbata, Norway, Hordaland, Os, I branter med lundvegetation nära Li, 1953 P.-O. Lindahl (UPS)
Sticta sylvatica, Norway, Rogaland, Sogndal, Nordsluttning mellan Raegefjord och Seljuåsen, 1932 G. Degelius (UPS)
Synalissa ramulosa, Norway, Nordland, Vega, Vega Island, Viksås, N of the farms, 1978 G. Degelius V-2053 (UPS)
Thallinocarpon nigritellum, Norway, Buskerud, Hole, Buksøya, 1997 Bratli & Timdal (O)
Thelignya lignyota, Sweden, Lycksele Lappmark, Tärna, Ume älv, Över-Umans sydvästligaste vik, 66º06-07'N 14º32-33'E, 530 m, 1960 G.E. Du Rietz 932b (UPS)
Thermutis velutina, Sweden, Bohuslän, Låka, Valla, Tjörn, 1920 A.H. Magnusson 4747 (UPS)
Thyrea confusa, Norway, Bærum, Kalvøya, 2000 Johnsen (BG)
Vestergrenopsis elaeina, Norway, Hordaland, Ankenes, Between Rombaksbotn and the railway station of Katterat, 110–130 m, 1959 Rolf Santesson 13497 (UPS)
Vestergrenopsis isidiata, Norway, Nordland, Ankenes, Between Rombaksbotn and the railway station Katterat, 110–130 m, 1959 R. Santesson 13496a (UPS)
Zahlbrucknerella calcarea, Norway, Nordland, Fauske, Fauske, trakten av Lund, 1951 G. Degelius (UPS)

Index to synonyms

Anema cernohorskyi (Servít) Henssen sensu Henssen & Jørgensen (1990) = Anema tumidulum
Anema decipiens sensu Th.Fr. = Anema nummularium
Anema notarisii (A.Massal.) Forssell = Anema nummularium
Anziella adglutinata (Anzi) Gyeln. = Placynthium flabellosum
Anziella Gyeln. = Placynthium
Arctoheppia Lynge = Thelignya
Arctoheppia scholanderi Lynge = Thelignya lignyota
Arctomia delicatula ssp. *andreaearum* Th.Fr. = Arctomia interfixa
Arctomia delicatula ssp. *cisalpina* Hulting = Arctomia delicatula
Arctomia delicatula var. *acutior* (Nyl.) Henssen = Arctomia delicatula
Arnoldia A.Massal. = Lempholemma
Arnoldia botryosa A.Massal. = Lempholemma botryosum
Asirosiphon densatulum Nyl. = ?Spilonema revertens, *Spilonema subsimile* Vain. = Spilonema revertens
Catillaria subalpina Th.Fr. = Placynthium asperellum
Collema aggregatum auct. = Collema fasciculare
Collema alpinum Th.Fr. p.p. = Lempholemma isidiodes
Collema arcticum Lynge = Collema ceraniscum
Collema ascaridosporum (A.Massal.) Degel. = Collema fasciculare
Collema auriculatum Hoffm. = Collema auriforme
Collema biatorinum Nyl. = Leptogium biatorinum
Collema botrytis Hoffm., *nom. inval*. = ?Synalissa ramulosa
Collema byssinum Hoffm. = Epiphloea byssina
Collema byssinum var. *juniperinum* Sommerf. = Collema occultatum
Collema chalazanum Ach. = Lempholemma chalazanum
Collema cheileum (Ach.) Ach. = Collema crispum
Collema cladodes Tuck. = Lempholemma cladodes
Collema coccodes Flot. = Porocyphus coccodes
Collema coccophylloides Hepp ex Müll.Arg. = Collema occultatum var. populinum
Collema coralliferum Degel. = Collema glebulentum
Collema cyanescens Rabenh. = Leptogium cyanescens
Collema demangeonii Moug. & Mont. = Phylliscum demangeonii
Collema furfureum Nyl. = Pyrenopsis furfurea
Collema furvellum Räsänen = Collema glebulentum
Collema furvum (Ach.) Sw. = Collema fuscovirens
Collema furvum subsp. *subhirsutulum* Nyl. = Collema bachmanianum var. millegranum
Collema glaucescens Hoffm. sensu Körber = Collema limosum
Collema granosum auct. = Collema auriforme
Collema granuliforme Nyl. = Cryptothele granuliformis
Collema isidiodes Nyl. ex Arnold = Lempholemma isidiodes
Collema leptogioides auct. (non Anzi) = Collema parvum
Collema lichinodeum Nyl. ex Cromb. = Lempholemma radiatum
Collema melaenum (Ach.) Ach. = Collema cristatum
Collema microphyllum Ach. = Collema fragrans
Collema minutissimum Flörke, *nom. illeg.* = Leptogium subtile
Collema multifidum (Scop.) Rabenh. = Collema cristatum var. marginale
Collema nummularium Dufour ex Durieu & Mont. = Anema nummularium
Collema omphalarioides Anzi = Staurolemma omphalarioides
Collema polyanthes Bernh. = Lempholemma polyanthes
Collema psorellum Nyl. = Collema callopismum var. rhyparodes
Collema pulposum (Bernh.) Ach. = Collema tenax
Collema quadratum J.Lahm ex Körb. = Collema occultatum
Collema radiatum Sommerf. = Lempholemma radiatum
Collema ramulosum Hoffm. ex Bernh. = Synalissa ramulosa
Collema subbadium Nyl. = Psoroticha schaereri
Collema subcorallinum Degel. = Collema tenax
Collema subfurvum sensu Degel. 1954 = Collema subflaccidum
Collema tuniforme (as "*tunaeforme"*) (Ach.) Ach. = Collema fuscovirens
Collema vespertilio (Lightf.) Hoffm. = Collema nigrescens
Collemodes bachmaniana Fink = Collema bachmanianum
Collemopsis Nyl. = Psorotichia
Cyanosticta aberrans (Hav. ex Lynge) Gyeln. = Pseudocyphellaria norvegica
Cyanosticta ecyphellata (Hav.) Gyeln. = Pseudocyphellaria norvegica
Cyanosticta normalis Gyeln. = Pseudocyphellaria intricata
Dendriscocaulon Nyl. = Lobaria
Dendriscocaulon umhausense (Auersw.) Degel. = Lobaria amplissima
Endocarpon phylliscum Wahlenb. = Phylliscum demangeonii
Ephebaceae = Lichinaceae
Ephebe lanata f. *tenuis* H.Magn. = Zahlbrucknerella calcarea
Ephebe lapponica Nyl.= Ephebe lanata
Ephebe papillata H.Magn. = Ephebe perspinulosa
Ephebe pubescens f. *trachytera* Nyl. = Ephebe perspinulosa
Ephebe pubescens var. *complicata* Vain. = Ephebe lanata
Ephebe spinulosa Th.Fr. = Ephebe hispidula
Ephebe trachytera (Nyl.) Henssen = Ephebe perspinulosa
Ephebeia hispidula (Ach.) Nyl. = Ephebe hispidula
Ephebeia hispidula subsp. *trachytera* (Nyl.) Vain. = Ephebe perspinulosa
Ephebeia Nyl. = Ephebe
Ephebeia perspinulosa (Nyl.) Räsänen = Ephebe perspinulosa
Erioderma boreale Ahlner = Erioderma pedicellatum
Euopsis haemaleella Nyl. = Pyrenopsis haemaleella
Fernaldia Lynge non Woodson, *nom. illeg.* = Thelignya
Gonohymenia nigritella (Lettau) Henssen = Thallinocarpon nigritellum
Heppia euploca (Ach.) Vain. = Peltula euploca
Heppia gotlandica Du Rietz = *Hymenelia rhodopis* (Sommerf.) Lutzoni
Lecanephebe Frey = Zahlbrucknerella
Lecanephebe meylanii Frey = Zahlbrucknerella calcarea
Lecanora adglutinata Kremp. = Heppia adglutinata
Lecanora ciliata Ach., *nom. nud*. = Psoroma paleaceum
Lecanora granatina Sommerf. = Euopsis granatina
Lecidea humida (Kullh.) Th.Fr. = Gregorella humida
Lecidea microphylla var. *radiata* Wahlenb. = Placynthium rosulans
Lecidea pulvinata Schaer. = Euopsis pulvinata
Lecidea tryptophylla var. *caesia* Schaer. = Collolechia caesia
Leciophysma occidentale E.Dahl = Leciophysma furfurascens
Lecothecium Trevis. = Placynthium
Lemmopsis suomiensis Räsänen = *Placynthiella icmalea* (Ach.) Coppins & P.James
Lempholemma albonigrum H.Magn. = Lempholemma cladodes
Lempholemma chalazanodes (Nyl.) Zahlbr. = Lempholemma polyanthes
Lempholemma fennicum (Räsänen) Degel. = Lempholemma intricatum
Lempholemma myriococcum (Ach.) Th.Fr. = Lempholemma polyanthes
Lempholemma silicicola H.Magn. = Lempholemma isidiodes
Leprocollema europaeum H.Magn. = Gregorella humida
Leptogidium Nyl. = Polychidium
Leptogium albociliatum Desm. = Leptochidium albociliatum
Leptogium albociliatum var. *eciliatum* Degel. = Leptochidium crenatulum
Leptogium amphineum Ach. ex Nyl. = Epiphloea byssina
Leptogium anomalum (Nyl.) Harm. = Epiphloea byssina
Leptogium atrocaeruleum (Schaer.) A.Massal. = Leptogium lichenoides

Leptogium azureum auct. = Leptogium cochleatum
Leptogium byssinum (Hoffm.) Nyl. = Epiphloea byssina
Leptogium caesium (Ach.) Vain. = Leptogium cyanescens
Leptogium corniculatum auct. = Leptogium palmatum
Leptogium cretaceum (Sm.) Nyl. = ?Leptogium biatorinum
Leptogium filiforme (Arn.) Malbr. = ?Leptogium teretiusculum
Leptogium glebulentum Nyl. ex Cromb. = Collema glebulentum
Leptogium humosum Nyl. = ?Leptogium tenuissimum
Leptogium hydrocharum (Ach.) Zahlbr. = Leptogium plicatile
Leptogium lacerum (Retz.) Gray = Leptogium lichenoides
Leptogium minutissimum auct. = Leptogium intermedium
Leptogium pulvinatum (Hoffm.) Flagey = Leptogium lichenoides
Leptogium pusillum Nyl. = Leptogium biatorinum
Leptogium rhyparodes Nyl. = Collema callopismum var. rhyparodes
Leptogium scotinum (Ach.) Fr. = Leptogium gelatinosum
Leptogium sernanderi Du Rietz = Leptogium rivulare
Leptogium sinuatum (Huds.) A.Massal. = Leptogium gelatinosum
Leptogium spongiosum (Sm.) Nyl. = Leptogium tenuissimum
Leptogium tremelloides L.f., *nom. illeg.* = Leptogium cochleatum
Leptogium turgidum (Ach.) Cromb. = Leptogium schraderi
Leptopterygium Zahlbr. = Zahlbrucknerella
Lichen byssinus Hoffm., *nom. illeg*. = Leptogium subtile
Lichen tremelloides Weiss. = Leptogium lichenoides
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Lichiniza Nyl. = Porocyphus
Lobaria herbacea (Huds.) DC. = Lobaria virens
Lobaria laciniata (Huds.) Vain., *nom. illeg*. = Lobaria amplissima
Lobaria laetevirens (Lightf.) Zahlbr. = Lobaria virens
Lobaria verrucosa (Huds.) Gyeln. = Lobaria scrobiculata
Lobaria verrucosa (Huds.) Hoffm., *nom. illeg*. = Lobaria scrobiculata
Lobarina Nyl. ex Cromb. = Lobaria
Malmgrenia acarosporoides Räsänen = Pyrenopsis grumulifera
Malmgrenia Vain. ex Räsänen, *nom. illeg*. = Cryptothele
Massalongia carnosa f. *compacta* H.Magn. = Massalongia carnosa
Moelleropsis humida (Kullh.) Coppins & P.M.Jørg. = Gregorella humida
Montinia A.Massal., *nom. illeg*. = Pyrenocarpon
Nephroma laevigatum s. auct. (before 1960) = Nephroma bellum
Nephroma lusitanicum Schaer. = Nephroma laevigatum
Nephroma norrlini Gyeln. = Nephroma resupinatum
Nephroma subtomentellum (Nyl.) Gyeln. = Nephroma bellum
Nephroma tomentosum (Hoffm.) Flot. = Nephroma resupinatum
Omphalaria decipiens A.Massal. = Anema decipiens
Omphalaria intricata Arnold = Lempholemma intricatum
Omphalaria notarisii A.Massal. = Anema nummularium
Omphalaria radiata (Sommerf.) Forssell = Lempholemma radiatum
Pannaria acutior Nyl. = Arctomia delicatula
Pannaria ahlneri P.M.Jørg. = Fuscopannaria ahlneri
Pannaria arctophila Th.Fr. = Santessoniella arctophila
Pannaria brunnea (Sw.) Mass. = Protopannaria pezizoides
Pannaria confusa P.M.Jørg. = Fuscopannaria confusa
Pannaria craspedia Körb. var. *isidiata* Harm. = Fuscopannaria sampaiana
Pannaria deficiens Nyl. = Santessoniella arctophila
Pannaria elaeina (Wahlenb.) Nyl. = Vestergrenopsis elaeina
Pannaria ignobilis Anzi = Fuscopannaria ignobilis
Pannaria isidiata Degel. = Vestergrenopsis isidiata
Pannaria lepidiota (Sommerf.) Th.Fr. = Fuscopannaria praetermissa
Pannaria leucolepis (Wahlenb.) Nyl. = Pannaria hookeri
Pannaria mediterranea Tav. = Fuscopannaria mediterranea
Pannaria microphylla Del. ex Bory = Fuscopannaria leucophaea
Pannaria muscorum (Ach.) Duby = Massalongia carnosa
Pannaria nigra var. *psotina* Ach. ex Nyl. = Placynthium nigrum
Pannaria nigra var. *triseptata* Nyl. = Placynthium dolichoterum
Pannaria nigra var. *triseptata* Nyl. = Placynthium nigrum
Pannaria pezizoides (Weber) Trevis. = Protopannaria pezizoides
Pannaria pityrea auct. = Pannaria conoplea
Pannaria porriginosa Vain. = Psoroma hypnorum
Pannaria praetermissa Nyl. = Fuscopannaria praetermissa
Pannaria sampaiana Tav. = Fuscopannaria sampaiana
Pannaria schaereri A.Massal. = Psoroticihia schaereri
Parmeliella arctophila (Th.Fr.) Malme = Santessoniella arctophila
Parmeliella arctophila var. *microspora* Lynge = Santessoniella arctophila
Parmeliella atlantica Degel. = Degelia atlantica
Parmeliella corallinoides s. Zahlbr. = Parmeliella triptophylla
Parmeliella corallinoides var. *onegensis* Räs. = Parmeliella triptophylla
Parmeliella corallinoides var. *pulvinata* H.Magn. = Parmeliella triptophylla
Parmeliella jamesii Ahlner & P.M.Jørg. = Parmeliella parvula
Parmeliella plumbea (Lightf.) Vain. = Degelia plumbea
Parmeliella praetermissa (Nyl.) P.James = Fuscopannaria praetermissa
Parmeliella stenophylla (Tuck.) Zahlbr. = Placynthium stenophyllum
Peltidea leucophlebia (Nyl.) Räsänen = Peltigera leucophlebia
Peltigera aphthosa var. *variolosa* A.Massal. = Peltigera leucophlebia
Peltigera erumpens (Taylor) Elenkin = Peltigera didactyla
Peltigera hazslinszkyi Gyeln. = Peltigera didactyla
Peltigera lactucifolia s. auct. = Peltigera hymenina
Peltigera mauritzii Gyeln. = Peltigera elisabethae
Peltigera nitens (Anders) Gyeln. = Peltigera degenii
Peltigera occidentalis sensu Kristinsson = Peltigera kristinssonii
Peltigera polydactyla var. *crassoides* Gyeln. = Peltigera hymenina
Peltigera polydactyloides s. auct. = Peltigera neckeri
Peltigera scutata (Ach.) Duby = Peltigera collina
Peltigera spuria (Ach.) DC. = Peltigera didactyla
Peltigera subcanina Gyeln. = Peltigera praetextata
Peltigera subscutata Gyeln. = Peltigera collina
Peltigera subscutata var. *spitsbergensis* Gyeln. = Peltigera collina
Peltigera suomensis Gyeln. = Peltigera canina
Peltigera variolosa (A.Massal.) Gyeln. = Peltigera leucophlebia
Phylliscum endocarpoides Nyl. = Phylliscum demangeonii
Phylliscum silesiacum Stein. = Phylliscum demangeonii
Physma arnoldianum Hepp = Lemmopsis arnoldiana
Physma chalazanum (Ach.) Arnold = Lempholemma chalazanum
Physma omphalorioides (Anzi) Arnold = Staurolemma omphalarioides
Placynthium adglutinatum (Anzi) Trevis = Placynthium flabellosum
Placynthium aspratile (Ach.) Henssen = Placynthium asperellum
Placynthium caesitium (Nyl.) Hue = Collolechia caesia
Placynthium caesium auct. = Collolechia caesia
Placynthium corallinoides (Flörke) Jatta = Placynthium nigrum
Placynthium garovaglii auct. scand. = Collolechia caesia
Placynthium lismorense f. *boreale* Gyeln. = Placynthium asperellum
Placynthium lismorense f. *meridionale* Gyeln. = Placynthium tremniacum
Placynthium nigrum var. *tantaleum* (Hepp) Arnold = Placynthium tantaleum
Placynthium pannariellum f. *conferciens* (Nyl.) Räsänen = Placynthium pannariellum
Placynthium pannariellum f. *sparsum* Gyeln. = Placynthium flabellosum
Placynthium pannariellum var. *rosulans* (Th.Fr.) Degel. = Placynthium rosulans
Placynthium pannariellum var. *squamulosum* Räsänen = Placynthium rosulans

Placynthium pluriseptatum (Arnold) Arnold = Placynthium dolichoterum
Placynthium rudetum (Ach. ex Nyl.) Zahlbr. = Placynthium nigrum
Placynthium siliceum Gyeln. = Placynthium nigrum
Placynthium subradiatum auct. scand. = Placynthium stenophyllum
Placynthium tremniacum f. *subeffiguratum* Gyeln. = Placynthium tremniacum
Placynthium vrangianum Gyeln. = Placynthium asperellum
Polychidium kalkuense Räsänen = Polychidium muscicola
Porocyphus areolatus (Flot.) Körb. = Porocyphus coccodes
Porocyphus dispersus E.Dahl = Thelignya lignyota
Porocyphus furfurellus (Nyl.) Forssell = Porocyphus coccodes
Porocyphus groenlandicus E.Dahl = Thelignya groenlandica
Porocyphus populicola Räsänen = *Gyalecta* (?*truncigena*).
Pseudocyphellaria thouarsii (Delise) Degel. = Pseudocyphellaria intricata
Psoroma femsionense (Fr.) Trevis. = Psoroma hypnorum
Psoroma hirsutulum Nyl. ex Crombie = Psoroma paleaceum
Psoroma hypnorum var. *paleaceum* (Fr.) Rostr. = Psoroma paleaceum
Psorotichia heterothallina Vain. = Lemmopsis arnoldiana
Psorotichia pelodes Körb. ex Stein = Lemmopsis pelodes
Pterygiopsis coracodiza (Nyl.) Henssen = Pterygiopsis concordatula
Pterygium conferciens Nyl. = ?Placynthium pannariellum
Pterygium Nyl. = Placynthium
Pyrenopsidaceae = Lichinaceae
Pyrenopsidium (Nyl.) Forssell = Cryptothele
Pyrenopsidium extendens (Nyl.) Forssell = ?Cryptothele granuliformis
Pyrenopsidium iivarense (Th.Fr.) Forssell = Pyrenopsis furfurea
Pyrenopsidium terrigenum (Th.Fr.) Forssell = Pyrenopsis furfurea
Pyrenopsis assimulans Nyl. = ?Pterygiopsis concordatula
Pyrenopsis caesiella Th.Fr. = Metamelaena caesiella
Pyrenopsis concordatula Nyl. = Pterygiopsis concordatula
Pyrenopsis conjugens Norman, *nom. inval*. = Pyrenopsis haemaleella
Pyrenopsis granatina (Sommerf.) Nyl. = Euopsis granatina
Pyrenopsis haemalea (Sommerf.) Norrl. = Euopsis pulvinata
Pyrenopsis homoeopsis Nyl. = Pyrenopsis furfurea
Pyrenopsis macrocarpa E.Dahl. = Euopsis pulvinata
Pyrenopsis multispora Coppins = Pyrenopsis grumulifera
Pyrenopsis myriospora E.Dahl = Pyrenopsis grumulifera
Pyrenopsis ocellata Th.Fr. = Thelignya lignyota
Pyrenopsis permiscens Nyl. = Cryptothele permiscens
Pyrenopsis picina (Nyl.) Forssell = ?Pyrenopsis grumulifera
Pyrenopsis pulvinata (Schaer.) Th.Fr. = Euopsis pulvinata
Pyrenopsis rhodosticta (Taylor) Müll. Arg. = Cryptothele rhodosticta
Pyrenopsis rhodosticta auct. scand. = Pyrenopsis subareolata
Pyrenopsis rufescens Nyl. = Euopsis granatina
Pyrenopsis separans Hulting = Pyrenopsis pleiobola
Pyrenopsis sphinctotricha Vain. = Pyrenopsis haemaleella
Pyrenopsis squamulosa Vain., *nom. nud*. = Pyrenopsis furfurea
Pyrenopsis subfuliginea Nyl. = ?Pyrenopsis grumulifera
Pyrenopsis umbilicata Vain. = ?Thelignya lignyota
Pyrenospis haematopsis (Sommer.) Th.Fr., *nom. illeg*. = Pyrenopsis haematina
Racoblenna A.Massal. = Placynthium
Santessoniella arctophila var. *glomerulosa* (Th.Fr.) Henssen = Santessoniella arctophila
Santessoniella arctophila var. *terricola* Henssen = Santessoniella arctophila
Schizoma Nyl. ex Cromb. = Lempholemma
Spilonema proboscideum Nyl. = ?Placynthium nigrum
Spilonema proboscideum Nyl. ex Vain. = Placynthium nigrum
Spilonema tenellum Vain. = Spilonema paradoxum
Spilonematopsis E.Dahl = Ephebe
Spilonematopsis multispora E.Dahl = Ephebe multispora
Spilonemella Nyl. ex Cromb. = Lempholemma
Sticta dufourii Delise (the blue-green morph) = Sticta canariensis
Stictaceae = Lobariaceae
Stictina Nyl., *nom. illeg*. = Sticta
Synalissa kenmorensis H.B.Holl ex Nyl. = Porocyphus kenmorensis
Synalissa symphorea s. auct. = Synalissa ramulosa
Thelochroa A.Massal. = Pyrenocarpon
Thrombium thelostomum (Ach. ex J.Harriman) = ?Pyrenocarpon flotowianum A.L.*Sm*ith
Thyrea nigritella Lettau = Thallinocarpon nigritellum
Thyrea pulvinata (Schaer.) A.Massal. = Euopsis pulvinata
Thyrea pulvinata (Schaer.) A.Massal. = *Thallinocarpon iodopulchrum* (Crozals) P.M.Jørg., ined.
Thyrea pulvinata auct. non = Thyrea confusa
Thyrea radiata (Sommerf.) Zahlbr. = Lempholemma radiatum
Verrucaria fuliginea Ach. = Thelignya lignyota
Verrucaria lignyota Wahlenb. = Thelignya lignyota
Verrucaria rhodosticta Taylor = Cryptothele rhodosticta
Wilmsia Körber = Placynthium
Zahlbrucknera Herre (1910) = Zahlbrucknerella

Index to volume 3 – Cyanolichens

The lichen flora of the Nordic countries has been regarded as one of the best known in the world, containing about 2000 species. The lichenological research of the region has been going on continuously since the days of Erik Acharius (1757–1819), the ”father of lichenology”. It has, however, been a painful and awkward fact that there is no modern flora treatment of the region, the last attempt being that of Th. M. Fries in the 1870-ies, a work (Lichenographia scandinavica) that was left unfinished.

A number of Nordic lichenologists have united forces to produce such a work, and we can now proudly present the third volume, comprising the cyanolichens, including “the small black ones” which have not been critically surveyed in our region since 1885. We hope that the next volumes will be published at shorter intervals than this one which took five years to complete.