NORDIC LICHEN FLORA

Volume 4

Parmeliaceae

Edited by

Arne Thell & Roland Moberg

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Preface

The fourth volume of the *Nordic Lichen Flora* deals with the largest macrolichen family, the *Parmeliaceae*, comprising about 2300 species and 80 genera, almost one sixth of all the known lichens. However, in the Nordic countries, only 152 species occur; these are distributed in 41 genera, here treated in separate chapters by a team of 13 specialists.

The corticolous lichens of the *Parmeliaceae* are often dominant in the landscape of northern boreal forests, as is the terricolous family *Cladoniaceae*, which includes the reindeer lichens. Until recently the *Parmeliaceae* was dominated by three genera, namely *Parmelia*, including foliose species with laminal fruiting bodies, *Cetraria*, erect foliose species with marginal fruiting bodies, and *Usnea*, beard-lichens, the largest of the fruticose genera. Since the 1960s, these large genera have been divided into smaller entities on the basis of thallus morphology, but gradually more attention has been paid to cortex anatomy, secondary chemistry, reproductive structures and phylogeny based on DNA sequences. The number of recognized genera increased from 18 in the early 1970s to 90 in the 1990s. After several decades of splitting genera and taxonomic flux, coupled with different opinions on the systematics, the number of genera has recently slightly decreased according to knowledge derived from molecular data. Although there is now a considerable degree of agreement, a further wave of changes based on DNA-phylogeny, especially at species level, is currently taking place. The nomenclature in this *Nordic Lichen Flora* follows the latest position as far as possible. *Parmeliaceae* is a monophyletic family of fruticose and foliose lichens, including some crustose species of *Xanthoparmelia* in the Southern Hemisphere and the parasitic genus *Nesolechia*, which will be treated in a future volume.

Prof. Ana Crespo, Dr P. K. Divakar, Prof. David Hawksworth (Madrid), Dr Tassilo Feuerer (Hamburg), Dr Thorsten Lumbsch (Chicago), Dr Anders Nordin (Uppsala) and Prof. Mark Seaward (Bradford) are gratefully acknowledged for interesting discussions and improvements to the texts. The distributions of all species were mapped by Roland Moberg using a model made by Dr Ulf Arup. Thanks are due to the staff of the herbaria C, B, BG, FI, G, H, HBG, LD, M, MAF, O, S, TRH and UPS for providing material and helping with type collections.

Arne Thell & Roland Moberg
Lund & Uppsala 3 May 2011

Introduction to Parmeliaceae

A. Thell & M. Westberg

THALLUS foliose or fruticose, adnate to erect or shrubby to pendent, rarely tubulose. Upper surface usually grey, brown or yellow; lower surface often blackish to pale brown or concolorous with the upper surface. Lobes dorsiventral to isodiametric. Cortex usually paraplectenchymatous, occasionally prosoplectenchymatous or with palisade plectenchyma. APOTHECIA zeorine with a cupular exciple. Asci of *Lecanora*-type, with an amyloid I+ blue tholus and a distinct axial body, rarely with an I+ dark blue amyloid ring structure, usually clavate, 8-spored, rarely 2- or 4-spored. Spores simple, hyaline, rarely brown, ellipsoid to globose. CONIDIOMATA laminal, marginal or terminal pycnidia, sometimes on projections. Conidia simple, oblong, usually with one or two apical, subapical or central thickenings, occasionally with a tail. PHOTOBIONT trebouxioid.

Chemistry. b-orcinol depsides and depsidones, fatty acids and usnic acid.

Distribution. Members of the Parmeliaceae are primarily found in the Southern Hemisphere where species-rich genera such as *Hypotrachyna*, *Menegazzia*, *Parmotrema*, *Usnea* and *Xanthoparmelia* have their main distributions in subtropical to temperate areas. Of an estimated 2300 species worldwide, only 152 are represented in the Nordic countries.

Literature: Arup et al., Mycologia 99: 42–49 (2007); Blanco et al., Mol. Phyl. Evol. 39: 52–69 (2006); Crespo et al., Taxon 50: 807–819 (2001); Mol. Phyl. Evol. 44: 812–824 (2007); Taxon 59: 1735–1753 (2010); Thell et al., Mycol. Progr. 3: 297–314 (2004); Symb. Bot. Ups. 34(1): 429−452 (2004); Lichenologist 41: 489–511 (2009).

Note. Molecular studies show that a number of former segregates, such as *Alectoriaceae*, *Cetrariaceae*, *Hypogymniaceae* and *Usneaceae*, cannot be maintained. A position of the crustose genus *Protoparmelia* in the *Parmeliaceae* has occasionally been proposed but can not be supported without also including the monotypic family *Gypsoplacaceae* (Arup et al. 2007). Although some genera have isolated positions in the family, most of them belong to more or less well supported clades, largely corresponding the old morphological groups (Blanco et al. 2006, Crespo et al. 2010). The alectorioid clade is composed of *Alectoria*, *Gowardia*, *Pseudephebe* and, with weaker support, *Allantoparmelia* and Bryoria, the latter genus segregated from *Alectoria* (Fig. 1). The frequently investigated cetrarioid clade, composed of *Allocetraria*, *Arctocetraria*, *Cetraria*, *Cetrariella*, *Dactylina*, *Flavocetraria*, *Masonhalea*, *Melanelia*, *Tuckermannopsis*, *Usnocetraria* and *Vulpicida*, is well supported, whereas the hypogymnioid clade, with the genera *Arctoparmelia*, *Brodoa*, *Evernia, Hypogymnia*, *Menegazzia* and *Pseudevernia*, has a weak support in cladistic analyses.

The parmelioid clade is composed of the genera *Cetrelia*, *Flavoparmelia*, *Hypotrachyna*, the *Melanelia disjuncta* group, *Melanelixia*, *Melanohalea*, *Parmelia*, *Parmelina*, *Parmeliopsis*, *Parmotrema*, *Pleurosticta*, *Pseudevernia*, *Punctelia* and *Xanthoparmelia*, with some hesitation about *Parmeliopsis*, whereas the usneoid clade consists exclusively of the genus *Usnea*. *Asahinea*, *Bryocaulon*, *Cornicularia*, *Evernia mesomorpha*, *Imshaugia*, *Letharia* and *Platismatia* lack close affinities (Crespo et al 2010; Thell et al. 2009).

Asci of *Parmeliaceae* are of two types, according to Thell et al. (1995), 1. the *Lecanora*-type and 2. the *Cetraria*-type. Both types usually have a clavate form with an apical starch-containing thickening (tholus) surrounding the ocular chamber through which the spore is released.

Conidia are of two main types: (1) with single swelling and (2) with double swelling (bifusiform). The swellings may have central, subterminal or terminal positions. Conidia with single swelling may be divided in several subtypes depending on the general shape of the conidium and the position of the swelling, i.e. citriform (lemon/spindle shaped), sublageniform (bottle shaped) or filiform (thread shaped) conidia, the former with a central swelling and the two latter with an apical-subapical swelling. Conidia with double swelling are usually thickened terminally, i. e. dumbbell-shaped, however, subterminally thickened, discbar-shaped, conidia also occur. Conidial shape is a character of great phylogenetic importance (Thell et al. 2004).

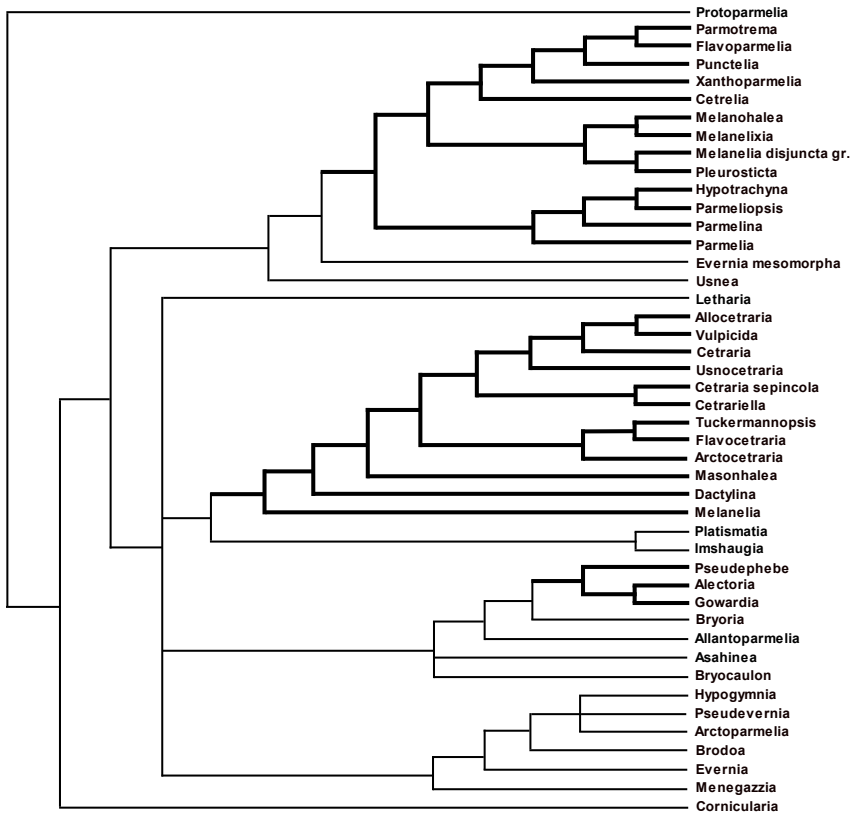

Fig. 1. A reconstructed phylogeny of the Parmeliaceae in the Nordic countries based on studies by Crespo et al. (2010), Halonen et al. (2009), Nelsen et. al. (2011, in press) and Thell et al. (2009). Three morphological groups are discerned as strongly supported clades, illustrated with thick branches: the *parmelioid* group, the *cetrarioid* group and the *alectorioid* group.

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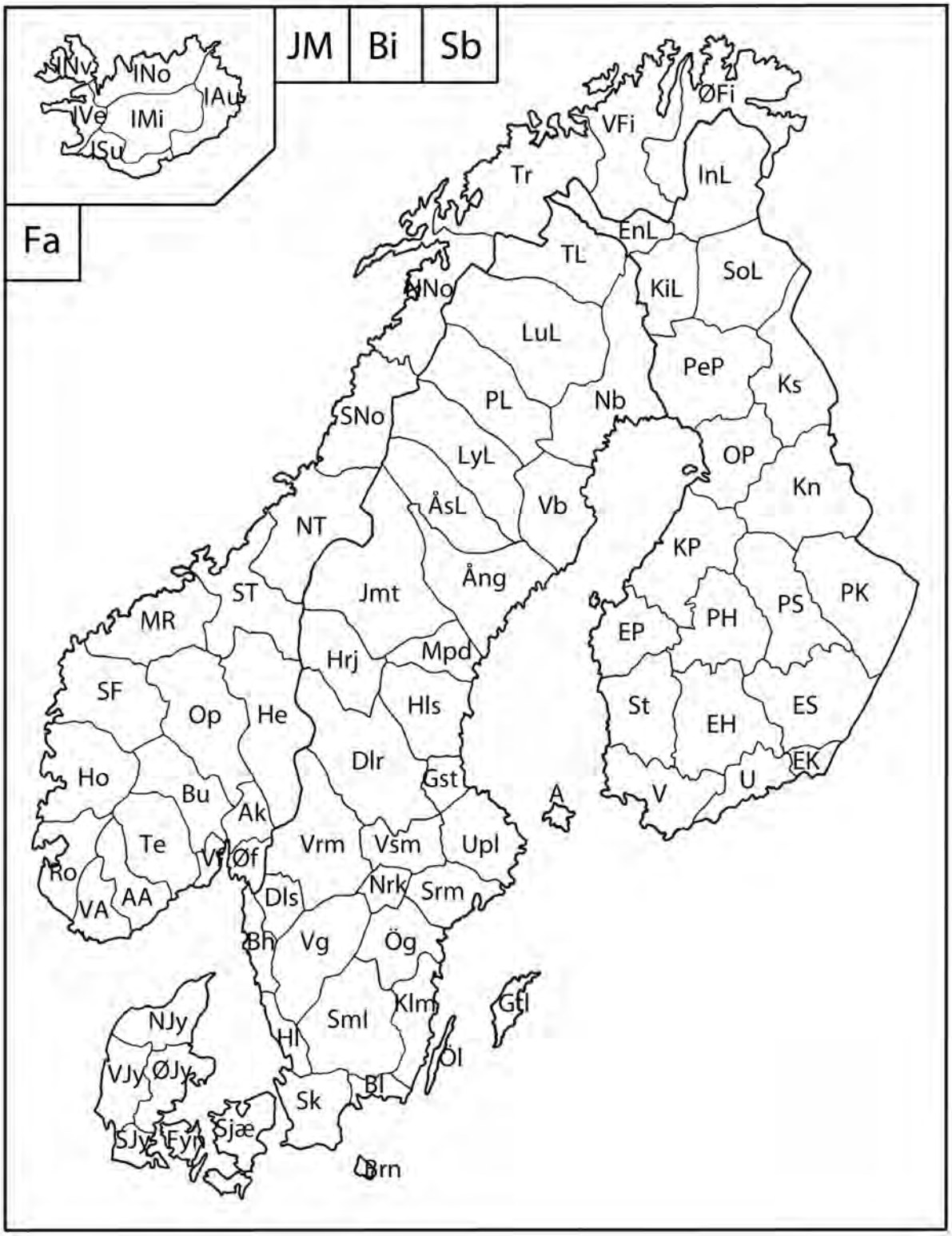
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Key to genera

Synopsis

1. Thallus fruticose, with erect, decumbent or hanging branches 2
– Thallus foliose, distinctly dorsiventral, horizontally spreading 24
24. Lobes hollow 25
– Lobes solid 26
26. Thallus yellow to yellow-green 27
– Thallus grey, green-brown, brown to dark brown 39
39. Thallus swollen or almost rounded in section; rhizines lacking 40
– Thallus flattened; rhizines present 43
43. Thallus brown-green to brown to dark brown 44
– Thallus whitish to grey to greenish or bluish grey 67

1. Thallus fruticose, with erect, decumbent or hanging branches 2
– Thallus foliose, distinctly dorsiventral, horizontally spreading 24
2. Thallus with a tough, elastic, medullary strand; yellow-green (usnic acid) ..... *Usnea*
– Thallus without a tough, elastic, medullary strand; colour various 3
3. Thallus closely appressed to rocks, forming strongly branched, entangled mats (all spot tests negative) ..... *Pseudephebe*
– Thallus shrubby or hanging, not closely appressed to rocks; chemistry various 4
4. Thallus inflated, hollow and/or with an arachnoid medulla; at least partly yellow; terricolous; erect 5
– Thallus not inflated and with a solid interior; colour and substrate various; erect, hanging or sprawling 7
5. Thallus not or little branched, hollow; cortex and/or medulla C+ red ..... *Dactylina arctica*
– Thallus distinctly branched; medulla arachnoid throughout or center partly hollow; cortex and medulla C− 6
6. Thallus greenish yellow; medulla arachnoid throughout ..... *Allocetraria madreporiformis*
– Thallus yellowish brown, usually with pale violet pruina; thallus medulla arachnoid but centrally hollow ..... *Dactylina ramulosa*
7. Branches rounded, not dorsiventral 8
– Branches flattened, distinctly dorsiventral 15
8. Thallus bright green yellow, yellowish green to pale yellow 9
– Thallus greyish to brown or black, without yellow or greenish-yellow tones 11
9. Thallus without soredia or isidia, not segmented ..... *Alectoria*
– Thallus sorediate, isidiate or segmented by frequent transverse cortical cracks 10
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– Medulla white 17
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– Thallus brown to dark brown to black; saxicolous or terricolous 20
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Alectoria

S. Velmala & L. Myllys

Alectoria Ach.

in Luyken, Tent. Hist. Lich.: 95 (1809). – Type: *Alectoria sarmentosa* (Ach.) Ach.

D: mankelav **F:** viherlupot **I:** kræður **N:** skjegglav **S:** tagellavar

Literature: Brodo & Hawksworth, Opera Bot. 42: 56–57 (1977); Dahl, Meddel. Grønland 150(2): 141–149 (1950); Halonen et al., Bryologist 112: 138–146 (2009); Hawksworth, Lichenologist 5: 181–261 (1972); Kärnefelt & Thell, Pl. Syst. Evol. 180: 196 (1992).

Thallus fruticose, erect, pendent or prostrate, greenish yellow to rarely greenish grey, apical parts often blackened, branches terete or flattened; pseudocyphellae abundant, conspicuous, raised, elongate fusiform to ovoid, white. Soralia absent or rare, tuberculate. Isidia absent; cortex composed of periclinally arranged prosoplectenchymatous hyphae. Ascomata apothecia, distinctly zeorine, same colour as the thallus; paraphyses frequently branched; asci clavate, 65–130 × 25–50 µm, usually 2–4 spored. Spores simple, ellipsoid, thick-walled, brown, 23–48 × 12–28 µm, epispore colourless. Conidiomata pycnidia, globose, immersed, common to scattered. Conidia bacilliform to fusiform. Photobiont *Trebouxia*.

Chemistry. Cortex with usnic acid. Medulla with alectoronic, diffractaic, squamatic acid.

Note. The recent study by Halonen et al. (2009) showed that Alectoria is not monophyletic, but consists of two separate, although closely related, genera: *Alectoria* with seven species and *Gowardia* with two species in the world.

1. Thallus pendent, usually epiphytic .....2. *A. sarmentosa* subsp. *sarmentosa*
– Thallus erect or prostrate, usually terricolous 2
2. Prostrate, main branches flattened, usually >2 mm diam. .....2. *A. sarmentosa* subsp. *vexillifera*
– Erect, main branches usually terete, <2 mm diam. .....1. *A. ochroleuca*

1. **Alectoria ochroleuca** (Hoffm. A.Massal.

Sched. Crit. 2: 47 (1856). – *Usnea ochroleuca* Hoffm., Descr. Pl. Cl. Crypt. 2(1): 7, Tab. 26 (1794). – Type: Germany, Fichtelgebirge, Funck, Krypt. Gew. Fichtelgeb. no. 420 (MW-Hoffm. 8562 neotype, Hawksworth & Moore, Bryologist 72: 248, 1969).

F: rakkaluppo **I:** skollakræða **N:** rabbeskjegg **S:** fjälltagellav

Literature: Brodo & Hawksworth 1977: 56; Hawksworth, Lichenologist 1972: 231.

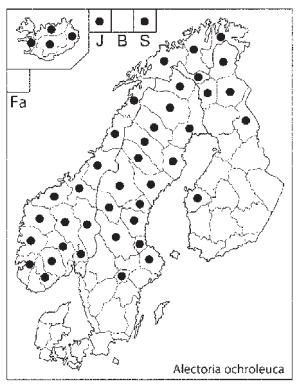
Figs: Brodo et al. 2001: 153; Hansen & Andersen 1995: 16; Hawksworth 1972: Pl. 6: E; Holien & Tønsberg 2006: 33; Krog et al. 1994: 111; Moberg & Holmåsen 1990: 100; Rikkinen 2008: 194; Wirth 1995: 118.

Thallus erect, sometimes becoming decumbent, to 10 cm long. Colour yellow to yellowish green, apices blackened. Main branches distinct, apices often drooping; branches more or less terete, sometimes flattened from the base, 0.5–2 mm diam. Soralia absent. Pseudocyphellae conspicuous, fusiform, raised, white, rather common. Apothecia usually rare, lateral, 3–6 mm diam.; disc reddish brown. Spores ellipsoid, becoming dark brown when mature, 26–42 × 12–28 µm. Pycnidia rare, minute and subapical. Conidia 7–8 × 0.8 µm.

Chemistry. Cortex C–, K–, KC+ yellow, PD–; usnic acid. Medulla C–, K–, KC–, PD–; diffractaic acid.

Habitat. On soil or rocks in ericaceous tundra heath. Rarely on bases of trees and shrubs in coniferous forests and subalpine habitats.

Distribution. A common and characteristic lichen in the northern mountains and tundra. **Gr. F:** *EP PeP Ks KiL SoL EnL InL*. **I:** *IVe IMi IAu INo*. **N:** *Ak He Op Bu Te AA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **AI:** *JM Sb*. **S:** *Nrk Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Europe, Asia, North and South America. Arctic-alpine.



Note. Similar to the likewise terricolous *A. sarmentosa* subsp. *vexillifera*, which, however, has broadly flattened branches and usually contains alectoronic acid (medulla KC+ red). *Alectoria ochroleuca* is distinguished from its associate species *Gowardia nigricans* by its yellow colour.

2. **Alectoria sarmentosa** (Ach.) Ach.

Lich. Univ.: 595 (1810). – *Lichen sarmentosus* Ach., Kongl. Vetensk. Akad. Nya Handl. 16: 212 (1795). – Type: Suecia (H-ACH 1818A lectotype, Howe, Mycologia 3: 150, Pl. 45, 1911; specified by Hawksworth, Lichenologist 5: 238, 1972).

Syn. *Alectoria albida* Räsänen, *Alectoria stigmata* Bystrek

F: korpiluppo **I:** birkikræða **N:** gubbeskjegg **S:** garnlav

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

Literature: Brodo & Hawksworth 1977: 42; Hawksworth, Lichenologist 1972: 238.

Figs: Brodo et al. 2001: 155; Holien & Tønsberg 2006: 34; Krog et al. 1994: 112; Moberg & Holmåsen 1990: 101; Rikkinen 2008: 152; Wirth 1995: 119.

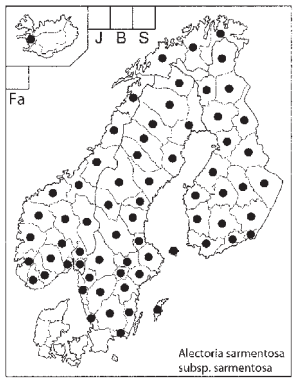
Thallus pendent, to 50 cm long (rarely longer), yellow to greenish grey, apices often blackened. Without distinct main branches, richly branched, branches mainly terete, sometimes slightly flattened or foveolate, 0.5–3 mm diam. Soralia rare, tuberculate. Pseudocyphellae conspicuous, raised, fusiform, white. Apothecia rare in Nordic countries, lateral, 2–3 mm diam.; disc orange yellow to black. Pycnidia usually common, to 2.0 mm diam. Conidia unknown.

Chemistry. Cortex C–, K–, KC+ yellow, PD–; usnic acid. Medulla C–, K–, KC+ red or KC–, PD–; usually alectoronic acid, sometimes squamatic acid.

subsp. **sarmentosa**

Habitat. Corticolous, especially on coniferous trees in old forests, rarely on tundra soil. Indicator of old-growth forests.

Distribution. Northern boreal forests, becoming rare towards south. Fairly oceanic. **F:** *A V U EK St EH ES EP PH PS PK KP Kn OP PeP Ks KiL SoL InL*. **I:** *IVe.* **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi.* **S:** *Bl 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.



Note. Differs from *Ramalina thrausta* by the more pliable and distinctly angular branches. *R. thrausta* is usually slender, paler, shiny and has small granular soralia at the hook-shaped branch apices.

subsp. **vexillifera** (Nyl.) D.Hawksw.

Taxon 19: 241 (1970). – *Alectoria ochroleuca* subsp. *vexillifera* Nyl. in Kihlman, Meddel. Soc. Fauna Fl. Fenn. 18: 48 (1891). – Type: Russia, Murmansk Region, Lapponia ponojensis, ad promontorium Orlow, 1889 Kihlman (H-NYL 35887 holotype).

Syn. *Alectoria cincinnata* (Fr.) Lynge, *Alectoria sarmentosa* var. *cincinnata* (Fr.) Nyl., *Alectoria vexillifera* (Nyl.) Stiz.

D: gulgrøn mankelav **F:** nauhaluppo **I:** flókakræða **N:** **S:** nordlig garnlav

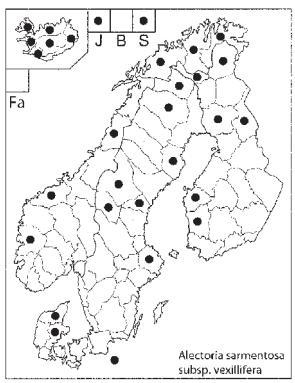
Red-listed in: **D N**

Literature: Brodo & Hawksworth 1977: 73–75; Hawksworth 1972: 243–246.

Figs: Brodo & Hawksworth 1977: 74; Hansen & Andersen 1995: 16; Hawksworth 1972: Pl. 8: A, C.

Thallus mainly prostrate, to 15 cm long. Main branches distinct, flattened, foveolate, over 2 mm or even 2–3 cm wide. Other characters as in *Alectoria sarmentosa* subsp. *sarmentosa*.

Habitat. Mainly on alpine or arctic soil or rocks, or sand dunes.



Distribution. Mostly northern, arctic-alpine. Shows a disjunct distribution pattern, being absent in southern Fennoscandia, but present in Denmark. **D:** *NJy ØJy Brn*. **Gr. F:** *St EP PeP Ks EnL InL*. **I:**

ISu IVe IMi IAu INv INo. **N:** *Ho MR SNo Tr VFi ØFi.* **AI:** *JM Sb.* **S:** *Upl Mpd Hrj Jmt Vb LuL TL.* Europe, Africa (Tanzania), North America.

Note. May resemble *A. ochroleuca*, which, however, has erect growth form and mainly terete branches. The status of subsp. *vexillifera* and distinction against subsp. *sarmentosa* is in need of further studies.

Allantoparmelia

M. Westberg & A. Thell

Allantoparmelia (Vain.) Essl.

Mycotaxon 7: 46 (1978). – *Parmelia* subg. *Allantoparmelia* Vain., Ark. Bot. 8(4): 30 (1909). – Type: *Allantoparmelia alpicola* (Th.Fr.) Essl.

F: tunturikarpeet **I:** fjallahnúta **N: S:** fjällblåslavar

Literature: Esslinger, J. Hattori Bot. Lab. 7–8, 42–46 (1977); Crespo et al., Taxon 59: 1735–1753 (2010).

Thallus foliose, closely adnate, dark brownish to blackish, lobate; lobes flattened to convex, often torulose, to 1.5 mm wide; without pseudocyphellae, soredia or isidia; upper and lower cortex prosoplectenchymatous; medulla compact, white; lower surface brown to black, without rhizines, attached to the substrate with irregular cortical outgrowths. Ascomata apothecia, zeorine, laminal, sessile; asci clavate, of *Lecanora*-type, 8-spored with colourless, simple spores. Conidiomata pycnidia, common, laminal, immersed. Conidia bacilliform to bifusiform. Photobiont trebouxioid.

Chemistry. Alectorialic, alectoronic, barbatolic, olivetoric and α-collatolic acids, plus unknown substances.

Note. A genus with an arctic-boreal distribution in the northern hemisphere. It comprises three species of which *A. alpicola* is the only one occurring in the Nordic countries outside Greenland. *Allantoparmelia almquistii* (Vain.) Essl. is another species, known from Greenland. *Allantoparmelia* was usually placed in the weakly supported hypogymnioid group of lichens with, e.g., *Brodoa*, *Hypogymnia* and *Pseudevernia*. However, the phylogenetic position of the genus is uncertain (Crespo et al. 2010).

1. **Allantoparmelia alpicola** (Th.Fr.) Essl.

Mycotaxon 7: 46 (1978). – *Parmelia alpicola* Th.Fr., Lich. Arct: 57 (1860). – Type: Norway, Øst-Finnmark, Varanger, Nyborg, på Amtmandshougen, 1857 Th. Fries (UPS lectotype, Esslinger 1977: 43.

Syn. *Hypogymnia alpicola* (Th.Fr.) Hav., *Hypogymnia atrofusca* sensu Räsänen, *Parmelia nigrita* (Flot.) Hillm.

F: tunturikarve **I:** fjallahnúta **N:** fjelltopplav **S:** fjällblåslav

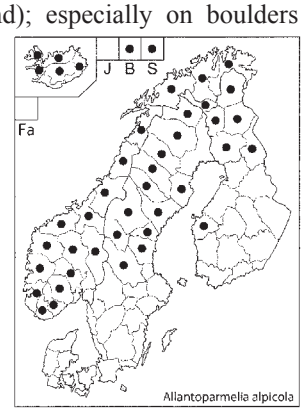
Literature: Esslinger 1977: 43–45; Hakulinen, Ann. Bot. Fenn. 3: 185–187 (1966).

Figs: Brodo et al. 2001: 156; Hansen & Andersen 1995: 43; Moberg & Holmåsen 1990: 83; Krog & al. 2004: 112; Holien & Tønsberg 2006: 50; Rikkinen 2008: 196.

Thallus to 8 cm diam., forming rosettes or irregularly developed, often with several individuals growing together, closely adnate to the substrate, blackish brown to greyish black, sometimes pale to reddish to olive brown. Lobes 0.2–0.8(–1.5) mm wide, flattened and often torulose (constricted at intervals) to convex and somewhat nodulose, margin crenulate, dull to somewhat shiny, especially towards the margin; lower surface black to brown at the lobe tips. Apothecia common, to c. 5 mm diam., margin smooth, rarely lobulate. Spores ellipsoid to subglobose, 7.5–10 × 5–7 µm. Pycnidia common, immersed, visible as black dots on the thallus. Conidia thickened at one end or bifusiform, c. 4.5–6 × 1 µm (Esslinger 1978).

Chemistry. Cortex K–. Medulla C+ red, K+ yellowish, KC+ red, PD+ yellow, UV–; alectorialic and barbatolic acids.

Habitat. Saxicolous, growing on exposed siliceous rocks (basaltic in Iceland); especially on boulders in treeless tundra and mountain heaths.



Distribution. Common in the arctic and alpine parts of the region, up to the upper zones, with scattered localities in the boreal zone south to central parts of Sweden and Finland. **Gr. F:** *EP PeP Ks KiL SoL EnL InL.* **I:** *IVe IMi IAu*

INv INo. **N:** *He Op Bu Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **AI:** *BI Sb.* **S:** *Dlr Hls Mpd Ång Hrj Jmt Vb ÅsL LyL PL LuL TL.* Circumpolar, arctic-alpine distribution also occurring in montane parts of Central Europe and Asia.

Note. Allantoparmelia almquistii (below) differs in having a different chemistry with a medulla that contains olivetoric acid (K–, PD–) and often in having a pale lower surface and a more pulvinate growth form. *Brodoa atrofusca* and *B. oroarctica* have less adnate lobes and the cortex contains atranorin (K+ yellow) and the medulla contains physodic acid (K–). *Melanelia stygia* is brown, has rhizines and pseudocyphellae and the medulla either contains fumarprotocetraric and protocetraric acids (K+ yellow turning red, PD+ rusty-red) or lacks secondary substances (K–, PD–).

Allantoparmelia almquistii (Vain.) Essl.

Mycotaxon 7: 46 (1978).

Syn. *Parmelia almquistii* Vain.

Literature: Esslinger 1977: 42–43.

Not treated as it is not known from the main area but in arctic Russia and North America including Greenland. This species resembles *A. alpicola* but differs in having a PD– reaction of the medulla and a pale lower surface and a more pulvinate or panniform growth form. When panniform it may resemble *Melanelia panniformis* (Nyl.) Essl., which, however, has a dark underside.

Allocetraria

T. Randlane & A. Thell

Allocetraria Kurok. & M.J.Lai

Bull. Nat. Sci. Mus. Tokyo, ser. B, 17: 60 (1991). – Type: *Allocetraria stracheyi* (Bab.) Kurok. & M.J.Lai

Literature: Kurokawa & Lai, Bull. Nat. Sci. Mus. Tokyo, ser. B, 17: 59–65 (1991); Thell et al. Flechten Follmann: 353–370 (1995); Kärnefelt & Thell, Nova Hedwigia 62: 507–509 (1996); Randlane & Saag, Symb. Bot. Ups. 34(1): 359–376 (2004); Thell et al., Symb. Bot. Ups. 34(1): 437–438 (2004).

Thallus terete, erect, finger-like, foliose or fruticose, yellow, greenish yellow or brownish yellow; pseudocyphellae present or absent. Ascomata apothecia, zeorine, rare, close to the lobe tips; disc pale brown. Asci narrowly clavate, with a large axial body. Spores broadly ellipsoid, colourless. Conidiomata pycnidia, common, immersed. Conidia filiform, slightly thickened at one end. Photobiont trebouxioid.

Chemistry. Cortex with usnic acid. Medulla with fatty acids, secalonic acids and related pigments.

Note. The taxonomic position of the single Nordic species in *Allocetraria* has been confirmed by ITS rDNA sequences.

1. **Allocetraria madreporiformis** (Ach.) Kärnefelt & A.Thell

Nova Hedwigia 62: 508 (1996). – *Dufourea madreporiformis* Ach., Lichenogr. Universalis: 525 (1810). – Type: Switzerland, Schleicher, Pl. Crypt. Helvetiae 2, no. 67 (UPS lectotype, Randlane & Thell, Nordic Lichen Flora 4: 139, 2011).

Syn. *Dactylina madreporiformis* (Ach.) Tuck.

Literature: Lynge, Skr. Svalbard Ishavet 59: 27–40 (1933); Thomson & Bird, Canad. J. Bot. 56: 1615–1618 (1978); Elvebakk & Hertel, Norsk Polarinstitutt Skrifter 198: 302 (1996); Kärnefelt & Thell 1996: 508–509.

Figs: Brodo et al. 2001: 157; Kärnefelt & Thell 1996: 493; Thell et al. 2004: 438; Thomson 1984: 206.

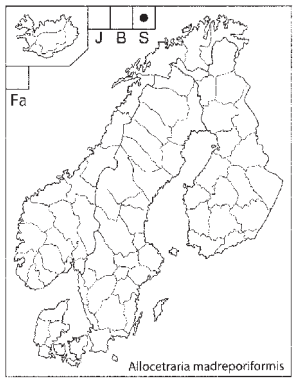
Thallus finger-like fruticose, sparsely branched, inflated cylindrical, foveolate, yellow to greenish yellow, brownish when exposed, growing in small tufts. Lobes to 3 cm tall, 1–2 mm wide, terete or slightly irregular, foveolate, center filled with arachnoid hyphae. Soredia and isidia unknown. Apothecia rare, close to tips of branches, to 4 mm diam.; disc pale brown. Spores broadly ellipsoid to subglobose, 6–10 × 4–8 µm. Pycnidia black, immersed to slightly raised, dispersed over the thallus. Conidia filiform, slightly thicker at one end, 15–20 × 0.5–1.5 µm.

Chemistry. Cortex C–, K–, KC+ yellow, PD–; usnic acid. Medulla C–, K–, KC–, PD–; with fatty (lichesterinic) acid only.

Habitat. On calcareous soil in arctic or alpine tundra heaths.

Distribution. Arctic-alpine species. **AI:** *Sb*. Circumpolar and rather widespread in North America (Arctic

and Rocky Mountains) and Asia (China, Mongolia, Russia), as well as at high altitudes in central Europe and Caucasus.



Note. The only species of the genus with a bulbose thallus, morphologically somewhat similar to *Dactylina ramulosa* (Hook.) Tuck., which is partly hollow and has a pale violet pruina towards the thallus tips.

Arctocetraria

A. Thell & I. Kärnefelt

Arctocetraria Kärnefelt & A.Thell

Bryologist 96: 402 (1993). – Type: *Arctocetraria andrejevii* (Oxner) Kärnefelt & A.Thell

Literature: Kärnefelt et al., Bryologist 96: 402 (1993); Thell et al., Mycological Progress 4(4): 303–316 (2005).

Thallus erect foliose or fruticose. Lobes canaliculate, dorsiventral, yellowish brown to dark brown or olive-green to blackish. Soralia absent or very sparse. Pseudocyphellae present or absent. Ascomata apothecia, zeorine, submarginal on the upper surface, rare, concolorous with the thallus. Asci narrowly clavate. Spores broadly ellipsoid, colourless, simple, 6–9 × 3–5 µm. Conidiomata pycnidia, common, on tips of small projections along the lobe margins. Conidia dumbbell-shaped or fusiform. Photobiont treboux-ioid.

Chemistry. Medulla with the fatty acids norrangiformic and rangiformic acids.

Note. This arctic genus of two species, was segregated from *Cetraria* based on deviating characters in the asci and presence of rangiformic and norrangiformic acids. Both species have a very variable morphology. Furthermore, two types of conidia have been found in *A. andrejevii*, which is very unusual. The most frequent shape of conidia is fusiform, as in *Cetraria* s. str., although more or less dumbbell-shaped conidia have rarely been observed; the latter one is the typical conidial shape of *A. nigricascens*. A DNA-study confirmed a close relationship between the two species but only a distant relationship with *Cetraria* s. str. Both species are extremely rare in the Nordic countries.

1. Lobes distinctly canaliculate, brown .....1. *A. andrejevii*
– Lobes weakly canaliculate, olivaceous ..... 2. *A. nigricascens*

1. **Arctocetraria andrejevii** (Oxner) Kärnefelt & A.Thell

Bryologist 96: 402 (1993). – *Cetraria andrejevii* Oxner, J. Bot. Acad. Sci. RSS Ukraine [Bot. Zhurn, Kiev] 1: 44 (1940). – Type: Russia, Sakha Republic (Yakutia), Distr. Bulun, Montes Charaulack [Kharaulakh], Karavaev (KW holotype).

Syn. *Cetraria simmonsii* Krog

N: polarskjerpe

Literature: Alstrup & Søchting, Graphis Scripta 1: 12 (1986); Kärnefelt, Opera Bot. 46: 56–63 (1979); Kärnefelt et al., Bryologist 96: 402 (1993); Thomson, Amer. Arctic Lich. 1: 71–73 (1984); Tønsberg, Sommerfeltia 23: 45–46 (1996).

Figs: Kärnefelt 1979: 58–60; Thomson 1984: 72.

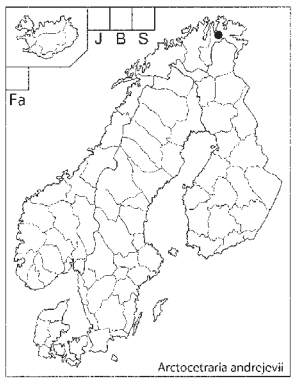
Thallus fruticose, erect, to 10 cm high, weakly branched. Upper surface dark brown to pale brown, discoloured in basal parts, somewhat ridged and wrinkled, usually glossy; lower surface variegated brown. Lobes canaliculate, 1–3 mm wide, terete or slightly irregular. Soralia absent. Pseudocyphellae laminal and marginal, rounded to narrow, to 0.5 mm diam. Marginal projections sparse, to 0.5 mm long. Apothecia rare, submarginal, positioned close to the lobe tips, to 15 mm diam.; disc brown. Spores broadly ellipsoid to subglobose 6–8.5 × 4–5 µm. Pycnidia at ends of the marginal projecttions. Conidia variable, either fusiform, thickened in the centre, or slightly dumbbell-shaped, 4–5.5 × 0.5–1 µm.

Chemistry. Cortex C–, K–, KC–, PD–. Medulla C–, K–, KC–, PD–; rangiformic and norrangiformic acids.

Habitat. Terricolous, growing in ericaceous tundra heaths.

Distribution. Greenland and a single occurrence in Finnmark in the north-easternmost part of the Scandi-

navian Peninsula. **Gr. N:** *ØFi*. Widely distributed in the amphi-Beringian region.



Note. The two species of *Arctocetraria* differ in lobe shape and colour. *A. andrejevii* has more pronouncedly canaliculate and brown lobes.

2. Arctocetraria nigricascens (Nyl.) Kärnefelt & A.Thell

Bryologist 96: 402 (1993). – *Platysma nigricascens* Nyl. in Kihlman, Meddeland. Soc. Fauna Fl. Fenn. 18: 50 (1891). – Type: Russia, [Murmansk Region] Lapponia ponojensis, ad promontorium Orlow [Mys Orlova], in lapidosis, 1889, Kihlman 244 (H lectotype, Kärnefelt, Opera Bot. 46: 121, 1979).

Syn. *Cetraria nigricascens* (Nyl.) Elenkin; *Cetraria elenkinii* Krog; *Cetraria magnussonii* Llano; *Cetraria rhizophora* (Vain.) Rass.; *Cetraria sibirica* H.Magn.

Literature: Kärnefelt, Opera Bot. 46: 121–128 (1979); Kärnefelt et al., Bryologist 96: 402 (1993); Thomson, Amer. Arctic Lich. 1: 87, 90–91 (1984).

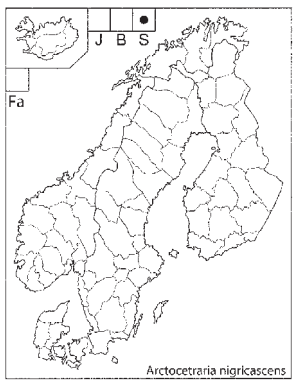
Figs: Kärnefelt 1979: 15D, E; 124; Thomson 1984: 90.

Thallus foliose, erect, dichotomously branched, to 5 cm high. Lobes to 6 mm wide, pale olivaceous grey to blackish, weakly canaliculate, somewhat wrinkled or smooth, glossy or dull. Marginal lobules sometimes present. Soralia very rare, laminal, irregular, close to lobe tips, to 1 mm diam. Pseudocyphellae rarely present, preferably on the lower surface, punctiform, to 0.2 mm diam. Marginal projections sparse, to 0.5 mm long. Marginal cilia rather common, to 3.5 mm long. Apothecia submarginal at lobe ends, sparse, to 8 mm diam.; disc usually blackish. Spores broadly ellipsoid, 6–8.5 × 3.5–4.5 µm. Pycnidia at ends of marginal projections. Conidia dumbbell-shaped, 4–5.5 × 1 µm.

Chemistry. Cortex C–, K–, KC–, PD–. Medulla C–, K–, KC–, PD–; rangiformic and norrangiformic acids.

Habitat. Grows both on twigs of dwarf bushes and soil in arctic tundra heaths.

Distribution. Known from single occurrences in Greenland and Svalbard. **Gr. AI:** *Sb*. High to low arctic-circumpolar distribution from Svalbard to Queen Elizabeth Islands and Franz Josef Land.



Note. The lobes of *A. nigricascens* are very variable both in shape, size and colour. The upper and lower surfaces are concolorous varying from whitish to almost black. It differs from *A. andrejevii* by an olivaceous tinge and less canaliculate lobes.

Arctoparmelia

R. Moberg & A. Thell

Arctoparmelia Hale

Mycotaxon 25: 251 (1986). – Type: *Arctoparmelia centrifuga* (L.) Hale

D: skållav **F:** kaarrekarpeet **S:** vinterlavar

Literature: Brodo et al., Lich. North America: 162 (2001); Clayden, Bryologist 95: 1–4 (1992); Thell et al., Symb. Bot. Ups. 34(1): 438 (2004).

Thallus foliose, adnate, often forming concentric circles, lobes to 2 mm wide. Upper surface with epicortex, yellowish-white, rarely grey; lower surface pale yellowish or dark purplish to brownish, with few, simple rhizines. Ascomata apothecia, zeorine, laminal, to 5 mm diam.; disc brown; asci clavate, of *Lecanora*-type. Spores colourless, simple, ellipsoid, 8–14 × 4–8 µm. Conidiomata pycnidia, frequent, laminal. Conidia bifusiform; slightly dumbbell-shaped. Photobiont trebouxioid.

Chemistry. Cortex with usnic acid and atranorin. Medulla with fatty acids.

Note. Arctoparmelia is an arctic-boreal genus of five species. *A. centrifuga* and *A. incurva*, are widespread in the Nordic countries, and *A. subcentrifuga* has been reported from the adjacent Murmansk Region, Russia. Even though the yellow-green colour makes it similar to some *Xanthoparmelia* species, molecular

analyses do not support a close relationship between the two genera (Thell et al. 2004). The epicorticate upper surface and the sparse development of rhizines are typical features for the genus.

1. Thallus orbicular, to several dm diam., often forming concentric circles; without soralia; apothecia usually abundant ..... 1. *A. centrifuga*
– Thallus ± orbicular, usually confluent, not forming concentric circles; with capitate soralia; apothecia rare ..... 2. *A. incurva*

Not yet known from the Nordic countries

1. Lower cortex pale to brownish ..... 1 (above)
– Lower cortex dark purplish 2
2. With apothecia ..... *A. separata*
– With soralia ..... *A. subcentrifuga*

1. Arctoparmelia centrifuga (L.) Hale

Mycotaxon 25: 252 (1986). – *Lichen centrifugus* L., Sp. Pl. 2: 1142 (1753). – Type: Sweden? (LINN 1273.58, upper specimen lectotype, Jørgensen et al., Bot. J. Linn. Soc. 115: 373, 1994).

Syn. *Parmelia centrifuga* (L.) Ach., *Xanthoparmelia centrifuga* (L.) Hale, *Arctoparmelia aleuritica* (Nyl.) Hale, *Parmelia centrifuga* f. *aleuritica* (Nyl.) H.Olivier, *Parmelia centrifuga* var. *dealbata* Fr. ex Th.Fr.

F: kaarrekarve **N:** stor gulkrinslav **S:** vinterlav

Literature: Hasselrot, Acta Phytogeogr. Suec. 33: 76–80, Figs 19–20 (1953).

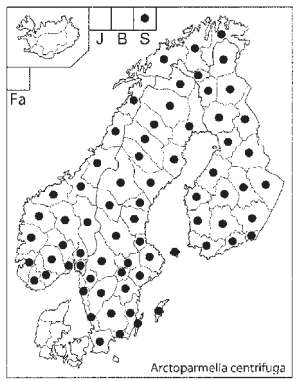
Figs: Brodo et al. 2001: 162; Hinds & Hinds 2007: 124; Holien & Tønsberg 2006: 50; Moberg & Holmåsen 1990: 87.

Thallus foliose, closely adnate, orbicular, forming concentric circles to almost one metre diam. Upper surface glossy, yellowish to green-yellow, in central parts darker, greyish, occasionally totally without yellowish tinge. Lower surface pale to whitish brown with sparse blackish rhizines. Lobes 1–2 mm wide. Apothecia common in the central parts, to 5 mm diam.; disc reddish brown. Spores ellipsoid, 8–14 × 4.5–6 µm. Pycnidia frequent, laminal and immersed. Conidia slightly dumbbell-shaped, 5–7 × 1 µm.

Chemistry. Cortex C–, K+ yellow, KC–, PD–; atranorin and usnic acid. Medulla C–, K–, KC+ red, PD–; atranorin and alectoronic acid. Usnic acid is occasionally absent, and 3–4 unidentified additional compounds (three fatty acids) are usually present.

Habitat. Saxicolous, usually growing on large boulders, rarely lignicolous and corticolous.

Distribution. Very common in northern Fennoscandia, rarer in the south. It has not been refound at its old localities in Skåne. **Gr. 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.* **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 LL TL*. Arctic-boreal worldwide.



Note. Most common of the *Arctoparmelia* species, both worldwide and in the Nordic countries. A conspicuous ashy grey, usnic acid-deficient form has sometimes been recognized as a distinct species, *Arctoparmelia aleuritica*. It is found scattered, probably throughout the range.

2. Arctoparmelia incurva (Pers.) Hale

Mycotaxon 25: 252 (1986). – *Lichen incurvus* Pers., Ann. Bot. (Usteri) 7 (sic!): 24 (1794). Type: Sweden, Fries, Lich. Suec. exs. no. 260 (UPS neotype, Moberg & Thell, Nordic Lichen Flora 4: 139, 2011).

Syn. *Parmelia incurva* (Pers.) Ach., *Parmelia recurva* Ach., *Xanthoparmelia incurva* (Pers.) Hale

D: krum skållav **F:** pallokarve **I:** bjúgþemba **N:** liten gulkrinslav **S:** krumlav

Literatur: Wirth, Diss. Bot. 17: 67 (1972).

Figs: Hinds & Hinds 2007: 125; Moberg & Holmåsen 1990: 90; Wirth 1995: 645.

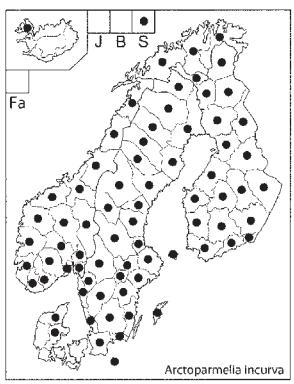
Thallus foliose, closely adnate, forming rosettes, to 10 cm diam., sometimes confluent with other thalli. Lobes 0.2–1 mm wide, well covering the surface, ± overlapping, distinctly convex. Upper surface yellowish, in central parts more greyish, glossy, ± frequently supplied with globose, mainly central soralia. Lower surface brownish with blackish rhizines. Apothecia rare, to 4 mm diam.; disc brown; spores ellipsoid, 9–12 × 6–8 µm. Pycnidia infrequent, im-

mersed, visible as small black dots. Conidia dumbbell-shaped, 4–7 × 1 µm.

Chemistry. Cortex C–, K–, KC+ yellow, PD–; usnic acid. Medulla C–, K–, KC+ pink, PD– or PD+ red; alectoronic acid and occasionally α-collatolic and protocetraric acids.

Habitat. Saxicolous on acid rocks, usually growing on large, often wind-exposed boulders, occasionally lignicolous.

Distribution. Less common than *A. centrifuga* but scattered and unlike this species it reaches the southernmost part of the Scandinavian Peninsula. **D:** *NJy ØJy Brn.* **Gr. F:** *A V U EK St EH ES EP PH PS PK KP Kn OP PeP Ks KiL SoL EnL InL.* **I:** *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 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 LL TL*. Widely distributed in arctic-boreal areas, known from the northern part of western Europe and Britain.



Note. This species is easily recognized by the globose soralia and the narrow, convex lobes.

Arctoparmelia separata (Th.Fr.) Hale

Mycotaxon 25: 252 (1986).

Literature: Vitikainen & Dudoreva, Graphis Scripta 14: 3–4 (2003).

Not treated as it is not known from the main area but from Greenland and widespread in northern North America and North Asia. Recognized by its smooth, ± matt upper surface and the ash grey to dark purplish or almost black lower surface.

Arctoparmelia subcentrifuga (Oxner) Hale

Mycotaxon 25: 252 (1986).

Syn. *Parmelia groenlandica* Lynge, nom. illeg.

Literature: Vitikainen & Dudoreva, Graphis Scripta 14: 3–4 (2003).

Not treated as it is not known from the main area but from East Asia, northern North America, Greenland and the Murmansk Region (very close to Finnish boundary) in Russia. Recognized by the bullate to strongly rugose, fragile, occasionally slightly sorediate upper surface and the dark purplish lower surface.

Asahinea

T. Randlane & A. Thell

Asahinea W.L.Culb. & C.F.Culb.

Brittonia 17: 183 (1965). – Type: *Asahinea chrysantha* (Tuck.) W.L.Culb. & C.F.Culb.

Literature: Asahina, J. Jap. Bot. 10: 473–486 (1934); Culberson & Culberson, Brittonia 17: 183–184 (1965); Gao, Nord. J. Bot. 11: 483–485 (1991); Randlane & Saag, Lichenologist 21: 303–311 (1989).

Thallus foliose, to 10 cm diam., lobes loosely attached, often wrinkled, and undulating, rather thin, 5–30 mm wide, with or without pseudocyphellae, lower surface blackish, lacking rhizines. Ascomata apothecia, zeorine, submarginal or laminal, rare, to 3 mm diam.; disc brown. Asci clavate, of *Lecanora*-type. Conidiomata pycnidia, common, marginal. Conidia dumbbell-shaped. Photobiont trebouxioid.

Chemistry. Cortex with atranorin and ± usnic acid. Medulla with alectoronic and α-collatolic acid.

Note. Asahinea is an arctic-alpine genus of two species restricted to the Northern Hemisphere.

1. **Asahinea chrysantha** (Tuck.) W.L.Culb. & C.F.Culb.

Brittonia 17: 184 (1965). – *Cetraria chrysantha* Tuck., Amer. J. Sci. Arts, ser. 2, 25: 423 (1858). – Type: Russia, Asian side of Bering Strait, Wright (FH lectotype, Culberson & Culberson, Brittonia 17: 184, 1965).

Syn. *Asahinea culbersoniorum* Trass

N: finnmarkslav

Red-listed in: **N**

Literature: Hakulinen & Ulvinen, Ann. Univ. Turku, ser. A II, 36: 101–105 (1966); Oxner & Rassadina, Not. Syst.

Crypt. Inst. Akad. Nauk SSSR 13: 5–14 (1960); Thomson, Amer. Arctic Lich. 1: 43–44, 46 (1984); Tønsberg et al., Sommerfeltia 23: 39–40 (1996).

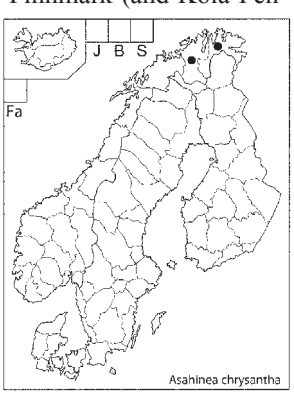
Figs: Thomson 1984: 44; Brodo et al. 2001: 166; Holien & Tønsberg 2006: 41.

THALLUS foliose, to 10 cm diam., loosely attached with scattered hapters. Lobes to 3 cm wide. Upper surface pale yellowish or occasionally grey (chemotype without usnic acid), with reticulate pattern of both large and small ridges. Pseudocyphellae few to many, yellow with black rims, most common on the ridges. Lower surface glossy brown towards the margins, otherwise blackish. APOTHECIA rare, not observed in the Nordic countries, submarginal or laminal, to 3 mm diam.; disc brownish black. Spores ellipsoid, 8–13 × 5–8 µm. PYCNIDIA marginal or submarginal, rare, minute and black. Conidia dumbbell-shaped, 5–7 × 1 µm.

Chemistry. Cortex C–, K+ yellow, KC–, PD–; atranorin and ± usnic acid. Medulla C–, K–, KC+ red or pink, PD–; alectoronic and α-collatolic acid. Three chemotypes have been recognized within the species (Randlane & Saag 1989).

Habitat. Terricolous or on siliceous rocks, usually among mosses on large boulders. In the Arctic mainly on soil.

Distribution. Restricted to Finnmark (and Kola Peninsula) with only two localities in the Nordic countries. **N:** *VFi ØFi*. Widespread in Asia (China, Japan, Mongolia, Russia) and amphi-Beringian area, having a center around the Bering Strait, ranging eastwards to Baffin Island and westwards to Novaya Zemlya and Ural Mts.



Note. Recognized by its large yellowish, typically double-reticulated thallus and black underside.

Brodoa

A. Thell & M. Westberg

Brodoa Goward

Bryologist 89: 222 (1986). – TYPE: *Brodoa oroarctica* (Krog) Goward

Syn. *Hypogymnia* subg. *Solidae* (Bitter) Krog

D: kvistlav **F:** suolikarpeet **S:** korallblåslavar

Literature: Goward, Bryologist 89: 219–223 (1986); Krog, Lichenologist 6: 136–139 (1974).

THALLUS foliose, adnate to ascending, pale grey to ash grey or brown to greyish black, lobate. Lobes swollen, convex, sometimes torulose, to c. 2 mm wide; without pseudocyphellae, soredia and isidia; lower surface black, without rhizines, attached to the substrate with hapters. Upper cortex paraplectenchymatous, medulla compact, lower cortex palisade (para)plectenchymatous. ASCOMATA apothecia, zeorine, laminal, sessile; asci clavate, of *Lecanora*-type, 8-spored with colourless, simple spores, 7–12 × 6–8 µm. CONIDIOMATA pycnidia, laminal, immersed, visible as black dots. Conidia bifusiform. PHOTOBIONT trebouxioid.

Chemistry. Atranorin in the cortex. Fumarprotocetraric, physodic and protocetraric acids in the medulla.

Note. Brodoa includes three, mainly arctic-alpine species, all present in the Nordic countries, growing on acid rock, mainly in exposed arctic and alpine localities. The genus was segregated from *Hypogymnia* due to the compact medulla, larger spores and different cortical structure.

1. Frequently supplied with flattish secondary lobes; medulla KC– ..... 2. *B. intestiniformis*
– Secondary lobes few or absent; medulla KC+ red 2
2. Thallus adnate, orbicular with a contiguous margin and irregularly swollen lobes; medulla PD+ orange. ..... 1. *B. atrofusca*
– Thallus loosely attached to ascending, irregularly spreading with torulose lobes (constricted at intervals); medulla PD– or PD+ orange only in apical parts ..... 3. *B. oroarctica*

1. **Brodoa atrofusca** (Schaer.) Goward

Bryologist 89: 222 (1986). – *Parmelia ceratophylla* var. *atrofusca* Schaer., Enum. Crit. Lich. Eur.: 42 (1850). – TYPE:

Switzerland, in mont. St. Bernhard, 1840 Schaerer (G lectotype, Krog, Lichenologist 6: 138, 1974).

Syn. *Hypogymnia atrofusca* (Schaer.) Räsänen, *Hypogymnia intestiniformis* var. *atrofusca* (Schaer.) Poelt, *Parmelia atrofusca* (Schaer.) Cromb., *Parmelia intestiniformis* var. *atrofusca* (Schaer.) Hasselrot

N: alperabbelav **S:** svartbrun blåslav

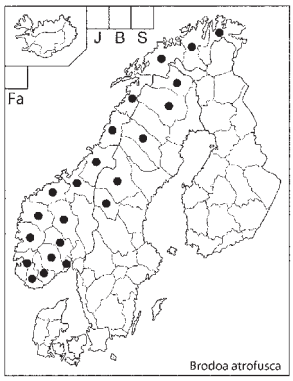
Literature: Goward 1986: 222; Krog 1974: 138; Østhagen, Blyttia 34: 195 (1976).

Figs: Krog 1974: 138, Pl. 1.

Thallus foliose, to 10 cm diam., closely adnate, forming orbicular thalli with few imbricate branches towards the centre, greyish to dark grey with brownish lobe tips; lobes 1–2 mm diam., convex, shiny; lower surface black or brown at the lobe tips. Apothecia frequent, to 10 mm diam.; disc brown, margin sometimes crenulate. Spores broadly ellipsoid, 7–10 × 6–7 µm. Pycnidia frequent. Conidia bifusiform, 5–7 × 1 µm.

Chemistry. Cortex C–, K+ yellow, KC–, PD–; atranorin. Medulla C–, K–, KC+ red, PD+ orange; physodic and protocetraric acids.

Habitat. Saxicolous, growing on exposed siliceous rocks, preferably on large boulders.



Distribution. Mainly in the high-alpine zone in Norway and Sweden. **N:** *Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **S:** *Hrj Jmt LyL LuL TL*. Also found in Central Europe.

Note. Characterized by its orbicular, adnate thallus lacking secondary lobules. The presence of physodic acid in the medulla also separates it from *B. intestiniformis*. From *B. oroarctica* it differs primarily in the growth form but also by having protocetraric acid in the medulla (PD+ orange), whereas this substance is absent in *B. oroarctica* or only present near the lobe tips. The distribution in Sweden is incompletely known.

2. **Brodoa intestiniformis** (Vill.) Goward

Bryologist 89: 222 (1986). – *Lichen intestiniformis* Vill., Hist. Pl. Dauphinè 3: 947 (1789). – Type: [Italy] Inter Rolle et Paneveggio Tiroliae meridionalis, 1885 Arnold in Lojka, Lichenoth. Universalis No. 63 (as *Parmelia encausta* (Sm.) Nyl.] (O neotype, Krog, Lichenologist 6: 139, 1974)

Syn. *Parmelia intestiniformis* (Vill.) Ach., *Parmelia encausta* (Sm.) Ach., *Hypogymnia encausta* (Sm.) Walt.Wats., *Hypogymnia intestiniformis* (Vill.) Räsänen

F: paasisuolikarve **N:** vanlig rabbelav **S:** korall-blåslav

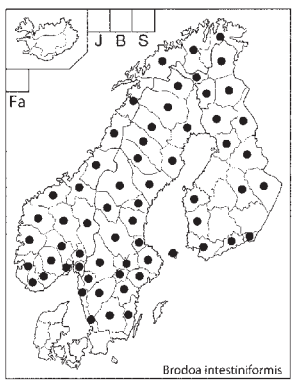
Literature: Goward 1986: 222; Hakulinen, Aquilo, ser. Bot. 3: 41–44, 60–61 (1965); Hasselrot, Acta Phytogeogr. Suec. 33: 83–87, 174 (1953); Krog 1974: 139–140; Østhagen, Blyttia 34: 194 (1976); Vitikainen, Lutukka 3: 54 (1985).

Figs: Holien & Tønsberg 2006: 49; Krog 1974: 138, Pl. 3; Moberg & Holmåsen 1990: 84; Wirth 1995: 181; Rikkinen 2008: 197.

Thallus foliose, to several dm diam., loosely to closely adnate, central parts more or less covered with numerous flattened secondary lobes, white to greyish to dark grey, with brownish tips, dull or somewhat shiny; lobes 0.5–1.5(–2) mm wide, often broadened towards the apices, marginal lobes appressed; secondary lobules 0.2–0.4 mm wide; lower surface black, usually with a thin whitish pruina in the outer parts, pale brown at the lobe tips, with scattered hapters. Apothecia fairly common, to c. 10 mm diam., irregular, sometimes lobulate; disc brown. Spores broadly ellipsoid, 10–12 × 6–8 µm. Pycnidia frequent. Conidia bifusiform, 5–7 × 1 µm.

Chemistry. Cortex C–, K+ yellow, KC–, PD–; atranorin. Medulla C–, K+ slowly reddish to orange brown, KC–, PD+ orange; fumarprotocetraic acid.

Habitat. Saxicolous, on exposed siliceous rocks, especially on hilltops or shores.



Distribution. Occurs in most parts of the Nordic countries except Denmark and southernmost Sweden. Most common in mountain regions in the north, in subalpine

regions, or near the coast, but scattered elsewhere. **F:** *A V U EK St EP PS PK 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:** *Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LL TL*. Restricted to Europe but rare outside Fennoscandia, occurring in mountain areas down to the Mediterranean region and in the Scottish Highlands.

Note. Characterized by its numerous, flattened secondary lobules, and the absence of physodic acid in the medulla.

3. **Brodoa oroarctica** (Krog) Goward

Bryologist 89: 222 (1986). – *Hypogymnia oroarctica* Krog, Lichenologist 6: 136 (1974). – Type: Norway, Svalbard, Spitsbergen, Lomfjorden, Dvergbreen, 1931, Scholander (O holotype).

D: fjeld-kvistlav **F:** paljakkasuolikarve **I:** snæþemba **N:** fjellrabbelav **S:** högfjällsblåslav

Literature: Brodo et al., Lich. North America: 177–178 (2001); Goward 1986: 222; Hasselrot, Acta Phytogeogr. Suec. 33: 86 (1953); Krog 1974: 136–138; Østhagen, Blyttia 34: 194 (1976); Vitikainen, Lutukka 3: 53–55 (1985).

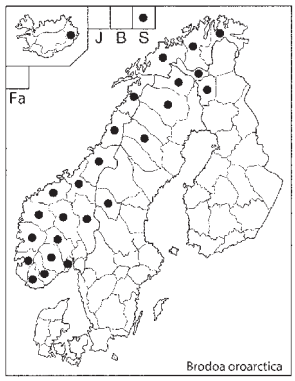
Figs: Brodo et al. 2001: 178; Krog 1974: 138, Pl. 2; Hansen & Andersen 1995: 38.

Thallus foliose, to 10 cm diam., irregularly spreading, loosely attached, brown to dark brown to black and only rarely paler, shiny but dull in central parts; lobes often ascending and somewhat entangled, narrow, to 1 mm wide, forked or irregularly branched, tapering at the tips, often linear but torulose (constricted at intervals); lower surface black, usually with a thin whitish pruina in the outer parts, brown at the lobe tips. Apothecia rare, to 5 mm diam.; disc brown. Spores broadly ellipsoid, 10–12 × 8 µm. Pycnidia frequent. Conidia bifusiform, 5–7 × 1 µm.

Chemistry. Cortex K+ yellow; atranorin. Medulla C+, red, K–, KC+ red, PD–, or PD+ orange near the lobe tips; physodic acid and traces of protocetraric acid and sometimes fumarprotocetraric acid.

Habitat. Saxicolous on highly exposed siliceous (basaltic in Iceland) rocks in alpine areas or tundra heaths occasionally on soil or small pebbles on the ground in windswept patches.

Distribution. Distinctly northern, occurring only at high altitudes in the southern parts of its distribution area. **Gr. F:** *KiL EnL*. **I:** *IAu*. **N:** *He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **AI:** *Sb*. **S:** *Hrj LL TL*. An arctic-alpine, northern boreal, circumpolar species and the only *Brodoa* occurring in North America.



Note. When well-developed characterized by its irregular thallus of loosely attached to ascending, dark and torulose lobes. Differs chemically from *B. intestiniformis* in having physodic acid in the medulla (KC+ red) and from *B. atrofusca* in lacking protocetraric acid in the medulla (sometimes present near the lobe tips). Young thalli of *B. oroarctica* may be mistaken for *Allantoparmelia alpicola* which has alectorialic and barbatolic acids in the medulla (K+ yellow, PD+ strongly yellow).

Bryocaulon

A. Thell & I. Kärnefelt

Bryocaulon Kärnefelt

Opera Bot. 86: 17 (1986). – Type: *Bryocaulon divergens* (Ach.) Kärnefelt

F: tunturiokajäkälät

Literature: Brodo et al., Lich. North America: 178–179 (2001); Kärnefelt, Opera Bot. 86: 17–28 (1986); Kärnefelt & Thell, Pl. Syst. Evol. 180: 198 (1992).

Thallus fruticose, erect, pendent or prostrate, from light greenish yellow to brownish black; branches terete, or slightly flattened; cortex prosoplectenchymatous; pseudocyphellae ± abundant, distinctive, whitish. Ascomata apothecia, zeorine, rather rare, of same colour as the thallus. Asci clavate, of *Lecanora*-type, usually 8-spored. Spores simple, ellipsoid, colourless. Conidiomata pycnidia, scattered, immersed. Conidia slightly dumbbell-shaped with sharp ends. Photobiont trebouxioid.

Chemistry. Olivetoric and physodic acids.

Note. The genus has a mainly arctic-alpine distribution, but is also common in coniferous forests of eastern Asia and northwestern North America. *B. divergens* has the widest distribution range of the three species and is widespread in the Northern Hemisphere. A similar genus is *Nodobryoria*, which is represented by *N. subdivergens* (E.Dahl) Common & Brodo in Greenland. It differs by growing pendent on twigs and lacking secondary substances.

1. Pseudocyphellae distinct; C+ red ..... 1. *B. divergens*
   Pseudocyphellae indistinct; C–..... 2. *B. hyperboreum*

1. **Bryocaulon divergens** (Ach.) Kärnefelt

Opera Bot. 86: 24 (1986). – *Cornicularia divergens* Ach., Methodus: 303 (1803). – Type: Lapponia, Wahlenberg (H-ACH 1869A lectotype, Brodo & Hawksworth, Opera Bot. 42: 149, 1977.

Syn. *Alectoria divergens* (Ach.) Nyl., *Coelocaulon divergens* (Ach.) R.Howe

F: tunturiokajäkälä **N:** fjelltagg **S:** spärrlav

Literature: Brodo et al. 2001: 179: Brodo & Hawksworth, Opera Bot. 42: 149 (1977); Hakulinen, Aquilo, ser. Bot. 3: 38–41 (1965); Kärnefelt 1986: 24–28; Kärnefelt & Thell 1992: 198; Thomson, Am. Arctic Lichens 1: 197–199 (1984).

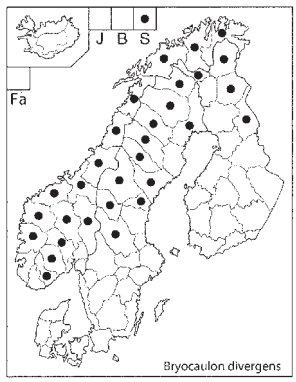
Figs: Brodo et al. 2001: 180; Hansen & Andersen 1995: 17; Hinds & Hinds 2007: 130; Holien & Tønsberg 2006: 42; Moberg & Holmåsen 1990: 79, Rikkinen 2008: 195.

Thallus fruticose, pendent to prostrate, reddish to chestnut brown to brownish black, glossy, paler in the the basal part, apically dark brown to blackish. Branching anisotomic dichotomous; branchlets slender, stiff, terete to flattened, to 15 cm long, 0.5–2 mm wide, erect or partly decumbent. Pseudocyphellae distinctive, raised and fusiform, white. Apothecia very rare, to 10 cm diam., but usually much smaller, with irregular and crenulate margins. Spores ellipsoid, 6–8 × 2.5–4 µm. Pycnidia spread over the surface, immersed. Conidia dumbbell-shaped, 4.5–5 × 1 µm.

Chemistry. Cortex and medulla C+ red, K–, KC+ reddish, PD–; olivetoric acid, traces of anziaic acid and 4-O-demethylmicrophyllinic acid (by HPLC).

Habitat. Growing on soil in ericaceous tundra and mountain heaths, often with *Gowardia nigricans* and *Alectoria ochroleuca*, on bare or mossy rocks, very rarely on trees at timberline.

Distribution. Mainly alpine along the Scandinavian mountains and in arctic areas in Svalbard and Greenland (not in Iceland!). Also on the rocky coast of Central Sweden. In Norway it avoids highly oceanic coastal areas. **Gr. F:** *Ks SoL EnL InL*. **N:** *He Op Bu Te AA Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **AI:** *Sb*. **S:** *Dlr Mpd Ång Hrj Jmt Nb ÅsL LyL PL LL TL*. Restricted to the northern hemisphere where it is widely distributed in the arctic tundra reaching hemiarctic and boreal areas of Europe, North America and Asia, in western North America and Asia also extending to more southern mountains.

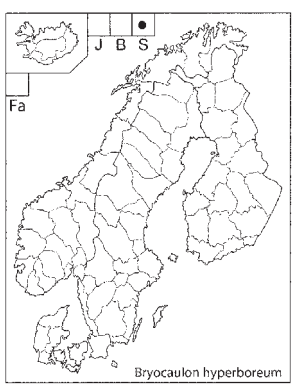


Note. Easily distinguished by the erect, caespitose thallus with the characteristic raised and fusiform pseudocyphellae and the glossy, reddish-brown to chestnut brown to brownish black thallus.

2. **Bryocaulon hyperboreum** Øvstedal

Sommerfeltia 33: 99 (2009). – Type: Svalbard, Kong Karls Land, Hårfagrehaugen, 1936 Dahl (O holotype).

Thallus fruticose, pendent to prostrate, brownish black and glossy. Branching anisotomic dichotomous; branchlets slender, stiff, terete to flattened, to 10 cm long, ca 0.7 mm wide, erect or partly decumbent. Pseudocyphellae rare, fusiform, 0.2–0.3 × 0.1 mm long, mostly closed, occasionally partly open. Apothecia unknown. Pycnidia rare, spread over the surface, immersed. Conidia not seen.



Chemistry. No secondary substances (by HPLC).

Habitat. Growing among bryophytes in arctic tundra.

Distribution. Scattered in Svalbard. **AI:** *Sb*.

Note. Easily distinguished from *B. divergens* by the indistinct, mostly closed pseudocyphellae and by the absence of secondary lichen substances.

Bryoria

L. Myllys, S. Velmala & H. Holien

Bryoria Brodo & D.Hawksw.

Opera Bot. 42: 78 (1977). – Type: *Bryoria trichodes* (Michx.) Brodo & D.Hawksw.

D: mankelav **F:** tummalupot **I:** skegg **N:** brunskjegg **S:** tagellavar

Literature: Brodo et al., Lich. N. America: 179–186 (2001); Brodo & Hawksworth, Opera Bot. 42: 1–164 (1977); Hawksworth, Lichenologist 5: 181–261 (1972); Holien, Lichenologist 21: 243–258 (1989); Kärnefelt & Thell, Pl. Syst. Evol. 180: 198–199 (1992); Velmala et al., Lichenologist 41: 231–242 (2009).

Thallus fruticose, erect, caespitose, pendent or prostrate to decumbent, whitish grey to dark brown to black, some species bicolorous; cortex dull to shiny, prosoplectenchymatous; branches generally terete, sometimes slightly flattened or foveolate, lateral spinules present in some species; soralia absent to abundant, tuberculate or fissural, often white, sometimes greenish, blackish or yellow; isidia absent, but some species have isidioid spinules in soralia; pseudocyphellae absent to abundant, fusiform to linear, often white, sometimes grey or yellow. Ascomata apothecia, zeorine, usually rare, unknown in some species, lateral, thalline margin concolorous with the thallus, usually becoming excluded; disc mostly reddish or dark brown. Asci clavate, of *Lecanora*-type, usually 8-spored. Spores simple, globose to broadly ellipsoid, colourless. Conidiomata pycnidia, rare. Conidia bifusiform. Photobiont trebouxioid.

Chemistry. β-orcinol depsidones common, especially fumarprotocetraric acid; atranorin frequent; alectorialic, barbatolic, gyrophoric or vulpinic acid occur in some species.

Note. Bryoria differs from the superficially similar genus *Alectoria* in having small colourless spores instead of large brown ones, and from *Usnea* in lacking a medullary cord. *Bryoria* is mainly confined to boreal regions, with 16 species listed from the Nordic countries. Many species have decreased due to air pollution and forest management. Although it is a conspicuous, easily recognized and frequently collected genus, the infraspecific relationships and the delimittations of the species are not well understood. Together with *Usnea*, it is regarded as one of the taxonomically most difficult genera of macrolichens. In the absence of apothecia, the diagnostic features include asexual characters, such as branching type, presence of soredia, form of pseudocyphellae and thallus colour. Moreover, secondary chemistry has played a major role in the delimitation of the species. However, especially many pendent species are highly variable in morphology and chemistry, and intermediate forms are frequently found. This is probably due to environmental factors and hybridization. Ongoing molecular studies by the authors indicate that the current species concept of many pendent taxa is questionable and the number of species is lower than previously reported.

1. Thallus erect or caespitose; terricolous, corticolous or saxicolous 2
– Thallus pendent, sometimes prostrate; usually corticolous or saxicolous 8
2. Distinctly bicolorous 3
– Not distinctly bicolorous 5
3. Soralia present ..... 14. *B. smithii*
– Soralia absent 4
4. Basal parts black, apical parts greyish brown to olive brown, tertiary branches present, angles between branches perpendicular; usually saxicolous, sometimes corticolous ..... 2. *B. bicolor*
– Basal parts black, apical parts pale brown to brown, tertiary branches absent, angles between branches acute; corticolous or saxicolous ..... 16. *B. tenuis*
5. Soralia absent; thallus dark brown to black, shiny; terricolous or saxicolous ..... 12. *B. nitidula*
– Soralia usually present; thallus pale greyish to dark brown, ± dull; corticolous or saxicolous 6
6. Thallus greyish brown to pale brown, usually with violet hue, K+ yellow ..... 11. *B. nadvornikiana*
– Thallus brown to dark brown, without violet hue, K– 7
7. Thallus brown; soralia white, with isidioid spinules, PD+ red ..... 6. *B. furcellata*
– Thallus dark brown to blackish brown; soralia greenish black, without spinules, PD– ..... 13. *B. simplicior*

8. Thallus yellow brown to reddish brown, soralia yellow, pseudocyphellae white or yellow, main branches often twisted and foveolate ..... 5. *B. fremontii*
– Thallus greyish brown to dark brown, soralia and pseudocyphellae never yellow, main branches rarely twisted and foveolate 9
9. Main branches with short lateral branches, soralia absent or present, pseudocyphellae white or brown .. 10
– Main branches usually without lateral branches, soralia usually present, pseudocyphellae white 11
10. Thallus pendent, dark brown, without violet hue; pseudocyphellae brown and depressed ..... 1. *B. americana*
– Basal parts caespitose, apical parts pendent, greyish brown to pale brown, often with violet hue; pseudocyphellae white, not depressed .... 11. *B. nadvornikiana*
11. Thallus olivaceous brown to dark brown, soralia regularly oval and white, branching regular, angles between branches obtuse and rounded ..... 8. *B. glabra*
– Thallus whitish grey to dark brown, soralia more variable, branching irregular, angles between branches acute or obtuse 12
12. Angles between branches mainly obtuse, pseudocyphellae conspicuous ..... 9. *B. implexa*
– Angles between branches mainly acute, pseudocyphellae absent or inconspicuous 13
13. Thallus mainly whitish grey, K+ yellow, KC+ red ..... 3. *B. capillaris*
– Thallus whitish grey to blackish brown, K–, KC– 14
14. Thallus whitish grey, pseudocyphellae inconspicuous, strongly PD+ red..... 15. *B. subcana*
– Thallus pale brown to blackish brown, pseudocyphellae absent, PD+ red or PD–..... 15
15. Thallus pale brown to brown, branches even, PD+ red.....7. *B. fuscescens*
– Thallus dark brown to black brown, branches uneven, PD–, soralia PD+ red 16
16. Prostrate to decumbent, robust, branches often twisted and foveolate; usually saxicolous .....4. *B. chalybeiformis*
– Pendent, delicate, branches brittle; usually corticolous .....10. *B. lanestris*

1. **Bryoria americana** (Motyka) Holien

Graphis Scripta 6: 40 (1994). – *Alectoria americana* Motyka, Fragm. Florist. Geobot. 6: 449 (1960). – Type: Canada, New Brunswick, Grand Manan, 1879 Willey (US holotype).

Syn. *Bryoria trichodes* subsp. *americana* (Motyka) Brodo & D.Hawksw.

F: kirjoluppo **N:** trådskjegg **S:** amerikatagel

Red-listed in: **F**

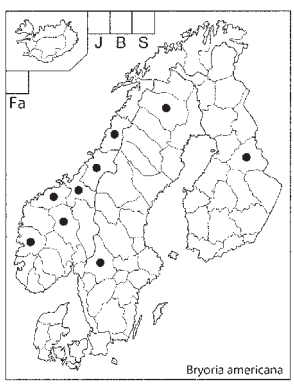
Literature: Brodo, Graphis Scripta 4: 61 (1992); Brodo & Hawksworth 1977: 96–97; Holien, Graphis Scripta 6: 40–41 (1994); Myllys et al., Graphis Scripta 18: 23–24.

Figs: Brodo et al. 2001: 186; Hinds & Hinds 2007: 139.

Thallus pendent, to 20 cm long, brown to dark brown, often with blackened fragmentation areas, slightly shiny. Irregularly branched, usually with wide branch angles, main branches often with thin perpendicular branches. Soralia absent to sparse, white, tuberculate or fissural, often recurving the branch. Pseudocyphellae sparse, fusiform and depressed, brownish, to 1 mm long. Apothecia locally common, to 2 mm diam.; disc brown, becoming convex. Spores ellipsoid, 5.5–7 × 4–5 µm. Pycnidia unknown.

Chemistry. Medulla and soralia PD+ red (sometimes faintly); fumarprotocetraric acid (sometimes in low concentrations). Apothecia PD+ yellow; psoromic acid.

Habitat. On *Picea* and *Betula* in humid forests and at the edges of swamps.



Distribution. Reported from humid spruce forests of Norway, rare in Sweden and Finland but insufficiently known. **F:** *Kn*. **N:** *Op Ho MR ST NT SNo*. **S:** *Vrm LuL*. Europe, Asia, coastal North America. Suboceanic.

Note. Probably much overlooked in Europe. It resembles *B. fuscescens* and *B. implexa*, from which it is distinguished by its broadly divergent isotomic dichotomous branching pattern, small perpendicular side branches, usually esorediate main branches with blackened fragmentation regions and depressed pseudocyphellae. The species was segregated from non-European *Bryoria trichodes* (Michx.) Brodo & D.Hawksw. and molecular studies support the separation of the two species.

2. **Bryoria bicolor** (Ehrh.) Brodo & D.Hawksw.

Opera Bot. 42: 99 (1977). – *Lichen bicolor* Ehrh., Hannover. Mag. 22: 161 (1784). – Type: Germany, Harz (”Hercynia”), Ehrhart, Pl. Crypt. Linn. no. 40 (LINN-Sm. 1712.2(3) lectotype, Brodo & Hawksworth, Opera Bot. 42: 99 (1977).

Syn. *Alectoria bicolor* (Ehrh.) Hoffm.

F: rotkoluppo **N:** kort trollskjegg **S:** broktagel

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

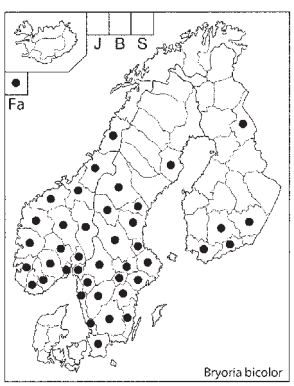
Literature: Arup et al., Skyddsvärda lavar i SV Sverige: 158–159 (1997); Botnen & Tønsberg, Gunneria 58: 15 (1988); Brodo & Hawksworth 1977: 99–101; Degelius, Acta Phytogeogr. Suec. 7: 36–44 (1935); Hawksworth, Lichenologist 1972: 204–209; Kuusinen et al., Mem. Soc. Fauna Fl. Fenn. 69: 23–25 (1993); Thor & Arvidsson, Rödlistade lavar i Sverige: 68–69 (1999).

Figs: Hawksworth 1972: Pl. 4: A–B; Holien & Tønsberg 2006: 62; Jørgensen & Ryvarden 1970: 6A; Moberg & Holmåsen 1990: 102.

THALLUS erect or caespitose, rigid, 2–7 cm high, bicolorous; basal parts black, apical parts of main branches as well as spinules greyish brown to olive brown, shiny. Without distinct main branches, usually with perpendicular, terete, secondary and tertiary branches, 0.2–0.5 mm diam., numerous perpendicular lateral spinules. Soralia absent. Pseudocyphellae sparse, fusiform, brown, plain or slightly raised. APOTHECIA very rare, to 1 mm diam.; disk dark brown. Spores globose to broadly ellipsoid, 6–9 x 4–6 µm. PYCNIDIA not seen in Nordic material.

Chemistry. Cortex and medulla PD+ red; fumarprotocetraric acid.

Habitat. Growing on mossy rock walls and on trees. The cool and humid microclimate provided by shaded, vertical north-exposed rock faces, often close to the sea or lakes, seems to be important to this species.



Distribution. Disjunct but widely distributed species. It has decreased or become extinct in many old localities. **Fa. F:** *V U EH ES Ks.* **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo*. **S:** *Sk Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Hrj Jmt Vb*. Europe, Africa, Asia, North and South America. Suboceanic.

Note. Recognized by the dense growth form and bicolorous thallus with numerous third order branches at right angles. Closely related to *B. tenuis*, which, however, lacks tertiary branches and has acute branch angles. *B. smithii* is also bicolorous but has spinulose soralia and lacks fumarprotocetraric acid. Old pseudocyphellae of *B. bicolor* may resemble soralia, but they are never spinulose.

3. **Bryoria capillaris** (Ach.) Brodo & D.Hawksw.

Opera Bot. 42: 115 (1977). – *Parmelia jubata* var. *capillaris* Ach., Methodus: 273 (1803). – TYPE: Sweden (H-ACH 1799 lectotype, Brodo & Hawksworth, Opera Bot. 42: 115, 1977).

Syn. *Alectoria capillaris* (Ach.) Cromb., *Alectoria cana* (Ach.) Leight., *Alectoria implexa* s. auct., *Alectoria setacea* (Ach.) Motyka, *Bryoria setacea* (Ach.) Brodo & D.Hawksw.

D: grå mankelav **F:** harmaaluppo **N:** bleikskjegg **S:** grå tagellav

Red-listed in: D

Literature: Brodo & Hawksworth 1977: 115–118; Hawksworth, Taxon 18: 393–394 (1969); Hawksworth 1972: 209–213; Holien 1989: 244–247.

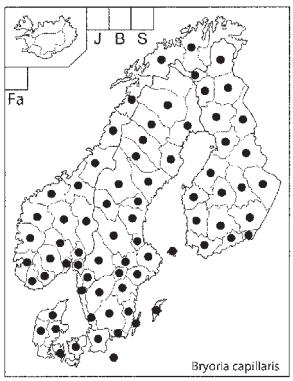
Figs: Brodo et al. 2001: 180; Hawksworth 1972: Pl. 4 C; Hinds & Hinds 2007: 133; Moberg & Holmåsen 1990: 103; Rikkinen 2008: 155; Wirth 1995: 187.

THALLUS pendent, to 30 cm long, whitish grey to brownish grey, rarely dark brown; dull to slightly shiny. Irregularly branched, usually without distinct main branches, to 0.5 mm diam., angles between branches mainly acute. Soralia absent to abundant, small, tuberculate. Pseudocyphellae fusiform, inconspicuous. APOTHECIA uncommon, 1–2 mm diam.; disc brown, becoming convex. Spores ellipsoid to subglobose, 5–9 × 4–6 µm. PYCNIDIA unknown.

Chemistry. Cortex and medulla C+ red or C–, K+ yellow, KC+ red, PD+ yellow; barbatolic acid, sometimes alectorialic acid and atranorin. Soralia PD+ red; fumarprotocetraric acid. Apothecia PD+ yellow; psoromic acid.

Habitat. On both coniferous and deciduous trees, occasionally on rocks, especially in shaded, humid spruce forests.

Distribution. Widespread, becoming rarer towards the north. **D:** *VJy ØJy NJy Fyn Sjæ Brn*. **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*. **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*. Incompletely circumboreal with oceanic tendencies. Europe, Macaronesia, Asia, North America.



Note. Distinguished by usually ash-grey colour, irregular branching pattern with acute angles between the main branches and production of barbatolic acid (K+ bright yellow reaction). May be confused with pale forms of *B. implexa*, which, however, has different chemistry, different branching pattern with obtuse angles and more distinct pseudocyphellae. *B. nadvornikiana* likewise contains barbatolic acid but has caespitose to subpendent growth form and perpendicular side branches.

Although *B. capillaris* is distinguished from other pendent *Bryoria* species by its chemistry, it does not differ from *B. chalybeiformis*, *B. fuscescens*, *B. implexa*, *B. lanestris* or *B. subcana* according to DNA analyses (see also Note under *B. fuscescens*). However, the molecular studies suggest that North American and European *B. capillaris* are two distinct entities. The result seems to correspond well with differences in morphology, as *B. capillaris* is frequently sorediate in Europe, while the North American specimens are always esorediate.

4. **Bryoria chalybeiformis** (L.) Brodo & D.Hawksw.

Opera Bot. 42: 81 (1977). – *Lichen chalybeiformis* L., Sp. Pl. 2: 1153 (1753), nom. cons. – TYPE: sine loco, herb. Linnaeus (LINN 1273.291, typ. cons.).

Syn. *Alectoria jubata* var. *chalybeiformis* (L.) Ach., *Alectoria chalybeiformis* (L.) Gray, *Alectoria intricans* (Vain.) Motyka, *Bryoria intricans* (Vain.) Brodo & D.Hawksw.

D: mørk mankelav **F:** vanuluppo **I:** jötunskegg **N:** flokeskjegg **S:** klipptagel

Red-listed in: **D**

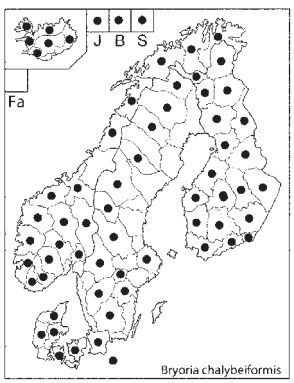
Literature: Brodo & Hawksworth 1977: 81–82; Hawksworth 1972: 213–216; Krog, Blyttia 29: 161–163 (1971); Jørgensen et al., Bot. J. Linn. Soc. 115: 290 (1994); Krog, Lichenologist 12: 243–245 (1980).

Figs: Hansen & Andersen 1995: 17; Hawksworth 1972: Pl. 4 E; Krog et al. 1994: 121.

THALLUS prostrate to decumbent, to 20 cm long, dark olivaceous brown to black, shiny. Branching irregular, sparse, main branches 0.3–2 mm diam., often twisted and foveolate. Soralia absent or sparse, tuberculate. Pseudocyphellae absent. APOTHECIA and PYCNIDIA unknown.

Chemistry. Cortex and medulla PD–. Soralia PD+ red; fumarprotocetraric acid.

Habitat. Typically on rocks at shores or in alpine regions. On soil and on shrubs among tundra vegetation. Occasionally on trees and lignum.



Distribution. Poorly known. Widespread according to traditional identifications. Arctic-alpine to boreal. **D:** *NJy ØJy VJy 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:** *Ak He Op Bu Te AA VA Ro Ho SF MR ST SNo NNo Tr VFi ØFi*. **AI:** *JM Bi Sb*. **S:** *Sk SmI Vg Ög Nrk Vrm Upl Dlr Hrj Jmt ÅsL PL LuL TL*. Europe, Asia, North and South America.

Note. Traditionally recognized by prostrate, stout, shiny and dark thallus. This habit, however, largely seems to represent environmental modifications of *B. fuscescens* s. lat. and its specific status is uncertain (see further under *B. fuscescens*).

5. **Bryoria fremontii** (Tuck.) Brodo & D.Hawksw.

Opera Bot. 42: 136 (1977). – *Alectoria fremontii* Tuck., Amer. J. Arts Sci., ser. 2, 25: 422 (1858). – Type: USA, California, Sierra Nevada, 'camp of Dec. 5–6', 1845 Frémont (FH-Tuck. 498 holotype).

Syn. *Alectoria tortuosa* G.Merr., *Bryoria tortuosa* (G.Merr.) Brodo & D.Hawksw., *Alectoria fremontii* subsp. *olivacea* (Räsänen) Räsänen, *Alectoria olivacea* Räsänen, *Alectoria corneliae* Gyeln.

F: kanadanluppo **N:** furuskjegg **S:** talltagel

Literature: Ahlner, Acta Phytogeogr. Suec. 22: 13–18 (1948); Brodo & Hawksworth 1977: 136–139; Gjerlaug, Blyttia 45: 69 (1987); Holien, Lichenologist 18: 265–268 (1986); Myllys et al., Graphis Scripta 18: 24–25 (2006); Velmala et al. 2009: 231–242.

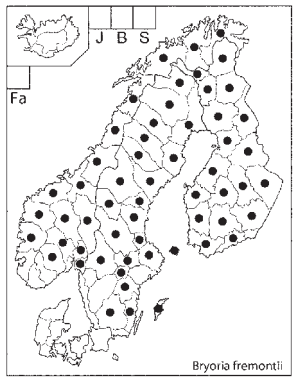
Figs: Brodo et al. 2001: 180 & 185; Holien & Tønsberg 2006: 64; Moberg & Holmåsen 1990: 103; Rikkinen 2008: 155; Velmala et al. 2009: 239.

Thallus pendent, to 60 cm long, yellowish brown or reddish brown, occasionally pale or blackish brown, colour may differ within the same specimen, dull or shiny. Distinctive main branches, to 4 mm wide, often foveolate and twisted, sometimes flattened, other branches relatively thin, sometimes with perpendicular side branches. Soralia absent or sparse to abundant, tuberculate, yellowish. Pseudocyphellae sparse to abundant, elongate or fusiform, white to bright yellow, colour may vary within the same specimen. Apothecia rather rare, rarely exceeding 2 mm diam.; disc becoming convex, covered by a bright yellow pruina, thalline margin persistent or becoming excluded. Spores subglobose, 5–8 × 4–5 µm. Pycnidia unknown.

Chemistry. C–, K–, KC–, PD–; vulpinic acid, though often absent from thallus outside soralia, barbatolic and norstictic acids rarely present.

Habitat. Mostly on old coniferous trees, especially pine but also on deciduous trees. In open or shady forests.

Distribution. Common in coniferous inland forests of northern Fennoscandia, becoming rarer in south. Abundant in pine forests of Lapland. **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 Te Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **S:** *Gtl Klm SmI Ög Nrk Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Europe, Asia, Western North America. Rather continental.



Note. A polymorphic species characterized by twisted, foveolate, often partly flattened main branches and finer rather terete secondary branches. Chemically unique in the genus because of its production of bright yellow pigment, i.e. vulpinic acid, present either in soralia and apothecia or throughout the thallus including the pseudocyphellae. The earlier recognized *B. tortuosa* was recently included in *B. fremontii* based on DNA analyses.

6. **Bryoria furcellata** (Fr.) Brodo & D.Hawksw.

Opera Bot. 42: 103 (1977). – *Cetraria furcellata* Fr., Syst. Orb. Veg. 1: 283 (1825). – Type: America borealis (UPS holotype).

Syn. *Alectoria nidulifera* Norrl.

F: tupsuluppo **N:** piggskjegg **S:** nästlav

Literature: Ahlner, Acta Phytogeogr. Suec. 22: 18–22 (1948); Brodo & Hawksworth 1977: 103–107.

Figs: Brodo et al. 2001: 181; Hinds & Hinds 2007: 134; Moberg & Holmåsen 1990: 102; Rikkinen 2008: 155.

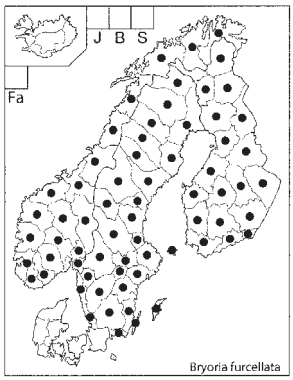
Thallus caespitose, to 8 cm high, pale brown to brown, shiny. Without distinct main branches, branches even, to 0.5 mm diam. Soralia frequent, fissural, sometimes raised, narrower than the branches, white, with numerous isidioid spinules. Pseudocyphellae absent. Apothecia extremely rare, to 2 mm diam.; disc pale to reddish brown, concave, becoming convex, thalline margin thick, often sorediate. Spores broadly ellipsoid to subglobose, 6–7 × 3–4 µm. Pycnidia not seen in material from the Nordic countries.

Chemistry. Cortex, medulla and soralia PD+ red; fumarprotocetraric acid.

Habitat. Mainly on *Pinus*, also on *Picea*, less fre-

quently on other trees or lignum, rarely on rocks. Characteristic in open pine woodlands on dry soil, on rock outcrops or in bogs, often abundant on tree trunks rather than twigs.

Distribution. Common in many provinces of Central Sweden and Finland and eastern parts of Norway, avoiding the west coast, rarer southwards to Småland. Northwards rare or absent in forests of northern Lapland. **F:** *A V U EK St EH ES EP PH PS PK KP Kn OP PeP Ks KiL SoL InL*. **N:** *Øf Ak He Op Bu 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*. Circumpolar with continental tendencies. Europe, Macaronesia, Asia, Oceania, North and Central America.



Note. Easily recognized by the spinulose soralia and caespitose shiny thallus. Specimens with poorly developed spinules may be confused with *B. simplicior*, which is PD– and has greenish-black soralia, which are broader than the branches.

7. **Bryoria fuscescens** (Gyeln.) Brodo & D.Hawksw.

Opera Bot. 42: 83 (1977). – *Alectoria fuscescens* Gyeln., Nyt Mag. Naturvid. 70: 55 (1932). – Type: Finland, Tavastia australis, Hollola, 1882 Norrlin, in Nylander & Norrlin, Lich. Fenn. exs. no. 466a (BP 33.947 lectotype, Motyka, Fragm. Flor. Geobot. 3:191, 1958).

Syn. *Alectoria fuscescens* Gyeln., *Alectoria jubata* auct., nom. rejic., *Alectoria positiva* (Gyeln.) Motyka

D: almindelig mankelav **F:** tummaluppo **I:** birkiskegg **N:** mørkskjegg **S:** manlav

Red-listed in: **I**

Literature: Brodo & Hawksworth 1977: 83–86; Hawksworth 1972: 217–222; Holien, Graphis Scripta 3: 139 (1992); Kärnefelt, Bothalia 17(1): 47–48 (1987).

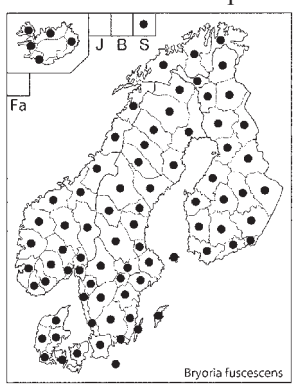
Figs: Brodo et al. 2001: 181; Hawksworth 1972: Pl. 5: A–B; Hinds & Hinds 2007: 135; Holien & Tønsberg 2006: 64; Moberg & Holmåsen 1990: 104; Rikkinen 2008: 155; Sérusiaux et al. 2004: 38; Wirth 1995: 188.

Thallus pendent, often prostrate when growing on rock or soil, to 30 cm long, usually shorter than 20 cm, greyish brown to blackish brown, paler at the basal portions, sometimes with blackened fragmentation areas. Irregularly branched, usually without main branches, angles mainly acute, 0.3–0.5 mm diam., sometimes uneven, usully straight, occasionally twisted and foveolate. Soralia frequent, tuberculate or fissural. Pseudocyphellae absent, but young soralia may resemble them. Apothecia very rare, to 1.5 mm diam.; disc brown to dark brown, concave, becoming convex. Spores ellipsoid, 6–9 × 5 µm. Pycnidia unknown.

Chemistry. Cortex and medulla PD+ red, partly PD–, soralia always PD+ red; fumarprotocetraric acid, sometimes chloroatranorin.

Habitat. On conifers, sometimes on deciduous trees, lignum, soil and rocks.

Distribution. Apparently common throughout Fennoscandia but abundance reduced due to air pollution. **D:** *SJy VJy ØJy NJy 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 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, Africa, Asia, North America.



Note. Belongs to a species complex with *B. americana*, *B. chalybeiformis*, *B. glabra*, *B. lanestris* and *B. subcana*, characterized by pendent growth form and PD+ red reaction at least in soralia (fumarprotocetraric acid). Species within this group are difficult to identify because of the extreme variability of the morphological characters. Furthermore, seemingly intermediate forms are frequently found. Typical specimens of *B. fuscescens* are olive brown, pale at the base, irregularly branched with narrow branch angles,

richly sorediate, and both medulla and soralia are PD+ red reaction both in medulla and soralia. For recognition of other species in this group, see their *Notes*.

Molecular studies shows that *B. americana* and *B. glabra* are distinct species. The systematic position of the other species, however, is very problematic; the DNA data suggests that *B. chalybeiformis*, *B. fuscescens*, *B. lanestris* and *B. subcana* are conspecific. This group also includes *B. capillaris* and *B. implexa*, which, however, chemically differ from the other taxa. If united, *B. chalybeiformis* is the oldest name at species level.

8. **Bryoria glabra** (Motyka) Brodo & D.Hawksw.

Opera Bot. 42: 86 (1977). – *Alectoria glabra* Motyka, Fragm. Florist. Geobot. 6: 448 (1960). – TYPE: USA, Washington, Olympic Peninsula, Clallam Co., Hurricane Ridge, 5 800 ft, 1950 Brown & Muenscher 129 (US holotype).

F: harsuluppo **N:** glattskjegg

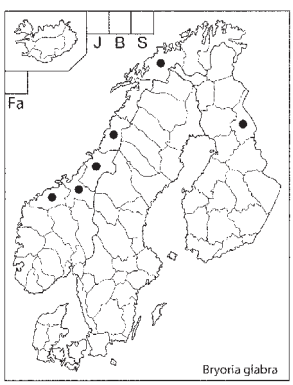
Red-listed in: **F**

Literature: Brodo & Hawksworth 1977: 86–88; Holien, Graphis Scripta 3: 138–139 (1992); Myllys et al., Graphis Scripta 18: 24 (2006).

Figs: Brodo et al. 2001: 182; Krog et al. 1994: 122.

THALLUS pendent, to 15 cm, brown, sometimes oliveaceous brown, occasionally with blackened fragmentation areas, shiny. Branching regular, without distinct main branches, even, angles between branches obtuse and rounded, 0.2–0.4 mm diam. Soralia frequent, usually fissural, often regularly oval, white. Pseudocyphellae rare, inconspicuous. APOTHECIA and CONIDIOMATA unknown in the Nordic countries.

Chemistry. Cortex and medulla PD–. Soralia PD+ red; fumarprotocetraric acid.



Habitat. Corticolous, especially on conifers but also on *Betula* in humid spruce forests.

Distribution. Not uncommon in central Norway, rare in Finland, but insufficiently known. **F:** *Ks*. **N:** *MR ST NT SNo Tr*. Europe, Asia, North America (mainly western).

Note. Recognized by the shiny, brown branches with distinctly U-shaped angles between main branches and by small, white, fissural, oval to almost round, PD+ red soralia. When well developed, easily identified in the field by its rounded appearance. Sometimes difficult to distinguish from *B. implexa*, which, however, is often more pseudocyphellate, has a less regular branching pattern and mostly different chemistry. Apparently much overlooked in Europe.

9. **Bryoria implexa** (Hoffm.) Brodo & D.Hawksw.

Opera Bot. 42: 121 (1977). – *Usnea jubata* [unranked] *implexa* Hoffm., Deutsch. Fl. 2: 134 (1796). – TYPE: Sine loco (MW-Hoffm. 8569 neotype, Hawksworth, Taxon 18: 395, 1969).

Syn. *Alectoria catharinae* Räsänen, *Alectoria implexa* (Hoffm.) Nyl., *Alectoria pseudofuscescens* Gyeln., *Alectoria subachariana* Gyeln., *Alectoria vrangiana* Gyeln., *Alectoria zopfii* Asahina, *Bryoria friabilis* Brodo & D.Hawksw., *Bryoria vrangiana* (Gyeln.) Brodo & D.Hawksw., *Bryoria pseudofuscescens* (Gyeln.) Brodo & D.Hawksw.

F: taigaluppo **I:** gálgaskegg **N:** vrangskjegg **S:** narrtagel

Red-listed in: **D I**

Literature: Brodo & Hawksworth 1977: 97–98, 118–122, 127–130; Hawksworth, Taxon 18: 395–396 (1969); Holien 1989: 247–258; Krog, Norwegian J. Bot. 26: 180 (1979); Øiseth & Aarvik, Blyttia 40: 83–84 (1982).

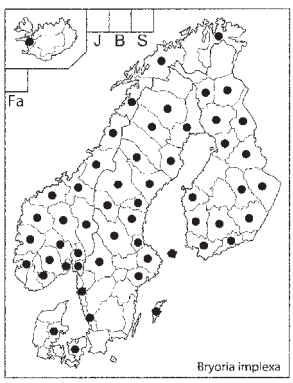
Figs: Holien 1989: 249–251; Holien & Tønsberg 2006: 65; Krog et al. 1994: 123.

THALLUS pendent, usually less than 25 cm long, usually pale brown but ranging from very pale to almost black, occasionally with blackened fragmentation areas, mostly dull. Branching mainly irregular, without distinct main branches, mostly smooth, angles between the branches mainly obtuse, 0.1–0.3 diam., branches sometimes twisted or foveolate. Soralia often present, tuberculate or fissural. Pseudocyphellae usually abundant, fusiform or linear, often white and conspicuous but, sometimes brownish. APOTHECIA possibly not rare, to 2 mm diam.; disc brown, becoming convex; thalline margin pale. Spores ellipsoid to subglobose, 4–6 × 3–5 µm. PYCNIDIA unknown.

Chemistry. Chemotype 1: Cortex, medulla and soralia PD+ yellow; psoromic acid. Chemotype 2: Cortex, medulla and soralia K+ red, P + yellow; norstictic acid. Chemotype 3: Cortex and medulla C+ red, KC+ red; gyrophoric acid. Soralia sometimes PD+ red; fumarprotocetraric acid. Chemotype 4: Cortex, medulla and soralia PD+ red; fumarprotocetraric acid. Chemotype 5: Cortex and medulla PD–. Soralia PD+ red; fumarprotocetraric acid. Atranorin sometimes present in all chemotypes. Apothecia PD+ yellow; psoromic acid.

Habitat. On coniferous and deciduous trees, rarely on rocks.

Distribution. Widespread but the distribution of the different chemotypes is very insufficiently known. **D:** *ØJy Sjæ*. **F:** *A V U St EH ES EP PS PK Kn OP PeP Ks KiL SoL*. **I:** *IVe*. **N:** *Øf Ak He Op Bu Vf Te AA Ro Ho SF MR ST NT SNo NNo Tr ØFi*. **S:** *Gtl Hl Bh Srm Vrm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL PL LuL*. Europe, Asia, North America.



Note. A variable species in chemistry and in thallus colour and differently treated by taxonomists. Morphologically characterized by obtuse angles between the main branches and the conspicuous pseudocyphellae. See also Note under *B. fuscescens*.

10. **Bryoria lanestris** (Ach.) Brodo & D.Hawksw.

Opera Bot. 42: 88 (1977). – *Alectoria jubata* var. *lanestris* Ach., Lichenogr. Universalis: 593 (1810). – Type: Switzerland ("Helvetia") (H-ACH 1808A holotype).

Syn. *Alectoria lanestris* (Ach.) Gyeln., *Alectoria tenerrima* Motyka

F: hiusluppo **N:** svartskjegg **S:** sprödtagel

Literature: Brodo & Hawksworth 1977: 88–90; Hawksworth 1972: 222–224; Holien, Graphis Scripta 3: 139 (1992).

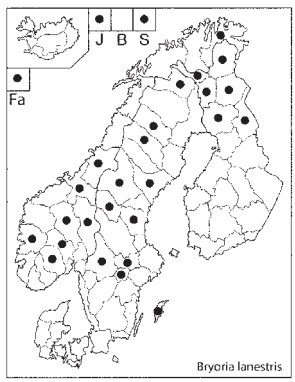
Figs: Brodo et al. 2001: 182; Hawksworth 1972: Pl. 5: C–E; Hinds & Hinds 2007: 137; Krog et al. 1994: 123.

Thallus pendent, 5–15 cm long, dark brown to blackish brown, dull. Irregularly branched, without distinct main branches, uneven and brittle, angles between branches mainly acute, 0.1–0.3 mm diam. Soralia sparse to abundant, fissural or tuberculate, white, sometimes pigmented. Pseudocyphellae unknown. Apothecia and Pycnidia unknown.

Chemistry. Cortex and medulla PD–. Soralia PD+ red; fumarprotocetraric acid.

Habitat. On conifers, rocks and sometimes on *Betula*.

Distribution. Insufficiently known, possibly more common towards the north. **Gr. Fa. F:** *PeP Ks KiL SoL EnL InL*. **N:** *He Op Bu Te Ho ST NT ØFi*. **AI:** *JM Sb*. **S:** *Gtl Nrk Vrm Vsm Hls Ång Hrj Jmt LyL PL TL*. Europe, Asia, North America. Continental.



Note. Dark colour, very fine, uneven, brittle branches and pigmented soralia are characters distinguishing this indistinct species from *B. fuscescens* and its allies. See also Note under *B. fuscescens*.

11. **Bryoria nadvornikiana** (Gyeln.) Brodo & D.Hawksw.

Opera Bot. 42: 122 (1977). – *Alectoria nadvornikiana* Gyeln., Acta Fauna Fl. Univ., ser. 2, 1: 6 (1932). – Type: Ukraine (Rossia carp.), Turkul, alt. 1850 m, 1930 Nádvornik, herb. Servít 17.653 (BP 33953 lectotype, Verseghy, Typen-Verzeichnis Flechtensamml.: 123, 1964).

Syn. *Alectoria altaica* (Gyeln.) Räsänen, *Alectoria spinulosa* Ahlner, nom. nud.

F: aarniluppo **N:** sprikeskjegg **S:** violettgrå tagellav

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

Literature: Ahlner, Acta Phytogeogr. Suec. 13: 27–38 (1940); Acta Phytogeogr. Suec. 22: 11–12, 148–150 (1948); Brodo & Hawksworth 1977: 122–125; Hermansson, Hotade och sällsynta växter i Dalarna: 439–468 (2008); Holien 1989: 256–257; Kuusinen, Graphis Scripta 4: 78–80 (1992); Oldhammer, Svensk Bot. Tidskr. 85: 33–38 (1991); Thor & Arvidsson, Rödlistade lavar i Sverige: 70–71 (1999).

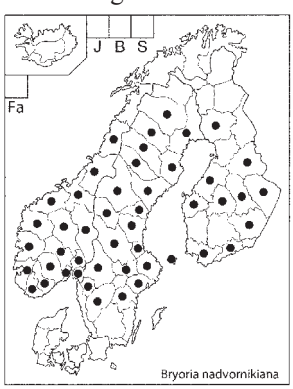
Figs: Brodo et al. 2001: 183; Holien & Tønsberg 2006: 65; Moberg & Holmåsen 1990: 104.

THALLUS basal parts caespitose, apical parts pendent, to 20 cm long, pale greyish to pale brown, sometimes dark brown, usually with a pink or violet hue, basal portions sometimes blackened, blackened fragmentation regions occasionally in whole thallus. Branching isotomic dichotomous, towards the base with obtuse angles, distinct main branches towards the apices with acute angles, small lateral, perpendicular, spinulose branches sparse to abundant. Soralia sparse to abundant, tuberculate, white to greenish white. Pseudocyphellae usually present, white, inconspicuous. APOTHECIA rare, to 2 mm diam.; disc brown, becoming convex. Spores ellipsoid to subglobose, 5–7 × 3–4 µm. PYCNIDIA not seen in Nordic material.

Chemistry. Cortex and medulla C+ red or C–, K+ yellow, KC+ red, PD+ yellow; alectorialic and barbatolic acids, sometimes atranorin. Soralia PD+ red; fumarprotocetraric acid.

Habitat. Especially on *Picea*, but also on *Pinus* and *Betula*, sometimes on rock faces. An old forest indicator.

Distribution. Widely distributed but absent from large areas in the south, the north and along the west coast. Locally common in SE Norway and Central Sweden, especially in Dalarna and Värmland, in Finland very scarce. **F:** *A V U ES EP PH PS PK KP Kn PeP.* **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo*. **S:** *Dls Vg Ög Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL.* Europe, Africa, Asia, Hawaii, North America.



Note. Characterized by the short lateral branches, the slightly violet colour and the presence of barbatolic acid. Saxicolous specimens are usually darker, more prostrate and richly branched than those growing on trees. May sometimes be confused with *B. capillaris*, which is typically pale grey, and pendent and lacks short lateral branches. Easily recognized species, even if the growth form varies from almost erect to pendent.

12. **Bryoria nitidula** (Th.Fr.) Brodo & D.Hawksw.

Opera Bot. 42: 107 (1977). – *Bryopogon jubatum* var. *nitidulum* Th.Fr., Nova Acta Reg. Soc. Sci. Upsal., ser. 3, 3: 25 (1860). – TYPE: Norway, Øst-Finnmark, Varanger, Klubben, 1857 Th. Fries (UPS lectotype, Brodo & Hawksworth, Opera Bot. 42: 107, 1977).

Syn. *Alectoria irvingii* Llano, *Alectoria nitidula* (Th.Fr.) Vain. *Alectoria lanea* auct.

F: kiiltoluppo **I:** glitskegg **N:** lappskjegg **S:** glanstagel

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

Literature: Ahlner, Natur i Ångermanland och Medelpad: 191 (1953); Brodo & Hawksworth 1977: 107–109; Granbo, Svensk Bot. Tidskr. 96: 130–137 (2002); Hakulinen, Ann. Bot. Fenn. 3: 180–181 (1966); Hawksworth 1972: 228–231; Moberg & Thor, Graphis Scripta 5: 40 (1993); Thor & Arvidsson, Rödlistade lavar i Sverige: 72–73 (1999); Tønsberg et al., Sommerfeltia 23: 40–42 (1996).

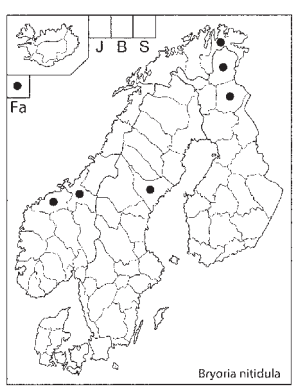
Figs: Brodo et al. 2001: 183; Hansen & Andersen 1995: 17; Hawksworth 1972: Pl. 6 C–D.

THALLUS erect to caespitose, occasionally prostrate, to 8 cm high, uniformly brown to dark brown to black, basal parts sometimes darker or dying, shiny. Main branches distinct, rigid, lateral spinules abundant. Soralia absent. Pseudocyphellae usually present, plane to slightly raised, elongate to fusiform, to 0.5 mm long, brownish to dark brown or black. APOTHECIA and PYCNIDIA unknown.

Chemistry. Cortex and medulla PD+ red; fumarprotocetraric acid.

Habitat. On the ground or on rocks in exposed habitats at or above timberline. In Sweden on top of exposed coastal rocks.

Distribution. Very rare and scattered in northern Fennoscandia. Probably retreating as it has not been recollected in recent time in many of its former localities. **Gr. Fa. F:** *SoL InL*. **N:** *MR ST ØFi.* **S:** *Ång*. Scattered arctic to hemiarctic in the Northern Hemisphere. Europe, Asia, North America.



Note. Recognized by the dark colour, the dark pseudocyphellae and the lateral spinules. Not easily mistaken for any other erect *Bryoria* species. *B. bicolor*, *B. smithii* and *B. tenuis* are bicolorous while the unicoloured *B. furcellata* and *B. simpicior* are sorediate and corticolous.

13. **Bryoria simplicior** (Vain.) Brodo & D.Hawksw.

Opera Bot. 42: 109 (1977). – *Alectoria nidulifera* f. *simplicior* Vain., Medd. Soc. Fauna Fl. Fenn. 6: 115 (1881). – TYPE: Finland, Lapponia inarensis, Inari, Paatsjoki (outflow), 1878 Vainio (TUR-V 1067 lectotype, Brodo & Hawksworth, Opera Bot. 42: 109, 1977).

Syn. *Alectoria simplicior* (Vain.) Lynge, *Alectoria nana* Motyka

F: lapinluppo **I:** kvistaskegg **N:** buskskjegg **S:** björktagellav

Red-listed in: **I**

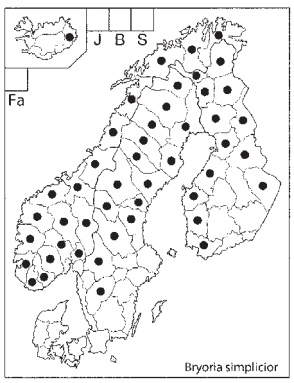
Literature: Ahlner, Acta Phytogeogr. Suec. 22: 29–33, 165–169 (1948); Brodo & Hawksworth 1977: 109–112.

Figs: Hansen & Andersen 1995: 18; Moberg & Holmåsen 1990: 105.

THALLUS caespitose, to 5 cm high, dark brown to blackish brown, shiny. Without distinct main branches, angles between the branches acute, lateral spinules common. Soralia frequent, fissural, broader than the branches, usually greenish black. Pseudocyphellae absent. APOTHECIA and PYCNIDIA unknown.

Chemistry. C–, K–, KC–, PD–; sometimes fatty acids.

Habitat. On twigs and branches of trees, especially *Betula* (e.g. in the mountain birch woodlands below timberline) and Pinus, sometimes on *Picea* and lignum, rarely on rocks.



Distribution. Very common in northern Norway, Sweden and Finland, rare in the south. Rare in Iceland. **Gr. F:** (*V*) *St EP PK KP Kn OP PeP Ks KiL SoL EnL InL*. **I:** *IAu*. **N:** *Ak He Op Bu Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **S:** *Vg Vrm Dlr Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Europe, Asia, North America. Circumboreal.

Note. Recognized by the greenish black soralia, which are broader than the branches. May be confused with *B. furcellata* specimens with poorly developed spinules in soralia. However, in *B. furcellata* the soralia are PD+ red and narrower than the branches.

14. **Bryoria smithii** (Du Rietz) Brodo & D.Hawksw.

Opera Bot. 42: 152 (1977). – *Alectoria smithii* Du Rietz, Ark. Bot. 20A (11): 15 (1926). – TYPE: China, Prov. Sichuan (Sze-shu'an), regio boreo-occidentalis, inter Tsago-gomba et Tamba, 4000 m, 1922 Smith 5025b (UPS lectotype, Jørgensen & Ryvarden, Årbok Univ. Bergen, mat.-nat. ser. 1969(10): 7, 1970).

Syn. *Alectoria berengeriana* (A.Massal. ex Stizenb.) Gyeln., *Alectoria bicolor* subsp. *smithii* (Du Rietz) Räsänen

F: piikkiluppo **N:** piggtrollskjegg **S:** stiftbroktagel

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

Literature: Ahlner, Acta Phytogeogr. Suec. 13: 32 (1940); Arup et al., Skyddsvärda lavar i SV Sverige: 159 (1997); Brodo & Hawksworth 1977: 152; Hawksworth 1972: 246–249; Jørgensen & Ryvarden, Årbok Univ. Bergen, mat.-nat. ser. 1969(10): 3–7 (1970); Kuusinen et al., Mem. Soc. Fauna Fl. Fenn. 69: 24–25 (1993); Thor, Svensk Bot. Tidskr. 94: 157 (2000); Thor & Arvidsson, Rödlistade lavar i Sverige: 74–75 (1999); Tønsberg et al., Sommerfeltia 23: 42–44 (1996).

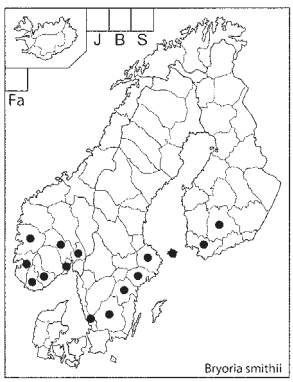
Figs: Hawksworth 1972: Pl. 8: B, D; Jørgensen & Ryvarden 1970: 6, B.

THALLUS erect, 4–7 cm high, bicolorous, basal parts brownish black to black, apical parts pale brown to brown, shiny. Main branches distinct and coarse, with some tertiary branches, short lateral spinules between the branches common. Soralia fissural, concave to plane, with isidioid spinules. Pseudocyphellae absent, but young or poorly developed soralia may resemble them. APOTHECIA and PYCNIDIA unknown.

Chemistry. No secondary substances (by TLC).

Habitat. On rocks and boulders, rarely on trees in humid habitats.

Distribution. Rare, suboceanic in southern Finland, Norway and Sweden. **F:** *A V EH Ks*. **N:** *Ak Bu Vf AA VA Ro Ho SF*. **S:** *SmI* (exctinct?) (*Hl*) *Ög* (*Srm*) (*Upl*). Europe, Asia, Hawaii.



Note. The isidioid soralia, the coarser habit, the different branching pattern and the lack of fumarprotocetraric acid separate this species from other bicolorous *Bryoria* species, i.e. *B. bicolor* and *B. tenuis*.

15. **Bryoria subcana** (Nyl. ex Stizenb.) Brodo & D.Hawksw.

Opera Bot. 42: 91 (1977). – *Alectoria prolixa* var. *subcana* Nyl. ex Stizenb., Ann. Naturhist. Mus. Wien 7: 129 (1892). – Type: Scotland, 1875 Crombie (H-NYL 35835 lectotype, Hawksworth, Lichenologist 5: 249, 1972).

Syn. *Alectoria subcana* (Nyl. ex Stizenb.) Gyeln., *Alectoria haynaldii* Gyeln.

F: kalvasluppo **N:** gråskjegg **S:** blektagel

Red-listed in: **D**

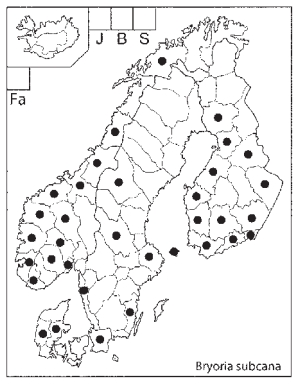
Literature: Brodo & Hawksworth 1977: 91–92; Christiansen et al., Bot. Tidsskr. 74: 91–92 (1979); Goffinet, Dumortiera 51: 19–21 (1992); Hawksworth 1972: 248–252; Holien, Graphis Scripta 3: 94–96 (1991); Graphis Scripta 3: 139 (1992); Schmull et al., Lichenologist 34: 87–88 (2002).

Figs: Hawksworth 1972: Pl. 8: A–B; Sèrusiaux et al. 2004: 39.

Thallus pendent, to 20 cm long, whitish grey to greyish brown, basal parts often brownish, dull. Branching irregular, fairly dense, without distinct main branches, angles between branches acute to obtuse, branches often delicate, 0.15–0.3 mm diam. Soralia tuberculate or fissural. Pseudocyphellae sparse, inconspicuous. Apothecia rare, to 2 mm diam.; disc brown, plane, becoming convex. Spores ellipsoid, 6–9 × 4–5 µm. Pycnidia uncommon, usually aggregated, black and shiny.

Chemistry. Cortex, medulla and soralia PD+ red; fumarprotocetraric acid.

Habitat. On both coniferous and deciduous trees and on mossy rock faces.



Distribution. Very insufficiently known. Oceanic. **D:** *VJy ØJy*. **F:** *A V U EK St EH ES EP PK KP Kn OP PeP*. **N:** *Op Bu Vf Te VA Ro Ho SF MR ST NT SNo Tr*. **S:** *Sk Klm Bh Upl Dlr Jmt.* Europe, Asia, western North America.

Note. Recognized by the pale colour and strong PD+ red reaction in the cortex. According to DNA data potentially conspecific with *B. capillaris*, *B. chalybeiformis*, *B. fuscescens*, *B. implexa* and *B. lanestris*. See also Note under *B. fuscescens*.

16. **Bryoria tenuis** (E.Dahl) Brodo & D.Hawksw.

Opera Bot. 42: 112 (1977). – *Alectoria tenuis* E.Dahl, Meddel. Grønland 150(2): 144 (1950). – Type: Greenland, Julianehåb (Quaqortoq) District, Igalikfjord, Eqaluit, 1937 Dahl (O holotype).

F: hentoluppo **N:** langt trollskjegg **S:** långt broktagel

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

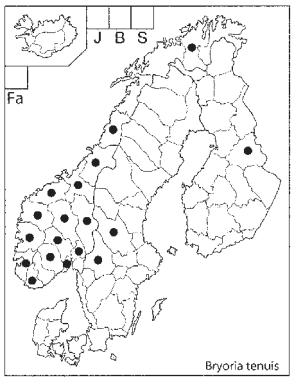
Literature: Brodo & Hawksworth 1977: 112–114; Hermansson, Hotade och sällsynta växter i Dalarna: 468–471 (2008); Jørgensen, Svensk Bot. Tidskr. 66: 199–200 (1972); Jørgensen & Ryvarden, Årbok Univ. Bergen, mat.-nat. ser. 1969(10): 7–9 (1970); Myllys et al., Graphis Scripta 18: 25–26 (2006); Thor & Arvidsson, Rödlistade lavar i Sverige: 76–77 (1999).

Figs: Brodo & Hawksworth 1977: 112; Hermansson 2008: 468; Jørgensen & Ryvarden 1970: 6, C.

Thallus erect, sometimes becoming pendent, to 4–7 cm long, bicolorous, basal parts black, apical parts pale brown to brown, shiny. Main branches distinct, thin, tertiary branches absent or poorly developed, angles between the branches acute, lateral spinules sometimes present. Soralia absent. Pseudocyphellae dark and inconspicuous. Apothecia rare, to 1.5 mm diam.; disc yellowish brown to reddish brown, concave to convex. Spores subglobose to ellipsoid, 7–10 × 5–7 µm. Pycnidia unknown.

Chemistry. Cortex and medulla PD+ red; fumarprotocetraric acid.

Habitat. On rocks or on branches of trees in humid habitats.



Distribution. Rare, mainly in coastal Norway. **Gr. F:** *Kn*. **N:** *Ak He Op Bu Vf Te VA Ro Ho SF MR ST NT SNo VFi*. **S:** *Vrm Dlr*. Europe, Asia, North America. Oceanic.

Note. Closely related to *B. bicolor*, but lacks tertiary branches and has acute branch angles. For differences with *B. smithii*, see that species. The Scandinavian material on rocks is closely similar to the saxicolous type from Greenland, but the often finer, longer, hanging thalli on trees in humid forests are morphologically more similar to *Bryoria asiatica* (DR) Brodo & D.Hawksw., a matter that needs further studies.

Cetraria

A. Thell & I. Kärnefelt

Cetraria Ach.

Methodus: 292 (1803). – Type: *Cetraria islandica* (L.) Ach.

Syn. *Coelocaulon* Link

I: fjallagrös **S:** islandslavar

Literature: Albertson, Acta Phytogeogr. Suec. 20: 221–222 (1946); Brodo et al., Lich. N. Am.: 213–215 (2001); Kärnefelt, Opera Bot. 46: 1–150 (1979); Kärnefelt et al., Pl. Syst. Evol. 183: 113–160 (1992); Kärnefelt et al., Bryologist 96: 396–399 (1993); Mattsson, Svensk Bot. Tidskr. 82: 29–30; Bryologist 94: 261–269 (1991); Poelt & Vězda, Bibl. Lichenol. 16: 126–134 (1981); Thell et al., Folia Cryptog. Estonica 36: 95–106 (2000); Thell et al. Lichenologist 41: 502−503 (2009).

Thallus foliose to fruticose, erect, greyish to greenish brown to blackish. Lobes narrow, often terete and almost isodiametric to broad and dorsiventral, sometimes canaliculate. Cortex paraplechtenchymatous, in some species overlaying a prosoplectenchymatous layer. Soralia rare. Pseudocyphellae common, often conspicuous. Ascomata apothecia, zeorine, ± marginal, rare in some species. Asci clavate, of *Lecanora*-type, usually 8-spored. Spores simple, ellipsoid, colourless. Conidiomata pycnidia, blackish, immersed in marginal projections. Conidia fusiform, citriform, rarely dumbbell-shaped. Photobiont *Asterochloris* or *Trebouxia*.

Chemistry. Fumarprotocetraric, lichesterinic and protolichesterinic acids.

Note. The genus is a characteristic element in arctic and boreal vegetation in the northern hemisphere. A few species also occur in cold areas of the southern hemisphere. The seven species occurring in the Nordic countries could be divided into three groups: the erect, rather high, foliose *C. ericetorum* and *C. islandica*; the low, narrowly foliose or fruticose *C. aculeata*, *C. muricata*, *C. nigricans* and *C. odontella* and the small, cusion-like, foliose *C. sepincola*. The latter differs from other *Cetraria* species by having dumbbell-shaped instead of fusiform conidia and does not belong to *Cetraria* s. str.

1. Thallus foliose or fruticose, erect; on the ground 2
– Thallus foliose, forming small cusions; on twigs ..... 8. *C. sepincola*
2. Thallus fruticose; branches more or less isodiametric 3
– Thallus erect foliose; branches dorsiventral 4
3. Forming irregular tufts; pseudocyphellae distinct ..... 1. *C. aculeata*
– Forming cushion-shaped tufts; pseudocyphellae minute ..... 5. *C. muricata*
4. Cilia rare, to c. 0.5 mm long; pycnidia projections common 5
– Cilia common, 0.5–2 mm long; pycnidia projections short and rare ..... 6. *C. nigricans*
5. Lobes 1–10 mm wide, sparsely branched with small lateral branches 6
– Lobes very narrow, to 1 mm wide; irregularly and frequently branched; cushion-shaped tufts ..... 7. *C. odontella*
6. Pseudocyphellae marginal and laminal, most frequent on the lower surface 7
– Pseudocyphellae mainly as a continuous line along the margins of the lower surface ..... 2. *C. ericetorum* subsp. *ericetorum*
7. Lobes canaliculate to subtubular; edges often fused; margins without a distinct ledge ..... 3. *C. islandica* subsp. *crispiformis*
– Lobes slightly canaliculate to flat; edges not fused; margins with a distinct ledge ..... 3. *C. islandica* subsp. *islandica*

1. **Cetraria aculeata** (Schreb.) Fr.

Syst. Orb. Veg.: 239 (1825). - *Lichen aculeatus* Schreb., Spic. Fl. Lips.: 125 (1771). Type: Icon in Dillenius, Hist. Musc.: tab. 17, fig. 31 B, 1742 (lectotype, Laundon, Lichenologist 16: 216, 1984); without locality, corresponding specimen in Herb. Dillenius (OXF epitype, Thell & Kärnefelt, Nordic Lichen Flora 4: 139. 2011).

Syn. *Cetraria racemosa* (Lynge) Øvstedal, *Coelocaulon aculeatum* (Schreb.) Link, *Cornicularia aculeata* (Schreb.) Ach., *Cornicularia tenuissima* (L.) Räsänen

D: grubet tjørnelav **F:** hietaokajäkälä **I:** sandkræða **N:** groptagg **S:** hedlav

Literature: Kärnefelt, Opera Bot. 86: 51–62 (1986); Kärnefelt et al. 1993: 399; Thell et al. 2000: 95–106; Thell et al., Mycol. Progr. 1: 349 (2002); Øvstedal et al., Sommerfeltia 33: 132 (2009).

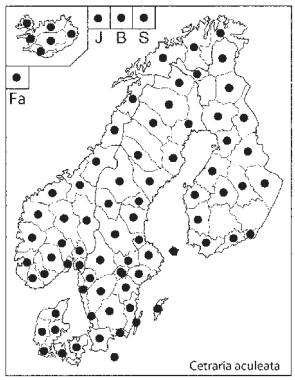
Figs: Brodo et al. 2001: 215; Hinds & Hinds 2007: 144; Krog et al. 1994: 174; Moberg & Holmåsen 1990: 79; Sérusiaux et al. 2004: 41; Wirth 1995: 269.

Thallus fruticose, erect, often forming more or less aggregated tufts, to 8 cm high, richly dichotomously branched, brown to dark brown, basal portions usually reddish, rather glossy. Branches mainly terete, irregular, more or less isodiameteric, 0.3–2 mm wide, hollow or with rather loose medullary hyphae. Soralia rare. Pseudocyphellae common and distinct, to 1 mm long, white, somewhat depressed (often in deep pits). Apothecia ± rare, to 5 mm diam.; disc concolorous with the thallus. Spores ellipsoid, 5.5–6.5 × 2.5–3.5 µm. Pycnidia blackish, immersed in short, marginal projections. Conidia fusiform, 5 × 1.5 µm.

Chemistry. Cortex C–, K–, KC–, PD–. Medulla C–, K–, KC–, PD–; lichesterinic and protolichesterinic acids, occasionally minor amounts of nephrosterinic and isonephrosterinic acids (by HPLC).

Habitat. On the ground or on soil over rocks in dry and sunny localities, on acid as well as more basic substrates.

Distribution. Fairly common in central Sweden, SW Finland, and along the south coast of Norway, but decreasing towards the north where the inland localities are very scarce. **D:** *NJy ØJy VJy SJy Fyn Sjæ Brn*. **Gr. Fa. F:** *A V U EK St EP PH PS PK KP Kn OP PeP 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.* **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 PL LuL TL.* Almost cosmopolitan, occurring in all bio-climatic zones, except tropical, in all continents. Most common in temperate areas and with slight oceanic preferences. In Europe most frequent in the western part, including the British Isles and northern Atlantic islands.



Note. A variable species sometimes difficult to separate from the slightly smaller and more densely branched *C. muricata*, which has smaller pseudocyphellae, hardly visible without a lens.

2. **Cetraria ericetorum** Opiz subsp. **ericetorum**

Seznam: 173 (1852). – Type: Svecia [Sweden], Swartz (H-ACH 1523B lectotype, Kärnefelt, Opera Bot. 46: 75, 1979).

Syn. *Cetraria crispa* (Ach.) Nyl., *Cetraria islandica* var. *crispa* Ach., *Cetraria tenuifolia* (Retz.) R.Howe

D: smal kruslav **F:** pikkuhirvenjäkälä **N:** smal islandslav **S:** smal islandslav

Literature: Ahti, Ann. Bot. Fenn. 1: 19 (1964); Kärnefelt 1979: 75–82; Kristinsson, Bryologist 72: 344–357 (1969).

Figs: Kärnefelt 1979: 10, E–F, 77, Moberg & Holmåsen 1982: 75; Wirth 1995: 265.

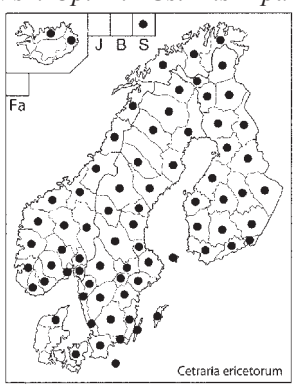
Thallus fruticose, erect, often forming rather dense tufts, to 3–8 cm high, dichotomously branched, more frequently in apical parts. Lobes narrow, canaliculate, to subtubular, glossy, 1–2 mm wide; apothecia-bearing lobes considerably broader and flat. Lower (outer) surface brown to dark brown, the middle parts often lighter, the basal portions reddish. Upper surface concolorous with the lower, but usually somewhat darker in upper parts. Marginal, pycnidia-bearing projections common, rarely longer than 0.5 mm. Soralia rare or absent. Pseudocyphellae marginal, rarely laminal, ± common, often more or less continuous along the margin of the lower surface, or as irregular dots.

Apothecia submarginal, usually close to tips of broad lobes, ± rare, to 10 mm diam.; disc concolorous with the thallus. Spores ellipsoidal, 5–9 × 2–4 µm. Pycnidia immersed in marginal projections, dark brown, mostly empty. Conidia fusiform, 6–7.5 × 1 µm.

Chemistry. Cortex C–, K–, KC–, PD–. Medulla C–, K–, KC–, PD–; lichesterinic and protolichesterinic acid.

Habitat. Growing mainly on the ground in open, dry, and ± acid situations.

Distribution. Amphi-atlantic, boreal-alpine, most common in northern boreal Fennoscandia. **D:** *NJy 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:** IAu 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 PL LuL TL*. Known eastwards to the Ural Mountains and southwards to northern Italy. Rare outside Europe, with scattered localities in northeastern North America and an isolated occurrence in westernmost Mongolia. However, subsp. *reticulata* (Räsänen) Kärnefelt is vicarious in North America and subsp. *patagonica* Kärnefelt in Patagonia.



Note. Easily distinguished from its closest relative *C. islandica*, at least when typical, by the narrower lobes and the marginal pseudocyphellae.

3. **Cetraria islandica** Ach.

Methodus: 293 (1803). – *Lichen islandicus* L., Sp. Pl. 2: 1145 (1753). – Type: (LINN 1273.97 lectotype, Howe, Bull. Torrey Bot. Club 39: 201 (1912).

D: islandsk kruslav **N:** islandslav **S:** islandslav

subsp. **islandica**

F: isohirvenjäkälä **I:** fjallagrös

Literature: Fries, Lich. Scand.: 98 (1871); Kärnefelt 1979: 98–107; Kristinsson, Bryologist 72: 344–357 (1969); Kujala, Commentat. Inst. Forest. Fenn. 59: 103 (1964).

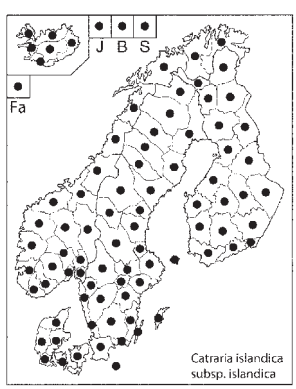
Figs: Brodo et al. 2001: 218; Hansen & Andersen 1995: 20; Kärnefelt 1979: 14 B–C, 100, 102–103; Rikkinen 2008: 65 Sérusiaux et al. 2004: 41; Wirth 1995: 267.

Thallus foliose, erect, very variable, often forming rather dense tufts, 3–6 cm high, occasionally to 12 cm, dichotomously branched with fairly long lateral branches, glossy. Lobes to 10 mm wide, fertile lobes to 45 mm, almost flat to canaliculate, forming rather broad subtubular branches, smooth or often slightly ridged or wrinkled. Lower (outer) surface brown to dark brown to greyish green, basal parts reddish, smooth or slightly ridged. Upper surface concolorous with the lower or slightly darker. Pycnidia-bearing projections present along the margins, common to rare, to 1 mm long. Soralia rare, laminal or marginal, to 1 mm long. Pseudocyphellae rather common, forming elongate, irregular, distinctive white spots on the surface and the margins. Apothecia ± common, to 20 mm diam.; disc concolorous with the lobes. Spores ellipsoidal, 6–10 × 3.5–5 µm. Pycnidia immersed in marginal projections, dark brown, mostly empty. Conidia fusiform, 6–7 × 1 mm.

Chemistry. Cortex C–, K–, KC–, PD–. Medulla C–, K+ orange yellowish, KC–, PD– or PD+ orange red; fumarprotocetraric, lichesterinic and protolichesterinic acid.

Habitat. On the ground in open, dry, ± acid situations, locally very common, occasionally dominating the vegetation, rarely on twigs of small trees and shrubs.

Distribution. Present in the whole Nordic area. Very common in open boreal forests and rock outcrops, where most fertile specimens are seen. Sometimes in rather mesic and shaded forests, also on grasslands, bogs, and sand dunes. **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*. Northern circumpolar, but absent or rare in large areas in central and eastern Canada and Greenland, or less abundant than subsp. *crispiformis* or *Cetraria laevigata* Rass., a closely related species. In the Far East the species is represented by subsp. *orientalis* (Asahina) Kärnefelt and in the Southern Hemisphere by subsp. *antarctica* Kärnef.

Note. C. islandica subsp. *islandica* and subsp. *crispiformis* differ in the branching pattern and general appearance of the lobes. In subsp. *islandica* the side lobes are longer and fewer, the main lobes are often flatter, and the pseudocyphellae larger. The predominantly laminal pseudocyphellae in *C. islandica* is the best distinguishing character towards *C. ericetorum*.

It is primarily subsp. *islandica* that has been used for folk medicine, cattle forage, human emergency food or production of alcohol.

subsp. **crispiformis** (Räsänen) Kärnefelt

Opera Bot. 46: 94 (1979). – *Cetraria islandica* var. *crispiformis* Räsänen, Ann. Bot. Soc. Zool.-Bot. Fenn. Vanamo 18(1): 19 (1943). – Type: Russia, Murmansk Region, Lapponia petsamoënsis, Petsamo, Kervanto, Lupuniemi, 1938 Räsänen (H lectotype, Kärnefelt, Opera Bot. 46: 94, 1979).

F: sirohirvenjäkälä **I:** klóungur

Literature: Fries, Lich. Scand.: 98 (1871); Kärnefelt 1979: 94–98; Kristinsson, Bryologist 72: 344–357 (1969).

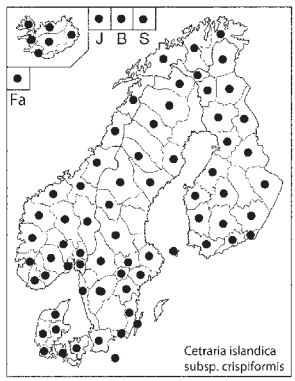
Figs: Brodo et al. 2001: 217; Holien & Tønsberg 2006: 35; Kärnefelt 1979: 11 F, 95.

Thallus fruticose, erect, often forming rather dense tufts, 3–10 cm high, dichotomously branched, with short lateral branches. Lobes rather narrow, canaliculate, 1–5 mm wide, glossy. Lower (outer) surface brown to dark brown to pale greenish, basal parts reddish, pitted and ridged. Upper surface concolorous with the lower but smoother. Marginal, pycnidia-bearing projections along the margins common, to 1 mm long. Soralia not observed. Pseudocyphellae rather common, as irregular white spots on the surface, rarely on the margins of the lower surface. Apothecia very rare, to 20 mm diam.; disc concolorous with the thallus. Spores not observed. Pycnidia terminal on projections, dark brown, mostly empty. Conidia fusiform, 6–7 × 1 µm.

Chemistry. Cortex C–, K–, KC–, PD–. Medulla C–, K+ orange yellowish, KC–, PD– or PD+ orange red; fumarprotocetraric, lichesterinic and protolichesterinic acid.

Habitat. On the ground, occasionally together with subsp. *islandica*, in open, dry, ± acid situations.

Distribution. Circumpolar with oceanic preferrances. **D:** *NJy ØJy VJy SJy Fyn Sjæ Brn*. **Gr. Fa. F:** *A V U EK St EH ES EP PH 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 Klm Bh Vg Ög Nrk Srm Vrm Vsm Upl Dlr Ång Hrj Jmt Vb ÅsL PL LuL TL*. Southwards to central North America and the Alps, however, rare in central Alps.



Note. See Note of subsp. *islandica*.

4. **Cetraria muricata** (Ach.) Eckfeldt

Bull. Torrey Bot. Club 22: 240 (1895). – *Lichen muricatus* Ach., Lichenogr. Suec. Prodr.: 214 (1799 ‘1798’). – Type: Svecia (H-ACH 1865A lectotype, Kärnefelt, Opera Bot. 86: 68, 1986).

Syn: *Coelocaulon muricatum* (Ach.) J.R.Laundon, *Cornicularia muricata* (Ach.) Ach.

D: tue-tjørnelav **F:** pikkuokajäkälä **I:** melakræða **N:** busktagg **S:** tuvad hedlav

Literature: Kärnefelt 1986: 68–73; Kärnefelt et al. 1993: 400.

Figs: Hansen & Andersen 1995: 34; Holien & Tønsberg 2006: 35; Krog et al. 1994: 174; Wirth 1995: 269.

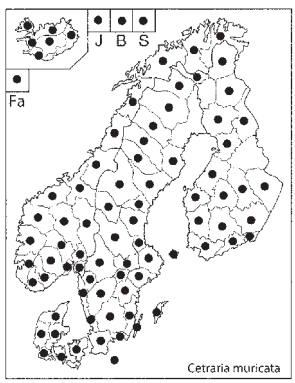
Thallus fruticose, erect, forming dense, cushion-shaped tufts, to 5 cm high, brown to brownish black, ± glossy, densely dichotomously branched. Branches mainly terete, irregular, more or less isodiametric, hollow or with rather loose medullary hyphae. Main axes

0.3–0.5 mm wide, side branchlets 0.1–0.3 mm wide, anastomosing and smooth. Soralia rare. Pseudocyphellae scattered, commoner on the side branches, to 0.3 mm long, flat to slightly depressed. Spinules scattered, 0.5–1 mm long. Apothecia ± common, to 8 mm diam.; disc concolorous with the thallus. Spores ellipsoid, 5.5–6.5 × 2.5–3.5 µm. Pycnidia blackish, terminal on short projections. Conidia fusiform, 5–6 × 1–1.5 µm.

Chemistry. Cortex C–, K–, KC–, PD–. Medulla C–, K–, KC–, PD–; lichesterinic and protolichesterinic acid.

Habitat. On the ground in sunny localities, most frequently on acid substrates but also on calcareous soil in heaths and steppes.

Distribution. Temperate to arctic, common in parts of Denmark, southern Sweden, southern Norway and SW Finland, but otherwise rare to scattered. **D:** *NJy ØJy VJy SJy Fyn Sjæ Brn*. **Gr. Fa. F:** *A V U EK St EH ES EP PH PS PK KP OP PeP 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*. **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 ÅsL LyL PL TL*. Occurring disjunctively on most continents, but not present in East Asia and Australia.



Note. C. muricata usually forms dense, cushion-like tufts. It has minute pseudocyphellae, almost invisible without a lens, but may at times be difficult to distinguish from *C. aculeata*. In the Nordic countries *C. muricata* is usually more abundant than *C. aculeata*, except for some coastal areas.

5. **Cetraria nigricans** Nyl.

Herb. Mus. Fenn.: 109 (1860). – Type: Russia, Murmansk Region, Lapponia tulomensis, Kola, 1843 F. Nylander (H-NYL 36333 lectotype, Kärnefelt, Opera Bot. 46: 117, 1979).

Syn. *Cetraria capitata* Lynge, *Cetraria odontella* var. *nigricans* (Nyl.) Lynge

F: tunturihirvenjäkälä **N:** svartskjerpe **S:** svart islandslav

Literature: Hakulinen, Ann. Bot. Fenn. 3: 184–185 (1966); Kärnefelt 1979: 117–121.

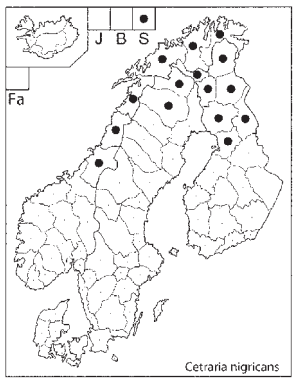
Figs: Hansen & Andersen 1995: 21; Kärnefelt 1979: 118.

Thallus foliose, erect, forming ± dense semiglobose tufts, to 3 cm high. Lobes 0.5–1.5 mm wide, rarely wider, dichotomously branched, canaliculate. Lower (outer) surface brown to pale brown to grey, usually smooth and dull. Upper (inner) surface dark brown to blackish, hardly visible. Marginal, pycnidia-bearing projections narrow and inconspicuous, scattered, to 0.1 mm long. Cilia common and conspicuous, to 2 mm long, occasionally dichotomously branched. Soralia absent but sometimes with soralia-like spots caused by an infection (see Note). Pseudocyphellae rather narrow, marginal. Apothecia ± rare, to 10 mm diam.; disc concolorous with the thallus. Spores ellipsoid, 5 × 2.5 µm. Pycnidia marginal, often empty. Conidia fusiform, 6–7.5 × 1 µm.

Chemistry. Cortex C–, K–, KC–, PD–. Medulla C–, K–, KC–, PD–; lichesterinic and protolichesterinic acid.

Habitat. On the ground, over rocks and soil, in dry, acid and open alpine and arctic situations.

Distribution. Restricted to northernmost Fennoscandia and Svalbard, where it is locally common. **Gr. F:** *OP PeP Ks KiL SoL EnL InL*. **N:** *NT SNo NNo Tr VFi ØFi*. **AI:** *Sb*. **S:** *LuL TL*. Arctic-alpine circumpolar tundra species, without disjunct occurrence in the mountain chains, though reaching as far south as the Gaspé Peninsula in eastern Canada.



Note. Easily recognized by its densely tufted habit, the shiny blackish colour, and the narrow but dorsi-ventral and canaliculate lobes with long cilia. The occasional capitate "soralia" are caused by an infection of the fungus *Taeniolella rolfii* Diederich & Zhurb.

6. Cetraria odontella (Ach.) Ach.

Syn. Methodus: 230 (1814). – *Lichen odontellus* Ach., Lichenogr. Suec. Prodr.: 213 (1799 '1798'). – Type: Suecia (H-ACH 1524 lectotype, Kärnefelt, Opera Bot. 86: 35, 1986).

Syn. *Coelocaulon odontellum* (Ach.) R.Howe, *Cornicularia odontella* (Ach.) Röhl.

F: okahirvenjäkälä **N:** tannlav **S:** dvärghedlav

Literature: Kärnefelt 1986: 35–39; Østhagen, Blyttia 34: 194 (1976); Vainio, Meddel. Soc. Fauna Fl. Fenn. 10: 254–255.

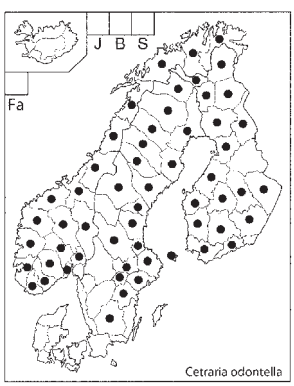
Figs: Kärnefelt 1986: 36; Krog et al. 1994: 132.

Thallus foliose, erect, often forming dense, cushion-like tufts, to 1–2 cm high, divided from the base in two main branches. Lobes flat, narrow, 0.1–0.5 mm wide, rarely to 1 mm, slightly canaliculate, dichotomously or irregularly and frequently branched with lateral branches in all directions; medulla loose. Upper and lower surfaces similar, brown to dark brown, rather glossy, basal parts usually reddish. Marginal, pycnidia-bearing projections very short. Cilia sparse, sometimes branched, to 0.5 mm long. Soralia absent. Pseudocyphellae rather small, indistict, on the margins of the lower surface. Apothecia ± rare, to 1 mm diam.; disc concolorous with the thallus. Spores ellipsoid, 7 × 4.5 µm. Pycnidia blackish, on short projections. Conidia fusiform, 3.6–4.8 × 0.5 µm.

Chemistry. Cortex C–, K–, KC–, PD–. Medulla C–, K–, KC–, PD–; lichesterinic and protolichesterinic acids.

Habitat. Mainly on the ground or on rocks in open, dry, ± acid situations.

Distribution. Distribution centre in eastern Fennoscandia, primarily in the archipelagos of the Baltic sea between Finland and Sweden. **Gr. F:** *A V U St EH ES EP PH PS PK KP OP PeP Ks KiL SoL EnL InL*. **N:** *Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi.* **S:** *SmI Ög Nrk Srm Vsm Upl Dlr Gst Hls Mpd Ång Jmt Vb Nb ÅsL LyL PL LuL TL*. Known from scattered localities in the Pyrenees, northern Eurasia to Taiwan, Alaska and Central Yukon, Venezuela and Peru.



Note. Easily recognized by the the flattened branches. Its closest relative is the Australian *Cetraria australiensis* Kärnefelt.

7. Cetraria sepincola (Ehrh.) Ach.

Methodus: 297 (1803). – *Lichen sepincola* Ehrh., Hannover. Mag. 21: 203 (1783) [= Beiträge zur Naturkunde 2(14): 95 (1788)]. – Type: [Sweden] Upsaliae, Ehrhart, Phytophylacium Ehrhartianum no. 90 (UPS neotype, Thell & Kärnefelt, Nordic Lichen Flora 4: 139, 2011).

Syn. *Cetraria scutata* (Wulfen) Poetsch non auct., *Cetraria* '*saepincola*', *Tuckermannopsis sepincola* (Ehrh.) Hale

F: pikkuröyhelö **I:** kvistagrös **N:** bjørkelav **S:** gärdsgårdslav

Literature: Kärnefelt et al. 1992: 154.

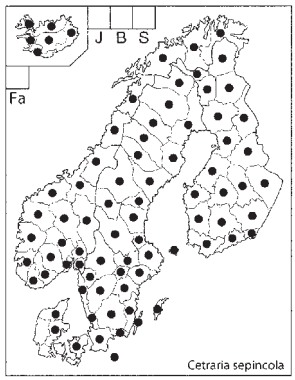
Figs: Brodo et al. 2001: 696; Hansen & Andersen 1995: 22; Hinds & Hinds 2007: 476; Moberg & Holmåsen 1990: 77; Holien & Tønsberg 2006: 36; Rikkinen 2008: 147; Wirth 1995: 269.

Thallus almost monophyllous, erect, forming dense, 0.5–2 cm high cushons, often together in colonies. Lobes ascending, rounded, flat to slightly canaliculate, shallowly dichotomously branched. Upper surface yellowish green, olivaceous or reddish brown to to dark brown; wrinkled, rather glossy. Lower surface pale brown, almost whitish towards the periphery, wrinkled, with few pale rhizines, cilia rare. Soredia absent. Pseudocyphellae concentrated to the margins of the apothecia. Apothecia very frequent, submarginal to lateral, often terminal, to 8 mm diam.; disc concolorous with the thallus. Spores ellipsoid, 6–10 × 3–6 µm. Pycnidia blackish, marginal, slightly protruding, mostly empty. Conidia with apical swellings, dumbbell-shaped, 5–7 × 1 mm.

Chemistry. Cortex C–, K–, KC–, PD–. Medulla C–, K–, KC–, PD–; lichesterinic and protolichesterinic acids.

Habitat. In open situations on twigs of trees and shrubs, often on *Betula*, *Sorbus*, *Salix* or *Alnus*, also lignicolous, rarely saxicolous.

Distribution. Common in most parts of Fennoscandia and Iceland. Less frequent in Denmark. **D:** *NJy ØJy 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*. **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 LL TL*. Widespread, primarily boreal in the Northern Hemisphere, but also in the Alps, uncommon in arctic and temperate regions.



Note. Easily recognized by the small, richly fertile cushions, commonly on thin twigs of *Betula*. According to recent molecular work it does not belong in the genus *Cetraria*, but its placement is not clarified.

Cetraria laevigata Rassad.

Matér. Bot., Sect. Crypt., Inst. Komarov, Ac. Sc. URSR 5: 133 (1945).

Literature: Kärnefelt 1979: 111–117.

Not treated in this flora as it is not known from the Nordic area but frequent in arctic Russia and North America including Greenland, The species resembles *C. ericetorum* and *C. islandica* but differs by a more slender, smooth and canaliculated growth form. The pseudocyphellae form a continuous line along the margin like in *C. ericetorum*, from which it usually differs also by a PD+ red reaction.

Cetrariella

A. Thell & I. Kärnefelt

Cetrariella Kärnefelt & A.Thell

in Kärnefelt at al., Bryologist 96: 402–403 (1993). – Type: *Cetrariella delisei* (Bory ex Schaer.) Kärnefelt & A.Thell

Literature: Kärnefelt et al., Bryologist 96: 402 (1993); Kärnefelt & Thell, Bibl. Lichenol. 75: 27–32 (2000); Thell et al., Symb. Bot. Ups. 34(1): 439–440 (2004); Thell et al., Lichenologist 41: 489–511 (2009).

Thallus foliose, adnate to erect, greyish brown to blackish. Lobes narrow to broad, convex to canaliculate, ± dorsiventral. Cortex paraplectenchymatous hyphae. Ascomata apothecia, zeorine, marginal or submarginal; disc concolorous with thallus. Asci broadly clavate, of *Lecanora*-type, 8-spored. Spores simple, ellipsoid, colourless. Conidiomata pycnidia, blackish, immersed or prominent. Conidia with one thickening, fusiform or sublageniform, 3.5–9 × 0.5–1.5 µm. Photobiont trebouxioid.

Chemistry. α-collatolic, alectoronic, gyrophoric and hiascic acids.

Note. This genus includes three species with wide arctic-boreal distributions in the Northern Hemisphere. The two terricolous species *Cetrariella delisei* and *C. fastigiata* are closely related and characterized by an erect foliose morphology, bottle-shaped conidia and presence of gyrophoric and hiascic acids. The position of *C. commixta* in *Cetrariella* was well supported in a recent analysis (Nelsen et al. 2011, in press). However, it differs by its saxicolous habit and a dorsiventral thallus from *C. delisei* and *C. fastigiata*, and by several characters, such as a saxicolous habit, a dorsiventral thallus, citriform conidia and presence of α-collatolic or alectoronic acid.

1. Thallus erect foliose; terricolous 2
– Thallus adnate foliose, saxicolous ..... 1. *C. commixta*
2. Lobes canaliculate; lobe tips pointed..... 2. *C. delisei*
– Lobes cucullate; lobe tips obtuse..... 3. *C. fastigiata*

1. **Cetrariella commixta** (Nyl.) A.Thell & Kärnefelt

Mycol. Progr. 3: 309 (2004). – *Platysma commixtum* Nyl., Syn. Meth. Lich. 1(2): 310 (1860). – Type: Finland, Uusimaa, Helsingfors (Helsinki), 1860 Nylander (H lectotype, Thell, Nova Hedwigia 60: 417, 1995).

Syn. *Cetraria commixta* (Nyl.) Th.Fr., *Cetraria fahlunensis* auct. fenn., *Melanelia commixta* (Nyl.) A.Thell

F: tummaröyhelö **N:** brunberglav **S:** stor hällav

Literature: Kärnefelt et al., Pl. Syst. Evol. 180: 153–154 (1992); Thell, Nova Hedwigia 60: 417–418 (1995); Thell et al., Mycol. Progr. 3: 309, 311 (2004).

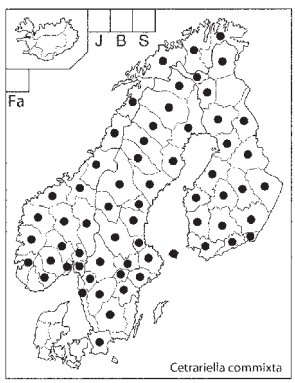
Figs: Thell 1995: 411, 3–4; Holien & Tønsberg 2006: 53.

Thallus dorsiventral, to 15 cm diam. Lobes elongate, somewhat convex, 1–4 mm wide. Upper surface brownish black, rather glossy; lower surface light brown, somewhat darker in central parts, with sparse rhizines. Pseudocyphellae small, whitish, usually laminal. Apothecia submarginal, to 5 mm diam.; disc concolorous with the thallus. Spores ellipsoid, 7–10.5 × 4.5–6.5 µm. Pycnidia immersed or slightly raised, common, more frequently marginal than laminal. Conidia fusiform, 3.5–6 × c. 1.5 µm.

Chemistry. Cortex C−, K−, KC−, PD−. Medulla C–, K–, KC+ red or KC–, PD–; α-collatolic or alectoronic acid.

Habitat. On sun-exposed rocks and boulders.

Distribution. Arctic-alpine, scattered in southern lowlands, absent in the temperate zone. **F:** *A V U EK St EH ES EP PH PS PK KP Kn OP PeP Ks KiL EnL InL*. **N:** *Øf Ak He Op Bu Vf Te AA Ro Ho SF MR ST NT SNo NNo Tr VFi ØF*i. **S:** (*Sk*) *SmI Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Eurasia and North America, a widespread circumboreal and arctic species.



Note. Similar to *Melanelia hepatizon* but distinguished by a combination of characters, such as canaliculate lobes, more pronounced and commonly marginal pycnidia and pale lower surface. Based on anatomy and ascus type it was included in *Melanelia*. However, the deviating citriform or rarely sublageniform conidia correlated with DNA data supports its inclusion in *Cetrariella*. A DNA study, based on ITS, β-tubulin and GAPDH sequen-ces, suggest that *C. delisei* is the most closely related species in the Nordic countries.

2. **Cetrariella delisei** (Schaer.) Kärnefelt & A.Thell

in Kärnefelt et al., Bryologist 96: 403 (1993). – *Cetraria islandica* var. *delisei* Bory ex Schaer., Enum. Crit. Lich. Eur.: 114 (1850). – Type: Canada, Newfoundland ("Terreneuve"), 1828 Despréaux (UPS lectotype, Kärnefelt, Opera Bot. 46: 68, 1979).

Syn. *Cetraria delisei* (Bory ex Schaer.) Nyl., *Cetraria hiascens* (Fr.) Th.Fr.

F: suohirvenjäkälä **I:** mundagrös **N:** snøskjerpe **S:** flikig islandslav

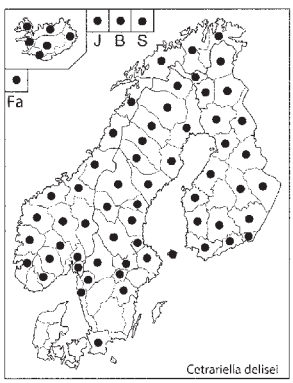
Literature: Hasselrot, Acta Phytogeogr. Suec. 33: 25–29, 115–118 (1953); Fries & Waldheim, Svensk Bot. Tidskr. 49: 348–349 (1955); Kärnefelt, Opera Bot. 46: 68–74 (1977); Kärnefelt et al., Pl. Syst. Evol. 180: 148 (1992); Kärnefelt et al. 1993: 403.

Figs: Brodo et al. 2001: 219; Hansen & Andersen 1995: 19; Hinds & Hinds 2007: 148; Kärnefelt 1979: 10, 68; Holien & Tønsberg 2006: 37; Moberg & Holmåsen 1990: 74.

Thallus erect, richly dichotomously branched, often forming rather dense tufts, to 5–8 cm high. Lobes weakly canaliculate, apically very narrow, 0.5–1 mm wide, middle and lower parts 2–8 mm wide, brown to dark brown in apical parts, gradually more yellowish in lower parts. Lower surface with longitudinal ridges, dull; upper surface smoother, rather glossy; medulla lax. Marginal pycnidia-bearing projections scattered, to 0.5 mm long. Soralia rare. Pseudocyphellae distinct on the lower surface. Apothecia rare, submarginal on expanded lobes, to 17 mm diam.; disc concolorous with the surrounding thallus. Spores ellipsoidal, 6–8.5 × 2.5 µm. Pycnidia blackish brown, on projections. Conidia bottle-shaped, 7–9 × 0.5–1.5 µm.

Chemistry. Cortex C−, K−, KC−, PD−. Medulla and pseudocyphellae C+ pale reddish, K–, KC+ reddish, PD–; gyrophoric and hiascic acids.

Habitat. Mainly in wet depressions of bogs or fens, especially in the north, occasionally also on rather exposed rock outcrops or alpine heaths.



Distribution. Common in arctic and alpine regions, scattered or rare in most provinces further south and in lowlands. **Gr. Fa. F:** *A V U EK St EH ES EP 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 Bi Sb*. **S:** *Sk Bh Dls Ög Nrk Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL.* In Europe also known from Scotland, the Alps and the Carpathians. It has a circumpolar arctic-alpine distribution, but occurs also in Patagonia and New Zealand.

Note. Differs from the closely related *C. fastigiata* by plane or weakly canaliculate lobes, numerous, not cucullate and distinctive pseudocyphellae both along the margins and on the lower surface.

3. **Cetrariella fastigiata** (Nyl.) Kärnefelt & A.Thell

in Kärnefelt et al., Bryologist 96: 403 (1993). – *Cetraria delisei* subsp. *fastigiata* Delise ex Nyl. in Norrl., Not. Sällsk. Fauna Fl. Fenn. Förh. 13: 325 (1873). – Type: Finland, Enontekiö Lapland, Enontekiö, ('Enontekis'), Hetta, 1867 Norrlin (H lectotype, Kärnefelt, Bot. Not. 130: 128, 1977).

Syn. *Cetraria fastigiata* (Delise ex Nyl.) Kärnefelt, *Cetraria delisei* var. *fastigiata* (Delise ex Nyl.) Vain.

F: aapahirvenjäkälä **N:** brunskjerpe **S:** sumplav

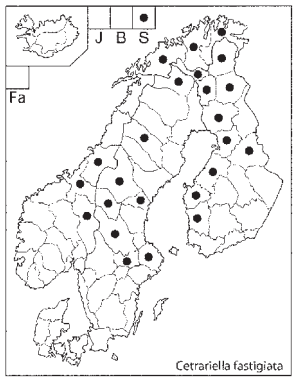
Literature: Kärnefelt et al., Pl. Syst. Evol. 180: 148 (1992); Kärnefelt et al. 1993: 403.

Figs: Hansen & Andersen 1995: 20; Holien & Tønsberg 2006: 37; Thell et al. 2004: 439.

Thallus erect, dichotomously branched, often forming rather dense tufts, usually not over 5 cm high. Lobes cucullate to subtubular, 2–5 mm wide, brown to dark brown in apical parts, gradually more yellowish in lower parts. Lower surface smooth and glossy; upper surface dull and glossy; medulla lax Marginal, pycnidia-bearing projections scattered, to 1 mm long. Soralia absent. Pseudocyphellae infrequent and mainly marginal. Apothecia rare, sub-marginally on expanded lobes, to 10 mm diam.; disc concolorous with the surrounding thallus. Spores ellipsoidal, 6–8.5 × 2.5–3.5 µm. Pycnidia, blackish brown, on projections. Conidia bottle-shaped, 7–9 × 0.5–1.5 µm.

Chemistry. Cortex C−, K−, KC−, PD−. Medulla and pseudocyphellae C+ pale reddish, K–, KC+ reddish, PD–; gyrophoric and hiascic acids.

Habitat. In wet depressions in bogs, and on bare soil in alpine and arctic heaths.



Distribution. Rather common in northern Fennoscandia, rarely extending to central parts but the range is not well known. **Gr. F:** *St EP KP Kn OP PeP KiL SoL EnL InL*. **N:** *He ST NT Tr VFi ØFi*. **AI:** *Sb*. **S:** *Vsm Upl Dlr Mpd Hrj Jmt LyL TL*. Apparently circumpolar but distribution poorly known.

Note. The cucullate habit reminds more of *Flavocetraria cucullata* and the non-Nordic *Cetraria kamzcatica* than of *C. delisei*. Distinguished from *C. delisei* by smoother surface, more obtuse lobes and less distinctive and mainly marginal pseudocyphellae. The species often occur together, but *C. fastigiata* seems to be a weaker competitor than *C. delisei*.

Cetrelia

A. Thell & I. Kärnefelt

Cetrelia W.L.Culb. & C.F.Culb.

Contr. U.S Natl. Herb. 34(7): 490 (1968). – Type: *Cetrelia cetrarioides* (Delise ex Duby) W.L.Culb. & C.F.Culb.

Literature: Culberson & Culberson, Contr. U.S. Natl. Herb. 34(7): 490–505 (1968); Culberson & Culberson, Bryologist 81: 517–523 (1978); Hale, Svensk Bot. Tidskr. 54: 269–272 (1960); Kärnefelt & Thell, Pl. Syst. Evol. 180: 199–200 (1992); Obermayer & Mayrhofer, Phyton (Horn) 47: 231–290 (2007); Randlane & Saag, Lichenologist 23: 113–126 (1991); Symb. Bot. Ups. 34(1): 364, 367–370 (2004); Thell et al., Symb. Bot. Ups. 34(1): 440 (2004).

Thallus broadly foliose, loosely adnate. Lobes rounded. Upper surface greenish or brownish grey. Lower surface black and pitted. Soralia common, laminal. Pseudocyphellae white, laminal. Ascomata apothecia, uncommon, not observed in Nordic material, submarginal, to 7 mm diam.; disc brown. Spores large and ellipsoidal, 12–15 × 7–10 µm. Conidiomata not observed in Nordic material, marginal, slightly raised. Conidia slightly dumbbell-shaped, 5–6 × 1 µm. Photobiont *Trebouxia gigantea*.

Chemistry. Orcinol depsides, in the *C. olivetorum* complex alectoronic and α-collatolic, olivetoric, perlatolic or imbricaric acid present in the different chemotypes, and atranorin. The fourth chemical species characterized by presence of alectoronic and α-collatolic, *C. chicitae*, has so far not been detected in the Nordic countries (Obermayer & Mayrhofer 2007).

Note. The three chemotypes of *Cetrelia* found in the Nordic countries, correspond to *C. cetrarioides* (Duby) W.L.Culb. & C.F.Culb., *C. monachorum* (Zahlbr.) W.L.Culb. & C.F.Culb., and *C. olivetorum*, all belong to the *C. olivetorum* morphotype and are here treated as a single species. The status of the chemical species is still little known. *Cetrelia olivetorum* s. lat. is widespread but almost everywhere rare as in the Nordic countries.

Obermayer & Mayrhofer (2007) made a thorough attempt to find correlating morphological and chemical characters between the four taxa (species) of the *C. olivetorum* complex. Almost 700 specimens from Europe were examined chemically and morphologically. No thalli were found to contain intermediate chemosyndromes. Morphological differences were found with some overlap. The according DNA-investigations have not yet been carried out.

1. **Cetrelia olivetorum** (Nyl.) W.L.Culb. & C.F.Culb.

Contr. U.S. Natl. Herb. 34(7): 490 (1968). – *Parmelia olivetorum* Nyl., Not. Sällsk. Fauna Fl. Fenn. Förhandl. – TYPE: Switzerland ('Helvetia'), [Schleicher?] (H-ACH 1327A, lectotype, Culberson & Culberson, Contr. U.S. Natl. Herb. 34(7): 515, 1968; specified by Hawksworth et al., Taxon 51: 626, 2002).

Syn. *Cetrelia cetrarioides* (Delise ex Duby) W.L.Culb. & C.F.Culb., *Cetrelia chicitae* W.L.Culb., *Cetrelia monachorum* (Zahlbr.) W.L.Culb & C.F.Culb, *Parmelia cetrarioides* (Delise ex Duby) Nyl., *Parmelia monachorum* Zahlbr., *Parmelia olivetorum* Nyl., *Parmelia olivaria* auct.

F: röyhelökarve **N:** praktlav **S:** jätteköldlav

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

Literature: Bjelland et al., Graphis Scripta 8: 5–7 (1997); Degelius, Bot. Not. 1933: 511; Bot. Not. 1942: 297; Culberson, Bryologist 68: 95 (1965); Culberson & Culberson, Syst. Bot. 1: 326 (1976); Jørgensen & Ryvarden, Årbok Univ. Bergen, mat.-nat. ser. 1969 n. 10: 9–11 (1970); Kuusinen et al., Mem. Soc. Fauna Fl. Fenn. 69: 25–27 (1993); Thor & Arvidsson, Rödlistade lavar i Sverige: 108–109 (1999); Tønsberg et al., Sommerfeltia 23: 46–51 (1996); Liljedahl, H. Examensarbete i ämnet naturvårdsbiologi No 146. SLU, Uppsala (2005).

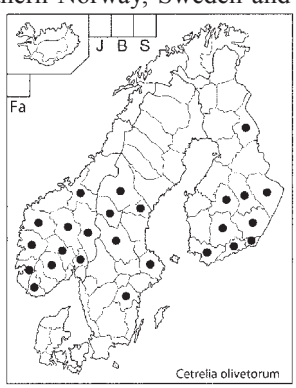
Figs: Brodo et al. 2001: 221; Hinds & Hinds 2007: 150; Sérusiaux et al. 2004: 42; Holien & Tønsberg 2006: 41; Wirth 1995: 276 (*C. cetrarioides*).

THALLUS to 10 cm diam. Lobes to 2 cm wide, rounded, often overlapping, with wavy margins. Upper surface greyish green to brownish. Soralia marginal, in older parts forming a continuous line. Pseudocyphellae laminal, scattered, minute (0.3–0.6 mm diam.), punctiform. Lower surface black, brown towards the margin, with scattered rhizines. APOTHECIA and PYCNIDIA not observed in Nordic material.

Chemistry. Thallus C–, K–, KC– or KC+ pinkish, PD–; olivetoric (in *C. olivetorum* s. str.), perlatolic (in *C. cetrarioides*) or imbricaric acid (in *C. monachorum*).

Habitat. Preferably among mosses on shady, south exposed rocks and boulders in Fennoscandia. In other parts of the distribution range often on bark of deciduous or coniferous trees.

Distribution. Rare in southern Norway, Sweden and Finland. **F:** *V U EK EH ES PH PS PK Ks*. **N:** *Ak He Op Bu Te VA Ro Ho SF ST*. **S:** (*Ög*) (*Upl*) *Dlr Mpd Hrj Jmt*. Spread over Eurasia and eastern and Pacific North America. It is locally common but in most areas rare, and belongs to old-growth forests.



Note. The punctiform pseudocyphellae, sorediate margins and large, overlapping lobes distinguish *C. olivetorum* s. lat. from superficially similar *Platis-matia* and *Parmotrema* species. According to a recent study, the perlatolic acid chemotype is commoner than the olivetoric acid chemotype in Sweden and Finland. The distribution of different chemo-types in Fennoscandia is presented by Bjelland et al. (1997), Kuusinen et al. (1993) and Liljedahl (2005).

Cornicularia

A. Thell & I. Kärnefelt

Cornicularia (Schreb.) Hoffm.

Descr. Pl. Cl. Crypt. 2(2): 36 (1794). – Type: *Cornicularia normoerica* (Gunnerus) Du Rietz

Literature: Kärnefelt, Opera Bot. 86: 76–85 (1986); Kärnefelt et al., Pl. Syst. Evol. 180: 155 (1992); Thell et al., Symb. Bot. Ups. 34(1): 440 (2004).

Thallus fruticose, erect, caespitose, forming tufts from a basal holdfast. Branches flattened, ± dichotomously divided, brownish black. Cortex double-layered, composed of a thin outer paraplechtenchymatous layer, and a very thick inner prosoplectenchymatous layer. Medulla dense. Ascomata apothecia, frequent, blackish, terminal to subterminal, supplied with few, cylindrical projections. Spores broadly ellipsoid, 5–6 × 3–4 µm. Conidiomata pycnidia, frequent, along the margins. Conidia dumbbell-shaped, 6–8 × 1 µm. Photobiont trebouxioid.

Chemistry. No secondary substances (by TLC).

Note. A monotypic genus without any evident close relatives. No close affinities to other genera of the Parmeliaceae. It was assumed to be related with the superficially similar Southern Hemisphere genus *Himantormia* but this is not supported by DNA-investigations.

1. **Cornicularia normoerica** (Gunnerus) Du Rietz

Ark. Bot. 20A(11): 32, 39 (1926). – *Lichen normoericus* Gunnerus, Fl. Norveg. 2(2): 123 (1772). – Type: Norway, Tordevigen, E.H. Kempe (TRH-Gunnerus 973 holotype, Jørgensen, Biblioth. Lichenol. 95: 44, 2007).

Syn. *Cetraria normoerica* (Gunnerus) Lynge, *Cetraria tristis* (Weber) Fr., *Cornicularia tristis* (Weber) Ach.

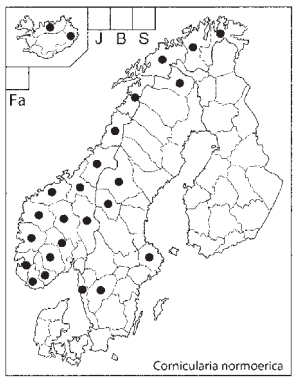
I: klettakræða **N:** nordmørslav **S:** nordmörelav

Literature: Du Rietz, Ark. Bot. 20A(11): 32, 39–41 (1926); Kärnefelt 1986: 79–85.

Figs: Brodo et al. 2001: 289; Kärnefelt 1986: 77, 81; Moberg & Holmåsen 1990: 80.

Thallus erect, caespitose, brownish black, rather dull, forming 1–3 cm high, rather dense tufts, often several individuals together arising from a basal, foliose, rudimentary holdfast, surrounded by a thin prothallus; branches flattened to more or less isodiametric, stiff, to 1 mm wide, sparsely dichotomously to irregularly branched, or unbranched, with knobby margins. Cortex double-layered, composed of a thin, outer paraplechten-chymatous layer, and a c. 100 µm thick, inner prosoplectenchymatous layer of strongly gelatinized hyphae. Medulla dense. Apothecia terminal or subterminal, to 5 mm diam.; disc blackish, with few, cylindrical projections. Spores broadly ellipsoid with more or less blunt ends, 5–6 × 3–4 µm. Pycnidia along the margins. Conidia dumbbell-shaped, 6–8 × 1 µm. Photobiont trebouxioid.

Habitat. On exposed, acid rocks.



Distribution. Along the coasts of Iceland, Norway, and the SW coast of Sweden but also inland in Härjedalen, Jämtland and Torne Lappmark. **I:** *IAu INo*. **N:** *He Op Bu Te AA VA Ro Ho SF MR ST NT SNo NNo Tr Vfi ØFi*. **S:** *Bh Vg* (*Upl*) *Hrj Jmt TL*. In Europe extending southwards to Portugal. In Asia found in the Caucasus and East Asia. In North America found along the west coast from southern Alaska to northern California and eastwards to Alberta and Montana, and at a single locality in Labrador.

Note. Several unique characters, such as the very thick, gelatinized cortex, the isotomic-dichotomously branched, flattened branches, the attachment of the thallus by a holdfast and the shape and size of the conidia separates it from the fruticose *Cetraria aculeata*, *C. muricata*, *C. odontella* and *Bryocaulon divergens*, all earlier accommodated in *Cornicularia*.

Dactylina

A. Thell & I. Kärnefelt

Dactylina Nyl.

Syn. Meth. Lich. 1(2): 286 (1860). – Type: *Dactylina arctica* (Richardson) Nyl.

F: sormijäkälät

Literature: Kärnefelt & Thell, Nova Hedwigia 62: 487–511 (1996); Lynge, Skrift. Svalbard Ishavet 59: 1–62 (1933); Thomson, Amer. Arctic Lich. 1: 202–208 (1984); Thomson & Bird, Canad. J. Bot. 56: 1602–1624 (1978).

Thallus erect, flattish to bulbose, finger-like, unbranched or sparsely dichotomously branched, occasionally supplied with small side branches, greenish yellow to yellowish brown, darker towards the base, hollow or with scattered medullar hyphae. Pseudocyphella, soralia and isidia absent. Ascomata apothecia, zeorine, rare, terminally on side branches, to 5 mm diam.; disc brown. Asci 8-spored. Spores globose to subglobose, 4–6 × 4–6 µm diam. Conidiomata pycnidia, black, globose, immersed to protruding. Conidia fusiform to almost bacilliform, 5–7 × 1 µm. Photobiont trebouxioid.

Note. The genus includes only two arctic-alpine species and is morphologically characterized by hollow, finger-like thallus.

1. Thallus almost unbranched, hollow throughout, more than 2 cm high, 5–15 mm diam., pale yellow to brownish yellow, without pruina ..... 1. *D. arctica*
– Thallus dichotomously branched, partly hollow, less than 2 cm high, 1–3 mm diam., with white or violet pruina ..... 2. *D. ramulosa*

1. **Dactylina arctica** (Richardson) Nyl.

Syn. Meth. Lich. 1(2): 286 (1860). – *Dufourea arctica* Richarson in Franklin, Narr. Journey Polar Sea: 762 (1823). – Type: Canada, Northwest Territories, District of Mackenzie, [Great] Bear Lake, Franklin (FH-Tuck, lectotype, Kärnefelt & Thell, Nova Hedwgia 62: 502, 1996).

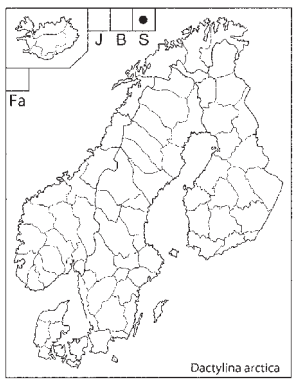
subsp. **arctica**

Literature: Kärnefelt & Thell 1996: 502–505; Lynge 1933: 13–26; Thomson 1984: 202–204.

Figs: Brodo et al. 2001: 294; Hansen & Andersen 1995: 36; Thomson 1984: 203.

Thallus erect, terete or slightly flattened, finger-like, to 8 cm high and to 1.5 cm diam., unbranched or sparsely branched with strongly inflated small side-lobes, pale yellow or brownish yellow, somewhat shiny but dull towards the base. Apothecia rare, on tips of lateral branches, to 5 mm diam.; disc chestnut brown. Spores globose to subglobose, 4–5 µm diam. Pycnidia immersed to slightly protruding, rare, scattered over the surface, occasionally forming small groups. Conidia fusiform, 5–6 × 1 µm.

Chemistry. Cortex C+ pink (rarely C–), K–, KC+ yellow, PD–; gyrophoric and usnic acids. Medulla C+ red K–, KC+ red, PD–; gyrophoric acid.



Habitat. Arctic, sometimes forming extensive colonies in wet situations on the tundra.

Distribution. Known from a few localities in northern Svalbard, more common in Greenland. **Gr. Al:** *Sb*. Arctic circumpolar, with southern outliers in the North American and Asian mountains.

Note. The species is divided into three morphologically similar subspecies with different distribution ranges. Only *D. arctica* subsp. *arctica* reaches Svalbard. However, subsp. *beringica* (C.D.Bird & J.W.Thomson) Kärnefelt & A.Thell, which reacts PD+ red (physodalic acid) may also be found in Greenland. *D. arctica* differs from *D. ramulosa* by its larger size and absence of a pruina.

2. **Dactylina ramulosa** (Hook.) Tuck.

Proc. Amer. Acad. Arts Sci. 5: 397 (1862). – *Dufourea ramulosa* Hook., App. Parry J. Sec. Voy.: 414 (1825). – Type: Canada, Northwest Territories, Melville Peninsula, Igloolik, Parry Expedition (BM lectotype, Kärnefelt & Thell, Nova Hedwigia 62: 505, 1996, as 'type').

F: sormijäkälä

Red-listed in: **F**

Literature: Hakulinen & Huuskonen, Ann. Bot. Fenn. 5: 112–114 (1968); Kärnefelt & Thell 1996: 505–507; Lynge 1933: 40–49; Thomson 1984: 207–208; Timdal, Graphis Scripta 16: 33–36 (2004).

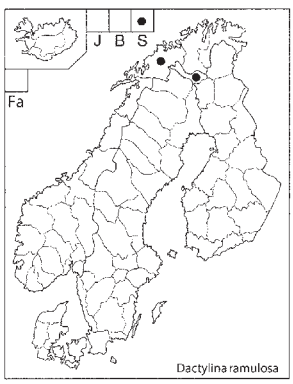
Figs: Brodo et al. 2001: 294; Hansen & Andersen 1995: 36; Thomson 1984: 207; Timdal 2004: 34.

Thallus erect to prostrate, flattish to subterete, to 2 cm high, sometimes forming small tufts of branched, fingerlike branches to 3 mm diam, yellowish brown, covered with a whitish to violet pruina, basal parts darker, hollow or in part filled with scattered medullar hyphae. Apothecia rare, terminally on side branches, to 3 mm diam; disc brown. Spores globose, 4.5–6 µm diam. Pycnidia more or less pronounced, laminal or terminal, frequent on side branches, appearing knobby. Conidia fusiform, 5–7 × 1 µm.

Chemistry. Cortex C–, K–, KC– or KC+ yellow to pink, PD–; usnic acid. Medulla C–, K–, KC+ red, PD+ red; usually physodalic and physodic acids and an unknown substance, occasionally physodalic acid absent (PD–).

Habitat. Terricolous, usually on calcareous ground in alpine or arctic tundra.

Distribution. Very rare in the continental part of the Nordic countries; present only on a few localities in Finnish Lapland and adjacent Norway, more widespread in Svalbard and Greenland. **Gr. F:** *EnL*. **N:** *Tr*. **AI:** *Sb*. Circumpolar arctic-alpine species, also reaching many Central European, Asian and western North American mountains.



Note. Although closely related, the two species are easily distinguished. *D. arctica* is large, bulbose, entirely hollow and almost unbranched, whereas *D. ramulosa* is thin, frequently branched and supplied with a whitish to violet pruina.

Evernia

R. Moberg & A. Thell

Evernia Ach.

Lichenogr. Universalis: 84: 441 (1810). – Type: *Evernia prunastri* (L.) Ach.

D: slåenlav **F:** hankajäkälät **S:** slånlavar

Literature: Bird, Canad. J. Bot. 52: 2427–2432 (1974); C.F. Culberson, Phytochemistry 2: 335–340 (1963); Kärnefelt et al. Nova Hedwigia 67: 76–77 (1998); von Keissler, Rabenh. Krypt.-Fl. ed. 2, 9,5(4), 1: 25–54, 60–73 (1958); Ryan in Nash et al. (eds), Lichen Fl. Greater Sonoran Desert Region 1: 188–190 (2002); Thor & Arvidsson, Rödlistade lavar i Sverige: 169–173 (1999).

Thallus foliose to fruticose, erect or pendent, richly branched, attached with a basal holdfast, yellowish to greyish green, upper and lower surfaces of the same colour except for *E. prunastri.* Ascomata apothecia, zeorine, marginal and lateral, somewhat stalked; disc reddish brown. Spores ellipsoid, 7–11 × 4–6 µm. Conidiomata pycnidia, marginal and laminal, often terminal on short side branches, immersed, blackish around the ostiole. Conidia slightly bifusiform or bacilliform (not observed in Nordic material). Photobiont trebouxioid.

Chemistry. Atranorin, chloratranorin, divaricatic, evernic and usnic acids.

Note. Primarily a Northern Hemisphere genus with 10 species. They have some resemblance with *Pseudevernia* and *Ramalina* but differs as *Pseudevernia* has a black lower surface and *Ramalina* has a shiny cortex. *Evernia* is a polyphyletic genus according to recent phylogeny studies.

1. Thallus flat, shrubby, lower surface whitish ..... 4. *E. prunastri*
– Thallus angular or subterete, pendulous, upper and lower surfaces of the same colour 2
2. Thallus to 10 cm long, with soredia and isidia ..... 3. *E. mesomorpha*
– Thallus usually considerably longer, without isidia, rarely with soralia 3
3. Thallus grey, K+ yellow ..... 2. *E. illyrica*
– Thallus greyish green to yellowish green, K– ..... 1. *E. divaricata*

1. **Evernia divaricata** (L.) Ach.

Lichenogr. Universalis: 85: 441 (1810). – *Lichen divaricatus* L., Syst. Nat., ed. 12, 2: 713 (1767). – Type: Helvetiae (Switzerland) or Missniae (Germany, Meissen), Schreber (LINN 1273.277 lectotype, Howe, Bull. Torrey Bot. Club 39: 201, 1912; specified by Jørgensen et al., Bot. J. Linn. Soc. 115: 375, 1994).

Syn. *Letharia divaricata* (L.) Hue

F: takkuhankajäkälä **N:** mjuktjafs **S:** ringlav

Red-listed in: **N S**

Literature: Ahlner, Acta Phytogeogr. Suec. 22: 43–48 (1948); Arup et al., Skyddsvärda lavar i SV Sverige: 193 (1997); Hermansson et al., Svensk Bot. Tidskr. 88: 314–323 (1988); Lommi, Lutukka 9: 63 (1993).

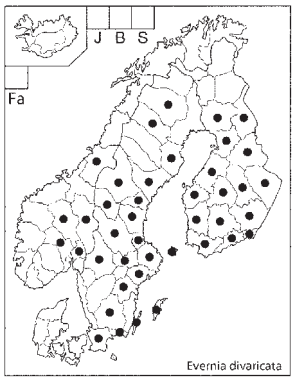
Figs: Arup et al. 1997: 180; Brodo et al. 2001: 312; Holien & Tønsberg 2006: 44; Moberg & Holmåsen 1990: 81; Wirth 1995: 391.

Thallus pendulous, to 30 cm long, soft, irregularly branched, broader and angular at nodes, grooved, pale greyish green to yellowish green. Soralia laminal, very rare; isidia absent. Cortex thin and soft, frequently cracked. Medulla white, loose, exposed in the cortical cracks. Apothecia rare, to 8 mm diam.; disc brown. Spores ellipsoid, 7–8 × 4–5 µm. Pycnidia terminal on short side branches. Conidia not observed.

Chemistry. Cortex C–, K–, KC– or KC+ yellowish, PD–; with small amounts of usnic acid. Medulla C–, K–, KC–, PD–; divaricatic acid.

Habitat. On coniferous trees, mainly *Picea* and *Pinus*, in humid forests, rarely also on rock faces.

Distribution. Eastern continental, in the Nordic countries occurring in boreal parts of Fennoscandia. Threatened by forestry and reduced in many of its former localities. **F:** *A V U EK St EH ES EP PH PS PK KP Kn OP PeP Ks*. **N:** (*Ak*) (*He*) *Op Bu NT*. **S:** (*Sk*) (*Bl*) *Öl Gtl SmI Ög Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb PL LuL*. Widespread in northern Eurasia, in North America only two disjunct areas in the Rocky Mountains.



Note. Recognized by the pendulous, soft thallus.

2. **Evernia illyrica** (Zahlbr.) Du Rietz

Svensk Bot. Tidsk. 20: 90 (1926). – *Evernia divaricata* subsp. *illyrica* Zahlbr., Ann. K. K. Naturhist. Hofmus. 19: 418 (1904). – Type: Slovenia, Nova Gorica, ('Österreich, Litorale austriacum, sylva "Trnovaner Wald" prope Görtz'), Loitlesberger in Zahlbruckner, Krypt. exs. Vindob. no. 1049 (UPS lectotype, Moberg & Thell, Nordic Lichen Flora 4: 139. 2011).

Syn. *Letharia divaricata* subsp. *illyrica* (Zahlbr.) Keissl., *Letharia illyrica* (Zahlbr.) Harm.

S: grå ringlav

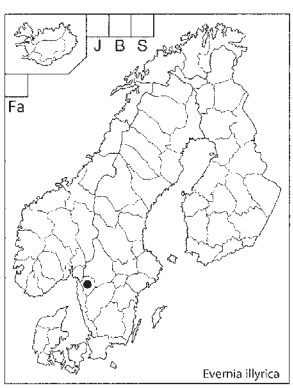
Literature: Du Rietz, Svensk Bot. Tidskr. 20: 90, 95 (1926).

Thallus pendulous, occasionally to 30 cm long, irregularly branched, broader and angular at nodes, grooved, pale greyish to greenish grey. Soralia laminal, rare; isidia absent. Cortex ± thick, frequently cracked. Medulla white, loose, exposed in the cortical cracks. Apothecia (in type) common, to 4 mm diam.; disc brown. Spores not well-developed, c. 7 × 4 µm. Pycnidia terminal on short side branches. Conidia not observed.

Chemistry. Cortex C–, K+ yellow, KC–, PD–; atranorin. Medulla C–, K–, KC–, PD–; divaricatic acid.

Habitat. The single specimen was collected on *Picea* close to a lake.

Distribution. Known from only one locality in the Nordic countries. **S:** (*Dls*). Mainly distributed in humid mountain forests of southern and south-eastern Europe, from the Alps to the Mediterranean.



Note. Similar to *E. divaricata*, but is distinguished by its grey colour (due to absence of usnic acid).

3. **Evernia mesomorpha** Nyl.

Lich. Scand.: 74 (1861). – Type: Finland, Etelä-Savo ('Savolaxia'), Taipalsaari, 1852 E. Nylander (H-NYL 35772, lectotype, Moberg & Thell, Nordic Lichen Flora 4: 139. 2011).

Syn. *Evernia thamnodes* (Flot.) Arnold, *Letharia mesomorpha* (Nyl.) Du Rietz, *Letharia thamnodes* (Flot.) Hue

F: jauhehankajäkälä **N:** gryntjafs **S:** grenlav

Literature: Ahlner, Acta Phytogeogr. Suec. 22: 48–53 (1948); Oldhammer, Svensk Bot. Tidskr. 88: 43–47 (1994).

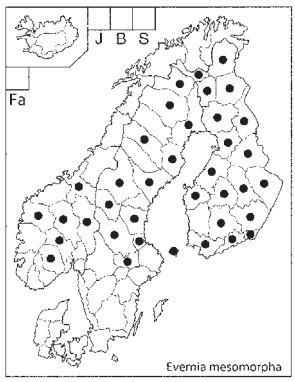
Figs: Brodo et al. 2001: 312; Hansen & Andersen 1995: 37; Hinds & Hinds 2007: 245; Moberg & Holmåsen 1990: 81.

THALLUS pendulous, to 8 cm long, irregularly branched, broader at nodes, grooved, pale greyish green to yellowish green; with diffuse, granular, isidiate soredia along the branches, originating from cracks along ridges. Branches ± grooved, angular. Medulla dense. APOTHECIA rare, to 6 mm diam.; disc brown. Spores ellipsoid, 8–9 × 5–6 µm. PYCNIDIA terminal on short side branches. Conidia not observed.

Chemistry. Cortex C–, K–, KC+ yellow, PD–; usnic acid. Medulla C–, K–, KC–, PD–; divaricatic acid.

Habitat. Prefers rather open conditions and grows mainly on conifers, especially *Picea*, rarely also on deciduous trees, lignum and stones.

Distribution. Scattered distribution in boreal parts of Fennoscandia. **Gr. F:** *A V U EK EH ES EP PH PS PK KP Kn OP PeP Ks KiL SoL EnL InL*. **N:** *He Op Bu Te SF ST.* **S:** *Vsm Dlr Gst Hls Ång Hrj Jmt Vb Nb LyL LuL TL*. Circumboreal and in montane inland areas of the Northern Hemisphere, very rare in the Arctic, with continental tendencies, ± common and widespread in North America.



Note. Distinguished as the only isidiate species in the genus.

4. Evernia prunastri (L.) Ach.

Lichenogr. Universalis: 85, 442 (1810). – *Lichen prunastri* L., Sp. Pl. 2: 1147 (1753). – TYPE: [Sweden] (LINN 1273.125 lectotype, Jørgensen et al., Bot. J. Linn. Soc. 115: 380, 1994).

Syn. *Evernia arenaria* auct., *Evernia elenkiniana* Zahlbr., *Evernia herinii* P.A.Duvign.

D: almindelig slåenlav **F:** valkohankajäkälä **I:** flathyrna **N:** bleiktjafs **S:** slånlav

Red-listed in: **I**

Literature: Ahlner, Ann. Bot. Soc. Zool. Bot. Fenn. Vanamo 9(1): 27–29 (1937).

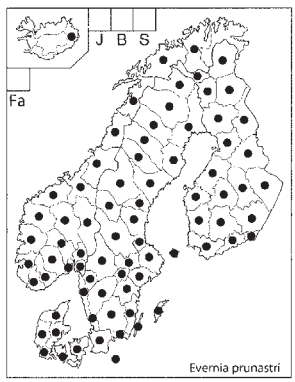
Figs: Brodo et al. 2001: 313; Holien & Tønsberg 2006: 43; Moberg & Holmåsen 1990: 82; Rikkinen 2008: 149; Sérusiaux et al. 2004: 81; Wirth 1995: 392.

THALLUS forming erect or pendent, loose tufts, to 10 cm high. Lobes irregularly branched, strap-shaped, often slightly convex. Upper surface pale greenish grey to yellow (rarely ash-grey), rather smooth. Lower surface whitish. Soralia ± capitate to confluent, especially in polluted areas abundant; soredia farinose. APOTHECIA rare, to 1.5 cm diam.; disc concolorous with the upper surface. Spores broadly ellipsoid, 7–11 × 4–6 µm. PYCNIDIA laminal and marginal, immersed. Conidia bacilliform, 6–7 × 0.5 µm.

Chemistry. Cortex C–, K+ yellow, KC+ yellow, PD–; usnic acid (rarely absent), chloratranorin and small amounts of atranorin. Medulla C–, K–, KC– PD–; evernic acid.

Habitat. On deciduous trees and shrubs, less often on conifers and lignum, rarely on rocks or over soil on sand dunes, northwards mainly in anthropogenic habitats.

Distribution. One of the most common species in the southern parts of Fennoscandia to the middle boreal zone but rare towards the north. **D:** *NJy ØJy VJy SJy Fyn Sjæ Brn*. **F:** *A V U EK St EH ES EP PH PS PK KP Kn OP PeP Ks KiL SoL EnL InL*. **I:** *IAu* **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi.* **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 western Eurasia, extending to West Siberia. Also in Far East, Macaronesia and North Africa. In North America primarily eastern, with scattered localities along the east coast and around the Great Lakes.



Note. Might be confused with *Ramalina farinacea* but distinguished by its whitish lower surface and softer thallus.

Flavocetraria

T. Randlane & A. Thell

Flavocetraria Kärnefelt & A.Thell

in Kärnefelt et al., Acta Bot. Fenn. 150: 81 (1994). – Type: *Flavocetraria cucullata* (Bellardi) Kärnefelt & A.Thell

D: kruslav **F:** lumijäkälät

Literature: Kärnefelt et al., Acta Bot. Fenn. 150: 79–86 (1994).

Thallus fruticose, erect. Lobes once or twice dichotomously branched, flat to subtubular. Upper surface more or less pale yellow, usually smooth and glossy; lower surface pale yellow; basal parts of the thallus generally duller, often reddish or brownish; pseudocyphellae as white spots on the lower surface; soredia absent or rare, marginal; isidia absent. Cortical layers thin. Medulla lax. Ascomata apothecia, zeorine, submarginal, at lobe ends, to 8 mm diam.; disc brown. Asci slenderly clavate, 8-spored. Spores ellipsoid, 5–10 × 3–5.5 µm. Conidiomata pycnidia, black, marginal, protruding or on short projections. Conidia dumbbell-shaped, 6 × 1 µm. Photobiont trebouxioid.

Chemistry. Usnic acid, lichesterinic acid complex and anthraquinones.

Note. Differs from *Cetraria* by the yellow colour, the thinner cortex and the dumbbell-shaped conidia. Its closest related is *Tuckermanopsis* and *Arctocetraria* (Thell et al. 2002).

1. Lobes strongly canaliculate or subtubular; surface rather smooth; basal parts reddish ..... 1. *F. cucullata*
– Lobes plane, not canaliculate or subtubular; surface foveolate and wrinkled; basal parts dark yellow ..... 2. *F. nivalis*

1. **Flavocetraria cucullata** (Bellardi) Kärnefelt & A.Thell

in Kärnefelt et al., Acta Bot. Fenn. 150: 81 (1994). – *Lichen cucullatus* Bellardi, Osserv. Bot.: 54 (1788). – Type: [Italy] "Al monte Ritten presso Bolzano, nel Tirolo meridionale l'esempl. inferiore, il superiore dalla Valdobbia", 1862. Hausmann & Carestia, Erbar. Crittogam. Ital. no. 926 (FI neotype, Randlane & Thell, Nordic Lichen Flora 4: 139, 2011).

Syn. *Cetraria cucullata* (Bellardi) Ach., *Allocetraria cucullata* (Bellardi) Randlane & Saag

D: kræmmerhus-kruslav **F:** kourulumijäkälä **I:** mývatnsgrös **N:** gulskjerpe **S:** strutlav

Literature: Hakulinen, Arch. Soc. Zool. Bot. Fenn. Vanamo 17: 142–143 (1962); Hasselrot, Acta Phytogeogr. Suec. 33: 20–25, 113–115 (1953); Randlane & Saag, Mycotaxon 44: 491–493 (1993).

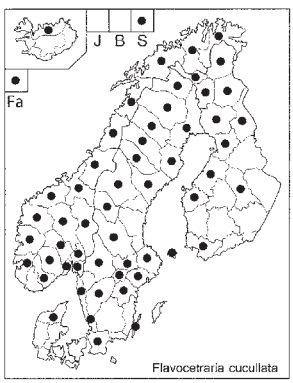
Figs: Brodo et al. 2001: 215; Hinds & Hinds 2007: 248; Holien & Tønsberg 2006: 38; Moberg & Holmåsen 1990: 73; Wirth 1995: 266.

Thallus erect, to 7 cm high, once or twice dichotomously branched; lobes to 5 mm wide, canaliculate or subtubular. Upper (inner) surface yellow, smooth and glossy; pseudocyphellae as white spots on the lower surface; lower (outer) surface pale yellow, basal necrotic parts reddish-violet. Apothecia rare, submarginal near lobe ends, to 6 mm diam.; disc brown. Spores ellipsoid, 5–10 × 3–5.5 µm. Pycnidia black, marginal, protruding, occasionally on short projections. Conidia 6 × 1 µm.

Chemistry. Cortex C–, K–, KC+ yellow, PD–; usnic acid. Medulla C–, K–, KC–, PD–; lichesterinic and protolichesterinic acids. Antraquinones in the basal part of the thallus.

Habitat. Common in tundra heaths and mountain areas, growing on the ground, on soil or gravel, together with *F. nivalis* and other lichens, such as *Cetraria* and *Cladonia*. In southernmost Fennoscandia it occurs exclusively in sunexposed dry localities in the lowland.

Distribution. Common in the arctic and alpine regions, extending to the boreal zone, rare in the southernmost parts of the Nordic countries. **D:** *NJy*. **Gr. Fa. F:** *A V EP PS KP OP PeP Ks KiL SoL EnL InL*. **I:** *INo*. **N:** *Øf Ak He Op Bu Vf Te AA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **AI:** *Sb*. **S:** (*Sk*) *Öl Hl Bh Vg Ög Nrk Vrm Vsm Srm Upl Dlr Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Present in the rest of Eurasia, also in North and South America.



Note. Differs from *F. nivalis* by the subtubular lobes and the reddish colour of the basal part.

2. **Flavocetraria nivalis** (L.) Kärnefelt & A.Thell

in Kärnefelt et al. 1994: 81–84. – *Lichen nivalis* L., Sp. Pl.: 1145 (1753). – Type: Sweden (LINN 1273.101 lectotype, Jørgensen et al., Bot. J. Linn. Soc. 115: 378, 1994).

Syn. *Allocetraria nivalis* (L.) Randlane & Saag, *Cetraria nivalis* (L.) Ach.

D: sne-kruslav **F:** lapalumijäkälä **I:** maríugrös **N:** gulskinn **S:** snölav

Literature: Hakulinen, Arch. Soc. Zool. Bot. Fenn. Vanamo 17: 145–148 (1962); Hasselrot, Acta Phytogeogr. Suec. 33: 29–34, 118–122 (1953); Randlane & Saag, Mycotaxon 44: 491–493 (1993); Schipperges et al., Lichenologist 27: 517–529 (1995).

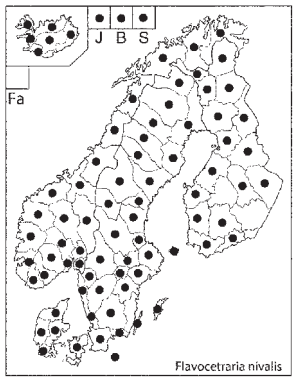
Figs: Brodo et al. 2001: 315; Hinds & Hinds 2007: 249; Holien & Tønsberg 2006: 38; Moberg & Holmåsen 1990: 77.

Thallus erect, to 8 cm high, loosely adnate, scattered or in tufts; lobes to 7 mm wide, foveolate, ridged and concave, irregularly branched towards tips, upper surface light yellow, smooth and glossy; pseudocyphellae as white spots on the lower surface; lower surface pale yellow, necrotic basal parts brownish. Apothecia rare, submarginal, close to branch tips, to 8 mm diam.; disc brown. Spores ellipsoid, 5–10 × 3–5.5 µm. Pycnidia black, marginal, slightly protruding. Conidia 6 × 1 µm.

Chemistry. Cortex C–, K–, KC+ yellow, PD–; usnic acid. Medulla C–, K–, KC–, PD–; no medullary compounds detected. Anthraquinones at base.

Habitat. Common lichen in tundra heaths and mountain areas, growing on the ground, on soil or gravel, together with *F. cucullata* and other lichens, such as *Cetraria* and *Cladonia*. In southernmost Fennoscandia it occurs exclusively in sun-exposed dry localities in the lowland.

Distribution. Common throughout the arctic and alpine regions, extending to the boreal zone, rare in the southernmost parts of the Nordic countries. **D:** *NJy ØJy VJy SJy Sjæ Brn*. **Gr. F:** *A V U ST EH EP 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 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*. Present in all of Eurasia, also in North America, Papua New Guinea, Peru and Argentina.



Note. Prefer the same habitat as *F. cucullata* from which it differs by flatter and foveolate lobes and brownish basal part.

Flavoparmelia

R. Moberg, A. Thell & P. Frödén

Flavoparmelia Hale

Mycotaxon 25: 604 (1986). – Type: *Flavocetraria caperata* (L.) Hale

D: skållav **F:** viherkarpeet **S:** getlavar

Literature: Hale, Smithsonian Contr. Bot. 31: 1–62 (1976); Mycotaxon 25: 603–605 (1986).

Thallus foliose, loosely to closely adnate, ± orbicular, to 20 cm diam., yellowish green. Lobes rounded, ± irregular. Lower surface black with few rhizines and a bare, often paler coloured margin. Medulla of a dense hyphal structure. Ascomata apothecia, zeorine, rare, somewhat stalked. Asci broadly clavate, 8-spored. Spores broadly ellipsoid, comparatively large, >15 µm long, with epispore. Conidiomata pycnidia, often in small groups, laminal, immersed or slightly protruding. Conidia ± dumbbell-shaped. Photobiont trebouxioid.

Chemistry. Cortex with usnic acid. Medulla with various depsidones of the protocetraric acid group, and often with fatty acids.

Note. Differs from *Parmelia* by the yellow colour (usnic acid) and the simple rhizines. More closely related to *Parmotrema* than to *Parmelia* according to phylogenetic analyses based on DNA. The genus includes worldwide c. 22 species, of which *F. caperata* and the recently discovered *F. soredians* are the only representatives in the Nordic countries.

1. Soralia usually not coalescent, coarsly granulate; lobes usually over 5 mm wide; medulla K+ yellow .....1. *F. caperata*
– Soralia ± coalescent, finely granulate; lobes usually less than 5 mm wide; medulla K+ yellow turning red .....2. *F. soredians*

1. Flavoparmelia caperata (L.) Hale

Mycotaxon 25: 604 (1986). – *Lichen caperatus* L., Sp. Pl. 1147 (1753). – Type: Icon in Dillenius, Hist. Musc.: t. 25, Fig. 97 (1742) (lectotype, Jørgensen et al., Bot. J. Linn. Soc. 115: 373, 1994; corresponding specimen in herb. Dillenius (OXF epitype, Jørgensen et al., Bot. J. Linn. Soc. 115: 373, 1994).

Syn. *Parmelia caperata (L.) Ach., Parmelia cylisphora (Ach.) Vain., Pseudoparmelia caperata* (L.) Hale

D: gulgrøn skållav **F:** viherkarve **N:** eikelav **S:** getlav

Red-listed in: **D S**

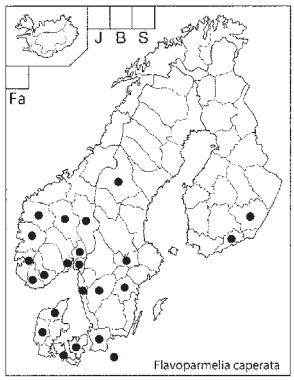
Literature: Arup et al., Skyddsvärda lavar i SV Sverige: 194–195 (1997); Ek et al., Svensk Bot. Tidskr. 96: 210–215 (2002); Räsänen, Luonnon Tutkija 57: 55–56 (1953); Thor & Arvidsson, Rödlistade lavar i Sverige: 176 (1999); Søchting, Graphis Scripta 15: 53–56 (2004).

Figs: Brodo et al. 2001: 317; Hinds & Hinds 2007: 251: Holien & Tønsberg 2006: 51; Sérusiaux et al. 2004: 81; Wirth 1995: 639.

Thallus ± orbicular, to 20 cm diam., yellowish to greyish green, ± closely attached to the substrate, in parts often wrinkled. Lobes rounded, 0.5–1.5 cm wide, often paler towards the tips; soralia ± common, laminal; soredia granular; lower surface black, dull, with few rhzines, towards the lobe tips brown and without rhizines. Apothecia rare, not observed in Nordic countries, somewhat stalked, to 3 mm diam.; disc pale brownish red. Spores ellipsoid, 17–24 × 8–13 µm. Pycnidia single or in small groups, laminal, immersed or slightly protruding. Conidia dumbbell-shaped, 5–7 × 1 µm.

Chemistry. Cortex C–, K–, KC–, PD–; usnic acid. Medulla C–, K+ yellow, KC–, PD+ red; caperatic and protocetraric acids, atranorin accessory.

Habitat. Corticolous on deciduous trees and shrubs, particularly in the canopy, but also saxicolous. It prefers open areas as roadsides and coastal sites.



Distribution. Only occasional and presumably southern and with a suboceanic preference in the Nordic countries. Increasing in recent years. **D:** *NJy VJy Fyn Sjæ Brn*. **F:** (*U*) (*ES*). **N:** *Øf Ak He Op Vf AA VA Ro Ho SF*. **S:** *Sk Bh Vg Ög Vsm Jmt*. Pantemperate in both hemispheres, reaching semi-arid areas and the hemiboreal zone in the north.

Note. Easily distinguished from *F. soredians* by the more wrinkled thallus, broader lobes and soralia originating from pustulae. The K reaction of the medulla and soralia is yellow, without turning red as in *F. soredians*.

2. Flavoparmelia soredians (Nyl.) Hale

Mycotaxon 25: 605 (1986). – *Parmelia soredians* Nyl., Flora 55: 426 (1872). – Type: Spain (H-NYL 34690, lectotype, Hale, Smithsonian Contr. Bot. 31: 48, 1976).

Syn. *Pseudoparmelia soredians* (Nyl.) Hale

S: liten getlav

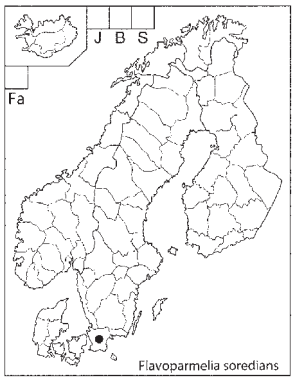
Literature: Frödén & Thell, Lavbulletinen 2010-3: 163–165 (2010); Hale, Smithsonian Contr. Bot. 31: 48–49 (1976); Mycotaxon 25: 605 (1986); Smith et al., The lichens of Great Britain and Ireland: 404 (2009).

Figs: Dobson 2005: 317; van Herk & Aptroot 2004: 183.

Thallus to 10 cm diam., forming rather distinctive conspicuous pale yellowish or greyish green regular rosettes, closely attached to the substrate; lobes subirregular, apically rounded, 2–5 mm wide, usually plane, rugose towards the centre of the thallus; soralia common, laminal, orbicular and coalescing; lower surface black, dull, with single rhizines, becoming brownish and bare towards the periphery. Apothecia rare, not observed in Nordic countries, adnate, to 3 mm diam.; disc brownish red. Spores ellipsoid, 17–18 × 8 µm. Pycnidia laminal and immersed. Conidia not observed.

Chemistry. Cortex C–, K– KC–, PD–; usnic acid. Medulla and soralia C–, K+ yellow turning red to brownish red, KC+ red, PD+ orange; salazinic acid.

Habitat. Corticolous on deciduous trees and bushes, rarely saxicolous, on siliceous rocks, in mild, open areas, preferrably close to coasts.



Distribution. Recently discovered in Lund, southernmost Sweden. **S:** *Sk*. Temperate in Europe, Africa, South America and New Zealand. In Europe it mainly occurs close to coasts but is now spreading to the inland (Smith et al. 2009).

Gowardia

S. Velmala & L. Myllys

Gowardia Halonen, Myllys, Velmala & Hyvärinen

Bryologist 112: 141 (2009). – Type: *Gowardia nigricans* (Ach.) P.Halonen, L.Myllys, S.Velmala & H.Hyvärinen

F: tunturilupot

Literature: Halonen et al., Bryologist 112: 138–146 (2009).

Thallus erect or decumbent, to 13 cm long, grey to black, often bicolorous, branches terete to flattened, sometimes foveolate; isidia absent; soralia very rare; pseudocyphellae sparse to abundant, fusiform to fissural, usually plane, white, 0.2–1 mm long. Ascomata apothecia, zeorine; disc yellowish brown to pale reddish brown; asci usually 2–4-spored. Spores simple, ellipsoid. Conidiomata unknown.

Chemistry. Alectorialic acid, barbatolic acid.

Note. Separated from *Alectoria* based on morphological, chemical and DNA characters. The genus includes two species, of which *G. nigricans* occurs in the Nordic countries and *G. arctica* Halonen et al. in the Arctic regions of Canada and Russia.

1. **Gowardia nigricans** (Ach.) Halonen et al.

Bryologist 112: 145 (2009). – *Cornicularia ochroleuca* var. *nigricans* Ach., Lichenogr. Universalis: 615 (1810). – Type: Sweden, Lapponia (H-ACH 1859B lectotype, Howe, Mycologia 3: 150, Pl. 45, 1911).

Syn. *Alectoria nigricans* (Ach.) Nyl., *Alectoria furcellata* R.Sant.

F: tunturiluppo **I:** surtarkræða **N:** jervskjegg **S:** upprätt tagellav

Literature: Brodo & Hawksworth, Opera Bot. 42: 63–66 (1977); Halonen et al. 2009: 145; Hawksworth, Lichenologist 5: 224–225 (1972).

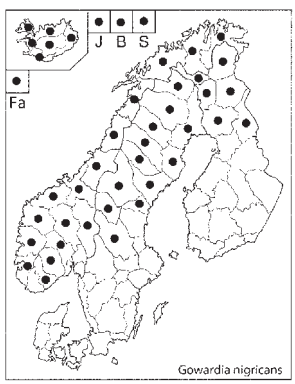
Figs: Brodo et al. 2001: 153; Halonen et al. 2009: 145; Hansen & Andersen 1995: 16; Holien & Tønsberg 2006: 33; Krog et al. 1994: 111; Moberg & Holmåsen 1990: 100; Rikkinen 2008: 195.

Thallus erect or partly decumbent, to 8 cm long; bicolorous, basal parts pale grey to pinkish grey, apical parts dark grey to black; main branches distinct, branches mainly terete, basal parts becoming flattened, to 1.5 mm wide. Soralia very rare. Pseudocyphellae conspicuous, usually abundant, concave to slightly convex, white, fusiform to fissural, to 1 mm long. Apothecia very rare, to 2 mm diam. Spores simple, usually 2 per ascus, rarely 4, colourless as young, becoming reddish brown, 20–40 × 12–25 µm.

Chemistry. Thallus C+ red, K+ faintly yellow, KC+ red, PD+ yellow; alectorialic acid and usually barbatolic acid.

Habitat. Terricolous on tundra soil, or on rocks. Often together with *Alectoria ochroleuca* and *Bryocaulon divergens*. Rarely on shrubs and tree bases.

Distribution. Locally abundant in the northern mountains and tundra. **Gr. Fa. F:** *PeP Ks KiL SoL EnL InL*. **I:** *ISu IVe IMi IAu INv INo*. **N:** *He Op Bu Te AA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **AI:** *JM BI Sb*. **S:** *Dlr Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Present in Europe, Asia, Australasia, North and South America, Antarctica. Arctic-alpine.



Note. Distinguished from *Alectoria* spp. by the greyish colour due to the lack of usnic acid.

Hypogymnia

M. Westberg, T. Ahti & A. Thell

Hypogymnia (Nyl.) Nyl.

Lich. Env. Paris: 39 and 139 (1896). – *Parmelia* [unranked] *Hypogymnia* Nyl., Flora 64: 537 (1881). – Type: *Hypogymnia physodes* (L.) Nyl.

Syn. *Cavernularia* Degel.

D: kvistlav **F:** paisukarpeet **I:** þembur **N:** kvistlav **S:** blåslavar

Literature: Bitter, Hedwigia 14: 174–274 (1901); Elix, Brunonia 2: 175–245 (1979); Goward et al., Lich. Brit. Columbia 1: 58–62 (1994); Hansen & McCune, Folia Cryptog. Estonica 47: 13–20 (2010); Hinds & Hinds, Mem. New York Bot. Gard. 96: 1–584 (2007); Ohlsson, Bryologist 76: 370–379 (1973); Østhagen, Blyttia 34: 194–195 (1976); Poelt & Vězda, Bestimmungsschlüssel europ. Flechten, Ergänzungsheft 1: 125–129 (1977); Rassadina, Novosti. Sist. Nizsh. Rast. 1967: 289–300 (1967); Thomson, Amer. Arctic Lich. 1: 235–243 (1984).

Thallus foliose to subfruticose, adnate to loosely attached by holdfasts or directly by patches of the lower cortex, occasionally semierect or pendulous. Lobes inflated, hollow (rarely compact in non-Nordic species). Upper surface grey to dark brown, without pseudocyphellae, often sorediate, rarely isidiate. Lower surface black or brown at the lobe tips, corticated, wrinkled, without rhizines, often perforate. Medulla lining the cavity of the lobes, white to brown to blackish. Ascomata apothecia, laminal, often stalked, rarely sessile; disc concave or flat, brown. Asci broadly clavate, 8-spored. Spores simple, broadly ellipsoid to subglobose, colourless. Conidiomata pycnidia, laminal, immersed. Conidia dumbbell-shaped. Photobiont trebouxioid.

Chemistry. Cortex with atranorin and chloroatranorin. Medulla usually with depsidones, such as physodic, physodalic and protocetraric acids.

Note. The genus *Hypogymnia* comprises over 90, predominantly corticolous, species, and is one of the few large Parmeliaceae genera with its main distribution in the Northern Hemisphere. Recent phylogenetic studies strongly support an inclusion of *Cavernularia* in *Hypogymnia* (unpublished data). The species occur on bark, more rarely on wood, rocks or on the ground.

1. Lower surface with pits (cavernulae) ..... 4. *H. hultenii*
– Lower surface without pits 2
2. On bark, wood or rocks 3
– On the ground in alpine heaths or arctic tundra..... 9
3. Soralia laminal, formed from papillae or irregularly spreading over the surface 4
– Soralia marginal, formed at the tips of marginal lobes or from the tips of short, inner lobes 5
4. Soralia spreading over the surface, thallus grey, southern Fennoscandia ..... 3. *H. farinacea*
– Soralia from laminal papillae; thallus partly, but distinctly brown; northern Fennoscandia, Iceland and Svalbard ..... 1. *H. austerodes*
5. Soralia capitate, convex, without a central opening 6
– Soralia labriform, lacerate or not, with a central opening to the medullary cavity 7
6. Thallus partly brown, closely adnate, northern Fennoscandia only ..... 2. *H. bitteri*
– Thallus grey, loosely attached to subfruticose ..... 8. *H. tubulosa*
7. Medulla PD–, soralia strongly lacerate, thallus with small side lobes, lower surface of the lobe tips with round perforations ..... 9. *H. vittata*
– Medulla PD+ orange, soralia labriform, thallus without side lobes, perforations present or not..... 8
8. Medulla K+ slowly reddish brown, lower surface of the lobe tips lacking perforations ..... 6. *H. physodes*
– Medulla K–, lower surface of the lobe tips with round perforations..... 5. *H. incurvoides*
9. Soralia from laminal papillae or lacking, thallus mainly or entirely brown 10
– Soralia formed in the lobe tips, thallus grey or mainly brown..... 11
10. Soralia present, boreal forest to arctic ..... 1. *H. austerodes*
– Soralia lacking, arctic-alpine ..... 7. *H. subobscura*
11. Thallus grey and often bluish in parts, orbicular; soralia labriform but often indistinct and poorly developed; medulla PD+ red. ..... 6. *H. physodes*
– Thallus mainly brown, irregular; soralia becoming lacerate but often indistinct and poorly developed; medulla PD–..... 9. *H. vittata*

1. **Hypogymnia austerodes** (Nyl.) Räsänen

Ann. Bot. Soc. Zool.-Bot. Fenn. Vanamo 18(1): 13 (1943). – *Parmelia austerodes* Nyl., Flora 64: 537 (1881). – Type: [Norway, Sør-Trøndelag] Oppdal, Kongsvoll, 1881 Norrlin 654 (H-NYL 34147 lectotype, Westberg, Ahti & Thell, Nordic Lichen Flora 4: 139, 2011).

Syn. *Hypogymnia obscurata* (Ach.) Räsänen, non sensu Räsänen et auct., *Parmelia obscurata* var. *isidiata* (Lynge) H.Magn., *Parmelia obscurata* (Ach.) Bitter (non sensu Bitter).

F: tunturipaisukarve **I:** móaþemba **N:** seterlav **S:** mörk blåslav

Red-listed in: **S**

Literature: Ahlner, Acta Phytogeogr. Suec. 22: 68–70, 189–190 (1948); Du Rietz, Svensk Bot. Tidskr. 9: 428–431 (1915); Thor & Arvidsson, Rödlistade lavar i Sverige: 192 (1999).

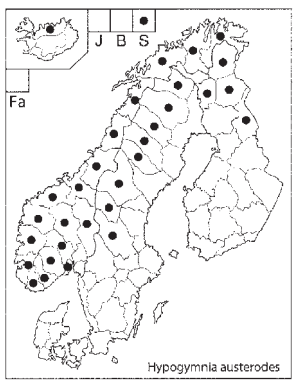
Figs: Brodo et al. 2001: 347; Hansen & Andersen 1995: 38; Hinds & Hinds 2007: 271; Moberg & Holmåsen 1990: 83; Thomson 1984: 237.

THALLUS to 8 cm diam., adnate, usually forming rosettes; lobes 1–3 mm wide; upper surface grey in the centre, becoming brownish towards the edges, short pustulate isidia on laminal papillae developing into soralia common in the central parts; lower surface black, brownish towards the periphery, glossy, sometimes perforate near the lobe tips. APOTHECIA rare, sessile, to 6 mm diam.; disc dark reddish brown. Spores broadly ellipsoid, 6.5–7.5 × 4.5–5 µm. PYCNIDIA not observed.

Chemistry. Cortex C−, K+ yellow, KC−, PD−; atranorin. Medulla C–, K–, KC+ red, PD–; 3-hydroxyphysodic, 2'-O-methylphysodic and physodic acids and an unknown substance.

Habitat. Corticolous, on acidic bark, e.g., *Picea*, *Pinus* and *Betula*, or saxicolous on soft calcareous or siliceous rocks in subalpine-alpine areas. Above the tree limit found on soft calcareous rocks or on the ground in calcareous heaths.

Distribution. Restricted to the Scandinavian mountains, Iceland and Svalbard. **Gr. F:** *Ks KiL SoL EnL InL*. **I:** *INo*. **N:** *He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **AI:** *Sb*. **S:** *Dlr Hrj Jmt ÅsL LyL PL LuL TL*. Circumpolar boreal-alpine in the Northern Hemisphere.



Note. Hypogymnia austerodes is similar to *H. bitteri* which has capitate soralia on the tips of submarginal lobes. In the Arctic it can also be confused with *H. subobscura*, which has papillae that never develop into soralia.

2. **Hypogymnia bitteri** (Lynge) Ahti

Ann. Bot. Fenn. 1: 20 (1964). – *Parmelia bitteri* Lynge, Videnskapsselsk. Skr., ser. 1, Mat. Naturvet. Kl. 7: 138 (1921). – TYPE: Switzerland, Schleicher 279a (H-ACH 1384B lectotype, Westberg, Ahti & Thell, Nordic Lichen Flora 4: 139, 2011).

Syn. *Hypogymnia obscurata* auct., *Parmelia obscurata* auct.

F: ruskopaisukarve **N:** granseterlav **S:** knottrig blåslav

Red-listed in: **S**

Literature: Ahlner, Acta Phytogeogr. Suec. 22: 63–68, 190–196 (1948).

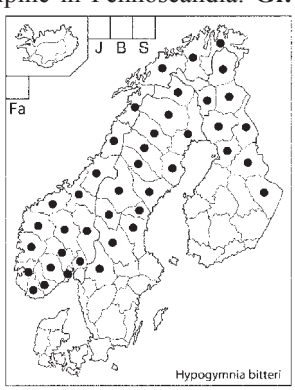
Figs: Brodo et al. 2001: 348; Hinds & Hinds 2007: 271; Holien & Tønsberg 2006: 48; Thomson 1984: 238.

THALLUS to 12 cm diam., adnate, usually forming rosettes; lobes 1–3 mm wide; upper surface glossy, grey to brown in parts; isidia absent; soralia capitate, blue-grey or whitish grey, mainly present on the ends of submarginal lobes or short side lobes; lower surface black. APOTHECIA and PYCNIDIA not observed in Nordic material.

Chemistry. Cortex C−, K+ yellow, KC−, PD−; atranorin. Medulla PD–, K–, KC+ red, C–; physodic, 3-hydroxyphysodic and 2'-O-methylphysodic acids and an unknown substance.

Habitat. Most commonly found in the subalpine spruce forests where it grows corticolous on *Betula*, *Picea* and *Salix*, occasionally also on *Pinus*, lignum and on rock.

Distribution. Boreal-subalpine in Fennoscandia. **Gr. F:** *PK KP Kn OP PeP Ks KiL SoL EnL InL*. **N:** *Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr Vfi ØFi*. **S:** *Vrm Dlr Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Circumboreal montane in the Northern Hemisphere, also in South America and East Africa.



Note. Similar to *Hypogymnia austerodes* but has capitate soralia on the tips of submarginal lobes. In *H. austerodes* the soralia are laminal and arise from papillae.

3. Hypogymnia farinacea Zopf

Ann. Chemie 352: 42 (1907). – Type: Sweden, Fries, Lich. Suec. exs. no. 291 (UPS lectotype, Westberg, Ahti & Thell, Nordic Lichen Flora 4: 139, 2011).

Syn. *Hypogymnia bitteriana* (Zahlbr.) Räsänen, *Parmelia bitteriana* Zahlbr., *Parmelia farinacea* Bitter, nom. illeg.

D: grynet kvistlav **F:** jauhepaisukarve **I:** skógarþemba **N:** sukkerlav **S:** grynig blåslav

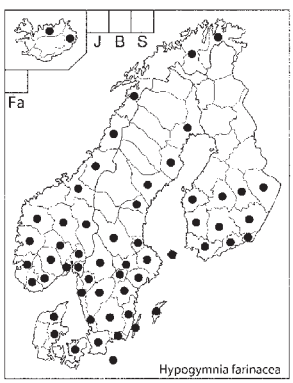
Red-listed in: **I**

Literature: Du Rietz, Svensk Bot. Tidskr. 9: 428–431 (1915); Gelting, Naturhist. Tidene 7(2): 27 (1943); Wirth, Flechten Baden-Württembergs**:** 428 (1995).

Figs: Holien & Tønsberg 2006: 48; Moberg & Holmåsen 1990: 84; Rikkinen 2008: 145; Wirth 1995: 429.

Thallus to 6 cm diam., closely adnate, usually forming rosettes; lobes to 3 mm wide, somewhat convex, flattening towards the tips, contiguous, overlapping in the centre, discrete at margins; upper surface grey, wrinkled; soralia greyish, laminal and irregularly spreading from the central parts and out; lower surface black. Apothecia rare, laminal, sessile or somewhat stalked, to 6 mm diam.; disc reddish brown. Spores ellipsoid, 6–7.5 × 3–4.5 µm. Pycnidia seen as black dots close to the lobe tips. Conidia slightly dumbbell shaped, 5–8 × 1 µm.

Chemistry. Cortex C−, K+ yellow, KC−, PD−; atranorin. Medulla C–, K–, KC+ red, PD–; physodic acid, 3-hydroxyphysodic and 2'-O-methylphysodic acids and an unknown substance.



Habitat. Usually corticolous on bark of conifers and deciduous trees, mainly *Pinus*, also lignicolous and saxicolous.

Distribution. Mainly distributed in the southern parts of the Nordic countries. In Finland rather oceanic, not extending to Russia. **D:** *NJy ØJy Sjæ Brn.* **F:** *A U V EK St EH ES EP PH PS PK*. **I:** *IAu INo*. **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF ST NT SNo NNo VFi ØFi*. **S:** *Sk Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Mpd Ång Vb Nb*. Restricted to western Eurasia, western North America (one loc. in eastern) and East Africa.

Note. The grey, wrinkled upper surface with irregularly spreading soralia distinguish this species from other *Hypogymnia* species in the area.

4. Hypogymnia hultenii (Degel.) Krog

Nyt Mag. for Naturvid. 88: 76 (1951). – *Cavernularia hultenii* Degel., Acta Horti Gothob. 12: 128 (1937). – Type: USA, Alaska, Kodiak Island, Kodiak, [on bark], 1932 E. Hultén 5062b (UPS holotype).

N: groplav **S:** kavernularia

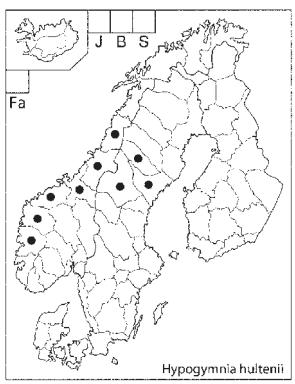
Red-listed in: **S**

Literature: Ahlner, Acta Phytogeogr. Suec. 22: 33–36, 169–172 (1948); Ahti & Henssen, Bryologist 68: 85–89 (1965); Brodo et al., Lich. North America: 212–213 (2006); Flatberg et al., Blyttia 33: 237–239 (1975); Holien & Tønsberg, Blyttia 54: 157–177 (1996); Printzen et al., Molec. Ecol. 12: 1473–1486 (2003).

Figs: Brodo et al. 2001: 213; Holien & Tønsberg 2006: 46.

Thallus foliose, ± orbicular, to 3 cm diam., attached to the substrate with small hapters. Upper surface greyish; lower surface black. Lobes very narrow, to 1 mm wide, elongate, ± ascending, partly hollow, with scattered, distinctive holes on the lower surface. Soralia capitate, close to the lobe tips. Apothecia rare, to 1 mm diam. Spores 3–4 µm diam. Pycnidia not observed in Nordic material.

Chemistry. Cortex C–, K+ yellow, KC–, PD–; atranorin. Medulla C–, K –, KC+ red, PD–; physodic acid.



Habitat. Moist, old-growth, coniferous forests, usu-ally on the thin lower twigs of *Picea*, but also on *Betula* and *Sorbus aucuparia*.

Distribution. Restricted to central western Scan-

dinavia. **N:** *Ho SF MR ST NT SNo*. **S:** *Ång Jmt ÅsL*. Also known from Scotland and in North America from Alaska to California and from Labrador, Newfoundland, Nova Scotia and New Brunswick.

Note. May be confused with young thalli of other *Hypogymnia* species. Well-developed it is easily identified by the pits (cavernulae) on the underside.

5. **Hypogymnia incurvoides** Rass.

Novosti Sist. Nizsh. Rast. 1967: 293: 289–300 (1967). – Type: Russia, Archangel'sk Region**:** Plesetsk District, near Obozerskaya, 1917 Savicz s. n. (LE holotype)

Literature: McCune et al., Bryologist 109: 80–82 (2006); Graphis Scripta 19: 10–12 (2007); Hansen & McCune, Folia Cryptog. Estonica 47: 15–16 (2010); Rassadina, Novosti Sist. Nizsh. Rast. 1967: 289–300 (1967).

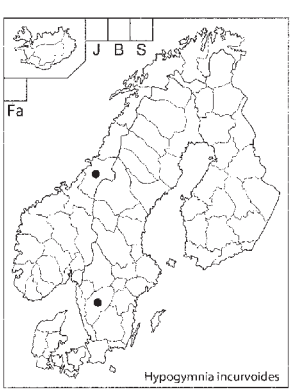
Figs: Hinds & Hinds 2007: 273; McCune et al. 2006: 81; McCune et al. 2007: 11.

Thallus to 10 cm diam., adnate, dichotomously branched; lobes contiguous to slightly separate and often somewhat imbricate, usually forming a regular lattice, 1.0–1.5 mm wide; upper surface whitish to pale greenish grey with dark margins; soralia terminal, originally labriform, becoming rounded beneath splayed open lobe tips; isidia and lobules absent; lower surface black with brown margins, strongly wrinkled with perforations at the lobe tips and axils. Apothecia not known in Nordic material. Pycnidia as black, laminal spots. Conidia not observed.

Chemistry. Cortex C−, K+ yellow, KC−, PD−; atranorin. Medulla C–, K–, KC+ reddish orange, PD+ orange-red; physodic, physodalic and protocetraric acids, rarely (in Greenland) diffractaic acid.

Habitat. Mainly on conifers in humid forests. The Norwegian material was found on *Picea abies* and the single Swedish specimen on *Alnus glutinosa*.

Distribution. Recently reported from a few localities in Scandinavia. **Gr. N:** *NTr*. **S:** *Vg*. Disjunct circumboreal in the Northern Hemisphere, known from northeastern Russia and eastern North America. Abundant in Newfoundland in Canada, extending south to North Carolina.



Note. Exclusively known from its type locality in northeastern Russia until recent times, when it was reported from eastern Canada (McCune et al. 2006) and shortly afterwards from the Appalachian mountains and Scandinavia (McCune et al. 2007). Although neglected and overlooked for a long time, this is most likely a rare species within its circumboreal distribution. According to a molecular analysis (Hansen & McCune 2010) it is most similar to *Hypogymnia krogiae* Ohlsson, from which it differs by the presence of soralia. Among the Nordic species *H. incurvoides* is very similar to *H. physodes* but differs from this species by having round perforations on the lower surface of the lobe tips and axils and a medulla reacting K– (lacking 3-hydroxyphysodic acid).

6. **Hypogymnia physodes** (L.) Nyl.

Lich. Env. Paris: 39 (1896). – *Lichen physodes* L., Sp. Pl. 2: 1144 (1753). – Type: Sine loco (LINN 1273.77 lectotype, Howe, Bull. Torrey Bot. Club 39: 201, 1912, specified by Jørgensen et al., Bot. J. Linn. Soc. 115: 338, 1994).

Syn. *Parmelia physodes* (L.) Ach.

D: almindelig kvistlav **F:** sormipaisukarve **I:** flatþemba **N:** vanlig kvistlav **S:** blåslav

Red-listed in: **I**

Literature: Poelt & Vězda, Bestimmungsschlüssel europ. Flechten, Ergänzungsheft 1: 129 (1977); Thomson 1984: 240.

Figs: Brodo et al. 2001: 354; Hansen & Andersen 1995: 38; Hinds & Hinds 2007: 274; Holien & Tønsberg 2006: 46; Moberg & Holmåsen 1990: 85; Rikkinen 2008: 145; Sérusiaux et al. 2004: 86; Wirth 1995: 427, 429.

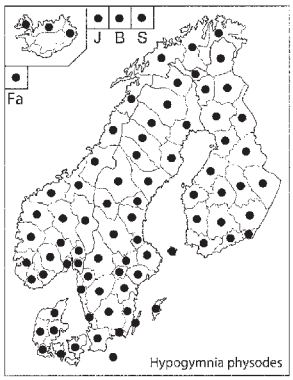
Thallus to 10 cm diam., loosely adnate, very variable, rosette-forming to irregularly spreading or subfruticose; lobes variable in shape from broad and overlapping to more elongate and discrete, somewhat ascending, upper surface grey, glossy; lower surface black; soralia lip-shaped, developing at lower side of the tips. Apothecia rather rare, laminal, to 6 mm diam.; disc reddish brown. Spores broadly ellipsoid,

6–9 × 4–5 µm. Pycnidia common, laminal, often in groups close to lobe ends, immersed, black. Conidia slightly dumbbell shaped, 5–8 × 1 µm.

Chemistry. Cortex C−, K+ yellow, KC−, PD−; atranorin and chloroatranorin. Medulla C–, K+ slowly reddish brown, KC+ red, PD+ red, UV+ pale blue; physodic, physodalic, 3-hydroxyphysodic and small amounts of 2'-O-methylphysodic (accessory) and protocetraric acids.

Habitat. Corticolous on both conifers and deciduous trees and shrubs, lignicolous, saxicolous or occasionally terricolous in coastal and mountain heaths. Found from sea level to high altitudes in the Scandinavian mountains. Rather resistant to air pollution and common also in urban areas, often on man-made substrates.

Distribution. Distributed throughout the Nordic countries. **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:** *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.* Northern circumpolar, arctic-temperate.



Note. The species is usually easily recognized, in spite of its large morphological variation. It resembles *H. incurvoides* but this species lacks 3-hydroxyphysodic in the medulla which reacts K–. It is also similar to *H. vittata* which has lacerate soralia and a medulla reacting PD– (lacking physodalic and protocetraric acid).

7. **Hypogymnia subobscura** (Vain.) Poelt

Mitt. Bot. Staatssamml. München 4: 298 (1962). – *Parmelia subobscura* Vain., Ark. Bot. 8(4): 33 (1909). – Type: Russia, Chukchi National Okrug, Jinretlen, 1878−1879 Almquist, (S lectotype, Westberg, Ahti & Thell, Nordic Lichen Flora 4: 139, 2011).

F: tundrapaisukarve

Red-listed in: **F**

Literature: Hansen & McCune, Folia Cryptog. Estonica 47: 18 (2010); Ohlsson, Bryologist 76: 379 (1973); Thomson 1984: 240.

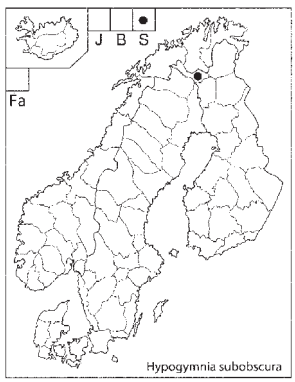
Figs: Brodo et al. 2001: 355; Hansen & Andersen 1995: 39; Thomson 1984: 242.

Thallus to 6 cm diam., closely adnate, forming rosettes, lobes elongate, dichotomously branched, usually 1–3 mm wide, tips shiny, bases often with small, laminal or marginal isidia-like papillae; soralia absent; upper surface entirely dark brown or partly yellowish brown; lower surface black, often perforate at the lobe tips. Apothecia not observed. Pycnidia infrequent, rod- or slightly dumbbell-shaped, 5–5.5 × 0.5–0.8 µm.

Chemistry. Cortex C−, K+ yellow, KC−, PD−; atranorin and chloroatranorin (not constant). Medulla C–. K–, KC+ red, PD–; physodic and 2'-O-methylphysodic acids.

Habitat. Arctic-alpine species growing over mosses on the ground in windy tundra heaths.

Distribution. Arctic with one known locality in northernmost Finland. **Gr. F:** *EnL*. **AI:** *Sb*. Incompletely circumpolar arctic-alpine. In North America it reaches south to Colorado and Quebec and in Eurasia to Caucasus.



Note. Resembles *H. austerodes* but differs in having papillae that never breaks up into soralia and in lacking 3-hydroxyphysodic acid. By Øvstedal et al. (2010) included in *H. austerodes*. In need of further studies.

8. Hypogymnia tubulosa (Schaer.) Hav.

Bergens Mus. Årbog 2: 31 (1918). – *Parmelia ceratophylla* var. *tubulosa* Schaer., Lich. Helv. Spicil. 10: 459 (1840). – Type: France, 'De l'ouest de la France', 1836 Delise (G lectotype, Ahti & Clerc in Westberg, Ahti & Thell, Nordic Lichen Flora 4: 140, 2011).

Syn. *Parmelia tubulosa* (Schaer.) Bitter

D: finger-kvistlav **F:** kärsäpaisukarve **I:** pípuþemba **N:** kulekvistlav **S:** pukstockslav

Red-listed in: **I**

Literature: Lynge, Videnskapsselskapets Skr. Mat. Naturv. Kl. 7: 136–137 (1921); Ohlsson, Bryologist 76: 379 (1973).

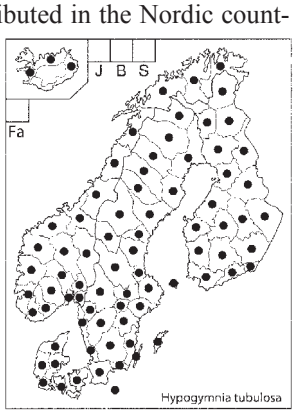
Figs: Brodo et al. 2001: 356; Hinds & Hinds 2007: 275; Holien & Tønsberg 2006: 47; Moberg & Holmåsen 1990: 85; Rikkinen 2008: 145; Sérusiaux et al. 2004: 86; Wirth 1995: 431.

Thallus to 8 cm diam., usually subfruticose, rarely as rosettes, loosely adnate; lobes elongate, tubular, almost isodiametric, usually ascending; soralia capitate, covering the upper part of the lobe tips; upper surface grey, matt; lower surface black. Apothecia rare, laminal, sessile or shortly stalked, to 10 mm diam.; disc reddish brown. Spores subglobose or broadly ellipsoid, 6.5–8.5 × 4.5–5.5 µm. Pycnidia not observed.

Chemistry. Cortex C−, K+ yellow, KC−, PD−; atranorin and chloroatranorin. Medulla C–, K–, KC+ red, PD–, UV+ pale blue; physodic and 3-hydroxyphysodic acids, often also 2'-O-methylphysodic acid.

Habitat. Corticolous and lignicolous, rarely saxicolous and terricolous. More sensitive to air pollution than *H. physodes*, with which it often grows together.

Distribution. Widely distributed in the Nordic countries, but absent from the small Atlantic islands and rare near and above timberline. **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:** *IVe 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 Nb ÅsL LyL PL LuL TL*. Circumboreal in the Northern Hemisphere, but is present also in montane areas of central Europe, Asia, North America and North Africa.



Notes. Often growing together with *H. physodes* but less frequent. Easily distinguished from the latter by its almost tubular branches with terminal, capitate soralia.

9. Hypogymnia vittata (Ach.) Parrique

Acta Soc. Linn. Bordeaux 53: 34 (1898). – *Parmelia physodes* var. *vittata* Ach., Methodus: 251 (1803). – Type: Without locality (H-ACH 1398A lectotype, Westberg, Ahti & Thell, Nordic Lichen Flora 4: 140, 2011).

Syn. *Parmelia hypotrypanea* Nyl., *Parmelia hypotrypodes* Nyl., *Parmelia vittata* (Ach.) Nyl., *Parmelia vittata* var. *hypotrypanea* (Nyl.) Nyl.

D: fliget kvistlav **F:** kalliopaisukarve **I:** prikþemba **N:** randkvistlav **S:** skuggblåslav

Literature: Du Rietz, Svensk Bot. Tidskr. 9: 428–431 (1915); Ingelög et al., Floravård i skogsbruket, ed. 2, 3: 340 (1987); Ohlsson, Bryologist 76: 379 (1973); Thomson, Amer. Arctic Lich. 1: 240, 243 (1984).

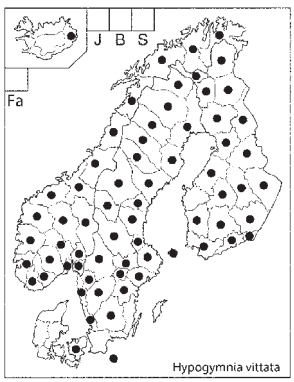
Figs: Brodo et al. 2001: 356; Hinds & Hinds 2007: 276; Holien & Tønsberg 2006: 47; Moberg & Holmåsen 1990: 86; Rikkinen 2008: 123; Wirth 1995: 431.

Thallus to 6 cm diam. but often several thalli coalescing, loosely adnate to ascending or pendent; upper surface whitish, greenish or yellowish grey or sometimes brown in parts; lobes 0.5–2 mm wide, elongate, slender, irregularly branching, sometimes imbricate, with small, secondary lobules along the margins; soralia lip-shaped developing from the lower side of the lobe tips, but becoming strongly lacerate; lower surface black to brownish black, convex and expanded, often visible from the upper side as a black margin, with round perforations near the tips. Apothecia rare, laminal, on 1–4 mm long, erect lobes, to 10 mm diam.; disc brown. Spores subglobose or broadly ellipsoid, 5–7 × 4–5 µm. Pycnidia frequent, laminal, black, often aggregated. Conidia slightly dumbbell shaped, 4.5–6.5 × 1 µm.

Chemistry. Cortex C−, K+ yellow, KC−, PD−; atranorin. Medulla C–, K–, KC+ red, PD–; 3-hydroxyphysodic, physodic and vittatolic acids.

Habitat. Mainly on shaded, mossy, vertical rocks, but also on tree trunks and twigs, rarely among mosses in alpine, somewhat calcareous heaths.

Distribution. Found all over Fennoscandia but rare in the southern parts and absent from Svalbard. **D:** (*Sjæ*) *Brn*. **F:** *A V U EK St EH ES PH PS PK KP Kn OP PeP Ks KiL SoL EnL InL*. **I:** *IAu*. **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr Vfi ØFi.* **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*. Circumboreal-montane in the Northern Hemisphere.



Note. The lacerate soralia and the PD– reaction (physodalic and protocetraric acids lacking) of the medulla separates *H. vittata* from *H. physodes*. The lobes of *H. vittata* are also generally more slender and slightly pendent and bears small secondary lobules. A small, brown morph growing on the ground in alpine areas has sometimes been recognized as *H. vittata* var. *hypotrypanea*.

Hypotrachyna

J. A. Elix & A. Thell

Hypotrachyna (Vain.) Hale

Phytologia 28: 341 (1974). – *Parmelia* subgen. *Euparmelia* sect. *Hypotrachyna* Vain., Acta Soc. Fauna Fl. Fenn. 7: 38 (1890). Type: *Hypotrachyna brasiliana* (Nyl.) Hale

Syn. *Parmelia* subgen. *Hypotrachyna* (Vain.) Hale, *Parmelinopsis* Elix & Hale

D: skållav **N:** buktkrinslav **S:** örlavar

Literature: Divakar et al., Molec. Phylog. Evol. 40: 448–458 (2006); Elix, Fl. Australia 55: 49–59 (1994); Hale, Smithsonian Contr. Bot. 25: 1–73 (1975); Jørgensen, Symb. Bot. Ups. 31(3): 297–317 (1996); Krog & Swinscow, Norw. J. Bot. 26: 11–43 (1979); Krog & Swinscow, Lichenologist 19: 420 (1987).

Thallus foliose, moderately to loosely adnate. Lobes narrow, linear, sublinear or irregular, to 4 mm wide, dichotomously branched, apically truncate, occasionally indented. Upper surface grey to yellowish; pseudocyphellae absent; cilia sparse or absent. Lower surface black with dichotomously branched rhizines. Ascomata apothecia, (hitherto not observed in the Nordic countries) zeorine, laminal, sessile or slightly stalked. Spores ellipsoid, comparatively large, 12–22 × 8–14 µm. Conidiomata pycnidia, laminal, immersed. Conidia dumbbell-shaped or bacilliform, 4–6 × 1 µm. Photobiont trebouxioid.

Chemistry. Contains orcinol depsides, orcinol depsidones, β-orcinol depsides, β-orcinol depsidones, fatty acids, lichexanthone and anthraquinones.

Note. As currently circumscribed one of the most species-rich genera of the family including c. 200 species worldwide but only 18 in Europe. Recent molecular data, however, indicate that the genus is polyphyletic. Mainly distributed in the montane tropics and subtropics (*H. taylorensis*, known from Scotland, should be looked for).

1. Upper surface yellowish ..... 4. *H. sinuosa*
– Upper surface grey 2
2. Soralia capitate; rhizines sparsely branched 3
– Soralia terminal; rhizines frequently branched ..... 2. *H. laevigata*
3. Soralia laminal or submarginal; rhizines mostly unbranched ..... 1. *H. afrorevoluta*
– Soralia subterminal, diffuse; rhizines sparsely branched ..... 3. *H. revoluta*

1. **Hypotrachyna afrorevoluta** (Krog & Swinscow) Krog & Swinscow

Lichenologist 19: 420 (1987). – *Parmelia afrorevoluta* Krog & Swinscow, Norw. J. Bot. 26: 22–23 (1979). – Type: Kenya. Central Province, Nyeri District, Aberdare Mts., 10 km W of Tusha, alt. 2900 m, 1974, H. Krog 3K 31/188 (O holotype).

Syn. *Parmelinopsis afrorevoluta* (Krog & Swinscow) Elix & Hale

N: kystorelav **S:** mörk örlav

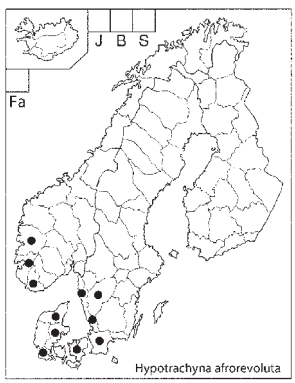
Red-listed in: **S**

Literature: Hawksworth et al., Lichenologist 40: 7 (2008); Krog et al., Lavflora: 195–196 (1994). Hultengren et al., Svensk Bot. Tidskr. 105: 4–8 (2011).

Figs: Krog & Swinscow 1979: 23; Elix 1994: 133a.

Thallus loosely adnate, 1–8 cm diam.; lobes 2–5 mm wide, sublinear, irregularly branched. Upper surface greyish-white, somewhat shiny, mixed with black, decorticated parts; soralia laminal, common in central parts; cilia marginal, sparse, short. Lower surface shiny, black; rhizines usually simple, rarely bifurcate. Apothecia rare, laminal, immersed or substipitate, becoming radially split, to 2 cm diam.; disc brown, imperforate. Spores ellipsoid, 16–22 × 10–14 µm. Pycnidia immersed. Conidia weakly dumbbell-shaped, 4–6 × 1 µm.

Chemistry. Cortex C–, K+ yellow, KC−, PD−; atranorin. Medulla C+ red, K–, KC+ red, PD–; gyrophoric acid (major), 5-O-methylhiascic and 4,5-di-O-methylhiascic acid (minor).



Habitat. On deciduous trees and rocks in areas with high precipitation.

Distribution. Restricted to coastal parts of Denmark, SW Norway and S Sweden. **D:** *NJy ØJy SJy Sjæ*. **N:** *VA Ro Ho*. **S:** *Sk Hl Boh Vg*. Temperate-montane in Europe (in several countries), Africa and Australasia.

Note. Differs from *H. revoluta* in having laminal rather than subterminal soralia, sparse marginal cilia, and mainly simple rhizines. It appears to be the most common *Hypotrachyna* species in coastal areas of Denmark and Sweden, whereas *H. revoluta* prefers inland localities.

2. **Hypotrachyna laevigata** (Sm.) Hale

Smithsonian Contr. Bot. 25: 44 (1975). – *Lichen laevigatus* Sm., Engl. Bot. 26: 1852 (1808). – Type: Wales, Anglesea and Caernarvonshire, Davies (BM holotype).

Syn. *Parmelia laevigata* (Sm.) Ach.

N: grå buktkrinslav

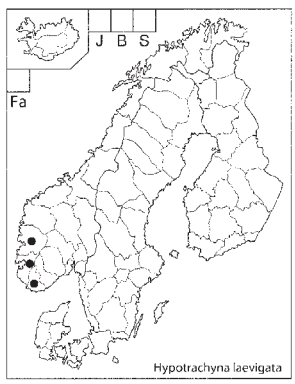
Red-listed in: **N**

Literature: Degelius, Acta Phytogeogr. Suec. 7: 127–130; Hale 1975: 44–45; Jørgensen 1996: 301; Tønsberg et al., Sommerfeltia 23: 86–88 (1996).

Figs: Hale 1975: 43f; Holien & Tønsberg 2006: 52; Krog et al. 1994: 196.

Thallus loosely adnate, 3–12 cm wide. Lobes linear, 1–4 mm diam., irregularly to subdichotomously branched. Upper surface smooth, shiny, grey-white. Soralia capitate at lobe tips, occasionally on apothecia margin. Lower surface black, with dense, dichotomously branched rhizines, some extending beyond the margins and visible from above. Apothecia rare, laminal, to 5 mm diam.; disc brown. Spores ellipsoid, 18–21 × 9–13 µm. Pycnidia laminal, immersed. Conidia weakly dumbbell-shaped, 4–6 × 1 µm.

Chemistry. Cortex C–, K+ yellow, KC–, PD−; atranorin. Medulla C+ orange, K–, KC–, PD–; barbatic and 4-O-demethylbarbatic acids, with traces of obtusatic and norobtusatic acids.



Habitat. Saxicolous on mossy rocks and corticolous on deciduous trees in moist situations.

Distribution. Restricted to western Norway. **N:** *VA Ro Ho*. In Europe limited to coastal areas in the northwest and central European mountains. Pantropical-temperate in Africa, North and South America and Australasia.

Note. Characterized by the terminal or marginal, capitate soralia and the frequently branched rhizines.

3. **Hypotrachyna revoluta** (Flörke) Hale

Smithsonian Contr. Bot. 25: 60 (1975). – *Parmelia revoluta* Flörke, Deutsche Lich. 1: 11 (1815). – Type: Germany, 'ex herb. Floerkei, Herb. Reg. Berol.' (FH-Tuck neotype, Krog & Swinscow, Norw. J. Bot. 26: 60, 1979).

D: bleggrå skållav **N:** orelav **S:** örlav

Literature: Arup et al., Skyddsvärda lavar i SV Sverige: 199–200 (1997); Fritz & Hultengren, Svensk Bot. Tidskr. 92: 139–146 (1998); Thor & Arvidsson, Rödlistade lavar i Sverige: 194–195 (1999); Tønsberg et al., Sommerfeltia 23: 86–88 (1996).

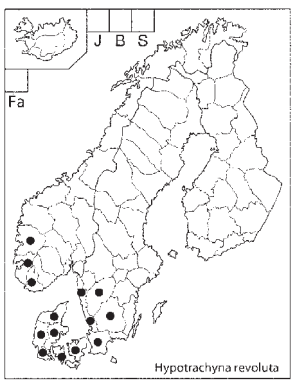
Figs: Arup et al. 1997: 181; Brodo et al. 2001: 359; Hale 1975: 61; Holien & Tønsberg 2006: 51; Sérusiaux et al. 2004: 87; Wirth 1995: 649.

Thallus moderately to loosely adnate, 4–10 cm diam.; lobes short, 1–5 mm wide, sublinear to subirregular, slightly concave and somewhat ascending; upper surface grey to greenish grey, weakly maculate; soralia coarse to pustulate, forming abraded patches towards the lobe apices, leaving bare blackish areas of medulla strongly sorediate lobes becoming revolute. Lower surface black with a brownish margin, sparsely rhizinate, rhizines simple or sparingly dichotomously branched. Apothecia rare, to 6 mm diam.; disc brown. Spores broadly ellipsoid to subglobose, 10–16 × 6–10 µm. Pycnidia laminal, immersed. Conidia weakly dumbbell-shaped, 4–5 × 1 µm.

Chemistry. Cortex C−, K+ yellow, KC−, PD−; atranorin. Medulla C+ red, K–, KC+ red, PD−; gyrophoric acid (major), 5-O-methylhiascic acid (minor).

Habitat. Corticolous in open forests. Mainly restricted to *Alnus glutinosa*, rarely on *Betula*, *Fraxinus* and *Quercus*.

Distribution. Southwestern, oceanic distribution in the Nordic countries, not reaching the boreal zone. **D:** *NJy ØJy VJy SJy Fyn Sjæ*. **N:** *VA Ro Ho*. **S:** *Sk SmI Hl Bh Vg*. Montane pantropical-temperate, occurring in Eurasia, South and East Africa, North and South America, Australasia.



Note. Differs from *H. afrorevoluta* in lacking marginal cilia and in often having greenish soralia, which develop from pustules close to lobe tips.

4. **Hypotrachyna sinuosa** (Sm.) Hale

Smithsonian Contr. Bot. 25: 63 (1975). – *Lichen sinuosus* Sm., Engl. Bot. 29: 2050 (1809). – Type: Scotland, Dumfriesshire, MacGarroc (LINN-Sm 1700.9 lectotype, Hale & Kurokawa, Lichenologist 2: 2, 1962).

Syn. *Parmelia sinuosa* (Sm.) Ach.

N: gul buktkrinslav

Literature: Hale 1975: 63–65; Krog & Swinscow 1979: 39; Østhagen, Blyttia 21: 252–254 (1971); Tønsberg, Blyttia 37: 130 (1979); Blyttia 38: 160–162 (1980); Sommerfeltia 23: 88–91 (1996).

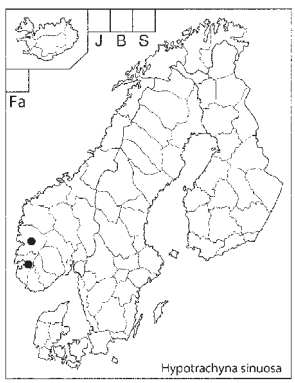
Figs: Brodo et al. 2001: 360; Holien & Tønsberg 2006: 52; Krog et al. 1994: 197.

Thallus moderately to loosely adnate, sometimes suberect, 2–7 cm diam. Lobes to 3 cm long, 1–2 mm wide, sublinear, dichotomously branched with rounded angles. Upper surface pale greenish yellow, sorediate. Soralia capitate, subterminal. Lower surface black, densely rhizinate, rhizines squarrose and ± dichotomously branched, extending beyond the lobe margin in a dense mat, visible from above. Apothecia rare, sessile, to 4 mm diam.; disc brown. Spores ellipsoid, 10–14 × 7–9 µm. Pycnidia common, laminal, immersed. Conidia bacilliform, 4–5 × 1 µm.

Chemistry. Cortex C–, K–, KC+ yellow, PD–; usnic acid. Medulla C–, K+ yellow, KC–, PD+ orange; salazinic acid (major), consalazinic and norstictic acids (minor).

Habitat. Corticolous on deciduous trees, particularly *Alnus glutinosa*, less frequently on *Sorbus*, *Betula* and *Fraxinus*.

Distribution. Restricted to westernmost Norway. **N:** *Ro Ho*. Pantropical-temperate with oceanic tendencies. Occurs in coastal areas or in humid parts of inland mountains, e.g. the Alps and the Carpathians.



Note. Distinguished from the other three Nordic species by the yellowish upper surface.

Imshaugia

R. Moberg & A. Thell

Imshaugia S.L.F.Mey.

Mycologia 77: 337 (1985). – Type: *Imshaugia aleurites* (Ach.) S.L.F.Mey.

D: stolpelav **F:** tuhkakarpeet

Literature: Meyer, Mycologia 77: 336–338 (1985); Hawksworth, Pl. Syst. Evol. 149 (3–4): 303–307 (1985); Ahti & Isoviita, Taxon 16: 105–108 (1987); Jørgensen, Taxon 37: 479–480 (1988); Thell et al., Symb. Bot. Ups. 34(1): 441 (2004).

THALLUS foliose, rosette-forming, small, firmly attached and adnate. Lobes narrow, contiguous to somewhat overlapping. Upper surface greyish with a pored epicortex. Upper cortex paraplectenchymatous. Lower surface whitish, with simple rhizines. ASCOMATA apothecia, zeorine, laminal, sessile; disc brown. Asci clavate, 8-spored. Spores ellipsoid and colourless. CONIDIOMATA pycnidia, laminal to marginal, protruding. Conidia ellipsoid to dumbbell-shaped, 3–5 × 1 µm. PHOTOBIONT trebouxioid.

Chemistry. Atranorin, chloroatranorin, evernic, and thamnolic acid.

Note. Similar to *Parmeliopsis*, but conidia ellipsoid to dumbbell-shaped versus reniform to falcate in *Parmeliopsis*. DNA-sequences do not indicate a close relationship between the two genera. Only one of the three known species is present in the Nordic countries.

1. **Imshaugia aleurites** (Ach.) S.L.F.Mey.

Mycologia 77: 337 (1985). – *Lichen aleurites* Ach., Lichenogr. Suec. Prodr.: 117 (1799 '1798'). – TYPE: Svecia (Sweden) (H-ACH 1315B lectotype, Meyer, Mycologia 77: 337, 1985).

Syn. *Cetraria aleurites* (Ach.) Th.Fr., *Parmelia aleurites* (Ach.) Ach.

D: kliddet stolpelav **F:** tuhkakarve **N:** furustokklav **S:** klilav

Literature: See the genus.

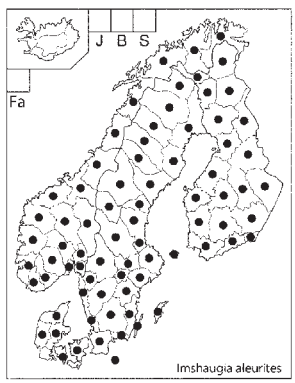
Figs: Brodo et al. 2001: 362; Hinds & Hinds 2007: 280; Holien & Tønsberg 2006: 61; Moberg & Holmåsen 1990: 97; Sérusiaux et al. 2004: 89.

THALLUS forming rosettes, closely adnate, to 5 cm diam., whitish grey, dull, shiny in the outer parts. Lobes to 3 mm wide, discrete to contiguous and overlapping. Central parts covered by cylindrical, fragile isidia becoming granulose with age. Lower surface pale brown with pale brown, simple rhizines. APOTHECIA rather rare, to 2 mm diam.; disc reddish brown. Spores ellipsoid, 6–9 × 5–6 µm. PYCNIDIA uncommon, laminal to marginal, protruding. Conidia ellipsoid to dumbbell-shaped, 3–5 × 1 µm.

Chemistry. Cortex and medulla C–, K+ yellow, KC–, PD+ orange; thamnolic acid (with trace of decarboxythamnolic acid), atranorin and chloroatranorin.

Habitat. Corticolous, mainly on conifers, *Betula* and lignum in open situations.

Distribution. Widespread in the Nordic countries, more common towards the north. **D:** *NJy ØJy VJy 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.* **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.* Widely distributed in the temperate and boreal zone of the Northern Hemisphere. Present also in the East African and SE Australian mountains.



Note. Differs from *Parmeliopsis* by the isidiate thallus, the whitish grey colour and the shape of the conidia.

Letharia

R. Moberg & A. Thell

Letharia (Th.Fr.) Zahlbr.

Hedwigia 31: 34 (1892). – *Evernia* sect. *Letharia* Th.Fr., Lichenogr. Scand. 2: 433 (1874). – TYPE: *Letharia vulpina* (L.) Hue

F: takkujäkälät **N:** ulvelav **S:** varglavar

Literature: Schade, Ber. Bayer. Bot. Ges. 30: 108–126 (1954); Keissler, Rabenh. Krypt.-Fl. ed. 2, 9, 5(4), 1: 51–60 (1958); Kärnefelt et al., Nova Hedwigia 67: 78 (1998); Kroken & Taylor, Mycologia 93: 38–53 (2001); Högberg et al., Molecular Ecology 11: 1191–1196 (2002); Thell et al., Symb. Bot. Ups. 34(1): 441–442 (2004); Arnerup et al., G. Mycol. Res. 108: 311–316 (2004).

Thallus fruticose to foliose, bright greenish yellow. Lobes rough, supplied with isidia and/or soredia. Cortex thin, paraplectenchymatous. Medullar hyphae arranged in bundles. Ascomata apothecia, zeorine, terminal, to 20 mm diam., rare in *L. vulpina*; disc concave, brown. Asci clavate, 8-spored. Spores colourless, ellipsoid, 5–8 × 4–5 µm. Conidiomata pycnidia, slightly protruding, black. Conidia sublageniform, 8–9 × 1 µm. Photobiont trebouxioid.

Chemistry. Vulpinic and norstictic acids.

Note. Six phylogenetic, morphologically similar "cryptic" species have been identified by phylogenetic analyses based on DNA sequences of which only *Letharia vulpina* occurs in the Nordic countries.

1. Letharia vulpina (L.) Hue

Nouv. Arch. Mus., sér. 4(1): 57 (1899). – *Lichen vulpinus* L., Sp. Pl. 2: 1155 (1753). Type: (LINN 1273.298 lectotype, Howe, Bull. Torrey Bot. Club 39: 201, 1912, specified by Jørgensen et al., Bot. J. Linn. Soc. 115: 383, 1994).

Syn. *Evernia vulpina* (L.) Ach.

F: takkujäkälä **N:** ulvelav **S:** varglav

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

Literature: Ahlner, Acta Phytogeogr. Suec. 22: 53–60 (1948); Arup et al., Skyddsvärda lavar i SV Sverige: 205–206 (1997); Oldhammer & Johansson, Svensk Bot. Tidskr. 96: 3–7 (2002); Thor & Arvidsson, Rödlistade lavar i Sverige: 217–218 (1999); Tønsberg et al., Sommerfeltia 23: 98–104 (1996).

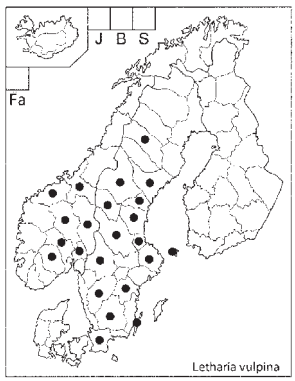
Figs: Arup et al. 1997: 185; Brodo et al. 2001: 413; Holien & Tønsberg 2006: 45; Moberg & Holmåsen 1990: 99.

Thallus fruticose to subpendent, often forming tufts, to 15 cm long, bright greenish yellow. Lobes flattened to almost isodiametric, angular, rough, covered with cylindrical isidia, occasionally developing into soralia. Apothecia rare, terminal, with short, marginal projections, to 7 mm diam.; disc concave, brown. Spores ellipsoid, 5–8 × 4–5 µm. Pycnidia slightly protruding, black, more common towards apices. Conidia sublageniform, 8–9 × 1 µm.

Chemistry. Cortex and medulla C–, K–, KC+ red, PD–; vulpinic acid. Norstictic acid found in the apothecia.

Habitat. On dead standing pine trees in open situations. Also on wooden buildings, fence posts etc., rarely on living conifers and *Betula*.

Distribution. Rare in most areas, but locally common in central Norway and Sweden. Extinct in Finland after a fire destroyed the wooden windmill where it occurred. **F:** (*A*). **N:** *Ak He Op Bu Te MR ST*. **S:** (*Sk*) *Öl SmI Vg Ög Vrm Upl Dlr Gst Hls Mpd Ång Hrj Jmt LyL*. Otherwise in Central Europe, Mediterranean area, SE Asia and western North America. Gaps in the distribution are due to lack of suitable substrate and air pollution.



Note. Characterized by the greenish yellow colour and the ± abundant isidia. Extinct from many old localities and nowadays rare in Fennoscandia with strong populations only in a few areas of Norway and Sweden. Poisonous (vulpinic acid) and therefore earlier used to kill foxes and wolves.

Masonhalea

A. Thell

Masonhalea Kärnefelt

Bot. Notiser 130: 101–102 (1977). − Type: *Masonhalea richardsonii* (J.D.Hooker) Kärnefelt

Literature: Kärnefelt, Bot. Notiser 130: 101–107 (1977); Kärnefelt & Thell, Plant Syst. Evol. 183: 147 (1992); Thell et al., Lichenologist 41: 504 (2010); Thomson, Amer. Arctic Lic. 1: 272–274 (1984).

Thallus foliose, cartilaginous, formed of few major branches, irregularly or dichotomously branched, pale to dark brown; pseudocyphellae conspicuous on the lower surface, either as patches or a continuous line along the margin. Ascomata apothecia, zeorine, rare, lateral; disc concolorous with the thallus. Asci narrowly clavate, with a fairly large axial body, 2–4 µm. Spores subglobose to broadly ellipsoid, colourless. Conidiomata pycnidia, marginal, pronounced, sparse to frequent, brown to black. Conidia of different sha-

pes, without thickenings or thickened at one end. Photobiont trebouxioid.

Chemistry. Medulla with lichestrinic and protolichesterinic or alectoronic acid.

Note. Characterized by a cartilaginous thallus, lateral position of the apothecia, subglobose or broadly ellipsoid spores and an arctic, northern-Beringian distribution. The pseudocyphellae are conspicuous, forming a continuous line close to the margin of the lower surface or large decorticate patches on the lower surface. The genus comprises two arctic species of which *M. inermis* reaches Svalbard.

1. **Masonhalea inermis** (Nyl.) Lumbsch et al.

in Nelsen et al., Lichenologist 43 (2011, in press). – *Cetraria crispa* f. *inermis* Nyl., Bull. Soc. Linn. Normandie, ser. 4: 214 (1887). – Type: Russia, [Magadan Region, Chukotka], Sibiria septentrionalis, sinus Konyam ad fretum Bering, 1879 Almquist (S lectotype, Krog, Bryologist 76: 299, 1973).

Syn. *Cetraria inermis* (Nyl.) Krog, *Tuckermannopsis inermis* (Nyl.) Kärnefelt

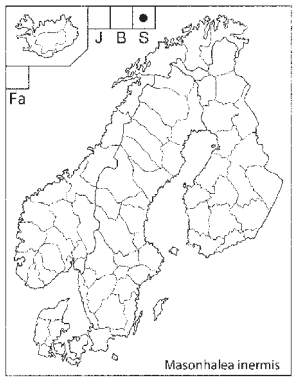
Literature: Elvebakk & Hertel, Norsk Polarinst. Skr. 198: 334 (1996); Krog, Bryologist 76: 299–300 (1973); Kärnefelt, Opera Bot. 46: 87–89 (1979) Kärnefelt et al., Pl. Syst. Evol. 180: 150 (1992); Bryologist 96: 403 (1993); Kärnefelt & Thell, 2001: 205; Thomson, Amer. Arctic Lich. 1: 83 (1984); Tønsberg & Elvebakk, Graphis Scripta 5: 73–74 (1993).

Figs: Krog 1973: 300.

Thallus unbranched to weakly branched, rarely over 2 cm high. Lobes flat or weakly canaliculate, smooth and glossy, 0.5–3 mm wide. Upper surface usually brown. Lower surface pale, convex in central part with a flat border along the margin; pseudocyphellae as a continuous line along the margin on the lower surface. Apothecia lateral, marginal, substipitate, margin slightly crenulate, 0.5–4 mm diam.; disc brown. Spores globose, 3.5–5 µm diam. Pycnidia marginal, protruding, dark brown. Conidia bacilliform to slightly sublageniform, i. e., sharpend in one or both ends, 8–10 × 1–1.3 µm.

Chemistry. Cortex and medulla C–, K–, KC–, PD–; lichesterinic and protolichesterinic acids.

Habitat. On twigs of shrubs in the arctic tundra, often on *Betula nana*, occasionally on soil, rare.



Distribution. Present only in Svalbard. **AI:** *Sb*. Amphi-Beringian (mainly in Alaska), but has been collected further west in Russia (to Taymyr Peninsula).

Note. A very characteristic and easily identified species, but often overlooked. The most striking character is the continuous line of pseudocyphellae close to the margin of the lower surface. Closely related to the North American *Masonhalea richardsonii*.

Melanelia

M. Westberg & A. Thell

Melanelia Essl.

Mycotaxon 7: 46 (1978). – Type: *Melanelia stygia* (L.) Essl.

Syn. *Parmelia* sect. *Melaenoparmelia* Hue, *Parmelia* subgen. *Melanoparmelia* (Hue) Räsänen

D: skållav **F:** mustakarpeet **I:** dumba **S:** sköldlavar

Literature: Blanco et al., Mycol. Res. 108: 873–884 (2004); Esslinger, J. Hattori Bot. Lab. 42: 46–56 (1977); Mycotaxon 7: 45–47 (1990); Mycotaxon 37: 401–402 (1978); Lichenologist 24: 13–20 (1992); Otte et al., J. Biogeogr. 32: 1221–1241 (2005); Thell, Nova Hedwigia 60: 407–422 (1995); Thell et al., Symb. Bot. Ups. 34(1): 442 (2004).

Figs: Thell 1995: 413–414, anatomy.

Thallus foliose, appressed and adnate. Lobes 0.4–3 mm wide, often elongate, flat to convex or concave. Upper surface brown to blackish, more or less shiny, occasionally with pseudocyphellae or soralia; true isidia absent. Cortex paraplectenchymatous. Lower surface pale to dark brown, lighter towards the margins, supplied with rhizines. Ascomata apothecia, laminal to submarginal; disc concolorous with the thallus. Asci broadly clavate, 8-spored with one multispored exception. Spores ellipsoid, simple, colourless. Conidiomata pycnidia, laminal, immersed or sessile to shortly stalked, black. Conidia pronounced dumbbell

shaped, thickened and rounded at both ends, rarely bacillariform. Photobiont trebouxioid.

Chemistry. Cortex HNO_3– (species in Nordic countries). Orcinol depsides and β-orcinol depsides.

Note. Melanelia s. str. has its main distribution in the Northern Hemisphere. As circumscribed today, around 13 species are left in the genus worldwide. The genus is however still polyphyletic and *M. disjuncta* represents a different evolutionary line (Blanco et al. 2004).

1. Soralia present 2
– Soralia absent 4
2. Medulla C+ red; pseudocyphellae whitish, usually distinct ..... 7. *M. tominii*
– Medulla C–; pseudocyphellae lacking or usually indistinct 3
3. Soralia terminal on secondary branches; pseudocyphellae absent ..... 5. *M. sorediata*
– Soralia laminal or submarginal, pseudocyphellae present near the margins (usually indistinct) ..... 2. *M. disjuncta*
4. Secondary lobes in form of numerous isidia-like lobules present ..... 4. *M. panniformis*
– Secondary lobes absent 5
5. Lower surface whitish to pale brown, medulla K– ..... 1. *M. agnata*
– Lower surface dark brown to black, medulla K+ yellow or yellow turning reddish (rarely K–) 6
6. Pycnidia sessile to shortly stalked with a constricted base, marginal to submarginal; lobes concave to flat, medulla K+ yellow ..... 2. *M. hepatizon*
– Pycnidia immersed, laminal; lobes mostly slightly convex; medulla K+ yellow-orange turning red to reddish brown, rarely K– ..... 6. *M. stygia*

1. **Melanelia agnata** (Nyl.) A.Thell.

Nova Hedwigia 60: 416: (1995). – *Platysma agnatum* Nyl., Flora, Jena 60: 562 (1877). – Type: Italy, Trentino-Alto Adige, Kraxentrager, 1871 Arnold 225 (H-NYL 36086 holotype).

Syn. *Cetraria agnata* (Nyl.) Kristinsson

I: fjalladumba **N:** søsterberglav **S:** ögonsköldlav

Literature: Kristinsson, Lichenologist 6: 144–145 (1974); Thell, Nova Hedwigia 60: 416–417 (1995); Westberg et al., Graphis Scripta 16: 25 (2004).

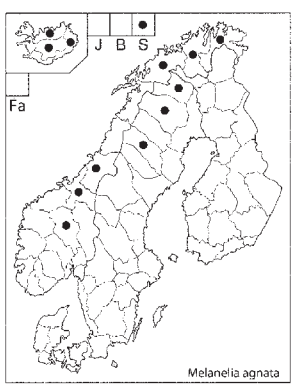
Figs: Kristinsson 1974: fig C facing p. 142, Thell 1995: 411.

Thallus to 10 cm diam., glossy, closely adnate. Lobes 0.5–2.5 mm wide, somewhat concave to flat, with thickened and slightly elevated margins. Upper surface dark, brown to black or partly greenish brown; pseudocyphellae common, whitish, rounded to elongated, laminal to marginal; soralia and isidia absent. Lower surface pale brown, often darker along the margin, somewhat wrinkled. Apothecia common, laminal to submarginal, shortly stalked, to 5 mm diam. Spores ellipsoid, 6.8–8.5 × 4.8–6.6 µm. Pycnidia common, marginal to laminal, sessile with a broad base. Conidia dumbbell-shaped, 5–7.5 × 1–1.5 µm.

Chemistry. Cortex HNO_3–. Medulla C–, K–, KC–, PD–; no secondary compounds (by TLC).

Habitat. The species grows in open places, usually on basic rocks, boulders and pebbles, in alpine situations, rarely on wood.

Distribution. Known from the Scandinavian mountains, Iceland and Svalbard. **I:** *IMi IAu INo*. **N:** *Op ST SNo Tr VFi ØFi*. **AI:** *Sb*. **S:** *LyL LuL TL*. *Melanelia agnata* is an arctic-alpine species known from the Alps, Carpathians and North America and is possibly circumpolar in the Northern Hemisphere.



Note. Although easy to distinguish, this species has been overlooked. The pale lower surface and the K– reaction in the medulla separates *M. agnata* from *M. hepatizon*. It may be confused with *Cetrariella commixta* which has citriform conidia and stalked, strictly marginal pycnidia.

2. **Melanelia disjuncta (Erichsen) Essl.**

Mycotaxon 7: 46 (1978). – *Parmelia disjuncta* Erichsen, Ann. Mycol. 37: 78 (1939) (nom. nov. for *P. sorediata* var. *coralloidea* Lynge). – Type: Germany. Bavaria, am Wege von Krottensee nach Neuhaus in der Oberpfalz, Arnold, Lich. exs. 743b (M lectotype, Westberg & Thell, Nordic Lichen Flora 4: 140, 2011).

Syn. *Melanelia granulosa* (Lynge) Essl., *Parmelia denalii* Krog, *Parmelia granulosa* Lynge, nom. illeg., *Parmelia granulosula* Oxner

D: gråbrun skållav **F:** rosoruskokarve **I:** hnúðdumba **N:** svart steinlav **S:** brunsvart sköldlav

Literature: Blanco et al., Mycol. Res. 108: 878–879 (2004); Esslinger 1977: 46–49.

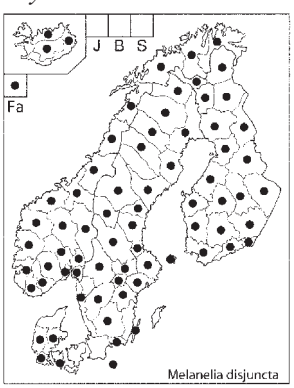
Figs: Brodo et al. 2001: 433; Esslinger 1977: 182; Hansen & Andersen 1995: 44; Krog et al. 1994: 208; Moberg & Holmåsen 1990: 89; Wirth 1995: 650.

Thallus to 6 cm diam., closely appressed. Lobes narrow, short, often broader and pitted towards the tips, 0.3–1 mm wide. Upper surface olive brown to blackish brown, rather shiny. Soralia conspicuous and crowded or diffuse, laminal to submarginal, partly developing from pseudocyphellae, punctiform or capitate; soredia usually blackish; isidia absent; pseudocyphellae present close to the margin, punctiform to somewhat elongated, whitish or more often rather obscure. Lower surface dark brown to black with simple, concolorous rhizines. Apothecia rare, sessile or shortly stalked, to 5 mm diam. Spores ellipsoid, 9–12.5 × 5–7 µm. Pycnidia rare, laminal. Conidia dumbbell-shaped, 6–7.5 × 1 µm.

Chemistry. Cortex HNO_3–. Medulla C–, K–, KC–, PD–; perlatolic and stenosporic acids.

Habitat. Saxicolous on siliceous stones and cliffs in open situations, more frequent in the inland areas, rarely on bark or lignum.

Distribution. Fairly common throughout the Nordic countries. **D:** *ØJy VJy SJy Fyn 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:** *IMi IAu 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:** *Bl Öl SmI Bh Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb LyL PL LuL TL*. Circumboreal in the Northern Hemisphere and also occurring at subalpine-alpine areas in East Africa. The species is easily overlooked and its distribution is therefore still insufficiently known.



Note. It is easily confused with *M. sorediata* and *M. tominii*, though it is only distantly related to *Melanelia* s. str. (Blanco et al. 2004: 878). *M. sorediata* differs from *M. disjuncta* by the absence of pseudocyphellae and the capitate, terminal soralia. The medulla in *M. disjuncta* reacts C– which distinguishes it from *M. tominii* which reacts C+ red.

3. **Melanelia hepatizon** (Ach.) A.Thell

Nova Hedwigia 60: 419–420 (1995). – *Lichen hepatizon* Ach., Lich. Suec. Prodr.: 110 (1799 ‘1798’). – Type: Sweden, Härjedalen, Tännäs, Mt. Gruvvålen, near Lake Glimsjön, c. 2 km NE of Hotel Ramundberget, 920 m., 1988 Santesson 32495 (UPS neotype, Thell, Nova Hedwigia 60: 419, 1995).

Syn. *Cetraria hepatizon* (Ach.) Vain., *Tuckermannopsis hepatizon* (Ach.) Kurok.

F: mustaröyhelö **I:** klettadumba **N:** svartberglav **S:** häll-lav

Literature: Elvebakk & Hertel, Norsk Polarinst. Skr. 198: 314 (1996); Kärnefelt et al., Pl. Syst. Evol. 183: 153–154 (1992); Poelt & Vězda, Biblioth. Lichenol. 16: 33 (1981); Thell 1995: 419–420; Westberg et al., Graphis Scripta 16: 23–27 (2004).

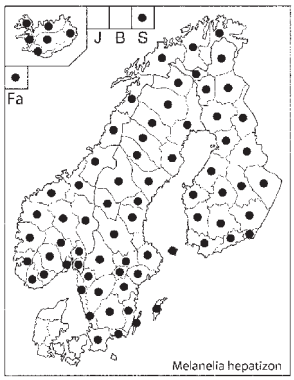
Figs: Brodo et al. 2001: 436; Hansen & Andersen 1995: 47; Hinds & Hinds 2007: 313; Moberg & Holmåsen 1990: 74; Rikkinen 2008: 107; Westberg et al. 2004: 25; Wirth 1995: 274.

Thallus to 20 cm diam., orbicular, adnate to loosely attached. Lobes elongate, 1–2 mm wide, somewhat concave to flat, with thickened and somewhat elevated margins. Upper surface greenish brown to black, rather glossy; soralia and isidia absent; pseudocyphellae common, rounded to elongated, sometimes with a distinct margin, whitish, marginal or laminal. Lower surface black, sometimes paler near the margin; rhizines scattered, black and simple. Apothecia common, submarginal, rarely laminal, shortly stalked, margin knobby, with pseudocyphellae, to 9 mm diam. Spores ellipsoid, 7–10.5 × 4.5–6 µm. Pycnidia frequent, marginal to submarginal, sessile and spherical to shortly stalked with a constricted base. Conidia dumbbell-shaped, 3.5–6 × 1–1.5 µm.

Chemistry. Cortex HNO_3–. Medulla C–, K+ yellow, KC–, PD+ yellow, C–; norstictic and stictic acids.

Habitat. Saxicolous, on exposed siliceous rocks and boulders.

Distribution. Widespread in all Nordic countries except Denmark. **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:** *Sb*. **S:** *Gtl Bh Vg Ög Nrk Srm Vrm Vsm Upl Dlr Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Circumboreal and widespread in the Northern Hemisphere, more frequent in alpine, subalpine and continental areas than along coasts and in the lowland.



Note. Separated from both *M. agnata* and *Cetrariella commixta* by the black lower surface. According to Elvebakk & Hertel (1996), this species may include additional taxa. DNA based studies confirm a close relationship between *M. hepatizon* and the type species *M. stygia* (Thell et al. 2002, 2004).

4. **Melanelia panniformis** (Nyl.) Essl.

Mycotaxon 7: 46 (1978). – *Parmelia prolixa* f. *panniformis* Nyl., Syn. Meth. Lich. 1(2): 397 (1860). – Type: Sweden, ad Holmiam (Stockholm), 1852 Nylander (H-NYL p. m. 1774 holotype).

Syn. *Parmelia panniformis* (Nyl.) Vain., *Parmelia pannariiformis* (Arnold) Vain.

F: limiruskokarve **N:** blokkrinslav **S:** finflikig sköldlav

Literature: Esslinger 1977: 49–50.

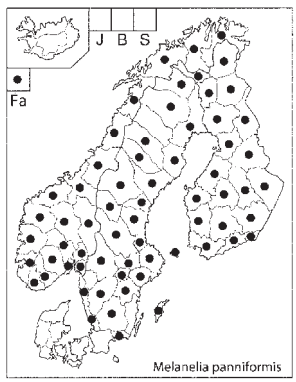
Figs: Brodo et al. 2001: 437; Esslinger 1977: 183; Hinds & Hinds 2007: 315; Rikkinen 2008: 123; Wirth 1995: 655.

Thallus to 10 cm diam., appressed, usually panniform, moderately to loosely adnate. Lobes to 1.5 mm wide, flat, somewhat elongate and imbricate. Upper surface moderately to dark olivaceous or reddish brown occasionally with a white pruina on the lobe ends, rarely sorediate, central parts more or less hidden by numerous, isidia-like, elongate to finger-like, simple or branched lobules which arise along the margins of the primary lobes; psudocyphellae lacking. Lower surface black, paler towards the margin; rhizines scattered, concolorous with the lower surface. Apothecia infrequent, sessile, with knobby margins, to 3 mm diam. Spores ellipsoid, 9–11.5 × 4.5–7 µm. Pycnidia common. Conidia dumbbell-shaped, 5–7 × 1 µm.

Chemistry. Cortex HNO_3–. Medulla C–, K–, KC–, rarely KC+ rose, PD–; perlatolic and stenosporic acids.

Habitat. Saxicolous, on siliceous stones and boulders.

Distribution. Scattered to common in the Nordic countries except Denmark. **Gr. 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 V A Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi*. **S:** *Bl Gtl SmI Hl Bh Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL LuL TL*. Circumpolar, arctic to temperate, also South America.



Note. The species has a characteristic morphology and is normally easily distinguished from other species. However, the narrow-lobed and broad-lobed morphs may be rather dissimilar. It has mostly been confused with *Allantoparmelia almquistii* (Vain.) Essl., present in Greenland and arctic Russia. Their known distributions do not overlap in the Nordic countries and *A. almquistii* differs by a pale, non-rhizinate lower surface and a C+ red or rose reaction in the medulla.

5. **Melanelia sorediata** (Ach.) Goward & Ahti

Mycotaxon 28: 94 (1987). – *Parmelia stygia* var. *sorediata* Ach., Lichenogr. Universalis: 471 (1810). – Type: Sweden (H-ACH 1414G lectotype, Goward & Ahti, Mycotaxon 28: 94, 1987).

Syn. *Melanelia sorediosa* (Almb.) Essl., *Parmelia sorediata* (Ach.) Th.Fr., nom. illeg., *Parmelia sorediosa* Almb.

F: kyhmyruskokarve **N:** hodesteinlav **S:** grynig sköldlav

Literature: Almborn in Krok & Almquist, Svensk Flora 2 ed. 6: 134 (1947); Esslinger 1977: 51–52, 178, Figs 59–60; Goward & Ahti, Mycotaxon 28: 94 (1987).

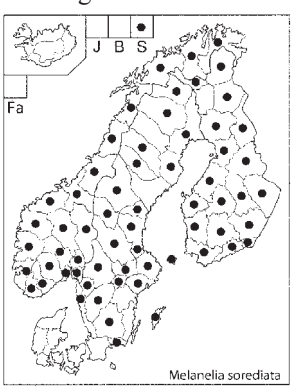
Figs: Brodo et al. 2001: 438; Esslinger 1977: 184; Hinds & Hinds 2007: 308, 317.

Thallus to 6 cm diam., appressed, firmly attached. Lobes 0.5–1.5 mm wide, discrete and elongate, flat even at tips. Upper surface olivaceous brown to greyish brown to blackish, often reticulate close to margins, usually dull. Soralia capitate, terminal on short lateral branches; isidia and pseudocyphellae lacking. Lower surface very dark brown, often paler towards the margin; rhizines concolorous with the lower surface, simple and scattered. Apothecia rare, sessile or somewhat stalked, to 2.5 mm diam. Spores ellipsoid, 9–11 × 4.5–6 µm. Pycnidia not observed.

Chemistry. Cortex HNO_3–. Medulla C–, K–, KC–, rarely KC+ rose, PD–; perlatolic and stenosporic acids.

Habitat. The species prefers siliceous stones and boulders in open situations, often in man-made habitats, rarely on wood.

Distribution. Widespread throughout the Nordic countries except Denmark. **Gr. F:** *A V U EK St EH ES EP PH PS PK KP Kn OP PeP Ks SoL EnL InL*. **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi.* **AI:** *Sb*. **S:** *Bl Gtl SmI Bh Dls Vg Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Hrj Jmt Vb Nb ÅsL LyL LuL TL.* Circumboreal in the Northern Hemisphere. In Europe present south to the Alps.



Note. Previously frequently confused with *M. disjuncta*, but clearly distinct as they differ in the position of the soralia. The two appears to be closely related though this has not yet been confirmed molecularly.

6. **Melanelia stygia** (L.) Essl.

Mycotaxon 7: 47 (1978). – *Lichen stygius* L., Sp. Pl. 2: 1143 (1753). – Type: Sweden, Uppland, Värmdö, Hasseludden, 1907 Malme, Lich. Suec. exs. no. 66 (UPS neotype, Jørgensen et al., Bot. J. Linn. Soc. 115: 381, 1994).

Syn. *Cetraria fahlunensis* (L.) Schaer. nom. utique rej., non sensu auct., *Parmelia stygia* (L.) Ach., *Parmelia stygia* var. *septentrionalis* Lynge

F: sysiruskokarve **I:** bikdumba **N:** blankkrinslav **S:** svart sköldlav

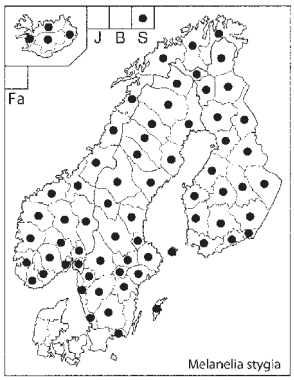
Literature: Esslinger 1977: 52–54; Elvebakk & Hertel, Norsk Polarinst. Skr. 198: 314 (1996); Westberg et al., Graphis Scripta 16: 23–27 (2004).

Figs: Brodo et al. 2001: 439; Hansen & Andersen 1995: 47; Hinds & Hinds 2007: 318; Moberg & Holmåsen 1990: 95; Rikkinen 2008: 107; Westberg et al. 2004: 25; Wirth 1995: 641.

Thallus adnate to adscendent, to 10 cm diam. Lobes usually convex sometimes flate to slightly concave, elongate, contiguous to imbricate, to 5 mm wide. Upper side dark brown, olive brown to blackish, often shiny, especially towards tips; soralia and isidia lacking but isidia-like papillae sometimes present, rarely developing into terete almost isodiametric lobes; pseudocyphellae common, rounded to elongated, sometimes with a distinct margin, whitish to greyish, laminal to submarginal. Lower surface dark brown to black with sparse, dark, simple or irregularely branched rhizines. Apothecia common, sessile, concave, to 8 mm diam., margins knobby, with pseudocyphellae. Spores ellipsoid to subglobose, 7–11.5 × 4.5–6 µm. Pycnidia common, laminal, immersed to slightly protruding. Conidia dumbbell-shaped, 5 × 1 µm.

Chemistry. Cortex HNO_3–. Medulla C–, K– (rarely) or K+ yellow to orange turning red to redbrown, KC–, PD– (rarely) or PD+ orange; consisting of several chemotypes in N. Europe probably most frequently containing fumarprotocetraric and protocetraric acids (very rarely, as in type specimen, with additional norstictic and connorstictic acids), but also the chemotypes with caperatic acid or without any lichen substances are widespread.

Habitat. Saxicolous on siliceous stones and rocks, often in sunny places.



Distribution. Almost throughout the Nordic countries, but rare in the south and lacking in Denmark. **Gr. F:** *A V U EK St EH ES EP PH PS PK KP Kn OP PeP Ks KiL SoL EnL InL*. **I:** *IVe IMi IAu 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:** *Bl Gtl SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. A widespread, circumpolar species in the Northern Hemisphere, extending from the Arctic to alpine areas of Europe, Asia and North America.

Note. Morphologically very variable being ascendent in some habitats. It is most commonly confused with *M. hepatizon* which has mainly marginal, sessile to stalked pycnidia and a medulla that reacts K+ yellow.

7. **Melanelia tominii** (Oxner) Essl.

Lichenologist 24: 15 (1992). – *Parmelia tominii* Oxner, Zh. Bio-Bot. Tsyklu Vseukrain'sk. Nauk 2(7–8): 171 (1933). – Type: Russia, 'Provincia Czita' [Transbaikal Territory], Atamanovka, 1927, Oxner (KW lectotype, Esslinger, Lichenologist 24: 15 (1992).

Syn. *Melanelia substygia* (Räsänen) Essl., *Parmelia saximontana* R.A.Anderson & W.A.Weber, *Parmelia substygia* Räsänen, *Parmelia borisorum* Oxner

N: prikksteinlav **S:** torneskölldlav

Literature: Esslinger 1977: 54–56, 174, Fig. 25; Lichenologist 24: 13–20 (1992); Krog, Blyttia 24: 244–246 (1966); Blyttia 25: 33 (1967); Tønsberg et al., Sommerfeltia 23: 111–113 (1996).

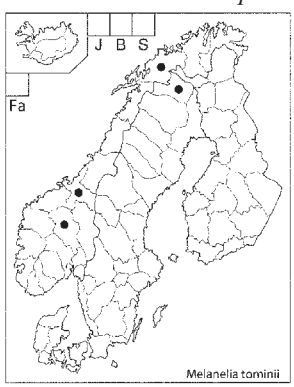
Figs: Brodo et al. 2001: 441, Esslinger 1977: 185; 1992: 16, Krog et al. 1994: 213.

Thallus appressed, moderately to loosely adnate, to 10 cm diam.; lobes flat to weakly convex, usually short and rounded, sometimes elongate, contiguous to slightly imbricate, rugose in central parts, 1–3 mm wide. Upper surface from pale olivaceous brown to blackish brown, dull. Soralia marginal or laminal, punctate to capitate, on central lobes; isidia absent; pseudocyphellae common, rounded to elongated, flat to concave, sometimes with a distinct margin, whitish to greyish laminal. Lower surface dark brown to black, paler at lobe ends, moderately rhizinate. Apothecia frequent, sessile to raised, to 6 mm diam.; disc with crenulate and sorediate margins. Spores 8.5–11 × 4.5–7 µm. Pycnidia common, laminal, immersed. Conidia 5–7 × 1 µm.

Chemistry. Cortex HNO_3–. Medulla C+ red, K–, KC+ red, PD–; gyrophoric acid.

Habitat. Saxicolous on siliceous stones and rocks.

Distribution. Very rare in the mountains. **N:** *Op ST Tr.* **S:** *TL*. Widespread in continental and arid climates from Scandinavia and Russian Karelia to southern Siberia (where often very abundant) and western North America, also in mountains of central and southern Europe, North Africa and the Himalayas.



Note. May be mistaken for *M. disjuncta* but is readily identified by the C+ red reaction of the medulla.

Melanelixia

M. Westberg & A. Thell

Melanelixia O.Blanco, A.Crespo, Divakar, Essl., D.Hawksw. & Lumbsch

Mycol. Res. 108: 881 (2004). – Type: *Melanelixia glabra* (Schaer.) O.Blanco, A.Crespo, Divakar, Essl., D.Hawksw. & Lumbsch

D: skållav **F:** tummakarpeet

Literature: Ahti, Bryologist 72: 233–239 (1969); Blanco et al., Mycol. Res. 108: 881 (2004); Esslinger, J. Hattori Bot. Lab. 42: 69–74, 86–89 (1977); Otte et al., J. Biogeogr. 32: 1221–1241 (2005).

Thallus foliose, loosely to moderately adnate. Lobes discrete to slightly imbricate, mostly short and rounded, flat to concave, 1–6 mm wide. Upper surface olivaceous brown, with or without pseudocyphellae. Cortex paraplectenchymatous. Medulla white, mo-

derately dense. Lower surface dark brown to black, rhizines simple with pale tips. Ascomata zeorine apothecia, laminal, sessile to substipitate; disc concave, olivaceous brown. Asci broadly clavate, 8-spored. Spores ellipsoid, simple, colourless. Conidiomata pycnidia, laminal, immersed. Conidia dumbbell-shaped to bacilliform. Photobiont trebouxioid.

Chemistry. Cortex HNO_3–. Medulla with depsides, lecanoric acid, ± rhodophyscin, isolichenan in the cell-walls.

Note. The genus includes eight species of which five, mainly corticolous species, belong to the flora of the Nordic countries.

1. Soralia and isidia absent ..... 2. *M. glabra*
– Soralia and/or isidia present 2
2. Soralia absent; isidia present, ... 3
– Soralia present; isidia absent or present 5
3. Medulla without orange, K+ purple pigment; isidia short and usually degrading into soredia ..... 4. *M. subaurifera*
– Medulla in patches with an orange, K+ purple pigment; isidia cylindrical, persistent 4
4. Upper surface blackish brown; mainly saxicolous ..... 1. *M. fuliginosa*
– Upper surface olivacous green to brown; mainly corticolous or lignicolous ..... 3. *M. glabratula*
5. Soralia mainly submarginal; isidia absent; with short hyaline hairs on the upper surface and especially along the margins of young lobes ..... 5. *M. subargentifera*
– Soralia mainly laminal; upper surface and margins without hairs ..... 4. *M. subaurifera*

1. **Melanelixia fuliginosa** (Fr. ex Duby) O.Blanco et al.

Mycol. Res. 108: 881 (2004). – *Parmelia olivacea* γ. *fuliginosa* Fr. ex Duby, Bot. Gall.: 602 (1830). – Type: France (not located, Arup & Sandler Berlin ms, Laundon 2006).

Syn. *Melanelia fuliginosa* (Fr. ex Duby) Essl., *Parmelia fuliginosa* (Fr. ex Duby) Nyl., nom. illeg. non (Dicks.) Schaer.

D: sod-skållav **F:** nokiruskokarve **N:** stiftbrunlav **S:** glänsande sköldlav

Literature: Arup & Sandler Berlin, Lichenologist 43: 89–97; Degelius, Bot. Notiser 1945: 396 (1945); Esslinger 1977: 70–71; Mycotaxon 7: 47–48 (1978); Bryologist 90: 163 (1987); Hafellner & Türk, Stapfia 76: 85 (2001); Laundon, Lichenologist 3: 67–68 (1965); Smith et al., The lichens of Great Britain and Ireland: 571 (2009).

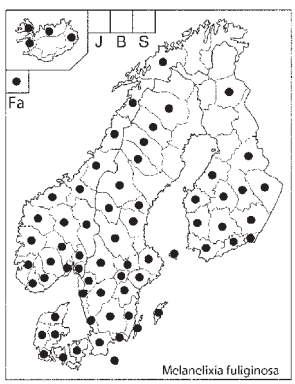
Figs: Moberg & Holmåsen 1990: 90.

Thallus foliose, appressed, moderately adnate, to 15 cm diam. Lobes 1–2 mm wide, short and rounded. Upper surface dark brown to blackish, shiny, usually densely covered (except at the margin) with cylindrical, simple or branched isidia, without psudocyphellae (but often with white scars from broken isidia). Lower surface black, paler towards the periphery, rhizinate; rhizines concolorous with the lower surface, to 1 mm long. Apothecia common, sessile, thalline margin papillate or isidiate, to 6 mm diam. Spores 10–14 × 5.5–9.5 µm. Pycnidia rare. Conidia slightly dumbbell-shaped, 6–7.5 × 1 µm.

Chemistry. Cortex C–, K–, KC–, PD–. Medulla C+ red, K–, KC+ red, PD–; lecanoric acid, also containing an orange, K+ purple pigment in patches.

Habitat. Saxicolous, rarely corticolous.

Distribution. Throughout the Nordic countries but rare towards the north. **D:** *NJy ØJy VJy SJy Fyn Sjæ Brn.* **Fa. F:** *A V U EK St EH ES EP PH PS PK KP Kn SoL.* **I:** *IVe IAu INv INo.* **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr.* **AI:** *Sb*?. **S:** *Sk Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Hls Mpd Hrj Jmt ÅsL LyL PL LuL.* In Europe from Iceland and Fennoscandia to northern Africa; scattered finds in Asia and North America.



Note. Until recently also including *M. glabratula* but Arup & Sandler Berlin (2011) have shown that the two species are molecularily distinct. *M. fuliginosa* has a darker brown colour and grows mainly on rocks.

2. **Melanelixia glabra** (Schaer.) O.Blanco, et al.

Mycol. Res. 108: 882 (2004). – *Parmelia olivacea* var. *corticola* f. *glabra* Schaer., Lich. Helv. Spic. 10: 466 (1840). – Type: Switzerland, Schaerer in Schaerer, Lich. Helv. exs. no. 370 (G lectotype, Esslinger, J. Hattori Bot. Lab. 42: 69, 1977).

Syn. *Melanelia glabra* (Schaer.) Essl., *Parmelia glabra* (Schaer.) Nyl.

F: karvaruskokarve

Red-listed in: **F**

Literature: Ahti, Acta Bot. Fenn. 70: 43–50 (1966); Esslinger 1977: 69–70; Puolasmaa, Graphis Scripta 4: 75–77 (1992).

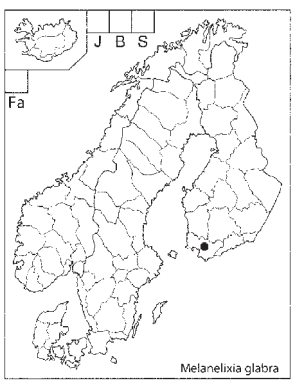
Figs: Jahns, Farne Moose Flechten: 193 (1980).

Thallus appressed, slightly adscendent towards the margin, loosely adnate, to 11 cm diam. Lobes 2–5 mm wide, more or less flat, mostly short and rounded, contiguous to imbricate. Upper surface olive-green to dark olive-brown, shiny, with short hyaline, cortical hairs; soralia and isidia absent; pseudocyphellae present on warts or ridges, especially on the apothecium margin. Lower surface dark brown, often paler at margins. Apothecia frequent, to 8 mm diam., sessile to raised; disc first concave then flat. Spores 11–15 × 5.5–8 µm. Pycnidia common. Conidia bacilliform, 6.5–9 × 1 µm.

Chemistry. Cortex C–, K–, KC–, PD–. Medulla C+ red, K–, KC–, PD–; lecanoric acid.

Habitat. Corticolous, on Ulmus in a graveyard. Perhaps introduced with human activities.

Distribution. Only known from SW Finland. **F:** V. The closest localities are situated in Estonia and NE Poland, but mainly distributed in southern Central Europe and in the Mediterranean area, including North Africa and the Near East. Also occurring eastwards in Asia reaching China.



Note. The thick thallus, the presence of fine hairs on the upper surface and apothecium margin and the absence of soralia and isidia distinguish *M. glabra* from related species in the Nordic countries.

3. **Melanelixia glabratula** (Lamy) Sandler Berlin & Arup

Lichenol. 43: 96 (2011) in Arup & Sandler, Lichenol. 43: 89–97 (2011). – *Parmelia fuliginosa* subsp. *glabratula* Lamy, Bull. Soc. Bot. France 30: 353 (1883). – Type: France, Riou, 1883 Lamy de Chapelle (H-NYL 34501 syntype).

Syn. *Melanelixia fuliginosa* subsp. *glabratula* (Lamy) J.R.Laundon, *Melanelia fuliginosa* subsp. *glabratula* (Lamy) Coppins, *Melanelia glabratula* (Lamy) Essl., *Parmelia glabratula* (Lamy) Nyl., *Parmelia laetevirens* (Flot. ex Körb.) F.Rosend., *Parmelia fuliginosa* var. *laetevirens* (Flot. ex Körb.) Nyl.

D: allé-skållav **F:** tammenruskokarve **N:** stiftbrunlav

Literature: Laundon, Lichenologist 3: 67–68 (1965); Lichenologist 38: 277–278 (2006); (see also under M. fuliginosa).

Figs: Brodo et al. 2001: 435; Hinds & Hinds 2007: 311; Holien & Tønsberg 2006: 54; Sérusiaux et al. 2004: 105; Wirth 1995: 653.

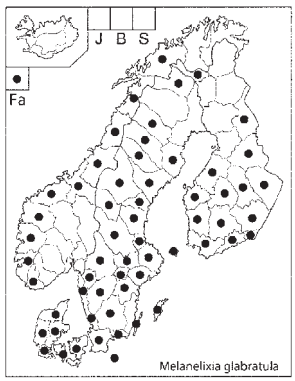
Thallus foliose, appressed, moderately adnate, to 15 cm diam. Lobes 1–2 mm wide, short and rounded. Upper surface olivaceous green to dark brown, shiny or partly matt, moderately to densely covered with cylindrical, simple or branched isidia; without pseudocyphellae (but often with white scars from broken isidia). Lower surface black, paler towards the margins, rhizines concolorous with the lower surface, to 1 mm long. Apothecia common, sessile, to 6 mm diam.; disc concave; thalline margin papillate or isidiate. Spores 10–14 × 5.5–9.5 µm. Pycnidia rare. Conidia slightly dumbbell-shaped, 6–7.5 × 1 µm.

Chemistry. Cortex C–, K–, KC–, PD–. Medulla C+ red, K–, KC+ red, PD–; lecanoric acid; also containing an orange, K+ purple pigment in patches.

Habitat. Corticolous or lignicolous, rarely saxicolous.

Distribution. Throughout the Nordic countries, but rare or absent in the north. **D:** *NJy ØJy VJy SJy Fyn Sjæ Brn*. **Gr. Fa. F:** *A V U EK St EH ES EP PH PS PK KP Kn Ks EnL*. **N:** *VA Ro Ho SF MR ST NT SNo NNo Tr*. **S:** *Sk Bl Öl Gtl SmI Hl Bh Dls Vg Ög Nrk*

Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb ÅsL LyL PL TL. Usually mapped together with *M. fuliginosa* and the distribution of the individual species is not clear (see that species). Seems to be present in Europe, North Africa, Asia and North America.



Note. A recent segregate from M. fuliginosa but for a long time recognized at infraspecific level. The two species were recently shown to be molecularily distinct (Arup & Sandler Berlin 2011). Differs from *M. fuliginosa* by its paler, oliva-ceous green to brown colour and the corticolous habit. Might be confused with indistinctly sorediate specimens of *M. subaurifera* but recognized by the presence of the orange pigment in patches in the medulla.

4. **Melanelixia subargentifera** (Nyl.) O.Blanco et al.

Mycol. Res. 108: 882 (2004). – *Parmelia subargentifera* Nyl., Flora 58: 359 (1875). – Type: Russia, Karelia ladogensis, Spasuvuori [‘Spususaari’] prope Sortavala, 1874 Norrlin (H-NYL 34578 lectotype (as ‘holotype’), Esslinger, J. Hattori Bot. Lab. 42: 86, 1977).

Syn. *Melanelia subargentifera* (Nyl.) Essl., *Parmelia conspurcata* (Schaer.) Vain.

D: sølv-skållav **F:** härmäruskokarve **N:** matt brunlav **S:** ljuskantad sköldlav

Red-listed in: **F**

Literature: Esslinger 1977: 86–87, 173, 176.

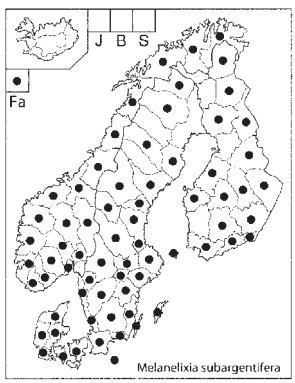
Figs: Brodo et al. 2001: 440; Wirth 1995: 656.

Thallus loosely adnate, with somewhat ascending margins, to 8 cm diam. Lobes rather short and rounded, contiguous to imbricate, to 7 mm wide. Upper surface pale olive-brown to dark brown, smooth to rugose, dull throughout or partly shiny, often pruinose along the margins, with short, hyaline, cortical hairs, mainly at the lobeends; soralia laminal and marginal, soredia granular to isidioid; isidia and pseudocyphellae absent. Lower surface dark brown to black, paler towards the periphery. Apothecia rare, sessile, to 3 mm diam., with sorediate edges; disc concave to flat. Spores 11–13 × 7–8.5 µm. Pycnidia rare. Conidia slightly dumbbell-shaped to bacilliform, 5–7.5 × 1 µm.

Chemistry. Cortex C–, K–, KC–, PD–. Medulla C+ red, K–, KC+ red, PD–; lecanoric acid.

Habitat. Mainly corticolous on deciduous trees, sometimes on coniferous trees and lignum, mostly in park and around old farms, but probably in decline over large areas. In the north mainly on mossy, calcareous rocks.

Distribution. Widespread in southern Fennoscandia, but becoming rare in central and especially northern Fennoscandia. **D:** *NJy ØJy VJy SJy Fyn Sjæ Brn*. **Fa. F:** *A V U EK EH ES EP PH PS PK KP Kn PeP Ks SoL InL*. **N:** *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 LyL LuL TL*. In Eurasia from northern Fennoscandia southwards to the Mediterranean and eastwards to India. Disjunct in North America, with a western distribution from southern California to southern British Columbia and an eastern distribution at the western Great Lakes.



Note. When well developed the cortical hairs, the mainly submarginal soralia, and the lack of true isidia easily distinguish *M. subargentifera* from *M. glabratula* and *M. subaurifera*.

5. **Melanelixia subaurifera** (Nyl.) O.Blanco et al.

Mycol. Res. 108: 882 (2004). – *Parmelia subaurifera* Nyl., Flora 56: 22 (1873). – Type: Finland, Pohjois-Häme, Keuruu, Pihlajavesi, 1871 Norrlin (H-NYL 34567, holotype).

Syn. *Melanelia subaurifera* (Nyl.) Essl.

D: gulpudret skållav **F:** lepänruskokarve **N:** brun barklav **S:** gulpudrad sköldlav

Literature: Esslinger 1977: 87–89.

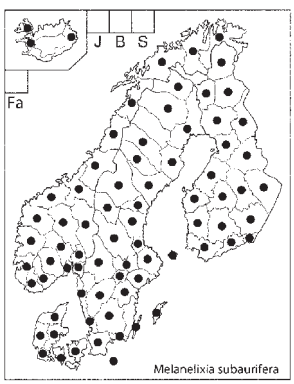
Figs: Brodo et al. 2001: 440; Hinds & Hinds 2007: 320; Rikkinen 2008: 187; Wirth 1995: 657.

Thallus to 10 cm diam., closely appressed, often forming rosettes. Lobes to 5 mm wide, flat, radiating, contiguous to overlapping towards the centre. Upper surface dull, brown to green-brown. Isidia bulbate to cylindrical, originating from soredia, rarely branched; soralia pale yellow (with yellow pigment) to white, often originating from indistinct pseudocyphellae. Lower surface dark brown to black, with simple, concolorous rhizines. Apothecia rare, sessile, flat, to 2 mm diam., with sorediate margins. Spores 9–12 × 5.5–7 µm. Pycnidia rare. Conidia slightly bifusiform to bacilliform, 5.5–7.5 × 1 µm.

Chemistry. Cortex C–, K–, KC–, PD–. Medulla C+ red, K–, KC+ red, PD–; lecanoric acid, often the yellow pigment subauriferin.

Habitat. Mainly corticolous on deciduous trees, rarely on conifers, lignum and rocks.

Distribution. Common in most of the continental forested areas of the Nordic countries, but scattered to rare in the northern boreal zone. **D:** *NJy ØJy VJy SJy Fyn Sjæ Brn*. **F:** *A V U EK St EH ES EP PH PS PK KP Kn OP PeP Ks KiL SoL InL*. **I:** *IVe IAu INv*. **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 Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL LuL TL*. Apparently continuously circumpolar temperate-boreal in the Northern Hemisphere, extending to the Alps and other mountains; also North Africa.



Note. The production of isidia and soredia is variable. When not distinctly sorediate it is similar to *M. glabratula*, but differs by lacking the orange pigment in the medulla, which occurs in patches in that species. *M. subaurifera* is presumably closest related with the darker *M. fuliginosa* (Arup & Sandler Berlin 2011).

Melanohalea

M. Westberg & A. Thell

Melanohalea O.Blanco, A.Crespo, Divakar, Essl., D.Hawksw. & Lumbsch

Mycol. Res. 108: 882 (2004). – Type: *Melanohalea exasperata* (De Not.) O.Blanco, A.Crespo, Divakar, Essl., D.Hawksw. & Lumbsch

D: skållav **F:** rusokarpeet

Literature: Ahti, Acta Bot. Fenn. 70: 1–68; Blanco et al., Mycol. Res. 108: 882 (2004); Esslinger, J. Hattori Bot. Lab. 42: 61–68, 74–97 (1977); Otte et al., J. Biogeogr. 32: 1221–1241 (2005).

Thallus foliose, loosely to moderately adnate; lobes flat to concave, 0.5–7 mm wide. Upper surface olivaceous brown; pseudocyphellae present or absent, often on warts or on tops of isidia; soralia and isidia present or absent. Cortex paraplectenchymatous. Lower surface pale brown to black, rhizines simple. Ascomata zeorine apothecia, laminal, sessile to substipitate; disc concave to flat, concolourous with the upper surface. Asci broadly clavate, 8-spored. Spores ellipsoid. Conidiomata pycnidia, laminal, immersed. Conidia dumbbell-shaped, rarely bacilliform. Photobiont trebouxioid.

Chemistry. Cortex HNO_3–. Depsidones in the medulla, or no products present.

Note. Melanohalea and *Melanelixia* are both recent segregates of *Melanelia* (Blanco et al. 2004). Like *Melanelia* and *Melanelixia*, the species of *Melanohalea* are primarily distributed in the Northern Hemisphere. A total of 19 species are included in *Melanohalea*, of which seven are present in the Nordic countries.

1. With isidia or short, cylindrical, pseudocyphellate papillae 2
– Without isidia or pseudocyphellate papillae 5
2. Without isidia; short secondary lobules (lacinulae) or with short, cylindrical, pseudocyphellate papillae ..... 2. *M. exasperata*
– With isidia; without cylindrical, pseudocyphellate papillae 3
3. Isidia cylindrical 4
– Isidia with a narrow base, clavate to spherical, hollow ..... 3. *M. exasperatula*

4. Without pruina; on bark; southwest Scandinavia ..... 1. *M. elegantula*
– Mostly with pruina; on rocks in the north ..... 4. *M. infumata*
5. With numerous small, imbricate secondary lobules, apothecia rare; southwest Scandinavia ..... 5. *M. laciniatula*
– Without secondary lobules; apothecia common; widely distributed 6
6. Pseudocyphellae laminal, punctiform; spores 12–17 µm long; subhymenium 20–45 µm thick ..... 6. *M. olivacea*
– Pseudocyphellae marginal to submarginal, elongated to irregular; spores 8–13 µm long; subhymenium 10–25 µm thick ..... 7. *M. septentrionalis*

1. Melanohalea elegantula (Zahlbr.) O.Blanco et al.

Mycol. Res. 108: 882 (2004). – *Parmelia olivacea* subsp. *aspidota* var. *elegantula* Zahlbr., Verh. Vereins Natur- Heilk. Pressburg 8: 39 (1894). TYPE: Slovakia, Bratislava Region, "am Fusse des grossen Ahornberges bei Sct. Georgen" [= Sväty Jur], Zahlbruckner (W syntype).

Syn. *Melanelia elegantula* (Zahlbr.) Essl., *Melanelia incolorata* (Parrique) Essl., *Parmelia elegantula* (Zahlbr.) Szatala, *Parmelia incolorata* (Parrique) Lettau

D: elegant skållav **N:** kystbrunlav **S:** elegant sköldlav

Red-listed in: **S**

Literature: Ahti, Bryologist 72: 234–235 (1969); Almborn, Bot. Not., suppl. 1(2): 142–148 (1948), Arup et al., Skyddsvärda lavar i SV Sverige: 209–210 (1996); Degelius, Svensk Bot. Tidskr. 62: 408 (1968); Esslinger 1977: 61–65; Ingelög et al., Floravård i jordbrukslandskapet: 419 (1993); Thell, Graphis Scripta 2: 156–160 (1989); Thor & Arvidsson, Rödlistade lavar i Sverige: 357–358 (1999); Tønsberg et al., Sommerfeltia 23: 108–110 (1996); Østhagen, Blyttia 34: 198 (1976).

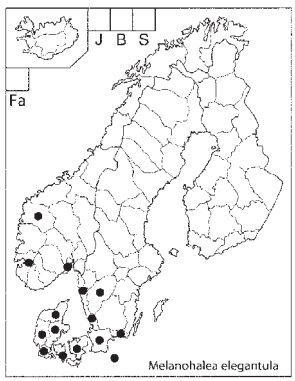
Figs: Arup et al. 1997: 189; Esslinger 1977: 180 (isidia), 183.

THALLUS appressed but often slightly raised at the periphery, loosely to moderately adnate, to 6 cm diam. Lobes short and of rounded, to 4 mm wide, contiguous to imbricate. Upper surface dark olive brown, occasionally pale, reddish or blackening, usually matt; isidia spread over most of the thallus, cylindrical, branched or unbranched. Lower surface pale brown, with concolorous rhizinae. APOTHECIA rare, sessile, with crenulate margin, to 3.5 mm diam. Spores 8–12 × 4–7 µm. PYCNIDIA rare. Conidia usually slightly dumbbell-shaped, 7 × 1 µm.

Chemistry. No secondary substances (by TLC).

Habitat. Preferably corticolous on deciduous trees in open situations, such as avenues, parks and churchyards.

Distribution. Has its northern limit in southwest Scandinavia where it occurs in Denmark, SW Sweden and S Norway. **D:** *NJy ØJy VJy SJy Fyn Sjæ Brn*. **N:** *Vf Ro SF*. ***S:*** *Sk Bl Hl Bh Vg*. Widely distributed and known from southern, central and western Europe, North and South America, Morocco and Pakistan.



Note. Similar to the northern saxicolous species *M. infumata*. Here *M. elegantula* is recognized as a nemoral, corticolous species with a distribution not overlapping that of *M. infumata*. Part of what is here recognized as *M. infumata*, however, was identified as *M. elegantula* by Esslinger (1977). According to Esslinger the isidia of *M. elegantula* arise from conical papillae, often close to the margin, and have apically positioned pseudocyphellae during the whole development, whereas the isidia of *M. infumata* are non-pseudocyphellate and arise from bulbate papillae. Further studies are required.

2. Melanohalea exasperata (DeNot.) O.Blanco et al.

Mycol. Res. 108: 882 (2004). – *Parmelia exasperata* De Not., Giorn. Bot. Ital. 2(2): 193 (1847). – TYPE: Italy, Piedmont ['Liguria'], Alessandria, Gavi, Savignone 83 (RO holotype)

Syn. *Melanelia exasperata* (De Not.) Essl., *Parmelia aspera* A.Massal., *Parmelia aspidota* (Ach.) Poetsch

D: vortet skållav **F:** tappiruskokarve **I:** birkiskóf **N:** vortebrunlav **S:** vårtig sköldlav

Literature: Ahti, Bryologist 72: 235–236 (1969); Esslinger 1977: 65–66, 173.

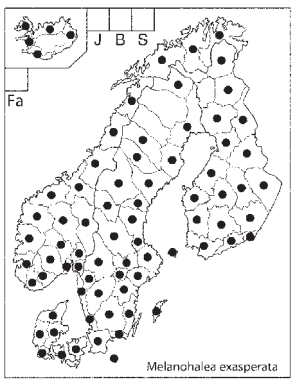
Figs: Esslinger 1977: 187; Hinds & Hinds 2009: 309; Holien & Tønsberg 2006: 53; Krog et al. 1994: 209; Wirth 1995: 651.

THALLUS appressed to moderately adnate, to 6 cm diam. Lobes contiguous to slightly imbricate, to 5 mm wide. Upper surface pale to dark olive brown, dull to moderately shiny, especially at margins, partly pruinose, with conical papillae or warts; with apical pseudocyphellae; pseudocyphellae obscure, punctiform, on the tips of the isidia. Lower surface dark brown to blackish, paler close to margins; rhizines concolourous with the lower surface. APOTHECIA common, sessile to shortly stalked, margins with pseudocyphellate papillae similar to those on the upper surface, to 6 mm diam. Spores ellipsoid, 8–12 × 5–7 µm. PYCNIDIA common. Conidia slightly dumbbell-shaped, 7 × 1 µm.

Chemistry. No secondary substances (by TLC).

Habitat. Epiphytic on deciduous trees, only rarely on other substrates such as conifers, lignum and stone.

Distribution. Present in the whole area except the Atlantic Islands, but more frequent in the north. **D:** *NJy ØJy VJy SJy Fyn Sjæ Brn*. **F:** *A V U EK St EH ES EP PH PS PK KP Kn OP PeP Ks SoL 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 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*. Common in most parts of Europe, less common in North America, where it occurs exclusively in the eastern part, and rare in Asia.



Note. Easily distinguished by the characteristic broad-based and conical papillae on the upper surface and on the apothecial margins.

3. **Melanohalea exasperatula** (Nyl.) O.Blanco et al.

Mycol. Res. 108: 882 (2004). – *Parmelia exasperatula* Nyl., Flora 56: 299 (1873). – TYPE: Finland, Etelä-Häme, Hollola, Tiirismaa, 1872 Norrlin (H-NYL 34611 holotype).

Syn. *Melanelia exasperatula* (Nyl.) Essl., *Parmelia papulosa* (Anzi) Vain., nom. illeg.

D: kølle-skållav **F:** nystyruskokarve **N:** klubbebrunlav **S:** klubbsköldlav

Literature: Ahti, Bryologist 72: 234–235 (1969); Esslinger 1977: 66–68, 174.

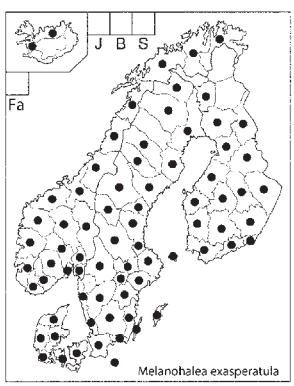
Figs: Brodo et al. 2001: 434; Hinds & Hinds 2007: 310; Holien & Tønsberg 2006: 54; Rikkinen 2008: 187; Wirth 1995: 643.

THALLUS appressed or slightly raised at margins, to 5 cm diam. Lobes short, broadly rounded, to 5 mm wide, contiguous to somewhat imbricate. Upper surface pale to dark olive brown, shiny, sometimes with a faint pruina in central parts, smooth or a slightly wrinkled and pitted; without pseudocyphellae and soredia; isdia common, inflated and clavate to spathulate, hollow, originating from cylindrical papillae. Lower surface pale brown, darker in central parts, with concolorous rhizines. APOTHECIA rare, sessile, margins smooth to crenulated, to 3 mm diam. Spores 8–11 × 5–8 µm. PYCNIDIA not observed.

Chemistry. No secondary substances (by TLC).

Habitat. Preferably corticolous on deciduous trees. In the northern part of its Nordic distribution range now and then also on conifers, on lignum, or saxicolous on soft rocks.

Distribution. Widely distributed in the Nordic countries up to the Arctic Circle. Most common in the south. **D:** *NJy ØJy VJy SJy Fyn Sjæ Brn*. **F:** *A V U EK St EH ES EP PH PS PK KP Kn OP PeP Ks KiL*. **I:** *IVe 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 Vg Ög Nrk Srm Vrm Vsm*



Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL LuL TL. Known from most parts of Europe and North America. Probably circumpolar but rare or poorly known in Asia.

Note. Often growing together with *M. elegantula* in the southwestern part of Scandinavia. In *M. exasperatula*, the isidia become distinctly flattened, clavate to spathulate and hollow, compared with the cylindrical and compact, isidia of *M. elegantula*. In addition *M. elegantula* has a thinner and usually darker brown thallus. From *M. glabratula* it is easily separated by the clavate, hollow isidia and the C– reaction of the medulla.

4. **Melanohalea infumata** (Nyl.) O.Blanco et al.

Mycol. Res. 108: 882 (2004). – *Parmelia infumata* Nyl., Flora 58: 359 (1875). – Type: Russia, Karelia ladogensis, Sortavala, Kirjavalaks (=Kirjavalahti), Kotomäki, 1874 Norrlin (H-NYL 34490 holotype).

Syn. *Melanelia infumata* (Nyl.) Essl.

F: pahtaruskokarve **I:** blikudumba **N:** rimkrinslav **S:** nordlig sköldlav

Literature: Esslinger 1977: 75–77, 177; Hakulinen, Ann. Bot. Fenn. 3: 187–188 (1966).

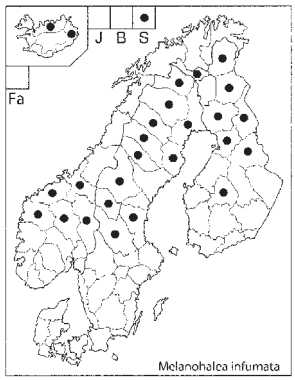
Figs: Esslinger 1977: 180 (isidia), 188; Hansen & Andersen 1995: 45; Hinds & Hinds 2007: 314.

Thallus appressed, loosely to moderately adnate, to 6 cm diam. Lobes short and rounded, to 3 mm wide, with indented margins, contiguous to imbricate. Upper surface dark olive brown, usually dull but sometimes shiny, central parts usually covered by a light greyish or bluish white pruina; isidia common, cylindrical, occasionally hollow, without pseudocyphellae. Lower surface dark brown to black but pale at margins; rhizines sparse, concolorous with the lower surface. Apothecia and Pycnidia not observed.

Chemistry. No secondary substances (by TLC).

Habitat. Saxicolous, preferably on soft rocks.

Distribution. Belongs to the arctic alpine and boreal zones and occurs from central Fennoscandia and northwards. **Gr. F:** *PH Kn OP PeP Ks SoL EnL InL*. **I:** *IAu INo*. **N:** *He Op SF MR ST SF MR ST*. **AI:** *Sb*. **S:** *Dlr Hls Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Outside the area in central European mountains and North America. Most common in North America.



Note. Similar to *M. elegantula* but with different distribution area in the Nordic countries. *M. infumata* is a saxicolous, northern species, *M. elegantula* a corticolous, southwestern-nemoral species.

5. **Melanohalea laciniatula** (Flagey ex H.Olivier) O.Blanco et al.

Mycol. Res. 108: 882 (2004). – *Parmelia exasperatula* var. *laciniatula* Flagey ex H.Olivier, Rev. Bot. Bull. Mens. 12: 69 (1894). – Type: France, Flagey in Flagey, Lich. Franche-Comté exs. no. 167 (UPS syntype).

Syn. *Melanelia laciniatula* (Flagey ex H.Olivier) Essl., *Parmelia laciniatula* (Flagey ex H.Olivier) Zahlbr.

D: småfliget skållav **F:** risaruskokarve **N:** sørlandslav **S:** flikig sköldlav

Literature: Almborn, Bot. Not., Suppl. 1(2): 149–156 (1948); Arup et al., Skyddsvärda lavar i SV Sverige: 210–212 (1996); Degelius, Svensk Bot. Tidskr. 62: 408 (1968); Esslinger 1977: 77–78; Ingelög et al., Floravård i jordbrukslandskapet: 420 (1993); Thell, Graphis Scripta 2: 156–160 (1989); Thor & Arvidsson, Rödlistade arter i Sverige: 359–360 (1999); Tønsberg et al., Sommerfeltia 23: 110–111 (1996).

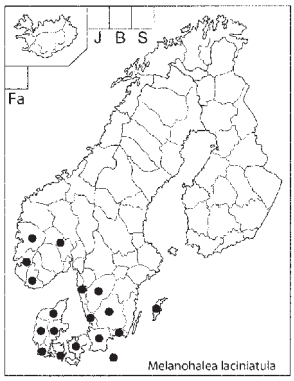
Figs: Arup et al. 1997: 189; Esslinger 1977: 189; Krog et al. 1994: 210.

Thallus appressed but often raised at margins, to 4 cm diam. Lobes to 1–3 mm wide, flat, short and rounded, contiguous or imbricate, with small papillae developing into folioles, often densely covering the central parts; pseudocyphellae obscure, punctiform, on the tips of the papillae. Upper surface olive-brown, rather smooth and dull, but often shiny towards the lobe ends, where small papillae may occur; without soredia and isidia. Lower surface pale brown, with sparse, concolorous rhizines. Apothecia rare, sessile, to 2 mm diam. Spores 7–9 × 4–7 µm. Pycnidia not observed.

Chemistry. No secondary substances (by TLC).

Habitat. Epiphytic on deciduous trees in open situations such as avenues, parks and churchyards.

Distribution. Reaches its northern limit in south-western Scandinavia where it occurs in Denmark, SW Sweden and S Norway. **D:** *NJy ØJy VJy SJy Fyn Sjæ Brn.* **N:** *Bu VA Ro Ho.* ***S:*** *Sk Bl Gtl SmI Hl Bh Vg*. Outside Scandinavia in southern, central and western Europe and in northern Africa.



Note. Resembles *M. elegantula* in the choice of substrate and distribution. When growing together young thalli of the two species could be mistaken for each other. Submarginal papillae of *M. laciniatula* resemble immature isidia of *M. elegantula*. Adult thalli of *M. laciniatula* are easily distinguished from all other brown parmelioid lichens due to the strongly laciniate habit.

6. **Melanohalea olivacea** (L.) O.Blanco et al.

Mycol. Res. 108: 883 (2004). – *Lichen olivaceus* L., Spec. Pl.: 1143 (1753), nom. cons. – Type: Sweden, Härjedalen, Fjellnäs, Vrang in Keissler, Krypt. exs. Vindob. no. 363 (UPS, typ. cons.).

Syn. *Melanelia olivacea* (L.) Essl., *Parmelia olivacea* (L.) Ach.

D: olivenbrun skållav **F:** koivunruskokarve **N:** snömållav **S:** snömärkeslav

Literature: Ahti, Acta Bot. Fenn. 70: 10–22 (1966); Esslinger 1977: 80–81; Truong et al., Lichenologist 41: 649–661 (2009).

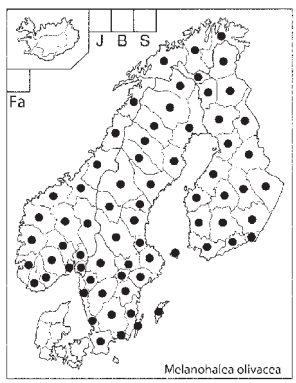
Figs: Brodo et al. 2001: 436; Hinds & Hinds 2007: 315; Holien & Tønsberg 2006: 55; Moberg & Holmåsen 1990: 92; Rikkinen 2008: 149; Truong et al 2009: 656.

Thallus appressed and closely adnate, to 15 cm diam. Lobes to 5 mm wide, irregularly shaped, discrete to imbricate, slightly raised at margins, not eroded and swollen; upper surface olive-brown, wrinkled, dull to shiny at the margins, often somewhat pruinose, flat to somewhat convex; with laminal, punctiform pseudocyphellae; without isidia and soredia; lower surface dark brown, paler towards the margins; rhizines concolorus with the lower surface, rather frequent. Apothecia common, sessile, to 9 mm diam., margins with pseudocyphellae. Spores 12–17 × 7–11 µm. Pycnidia common. Conidia more or less dumbbell-shaped, c. 8 × 1 µm.

Chemistry. Cortex C–, K–, KC–, PD–. Medulla C–, K–, rarely K+ yellow, KC–, PD+ orange, rarely PD–; fumarprotocetraric acid, rarely without secondary substances (by TLC).

Habitat. Frequent on bark, preferably on *Betula*, rarely also on rock. Most abundant in mountain birch forests near the timberline (absent below the average winter snow cover).

Distribution. Occurs scattered in the entire Fennoscandia, but is rare in the south and especially common in the subalpine *Betula* zone. **F:** *A V U EK St EH ES EP PH PS PK KP Kn OP PeP Ks KiL SoL EnL InL*. **I:** *IAu.* **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*. Incompletely circumpolar in the Northern Hemisphere: Northern Europe, Russia, Japan, Alaska, central Canada and northeastern North America.



Note. Similar to *M. septentrionalis*, but has laminal, punctiform pseudocyphellae, a thicker subhymenium and larger spores.

7. **Melanohalea septentrionalis** (Lynge) O.Blanco et al.

Mycol. Res. 108: 883 (2004). – *Parmelia olivacea* var. *septentrionalis* Lynge, Bergens Mus. Årbok 1912 (10): 4 (1912). – Type: Norway, Troms, Målselven, Likkavarre, 1911 Holmboe & Lynge (O holotype).

Syn. *Melanelia septentrionalis* (Lynge) Essl., *Parmelia septentrionalis* (Lynge) Ahti

D: nordlig skållav **F:** pohjanruskokarve **I:** gljádumba **N:** falsk snömållav **S:** liten snömärkeslav

Literature: Ahti, Acta Bot. Fenn. 70: 22–33 (1966); Esslinger 1977: 84–85; Hansen & Andersen 1995; 46; Truong et al., Lichenologist 41: 649–661 (2009).

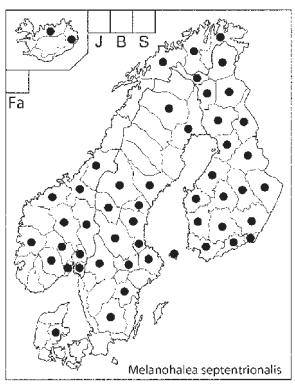
Figs: Ahti 1966: 65; Brodo et al. 2001: 438; Hansen & Andersen 1995: 46; Hinds & Hinds 2007: 316; Krog et al. 1994: 211; Truong et al. 2009: 656.

Thallus appressed, moderately to loosely adnate, to 5 cm diam. Lobes to 4 mm wide, irregularly shaped, rounded to slightly elongate, flat to somewhat convex, margins often swollen and eroded. Upper surface olive-brown, with marginal to submarginal, elongated to irregular pseudocyphellae; without isidia and soredia. Lower surface usually dark brown, with sparse, concolorous rhizines. Apothecia usually abundant, crowded in the centre but frequently extending to the lobe ends, margins smooth or slightly crenulate, pseudocyphellate, to 5 mm diam. Spores 8–13 × 5–9 µm. Pycnidia common. Conidia slightly dumbbell-shaped or bacilliform, 5–7 × 1 µm.

Chemistry. Cortex C–, K–, KC–, PD–. Medulla C–, K–, rarely K+ yellow, KC–, PD+ orange, rarely PD–; fumarprotocetraric acid, rarely no secondary substances (by TLC).

Habitat. Epiphytic on deciduous trees, especially *Salix* and *Alnus incana* along water courses, but also in other habitats.

Distribution. Widely distributed in the Nordic countries, particularly common in the *Betula* woodlands in Iceland and northern Fennoscandia. Less frequent towards the south and absent in southernmost Scandinavia. **Gr. D:** (*ØJy*). **F:** *A V U EK St EH ES EP PH PS PK KP Kn OP PeP Ks KiL SoL EnL InL*. **I:** *IAu INo*. **N:** *Øf Ak He Op Bu Vf Te Ho MR ST NT Tr VFi ØFi*. **S:** *SmI Ög Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Nb LuL*. Circumpolar, primarily boreal, but extends to the low arctic and temperate zones. Isolated occurrences in the Alps and other mountains.



Note. Differs from *M. olivacea* by the marginal, elongated to somewhat irregular pseudocyphellae, smaller thallus and spores and the presence of apothecia close to the lobe ends.

Menegazzia

M. Westberg & A. Thell

Menegazzia A.Massal.

Neagen. Lich.: 1 (1854). – Type: *Menegazzia terebrata* (Hoffm.) A.Massal.

F: reikäkarpeet **S:** hållavar

Literature: Santesson, Ark. Bot. 30A(11): 1–35 (1942); James & Galloway, Flora of Australia 54: 214 (1992); Kärnefelt & Thell, Pl. Syst. Evol. 180: 200–201 (1992); Galloway, Fl. of New Zealand Lich., 2, 1: 904 (2007).

Thallus foliose, rosette-forming to irregular, closely adnate to the substrate. Lobes inflated and hollow. Upper surface grey to greenish grey, smooth, shiny, with rounded perforations, with or without soredia or isidia, without pseudocyphellae. Upper and lower cortex paraplectenchymatous. Medulla white, lax. Lower surface black, brown at the margin, wrinkled, without perforations and rhizines. Ascomata apothecia, zeorine, laminal, sessile to shortly stalked; disc concave, brown. Asci broadly clavate, 2–8-spored. Paraphyses richly branched. Spores simple, colorless, ellipsoid, large and thick-walled. Conidiomata pycnidia, laminal, immersed. Conidia short, bacilliform. Photobiont trebouxioid.

Chemistry. Cortex with atranorin; medulla with stictic, constictic, menegazziaic and sometimes norstictic acids. A diverse secondary chemistry of depsidones, fatty acids and pigments has been reported from species in other parts of the world (Galloway 2007).

Note. About 70 species worldwide, mainly in the temperate and montane areas of the Southern Hemisphere. Only two species reaches the Nordic countries. The two species in the Nordic countries resemble *Hypogymnia* but are easily distinguished by the scattered perforations on the upper surface.

1. Soralia lacerate, funnel-shaped with flange-like margins, early with a central opening into the medullary cavity .....1. *M. subsimilis*
– Soralia not lacerate, capitate, later becoming maniciform with a central opening to the medullary cavity .....2. *M. terebrata*

1. Menegazzia subsimilis (H.Magn.) R.Sant.

Ark. Bot. 30A(11): 13 (1942). – *Parmelia subsimilis* H.Magn, Ark. Bot. 30B(3): 5 (1941) – Type: Hawaii, Kauai, Lehua makanoe, 1938 Selling 6034 (UPS isotype).

Syn. *Menegazzia dissecta* (Rass.) Hafellner

S: atlantisk hål-lav

Red-listed in: **N S**

Literature: Bjerke, Lichenologist 34: 503–508 (2002); Lichenologist 35: 393–396 (2004); Clerc, Meylania 29: 11–19 (2004); Westberg, Lavbulletinen 2004: 20–21 (2004); Bjerke & Timdal, Graphis Scripta 18: 58–61 (2006).

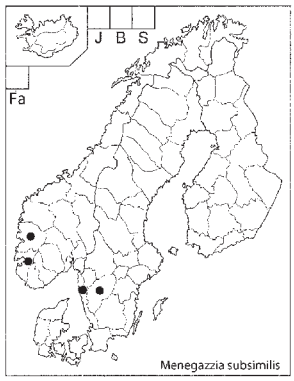
Figs: Bjerke 2002: 504; 2004: 394; Bjerke & Timdal 2006: 59; Brodo et al. 2001: 442 (as M. terebrata); Clerc 2004: 12–14; Hinds & Hinds 2007: 321; Westberg 2004: 21.

Thallus often forming rosettes, to c. 10 cm diam., closely adnate. Lobes to c. 2.5 mm wide, hollow, with rounded tips, indented, branched, radiating. Upper surface grey or greenish grey, usually darker along the margins, smooth, shiny and perforate; perforations rounded-elongated, mostly <0.5 mm diam.; soralia in the lobe tips, labriform, lacerate, funnel-shaped with flange-like margins, early with a central opening into the medullary cavity. Lower surface black, wrinkled, without rhizines. Apothecia not known in the Nordic countries, sessile, margin ± sorediate. Pycnidia infrequent. Conidia c. 5 × 1 µm.

Chemistry. Cortex C−, K+ yellow, KC−, PD−; atranorin. Medulla C– K+ yellow, KC–, PD+ yellow orange; stictic, constictic, menegazziaic and ± norstictic acids.

Habitat. Corticolous, most common on acid bark as *Betula* and *Alnus* but also on *Fraxinus* and *Sorbus*, occasionally saxicolous, on shaded, vertical rocks.

Distribution. Rare but locally common in southwestern Norway. **N:** *Ho Ro*. **S:** *Bh Vg.* Suboceanic, in Europe occurring along the Atlantic coast and in the Alps. Otherwise widespread in temperate and montane areas including Oceania, Asia, North and South America and the Caribbean.



Note. Recently discovered in the Nordic countries. Distinguished from *M. terebrata* by the strongly lacerate soralia which from an early stage have a central opening to the medulla. However, in young or badly developed specimens the soralia may look similar to those in *M. terebrata*.

2. Menegazzia terebrata (Hoffm.) A.Massal.

Neagen. Lich.: 1 (1854). – *Lobaria terebrata* Hoffm., Deutschl. Flora: 151 (1796). – Type: [Switzerland] Schaerer, Lich Helv. exs. no. 365 (UPS neotype, Westberg & Thell, Nordic Lichen Flora 4: 140, 2011).

Syn. *Menegazzia pertusa* (Schrank) B.Steiner, *Parmelia pertusa* (Schrank) Schaer.

F: reikäkarve **N:** skoddelav **S:** hål-lav

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

Literature: Arup, Skyddsvärda lavar i SV Sverige: 212 (1997); Hasselrot, Svensk Bot. Tidskr. 39; 130–132 (1954); Kuusinen et al., Mem. Soc. Fauna Fl. Fenn. 69: 27–29 (1993); Thor & Arvidsson, Rödlistade lavar i Sverige: 361–362 (1999); Tønsberg et al., Sommerfeltia 23: 113–119 (1996).

Figs: Moberg & Holmåsen 1990: 98; Arup et al. 1997: 189; Clerc 2004: 15; Holien & Tønsberg 2006: 49; Krog et al. 1994: 213; Rikkinen 2008: 169; Westberg 2004: 21; Wirth 1995: 574.

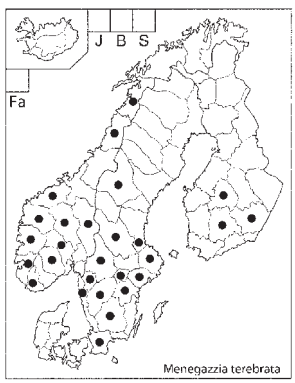
Thallus forming rosettes, to 10 cm diam., closely adnate. Lobes radiating, hollow, with rounded tips, indented, branched, to 2.5 mm wide. Upper surface grey or greenish grey, often brownish along the margins, smooth, shiny and perforate; perforations rounded, to 1 mm diam.; soralia mostly elevated and on the tips of short, erect projections from the surface of the lobes, capitate, to 1.5 mm wide, later often becoming ma-

niciform with a central opening to the medullary cavity. Lower surface black, wrinkled, without rhizines. Apothecia rare, not known in the Nordic countries. Pycnidia uncommon. Conidia c. 5 × 1 µm.

Chemistry. Cortex C–, K+ yellow, KC–, PD–; atranorin. Medulla C–, K+ yellow, KC–, PD+ yellow orange; stictic, constictic, menegazziaic and ± norstictic acids.

Habitat. Mainly corticolous in humid and sheltered forests such as *Alnus* swamps. It has a preference for acid bark as *Alnus* and *Betula* sometimes also on *Quercus*, *Picea* and *Fraxinus* or on mossy, shaded rocks.

Distribution. Southern with scattered localities in central parts of Scandinavia. **F:** *EH ES PH.* **N:** *He Op Bu Te VA Ro Ho SF MR SNo NNo*. **S:** *Sk SmI Bh Dls Vg Ög Nrk Srm Vrm Upl Dlr Gst Jmt.* Widespread in Europe, East Asia, N and S America, New Zealand and Tasmania.



Note. Distinguished from *M. subsimilis* by the capitate soralia. In later stages the soralia may become maniciform with a central opening to the medulla, but never lacerate.

Parmelia

A. Thell, G. Thor & T. Ahti

Parmelia Ach.

Methodus: 153 (1803). – Type: *Parmelia saxatilis* (L.) Ach.

D: skållav **F:** karpeet **I:** litunarskófir **S:** färglavar

Literature: Hale, Smithsonian Contr. Bot. 66: 1–55 (1987); Hale & Kurokawa, Contr. U.S. Natl. Herb. 36: 1–191 (1964); Hawksworth et al., Lichenologist 40: 1–21 (2008); Kärnefelt & Thell, Pl. Syst. Evol. 180: 201–202 (1992); Kurokawa, J. Jap. Bot. 69: 61–68, 121–126, 204–213, 262–269, 373–378 (1994); Molina et al., Lichenologist 36: 37–54 (2004); Thell et al., Symb. Bot. Ups. 34(1): 443–444 (2004); Thell et al., Sauteria 15: 545–559 (2008).

Thallus foliose, loosely to rather closely adnate; lobes rounded, sublinear, subirregular, contiguous to imbricate; upper surface smooth to foveolate, greenish to whitish grey to greyish brown, occasionally pruinose, pseudocyphellate, isidiate and/or sorediate in most species; lower surface blackish with simple or branched rhizines; cortex paraplectenchymatous. Ascomata apothecia, zeorine, laminal to substipitate; disc brown, rarely blackish. Asci 8-spored. Spores ellipsoid, colourless, 10–18 × 5–13 µm. Conidiomata pycnidia, laminal, immersed, black. Conidia more or less dumbbell-shaped, 5.5–8.0 × 1 µm. Photobiont: *Asterochloris* or *Trebouxia* sp.

Chemistry. Atranorin in cortex of all species, chloroatranorin in some. Galbinic, lecanoric, lobaric, protocetraric, lichesterinic, protolichesterinic, nephrosterinic, isonephrosterinic, salazinic and consalazinic acids in different combinations in the medulla, and usnic acid in the soralia of *P. fraudans*.

Note. Nine species, of almost 60 in the world, belong to the Nordic lichen flora. *P. saxatilis* and *P. sulcata* are the most common and widespread species in the Nordic countries. Some of the others have rather restricted distribution while the distribution of *P. ernstiae*, *P. serrana* and *P. submontana* is poorly known. *P. fraudans* is rare in the temperate parts of the region. *P. ernstiae* and *P. submontana* have a southern distribution in the Nordic countries and are restricted to the temperate zone.

1. Thallus sorediate to sorediate isidiate.....2
– Thallus isidiate or vegetative propagules lacking.....4
2. Soralia laminal along ridges,white 3
– Soralia mostly marginal, yellowish .....2. *P. fraudans*
3. Lobe margins down-rolled, rhizines simple .....8. *P. submontana*
– Lobe margins not down-rolled, rhizines squarrosely branched.....9. *P. sulcata*
4. Thallus isidiate.....5
– Thallus lacking isidia.....7
5. Thallus shiny or dull, most parts without pruina, saxicolous or corticolous 6
– Thallus dull, whitish pruinose; mainly corticolous .....1. *P. ernstiae*
6. Isidia mainly laminal; most frequent in the central parts .....5. *P. saxatilis*
– Isidia common along the margins, but also laminal, often clustered on ridges.....6. *P. serrana*

7. Thallus closely appressed; uniformly dark brown; medulla K– ..... 3. *P. omphalodes* subsp. *discordans*
– Thallus loosely appressed or cushion-formed; pale brown to black; medulla K+ yellow or red 8
8. Usually saxicolous; norstictic acid absent 9
– Terricolous or saxicolous on arctic tundra; norstictic acid present; ..... 7. *P. skultii*
9. Pseudocyphellae marginal and laminal, lobes usually 2−4 mm wide ..... 3. *P. omphalodes* subsp. *omphalodes*
– Pseudocyphellae mainly marginal, lobes usually <1 mm wide, panniform or nearly pulvinate ..... 4. *P. pinnatifida*

1. **Parmelia ernstiae** Feuerer & A.Thell

Mitt. Inst. Allg. Bot. Hamb. 30–32: 52 (2002). – Type: Germany, Niedersachsen, Lüneburg, Soltau-Fallingbostel, Hof Möhr, Alfred Töpfer Academy of Nature Conservation, 2000 Ernst (HBG-4619 holotype).

Syn. *Parmelia saxatilis* var. *laciniata* Erichsen

D: rimstift-skållav **S:** daggfärglav

Literature: Feuerer & Thell, Mitt. Inst. Allg. Bot., Hamburg 30–32: 49–60 (2002); Nordén, Svensk Bot. Tidskr. 97: 205 (2003); Molina et al. 2004: 37–54; Thell, Graphis Scripta 14: 10 (2003); Thell et al., Bibl. Lichenol. 96: 299–304 (2007); Thell et al. 2008: 545–559.

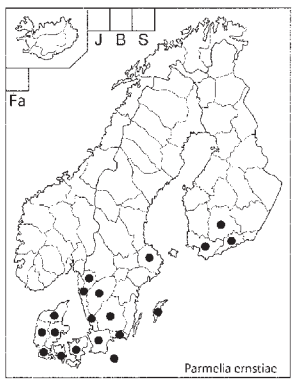
Figs: Feuerer & Thell 2002: 53; Thell et al. 2004: 443; Thell et al. 2007: 301.

Thallus irregularly rosulate, loosely attached, to 10 cm diam.; lobes short and broad, rounded, imbricate, outer lobes to 8 mm wide, laciniate in central parts of the thallus; upper surface pale grey, slightly pruinose, slightly wrinkled, frequently supplied with lobules, developed from flat isidia; pseudocyphellae minute, narrow, to 0.1 mm long, linear as young, becoming wider; soralia very rare, whitish, rounded and laminal or linear and marginal; isidia common, laminal, often more frequent in central parts of the thallus, cylindrical to flat, usually unbranched; lower surface black, wrinkled; rhizines simple, black, lighter towards tips. Apothecia not observed. Pycnidia very sparse. Conidia not observed.

Chemistry. Cortex C–, K+ yellow, KC–, PD–; atranorin and chloroatranorin. Medulla C–, K+ red, KC–, PD+ orange; consalazinic, salazinic (major), lobaric, lichesterinic, protolichesterinic, nephrosterinic, isonephrosterinic and protocetraric (trace) acids.

Habitat. Corticolous, on deciduous trees in semi-open to open situations. In Denmark rarely found saxicolous.

Distribution. Widespread in Denmark and southern Sweden, range still incompletely known. **D:** *NJy ØJy VJy SJy Fyn Sjæ Brn*. **F:** *V U EH*. **S:** *Sk Bl Gtl SmI Hl Bh Dls Vg Upl.* Originally categorized as nemoral-atlantic but the known distribution has gradually enlarged and the species has recently been recorded from southern Scandinavia via the British Isles to the Canary Islands and eastwards to Bosnia-Hercegovina, Czech Republic and eastern Germany.



Note. Differs from *P. saxatilis* in the partly pruinose upper surface, the rounded often short and small lobes and the pruinose isidia which often develop into flat laciniae. The thallus and isidia of *P. serrana* are rarely pruinose, the lobes are broad and rounded as in *P. ernstiae*, but usually larger. In *P. serrana*, the isidia are often clustered along rigdes, whereas in *P. ernstiae* they are typically spread over the surface in central parts of the thallus.

2. **Parmelia fraudans** (Nyl.) Nyl.

in Norrlin & Nylander, Herb. Lich. Fenniae No. 25 (1875). – *Parmelia saxatilis* subsp. *fraudans* Nyl., Lich. Scand.: 100 (1861). − Type: Finland, Pohjois-Savo, Kuopio, Toivala, Karhusaari, E. Nylander (H-NYL 34869 lectotype, Hale, Smithsonian. Contr. Bot. 66: 25, 1987).

F: kouruisokarve **N:** knauslav **S:** gulaktig färglav

Literature: Hasselrot, Acta Phytogeogr. Suec. 33: 80–83 (1953); Lynge, Naturen 45: 171–172 (1921).

Figs: Krog et al. 1994: 226; Thomson 1984: 302.

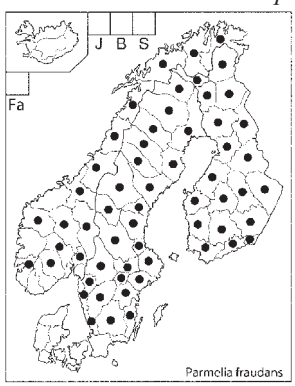
Thallus irregularly rosulate, ± closely attached, to 16 cm diam.; lobes dichotomously to irregularly branched, contiguous to imbricate, sublinear and short, to 4 mm wide, concave; upper surface greenish grey to brownish grey (with yellowish tinge, especially when wet), shiny or dull, pruinose, transversely cracked;

pseudocyphellae small, to 0.5 mm long, effigurate; soralia yellowish with isidia-like structures; lower surface black in the centre, shiny brown towards margins; rhizines frequent, simple to furcate. Apothecia rare, isidiate-sorediate, to 10 mm diam.; disc brown. Spores 10–16 × 5–9 µm. Pycnidia sparse. Conidia 5.5–6.5 × 1 µm.

Chemistry. Cortex C–, K+ yellow, KC–, PD–; atranorin. Medulla C–, K+ red, KC– and PD+ orange; salazinic (major), consalazinic and protolichesterinic acids and traces of usnic acid in the soralia (KC+ yellow).

Habitat. On sun-exposed siliceous rocks, often on bird-perching boulders in cultivated fields and on shores.

Distribution. Most common in the northern inland, rare towards the south, lacking in the southernmost part and Iceland. **Gr. F:** *V U EK St EH ES EP PH PS PK KP Kn OP PeP Ks KiL SoL EnL InL*. **N:** *Ak He Op Bu Te Ro SF ST NT SNo NNo Tr VFi 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 TL*. A circumpolar arctic-alpine and boreal species with continental preferences. In Europe an outlier in the Carpathian Mts.



Note. The yellowish tinge in the soralia and thallus, caused by usnic acid, is unique in the genus *Parmelia*. The species reminds of *P. sulcata* but differs in having sorediate isidia along the margins and a brownish grey upper surface on the concave lobes.

3. **Parmelia omphalodes** (L.) Ach.

Methodus: 204 (1803). – *Lichen omphalodes* L., Sp. Pl. 1143 (1753). – Type: Icon in Dillenius, Hist. Musc.: t. 23, Fig. 80A (lectotype, Jørgensen et al., Bot. J. Linn. Soc. 115: 333, 1994); without locality, corresponding specimen in herb. Dillenius (OXF epitype, Jørgensen et al., Bot. J. Linn. Soc. 115: 333, 1994).

D: bronze-skållav **F:** limi-isokarve **I:** litunarskóf **N:** brun fargelav **S:** letlav

subsp. **omphalodes**

Literature: Culberson, Rev. Bryol. Lichénol. 37: 183–186 (1970); Elvebakk & Hertel, Norsk Polarinst. Skr. 198: 317 (1996); Krog, Blyttia 29: 165–166 (1971); Molina et al. 2004: 49–50; Skult, Ann. Bot. Fenn. 21: 117–142 (1984); Ann. Bot. Fenn. 24: 371–383 (1987); Skult et al., Ann. Bot. Fenn. 27: 47–52 (1990).

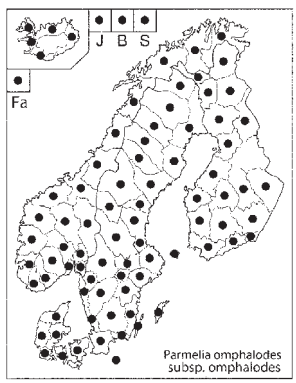
Figs: Brodo et al. 2001: 482; Hansen & Andersen 1995: 45; Holien & Tønsberg 2006: 56; Skult 1987: 381.

Thallus more or less orbicular, often confluent with other thalli, loosely attached; lobes to 4 mm wide, imbricate, to 20 cm diam.; upper surface variable in colour, from pale grey to dark brown, shiny, not pruinose; pseudocyphellae marginal and laminal, rounded as young, later elongated and branched, to several mm long, sometimes developing into cracks; soredia and isidia absent; lower surface black, with simple to furcate rhizines. Apothecia sparse, to 12 mm diam.; disc brown, often splitting. Spores 10–15 × 7–9 µm. Pycnidia common. Conidia 5.5–6.5 × 1 µm.

Chemistry. Cortex C–, K+ yellow, KC–, PD–; atranorin. Medulla C–, K+ red, KC–, PD+ orange; consalazinic, salazinic, lobaric, and protolichesterinic protocetraric acids constanct or subconstant; galbinic and fumarprotocetraric acids are accessory and in trace amounts.

Habitat. Saxicolous on siliceous rocks (basaltic in Iceland).

Distribution. Widely distributed in the Northern Hemisphere including the Nordic countries. **D:** *NJy ØJy VJy SJy Fyn Sjæ Brn*. **Gr. Fa. F:** *A V U EK St EH ES EP PH PS PK KP 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*. **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*.



Note. Characterized by the distinct laminal and marginal pseudocyphellae, and the presence of salazinic and usually lobaric acid in the medulla.

subsp. **discordans** (Nyl.) Skult

Ann. Bot. Fenn. 21: 139 (1984). – *Parmelia discordans* Nyl. in Brenner, Meddeland. Soc. Fauna Fl. Fenn. 13: 340 (1886 '1885'). – Type: Russia [formerly Finland], island Hogland (=Gogland; Suursaari), 1868 Brenner (H-NYL 34916 lectotype [as 'holotype'], Culberson, Rev. Bryol, Lichénol. 37: 186, 1970).

Syn. *Parmelia insensitiva* (H.Magn.) Hilitzer, *Parmelia omphalodes* var. *insensitiva* H.Magn, *Parmelia omphalodes* var. *discordans* (Nyl.) H.Magn.

F: luotoisokarve

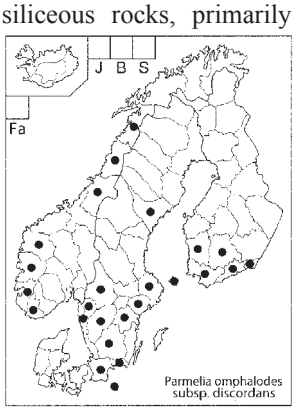
Literature: Hale 1987: 23–24; Kurokawa, J. Jap. Bot. 51: 380 (1976); Molina et al. 2004: 49–50; Skult, Ann. Bot. Fenn. 21: 138-139 (1984); Thell et al. 2008: 553.

Figs: Hale 1987: 20; Skult 1987: 381.

Thallus fragile, moderately to loosely attached, to 10 cm diam.; lobes sublinear, short and imbricate, to 3 mm wide but rarely more than 1 mm; upper surface shiny dark brown; pseudocyphellae marginal, sparsely laminal, to 0.5 mm long, effigurate; soredia and isidia absent; lower surface black, rhizines simple to furcate. Apothecia sparse, to 5 mm diam.; disc brown. Spores 14–16 × 8–10 µm. Pycnidia rare. Conidia 5.5–6.5 × 1 µm.

Chemistry. Cortex C–, K+ yellow, KC–, PD–; atranorin. Medulla C–, K–, KC+ violet or KC–, PD+ orange; atranorin, lobaric, protocetraric and protolichesterinic acids; galbinic and fumarprotocetraric acids are accessory and in trace amounts.

Habitat. Saxicolous on siliceous rocks, primarily coastal but usually 15–100 m above the sealevel rather than in the "splash zone".



Distribution. Slightly oceanic and accordingly most frequent in coastal regions. Absent in the major part of the area but locally common, e.g. in the SW archipelago of Finland and along the west coast of Sweden and Norway. **D:** *Brn*. **F:** *A V U EK St EH*. ***N:*** *VA Ro Ho SF NT SNo NNo*. **S:** *Sk Bl SmI Bh Dls Vg Ög Srm Vrm Upl Ång*. Restricted to western Europe, from Spain to Norway and Estonia.

Note. Differs from *P. omphalodes* subsp. *omphalodes* in a more adnate thallus, a uniform dark brown colour, narrower, and overlapping lobes. The secondary chemistry is characterized by lobaric and protocetraric acids instead of salazinic acid.

4. **Parmelia pinnatifida** Kurok.

J. Jap. Bot. 51: 378 (1976). – *Parmelia omphalodes* β. *panniformis* Ach., Methodus: 204 (1803). – Type: Switzerland, Schleicher? 257 (H-ACH 1297A lectotype, Kurokawa, J. Jap. Bot. 51: 378, 1976).

Syn. *Parmelia omphalodes* var. *pinnatifida* (Kurok.) Skult

F: liuskaisokarve

Literature: Hale 1987: 34; Kurokawa, J. Jap. Bot. 51: 378–380 (1976); Magnusson, Svensk Bot. Tidskr. 13: 89 (1919); Molina et al. 2004: 49–50; Skult, Ann. Bot. Fenn. 21: 138 (1984); Ann. Bot. Fenn. 24: 379–381 (1987); Thell et al. 2008: 554.

Figs: Skult 1984: 137; 1987: 381; Rikkinen 2008: 122 (as *P. omphalodes*).

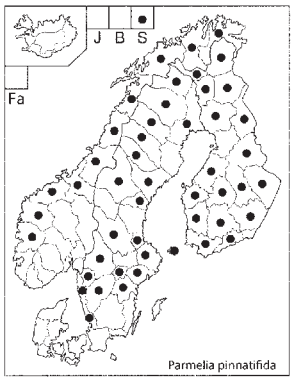
Thallus more or less orbicular, loosely attached, flat to cushion forming, to 10 cm diam.; lobes repeatedly branched, to 2.5 mm wide but usually <1 mm wide; lobules narrow, to 0.3 mm wide; upper surface blackish, occasionally pale brown to grey; pseudocyphellae usually marginal, furcated, sometimes as a continuous rim; without soredia and isidia; lower surface black, with simple to furcate rhizines. Apothecia sparse and small, rarely >4 mm diam.; disc brown to blackish. Spores 10–15 × 7–9 µm. Pycnidia common. Conidia 5.5–6.5 × 1 µm.

Chemistry. Cortex C–, K+ yellow, KC–, PD–; atranorin. Medulla C–, K+ red, KC–, PD+ orange; consalazinic, salazinic, galbinic (trace), fumarprotocetraric acids, occasionally protolichesterinic acid.

Habitat. Saxicolous on siliceous rocks.

Distribution. Present in most provinces, but more frequent towards the north. **F:** *A V U St EH ES EP PH PS PK KP Kn PeP Ks KiL SoL EnL InL*. **N:** *Ho SF MR*

ST NT SNo NNo Tr VFi ØFi. **AI:** *Sb*. **S:** *Hl Bh Dls Vg Ög Nrk Srm Vrm Upl Dlr Gst Mpd Ång Jmt ÅsL LyL PL LuL TL.* Widespread in boreal and arctic northern Europe and throughout northern North America, Asian distribution little known.



Note. Resembles *P. omphalodes* but has even narrower lobes than *P. omphalodes* subsp. *discordans*. The lobes are more branched and supplied with narrow lobules and the pseudocyphellae are more distinctly marginal then in *P. omphalodes* and *P. skultii* in which they are spread over the upper surface. Also the absence of both lobaric and protocetraric acids is diagnostic. Hale (1987) treated *P. pinnatifida* as a synonym of *P. omphalodes* but the two taxa are phylogenetically distinct. According to Skult (1984, 1987) specimens seemingly intermediate beween *P. pinnatifida* and *P. omphalodes* s. lat. occur, but their status needs further studies.

5. **Parmelia saxatilis** (L.) Ach.

Methodus: 204 (1803). – *Lichen saxatilis* L., Sp. Pl.: 1142 (1753). – Type: Sweden, ca 1740 Linnaeus (LINN 1273.62, second from bottom, lectotype, Galloway & Elix, New Zealand J. Bot. 21: 405, 1983); Sweden, Västerbotten, Umeå, October 1998, S. Ott (MAF 6882 epitype, Molina et al., Lichenologist 36: 47, 2004).

D: farve-skållav **F:** kallioisokarve **I:** snepaskóf **N:** grå fargelav **S:** färglav

Literature: Crespo et al., Mycol. Res. 106: 788–795 (2002); Hale 1987: 38–40; Kurokawa 1994: 61–68, 262–269; Molina et al. 2004: 47–48, 50–52; Thell et al. 2008: 545–559.

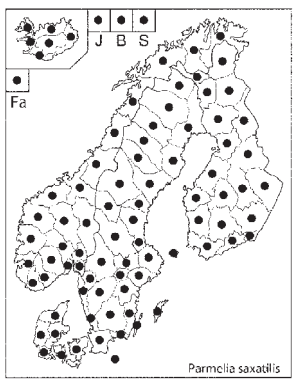
Figs: Moberg & Holmåsen 1990: 94; Hansen & Andersen 1995: 46; Brodo et al. 2001: 483; Sérusiaux et al. 2004: 117; Holien & Tønsberg 2006: 56; Rikkinen 2008: 105.

Thallus orbicular to irregular, loosely attached, to 20 cm diam.; lobes sublinear, contiguous to imbricate, to 4 mm wide; upper surface grey to glaucous, brownish or blackish, shiny, frequently with pseudocyphellae as older, rarely pruinose; soralia absent; isidia frequent, cylindrical, abundant to scarce, simple or branched, usually black (pseudocyphellate) at tips; lower surface black with simple to furcate rhizines. Apothecia rare in most areas, locally common; disc brown. Spores 16–18 × 9–11 µm. Pycnidia uncommon. Conidia 5–7 × 1 µm.

Chemistry. Cortex C–, K+ yellow, KC–, PD–; atranorin and chloroatranorin. Medulla C–, K+ red, KC–, PD+ orange; consalazinic, salazinic (major), lobaric and protocetraric (trace) acids.

Habitat. More common on rocks than on bark in the Nordic countries, except for Denmark and coastal Norway, where a corticolous habit dominates (like elsewhere in oceanic conditions). Preferably on acid substrates in both open and shaded habitats, but also in ornithocoprophilous communities.

*Distribution.*Very common in the major part of the Nordic countries. **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*. A bipolar, very widespread, temperate to arctic/antarctic species.



Note. The species is highly variable but usually morphologically distinguished from the two most closely related, mainly corticolous relatives, *P. ernstiae* and *P. serrana*. *P. ernstiae* differs by the pruinose surface, whereas *P. serrana* differs by longitudinal cracks and ridges. Finally, *P. saxatilis* possibly differs by a distinct set of minor chemical compounds, all not well known.

6. **Parmelia serrana** A.Crespo et al.

Lichenologist 36: 48–49 (2004). – Type: Spain, Madrid Prov., Sierra del Guadarrama, Navacerrada, S of Antón Real, 2003 Crespo & Divakar (MAF 9756 holotype).

Literature: Molina et al.: 37–52; Thell et al. 2008: 545–559 (2008).

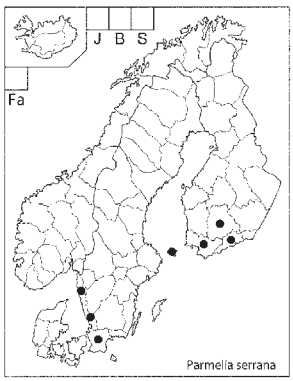
Figs: Molina et al. 2004: 48.

THALLUS orbicular to irregular, loosely attached, to 15 cm diam.; lobes broad, short, rounded to sublinear, to 6 mm wide, contiguous to imbricate; upper surface pale greenish grey to whitish grey, shiny mainly towards margins, occasionally dull, foveolate, becoming reticulately cracked; pseudocyphellae common, linear or irregular to several mm long; soralia absent; isidia laminal and marginal, also often clustered along rigdes, cylindrical, simple to branched; lower surface blackish, rhizines simple or branched. APOTHECIA rather frequent; disc brown, concave. Spores broadly ellipsoid, 17–18 × 12–13 µm. PYCNIDIA sparse. Conidia not observed.

Chemistry. Cortex C–, K+ yellow, KC–, PD–; atranorin; chloroatranorin. Medulla C–, K+ red, KC–, PD+ orange; consalazinic, salazinic (major), lichesterinic, protolichesterinic (major), nephrosterinic, isonephrosterinic (major) and protocetraric (trace) acids.

Habitat. Corticolous on deciduous and coniferous trees, in southern Europe also on mossy rocks. The Swedish specimens have been collected on *Betula*, *Malus*, *Picea abies* and *Populus tremula*.

Distribution. Known only from S Finland and southern and western Sweden. **F:** *A V U EH.* **S:** *Sk Hl Bh*. The world distribution is poorly known and it is hitherto known from southern, central and western Europe and the Canary Islands. The Atlantic preference is less pronounced compared with *P. ernstiae*.



Note. The most recently discovered member of the Nordic *Parmelia*-flora, originally discovered in Spain and first reported from Sweden by Hawksworth et al. (2008). The species is morphologically variable and often very similar to both *P. ernstiae* and *P. saxatilis*, but distinguished by distinct longitudinal cracks and ridges. The isidia are mainly concentrated to the ridges and the margins. It is chemically possibly distinct from both *P. ernstiae* and *P. saxatilis*. The distribution in the Nordic countries is still poorly known.

7. *Parmelia skultii* Hale

Smithsonian Contr. Bot. 66: 43 (1987). – TYPE: Mould Bay, Prince Patrick Island, NWT, Canada, MacDonald s.n. (CANL holotype).

Syn. *Parmelia omphalodes* subsp. *glacialis* Skult

Literature: Elvebakk & Hertel, Norsk Polarinst. Skr. 198: 317 (1996); Hale 1987: 43; Skult, Ann. Bot. Fenn. 22: 201–205 (1985); Ann. Bot. Fenn. 24: 371–383 (1987).

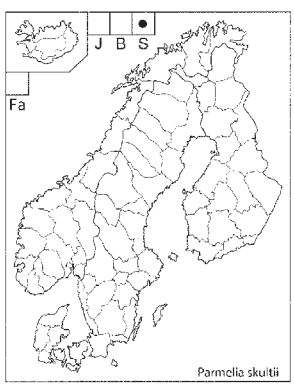
Figs: Hale 1987: 42; Skult 1985: 202; Thell et al. 2004: 444.

THALLUS orbicular to irregular, loosely attached, to 10 cm diam.; lobes sublinear, rather short, to 8 mm wide, imbricate, with secondary laciniae; upper surface smooth, blackish to rather pale brown, but with a black rim along the margin, with a whitish to lilac pruina; pseudocyphellae marginal, sometimes more or less continuous; soredia and isidia absent; lower surface black with simple to sparsely furcate black rhizines. APOTHECIA very rare, not seen in Nordic material. PYCNIDIA sparse or absent. Conidia 6–8 × 1 µm.

Chemistry. Cortex C–, K+ yellow, KC–, PD–; atranorin. Medulla C–, K+ yellow, KC+ red, PD+ yellow, turning red; norstictic and salazinic acids in equal concentrations, also consalazinic, fumarprotocetraric, protolichesterinic and stictic acids.

Habitat. Terricolous in tundra heaths, usually among mosses, but also on bare rocks.

Distribution. An arctic circumpolar species with some oceanic preferences, occurring in northern Canada, Alaska, Greenland, Franz Josef Land, Novaya Zemlya and Svalbard. **Gr. AI:** *Sb*.



Note. Differs from *P. omphalodes* by the bluish white to lilac pruina, the presence of marginal pseudocyphellae, sometimes as a continuous silvery line, and the presence of norstictic acid. Furthermore the upper surface has a black rim along the margin. Also *P. pinnatifida* has marginal pseudocyphellae, but this species has narrower and repeatedly branched lobes. The colour of the upper surface is usually blackish but may differ considerably

within the same specimen, although a blackish colour is commonest.

8. **Parmelia submontana** Nádv. ex Hale

Smithsonian Contr. Bot. 66: 44 (1987) – *Parmelia bohemica* Nádv., Stud. Bot. Czechoslov. 12: 244 (1951), nom. illeg. – *Parmelia submontana* Nádv. in Sborn. Prac. Tatr. Narodnom Parku 1: 72 (1957), nom. nov. inval. – TYPE: Czech Republic, Bohemia, Hlinsko, Planavy, 1931 Nádvorník (PRM lectotype, Hale, Smithsonian Contr. Bot. 66: 44, 1987).

Syn. *Parmelia contorta* Bory, nom. illeg., *Parmelia saxatilis* var. *contorta* Zahlbr.

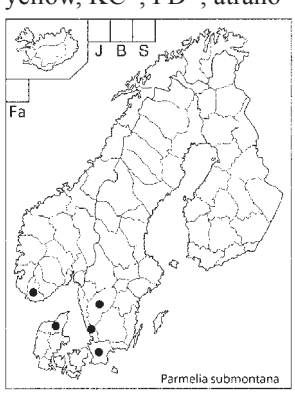
S: kupig skrynkellav

Literature: Alstrup et al., Graphis Scripta 15: 45–50 (2004); Arup et al., Skyddsvärda lavar i SV Sverige: 224, 228 (1997); Arvidsson, Svensk Bot. Tidskr. 83: 156–160 (1989); Christensen Graphis Scripta 8: 61–63 (1997); Gauslaa, Graphis Scripta 11: 25–28 (1999); Motiejunaite et al., Graphis Scripta 14: 62–64 (2004); Schindler, Herzogia 3: 347–364 (1975); Thor & Arvidsson, Rödlistade lavar i Sverige: 396 (1999); Wirth, Die Flechten Baden-Württembergs**:** 318–319 (1987).

Figs: Arup et al. 1997: 228; Sérusiaux et al. 2004: 116; Wirth 1995: 661.

THALLUS irregular, loosely attached, to 15 cm diam.; lobes elongate, little branched, to 7 mm wide, with down-rolled margins, apices often turned slightly upwards; upper surface shiny, greenish grey; pseudocyphellae laminal and marginal, round to effigurate, developing into whitish orbicular soralia; soredia isidia-like; lower surface black, with simple or more seldom furcate, rhizines. APOTHECIA and PYCNIDIA not observed.

Chemistry. Cortex C–, K+ yellow, KC–, PD–; atranorin. Medulla C–, K+ red, KC–, PD+ orange; salazinic and consalazinic acids.



Habitat. Corticolous on deciduous trees, often among mosses.

Distribution. Scattered, south-western, with oceanic preferences in Scandinavia. **D:** *NJy*. **N:** *VA*. **S:** *Sk Hl Vg*. Widespread in temperate and Mediterranean Europe, also in Turkey and the Canary Islands.

Note. An overlooked and poorly understood species, first reported from Sweden 1989 and later found in Denmark and Norway. It seems to be increasing in south westernmost Sweden, but since material from the 1940s has been found in LD and UPS (immixed in collections of *P. sulcata*) it is not unlikely that it has been present at the localities for a long time. It is similar to *P. sulcata*, but differs, when well-developed by the long, little branched lobes with down-rolled margins and the isidia-like soredia. It is probably spreading in northern Europe. The long lobes with down-rolled margins and mostly simple rhizines are typical features of the species.

9. **Parmelia sulcata** Taylor

in Mackay, Fl. Hibern.: 145 (1836). – TYPE: Ireland, Kerry, Dunkerron, Taylor (FH-Taylor, lectotype, Galloway & Elix, New Zealand J. Bot. 21: 409 (1983).

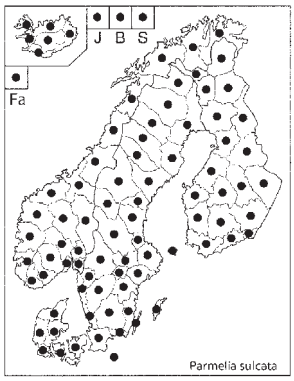
D: rynket skållav **F:** raidanisokarve **I:** hraufuskóf **N:** bristlav **S:** skrynkellav

Figs: Moberg & Holmåsen 1990: 96; Hansen & Andersen 1995: 47; Brodo et al. 2001: 485; Sérusiaux et al. 2004: 117; Holien & Tønsberg 2006: 57; Rikkinen 2008: 145.

THALLUS more or less orbicular, moderately attached, to 20 cm diam., often continuous patches of several thalli; lobes sublinear, short and imbricate, to 5 mm wide; upper surface shiny, greenish grey to pale grey, foveolate, sometimes cracked; pseudocyphellae effigurate, laminal to marginal, to 1 mm long, developing into soralia; soralia whitish, becoming continuous along ridges; lower surface black; rhizines frequent, simple to furcate, basally often squarrose. APOTHECIA rare, to 6 mm diam.; disc concave, brownish with sorediate margins. Spores 11–14 × 6–8 µm. PYCNIDIA uncommon. Conidia 6–8 × 1 µm.

Chemistry. Cortex C–, K+ yellow, KC–, PD–; atranorin. Medulla C–; K+ red; KC–, PD+ orange; salazinic and consalazinic acids.

Habitat. Corticolous, preferably on deciduous trees, also saxicolous, especially on nitrogen-rich habitats such as bird-perching rocks and around cultivated fields.



Distribution. Very common in most parts of the Nordic countries. **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*. Widespread in temperate to arctic/antarctic zones in both hemispheres and all continents, also in high mountains.

Note. Morphologically very variable but typically foveolate, with a sorediate pseudocyphellate upper surface. It may be mistaken for *P. submontana*, and young thalli with poorly developed, punctiform soralia may even be confused with *Punctelia* species, a genus characterized by simple rhizines instead of squarrosely branched rhizines of *Parmelia sulcata*. Also very young thalli without soredia or isidia can be distinguished from *P. saxatilis* on the basis of the rhizines.

Parmelina

A. Thell

Parmelina Hale

Phytologia 28: 481 (1974). – Type: *Parmelina tiliacea* (Hoffm.) Hale

D: skållav **F:** riuttakarpeet **N:** lindelav **S:** silverlavar

Literature: Hale, Phytologia 28: 481–483 (1974); Smithsonian Contr. Bot. 33: 1–60 (1976); Crespo et al., Syst. Biodivers. 8: 209–221 (2010); Clerc & Truong, Sauteria 15: 175–194.

Thallus ± orbicular, closely adnate, to 10(–15) cm diam. Lobes sublinear to irregular, continuous to imbricate, to 4 cm wide, irregularly branched and indented; unbranched cilia present at margins. Upper surface pale grey, partly pruinose; pseudocyphellae absent; isidia present or absent. Lower surface black; rhizines simple; cortex paraplectenchymatous. Ascomata apothecia, zeorine, common or rare; disc brown, concave. Asci 8-spored. Spores simple, ellipsoid, colourless, 6–12 × 4.5–8 µm. Conidiomata pycnidia, black, immersed. Conidia slightly dumbbell-shaped, 5–8 × 1 µm. Photobiont trebouxioid.

Chemistry. Atranorin in the cortex; usually lecanoric acid in the medulla.

Note. Characterized by broad lobes with a smooth upper surface. Differs from *Parmelia* and *Punctelia* by the marginal cilia, the absence of pseudocyphellae and by molecular data (Crespo et al., 2010). *Parmelina* is a genus of c. 13 species, mainly distributed in Eurasia and Australasia. It has a southern to oceanic distribution in the Nordic countries.

1. Isidia present; apothecia very rare 2
– Isidia absent; apothecia common ..... 2. *P. quercina*
2. Isidia apically flattened ..... 1. *P. pastillifera*
– Isidia cylindrical ..... 3. *P. tiliacea*

1. **Parmelina pastillifera** (Harm.) Hale

Nova Hedwigia 11: 58 (1966). – *Parmelia scortea* var. *pastillifera* Harm., Lich. France 4: 558 (1909). – Type: France, Vosges, Bussang, Harmand in Claudel et al., Lich. Gall. exs. no. 491 (H lectotype, Dobson & Hawksworth, Lichenologist 8: 57, 1976).

Syn. *Parmelia pastillifera* (Harm.) R.Schub. & Klem., *Parmelia tiliacea* var. *pastillifera* (Harm.) Grumm., *Parmelia scortea* f. *borealis* Norman ex Lynge

D: pastil-skållav **F:** nappikarve **N:** liten lindelav **S:** västlig silverlav

Red-listed in: **D S**

Literature: Dobson & Hawksworth, Lichenologist 8: 57 (1976); Hale 1976: 39; Honegger, Bot. Helvet. 97: 147–152 (1987); Hultengren & Arvidsson, Svensk Bot. Tidskr. 97: 94–99 (2003); Jørgensen, Blyttia 30: 156–157 (1972); Symb. Bot. Ups. 31(3): 313 (1996); Puolasmaa, Graphis Scripta 2: 100–103 (1989).

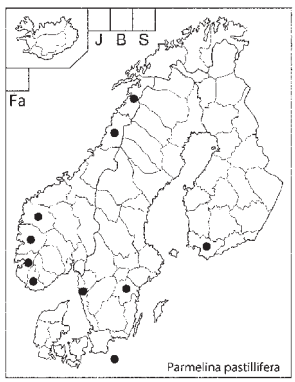
Figs: Dobson & Hawksworth 1976: 48, 1B, 49 B, D; Sérusiaux et al. 2004: 119; Wirth 1995: 665.

Thallus foliose, adnate, more or less rosette-forming, to 10 cm diam., irregularly branched, pale grey with a bluish tinge. Lobes sublinear, often imbricate, apically rounded, partly pruinose, 2–6 mm wide, ciliate, cilia black, to 0.7 mm long; isidia very common,

apically flattened, ± branched, dark, blackish at tips. Lower surface black; rhizines black and simple, 1–2 mm long. Apothecia rare, sessile, rhizinate, to 4 mm diam.; disc brown, Spores ellipsoid, 8–11 × 5–6 µm. Pycnidia immersed, black. Conidia slightly dumbbell-shaped, c. 5 × 1 µm.

Chemistry. Cortex C–, K+ yellow, KC–, PD–; atranorin. Medulla C+ red, K–, KC+ red, PD–; lecanoric acid.

Habitat. Corticolous, on bark of deciduous trees in parks and other nutrient-enriched habitats, as manured maritime rocks on its northern and eastern limit.



Distribution. Infrequent along the west coasts of southern Fennoscandia and on Bornholm. A single locality on maritime rocks in SW Finland. **D:** *Brn*. **F:** *V*. **N:** *VA Ro Ho SF SNo NNo*. **S:** *Bh Ög*. Temperate western, central and southern Europe to Ural Mts., also Caucasus, with oceanic tendencies.

Note. A rare suboceanic species which differs from P. tiliacea in having a smaller thallus with narrower lobes and black, apically flattened isidia. It seems to be increasing in parts of Norway.

2. Parmelina quercina (Willd.) Hale

Phytologia 28: 483 (1974). Lichen quercinus Willd., Fl. Berol. Prodr.: 353 (1787). Type: Germany, Berlin, icon in Willdenow, Fl. Berol. Prodr.: 1787: Pl. 7, Fig. 13 (lectotype, Hawksworth et al., Lichenologist 43, 2011, in press); Spain, Madrid, Aldea del Fresno, 2003 Argüello et al. (MAF-Lich 13946 epitype, Hawksworth et al., Lichenologist 43, 2011, in press).

Syn. *Parmelia quercina* (Willd.) Hale

D: ege-skållav

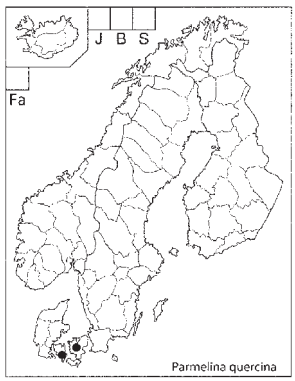
Literature: Almborn, Bot. Not., Suppl. 1(2): 208 (1948); Brodo et al., Lich. N. Amer.: 486 (2001); Dobson & Hawksworth, Lichenologist 8: 55–56 (1976); Hale: 1976: 42–43; Argüello, Crespo & Hawksworth, Lichenologist 39: 398–399 (2007); Clerc & Truong, Sauteria 15: 178–180.

Figs: Brodo et al. 2001: 486.

Thallus foliose, closely adnate, rosette-forming, dichotomously branched, to 8 cm diam., pale grey with a slightly bluish or olivaceous tinge, rather glossy, slightly maculate and partly pruinose. Lobes rounded, indented to entire, continuous, to 10 mm wide, overlapping towards the centre; cilia sparse, marginal, black, to 1 mm long. Lower surface brownish black, pale towards the margin; rhizines common, simple, rarely squarrose, to 3 mm long. Apothecia common, slightly raised, strongly concave, with smooth edges, rhizinate on underside, to 5 mm diam.; disc brown. Spores ellipsoid, 6–12 × 4.5–7 µm. Pycnidia immersed, black. Conidia slightly dumbbell shaped, 5–8 × 1 µm.

Chemistry. Cortex C–, K+ yellow, KC–, PD–; atranorin. Medulla C+ red, K–, KC+ red, PD–; lecanoric acid.

Habitat. On bark of deciduous trees, preferably on twigs of oak, in open woodlands.



Distribution. Known from southern Danish islands and north-eastern Zealand, but has disappeared from all former localities. **D:** (*Fyn Sjæ*). Common in southern Europe, extending to Macaronesia, northern Africa, Asia, California, Central America and Australasia.

Note. The closest relatives, *P. atricha* (Nyl.) P.Clerc and *P. carporrhizans* (Taylor) Poelt & Vězda, have not been found in the Nordic countries. *Parmelina carporrhizans* follows the same distribution pattern as *P. quercina*, whereas *P. atricha* is restricted to the Alps and the Pyrenees.

3. Parmelina tiliacea (Hoffm.) Hale

Phytologia 28: 483 (1974). – *Lichen tiliaceus* Hoffm., Enum. Lich.: 96 (1784). – Type: Europe, icon in Hoffmann, Enum. Lich. 1784: tab. 16, Fig. 2 (lectotype, Thell, Nordic Lichen Flora 4: 140, 2011); Sweden, Skåne, Eslöv par., Ellinge, at the castle, 2010 Thell 1001 (to be distributed in Moberg, Lich. exs. Ups) (LD epitype, Thell, Nordic Lichen Flora 4: 140, 2011).

Syn. *Parmelia scortea* (Ach.) Ach., *Parmelia tiliacea* (Hoffm.) Ach.

D: sølvgrå skållav **F:** riuttakarve **N:** stor lindelav **S:** silverlav

Red-listed in: **D**

Literature: Arup et al., Skyddsvärda lavar i SV Sverige (1996); Dobson & Hawksworth, Lichenologist 8: 57 (1976); Hale: 1976: 48–50; Puolasmaa, Lutukka 4: 75–80 (1988); Sernander-Du Rietz, Svensk Bot. Tidskr. 20: 352–365 (1926); Svensk Bot. Tidskr. 51: 454–488 (1957); Thor & Arvidsson, Rödlistade lavar i Sverige: 399–400 (1999).

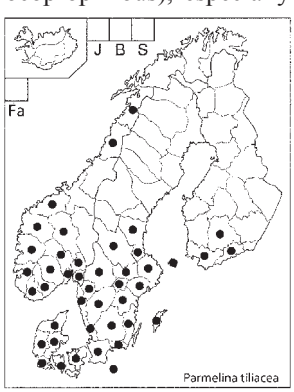
Figs: Arup et al. 1997: 229; Dobson & Hawksworth 1976: 48, 1A, 49A, C; Holien & Tønsberg 2006: 57, Moberg & Holmåsen 1990: 97; Sérusiaux et al. 2004: 119; van Herk & Aptroot 2004: 279; Wirth 1995: 665.

Thallus foliose, adnate, more or less rosette-forming, to 15 cm diam., irregularly branched, pale grey. Lobes sublinear, often imbricate, apically rounded, partly pruinose, to 8 mm wide, ciliate; cilia black, to 0.7 mm long; isidia very common, cylindrical, little-branched, short and broad, blackened at tips. Lower surface black; rhizines black and simple, 1–2 mm long. Apothecia rare, sessile, rhizinate, to 4 mm diam.; disc brown. Spores ellipsoid, 8–11 × 5–6 µm. Pycnidia black, immersed. Conidia slightly dumbbell-shaped, 5–8 × 1 µm.

Chemistry. Cortex C–, K+ yellow, KC–, PD–; atranorin. Medulla C+ red, K–, KC+ red, PD–; lecanoric acid.

Habitat. On bark of deciduous trees, especially in nutrient-rich, open woodland areas, parks and along avenues, less common on rocks, but often abundant on maritime rocks (ornithocoprophilous), especially at its northern localities.

Distribution. Southern, reaching Central Norway, Central Sweden and SW Finland. **D:** *NJy ØJy VJy SJy Fyn Sjæ Brn*. **F:** *A V U EH*. **N:** *Øf Ak Op Bu Vf Te AA VA Ro Ho SF MR SNo NNo*. **S:** *Sk Bl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls*. Common in temperate and subtropical areas of Central and South Europe with continental tendencies, extending to Macaronesia, North Africa, Near East, and recently recorded across Russia to Far East and China.



Note. Easily recognized by its characteristic silvery colour and large amount of cylindrical isidia. Occurrences in central parts of cities indicate tolerance to poor air quality.

Parmeliopsis

T. Ahti, R. Moberg & A. Thell

Parmeliopsis (Nyl.) Nyl., nom. cons.

Lich. Lapp. Orient. 121 (1866). – *Parmelia* subg. *Parmeliopsis* Nyl., Lich. Scand.: 105, 130 (1861). – Type: *Parmeliopsis ambigua* (Wulfen) Nyl. (typ. cons.)

D: stolpelav **F:** tyvikarpeet **I:** stikur **N:** stokklav **S:** stocklavar

Literature: Riddle, Bryologist 20: 69–76 (1917); Ahti & Isoviita, Taxon 36: 105–108 (1987); Hawksworth, Pl. Syst. Evol. 149: 303–307 (1985); Hinds, Mycotaxon 72: 271–288 (1999); Jørgensen, Taxon 37: 279–280 (1988); Tehler & Källersjö, Lichenologist 33: 403–408 (2001).

Syn. *Foraminella* S.F.Mey.

Thallus foliose, forming small, closely adnate rosettes, to 5 cm diam.; lobes to 1 mm wide, discrete to imbricate; upper surface grey or yellow, lower surface pale whitish brown to dark brown, often shiny; cortex paraplectenchymatous. Medulla dense. Ascomata apothecia, zeorine; disc brown. Asci 8-spored. Spores simple, narrowly ellipsoid, 7–12 × 2–4 µm. Conidiomata pycnidia, laminal, protruding, black. Conidia filiform, 12–30 × 1 µm. Photobiont trebouxioid.

Chemistry. Atranorin or usnic acid in the cortex. Medulla with divaricatic acid.

Note. Parmeliopsis includes three species in the Nordic countries and has earlier also included *Imshaugia*, which is superficially similar but differs in shape and size of spores and conidia, and the presence of thamnolic acid. DNA data do not indicate a closer relationship between these genera, but *Cetrariastrum*,

Everniastrum and *Hypotrachyna* seem to be the most closely related genera to *Parmeliopsis*.

1. Non-sorediate, apothecia common ..... 2. *P. esorediata*
– Sorediate, apothecia uncommon 2
2. Upper surface yellowish green; usnic acid present ..... 1. *P. ambigua*
– Upper surface pale grey; usnic acid absent ..... 3. *P. hyperopta*

1. **Parmeliopsis ambigua** (Wulfen) Nyl.

Lich. Lapp. Orient. 121 (1866). – *Lichen ambiguus* Wulfen in Jacquin, Collectanea 4: 239 (1791). – Type: Icon in Jacquin, Collectanea 4: tab. 20, Fig. 2a (lectotype, Ahti, Moberg & Thell, Nordic Lichen Flora 4: 140, 2011); [Germany, Bavaria], München (Munich), "längs der Römerstrasse zwischen Sauerlach und Hofolding", 1893 Arnold in Arnold, Lich. Monac. exs. no. 283 (UPS epitype, Ahti, Moberg & Thell, Nordic Lichen Flora 4: 140, 2011).

Syn. *Parmelia ambigua* (Wulfen) Ach., *Parmelia diffusa* auct., *Parmelia viridisorediens* Elix

D: gul stolpelav **F:** keltatyvikarve **I:** gulstika **N:** gul stokklav **S:** stocklav

Red-listed in: **I**

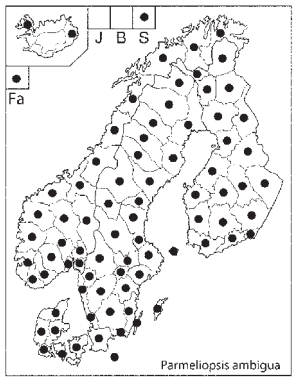
Literature: Brodo et al., Lich. N. Amer.: 489 (2001); Hinds 1999: 274–276.

Figs: Brodo et al. 2001: 489; Hansen & Andersen 1995: 47; Moberg & Holmåsen 1990: 98; Rikkinen 2008: 149; Sérusiaux et al. 2004: 120; Holien & Tønsberg 2006: 61; Wirth 1995: 671.

Thallus forming rosettes, closely adnate, often growing together in large patches, to 5 cm diam., usually smaller; lobes to 1 mm wide, elongate, flat or slightly concave, discrete, sparingly indented and branched towards the tips; upper surface yellow-green, matt; soralia frequent, laminal, rarely capitate; lower surface brown. Apothecia infrequent, to 2 mm diam.; disc brown. Spores narrowly ellipsoid, 6–12 × 3 µm. Pycnidia common. Conidia filiform, 12–18 × 1 µm.

Chemistry. Cortex C–, K+ pale yellow, KC+ yellow, PD–, UV–; usnic acid; medulla K–, KC–, PD–, UV+ white; divaricatic and nordivaricatic acids.

Habitat. On bark and wood, often old conifers and fence posts, rarely on rocks. Indicator of snow depth in northern forests (see *P. hyperopta*).



Distribution. Common throughout the forests of the Nordic countries, extending to dwarf shrubs in alpine and arctic 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:** *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*. Widely distributed in temperate-boreal areas of the Northern Hemisphere, also known from Australia. In eastern North America much less frequent than the similar *P. capitata* and *P. subambigua* with capitate and postulate soralia respectively.

Note. Differs from *P. hyperopta* by the yellow-green colour (usnic acid), and they have sometimes been regarded as chemotypes. Molecular studies, however, strongly supports their separation into two distinct species. There are also subtle differences in morphology and ecology (Hinds 1999), such as slightly longer spores in *P. hyperopta*.

The reference in the original publication to Tab. 4 Fig. 2 is evidently a printing error as the figure with the species is on Tab. 20, Fig. 2 (a-c). Fig. 2a has thus been selected as the type.

2. **Parmeliopsis esorediata** (Degel.) Nordnes

Nord. J. Bot. 2: 381–382 (1982). – *Parmeliopsis hyperopta* (Ach.) Arn. var. *esorediata* Degel., Bot. Not. 109: 362 (1956). Type: Norway, Aust-Agder, Valle, Berg, alt. 650 m, 1955 Degelius (UPS holotype).

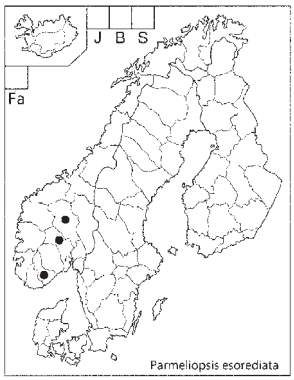
N: fjellbjørklav

Literature: Hawksworth 1985: 306; Nordnes, Nord. J. Bot. 2: 381–382 (1982); Tønsberg et al., Sommerfeltia 23: 134–136 (1996).

Thallus forming closely adnate rosettes, to 5 cm diam.; lobes to 3 mm wide; upper surface grey, brownish towards the tips; soralia and isidia lacking; lower surface

brown to blackish brown with pale rhizines. Apothecia laminal, frequent in central parts, to 2 mm diam.; disc brown. Spores curved, 7.5–9.5 × 2.5–3.5 µm. Pycnidia common. Conidia filiform, 17–24 × 1 µm.

Chemistry. Cortex C−, K+ yellow, KC−, PD−; atranorin. Medulla C–, K–, KC–, PD–, UV+ white; divaricatic acid.



Habitat. On *Betula*, *Picea abies*, *Pinus sylvestris* and *Juniperus communis* in the subalpine zone.

Distribution. Locally common and endemic in southern central Norway. **N:** *Op Bu AA*.

Note. Observed exclusively in southern Norway; it is the only macrolichen, and one of the very few lichens, endemic to the Nordic countries.

3. **Parmeliopsis hyperopta** (Ach.) Arnold

Verh. K. K. Zool.-Bot. Ges. Wien 30: 117 (1881). – *Parmelia hyperopta* Ach., Syn. Meth. Lich.: 208 (1814). – Type: Helvetia (Switzerland), [Schleicher] 171a (H-ACH 1317 lectotype, Meyer in Hinds, Mycotaxon 72: 280, 1999).

D: grå stolpelav **F:** harmaatyvikarve **I:** grástika **N:** grå stokklav **S:** vedlav

Red-listed in: **I**

Literature: Degelius, Bot. Not. 109: 349–367 (1956); Hasselrot, Acta Phytogeogr. Suec. 33: 95–98, 175 (1953); Hawsksworth in Brown, Lichenology: Progr. Probl.: 167 (1976).

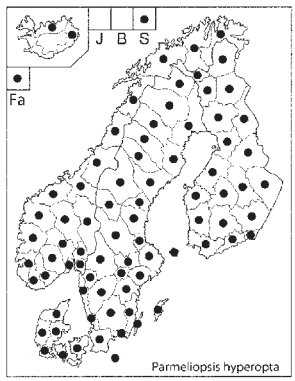
Figs: Brodo et al. 2001: 490; Hansen & Andersen 1995: 48; Hinds & Hinds 2007: 346; Moberg & Holmåsen 1990: 98; Wirth 1995: 671.

Thallus forming closely adnate rosettes, 3–5 cm diam.; lobes to 1 mm wide; upper surface grey, brownish towards the tips, soralia frequent, laminal or often capitate, convex; lower surface dark brown to blackish with brown, usually pale, rhizines. Apothecia infrequent, laminal, to 2 mm diam.; disc brown. Spores narrowly ellipsoid, 8–15 × 2–4 µm. Pycnidia common. Conidia filiform, 16–30 × 1 µm.

Chemistry. Cortex C−, K+ yellow, KC−, PD−; atranorin. Medulla C–, K–, KC–, PD–, UV+ white; divaricatic acid.

Habitat. On bark and wood, often old conifers and fence posts, rarely on stone. Abundant on basal parts of trees, further north below winterly snow level (chionophilous), indicating the average depth of snow cover in forest.

Distribution. Like *P. ambigua* common in forests all over the area, but much less common in the south than *P. ambigua*. Both are rare in Iceland. **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:** *IAu 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 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*. Widely distributed, circumpolar in the boreal zone but less frequent and more disjunctive than *P. ambigua* in temperate regions and mountains; also in southern South America.



Note. Similar to *P. ambigua* but differs in the grey colour and they often grow intermixed. See also under *P. ambigua*.

Parmotrema

J. A. Elix & A. Thell

Parmotrema A.Massal.

Syn. *Parmelia* subgen. *Amphigymnia* (Vain.) C.W.Dodge

Literature: Hale, Contr. U.S. Natl. Herb. 36: 193–358 (1965); Krog & Swinscow, Bull. Brit. Mus. (Nat. Hist.) Bot. 9: 143–231 (1981); Jørgensen, Symb. Bot. Ups. 31(3): 313 (1996); Hawksworth, Herzogia 17: 37–44 (2004); Blanco et al., Mycologia 97: 150–159 (2005); Smith et al., Lich. Gr. Britain Ireland, ed 2: 661–663 (2009).

Thallus foliose, loosely adnate, to 20 cm diam., rounded or irregularly shaped, broad-lobed. Lobes variable in shape and width, 5–20 mm wide, rounded

or elongate, overlapping, often undulating, with or without cilia, soralia, isidia and lobules. Upper surface pale grey, greenish or yellowish. Lower surface black with a broad, brownish zone along the margin without rhizines; rhizines simple, concolorous with the lower surface. Cortex paraplectenchymatous. Ascomata apothecia, zeorine (not known in the Nordic countries). Spores simple, ellipsoid, colourless. Conidiomata pycnidia, laminal, generally very rare. Conidia unknown in Nordic material, bacilliform, 3–15 × 1 µm. Photobiont trebouxioid.

Chemistry. Cortex with atranorin. Medulla with orcinol or β-orcinol depsidones.

Note. Among the most species rich of all lichen genera, comprising over 300 species mainly distributed in tropical and subtropical areas of Africa and South America. The three species in the Nordic countries are restricted to oceanic localities in western Norway and Denmark. They are most frequently found on mossy tree trunks or on rocks in oceanic conditions. Apothecia and pycnidia have hitherto not been found in the Nordic countries.

1. Soralia present, isidia absent 2
– Soralia absent, isidia present .....2. *P. crinitum*
2. Lobes usually more than 10 mm wide; cilia 1–3 mm; medulla K–, KC+ red ..... 1. *P. arnoldii*
– Lobes 5–10 mm wide; cilia shorter than 2 mm; medulla K+ yellow, KC– .....3. *P. perlatum*

1. **Parmotrema arnoldii** (Du Rietz) Hale

Phytologia 28: 335 (1974). – *Parmelia arnoldii* Du Rietz, Nyt. Mag. Naturvid. 62: 80 (1924). – Type: Germany, Bavaria, 'zwischen Pullach und Baierbrunn bei München', 1870 Arnold in Arnold, Lich. exs. no. 136b (UPS lectotype, Hale, Contr. U.S. Natl. Herb. 36: 279, 1965).

Syn. *Parmelia arnoldii* Du Rietz

N: stor praktkrinslav

Red-listed in: **N**

Literature: Degelius, Acta Phytogeogr. Suec. 7: 124–127, 352 (1935); Hale 1965: 222, 279–281; Hasselrot, Bot. Not. 1942: 296 (1942); Jørgensen 1996: 313; Tønsberg et al., Sommerfeltia 23: 137 (1996).

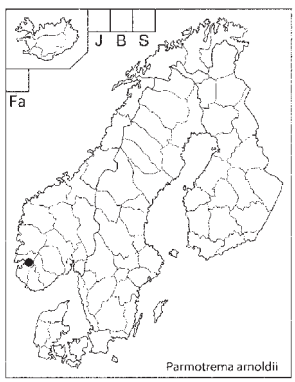
Figs: Brodo et al. 2001: 492; Hinds & Hinds 2007: 349.

Thallus loosely adnate, to 20 cm diam., irregularly shaped. Lobes 8–15 mm long, 5–20 mm wide, variable in shape, crowded towards the centre, revolute, with undulating, ciliate and dentate lobulate margins; cilia black, rather sparse, 1–3 mm long. Upper surface pale grey; soralia submarginal, usually on the lobules, light grey. Lower surface black in the centre, brown, and paler towards the margin; rhizines simple, black, in central parts of the thallus. Apothecia not known in the Nordic countries. Pycnidia laminal, immersed, rare. Conidia not known in the Nordic countries.

Chemistry. Cortex C–, K+ yellow, KC–, PD–, UV–; atranorin. Medulla C–, K–, KC+ red, PD–, UV+ blue; alectoronic and α-collatolic acids.

Habitat. On north-facing mossy rocks in southern boreal zone.

Distribution. Only found in a few localities in Norway. **N:** *Ro*. Widely distributed in western Europe, eastern and western North America, Middle America, Chile, Macaronesia, S. Asia, Africa, New Zealand, in general in temperate, oceanic conditions.



Note. The largest of the two sorediate *Parmotrema* species. The lobes are broader and more crowded in the centre compared with *P. perlatum* and the soralia remain capitate or coalesce to form a continuous line along the lobe margin on the upper surface. Furthermore, *P. perlatum* reacts K+ yellow both in cortex and medulla, whereas the medulla of *P. arnoldii* is K–.

2. **Parmotrema crinitum** (Ach.) M.Choisy

Bull. Mens. Soc. Linn. Lyon 21: 175 (1952). – *Parmelia crinita* Ach., Syn. Meth. Lich.: 196 (1814). – Type: North America, ('Amer. septentr.'), Mühlenberg 87-2 (H-ACH 1335 holotype).

Syn. *Parmelia chlorocarpa* Müll.Arg., *Parmelia ciliata* Nyl., *Parmelia crinita* Ach., *Parmelia pilosella* Hue, *Parmelia proboscidea* Tayl.

N: hårkrinslav

Red-listed in: **N**

Literature: Asahina, Lich. Japan 2: 136 (1952); Degelius, Acta Phytogeogr. Suec. 7: 126–128, 352–353 (1935); Hale 1965: 36: 222, 284–287; Jørgensen 1996: 313; Jørgensen & Ryvarden, Årbok Univ. Bergen, mat.-nat. ser. 1969 n. 10: 16 (1970); Tønsberg et al., Sommerfeltia 23: 137–139 (1996).

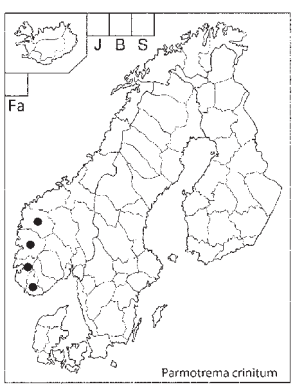
Figs: Brodo et al. 2001: 494; Hinds & Hinds 2007: 350; Holien & Tønsberg 2006: 58; Wirth 1995: 675.

Thallus closely to loosely adnate, to 10 cm diam., irregularly shaped. Lobes rounded or irregularly divided, 5–10 mm wide, frequently overlapping in the centre, with somewhat ascending tips; cilia often apical, rather sparse, 1–3 mm long, black. Upper surface pale grey; isidia common, simple or coralloid, often ciliate at tips. Lower surface rugose, black in the centre, brown and shiny towards the margin; rhizines simple, black, in central parts of the thallus. Apothecia rare, unknown in the Nordic countries. Pycnidia rare, laminal and immersed. Conidia unknown in the Nordic countries.

Chemistry. Cortex C–, K+ yellow, KC–, PD–; atranorin. Medulla C–, K+ yellow, KC–, PD+ yellow; stictic acid (major), constictic acid (minor), cryptostictic acid (trace), norstictic acid (trace), ± menegazziaic acid (trace), ± connorstictic acid (trace), ± peristictic acid (trace) and hypostictic acid (trace).

Habitat. On mossy tree trunks and mossy rocks.

Distribution. Only known from Norway where it is rare but locally common. **N:** *VA Ro Ho SF*. Widespread in tropical and temperate areas in both hemispheres, reaching sub-boreal forests.



Note. The frequent isidia distinguishes *P. crinitum* from the sorediate *P. arnoldii* and *P. perlatum*. The lobes are comparatively narrow and the naked marginal zone of the lower surface is narrower, rugose and shiny.

3. **Parmotrema perlatum** (Huds.) M.Choisy

Bull. Mens. Soc. Linn. Lyon 21: 174 (1952). – *Lichen perlatus* Huds., Fl. Angl.: 448 (1762); *Parmelia perlatus* (Huds.) Ach., Methodus: 216 (1803). – Type: specimen and pl. 20, Fig. 39B, Dillenius Hist. Musc. 147, 1741 (OXF lectotype).

Syn. *Parmotrema chinense* auct. non (Osbeck) Hale & Ahti, q. e. *Parmotrema tinctorum* (Nyl.) Hale, *Parmelia coniocarpa* Laurer, *Parmotrema trichoterum* (Hue) M.Choisy

D: trådet skållav **N:** liten praktkrinslav **S:** praktsköldlav

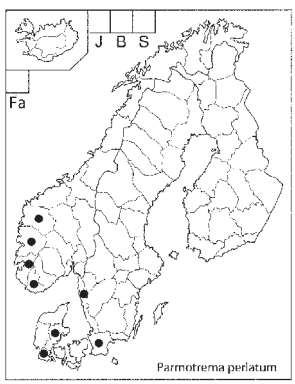
Red-listed in: **S**

Literature: Almborn, Bot. Not., suppl., 1(2): 188–193 (1948); Hale 1965: 223, 300–302 (1965); Hawksworth, Herzogia 17: 37–44; Jørgensen 1996: 313 (1996); Jørgensen & Ryvarden, Årbok Univ. Bergen, mat.-nat. ser. 1969 n. 10: 18–19 (1970); Lindahl, Svensk Bot. Tidskr. 51: 564 (1957). Hultengren et al., Svensk Bot. Tidskr. 105: 4–8 (2011).

Figs: Brodo et al. 2001: 493; Hinds & Hinds 2007: 352; Holien & Tønsberg 2006: 58; Sérusiaux et al. 2004: 121; Wirth 1995: 673.

Thallus closely to loosely adnate, to 15 cm diam., irregularly shaped. Lobes broadly rounded, 5–12 mm wide, frequently overlapping in the centre, strongly revolute; cilia marginal, sparse, 1–2 mm long, black. Upper surface grey; soralia present, capitate, submarginal, eroding into large patches; soredia grey. Lower surface black in the centre, brown towards the margin; rhizines simple, black, in central parts of the thallus. Apothecia not known in the Nordic countries. Pycnidia not observed.

Chemistry. Cortex C–, K+ yellow, KC–, PD–; atranorin. Medulla C–, K+ yellow or orange, KC–, PD+ orange; stictic acid (major), constictic, menegazziaic and cryptostictic acids (minor), ± norstictic acid (trace).



Habitat. On mossy tree trunks, less often on silicious rocks.

Distribution. Rare in Denmark and the SW coast of Norway. **D:** *ØJy*

SJy. **N:** *VA Ro Ho SF*. **S:** *Sk Boh*. Widespread in moist, temperate and tropical regions of Eurasia, Africa, N and S America, Hawaii and Australasia.

Note. Similar to *P. arnoldii* but separated by the K+ yellow reaction of the medulla, the darker, mineral grey colour, and the patchy distributed soralia.

Platismatia

A. Thell

Platismatia W.L.Culb. & C.F.Culb.

Contr. U.S. Natl. Herb. 34(7): 524–525 (1968). – Type: *Platismatia glauca* (L.) W.L.Culb. & C.F.Culb.

Syn. Platysma auct.

D: papirlav **F:** harmaaröyhelöt **N:** papirlav **S:** näverlavar

Literature: Culberson & Culberson, Contr. U.S. Natl. Herb. 34(7): 524-553 (1968); Thell et al., Cryptog. Bryol. Lichénol. 19: 307–319 (1998).

Thallus foliose to subfruticose, loosely adnate; lobes overlapping and ascending. Upper surface whitish grey to greenish or brownish, wrinkled, isidiate or sorediate. Lower surface brown to black, often pale close to margins, with scattered pale or black rhizines. Cortex paraplectenchymatous. Ascomata apothecia, zeorine, rare, submarginal, usually <10 mm diam.; disc brown. Asci 8-spored. Spores simple, colourless, ellipsoid, 4–10 × 3–5 µm. Conidiomata pycnidia, marginal, immersed, usually rare. Conidia rare, sublageniform, 5–7 × 1 µm. Photobiont trebouxioid.

Chemistry. Atranorin and caperatic acid, rarely fumarprotocetraric acid.

Note. A well-defined genus of 11 species which was segregated from *Cetraria* by Culberson & Culberson (1968). The distribution of the genus is centered around the Pacific Ocean, with some endemic spe-cies restricted to western North America and northeastern Asia.

1. Thallus smooth to reticulately wrinkled; lobes irregularly shaped, usually with narrow lobules ..... 1. *P. glauca*
– Thallus reticulately ridged; lobes broadly rounded ..... 2. *P. norvegica*

1. **Platismatia glauca** (L.) W.L.Culb. & C.F.Culb.

Contr. U.S. Natl. Herb. 34(7): 449–558 (1968). – *Lichen glaucus* L., Sp. Pl. 2: 1148 (1753). – Type: Sine loco (LINN 1273.139 lectotype, Howe, Bull. Torrey Bot. Club. 39: 201, 1912; specified by Jørgensen et al., Bot. J. Linn. Soc. 115: 377, 1994).

Syn. *Cetraria fallax* (Weber) Anders, *Cetraria glauca* (L.) Ach.

D: blågrå papirlav **F:** harmaaröyhelö **I:** næfurskóf **N:** vanlig papirlav **S:** näverlav

Red-listed in: **I**

Literature: Culberson & Culberson 1968: 530–537; Kärnefelt, Bothalia 17(1): 46–47 (1987); Lynge, Vidensk. Selsk. Skr. 1921(7): 198–201; Thell et al. 1998: 314–315.

Figs: Brodo et al. 2001: 575; Hansen & Andersen 1995: 57; Hinds & Hinds 2007: 414; Holien & Tønsberg 2006: 40; Moberg & Holmåsen 1990: 78; Rikkinen 2008: 147; Sérusiaux et al. 2004: 146; Wirth 1995: 949.

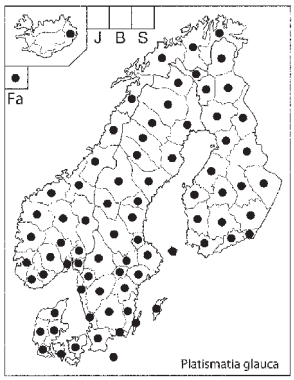
Thallus to 15 cm diam., broadly foliose to subfruticose and coralloid, most frequently irregularly foliose, loosely adnate. Lobes to 20 mm wide, frequently overlapping and ascending. Upper surface bluish-green, greyish-green or brownish, smooth to reticulately wrinkled, isidiate and sorediate, sometimes finely coralloid along margins. Lower surface brown to black, often pale close to margins, with scattered pale to black rhizines. Apothecia rare, submarginal, to 10 mm diam.; disc brown. Spores ellipsoid, 6–8 × 4–5 µm. Pycnidia very rare, marginal, immersed. Conidia sublageniform, 6–7 × 1 µm.

Chemistry. Cortex C–, K+ yellow, KC–, PD–; atranorin. Medulla C–, K–, KC–, PD–; caperatic acid.

Habitat. Corticolous, lignicolous, occasionally saxicolous, also on soil in coastal and mountain heaths.

Distribution. One of the most common and conspicuous of all lichens in the southern and central parts of the Nordic countries, rarer in the north, in the oceanic mountains also above timberline. In Iceland it has only been found in the eastern part. **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:** *IAu*. **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. Incompletely circumpolar in the northern boreal and temperate areas, absent from East Siberia and Far East and very rare in interior Canada; also in Africa and southern South America.



Note. In spite of the huge morphological variation, *P. glauca* is easily separated from all other lichen species in the Nordic countries except for *P. norvegica* (see below).

2. **Platismatia norvegica** (Lynge) W.L.Culb. & C.F.Culb.

Contr. U.S. Natl. Herb. 34(7): 449–558 (1968). – *Cetraria lacunosa* f. *norvegica* Lynge, Vidensk. Selsk. Skr., Math. Naturvid. Kl. [Kristiania] 1921(7): 196 (1921). – TYPE: Norway, Hordaland, Store Kalsø (Stora Karlsøy, Austevoll), 1920 Lynge (O lectotype, Culberson & Culberson, Contr. U.S. Natl. Herb. 34(7): 543, 1968).

Syn. *Cetraria norvegica* (Lynge) Du Rietz

F: norjanröyhelö **N:** skrukkelav **S:** norsk näverlav

Red-listed in: **F S**

Literature: Ahlner, Acta Phytogeogr. Suec. 22: 36–39 (1948); Culberson & Culberson 1968: 543–547; Jørgensen & Ryvarden, Årbok Univ. Bergen, mat.-nat. ser. 1969 n. 10: 22 (1970); Kuusinen et al., Memoranda Soc. Fauna Fl. Fenn. 69: 30 (1993); Löfgren & Moberg, Naturvårdsverket PM 1819: 18, 37 (1984); Lynge, Vidensk. Selsk. Skr. 1921(7): 196; Thell et al. 1998: 315–316; Thor & Arvidsson, Rödlistade lavar i Sverige: 427–428 (1999).

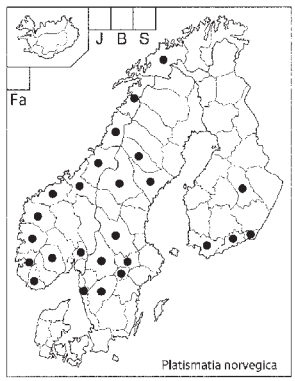
Figs: Brodo et al. 2001: 577; Holien & Tønsberg 2006: 40; Moberg & Holmåsen 1990: 78.

THALLUS broadly foliose, loosely adnate, to 20 cm diam. Lobes to 20 mm wide, frequently overlapping and ascending. Upper surface whitish grey, occasionally slightly brownish towards the margins, strongly reticulately ridged; isidia present on the ridges or at the margins. Lower surface brown to black, often pale close to margins, with scattered pale to black rhizines. APOTHECIA very rare, submarginal, to 10 mm diam.; disc brown. Spores ellipsoid 6–8.5 × 3–4 µm. PYCNIDIA marginal, immersed. Conidia not seen.

Chemistry. Cortex C–, K+ yellow, KC–, PD–; atranorin. Medulla C–, K–, KC–, PD–; caperatic acid.

Habitat. On rocks and on spruce bark in humid situations. Outside the Nordic countries mainly an epiphyte of conifers.

Distribution. Rare along the southwestern coast of Finland, and at coastal localities in Sweden, more common along the Norwegian coast extending to the inland of Norway and western Sweden. **F:** *V U EK PS*. **N:** *Ak Te VA Ro Ho SF MR ST NT SNo NNo Tr.* **S:** *Bh Vg Nrk Vrm Vsm Dlr Ång Jmt ÅsL.* A boreal oceanic species, occurring in NW Europe (also Scotland), eastern Canada (mainly Newfoundland) and NW North America.



Note. Similar to *P. glauca*, but differs by the strongly reticulately ridged upper surface, the broad and smoothly rounded lobes and its much more specialized habitats.

Pleurosticta

M. Westberg & A. Thell

Pleurosticta Petr.

Kryptog. Forsch. 2: 190 (1931). – TYPE: *Pleurosticta lichenicola* Petr.

F: puistokarpeet

Syn. *Melanelia* sect. *Olivascentes* (Harm.) Essl.

Literature: Santesson, Svensk Bot. Tidskr. 43: 142 (1949); Esslinger, J. Hattori Bot. Lab. 42: 56–59 (1977); Lumbsch et al., Mycotaxon 33: 453 (1988).

THALLUS foliose, moderately adnate with more or less wavy or crispy margins, Lobes contiguous to imbricate. Upper surface olivaceous, pale to dark bluish green or brown, marginally smooth and shiny, cen-

trally rugose and dull, ± pruinose, without pseudocyphellae, soredia or isidia. Upper and lower cortex paraplectenchymatous, medulla white. Lower surface brownish, paler towards the periphery; rhizines simple, pale. Ascomata apothecia, common or absent, sessile to raised, centrally positioned. Asci 8-spored. Spores ellipsoid, simple and colourless. Conidiomata pycnidia, laminal, immersed. Conidia cylindrical to fusiform. Photobiont trebouxioid.

Chemistry. Either with norstictic and connorstictic acid or with salazinic acid in the medulla.

Note. Characterized by dark olive-green colour of the upper surface and pored epicortex. The two species of the genus have a temperate distribution, *P. acetabulum* reaching the southern part of the Nordic countries, and *P. koflerae* ranging from Central Europe to Kyrgyzstan. The latter is a sterile, saxicolous species with relatively small, imbricate lobes.

1. **Pleurosticta acetabulum** (Neck.) Elix & Lumbsch

in Lumbsch & Elix, Mycotaxon 33: 453 (1988). – *Lichen acetabulum* Neck., Delic. Gallo-Belg. 2: 506 (1768). – Type: France, Vosges, Docelles, H. & V. Claudel in Claudel & Harmand, Lich. Gall. exs. no. 119 (UPS neotype, Westberg & Thell, Nordic Lichen Flora 4: 140, 2011).

Syn. *Melanelia acetabulum* (Neck.) Essl., *Parmelia acetabulum* (Neck.) Duby, *Parmelia corrugata* Ach., *Pleurosticta lichenicola* Petr.

D: stor skållav **F:** puistokarve **N:** herregårdslav **S:** kyrkogårdslav

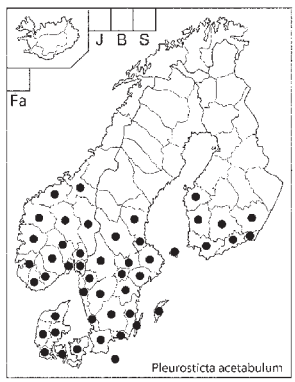
Literature: Almborn, Bot. Not., suppl. 1(2): 19 (1948); Esslinger 1977: 56–58; Puolasmaa, Lutukka 3: 11−15 (1987); Botnen & Tønsberg, Gunneria 58: 31–33 (1988); Lumbsch et al., Mycotaxon 1988: 447–455.

Figs: Holien & Tønsberg 2006: 59; Moberg & Holmåsen 1990: 86; Rikkinen 2008: 183; Sérusiaux et al. 2004: 146; Wirth 1995: 638.

Thallus moderately adnate with wavy to crispy margins, sometimes very large, to 30 cm across; lobes to 15 mm wide, contiguous to imbricate. Upper surface pale or dark olive (bluish) green to brown, smooth and shiny close to lobe edges and rugose and dull, sometimes warted towards the centre, often pruinose. Lower suface brownish, paler towards the periphery; rhizines simple, pale. Apothecia common, often crowded in the centre of the thallus, sessile to raised, to 2 cm wide; disc brown. Spores ellipsoid, 12–16 × 6.5–10.5 µm. Pycnidia common, laminal and immersed. Conidia cylindrical to fusiform, 5–7 × 1 µm.

Chemistry. Cortex C–, K– or K+ yellow, PD–. Medulla C–, K+ yellow turning orange-red, KC–, PD+ orange-yellow; norstictic and connorstictic acids.

Habitat. Corticolous on bark of deciduous trees in parks, churchyards or along avenues. Commonly growing on *Fraxinus*, *Ulmus* and *Acer*, rarely on other trees and substrates such as lignum and rock.



Distribution. Common in Denmark and southernmost Sweden, extending to central Sweden, southeastern Finland and sparsely along the Norwegian coast to Trøndelag. **D:** *NJy ØJy VJy SJy Fyn Sjæ Brn.* **F:** *A V U EK St EH ES EP*. **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST*. **S:** *Sk Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls*. Widespread from temperate Europe to China, India and northern Africa.

Note. Characteristic on nutrient-rich bark in open situations in the southern part of the Nordic countries, when well developed easily recognized by its broad lobes with a dark olivaceous green colour and large, brown apothecia.

Pseudephebe

L. Myllys, S. Velmala & T. Ahti

Pseudephebe M.Choisy

Icon. Lich. Univ., ser. 2(1): sine pag. (1930). – Type: *Pseudephebe pubescens* (L.) M.Choisy.

D: trådlav **F:** villakarpeet **I:** ullarskófir **N:** steinskjegg **S:** stentagel

Literature: Brodo & Hawksworth, Opera Bot. 42: 140 (1977); Degelius, Nyt Mag. Naturvid. 78: 286 (1938); Kärnefelt & Thell, Pl. Syst. Evol. 180: 199 (1992).

THALLUS fruticose, prostrate, decumbent to shrubby, attached to substrate by disc-like lobuloids and a central holdfast. Sometimes subcrustose in the centre, <1 cm high, dark brown to black, dichotomously branched, branches usually thread-like, mainly terete; cortex shiny, compact, prosoplectenchymatous. Pseudocyphellae, soralia and isidia absent. ASCOMATA apothecia, ± common, lateral, zeorine; disc usually concolorous with the thallus. Asci short and broad, 8-spored. Spores simple, ellipsoid and colourless, 7–12 × 5–8 µm. CONIDIOMATA pycnidia, common, abundant, immersed in conspicuous knobs, ostioles broad, clearly visible. Conidia slightly dumbbell-shaped, 5–8 × 1–2 µm. PHOTOBIONT trebouxioid.

Chemistry. No secondary substances (by TLC).

Note. The genus includes only two species and has a bipolar (boreal-)arctic-alpine distribution. Molecular studies suggest that Pseudephebe is part of the alectorioid group. However, it differs from other alectorioid genera by the absence of lichen products and the lack of isidia, soralia and pseudocyphellae.

1. Branches to 0.5 mm diam., terete but usually flattened at the tips; internodes to 1 mm long .....1. *P. minuscula*
– Branches 0.1–0.2 mm diam., mainly terete; internodes 1–3 mm long .....2. *P. pubescens*

1. Pseudephebe minuscula (Nyl. ex Arnold) Brodo & D.Hawksw.

Opera Bot. 42: 140 (1977). – *Imbricaria lanata* var. *minuscula* Nyl. ex Arnold, Verh. K. K. Zool.-Bot. Ges. Wien 28: 293 (1878). – TYPE: Austria, Tirol, summit of Kreuzspitze by Vent in Ötztal (Oezthale), 11000 ft., Arnold 83 (H-NYL 34356 lectotype, Myllys et al., Nordic Lichen Flora 4: 140, 2011).

Syn. *Alectoria minuscula* (Nyl. ex Arnold) Degel., *Parmelia minuscula* (Nyl. ex Arnold) Nyl.

D: liden trådlav **F:** pikkuvillakarve **I:** voðarskóf **N:** småskjegg **S:** fransigt stentagel

Red-listed in: **D**

Literature: Brodo & Hawksworth 1977: 140–143; Hakulinen, Aquilo, ser. Bot. 3: 23–25 (1965); Hasselrot, Acta Phytogeogr. Suec. 33: 87–90, 158–160 (1953).

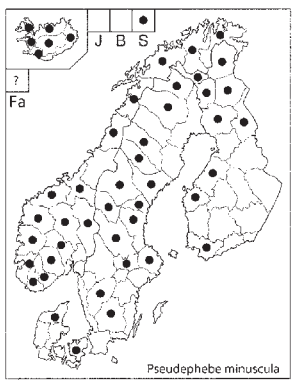
Figs: Brodo et al. 2001: 588; Moberg & Holmåsen 1990: 105.

THALLUS prostrate and decumbent, sometimes subcrustose in central parts, closely attached to the substratum, rosettes usually not exceeding 3 cm diam., dark brown to black, mostly shiny. Branching isotomic dichotomous, internodes distance 0.2–0.5(–1) mm, branches mainly uneven and knobby due to pycnidia, terete, 0.2–0.5 mm diam. but flattened at apices and to 1 mm wide, in central parts thinner and with numerous side branches. APOTHECIA rather common, to 3 mm diam., margins smooth to verrucose; disc dark brown. Spores ellipsoid, 8–10 × 5–7 µm. PYCNIDIA common. Conidia slightly dumbbell-shaped, 6–8 × 1–2 µm.

Chemistry. No secondary substances (by TLC).

Habitat. Siliceous rocks and stones in open areas, often alpine or arctic heaths or along sea and lake shores.

Distribution. Mainly in the alpine and arctic areas, but scattered south to Denmark. **D:** *NJy Sjæ*. **Gr. Fa**? **F:** *V EP KP PeP Ks KiL SoL EnL InL*. ***I:*** *ISu IVe IMi IAu INv INo*. **N:** *He Op Bu Te AA VA Ro Ho SF MR ST SNo NNo Tr VFi ØFi*. **AI:** *Sb*. **S:** *SmI Vg Vsm Upl Dlr Hls Mpd Ång Hrj Jmt ÅsL LyL LuL TL*. Circumpolar arctic-alpine, extending to boreal zone in Europe, Asia, Australasia, North America, South America, Antarctic.



Note. Usually growing closely appressed to the substrate. Morphologically very variable and may resemble *P. pubescens* but has partly flattened branches and is more richly branched with shorter internodes.

2. Pseudephebe pubescens (L.) M.Choisy

Icon. Lich. Univ., ser 2(1): sine pag. (1930). – *Lichen pubescens* L., Sp. Pl. 2: 1155 (1753). – TYPE: Icon in Dillenius, Historia Muscorum: tab. 13, Fig. 9, 1742 (lectotype, Jørgensen et al.,

Bot. J. Linn. Soc. 115: 380, 1994); sine loco (LINN 1273.286 epitype, Jørgensen et al., Bot. J. Linn. Soc. 115: 380, 1994).

Syn. *Alectoria lanea* (Ehrh. ex Hoffm.) Vain. (non auct.), *Alectoria pubescens* (L.) R.Howe, *Parmelia lanata* auct., *Parmelia pubescens* (L.) Vain.

F: isovillakarve **I:** ullarskóf **N:** vanlig steinskjegg **S:** stentagel

Literature: Brodo & Hawksworth: 1977: 143–145; Hakulinen, Aquilo, ser. Bot. 3: 30–33 (1965); Hasselrot, Acta Phytogeogr. Suec. 33: 90–94, 160–163 (1953); Hawksworth, Lichenologist 5: 235–238 (1972); Kärenlampi, Turun Ylioppilas 12: 93–94 (1965).

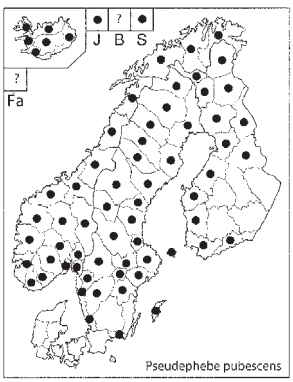
Figs: Brodo et al. 2001: 588; Moberg & Holmåsen 1990: 106; Rikkinen 2008: 197; Wirth 1995: 781.

Thallus decumbent to shrubby, to 10 cm diam., dark brown to black and shiny. Branching isotomic to anisotomic dichotomic; internodes 1–3 mm; branches terete, uneven, to 0.2 mm diam. Apothecia rather common, brown to black, to 5.5 mm diam., margins usually smooth; disc flat, becoming convex. Spores ellipsoid, 7–12 × 5.5–8 µm. Pycnidia common. Conidia slightly dumbbell-shaped, 5–7 × 1 µm.

Chemistry. No secondary substances (by TLC).

Habitat. Often together with *P. minuscula* on siliceous stones, pebbles and rocks in open localities, although *P. pubescens* is more common in moist areas.

Distribution. Mostly along the seashores, especially on smaller islands, also common at and above timberline in the mountains and in arctic areas, rare in inner lowlands and the extreme south. **Gr. Fa**? **F:** *A V U St EP 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:** *Bl Gtl Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL*. Circumpolar in arctic and alpine areas in Europe, Asia, Australasia, North America, South America, and Antarctic.



Note. May resemble *P. minuscula* in extreme habitats. However, *P. pubescens* is more robust, has terete branches, and longer internodes and is more loosely attached to the substrate.

Pseudevernia

T. Ahti & A. Thell

Pseudevernia Zopf

Beih. Bot. Centralbl. 14: 124 (1903). – Type: *Pseudevernia furfuracea* (L.) Zopf

D: fyrrelav **F:** hankakarpeet **I:** elgshyrna **N:** elghornslav **S:** gäl-lavar

Literature: Hale, Bryologist 71: 1–11 (1968); Kärnefelt et al., Nova Hedwigia 67: 90 (1998); Crespo et al., Taxon 59: 1735–1753 (2010).

Thallus prostrate, shrubby to narrowly foliose, to 12 cm diam., with flattened to terete, often pendent lobes. Lobes dorsiventral, strap-shaped, corticate on both sides or partly decorticate on the lower surface. Upper surface smooth, light to dark grey; soralia sometimes present; often isidiate, isidia usually frequent, simple to coralloid. Lower surface ridged and mainly black, without rhizines. Cortex parapletenchymatous, leptodermatous. Medulla lax. Ascomata apothecia, zeorine, rare in most species, laminal or submarginal, with permanent thalline margin, stalked, concave, to 15 mm diam.; disc brown. Asci 8-spored. Spores ellipsoid, simple, colourless, 7.5–10 × 4–5.5 µm. Conidiomata pycnidia, laminal or marginal, rare, immersed to emergent, blackish. Conidia sublageniform or slightly dumbbell-shaped with one thickening larger than the other, 5–7 × 1 µm. Photobiont trebouxioid.

Chemistry. Cortex with atranorin and chloroatranorin. Medulla with depsides, depsidones and β-orcinol depsidones.

Note. Includes four species occurring in temperate to tropical North America and boreal to subtropical western Eurasia and adjacent Africa. Its relationships to other genera remain unclear. The sublageniform conidia indicate a closer relationship with *Letharia*, *Platismatia* or *Usnea* (Kärnefelt et al. 1998). However, *Pseudevernia* probably belongs to the hypogymnioid clade of the Parmeliaceae (Crespo et al. 2010).

1. Pseudevernia furfuracea (L.) Zopf

Beih. Bot. Centralbl. 14: 124 (1903). – *Lichen furfuraceus* L., Sl. Pl. 2: 1146 (1753). – Type: [Sweden] (LINN 1273.107 lectotype, Howe, Bull. Torrey Bot. Club 39: 201, 1912; restricted by Hawksworth & Chapman, Lichenologist 5: 51, 1971)

Syn. *Evernia furfuracea* (L.) W.Mann, *Parmelia ceratea* (Ach.) Zopf, *Parmelia furfuracea* (L.) Ach., *Parmelia furfuracea* var. *ceratina* (Ach.) D.Hawksw., *Pseudevernia olivetorina* (Zopf) Zopf, *Pseudevernia soralifera* (Bitter) Zopf

D: grå fyrrelav **F:** hankakarve **I:** elgshyrna **N:** elghornslav **S:** gäl-lav

Red-listed in: **I**

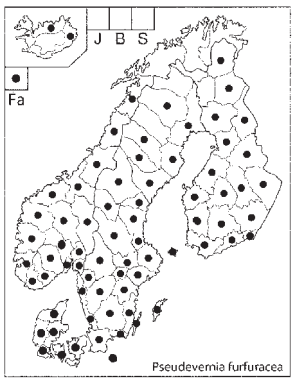
Literature: Culberson, Bryologist 68: 435–439 (1965); Culberson & Johnson, Mycologia 69: 604–614 (1977); Hale 1968: 7–9; Amer. J. Bot. 43: 456–459 (1956); Halvorsen & Bendiksen, Nord. J. Bot. 2: 371–380 (1982); Hawksworth & Chapman, Lichenologist 5: 51–58 (1971).

Figs: Holien & Tønsberg 2006: 43; Moberg & Holmåsen 1990: 82; Rikkinen 2008: 149; Sérusiaux et al. 2004: 148; Wirth 1995: 783.

Thallus foliose to shrubby, becoming pendent, often rosette-forming, to 15 cm diam. Lobes strap-shaped, incurved, dichotomously branched, 1–4(–25) mm wide. Upper surface smooth, light to dark grey, sometimes brownish at apices, partly to completely covered by cylindrical, often coralloid or flattened isidia, to 3 mm long; rarely with soralia. Lower surface ridged, usually black, occasionally brown to brownish white or pinkish. Apothecia rare, laminal or submarginal, raised, concave, to 15 mm diam.; disc brown. Spores ellipsoid, 7.5–10 × 4–5.5 µm. Pycnidia rare, immersed, blackish. Conidia sublageniform or slightly dumbbell-shaped with one thickening larger than the other, 5–7 × 1 µm.

Chemistry. Cortex C–, K+ yellow, KC–, PD–; atranorin and chloroatranorin. Medullary substances represent two chemotypes**:** 1) C–, K–, KC–, PD–; physodic acid, with traces of 2'-O-methylphysodic and oxyphysodic acids; 2) C+ red, K–, KC+ red, PD–; olivetoric acid ("var. *ceratea*"). Both chemotypes are widespread in the Nordic countries, but the latter is more frequent.

Habitat. Corticolous on trees and shrubs, especially on conifers, also lignicolous and rarely saxicolous.



Distribution. Common in the southern boreal zone in Fennoscandia, scattered to rare further north, absent from alpine and arctic 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 SoL InL.* **I:** *IAu INo.* **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo.* **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 LuL*. Europe, western Eurasia, extending to West Siberia and Xinjiang, China, also in North Africa. The physodic acid chemotype has a more southern distribution.

Note. The general habit of *P. furfuracea* reminds of the distantly related *Evernia prunastri*. The presence of isidia on the grey upper surface combined with a black lower surface distinguish it from *E. prunastri* with its greenish upper surface and white lower surface. The chemical variation has sometimes been given taxonomic recognition.

Punctelia

A. Thell

Punctelia Krog

Nord. J. Bot. 2: 287–292 (1982). – Type: *Punctelia borreri* (Sm.) Krog

D: skållav **S:** punktsköldlavar

Literature: Crespo et al., Lichenologist 36: 299–308 (2004); Hale & Kurokawa, Contr. U.S. Nat. Herb. 36: 1–191 (1964); Hale, Svensk Bot. Tidskr. 59: 37–48 (1965); Krog, Nytt Mag. Bot. 17: 11–15 (1970); Nord. J. Bot. 2: 287–292 (1982); Krog & Swinscow, Norw. J. Bot. 24: 167–177 (1977); Thell et al., Folia Cryptog. Estonica 41: 115–122 (2005); Thell et al., Sauteria 15: 545–559 (2008); Westberg & Thell, Lavbulletinen 1: 14–15 (2007).

Thallus foliose, more or less rosulate, adnate, usually not exceeding 5 cm diam., ridged and wrinkled in the centre, smooth towards the margin. Lobes broadly rounded, to 20 mm long and 5–7 mm wide, partly im-

bricate, occasionally canaliculate towards the apices. Upper surface greenish grey, grey, brown to brownish towards the margins; pseudocyphellae punctiform to irregular, often sorediate, sparse to abundant; soralia punctiform, laminal or marginal. Lower surface pale brown to black; rhizines simple, often clustered, brownish to pale. Ascomata apothecia, zeorine; disc brown. Asci 8-spored. Spores simple, broadly ellipsoid, colourless. Conidiomata pycnidia, rare, immersed, laminal, black. Conidia unciform, rarely filiform, 3–6 × 1 µm. Photobiont trebouxioid.

Chemistry. Atranorin in the cortex, gyrophoric or lecanoric acid in the medulla.

Note. The genus includes c. 30 species and has its highest diversity in South America and Africa. The three species in the Nordic countries are rare, representing outposts from rather large temperate world distributions. The genus was considered extinct from Denmark and Sweden, but both *P. jeckeri* and *P. subrudecta* have recently been rediscovered in both countries perhaps as a result of recent climatic warming. Punctelia reddenda has incorrectly been reported from Sweden.

1. Upper surface grey, sometimes with a brownish tinge along the thallus margin; lower surface brown..... 2
– Upper surface greenish grey with a broad brown zone towards the thallus margin; lower surface black .....2. *P. stictica*
2. Soralia mainly marginal; pruina present towards the thallus margin ..... 1. *P. jeckeri*
– Soralia laminal and marginal; pruina absent ..... 3. *P. subrudecta*

1. Punctelia jeckeri (Roum.) Kalb

Biblioth. Lichenol. 95: 312–313 (2007). – *Sticta jeckeri* Roum., Rev. Mycol. 3: 33 (1881), as "jackeri". – Type: France, Deux-Sèvres, cascade de Crévent, 1880 Jecker in Roumeguère, Lich. Gall. exs. no. 245 (UPS lectotype, Kalb, Biblioth. Lichenol. 95: 312, 2007).

Syn. *Parmelia ulophylla* auct., *Punctelia ulophylla* auct. (non (Ach.) van Herk & Aptroot).

D: randstøvet skållav **S:** daggig punktsköldlav

Red-listed in: **N**

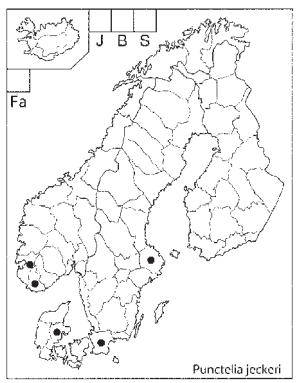
Literature: Christensen & Søchting, Graphis Scripta 19: 13–16 (2007); Gauslaa, Graphis Scripta 12: 12–14 (2000); van Herk & Aptroot, Lichenologist 32: 233–246 (2000), Kalb, Biblioth. Lichenol. 95: 312–313 (2007); Thell et al. 2005: 118–119; Thell et al. 2008: 555–556.

Figs: Dobson 2005: 376; Sérusiaux et al. 2004: 152; van Herk & Aptroot 2004: 327; Wirth 1995: 667 (as P. subrudecta).

Thallus variable, rosette-forming or irregular, rather closely attached, to 5 cm diam. Lobes to 3 mm wide, rounded, occasionally concave with margins bent upwards. Upper surface greenish grey, slightly shiny, pruinose and slightly brownish towards the margins; pseudocyphellae sparse to absent, small; soralia mainly marginal, rarely laminal. Lower surface whitish or pale brown, rarely dark brown; rhizines simple often clustered, brownish to pale. Apothecia not observed. Pycnidia rare, laminal, immersed and blackish. Conidia unciform to filiform, 3–5 × 1 µm.

Chemistry. Cortex C–, K+ yellow, KC–, PD–; atranorin. Medulla and soralia C+ red, K–, KC+ red, PD–; lecanoric acid.

Habitat. Corticolous on deciduous trees in the lowlands.



Distribution. Southern, known only from a few localities in southern Denmark, Norway and Sweden. **D:** *ØJy*. **N:** *VA Ro.* **S:** *Sk* (*Upl*). Western and Central Europe, eastwards to Estonia and western Russia.

Note. Differs from *P. subrudecta* by the numerous marginal soralia and the presence of a pruina at the lobe margins. *P. jeckeri* was earlier included in *P. subrudecta* but DNA sequences clearly supports separate species.

2. Punctelia stictica (Duby) Krog

Nord. J. Bot. 2: 291 (1982). – *Parmelia borreri* β. *stictica* Duby, Bot. Gall 2: 601 (1830). – Type: France, Calvados Vire, Delise (H-NYL 35034 syntype).

Syn. *Parmelia stictica* (Delise ex Duby) Nyl.

N: brun punktlav

Red-listed in: **N**

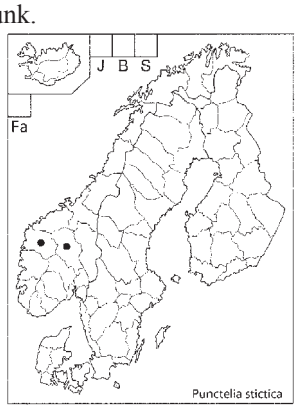
Literature: Adler, Mycotaxon 58: 77–92 (1996); Hale 1965: 41; Krog 1970: 12–14; Krog 1982: 291; Krog & Swinscow 1977: 174; Swinscow & Krog, Macrolich. East Africa: 261 (1988); Thell et al. 2008: 555–556; Tønsberg et al., Sommerfeltia 23: 166–168 (1996).

Figs: Brodo et al. 2001: 609; Holien & Tønsberg 2006: 59.

Thallus rosette-forming or irregular, loosely attached, to 5 cm diam. Lobes rounded, to 5 mm wide. Upper surface greenish grey, becoming brown towards the margin, occasionally entirely brown; pseudocyphellae common, irregularly shaped, laminal; soralia common, developing from the pseudocyphellae; soredia isidioid. Lower surface black with a narrow brown zone; rhizines simple often clustered, blackish to pale. Apothecia not observed. Pycnidia laminal, black. Conidia filiform, 9–14 × 1 µm.

Chemistry. Cortex C–, K+ yellow, KC–, PD–; atranorin. Medulla and soralia C+ pink, K–, KC+ red, PD–; gyrophoric acid.

Habitat. A saxicolous inland species, growing on siliceous and calcareous rocks in open, sunny situations, once found on a rowan trunk.



Distribution. Southern central continental in Norway. **Gr. N:** *Op SF*. Common in continental parts of Europe, particularly in France. The world distribution is disjunct, with scattered occurrences in Africa and S America.

Note. Characterized by the black lower surface and the comparatively wide brown rim of the otherwise dark greenish grey upper surface.

3. **Punctelia subrudecta** (Nyl.) Krog

Nordic J. Bot. 2: 291 (1982). – *Parmelia subrudecta* Nyl., Flora 69: 320 (1886). – Type: [Indian Ocean] St. Paul Island, 1875 Fenzl (H-NYL 35033 holotype).

Syn. *Parmelia dubia* (Wulfen) Schaer., nom illeg.

D: punkt-skållav **N:** grå punktlav **S:** punktsköldlav

Red-listed in: **N**

Literature: Adler & Ahti, Lichenologist 28: 431–436 (1996); Christensen & Søchting, Graphis Scripta 19: 13–16 (2007); Gauslaa, Graphis Scripta 12: 12–14 (2000); Hale 1965: 42–43; Hasselrot, Svensk Bot. Tidskr. 59: 41–43 (1945); van Herk & Aptroot, Lichenologist 32: 235–239 (2000); Jørgensen, Symb. Bot. Ups. 31(3): 314 (1996); Krog 1970: 12; Krog 1982: 291; Krog & Swinscow 1977: 174–175; Swinscow & Krog, Macrolich. East Africa: 261 (1988); Thell et al. 2008: 556; Thor & Arvidsson, Rödlistade lavar i Sverige: 442 (1999); Tønsberg et al., Sommerfeltia 23: 168–170 (1996).

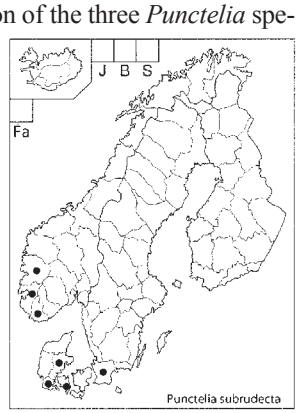
Figs: Sérusiaux et al. 2004: 151; Jahns 1980: Pl. 426; Thor & Arvidsson 1999: 313; van Herk & Aptroot 2004: 327.

Thallus variable, rosette-forming or irregular, rather closely attached, to 5 cm diam. Lobes to 10 mm wide, rounded, occasionally concave with margins bent downwards. Upper surface yellowish grey, slightly brownish close to the margins; pseudocyphellae small, sparse to absent; soralia mainly marginal, rarely laminal. Lower surface whitish to pale brown, rarely dark brown; rhizines simple often clustered, pale. Apothecia not observed. Pycnidia rare, laminal, immersed and blackish. Conidia unciform to filiform, 4–7 × 1 µm.

Chemistry. Cortex C–, K+ yellow, KC–, PD–; atranorin. Medulla and soralia C+ red, K–, KC+ red, PD–; lecanoric acid.

Habitat. Corticolous, growing on trunks of broad-leaved, mostly solitary trees, often in open agricultural landscapes such as grazed woodlands.

Distribution. Most common of the three *Punctelia* species extending to south-western Scandinavia. **D:** *ØJy SJy Fyn*. **N:** *VA Ro Ho*. **S:** *Sk*. Temperate and tropical zones in Europe, Asia, Africa and Australasia (incorrectly reported from North and South America).



Note. Similar to *P. jeckeri* but distinguished by a

closer attachment to the substrate, mainly laminal soralia and a thinner and more grey thallus.

Tuckermannopsis

T. Ahti & A. Thell

Tuckermannopsis Gyeln.

Acta Fauna Fl. Universali, Ser. 2, Bot. 1(5–6): 6 (1933). – Type: *Tuckermannopsis ciliaris* (Ach.) Gyeln.

F: ruskoröyhelöt

Literature: Kärnefelt & Thell, Biblioth. Lichenol. 78: 193–209 (2001); Randlane & Saag, Sauteria 9: 48 (1998); Thell, Anatomy and taxonomy of cetrarioid lichens, PhD thecis, Dept. Syst. Bot., Lunds Univ.: 34–36 (1996).

Thallus foliose, erect to shrubby, rosette-forming or irregular, to 6 cm diam. Lobes elongate, occasionally branched with smooth or crenulate margin. Upper surface pale to dark greenish brown; pseudocyphellae sparse on the upper surface; soredia present in one species. Lower surface pale brown to blackish; pseudocyphelle as minute white spots on lower side; rhizines pale or dark in central parts. Cortex paraplectenchymatous. Medulla lax. Ascomata apothecia, zeorine, marginal, lateral to terminal; disc brown. Asci 8-spored. Spores simple, globose, 3.5–6 µm diam. Conidiomata pycnidia, marginal, brown to black, protruding. Conidia dumbbell-shaped to sublageniform, 5–10 × 1–1.5 µm. Photobiont trebouxioid.

Chemistry. No secondary compounds present in the cortex. Medulla with fatty acids.

Note. Tuckermannopsis inermis has been moved to *Masonhalea*.

1. Soralia present, marginal .....1. *T. chlorophylla*
– Soralia absent.....2. *T. ciliaris*

1. Tuckermannopsis chlorophylla (Willd.) Hale

Bryologist 90: 164 (1987). – *Lichen chlorophyllus* Willd. ex Humb., Fl. Friberg.: 20 (1793). Type: [Germany, Saxony], Freiberg, "in cortice Pyni silvestris beym Vorwerk Hals"; Austria, "in pinetis alpium Salisburgensium", 1792 Humboldt (syntypes, probably destroyed in B); Denmark, Jylland, Vendsyssel, W of Råbjerg Mile, 1994 Christensen 11056 in Hansen, Lich. Danici exs. no. 34 (C neotype, Ahti & Thell, Nordic Lichen Flora 4: 141, 2011).

Syn. Cetraria chlorophylla (Willd.) Vain., *Cetraria scutata* auct., *Cetraria ulophylla* (Ach.) Rebent.

D: olivenbrun kruslav **F:** ruskoröyhelö **I:** krypplugrös **N:** vanlig kruslav **S:** brämlav

Literature: Kärnefelt, Bothalia 17: 45–46 (1987); Kärnefelt et al., Pl. Syst. Evol. 183: 149–150 (1992); Kärnefelt & Thell 2001: 201–202.

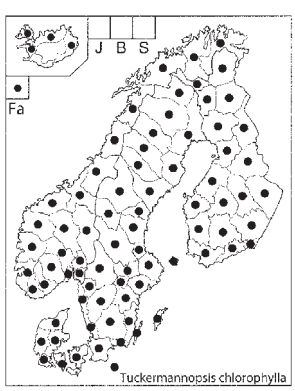
Figs: Brodo et al. 2001: 692; Hansen & Andersen 1995: 18; Holien & Tønsberg 2006: 36; Moberg & Holmåsen 1990: 73; Rikkinen 2008: 147; van Herk & Aptroot 2004: 371; Wirth 1995: 269.

Thallus rosette-formed to loosely tufted, to 6 cm diam. Lobes irregularly branched, 1–4 mm wide at their bases, ascending at margins and narrowing towards tips, flattish to weakly canaliculate; pseudocyphellae sparse on the lower side as minute white spots, 0.1 mm diam. Soralia marginal, abundant, sometimes continuous, particularly towards the tips, grey to brownish, sometimes isidioid; cilia absent or rarely observed. Upper surface olivaceous brown or (pale) brown, glossy and rather smooth. Lower surface pale brown to brownish white, wrinkled; rhizines sparse, pale. Apothecia rare, lateral and marginal, sessile, to 3 mm diam.; disc concolorous with the thallus. Spores globose, 5 × 5 µm. Pycnidia scattered, marginal and protruding. Conidia dumbbell-shaped, 5–6 × 1.5 µm.

Chemistry. Cortex C–, K–, KC–, PD–. Medulla C–, K–, KC–, PD–; protolichesterinic acid.

Habitat. Primarily corticolous on both conifers and deciduous trees, also lignicolous, occasionally saxicolous.

Distribution. Common in most of the forested area of the Nordic countries, but absent or scarce in the subalpine birch woods and above the timberline, rare in Iceland. **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:** *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*. Widespread in temperate and boreal regions of the Northern Hemisphere, very rare (adventive?) in eastern North America. Also occurring in areas with similar climatic conditions such as South America, Australasia and South Africa.

Note. Easily recognized by its greenish brown colour and dark marginal soralia.

2. **Tuckermannopsis ciliaris** (Ach.) Gyeln.

Acta Fauna Fl. Universali, Ser. 2, Bot. 1(5–6): 6 (1933). – *Cetraria ciliaris* Ach., Lichenogr. Universalis: 508 (1810). – Type: USA, 'America borealis', Mühlenberg (H-ACH 1511 lectotype, Culberson & Culberson, Bryologist 70: 159, 1970, as holotype).

Syn. *Cetraria ciliaris* Ach., *Cetraria ciliaris* var. *halei* (W.L.Culb. & C.F.Culb.) Ahti, *Cetraria halei* W.L.Culb. & C.F.Culb., *Nephromopsis ciliaris* (Ach.) Hue, *Tuckermannopsis americana* (Spreng.) Hale, *Tuckermannopsis halei* (W.L.Culb. & C.F.Culb.) M.J.Lai

F: ripsiröyhelö

Red-listed in: **F**

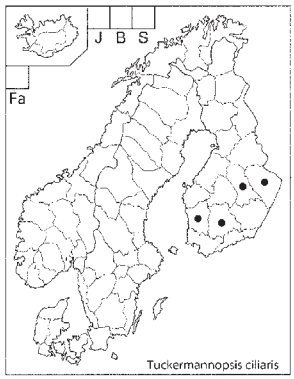
Literature: Ahlner, Acta Phtyogeogr. Suec. 22: 133–143 (1948); Culberson & Culberson, Bryologist 70: 158–166 (1967); Hakulinen, Arch. Soc. Zool.-Bot. Fenn. Vanamo 17: 1–4 (1962); Hale, Brittonia 15: 126–133 (1963); Laurila, Ann. Bot. Soc. Zool.-Bot. Fenn. Vanamo 15: 3–4 (1940); Lai, Quart. J. Taiwan Mus. 33: 226 (1980); Kärnefelt et al., Pl. Syst. Evol. 183: 153 (1992); Kärnefelt & Thell 2001: 202–203 (2001); Randlane & Saag, Folia Crypt. Estonica 29: 33–36 (1992).

Figs: Brodo et al. 2001: 692; Hinds & Hinds 2007: 475; Thomson 1984: 81.

Thallus loosely adnate, irregular to rosette-forming, to c. 5 cm diam. Lobes elongate, 1–4 mm wide, weakly wrinkled, usually with scattered, long, marginal cilia. Upper surface pale to dark greenish brown; pseudocyphellate absent. Lower cortex brown to blackish, somewhat wrinkeled. Apothecia lateral and marginal, to 3 mm diam. Spores globose, 4–5 × 4–5 µm. Pycnidia marginal, protruding, black. Conidia dumbbell-shaped, c. 5 × 1 µm.

Chemistry. Two chemotypes (1) Cortex C–, K+ yellow, KC–, PD–; atranorin. Medulla C+ red, K–, KC+ red, PD–, UV–; olivetoric and physodic acids. (2) Cortex C–, K± yellow, KC–, PD–; sometimes atranorin. Medulla C–, K–, KC+ orange to pink, PD–, UV+ bluish white; alectoronic acid, sometimes also α-collatolic acid.

Habitat. Exclusively on trunks and branches of *Betula* in the Nordic countries, elsewhere also on conifers and other trees.



Distribution. Mainly found in the inner, southern part of Finland, but most records are from the 1930's or earlier. Now regarded as extinct in the area. **F:** (*St EH PS PK*). Common in boreal and northern temperate eastern North America, also widespread in Northern Asia and European Russia.

Note. Similar to *T. chlorophylla*, but easily distinguished by the ciliate instead of sorediate margin. The alectoronic-α-collatolic acid chemotype of this species has often been regarded as a distinct species, *T. americana*. It is actually the main strain throughout the boreal zone, also in Finland, while *T. ciliaris* s. str. is mainly restricted to a relatively small area in the NE United States. However, *T. ciliaris* s str. is known from a single locality (EH: Evo) in South Finland (several specimens, with *T. americana*!) and a few places in Russia and Alaska. Here they are treated as one species. A third member in the complex is *T. orbata* (Nyl.) M.J.Lai, only known from North America which contains protolichesterinic acid and is slightly different also in morphology.

Usnea

P. Clerc

Usnea Adans.

Fam. Pl. 2: 7, 1763. – Type: *Usnea florida* (L.) F.H.Wigg.

Syn. *Dolichousnea* (Y.Ohmura) Articus, *Eumitria* Stirt., *Neuropogon* Nees & Flot.

D: skæglav **F:** naavat **N:** skjegglavar **S:** skägglavar

Literature: Asahina, Lich. Japan 3. Genus Usnea (1956); Clerc 1987a: 479–495; Biblioth. Lichenol. 25: 99–102 (1987b); Candollea 47: 513−526 (1992); Lichenologist 30: 321−340 (1998); Lichenologist 38: 191−212 (2006); Clerc in Nash et al., Lich. Fl. Great Sonoran Desert Region 3: 302−335 (2007); Clerc & Herrera-Campos, Bryologist 100: 281−301 (1997); Fos & Clerc, Lichenologist 32: 67−88 (2000a); Halonen, Bryologist 103: 38−43 (2000b); Halonen et al., Bryologist 101: 36−60 (1998); Ann. Bot. Fenn. 36: 235–256 (1999); Hinds & Hinds, Mem. New York Bot. Gard.: 96: 487−511 (2007); Krog et al., Lavflora: 298–308 (1994); Ohmura, J. Hattori Bot. Lab. 90: 1–96 (2001); Ohmura & Kanda, Lichenologist 36: 217−225 (2004); Randlane et al., Biblioth. Lichenol. 100: 440−441 (2009); Tõrra & Randlane, Lichenologist 39: 415–438 (2007); Wirtz et al., Taxon 55: 367−376 (2006).

Thallus fruticose, erect to pendent, greyish to yellowish green, usually attached by a holdfast. Branches cylindrical, fusiform, tapering or irregular; terete, obtuse-angled, ridged or acute-angled, flattened or alate; constricted or not at attachment points or trapeziform; with or without annulations; divided into ± conspicuous segments which may be cylindrical or ± sausage-like; with or without papillae, fibrils, tuberucles, fibercules, maculae, pseudocyphellae, soralia, isidiomorphs, isidiofibrils; without true isidia. Cortex composed of radially or irregularly oriented leptodermatous or pachydermatous hyphae which are firmly or loosely conglutinated. Medulla lax, dense or compact, sometimes pink pigmented. Central axis running throughout the thallus with a whitish cartilaginous strand of solid, tough, compacted, prosoplectenchyma in which hyphae are conglutinated and longitudinally arranged; fistulose and/or solid, I+ blue or I−. Ascomata zeorine apothecia, rare in most species, lateral, serial, subterminal or terminal, sessile to pedicellate; ± cup-shaped; margin prominant with thalloid rim and few to numerous well-developed fibrils; disc pruinose or not, pale to dark yellowish to brownish; asci *Lecanora*-type, elongate-clavate, 8-spored; spores simple, ellipsoid to broadly ellipsoid, 7−11 × 5−7 µm, colourless, not amyloid. Conidiomata pycnidia, mainly apical or subapical, immersed. Conidia simple, colourless, bacilliform or bifusiform, straight or curved. Photobiont trebouxioid.

Chemistry. Cortex with usnic acid; medulla with alectorialic, baeomycecic, barbatic with satellites, bourgeanic, caperatic, diffractaic with satellites, evernic, fumarprotocetraric, lecanoric, lobaric, murolic with satellites, norstictic, protocetraric, psoromic with satellites, salazinic, squamatic, stictic with satellites, thamnolic with satellites and fatty acids. Also terpenoids and unidentified substances.

Note. Recognized by the fruticose thallus and the presence of an elastic central cord in the medulla (seen by stretching a branch). *Usnea* species in the Nordic countries are mostly corticolous, frequently lignicolous, more rarely saxicolous. Most species have a more or less southern distribution in the Nordic region. Four species, *U. cornuta*, *U. flammea*, *U. fragilescens*, and *U. silesiaca* have a pronounced oceanic distribution. Recent DNA-investigations clearly show that the earlier segregates *Dolichousnea*, *Eumitria* and *Neuropogon* belong to *Usnea* (Ohmura & Kanda 2004; Wirtz et al. 2006).

Each species of *Usnea* accepted here consists of a distinctive combination of morphological, anatomical and chemical characters (see also Clerc 1998). However, quite often one or more rarely two diagnostic characters are lacking or are difficult to interpret, especially when specimens are young or growing in an extreme locality (for example an area with high insolation, strong winds, or very high humidity), when they are infected by a lichenicolous fungus or when they are necrotic (for instance specimens collected on the ground).

Maps: stars indicate material not seen by the author.

Important characters

Thallus

There are different habits in *Usnea*: 1. erect type: short diverging branches, 2. subpendent type: some branches might be longer and hanging, but remain divergent; 3. pendent type: branches are long and hanging downwards, running parallel to each other (see Ohmura 2001, Fig 1).

Ramification types

Although sometimes indistinct, the branching type is important for the identification of some species. There are three main type of branching among species from the Nordic countries: (1) the sympodial or anisotomic-dichotomic type (Fig. 1a), where a main branch runs through to the apex (with *U. cornuta* as a typical example); (2) the isotomic-dichotomic type (Fig. 1b), where a short basal part divides into two main branches of ± equal diameter, the latter dividing themselves the same way and so one (with *U. florida* as a typical example); (3) the filamentose type (Fig. 1c), where a short and thin, almost indistinct main branch divides at once, producing secondary branches of almost equal diameter that elongate into cylindrical type branches that run parallel to each other (with *U. cylindrica* and *U. longissima* as the only examples from the Nordic countries).

Basal part

The pigmentation of the basal part close to the hold-fast (point of fixation of the thallus to the substrate) is diagnostic for most species. It is concolorous or paler than the main branches, yellowish to reddish or jet black. Saxicolous species exhibit a special kind of holdfast that seems to proliferate horizontally on the surface of the substrate, with numerous branches growing vertically and tightly appressed. This kind of basal part is called a proliferating holdfast and has been described for neuropogonoid species (Walker 1985, Fig. 20) or for other saxicolous species of the genus *Usnea* (Rodriguez et al., in press).

Branches

The branch morphology is a fundamental character for the circumpscription of Usnea species. **1. The general shape of a branch** from the base to the apex might be tapering, irregular, cylindrical or fusiform. When cylindrical the diameter of the branch remains the same along most of the length of the branch, tapering only at the apices (Fig. 2a). When tapering the diameter of the branch ± gradually decreases from the basal part towards the apex (Fig. 2b). When irregular the diameter of the branch varies irregularly along the length of the branch (Fig. 2c). When fusiform swollen ± at middle part and tapering towards each end like a spindle (Fig. 2d). **2. The shape in cross-section** can be terete, i.e. ± circular (Fig. 5a), obtuse-angled, i.e. angular with rounded angles (Fig. 5b), ridged or acute-angled, i.e. angular sharp angles (ridges) (Fig. 5c), alate, i.e. strongly angular with ”wing-like” protuberances (Fig. 5d) or flattened (Fig. 5e). **3. The branches are ± distinctly partitioned into segments.** Segments are cylindrical, i.e. of the same diameter overall (Fig. 4a) or slightly to distinctly swollen, i.e. larger in the middle and thinner at both ends, giving a ± sausage-like appeareance to the branches (Fig. 4b). **4. At ramification points** the branches might be ± constricted (Fig. 3b), not constricted, i.e. cylindrical (Fig. 3a), broadened or trapeziform (Fig. 3c). This character seems to be an important phylogenetic marker, delimitating groups at the subgeneric level, clearly separating for instance the *U. cornuta-fragilescens* group (branches constricted) from the *U. florida* group (branches not constricted).

Foveoles and transverse furrows

Segments can be deformed by the depressions in the surface of the cortex such as foveoles (circular depressions) or transverse furrows (transverse depres-sions) (Fig. 5b).

Papillae, tuberucles, fibrils and fibercules

Papillae are small cortical outgrowths without medulla or algae inside. They are cylindrical (taller than broad), verrucose (± equally broad as tall) or hemisphaerical (short, broader than tall, often inapparent) (Ohmura 2001, Fig. 7). Tuberucles are cortical outgrowths usually larger than papillae, with medulla and algae inside, often eroded at their tips and then producing soralia. Fibrils are short, branch-like appendages with a central axis not attached to the central cord as in lateral branches; short fibrils (1−2 mm long) are spinulous; fibrils can be considered as a special kind of diaspores. Fibercules are scars left when fibrils are shed; they often produce soralia (Clerc & Herrera-Campos 1997).

Pseudocyphellae

In *Usnea* this term is used only for small, whitish, often thin and elongate, ± fusiform breaks in the cortex that never produce soralia at a later stage of their ontogeny. The starting point of a soralia is de facto a pseudocyphella but is called ”juvenile soralia” in *Usnea* to distinguish them from the pseudocyphellae as defined above.

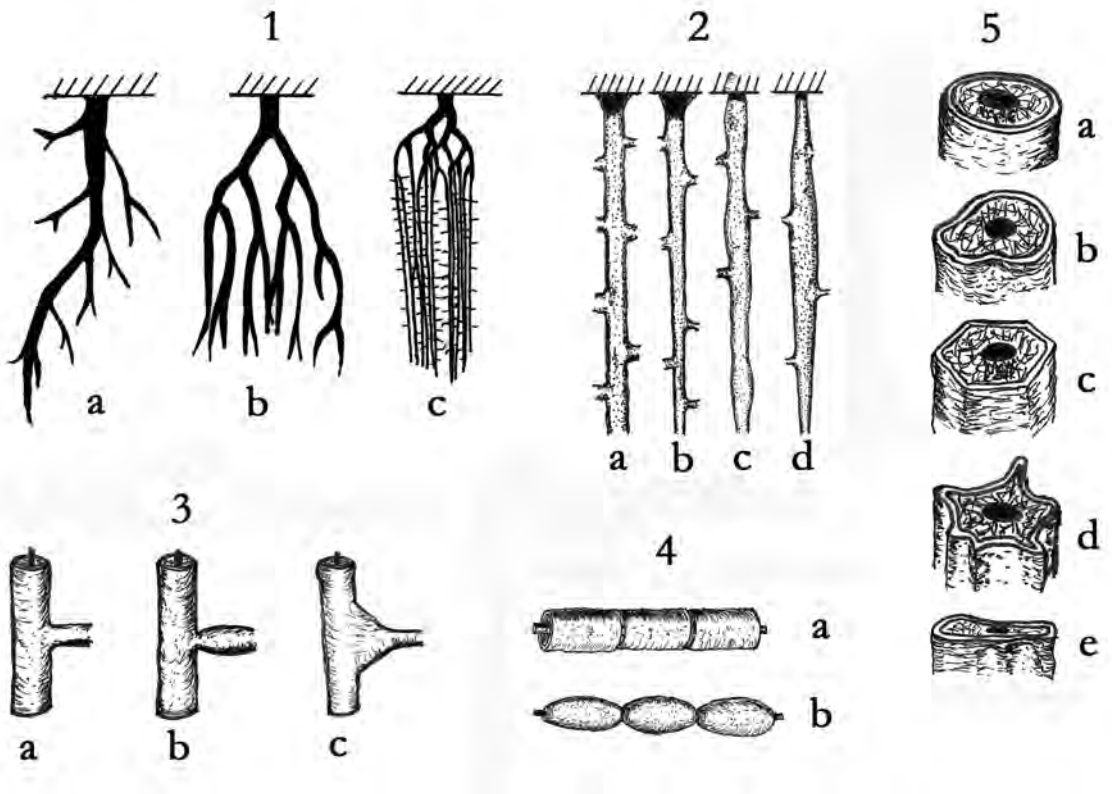


Fig. 1−5.
1a. Ramification of the anisotomic-dichotomic or sympodial type (*U. cornuta*). 1b. Ramification of the isotomic-dichotomic type (*U. glabrescens*). 1c. Ramification of the filamentose type (*U. longissima*).
2a. Branch cylindrical (*U. longissima*). 2b. Branch tapering (*U. subfloridana*). 2c. Branch irregular (*U. lapponica*). 2d. Branch fusiform (*U. fragilescens*).
3a. Branch not constricted or cylindrical at ramification point (*U. subfloridana*). 3b. Branch constricted at ramification point (*U. cornuta*). 3c. Branch broadened or trapeziform at ramification point.
4a. Segments cylindrical (*U. subfloridana*). 4b. Segment swollen (*U. fragilescens*).
5a. Segment terete in cross-section (*U. cylindrica*) 5b. Segment obtuse-angled in cross-section (*U. hirta*). 5c. Segment ridged or acute-angled in cross-section (*U. barbata*). 5d. Segment alate in cross-section. 5e. Segment flattened in cross-section (*U. longissima*).

Soralia, isidiomorphs and isidiofibrils

The morphology of the soralia is a very important character at species level in the genus *Usnea*, see Clerc (1987) and Ohmura (2001), but a less important character at the phylogenetic level with the occurence of many convergences. The presence or absence of isidiomorphs is a very important diagnostic character. Isidiomorphs are ± short and thin "isidia-like" structures occurring commonly in bundles (rarely singly) in the soralia (Clerc & Herrera-Campos 1997, Clerc 1998). Isidiofibrils are isidiomorphs that develop an axis during their growth in the soralia, so that they look morphologically like short fibrils (Truong et al. in press). There are no true isidia in *Usnea*.

Cortex, medulla and axis

The morphology and thickness of the cortex, the medulla and the axis provide useful characters. The observation of these structures needs to be done with a dissecting microscope at 40× magnification on a short longitudinal section (razor blade needed!) through the center of the axis, in the largest part of the largest branch of the thallus. Measurements (CMA values) in the species descriptions are given as percentages of the whole width of the measured branch (Clerc 1987). The cortex is mat or shiny like broken glass, thin (<6 %), moderately thin (6−8 %), moderately thick (8−10 %) or thick (>10 %). The medulla is lax (individual hyphae visible and separated), dense (hyphae agglutinated but remaining ± individually visible) or compact (hyphae adgluti-nated not visible individually), thin (<18 %), moderately thin (18−23 %), moderately thick (23−28 %) or thick (>28 %). The axis is solid, more rarely fistulose in the basal part of large branches, thin (<30 %), moderately thin (30−40 %), moderately thick (40−50 %) or thick (>50 %). It is useful to calculate the ratio axis/medulla (A/M) for each species.

The key

This key takes into account the variability observed on the specimens collected in the Nordic countries. It may not be usable for specimens collected elsewhere in Europe. It often happens that one or more rarely two morphological diagnostic characters are lacking, or not well developed and then not interpretable, especially when specimens are too young or growing under extreme environmental conditions (for instance strong winds, high insolation or very high humidity) or if they are infected by a lichenicolous fungus (inducing for example abnormal development of soralia) or when they are necrotic (reddish colour in specimens collected on the ground). When such difficulties are encountered, chemistry should be investigated with TLC and possibly specialists should be consulted. CMA values given are standard deviations around the middle values. Minimal and maximal values are not indicated.

The key

1. Cortex of main branches soon disintegrating leaving rough patches of white medulla; thallus pendent, very long, to 2−3 m; draping over horizontal branches; ramifications of the filamentose type; central axis very thick (68−86%) ..... 13. *U. longissima*

− Main branches fully corticate; thallus shrubby to pendulous but not exceeding 60 cm; ramifications of various types; central axis thinner (13−65%) 2

2. Branches with black and yellow annulations, especially in terminal parts ..... 15. *U. sphacelata*

− Branches lacking black and yellow annulations; mainly corticolous, rarely saxicolous 3

3. Medulla and axis C+ yellow, CK+ orange, with a reddish-pink pigment, sometimes very faint and hardly visible. Mature soralia at least larger than half the diameter of the branch, well delimited and ± regularly outlined, not coalescing, stipitate, developing on top of tuberucles; pigment pink, sometimes inconspicuous; medulla K−, PD− ..... 2. *U. ceratina*

− Medulla and axis C−, CK− without a reddish-pink pigment 4

4. Soralia absent; with apothecia numerous or when absent, then with nodule-like Pycnidia often numerous on terminal branches.....5

− Soralia usually present; Apothecia absent or few (Pycnidia absent).....6

5. Basal part pale, never black pigmented; main branches usually ± obtuse-angled or ridged, with small transverse furrows or foveoles; branches smooth, without papillae and tuberucles, with numerous irregularly crowded isidiomorphs and isidiofibrils; Apothecia few to numerous; thallus limp and flaccid when wet; cortex thin (3−7%); medulla moderately large (27−33%), lax, often lignicolous ..... 11. *U. hirta*

− Basal part always jet black pigmented; main branches terete in section, never with foveoles or transverse furrows; branches rough, with papillae and/or tuberucles, without isidiomorph-like spinules; Apothecia frequent,

usually numerous, very rarely absent; thallus usually stiff when wet; cortex thick (9−12%); medulla usually thin (11−20%), dense to compact ..... 7. *U. florida*

6. Lateral branches constricted at their point of attachment or fusiform; cortex mostly thin (3−7%) and shiny in longitudinal section (*U flammea* excepted); medulla mostly thick (28−38%) and lax (*U. flammea* excepted) 7

− Lateral branches not constricted at their point of attachment nor fusiform; cortex and medulla various.....11

7. Medulla PD+ red orange and K− or K± brownish-yellow (protocetraric acid present as main substance); terminal branches with broad soralia, larger than half the diameter of the branch, stipitate to excavate; papillae absent or rare; medulla moderately thick to thick (29−38%) and lax; cortex thin (3−7%) and glossy in longitudinal section.....9. *U. glabrata*

− Medulla not at the same time PD+ red orange and K– (protocetraric acid absent or present only as accessory substance); soralia large or punctiform; papillae absent or present; medulla and cortex various.....8

8. Cortex mat (longitudinal section); basal part concolorous with branches or paler, usually with numerous pale annular cracks, especially near the holdfast; ramifications of the isotomic-dichotomous type; soralia irregular in shape, enlarged to half the diameter of the branch when mature, usually with numerous isidiomorphs when mature; central axis ± thick (30−49%), medulla ± thin (17−28%)..... 6. *U. flammea*

− Cortex glossy (longitudinal section); basal part jet black pigmented or not, usually without conspicuous pale annular cracks; ramifications distinctly of the sympodial type; soralia punctiform to enlarged when mature, irregular in shape or circular, with or without isidiomorphs; central axis ± thin (16−33%), medulla ± thick (27−38%).....9

9. Isidiomorphs absent (not to be confounded with small spinules growing at the edge of the soralia); papillae absent or few; soralia large, irregular in shape, stipitate to distinctly excavate, often becoming confluent .....9. *U. glabrata*

− Isidiomorphs usually present (at least on a few soralia but might be absent on old herbarium specimens); papillae always present, usually numerous; soralia punctiform or large but then ± regular and ± circular in shape, plane to ± tuberculate, never excavate.....10

10. Soralia mainly covering the terminal branches (last third of the thallus length), minute and crowded (30−50 soralia/mm^2), often becoming confluent and then looking like a single large soralium (cfr. single soralia), irregular in shape, ± level with the cortex, usually without margin, arising mostly directly on the cortex, rarely efflorescent-excrescent; isidiomorphs rarely numerous; fibrils usually numerous..... 3. *U. cornuta*

− Soralia numerous on primary and terminal branches, usually not crowded but widely spaced (15–25 soralia/mm^2), rarely becoming confluent, larger than half the diameter of the branch when mature, mostly rounded, ± plane, usually with a distinct margin, often efflorescent-excrescent; isidiomorphs often conspicuous and numerous; fibrils few..... 8. *U. fragilescens*

11. Mature soralia strongly excavate, often open to the central axis when well developed, never with isidiomorphs, but short fibrils (spinules) may be present at the edge of the soralia.....12

− Mature soralia stipitate or level with the cortex to slightly excavate, never strongly excavate and open to the central axis, with or without isidiomorphs 13

12. Branches irregular, often ± deformed and/or foveolate, often with depressions in the cortex, sometimes irregularly swollen; ramifications anisotomic-dichotomic; base pale or blackened; cortex moderately thin (5−8%); medulla moderately thick (21−30%), dense to lax; axis moderately thin (28−43%).....12. *U. lapponica*

− Branches cylindrical, never swollen, without foveoles or transverse furrows; ramifications mostly isotomic-dichotomic; base distinctly blackened; cortex moderately thick to thick (8−12%); medulla thin (13−23%), dense to compact; axis moderately thick (36−52%) (*U. fulvoreagens* morphotype).....10. *U. glabrescens*

13. Thallus erect to subpendulous, to 15 cm long; branches mostly diverging along their entire length.....14

− Thallus pendulous, to 60 cm long when mature; branches parallel along most of their length.....23

14. Soralia minute, smaller than or to half the diameter of the branch(cfr. single soralia and not coalescing minute soralia forming extensive larger soralia-like structures); basal part black pigmented or not.....15

– Soralia large, wider than half the diameter of the branch; basal part distinctly black 19

15. Basal part not black, concolorous with branches or paler 16

– Basal part distinctly black over 1−10 mm.....17

16. Main branches typically ± obtuse-angled or ridged in section and irregular, often with foveoles or transversal furrows; basal part without conspicuous annulations; papillae absent; branches irregularly covered with ± isolated and diffuse isidiomorphs and isidiofibrils; soralia minute, smaller than half the diameter of the branch, even with the cortex, sometimes abundant and covering

the surface of terminal branches when isidiomorphs and isidiofibrils are shed; cortex thin (3−7%) and shiny in longitudinal section; medulla thick (27−33%) ..... 11. *U. hirta*

− Main branches terete, tapering, without foveoles or transverse furrows; basal part often with conspicuous annulations and everted medulla; papillae few and inapparent to numerous; isidiomorphs, when present, in bundles inside the soralia; soralia punctiform to enlarged, even to stipitate; cortex mostly thicker (6−14%); medulla dense to compact, thin to moderately thick (7−29%) ..... 6. *U. flammea*

17. Main branches ± irregular; terminal branches mostly anisotomic-dichotomic, not tapering but similar in diameter over their entire length, often sinuose, not all of the same length; isidiomorphs frequent and often long (*U. diplotypus* morphotype)..... 5. *U. dasypoga*

− Main branches tapering; terminal branches mostly isotomic-dichotomic, tapering, usually not sinuose, all of ± the same length; isidiomorphs rare to frequent, short; chemistry diverse, always; corticolous 18

18. Medulla K+ yellow turning red, PD+ orangish-yellow (salazinic acid); central axis thick (50−62%). Medulla thin (9−13%) with a ratio axis/medulla varying between 3 and 10; basal black pigmentation often well developed on 5−10 mm with numerous annular cracks (6−9/5 mm); isidiomorphs rare (morphotype with badly developed, punctiform soralia).....14. *U. silesiaca*

− Medulla K+ intense yellow turning slowly orange, PD+ orange (thamnolic acid) or K−, PD– (squamatic acid); central axis moderately thick (35−55%) and medulla moderately thin (11−21%), with a ration axis/medulla varying between 2 and 5 with fewer annular cracks (3−6/5 mm); soralia punctiform, of irregular shape, usually with conspicuous and numerous isidiomorphs .....16. *U. subfloridana*

19. Main branches irregular, uneven in thickness, usually with foveoles or transverse furrows; ramifications mostly of the anisotomic-dichotomous type; isidiomorphs few, only on young soralia or absent; papillae thick and verrucose, usually numerous especially on main branches ..... 17. *U. substerilis*

− Main branches tapering, without foveoles or transverse furrows; ramifications mostly isotomic-dichotomic; isidiomorphs numerous to absent 20

20. Basal part concolorous with branches or paler, never distinctly blackened, with numerous and conspicuous annulations; papillae sparse or absent; lobaric acid often present..... 6. *U. flammea*

− Basal part distinctly jet black; lobaric acid absent 21

21. Isidiomorphs absent; soralia plane to slightly stipitate, regularly shaped and distinctly rounded when mature or becoming strongly excavate with age; basal part often with small but distinct longitudinal cracks as seen at 40× magnification; stictic and/or norstictic acids usually present.....10. *U. glabrescens*

− Isidiomorphs present, few to numerous, rarely absent; soralia mostly irregular, rarely distinctly rounded; basal part with or without longitudinal cracks as seen at 40× magnification; stictic and norstictic acids absent 22

22. Basal part with small but distinct longitudinal cracks as seen at 40× magnification and few annular cracks; mature soralia usually longitudinally streched, becoming excavate with age; isidiomorphs few and inconspicuous; barbatic acid mostly present ..... 18. *U. wasmuthii*

– Basal part without small longitudinal cracks as seen at 40× magnification (not to be confounded with some reticulation of the blackened cortex of the basal part); mature soralia not longitudinally streched but enlarging ± transversally or ± of regular shape and rounded, remaining superficial to slightly excavate, rarely deeply excavate; isidiomorphs few to numerous and conspicuous; barbatic always absent [*U. silesiaca* and *U. subfloridana* (morphotype with large and ± concave soralia)] ...18

23. Cortex thin (4−7%); medulla moderately thick to thick (24−33%), lax to dense; ratio A/M varying between 0.9 and 1.5; branches usually strongly irregular with the largest diameter not at the basal part; segments cylindrical or ± flattened or slightly swollen to sausage-like, often obtuse-angled or ridged, with foveoles or transverse furrows; basal part blackened or not; soralia punctiform, ± plane or slightly stipitate; papillae rare to numerous, verrucose to cylindrical ..... 1. *U. barbata*

− Cortex moderately thick to thick (8−14%); medulla thin to moderately thin (12−22%), dense to compact; ratio A/M varying between 1.2 and 5; branches tapering or irregular but then with largest diameter situated close to the basal part; segments cylindrical or slightly swollen, without foveoles or transverse furrows, ± terete; basal part always black pigmented; papillae verrucose 24

24. Ramifications filamentose; main branches thin (≤1 mm) difficult to observe, almost indistinct, at once dividing into a system of thin secondary branches that are almost of the same diameter (around 0.5 mm) over most of their length and running parallel to each other; segments strictly cylindrical; basal part with numerous and distinct annular cracks; branches often irregularly greyish-blackish pigmented; soralia distinctly stipitate, arising on top of fibercules; papillae verrucose; fibrils slender when mature, often numerous in a fish-bone like arrang-

ement, or few when shed (then fibercules and soralia numerous) .....4. *U. cylindrica*

− Ramifications isotomic-dichotomic or anisotomic-dichotomic; main branches thick (≥1 mm) and distinct, tapering or slightly irregular; segments cylindrical or slightly swollen in their middle part; secondary branches not all of the same diameter, tapering or cylindrical; basal part with or without conspicuous annular cracks; soralia plane to slightly stipitate, arising ad initio on the cortex or on top of fibercules; papillae verrucose or cylindrical; fibrils few to numerous, spinulous to slender.....25

25. Medulla K+ yellow turning red, PD+ orangish-yellow (salazinic acid); ramifications usually anisotomic-dichotomic; main branches ± irregular; segments often slightly swollen in their middle part; secondary branches slightly irregular and mostly of equal thickness over most of their length, usually with numerous and conspicuous, short to 5 mm long fibrils arising at right-angles from the branches, ± regularly distributed along their entire length in a fishbone like arrangement or not ..... 5. *U. dasypoga*

− Medulla K+ intense yellow turning slowly orange, PD+ orange (thamnolic acid) or K−, PD– (squamatic acid); ramifications usually of the isotomic-dichotomic; main branches tapering; segments cylindrical; secondary branches distinctly tapering; fibrils few, not conspicuous, irregularly distributed along the branches (rare pendent morphotype).....16. *U. subfloridana*

1. **Usnea barbata** (L.) F.H.Wigg.

Primit. Fl. Holsat.: 91 (1780). – *Lichen barbatus* L., Sp. Pl. 2: 1155 (1753). − Type: Icon in Dillenius, Hist. Musc.: t. 12, f. 6, r (1742), right-hand specimen (lectotype, Jørgensen et al., Bot. J. Linn. Soc. 115: 372 (1994); Sweden, Västmanland, Kila, SO om Granmuren, 1962 Nordin 1449 (UPS epitype, Jørgensen et al., Bot. J. Linn. Soc. 115: 372, 1994).

Syn. *Usnea chaetophora* sensu auct. p.p., *Usnea esthonica* Räsänen, *Usnea graciosa* Motyka, *Usnea leucosticta* Vain., *Usnea pendulina* Motyka, *Usnea prostrata* Vain. ex Räsänen, *Usnea rugulosa* Vain., *Usnea scabrata* Nyl., *Usnea scrobiculata* Motyka.

F: partanaava **N:** grovstry **S:** gropig skägglav

Red-listed in: **N S**

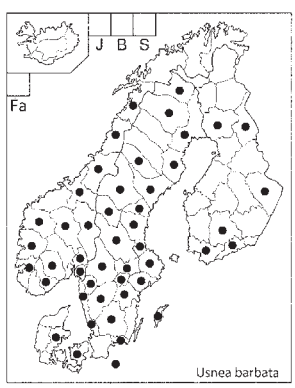
Literature: Articus, Svensk Bot. Tidskr. 94: 83, 92–93 (2000); Arup et al., Skyddsvärda lavar i SV Sverige: 254–255 (1997); Carlin & Swahn, Svensk Bot. Tidskr. 71: 94 (1977); Clerc in Naah et al. 2007: 329 (as *U. scabrata*); Halonen et al., 1998: 55−56 (as *U. scabrata*); Herrera-Campos et al., Bryologist 101: 325 (1998) (as *U. scabrata*); Hinds & Hinds 2007: 504 (as *U. scabrata*); Krog et al. 1994: 301; Thor & Arvidsson, Rödlistade lavar i Sverige: 509 (1999); Tõrra & Randlane 2007: 424–425; Randlane et al. 2009: 440−441.

Figs: Articus 2000: 92; Halonen et al. 1998: 39; Herrera-Campos et al. 1998: 307 (Fig. 5f); Krog et al. 1994: 301.

Thallus pendent, to 30 cm long, rarely 60 cm, with branches running parallel, sometimes prostrate with branches ± divergent; ramifications sympodial, with distinct main branches throughout most of the length of the thallus, with thickest part of branches not close to the basal part. Base pale brownish or blackish. Branches often distinctly irregular; secondary branches not narrowed at their point of attachment. Segments distinct, cylindrical to ± swollen, terete to obtuse-angled to ridged, with foveoles or transverse furrows. Papillae scarce to numerous, small and inapparent to verrucose or cylindrical. Tuberucles few to numerous, eroded or not. Fibrils 2−5 mm long; fibercules few to numerous. Soralia punctiform, rarely enlarging, not larger than half the branch diameter, of irregular outline, flat or distinctly stipitate, developing on the cortex ad initio or at the top of fibercules or eroded tuberucles; isidiomorphs scarce to numerous; isidiofibrils absent to numerous. Cortex thin (4−7%), mat to ± shiny; medulla lax to dense, moderately thick (24−33%); axis moderately thin (24−38%); A/M = 0.7−1.5. Apothecia rarely present. Pycnidia not observed.

Chemistry. Medulla C−, K+ yellow then reddish-orange, PD+ orange (salazinic acid) or C−, K, PD– (no secondary substances by TLC).

Habitat. Corticolous, mainly confined to *Picea* in the Nordic region, very common for instance on *Larix* in the Alps.



Distribution. Rare or scattered, probably much decreased in recent times. **D:** ØJy Sjæ Brn. **F:** *V U EH PK PeP Ks.* **N:** *Øf Ak He Op Te AA Ro Ho SF ST NT SNo NNo* **S:** *Bl Gtl SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt*

Vb Nb ÅsL LuL TL. The world distribution is poorly known because of confusion with other species.

Note. Characterised by its pendent thallus, the strongly sympodial ramification, the distinctly irregular branches with slightly to strongly inflated segments, the thin cortex, and the rather large and dense to lax medulla. It differs from both *U. dasypoga* and *U. cylindrica* by the much thinner cortex, the strongly irregular branches and the distinctly inflated segments; see also under *U. cylindrica*. *Usnea barbata* is related to *U. lapponica*, *U. substerilis* and to the *U. intermedia* group.

2. Usnea ceratina Ach.

Lichenogr. Universalis: 610 (1810). – Type: [Poland] Silesia, Mosig (H-ACH 1890 lectotype, Ohmura, J. Hattori Bot. Lab. 90: 38, 2001).

S: knölig skägglav

Red-listed in: **S**

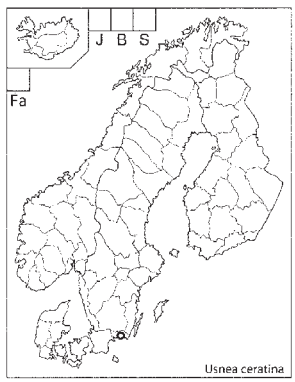
Literature: Almborn, Bot. Not., suppl., 1(2): 206 (1948); Articus, Svensk Bot. Tidskr. 94: 94 (2000); Arup et al., Skyddsvärda lavar i sydvästra Sverige: 255 (1996); Brodo et al. 2001: 715; Carlin & Swahn, Svensk Bot. Tidskr. 71: 93 (1977); Clerc 2007: 312−313; Fos & Clerc 2000a: 74; Halonen et al., 1998: 46; Herrera-Campos et al., Bryologist 101: 317 (1998); Hinds & Hinds 2007: 493; James et al. in Smith et al., The lichens of Great Britain and Ireland: 922 (2009); Ohmura 2001: 38; Randlane et al. 2009: 442; Thor & Arvidsson, Rödlistade lavar i Sverige: 510–511 (1999); Tõrra & Randlane 2007: 432.

Figs: Brodo et al. 2001: 715; Clerc 2004: 82 (Figs 1−3); Halonen et al. 1998: 39 (Figs 1 & 6); Herrera-Campos et al. 1998: 309 (Fig. 6); Randlane et al. 2009: 427.

Thallus short and erect to long and pendent, to 30 cm long, usually coarse and stiff; ramifications sympodial or isotomic-dichotomic, with divergent to parallel branches. Base not blackened, often with a brownish-orange pigment. Main branches cylindrical to irregular, secondary branches not narrowed at their point of attachment to the main stems. Segments cylindrical to ± sausage-like, terete to ± angular, usually without foveoles or transverse furrows. Papillae low and inapparent to verrucose, sparse; tuberucles conspicuously raised, at first eroded and white at tip, then bursting to form ulcerose soralia, sparse to numerous; fiberculeles absent; fibrils spinulous, to 2−5 mm long, few to numerous. Soralia punctiform to larger than half the branch diameter, stipitate, flat to convex or frequently capitate, arising mainly on tuberucles, nearly absent to numerous, sometimes completely covering the apices; isidiomorphs tufted on soralia, few to numerous. Cortex moderately thin to moderately thick (6−10%), shiny in longitudinal section; medulla moderately thin (18−25%), dense to compact; ± irregularly pink pigmented, sometimes not pigmented at all; axis moderately thin to moderately thick (31−48%); A/M = 1.1−2.7. Apothecia uncommon. Pycnidia not observed.

Chemistry. Medulla C+ yellow, KC+ yellow-orange, K– and PD– (barbatic and diffractaic acids).

Habitat. Corticolous on *Fagus*.



Distribution. Widely distributed in boreal and temperate areas of the Northern Hemisphere. It was found only once in the Nordic countries and is now considered extinct. **S:** (*Bl*).

Note. The pale base, the stiff and often robust thallus, the eroded tuberucles, the stipitate soralia, the shiny cortex in longitudinal section combined with the rose coloured medulla (pigmentation sometimes absent or not visible!) and the axis with a C+ yellow reaction (the only *Usnea* species with this reaction in the Nordic countries) are distinguishing characters for *U. ceratina.*

3. Usnea cornuta Körb.

Parerga Lichenol.: 2 (1865). – Type: [Germany] Hercyniae [Harz], prope Blankenburg, Regenstein, Hampe in Koerber: Lich. Sel. Germ. exs. no. 181 (L lectotype, Clerc, Nord. J. Bot. 7: 487, 1987)

Syn. *Usnea constrictula* Stirt., *Usnea inflata* (Duby) Motyka, *Usnea intexta* Stirt.

N: hornstry

Red-listed in: **N**

Literature: Brodo et al., Lich. North America: 715−716 (2001); Clerc in Nash et al. 2007: 313−314; Clerc 2006:

194−196; Clerc 1987a: 487–489, 491; Fos & Clerc 2000a: 74; Halonen et al., 1998: 47−48; Herrera-Campos et al., Bryologist 104: 251 (2001); Hinds & Hinds 2007: 493−494; James et al. in Smith et al., The lichens of Great Britain and Ireland: 923 (2009); Jørgensen, Symb. Bot. Ups. 31(3): 305 (1996); Krog et al. 1994: 302; Tønsberg et al., Sommerfeltia 23: 198–201 (1996).

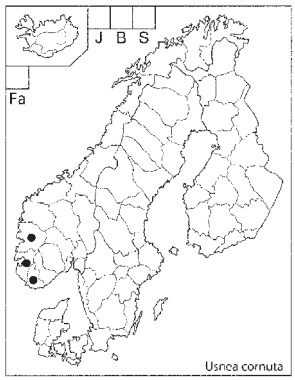
Figs: Brodo et al. 2001: 716; Clerc 1987: 484 (Figs 15B, 20B,C & 24); Clerc 1987b: 101 (Fig. 1C); Herrera-Campos et al. 2001: 240 (Fig. 4), 242 (Fig. 7); Holien & Tønsberg 2006: 66; Krog et al. 1994: 302.

Thallus fruticose, short, usually small and erect, to 7 cm long, forming small tufts; ramifications usually of the sympodial type, with divergent branches. Base black or not. Main branches tapering or fusiform; secondary branches distinctly narrowed at their point of attachment to the main stems; terminal branches at right angles to the secondary branches. Segments distinct, cylindrical to clearly inflated and sausage-like, terete. Papillae and tuberucles verrucose, few to numerous; fibercules absent; fibrils short (<3 mm long) and spinulous, few to numerous. Soralia typically minute (50−200 µm), smaller than half the branch diameter, looking like small pseudocyphellae, often becoming confluent, then resembling a single large soralium, of irregular outline, flat, arising mainly on the cortex ad initio, usually numerous on secondary and terminal branches; isidiomorphs numerous at the beginning but often absent on mature soralia. Cortex thin to moderately thin (5−7%), shiny in longitudinal section; medulla thick (27−37%) lax to dense, white; axis thin (18−32%) sometimes slightly orange pigmented; A/M = 0.4−1.2. Apothecia and pycnidia not observed.

Chemistry. Medulla C–, K+ yellow turning reddish-orange, PD+ yellow turning orangish-yellow (stictic, norstictic, ± salazinic acids) or C–, K+ yellow turning blood red, PD+ yellow turning orangish-red (salazinic, ± protocetraric acids).

Habitat. Corticolous, rarely saxicolous, in oceanic forests.

Distribution. A very limited distribution in the Nordic countries, only occurring along the Norwegian coast from Vest-Agder to Hordaland, where it is locally abundant, especially on Pinus. **N:** *VA Ro Ho*. Known from oceanic to suboceanic localities in Europe especially in the western part including the British Isles, as well as from Macaronesia, eastern and western North America, south America, Japan and Australia.



Note. The shrubby habit, the constricted branches at ramification points, combined with the presence of the numerous, typical punctiform soralia with isidiomorphs, the thin and shiny cortex, and the large and lax medulla are typical features of *Usnea cornuta*. It might be confused with *U. fragilescens* and *U. glabrata*, the two other species with branches distinctly constricted at their ramification points. Both the latter species have larger, often ± concave soralia, that are often concave, ± deeply excavate, and without isidiomorphs, in *U. glabrata*, and superficial and circular with isidiomorphs in *U. fragilescens*. Another similar species, *U. flammea* has a mat cortex in longitudinal section, a pale and distinctly annulated base, a thinner medulla and a thicker axis.

4. **Usnea cylindrica** P.Clerc

Nordic Lichen Flora 4: 141 (2011). – Type: Sweden, Småland, Norra Hestra par., Kyrkebol, 1938 Stenholm (UPS holotype).

Syn. *Usnea chaetophora* sensu auct. p.p.

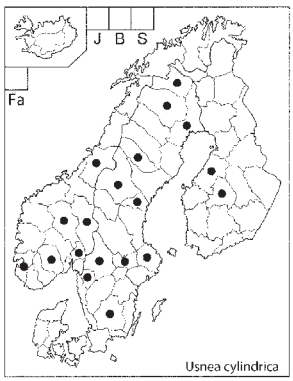
Figs: Holien & Tønsberg 2006: 69.

Thallus pendent, to 50 cm long; ramifications ± of the filamentose, usually with a narrow in its shape, with strongly parallel branches that are ± isodiametric. Base black, with distinct annulations. Main branches short and inconspicuous, cylindrical to tapering, often darker coloured, soon divided by further dichotomies into secondary branches that elongate uniformly and are distinctly cylindrical (not tapering), parallel to each other, mostly even in thickness (in average not thicker than 0.5 mm) and branching sympodially, not narrowed at their point of attachment to the main stems; segments distinctly cylindrical and terete, without foveoles or transverse furrows. Papillae indis-

tinct to verrucose, absent to few; tuberucles absent; fibercules numerous, sorediate; fibrils 3−7 mm long, slender, usually numerous, covering the entire length of the secondary branches in a fishbone-like arrangement. Soralia punctiform or enlarging, as large or larger than half the branch diameter, of regular outline, distinctly stipitate, flat to capitate, arising on the top of fibercules left when fibrils are shed; isidiomorphs usually frequent. Cortex thick (9−16%), mat in longitudinal section; medulla rather thin (10−19%) dense to compact, white; axis thick (38−54%). Apothecia rare, mostly lateral. Pycnidia not observed.

Chemistry. Medulla C–, K+ yellow turning blood red, PD+ yellow turning orangish-red (salazinic, ± protocetraric acids).

Habitat. A corticolous species, occurring mainly on *Picea* in the Nordic countries.



Distribution. Seems to be an uncommon species in the Nordic countries. **F:** *PH KP*. **N:** *Ak He Op Te Ro NT*. **S:** *SmI Dls Vrm Vsm Upl Mpd Jmt Nb ÅsL LuL TL*. Distribution outside the Nordic countries is not known yet.

Note. Characterized by the filamentose ramifications, the inconspicuous and short main branches, and the parallel, cylindrical, evenly thickened (c. 0.5 mm) secondary branches. The closely related *U. dasypoga* has sympodial ramifications, conspicuous and ± irregular main branches, with ± inflated segments that remain visible over at least the first third of the thallus, and secondary branches that are slightly but distinctly irregular. *U. barbata* has a thinner cortex, a thicker medulla and a thiner axis, distinctly irregular main branches and secondary branches with largest diameter not close to the basal part, and inflated segments often with foveoles or transverse furrows.

5. **Usnea dasypoga** (Ach.) Nyl.

in Norrlin, Meddeland. Soc. Fauna Fl. Fenn. 1: 14 (1876). – *Usnea plicata* var *dasypoga* Ach., Methodus: 312 (1803). – Type: [Switzerland] Helvetia, Schleicher (H-ACH 1873 lectotype, Clerc, Nordic Lichen Flora 4: 141, 2011).

Syn. *Usnea capillaris* Motyka, *Usnea chaetophora* Stirt., *Usnea diplotypus* Vain., *Usnea filipendula* Stirt., *Usnea saxicola* Anders, *Usnea sublaxa* Vain. ex Motyka, *Usnea subscabrata* (Vain.) Motyka

D: almindelig skæglav **F:** riippunaava **N:** hengestry **S:** skägglav, klippskägglav.

Red-listed in: **S** (as *U. chaetophora* and *U. diplotypus*)

Literature (as *U. diplotypus*): Carlin & Swahn, Svensk Bot. Tidskr. 71: 96 (1977); Halonen et al. 1999: 241; Thor & Arvidsson, Rödlistade lavar i Sverige: 513 (1999); Tõrra & Randlane 2007: 425–426.

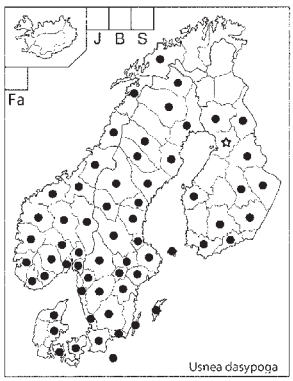
Figs (as *U. diplotypus*): Brodo et al. 2001: 717; Clerc 1987b: 100 (Fig. 1B); Krog et al. 1994: 302; Tõrra & Randlane 2007: 420.

Thallus fruticose, erect, subpendent to pendent, to 50 cm; ramification mainly sympodial, with diver-gent branches. Basal part black with few to numerous annulations. Main branches, one to several, distinct over at least half the length of the thallus, with distinct annulations, often with everted medulla and longitudinal cracks in the cortex, irregular to ± tapering, but with the thickest part close to the base; secondary branches not narrowed at their point of attachment to the main stems, distinctly irregular; segments cylindrical to weakly sausage-like, terete, foveoles or transverse furrows absent or few. Papillae few to numerous, small and almost inapparent to distinct and verrucose; tuberucles absent; fibercules few to numerous; fibrils 2−3 mm long, irregularly distributed or covering the entire length of the secondary branches in a fishbone-like arrangement. Soralia punctiform or enlarging, as large or larger than half branch diameter, usually of irregular outline, flat to distinctly stipitate or ± capitate, arising on the top of fibercules left when fibrils are shed or on the cortex ad initio; isidiomorphs few to numerous, sometimes developing into isidiofibrils. Cortex thick (9−13%), mat in longitudinal section; medulla moderately thin (13−22%), dense to compact, white; axis thick (36−51%); A/M = 1.5−4. Apothecia rare, mostly lateral. Pycnidia not observed.

Chemistry. Medulla C–, K+ yellow turning blood red, KC−, PD+ yellow turning orangish-red (salazinic, ± protocetraric acids) or C+ reddish, KC+ reddish, K–, PD– (alectorialic acid).

Habitat. Corticolous, common both on coniferous and deciduous trees or saxicolous on siliceous rocks in coastal areas.

Distribution. Seems to occur all over Europe including Fennoscandia, where it is the most frequent of the pendent *Usnea*-species. Most common in mountain and inland regions compared with coastal and lowland areas. **D:** *NJy ØJy Fyn Sjæ Brn.* **F:** *A V U EH ES EP PS PK Kn OP PeP Ks*. **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr.* **S:** *Sk Bl Öl Gtl SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL LuL*. Has a wide temperate and boreal distribution in the Northern Hemisphere. The world distribution is poorly known because of confusion with other species.



Note. Characterized by the pendent thallus, the distinct, ± irregular main branches with sympodial ramification type, the slightly to distinctly inflated segments and the rather thick cortex. The saxicolous morphotype (*U. diplotypus*) is shorter and shrubby-like, probably as a result of the adaptation to the habitat. *Usnea chaetophora* Stirt. is a phenotype characterized by branches with numerous and short segments separated by distinct annulations. This morphotype can be found both in *U. barbata* and in *U. dasypoga*. *U. dasypoga* is closely related to *U. cylindrica* (see under this species for differences).

6. **Usnea flammea** Stirt.

Scott. Naturalist (Perth) 6: 102 (1881). – TYPE: Madeira, Funchal, Paine (BM lectotype, Clerc, Nord. J. Bot. 7: 489, 1987).

Syn. *Usnea dalmatica* Motyka, *Usnea rupestris* Motyka

N: ringstry

Red-listed in: **N**

Literature: Clerc 1987a: 489–491, 491; Clerc 2006: 196; Clerc & May Bryologist 110: 126−128 (2006); Hinds & Hinds 2007: 496; Fos & Clerc 2000a: 77; James et al. in Smith et al., The lichens of Great Britain and Ireland: 924 (2009); Jørgensen, Symb. Bot. Ups. 31(3): 305 (1996); Krog et al. 1994: 303; Randlane et al. 2009: 445; Tønsberg et al., Sommerfeltia 23: 198–201 (1996).

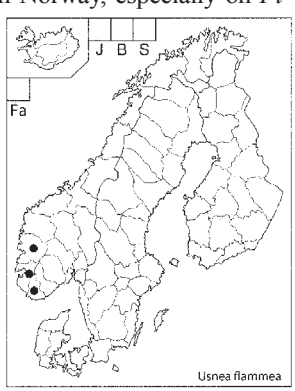
Figs: Clerc 1987: 483, 484, 488; Krog et al. 1994: 303; Randlane et al. 2009: 431.

THALLUS fruticose, erect to subpendent, to 7 cm long; ramifications usually isotomic-dichotomic at least near the basal part with divergent branches. Base not blackened, frequently whithish and ± densely divided into segments by pale annular cracks, often with everted medullary tissue. Main branches tapering, rarely fusiform or ± irregular; secondary branches not or only slightly narrowed at their point of attachment to the main stems. Segments distinct, cylindrical or rarely slightly sausage-like and terete. Papillae often absent or scarce, verrucose; tuberucles scarse, sorediate; fibercules absent; fibrils slender, 2−4 mm long, sparse. Soralia punctiform, often enlarging to half the branch diameter or more, of irregular outline, flat or slightly stipitate, efflorescent, arising on the cortex ad initio or on top of papillae; isidiomorphs frequent, fragile and easily abraded. Cortex moderately thin (6–9%), mat; medulla moderately thin to moderately thick (17–28%), dense to compact, white; axis moderately thin to moderately thick (30–49%); A/M = 1–2.4. APOTHECIA and PYCNIDIA not observed.

Chemistry. Medulla C–, K+ yellow turning reddish-orange, PD+ yellow turning orangish (stictic, norstic-tic, ± lobaric acids).

Habitat. Mainly on bark, but also found on stone and wood.

Distribution. Locally abundant along the coast from Vest-Agder to Hordaland in Norway, especially on *Pinus*. **N:** *VA Ro Ho*. Occurs in coastal areas of western Europe, Macaronesia and western North America.



Note. Among the sorediate species characterized by the distinct and numerous pale annulations of the basal part; the ± smooth branches, the lateral branches that are not or only scarcely constricted at their point of attachment, the usually efflorescent and ± large soralia with numerous isidiomorphs, the mat cortex in longitudinal section and the presence of lobaric acid (80% of the specimens tested). For differences with *U. cornuta* and *U. fragilescens*, see under these species.

7. **Usnea florida** (L.) F.H.Wigg.

Primit. Fl. Holsat.: 91 (1780). – *Lichen floridus* L., Sp. Pl. 2: 1156 (1753). – Type: Sweden? (LINN 1273.300 lectotype, Howe, Bull. Torrey Bot. Club 39: 201, 1912; restricted to lower specimen by Clerc, Cryptog., Bryol. Lichénol. 5: 341, 1984).

D: storfrugtet skæglav **N:** blomsterstry **S:** blomskägglav

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

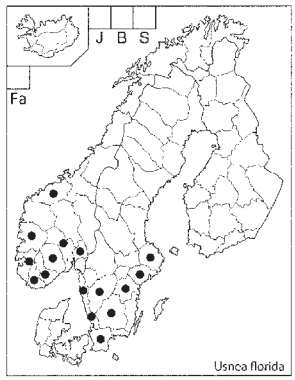
Literature: Almborn, Bot. Not., suppl., 1(2): 116–121 (1948); Articus et al., Mycol. Res. 106: 412–418 (2002); Arup et al., Skyddsvärda lavar i sydvästra Sverige: 255–256 (1996); Carlin & Swahn, Svensk Bot. Tidskr. 71: 100 (1977); Clerc, Cryptog., Bryol. Lichénol. 5: 333–360 (1984); Clerc in Nash et al. 2007: 318; James et al. in Smith et al., The lichens of Great Britain and Ireland: 925 (2009); Krog et al. 1994: 304; Ohmura 2001: 26; Peterson, Svensk Bot. Tidskr. 42: 288 (1948); Skarpe & Bergström, Svensk Bot. Tidskr. 75: 145–146 (1981); Thor & Arvidsson, Rödlistade lavar i Sverige: 514–515 (1999); Tønsberg et al., Sommerfeltia 23: 196–198 (1996).

Figs: Arup et al. 1997: 237; Dobson 2000: 396; Holien & Tønsberg 2006: 66; Moberg & Holmåsen 1990: 107; Wirth 1995: 947.

Thallus fruticose, erect, to 10 cm long, stiff; ramifications usually isotomic-dichotomic with divergent branches. Base black, often with distinct annulations. Main branches tapering; secondary branches not narrowed at their point of attachment to the main stems. Segments ± distinct, cylindrical and terete. Papillae verrucose sparse to numerous; tuberucles and fibercules absent; fibrils 2–4 mm long, slender. Soralia absent. Cortex thick (9–13%), mat in longitudinal section; medulla thin (11–20%), dense to compact; axis moderately thick (38–54%); A/M = 0.8–6. Apothecia usually numerous, terminal on main branches; disc to 2 cm across. Spores 8.5–11 × 5.5–7 µm. Pycnidia not observed.

Chemistry. Medulla C–, K+ bright yellow, KC– or KC+ rose; PD+ yellow-orange (thamnolic, ± alectorialic, ± bourgeanic acids) or C–, K–, KC– or KC+ rose, PD– (squamatic, ± alectorialic, ± bourgeanic acids).

Habitat. On deciduous trees in open situations, often on the trunks and twigs of *Acer*, *Fagus*, *Fraxinus* and *Quercus*.



Distribution. Scattered occurrences inland in southern Sweden, in Norway close to the coast from Akershus to Nordland. Probably extinct in Denmark. **D:** (*ØJy*) **N:** *Ak Bu Te AA VA Ro Ho MR*. **S:** *Sk SmI Hl Bh Vg Ög Srm Upl*. A temperate and hemiboreal distribution; locally common on the European continent and in the British Isles.

Note. In the Nordic countries, as in the British Islands, *Usnea florida* is the only nonsorediate species with numerous apothecia. It is closely related to *U. dasypoga*, *U. cylindrica*, *U. glabrescens*, *U. silesiaca*, *U. subfloridana* and *U. wasmuthii*. Articus et al. (2004) showed that *U. florida* and *U. subfloridana* form one group of intermixed specimens when studied with molecular markers. However, young species in the process of speciation might be paraphyletic. For this reason, these species have been kept separate here.

8. **Usnea fragilescens** Hav.

in Lynge, Skr. Vidensk. Selsk. Christiania, Math.-Naturvidensk. Kl. 1921 (7): 230 (1921). – Type: Norway, Hordaland, Radøen, between Mangenr and Hallandsvand, 1909 Havaas (O lectotype, Clerc, Nord. J. Bot. 7: 491, 1987.

Syn. *Usnea fragilescens* var. *mollis* (Vain.) P. Clerc

N: kyststry

Red-listed in: **N**

Literature: Clerc 1987a: 491–492; Clerc in Nash et al. 2007: 318−319; Halonen et al., 1998: 49−50; Herrera-Campos et al., Bryologist 104: 253 (2001); James et al. in Smith et al., The lichens of Great Britain and Ireland: 925−926 (2009); Jørgensen, Symb. Bot. Ups. 31: 305 (1996); Ohmura, J. Jap. Bot 75: 303−307 (2000); Krog et al. 1994: 304; Ohmura 2001: 46–48; Tønsberg et al., Sommerfeltia 23: 198–201 (1996).

Figs: Brodo et al. 2001: 719; Clerc 1987: 483 (figs 7, 10 & 13), 484 (figs 14, 15, 16 & 19). 490 (figs 25 & 26); Clerc 1987b: 100 (Fig. 1F); Dobson 2000: 396; Herrera-Campos et al. 2001: 244 (Fig. 10).

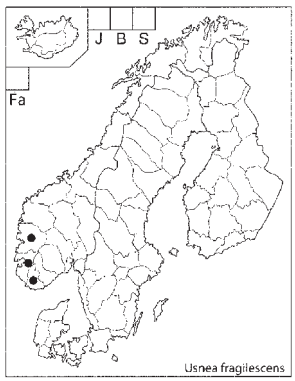
Thallus shrubby, erect to subpendent, to 6 cm long; sparsely branched and flaccid. Ramifications sympo-

dial with divergent branches. Base black with sparse and thin annular cracks lacking everted medullary tissue. Main branches usually fusiform, more rarely tapering or irregular; secondary branches narrowed at their point of attachment to the main stems. Segments distinct, cylindrical to weakly sausage-like, terete. Papillae as low subhemispherical bumps, broader than high, rather inapparent, numerous on main branches close to basal part; tuberucles and fibercules absent; fibrils 3−5 mm long, slender, sparse to absent. Soralia usually larger than half branch diameter when mature, of circular outline with a well delimited margin; flat to slightly concave, arising ad initio on the cortex; isidiomorphs present on young, small soralia, rarely on mature ones. Cortex thin (3.5–6.5%), shiny in longitudinal section; medulla thick (28–38%), loose, white; axis thin (16.5–33%); A/M = 0.4–1. Apothecia rare. Pycnidia not observed.

Chemistry. Medulla C–, K+ yellow turning orange, PD+ deep yellow; (stictic, ± norstictic acids).

Habitat. On deciduous trees, often Pinus, and on damp siliceous rocks in oceanic areas.

Distribution. Known only from western Norway in the Nordic countries. **N:** *VA Ro Ho*. Northwestern Europe, eastern and western North America and Japan. An extremely oceanic species with a northern tendancy in its European distribution pattern.



Note. This taxon is distinguished by its large, ± circular and plane to slightly concave soralia with numerous isidiomorphs present on main and terminal branches, its constricted branches at ramification points; its glossy and thin cortex and its black basal part. *Usnea cornuta* is characterized by dense minute soralia of irregular shape. *U. flammea* has a matt cortex in longitudinal section, soralia of irregular shape and a pale basal part with distinct annulations.

9. **Usnea glabrata** (Ach.) Vain.

Ann. Acad. Sci. Fenn., Ser. A, 4(7): 7 (1915). – *Usnea plicata* var. *glabrata* Ach., Lichenogr. Universalis: 624 (1810). – Type: Switzerland (Helvetia), Schleicher 318 (H-ACH 1854A holotype).

Syn. *Usnea sorediifera* (Arnold) Lynge, non. auct. See Halonen et al. (1999) for further synonyms.

D: glat skæglav **F:** kiiltonaava **N:** dvergstry **S:** dvärgskägglav

Red-listed in: **N S**

Literature: Brodo et al. 2001: 719; Carlin & Swahn, Svensk Bot. Tidskr. 71: 99 (1977); Clerc in Nash et al. 2007: 320; Fos & Clerc 2000a: 78; Halonen et al., 1998: 50; Herrera-Campos et al., Bryologist 104: 254−255 (2001); Hinds & Hinds 2007: 498; James et al. in Smith et al., The lichens of Great Britain and Ireland: 926−927 (2009); Myllys, Acta Bot. Fennica 150: 125–130 (1994); Krog et al. 1994: 304; Ohmura 2001: 49–50; Randlane et al., Biblioth. Lichenol. 100: 440−441 (2009); Thor & Arvidsson, Rödlistade lavar i Sverige: 516 (1999); Tõrra & Randlane 2007: 427–428.

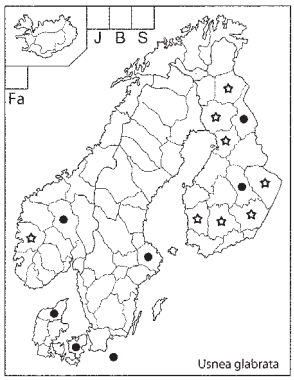
Figs: Brodo et al. 2001: 719; Halonen et al. 1999: 244 (Fig. 4); Herrera-Campos et al. 2001: 244 (Fig. 11); Randlane et al. 2009: 430; Tõrra & Randlane 2007: 420 (Fig. 1A).

Thallus fruticose, erect and tufted, small, to 3−5 cm, rarely larger; ramifications of the sympodial type with divergent branches. Basal part not blackened. Main branches tapering on ± fusiform, smooth; secondary branches distinctly narrowed at their point of attachment to the main stems. Segments distinct, cylindrical to clearly sausage-like, terete to obtuse-angled; foveoles or transverse furrows sometimes present. Papillae absent or sparse and inapparent; tuberucles and fibercules absent; fibrils usually abundant, <3 mm long. Soralia conspicuous, larger than half the branch diameter, often larger than the branch itself, of irregular outline, deeply concave to convex-globular and then efflorescent, at apices numerous; isidiomorphs absent. Cortex thin (3–5%), shiny in longitudinal section; medulla thick (29–38%), very loose, white; axis thin (18–32%); A/M = 0.4–1.2. Apothecia rare. Pycnidia not observed.

Chemistry. Medulla C–, K– or K+ brownish, KC–, PD+ red-orange (protocetraric and fumarprotocetraric acids) or C–, K+ yellow turning orange-red, KC−, PD+ yellow (salazinic, norstictic, ± stictic (trace), ± protocetraric (trace) acids).

Habitat. Corticolous in montane forests.

Distribution. Only in East Fennoscandia except for two localities in Hordaland and Oppland (N). Rare but perhaps overlooked in the Nordic countries. **D:** *NJy Sjæ Brn*. **F:** *St EH ES PS PK OP PeP Ks SoL*. **N:** *Op Ho*. **S:** *Upl*. Circumpolar in boreal, temperate and Mediterranean regions of the Northern Hemisphere.



Note. The single eastern element of the *Usnea fragilescens* aggregate present in the Nordic countries. This group is usually characterized by an oceanic distribution, a thin and shiny cortex, a thin central axis, a large and lax medulla and rather swollen branches that are constricted at their ramification points. *U. glabrata* has the same type of soralia as *U. lapponica* but it is not closely related to this species. Branches of the latter species are not constricted at their ramification points, the cortex is thicker and mat and the medulla is thinner, and dense to compact. Morphotypes of *U. glabrescens* with excavate soralia have non constricted lateral branches at the ramification points, a much thicker cortex, and a much thinner and compact medulla.

10. **Usnea glabrescens** (Nyl. ex Vain.) Vain. ex Räsänen

Luonnon Ystävä 23:9 (1919) – *Usnea barbata* var. *glabrescens* Nyl. ex Vain., Meddeland. Soc. Fauna Fl. Fenn. 2: 46 (1878). – Type: Russia, Leningrad Region, Karelia australis, Vyborg (Viipuri), Vysotsk (Uuras), 1875 Vainio (TUR-V 708 holotype).

Syn. *Usnea compacta* Motyka, *Usnea distincta* Motyka nom. illeg. non Motyka ex Räsänen, *Usnea extensa* Vain., *Usnea fulvoreagens* (Räsänen) Räsänen, ?*Usnea laricina* Vain. ex Räsänen, *Usnea glabrescens* var. *fulvoreagens* Räsänen. For further synonyms, see Halonen et al. (1999).

F: silonaava **N:** hårstry **S:** spretig skägglav

Literature: Fos & Clerc 2000a: 77−78 (as *U. fulvoreagens*); Halonen et al., 1998: 50−51; Halonen et al. 1999: 242–247 (as *U. fulvoreagens*); Hinds & Hinds 2007: 497–499 (as *U. fulvoreagens*); James et al. in Smith et al., The lichens of Great Britain and Ireland: 927, 926 (as *U. fulvoreagens*) (2009); Krog et al. 1994: 305; Ohmura 2001: 26–29 (as *U. fulvoreagens*); Randlane et al. 2009: 449−450; Tõrra & Randlane 2007: 426–429 (as *U. fulvoreagens*).

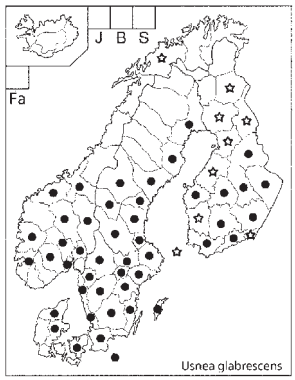
Figs: Clerc 1987b: 100 (Fig. 1H); Halonen et al. 1999: 246 (Fig. 5), 242−243 (Figs 2 & 3) (as *U. fulvoreagens*); Hinds & Hinds 2007: 497 (as *U. fulvoreagens*); Holien & Tønsberg 2006: 67; Randlane et al. 2009: 435, 436 (as *U. fulvoreagens*); Tõrra & Randlane 2007: 420 (Fig. 3C), 422 (Fig. 3E, as *U. fulvoreagens*).

Thallus fruticose, erect to subpendulous, to 15 (−25) cm long, stiff; ramification usually isotomic-dichotomic with divergent branches. Base black pigmented with distinct annular cracks, often with tiny, lenticular, longitudinally oriented cracks as seen at 40× magnification. Main branches tapering, without foveoles or transverse furrows; secondary branches not narrowed at their point of attachment to the main stems. Segments cylindrical, terete. Papillae sparse and almost inapparent to verrucose and numerous; tuberucles and fibercules absent; fibrils sparse and irregularly dispersed to numerous and with a fishbone-like appearance, slender, 3−7 mm long. Soralia conspicuous, distinctly rounded, well delimited, as large or larger than half the branch diameter, flat to slightly concave, arising ad initio on main and secondary branches; sometimes deeply excavate and reaching the central axis, bursting from low pustules (tubercle-like structure but wider than high) on terminal branches; isidiomorphs absent or rarely present on young and punctiform soralia. Cortex thick (8−12%) and mat in longitudinal section; medulla thin (13−23%), dense to compact, white; axis moderately thick (36−52%); A/M = 1.2–5. Apothecia and pycnidia not observed.

Chemistry. Medulla C–, K+ yellow turning orange-red, KC–, PD+ orange-yellow (norstictic ± salazinic, ± diffractaic, ± protocetraric (trace) acids) or C–, KC–, K+ yellowish slowly turning orange, PD+ deep orange (stictic, norstictic, ± constictic, ± cryptostictic, ± menegazziaic, ± diffractaic acids) or C–, K+ yellowish, KC–, PD– (unknown A2/B2 (Halonen et al. 1999)) or C–, K–, KC–, PD– (no secondary substances by TLC).

Habitat. Usnea glabrescens occurs in many different types of localities, where it is mostly corticolous, very rarely saxicolous and commoner in the inland than in coastal areas.

Distribution. Fairly common in the south-central parts of the Nordic countries and with a wide distribution, but much rarer in the northern regions. **D:** *NJy ØJy Sjæ Brn.* **F:** *A V U EK St EH ES EP PH PS PK KP Kn OP PeP Ks SoL* **N:** *Ak He Op Bu Vf Te Ro Ho MR ST Tr.* **S:** *Sk Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb*. Widely distributed in temperate and boreal parts of Europe, eastern Asia and North America.



Note. Seems to be more restricted to old-growth forests than other shrubby *Usnea*-species (Halonen et al. 1999). A very characteristic species of the *U. florida* group with the black pigmented basal part and the circular soralia lacking isidiomorphs (rarely present on very young soralia). The soralia are quite variable, remaining superficial or becoming fully excavate. "*U. fulvoreagens*" represents a morphotype where most of the soralia are deeply excavate. *Usnea lapponica* is distinguished by its irregular branches and its chemistry.

11. **Usnea hirta** (L.) F.H.Wigg. nom. cons.

Prim. Fl. Holsat. 91 (1780). – *Lichen hirtus* L., Sp. Pl. 2: 1155 (1753). − Type: Sweden, Fries, Lich. Suec. exs. no. 150 (UPS typ. cons.).

Syn. *Usnea foveata* Vain. (non auct.), *Usnea glaucescens* Vain., *Usnea hirta* subsp. *helvetica* Motyka, *Usnea hirta* subsp. *laricicola* Motyka, *Usnea hirta* subsp. *villosa* Motyka, *Usnea variolosa* Motyka. For further synonyms, see Halonen & Puolasmaa (1995).

D: liden skaeglav **F:** tupsunaava **N:** glattstry **S:** luddig skägglav

Literature: Brodo et al. 2001: 720–721; Clerc in Nash et al. 2007: 321–322; Halonen et al. 1999: 247–248; Halonen et al., 1998: 51–52; Halonen & Puolasmaa, Ann. Bot. Fenn. 32: 127–135 (1995); Hinds & Hinds 2007: 499; James et al. in Smith et al., The lichens of Great Britain and Ireland: 927 (2009); Krog et al. 1994: 305; Randlane et al. 2009: 450; Tõrra & Randlane 2007: 429.

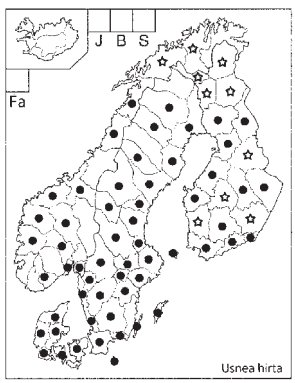
Figs: Brodo et al. 2001: 720; Halonen et al. 1998: 39 (Fig. 9); Hinds & Hinds 2007: 499; Holien & Tønsberg 2006: 67; Moberg & Holmåsen 1990: 107; Randlane et al. 2009: 430; Wirth 1995: 949.

Thallus fruticose, usually small and erect, rarely subpendulous, to 10 cm long, flaccid when wet; ramifications usually sympodial with divergent branches. Base not blackened. Main branches smooth, irregular; secondary branches not narrowed at their point of attachment to the main stems. Segments indistinct, ± cylindrical and terete to obtuse-angled or ridged, with foveoles or transverse furrows. Papillae usually absent or rarely present, minute and inapparent; tuberucles and fibercules absent; fibrils <3 mm long, few. Soralia punctiform, not larger than half the branch diameter, numerous, producing numerous isidiomorphs and isidiofibrils making the branches spinulose, or frequently pseudocyphella-like when isidiomorphs and isidiofibrils are shed, often fusing together in irregular patches. Cortex smooth, thin (3−7%) and mat to ± shiny in longitudinal section; medulla moderately large (27−33%), lax to dense, white; axis moderately thin to thin (24−35%); A/M = 0.8−1.4. Apothecia rare to locally rather common. Pycnidia not observed.

Chemistry. Medulla C−, K+ yellow turning slowly orange, PD+ yellow (norstictic acid, ± acids of the murolic group) or C−, K−, PD– (acids of the murolic group or no secondary substances by TLC).

Habitat. Corticolous and lignicolous on both deciduous trees and conifers, often in open areas.

Distribution. Comparatively pollution tolerant and occurs preferably on acid bark and on wood in all provinces of Fennoscandia, but it is less frequent towards the north (Halonen & Puolasmaa 1995). **D:** *NJy ØJy VJy SJy Fyn Sjæ Brn.* **F:** *A V U EK St EH ES EP PH PS PK KP Kn OP PeP Ks KiL SoL EnL InL*. **N:** *Øf Op Bu Vf AA Ho SF MR ST SNo NNo Tr VFi*. **S:** *Sk Bl Öl Gtl SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL PL LuL*. Widely distributed in the Northern Hemisphere, but probably cosmopolitan.



Note. The pale base, the smooth and irregular main branches with obtuse-angled segments and foveoles, the lateral branches not constricted at ramification points, the numerous isidiomorphs/isidiofibrils and the numerous punctiform soralia (when isidiomorphs/ isidiofibrils are shed) are typical characters for *U. hirta*.

12. **Usnea lapponica** Vain.

Meddeland. Soc. Fauna Fl. Fenn. 48: 173 (1925, ”1924”). – Type: Russia, Murmansk Region, Lapponia Imandrae, Lovozero (Lowosersk), 1887 Kihlman (H lectotype, Clerc, Nord. J. Bot. 7: 494, 1987).

Syn. *Usnea arnoldii* Motyka, *Usnea betulina* Mot. For further synonyms, see Halonen et al. (1999).

F: lapinnaava **N:** pulverstry **S:** grynig skägglav

Literature: Brodo et al. 2001: 721; Clerc in Nash et al. 2007: 323−324; Halonen et al. 1998: 52; Halonen et al. 1999: 248–250; Krog et al. 1994: 305−306; Randlane et al. 2009: 451−452; Tõrra & Randlane 2007: 429–430.

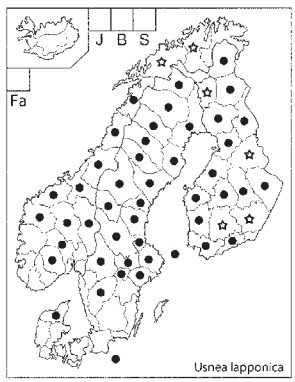
Figs: Brodo et al. 2001: 721; Clerc 1987b: 100 (Fig. 1I); Halonen et al. 1998: 39 (Fig. 10); Halonen et al. 1999: 249 (Fig. 6); Holien & Tønsberg 2006: 68; Randlane et al. 2009: 430.

Thallus fruticose, erect to subpendulous, to 12 cm long; ramifications sympodial with divergent branches. Base black or concolorous with the thallus. Main branches irregular, with or without foveoles and transverse furrows; secondary branches not constricted at their point of attachment to the main stems. Segments ± distinct, cylindrical or slightly inflated, terete or obtuse-angled to ridged. Papillae usually numerous especially on main branches, verrucose to cylindrical; tuberucles and fibercules absent; fibrils <3 mm long, irregularly distributed. Soralia conspicuous, larger than half the branch diameter, deeply excavate, typically reaching the central axis and tearing off the adjacent cortex; isidiomorphs absent. Cortex moderately thin (5–8%), mat in longitudinal section; medulla moderately thick (21–30%), loose to dense, white; axis moderately thin (28–43%); A/M = 0.8–2.2. Apothecia extremely rare. Pycnidia not observed.

Chemistry. Medulla C–, K+ yellow turning orange red, KC–, PD+ orangish-yellow (salazinic, ± caperatic, ± protocetraric (trace) acids) or C–, K–, KC–, PD+ deep yellow (psoromic, 2’-O-demethylpsoromic acids) or C–, KC–, K–, PD– (no secondary substances by TLC).

Habitat. Corticolous, both on deciduous trees and conifers, preferably in boreal forests.

Distribution. Common in Finland, Norway and Sweden with a northern tendency except in East Fennoscandia where it has a wide range from the south coast to the northernmost part. **D:** *NJy Brn*. **F:** *A V U St EH ES EP PH PS PK KP Kn OP PeP KS KiL SoL InL*. **N:** *He Op Bu Te SF MR ST NT SNo NNo Tr VFi*. **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*. Circumpolar and continental in montane and/or boreal forests but also in mediterranean coastal areas (Europe and California).



Note. The deeply concave, excavate soralia without isidiomorphs and the distinctly irregular branches on the small shrubby thallus are the most distinctive characters of this species. For differences with *U. glabrescens* and *U. substerilis*, see under these species. The morphology and anatomy of *Usnea betulina* Mot (isotype in LBL) correspond well to *U. lapponica*. The presence of norstictic acid is however highly unusual in this species and might be the result of a ”hybridisation”.

13. **Usnea longissima** Ach.

Lichenogr. Universalis: 626 (1810). – Type: Germany, Lausitz region (Lusatia), Mosig (H-ACH 1893 holotype).

Syn. *Dolichousnea longissima* (Ach.) Articus

F: rihmanaava **N:** huldestry **S:** långskägg

Red-listed in: **N S**

Literature: Ahlner, Svensk Bot. Tidskr. 25: 395–416 (1931); Acta Phytogeogr. Suec. 22: 95–98, 214–216 (1948); Arup et al., Skyddsvärda lavar i sydvästra Sverige: 256–257 (1996); Brodo et al. 2001: 721−722; Carlin & Swahn, Svensk Bot. Tidskr. 71: 93 (1977); Ericson & Esseen, Sveriges Natur 1981: 81–84; Esseen et al., Lichenologist 13: 177–190

(1981); Esseen & Ericson, Naturvårdsv. Rapport 153: 139 (1982); Gauslaa, Lichenologist 29: 455–469 (1997); Halonen in Kotiranta et al., Red Data Book of East Fennoscandia: 167–168 (1998); Halonen & Puolasmaa, Graphis Scripta 8: 51–56 (1997); Halonen et al. 1998: 53; Hinds & Hinds 2007: 500−501; Jørgensen & Øvstedal, Blyttia 33: 15 (1975); Krog et al. 1994: 306; Motyka, Lichenum Generis *Usnea* Studium Monographicum. Pars Systematica, vol. 1–2: 423–432 (1937); Ohmura 2001: 82–85; Olsen & Gauslaa, Svensk Bot. Tidskr. 85: 342–346 (1985); Rolstad & Rolstad, Blyttia 54: 145–150 (1996); Thor & Arvidsson, Rödlistade lavar i Sverige: 517–518 (1999); Tønsberg et al., Sommerfeltia 201–222 (1996); Tõrra & Randlane 2007: 433.

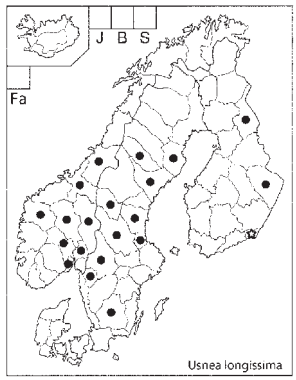
Figs: Brodo et al. 2001: 722; Hinds & Hinds 2007: 500; Holien & Tønsberg 2006: 70; Moberg & Holmåsen 1990: 108; Rikkinen 2007: 7; Wirth 1995: 941.

Thallus pendent, to 3 m long, draping horizontal branches; sparsely branching ± of the filamentose type with strongly parallel, ± isodiametric branches. Basal part difficult to localize and see because the thallus become detached and drape over the tree branches, often with several attachment points present. Main branches cylindrical, with cortex scaling off, leaving a rough, dull, whitish, ecorticate surface; almost undivided, with many perpendicular secondary branches resembling long fibrils, not narrowed at their point of attachment to the main stems. Segments cylindrical and terete to distinctly flattened. Papillae absent or few, verrucose. Tuberucles and fibercules absent. Fibrils absent or few, spinulous, 2−3 mm long. Soralia occasional, punctiform, smaller or as large as half the branch, arising ad initio on the cortex of lateral branches; isidiomorphs few to absent. Cortex of main branches soon disintegrating leaving rough patches of white medulla, thin when present (2–3.5%); medulla thin (6–12%), compact, whitish; axis thick (69–86%), whitish, pinkish to brown; A/M = 4–15. Apothecia rare, lateral on lateral branches. Pycnidia not observed.

Chemistry. Medulla C–, K–, KC–, PD–; diffractaic, ± squamatic acids, ± unknown fatty acid (A2/B3) or evernic acid.

Habitat. Usually on Picea in old-growth forests in boreal and montane areas.

Distribution. From the surroundings of Oslo to the coast of central Sweden with the northernmost known localities in Nordland (N) and in Norrbotten (S), and a few scattered localities in eastern Finland. **F:** *EK PK Ks.* **N:** *Ak He Op Bu Vf SF ST NT*. **S:** *Dls Vrm Dlr Gst Hls Ång Hrj Vb ÅsL*. Seems to occur only in the Northern Hemisphere where it is circumpolar, although absent or extinct in large areas. In Europe and Asia it grows in areas with high atmospheric humidity but it seems to be more oceanic in North America.



Note. A well-known and easily distinguished species, when well-developed, with the filamentose type of ramification, the cortex that desintegrates on main branches and the very thick central axis. The species is restricted to slow growing old-growth forests and therefore in need of protected areas to survive.

14. **Usnea silesiaca** Motyka

Wydaw. Muz. Slask. Katowicach, Dzial 3, 2: 19 (1930). – Type: Poland, Silesia, Beskidy Slaskie, Grabowa, 1928 Motyka (LBL holotype).

Syn. *Usnea madeirensis* Motyka

N: madeirastry

Red-listed in: **N**

Literature: Clerc, Candollea 46: 427−438 (1991) (as *U. madeirensis*); Clerc, Lichenologist 29: 212–213 (1997) (as *U. madeirensis*); Clerc in Nash et al. 2007: 330−331; Halonen et al. 1998: 53−54 (as *U. madeirensis*); Hinds & Hinds 2007: 505−506; James et al. in Smith et al. The lichens of Great Britain and Ireland: 928 (2009); Krog et al. 1994: 306 (as *U. madeirensis*); Randlane et al. 2009: 454.

Figs: Clerc, 1987b: Fig. 1E (as *U. madeirensis*); Clerc, 1991: 430−432 (as *U. madeirensis*); Clerc, 1998: Fig. 10 (as *U. madeirensis*); Halonen et al. 1998: 39 (Fig. 11) (as *U. madeirensis*); Krog et al., 1994: 306 (as *U. madeirensis*); Randlane et al. 2009: 434.

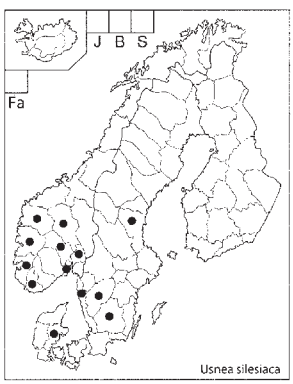
Thallus erect to subpendent, to 15 cm long, stiff; ramifications usually isotomic-dichotomic with divergent branches. Basal part black pigmented with pigmentation often extending onto main branches; with nu-

merous annular cracks. Main branches tapering often with numerous annular cracks, at least close to basal part; secondary branches not narrowed at their point of attachment to the main stems. Seg-ments cylindrical and terete. Papillae few to numer-ous, verrucose. Tuberucles and fibercules absent. Fibrils slender, 3−5 mm long, sometimes in a fish-bone-like arrangement. Soralia larger than half the branch diameter, irregularly rounded to transversally elliptical, flat to slightly stipitate, rarely concave and encircling the branch, rarely confluent; isidiomorphs present on young soralia, generally absent on mature soralia. Cortex thick (9.5–14%), mat; medulla thin (7.5–13%), compact, whitish; axis thick (50–63%); A/M = 3–9.5. Apothecia and pycnidia not observed.

Chemistry. Medulla C–, KC–, K+ yellow turning red, PD+ orangish-yellow; salazinic acid.

Habitat. Corticolous on deciduous trees and conifers.

Distribution. Close to the coasts. **D:** *ØJy*. **N:** *Ak Op Bu Vf VA Ro Ho SF*. **S:** *SmI Bh Vg Hls*. Southern boreal and montane with oceanic preferences in Europe, Macaronesia, eastern and western North America.



Note. The basal part with distinct black pigmentation and numerous annular cracks, the thick cortex, the thin medulla, the soralia enlarging transversally and the presence of salazinic acid in the medulla make this species distinct. Difficult to distinguish from *U. subfloridana* when not optimally developed. The presence of salazinic acid is sometimes the only diagnostic character separating the two species. *U. glabrescens* has circular soralia without isidiomorphs and a different chemistry. *U. wasmuthii* has tiny, lenticular, longitudinally oriented cracks as seen at 40× magnification, a different type of soralia and usually barbatic acid in the medulla.

15. **Usnea sphacelata** R.Br.

Chlo. Melvill.: 49 (1823, ”1821”). – Type: Canada, Northwest Territories, Melville Island, Ross 114 (BM – holotype).

Syn. *Neuropogon sphacelatus* (R.Br) D.J.Galloway, *Neuropogon sulphureus* (Koenig) Hellb. For further synonyms, see Walker (1985).

I: tröllaskegg

Literature: Elix et al., Nova Hedwigia 85: 498 (2007); Elvebakk & Hertel, Norsk Polarinst. Skr. 198: 316 (1996); Randlane et al. 2009: 455; Seymour et al., Antarctic Science 19: 73 (2007); Thomson, American Arctic Lichens 1: 285 (1984); Walker, Bull. Brit. Mus. 13: 92 (1985).

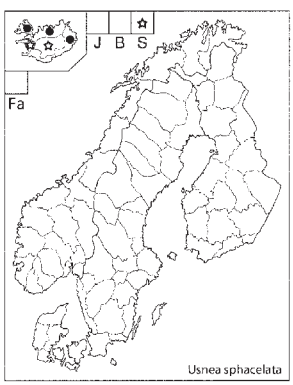
Figs: Hansen & Andersen 1995: 71; Randlane et al. 2009: 424; Seymour 2007: 72 (Fig. 1d); Thomson 1984: 285; Walker 1985: 94.

Thallus fruticose, erect, to 3 cm long, stiff; ramifications sympodial with divergent branches. Basal part often with proliferating holdfast, not pigmented or brownish to blackish. Main branches irregular, sometimes ± fusiform, with few to numerous foveoles or transverse furrows, distinctly yellow with little black; secondary branches not narrowed at their point of attachment to the main stems, tapering, yellow, conspicuously variegated with bands of black pigments; terminal branches ± continuously black pigmented. Segments variable, cylindrical, terete or flattened. Papillae few to numerous, verrucose, often of irregular shape; tuberucles few to numerous, often eroded at their top; fibercules absent; fibrils absent or few. Soralia conspicuous on terminal branches, as large or often larger than the branch diameter, well delimited, plane or excavate to frequently globose and black at maturity; isidiomorphs absent. Cortex moderately thin (5–9%), mat in longitudinal section; medulla whitish, moderately thin to moderately thick (18–28%), compact close to the cortex and lax close to the axis; axis moderately thin to moderately thick (31–49%); A/M = 1.1–2.7. Apothecia and pycnidia not observed.

Chemistry. No secondary substances (by TLC).

Habitat. On granite in the arctic tundra.

Distribution. Bipolar and on high mountains in South America. An extremely northern species in Europe. **Gr. I:** *IVe IMi IAu Inv INo* **AI:** *Sb*.



Note. Differs from all other European *Usnea* species by the yellow to yellow-green thallus that is variegated with bands of black pigmentation, the arctic distribution and its exclusive saxicolous habitat.

16. **Usnea subfloridana** Stirt.

Scott. Naturalist (Perth) 6: 294 (1882). – Type: Scotland, Perthshire, Killin, 1881 Stirton (BM holotype).

Syn. *Usnea comosa* (L.) Vain., nom. illeg. non Pers., *Usnea similis* (Motyka) Räsänen. For further synonyms, see Halonen et al. (1999).

D: busket skæglav **F:** tukkanaava **I:** ljósaskegg **N:** piggstry **S:** kort skägglav

Literature: Articus et al., Mycol. Res. 106: 412–418 (2002); Clerc in Nash et al. 2007: 332−333; Fos & Clerc 2000a: 82–83; Halonen et al., 1998: 56−57; Halonen et al. 1999: 250–251; Hinds & Hinds 2007: 507−508; James et al. in Smith et al., The lichens of Great Britain and Ireland: 928−929 (2009); Krog et al. 1994: 307; Laundon, Lichenologist 3: 70–71 (1965); Ohmura 2001: 29–31; Ohmura & Kashiwadani, J. Jap. Bot. 75: 164–177 (2000); Randlane et al. 2009: 456; Tõrra & Randlane 2007: 430.

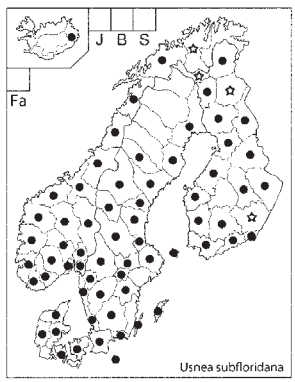
Figs: Clerc 1987b: 100 (Fig. 1A); Hinds & Hinds 2007: 507; Holien & Tønsberg 2006: 68; Moberg & Holmåsen 1990: 109; Randlane et al. 2009: 434; Tõrra & Randlane 2007: 420; Wirth 1995: 952.

Thallus fruticose, erect to subpendent, rarely pendent, to 12–15 cm long; ramifications mostly isotomic-dichotomic with divergent branches. Basal part black with ± distinct annular rings. Main branches tapering; secondary branches not narrowed at their point of attachment to the main stems. Segments cylindrical and terete. Papillae few to numerous, verrucose; tuberucles and fibercules usually absent; fibrils slender, 3–5 mm long, few to numerous. Soralia typically punctiform, not larger than half the branch diameter, of irregular shape, plane to slightly stipitate, ± efflorescent, sometimes fusing together and looking like a large soralia or enlarging ± isodiametrically and then larger than half the branch diameter, of irregular shape, slightly excavate; isidiomorphs always present, usually numerous and conspicuous. Cortex moderately thick to thick (8–12%) mat in longitudinal section; medulla thin (11–20%), dense to compact, white; axis moderately thick (36–56%), A/M = 1.5–5.3. Apothecia rare, terminal. Pycnidia not observed.

Chemistry. Medulla C–, CK–, K+ intensely yellow turning slowly orange, PD+ yellow-orange (thamnolic, ± alectorialic, ± bourgeanic, ± squamatic (trace) acids) or K– or C–, CK–, K–, PD– (squamatic acid).

Habitat. Corticolous, both on deciduous trees and conifers, very rarely saxicolous.

Distribution. One of the most common and widespread shrubby *Usnea* in mesic and moist forests in the Nordic countries, where it has a wide ecological amplitude, avoiding however very dry localities; rare only in the northernmost parts. **D:** *NJy ØJy VJy Fyn Sjæ Brn.* **F:** *A V U EK St EH ES EP PS PK KP Kn OP PeP Ks KiL SoL EnL InL.* **I:** *IAu.* **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi.* **S:** *Sk Bl Öl Gtl SmI Hl Bh Dls Vg Ög Nrk Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL.* Temperate and boreal Eurasia, Macaronesia and North America.



Note. Very variable, especially in the Nordic countries, where more than half of the individuals have soralia that are larger than half the branch diameter (specimens from other areas have mostly minute soralia). Consequently, it might be difficult to separate these specimens from *U. glabrescens*, *U. silesiaca* and *U. wasmuthii*. *U. glabrescens* has circular soralia of regular shape without isidiomorphs and stictic acid or norstictic acid in the medulla. *U. silesiaca* has a thinner medulla, a larger central axis and consequently a much higher A/M, as well as salazinic acid in the medulla. *U. wasmuthii* has more excavate soralia with few or no isidiomorphs, a basal part with tiny, lenticular, longitudinally oriented cracks as seen at 40× magnification and mostly barbatic, sometimes salazinic acids in the medulla.

17. **Usnea substerilis** Motyka

Wydaw. Muz. Slask. Katowicach, Dzial 3, 2: 24 (1930). – Type: Italy ("Austria"), Bolzano (Bozen), Gröden, St. Ul-

rich, above Unterkoffel, 1899, Arnold, Lich. exs. no. 1538b p. p. (W lectotype, Motyka, *Usnea* 1: 291 1936).

Syn. *Usnea sorediifera* Motyka, nom. illeg. non (Arnold) Lynge. See Halonen et al. (1999) for further synonyms.

F: jyväsnaava **N:** grynstry

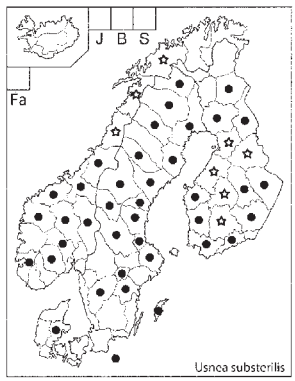
Literature: Clerc in Nash et al. 2007: 333−334; Fos & Clerc 2000a: 84; Halonen et al., 1998: 57; Halonen et al. 1999: 250–251; Hinds & Hinds 2007: 509; Hermansson & Thor, Graphis Scripta 15: 43–44 (2004); Krog et al. 1994: 307; Randlane et al. 2009: 457; Tõrra & Randlane 2007: 430–431.

Figs: Clerc 1987b: 100 (Fig. 1G); Halonen et al. 1998: 39 (Fig. 12); Randlane et al. 2009: 435; Tõrra & Randlane 2007: 422.

Thallus fruticose, erect to subpendent, to 12 cm long; ramifications sympodial with divergent branches. Base black or concolorous with the thallus. Main branches irregular, with or without foveoles and transverse furrows; secondary branches not constricted at their point of attachment to the main stems. Segments ± distinct, cylindrical or slightly inflated, terete or obtuse-angled to ridged. Papillae usually numerous, especially on main branches, verrucose to cylindrical; tuberucles and fibercules absent; fibrils short, <3 mm long, unevenly distributed. Soralia conspicuous, of irregular shape to ± circular, slightly tuberculate to slightly excavate but remaining superficial, larger than half the branch diameter when mature, sometimes ± encircling the branch at the tips, not tearing off the adjacent cortex, usually not confluent; isidiomorphs rare, only on young soralia, never on mature ones. Cortex moderately thin to moderately thick (5.5–9.5%), mat in longitudinal section; medulla moderately thin to modereately thick (19–29%), dense to compact, white; axis moderately thin to moderately thick (28–46%); A/M = 0.8–2.8. Apothecia and pycnidia not observed.

Chemistry. Medulla C–, K+ yellow turning orange red, KC–, PD+ orangish yellow; salazinic, ± protocetraric acids or salazinic, barbatic, ± 4-*O*-demethylbarbatic acids or salazinic, norstictic acids or no secondary substances by TLC.

Habitat. Corticolous, both on deciduous trees and conifers.



Distribution. Has a wide range in the Nordic countries with Northern tendencies, often occurring together with *U. lapponica* but less common than this species. **D:** *ØJy Brn*. **F:** *V St EH EP PH PS PK KP Kn OP PeP Ks SoL*. **N:** *He Op Bu Te Ro SF MR ST NT SNo NNo Tr*. **S:** *Gtl Vg Ög Nrk Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL PL LuL TL*. Circumpolar, continental, boreal-montane in the Northern Hemisphere.

Note. Among the species with irregular branches, *Usnea substerilis* is closely related to *U. lapponica.* The latter usually forms deeply excavate soralia often reaching the central axis and tearing off the cortex around the soralia, and it never produces isidiomorphs. The soralia of *U. substerilis* remain ± superficial, and the cortex around the soralia is not torn off. Short forms (*U. diplotypus* morphotype) of *U. dasypoga* might resemble *U. substerilis* but have punctiform soralia usually with numerous isidiomorphs or isidiofibrils, a thinner cortex and are often saxicolous. *U. wasmuthii* might have almost the same type of soralia but has a much higher A/M ratio and a different basal part.

18. **Usnea wasmuthii** Räsänen

Ann. Acad. Sci. Fenn., Ser. A4, 34(4):19 (1931). – Type: Estonia, Harjumaa, Tallinn, Kakumäe (Kakkomägi), 1908 Wasmuth (H holotype).

Syn. See Halonen et al. (1999).

F: etelännaava **N:** narrepiggstry **S:** sprickskägglav

Literature: Clerc in Nash et al. 2007: 335; Fos & Clerc 2000a: 84−85; Halonen et al. 1999: 253–254; Halonen, Bryologist 103: 42−43 (2000); James et al. in Smith et al., The lichens of Great Britain and Ireland: 929 (2009); Krog et al. 1994: 307–308; Hinds & Hinds 2007: 510–511; Ohmura 2001: 31–32; Randlane et al. 2009: 457−458; Tõrra & Randlane 2007: 431.

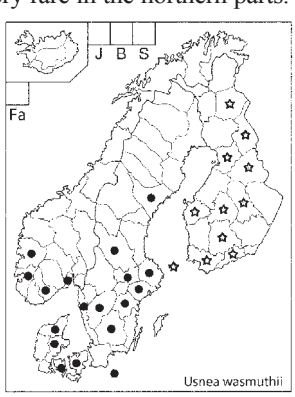
Figs: Clerc 1987b: 100 (Fig. 1D); Halonen et al. 1999: 253 (Fig. 8); Randlane et al. 2009: 435; Tõrra & Randlane 2007: 422 (Fig. 3D).

Thallus fruticose, erect to rarely subpendent, to 10 cm long; ramifications sympodial or isotomic-dichotomic with divergent branches. Basal part black pigmented with ± distinct annular rings; usually with tiny, lenticular, longitudinally oriented cracks as seen at 40× magnification. Main branches tapering; secondary branches not narrowed at their point of attachment to the main stems. Segments cylindrical and terete. Papillae few to numerous, verrucose; tuberucles few to numerous, especially on main branches; fibercules usually absent; fibrils slender, 2−3 mm long, few to numerous, mainly close to basal part. Soralia conspicuous, larger than half the branch diameter, irregularly rounded or typically oblong, lenticular and longitudinally oriented when mature; plane to ± excavate; isidiomorphs unconspicuous, only present on young punctiform soralia, rarely on mature, large and excavated soralia. Cortex moderately thick to thick (8–12%) mat to slightly shiny in longitudinal section; medulla thin (10–18%), dense to compact, white; axis thick (43–60%); A/M = 1.5–5.3. Apothecia and pycnidia not observed.

Chemistry. Medulla C–, K–, KC–, PD– (barbatic, ± 4-*O*-demethylbarbatic acids or no medullary substances) or C– K+ yellow turning red, KC–, PD+ orangish-yellow (salazinic, ± barbatic, ± 4-*O*-demethylbarbatic acids) or rarely C– K+ intensely yellow turning slowly orange, KC–, PD+ yellow-orange (thamnolic acid).

Habitat. Boreal montane with suboceanic preferences. Grows on both deciduous trees and conifers, often on *Betula*, *Picea*, and *Pinus*.

Distribution. A scattered distribution in southern parts of the Nordic countries and very rare in the northern parts. It seems to be a threatened species since there are only a few collections from the last decades (Halonen et al. 1999). In Norway it is mainly present along the coast. **D:** *NJy ØJy Fyn Sjæ Brn.* **F:** *A V U EH EP PH PS Kn OP PeP Ks SoL*. **N:** *Vf AA Ro Ho*. **S:** *SmI Bh Vg Ög Srm Vsm Upl Dlr Ång*. Rather wide but scattered distribution in Europe in boreal and montane areas with rather high precipitation.



Note. This species may be confused with *U. silesiaca*, *U. subfloridana* and *U. glabrescens*. *U. glabrescens* has circular soralia of regular shape, no isidiomorphs and stictic or norstictic acid in the medulla. *U. wasmuthii* is a variable species in the Nordic countries with soralia not always longitudinally developed, with no or few to numerous isidiomorphs. Moreover, there are individuals with thamnolic acid in the medulla, which complicates the delimitation against *U. subfloridana*. The most valuable diagnostic character to delimit *U. wasmuthii* from *U. subfloridana* is the presence of the tiny, lenticular, longitudinally oriented cracks on the basal part as seen at 40× magnification of the former species which should not be confounded with the reticular cracks that sometimes occurs on the basal part of *U. subfloridana*.

Usnocetraria

A. Thell

Usnocetraria M.J.Lai & J.C.Wei

J. Natl. Taiwan Mus. 60: 45 (2007). – Type: *Usnocetraria oakesiana* (Tuck.) M.J.Lai & J.C.Wei

Literature: Lai et al., J. Natl. Taiwan Mus. 60: 45–61 (2007); Thell et al., Lichenologist 41: 505 (2009).

Thallus foliose, dorsiventral, irregular, adnate. Upper surface yellowish green. Soralia present along the margin; isidia absent. Medulla white to pale orange. Lower surface pale brown to whitish. Pseudocyphellae absent. Rhizines few, scattered, simple or branched, pale brown. Upper and lower cortex paraplectenchymatous, rather thin, hyphae thick-walled, sometimes anticlinally arranged. Ascomata apothecia, zeorine, rare, usually sub-marginal, to 7 mm diam.; disc pale brown. Asci clavate, 8-spored. Spores colourless, globose, 5 µm diam. Conidiomata pycnidia, marginal, black, protruding. Conidia sublageniform, 9–12 × 1–2 µm. Photobiont trebouxioid.

Chemistry. Usnic and fatty acids.,

Note. Eleven species of different phylogenetic origins have been listed under *Usnocetraria* but nine of them are invalidly published. None of the species

included are closely related to the type species *U. oakesiana*. Its systematic position is unclear but it is closely related to the genera *Allocetraria*, *Cetraria* s.str. and *Tuckermannopsis*. Thell et. al (2009) regarded *Usnocetraria* monospecific.

Usnocetraria oakesiana (Tuck.) M.J.Lai & J.C.Wei

J. Nat. Taiwan Mus. 60: 45 (2007). – *Cetraria oakesiana* Tuck., Boston J. Nat. Hist. 3: 445 (1841) – Type: USA, New Hampshire, White Mountains, alpine regions, 1839 Oakes (FH lectotype, Thell et al. in Daniëls et al., Flechten Follmann: 363, 1995).

Syn. *Allocetraria oakesiana* (Tuck.) Randlane & A.Thell, *Cetraria bavarica* Kremp., *Tuckermannopsis oakesiana* (Tuck.) Hale

Literature: Hale, Bryologist 59: 116–117 (1956); Randlane & Saag, Symb. Bot. Ups. 34(1): 359–376 (2004); Randlane et al., Mycotaxon 80: 403–405 (2002); Thell et al. in Daniëls et al., Flechten Follmann: 363–365 (1995); Klepsrud & Timdal, Graphis Scripta 22: 14–17 (2010).

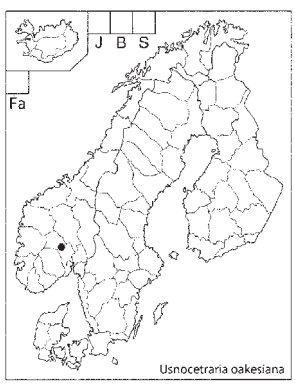
Figs: Wirth 1995: 271; Brodo 2001: 157; Hinds & Hinds 2007: 120.

See generic description. Apothecia not known in material from the Nordic countries.

Chemistry. Cortex C–, K–, KC–, PD–; usnic acid. Medulla C–, K–, KC–, PD–; caperatic, lichesterinic and protolichesterinic acids.

Habitat. Corticolous, often at the shaded bases of trees in montane forests; in Norway on *Picea* and *Betula*.

Distribution. Recently discovered at a single locality in Norway. **N:** *Bu*. Disjunct in East Asia, North and Central Europe, and North America.



Note. May be confused with *Nephromopsis laureri* (known from Russian Karelia), which differs by thinner, more ascending lobes with scattered pseudocyphellae on the lower surface, and shorter, to 5 µm long, bifusiform conidia. The closest relative is most likely *Cetraria obtusata* (Schaer.) v.d.Boom & Sipman (growing in the Alps), which is brown, fruticose, erect and has fusiform conidia. *U. oakesiana* was until recently placed in *Allocetraria* and was the single sorediate species of that genus.

Vulpicida

A. Thell. T. Ahti & T. Randlane

Vulpicida J.-E.Mattsson & M.J.Lai

Mycotaxon 49: 427 (1993). – Type: *Vulpicida juniperinus* (L.) J.-E.Mattsson & M.J.Lai

D: kruslav **F:** keltaröyhelöt **N: S:** enlavar

Literature: Mattsson, Svensk Bot. Tidskr. 82: 27–31 (1988); Bryologist 94: 261–269 (1991); Opera Bot. 119: 1–61 (1993); Mattsson & Lai, Mycotaxon 49: 427 (1993); Randlane & Saag, Folia Cryptog. Estonica 41: 89–96 (2005).

Thallus foliose to subfruticose, usually dorsiventral, to terete, irregular to rosette-forming. Upper surface greenish yellow to dark yellow. Soredia present in one species; isidia absent. Lower surface blackish, pale yellow towards the margins, or entirely pale; rhizines black, simple or irregularly branched. Cortex paraplectenchymatous, rather thin. Ascomata apothecia, zeorine, submarginal; disc brown, Asci broadly clavate, 8-spored. Spores broadly ellipsoid, almost spherical, 5–6 × 5 µm. Conidiomata pycnidia, marginal, black, protruding. Conidia sublageniform (bottle-shaped), 6–8 × 1–2 µm. Photobiont trebouxioid.

Chemistry. Cortex with usnic acid; medulla with vulpinic and pinastric acids.

Note. Characterized by intensely yellow to greenish yellow colour primarily caused by the presence of pinastric and vulpinic acids. *V. tilesii* and the three species in the Nordic countries have sublageniform conidia while the North American species, *V. canadensis* and *V. viridis*, have citriform conidia. The two groups are, however, closely related according to DNA data. The genus belongs to the same phylogenetic linage as *Cetraria*, also characterized by citriform and sublageniform conidia.

1. Soredia present .....2. *V. pinastri*
– Soredia absent.....2
2. Thallus foliose with thin lobe margins; mainly corticolous .....1. *V. juniperinus*
– Thallus subfruticose to foliose with thick lobe margins; mainly terricolous.....3. *V. tubulosus*

1. **Vulpicida juniperinus** (L.) J.-E.Mattsson & M.J.Lai

Mycotaxon 49: 427 (1993). – *Lichen juniperinus* L., Sp. Pl. 1147 (1753), nom. cons. – Type: Sweden, Härjedalen, Storsjö, Flatruet W of Falkvålen, 1991 Mattsson 2340 (LD, typ. cons.).

Syn. *Cetraria juniperina* (L.) Ach, *Cetraria juniperina* var. *terrestris* Schaer., *Tuckermannopsis juniperina* (L.) Hale

F: katajanröyhelö **N:** einerlav **S:** enlav

Literature: Mattsson 1988: 27–29; 1993: 35–39; Randlane & Saag 2005: 91.

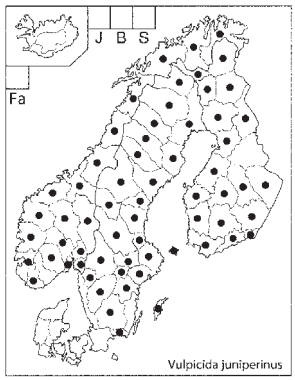
Figs: Holien & Tønsberg 2006: 38; Jahns 1980: 185; Moberg & Holmåsen 1990: 76; Rikkinen 2008: 193.

Thallus foliose, loosely adnate, forming irregular rosettes, to 3 cm diam. Lobes 1–5 mm wide, dorsiventral, raised. Upper surface shiny, yellow to dull greenish grey-yellow in shady habitats. Lower surface pale yellow to brownish white, veined; rhizine brownish white, squarrose. Apothecia frequent, submarginal with a smooth thalline exciple, to 6 mm diam.; disc reddish brown. Spores broadly ellipsoid to almost spherical, 5–6 × 5 µm. Pycnidia frequent, marginal, on short projections. Conidia sublageniform, 6–8 × 1–2 µm.

Chemistry. Cortex C–, K–, KC+ yellow, PD–; usnic acid. Medulla C–, K–, KC–, PD–; vulpinic and pinastric acids.

Habitat. Corticolous, mainly on *Juniperus communis* in the Nordic countries, primarily in boggy habitats in Lapland and elsewhere in the mountains or on coastal rock outcrops further south. Occasionally terricolous, mainly on calcareous ground or alluvial soil on river banks in the north.

Distribution. Mainly in the northern boreal and timberline areas in the Nordic countries, rare in southern lowlands. Much reduced in distribution in recent decades except for the mountains. **F:** *A V U EK St EH ES EP PH PS PK KP OP PeP Ks KiL SoL EnL InL.* **N:** *Øf Ak He Op Bu Vf Te VA Ro Ho SF MR ST NT SNo NNo Tr VFi ØFi.* **S:** *Bl Gtl SmI Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Hrj Jmt Vb Nb ÅsL LyL PL LuL TL.* Only known from northern Eurasia, from the British Isles to Japan.



Note. Terricolous specimens of *V. juniperinus* are similar to *V. tubulosus*, locally almost impossible to distinguish. Generally, *V. juniperinus* has more vertically raised lobes, forming tufts, and thinner lobe margins.

2. **Vulpicida pinastri** (Scop.) J.-E.Mattsson & M.J.Lai

Mycotaxon 49: 428 (1993). – *Lichen pinastri* Scop., Fl. Carn. 2, ed. 2: 382 (1772). – Type: Italy, Friuli Venezia Giulia, Prov. Udine, Carnic Alps, road between Sauris and Casera Razzo, 1750 m., 1993 Nimis (LD neotype, Mattsson, Opera Bot. 119: 39, 1993).

Syn. *Cetraria pinastri* (Scop.) Gray, *Cetraria caperata* auct., *Tuckermannopsis pinastri* (Scop.) Hale, *Vulpicida pinastri* var. *soralifera* (Frey) J.-E.Mattsson

D: gul kruslav **F:** keltaröyhelö **I:** gullinvarp **N:** gullroselav **S:** granlav

Literature: Mattsson 82: 30(1988); 1993: 39–45; Randlane & Saag 2005: 92.

Figs: Brodo et al. 2001: 731; Hansen & Andersen 1995: 22; Hinds & Hinds 2007: 512; Holien & Tønsberg 2006: 38; Jahns 1980: 185, Krog et al. 1994: 86; Moberg & Holmåsen 1990: 76; Rikkinen 2008: 147; Sérusiaux et al. 2004: 175; Wirth 1995: 971.

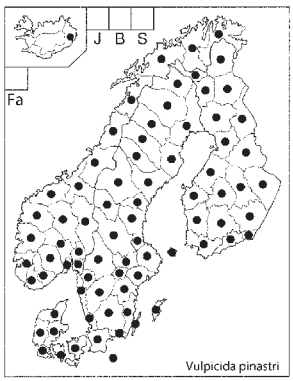
Thallus foliose, loosely adnate, forming irregular rosettes, to 3 cm diam. Lobes to 5 mm wide with rounded tips; margins somewhat ascending. Upper surface yellow to pale greenish yellow; soralia marginal, occasionally laminal. Lower surface pale yellow to brownish white, veined; rhizines brownish white, squarrose. Apothecia very rare, with a smooth thalline exciple, submarginal; disc brown. Spores broadly ellipsoid to almost spherical, 5(–6) × 5 µm. Pycnidia rare, margi-

nal, on short projections. Conidia sublageniform, 6–8 × 1–2 µm.

Chemistry. Cortex C–, K–, KC+ yellow, PD–; usnic acid. Medulla C–, K–, KC–, PD–; vulpinic and pinastric acids. Zeorin (and other triterpenoids) occasionally abundant, especially in saxicolous specimens from Lapland.

Habitat. Corticolous on both deciduous trees and conifers, especially at tree bases below snow-line, and on dwarf-shrubs, also lignicolous on stumps, fences, barn walls etc., occasionally saxicolous.

Distribution. Common all over the forest-covered areas of the Nordic countries, rare or absent from above timberline and arctic tundras; rarely found in Greenland. **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:** *IAu*. **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*. Common in NW Europe and East Asia, scattered in intermediate parts of boreal Eurasia.



Note. Easily recognized by the yellow to greenish yellow colour and the sorediate margins. Specimens with laminal soralia ("var. *soralifera*") has been found in many localities in Sweden, Norway and Finland.

3. **Vulpicida tubulosus** (Schaer.) J.-E. Mattsson & M.J.Lai

Mycotaxon 49: 428 (1993). – *Cetraria juniperina* (L.) Ach. var. *tubulosa* Schaer., Lich. Helv. Spicil.: 372 (1836). – Type: Switzerland, Mt. Gemmi, 1853 Guthmick (G lectotype, Mattsson, Opera Bot. 119: 48, 1993).

Syn. *Cetraria alvarensis* (Wahlenb.) Vain. ex Lynge, *Cetraria tilesii* auct., *Cetraria tubulosa* (Schaer.) Zopf

F: alvariröyhelö **S:** trind enlav

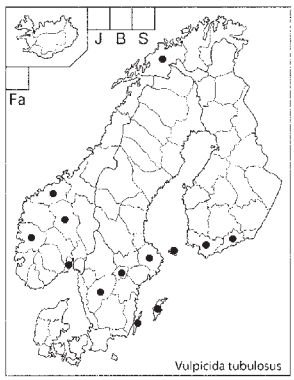
Literature: Mattsson 1988: 29–30; 1993: 48–53; Randlane & Saag 2005: 92.

Thallus foliose to subfruticose, to 5 cm diam.; when terricolous forming dense tufts of raised to terete lobes; when corticolous usually forming rosettes of somewhat broader lobes, 1–5 mm wide. Upper surface greenish (grey-) yellow to bright yellow, smooth. Soralia absent. Lower surface pale yellow to whitish brown, veined; rhizines brownish white, squarrose. Apothecia rare, more common on corticolous specimens, submarginal, with smooth thalline margin; disc brown. Spores broadly ellipsoid to almost spherical, 5 × 6 µm. Pycnidia abundant, marginal to laminal, immersed or on short projections. Conidia sublageniform (bottle-shaped), 6–8 × 2 µm.

Chemistry. Cortex C–, K–, KC+ yellow, PD–; usnic acid. Medulla C–, K–, KC–, PD–; vulpinic and pinastric acids.

Habitat. On calcareous ground, rarely corticolous, then preferably on twigs of *Juniperus* close to the ground.

Distribution. Known from S Finland and S Sweden. **F:** *A V U*. **N:** *Op Vf Ho MR Tr.* **S:** *Öl Gtl Vg Nrk Upl*. Endemic to Europe. Two distribution centres, one in northern Europe around the Baltic Sea, including the Estonian islands and western mainland and NW shore of Lake Ladoga in Russia and another around the Central European mountains (the Alps, Carpathians, Pyrenees), where it occurs up to the timberline.



Note. Difficult to distinguish from *V. juniperinus*, see above. It has disappeared from several of its mainland localities in Sweden. Several earlier reports from Finland seem to be erroneous (referable to *V. juniperinus*).

Xanthoparmelia

J. A. Elix & A. Thell

Xanthoparmelia (Vain.) Hale

Phytologia 28: 485 (1974). – *Parmelia* sect. *Xanthoparmelia* Vain., Acta Soc. Fauna Fl. Fenn. 7: 60 (1890). – Type: *Xanthoparmelia conspersa* (Ach.) Hale

Syn. *Neofuscelia* Essl., *Parmelia* subgen. *Neofusca* (Gyeln.) Essl.

D: skållav **F:** keltakarpeet **N:** steinkrinslav **S:** kaklavar

Literature: Blanco et al., Taxon 53: 959–975 (2004); Esslinger, J. Hattori Bot. Lab. 42: 97–158 (1977); Hale, Smithsonian Contr. Bot. 74: 1–250 (1990); Giordani et al., Lichenologist 34: 189–198 (2002), Lichenologist 35: 377–385 (2003); Nash et al., Symb. Bot. Ups. 34(1): 295 (2004).

Thallus foliose, closely adnate, to 20 cm diam., dichotomously to irregularly branched. Lobes linear to irregular, separate to imbricate, to 10 mm wide; upper surface smooth to rugose, yellowish green to olivaceous brown or dark brown; isidia and soralia sometimes present; pseudocyphellae absent; lower surface plane or canaliculate, pale brown to black, rhizines simple or sparsely branched. Cortex paraplectenchymatous. Medulla white, rather loose. Ascomata apothecia, zeorine, laminal, adnate to shortly stipitate, to 20 mm diam.; disc plane to concave, pale to dark brown. Asci 8-spored. Spores simple, colourless, ellipsoid, 6–13 × 4–8 µm. Coniodiomata pycnidia, laminal, immersed. Conidia dumbbell-shaped, 4–8 × 1 µm. Photobiont trebouxioid.

Chemistry. Usnic acid usually present in the cortex, absent in former *Neofuscelia* species, which are brown, with a HNO_3+ green to dark blue-green cortex. The variable medullary chemistry is to a large degree characterized by β-orcinol depsides and depsidones, in the brown species also orcinol depsides and depsidones.

Note. The largest genus in the *Parmeliaceae*, and among the largest of all lichen genera, comprising approximately 800 species, with an enormous species diversity in southern Africa and Australia, but only 22 species in Europe and eleven in the Nordic countries. Traditionally only yellowish species (with usnic acid) have been included in the genus. However, molecular studies have indicated that species of the brown coloured genus *Neofuscelia* are closely related and currently regarded as part of *Xanthoparmelia*. Although other interpretations of the phylogeny are possible we have followed Crespo et al. (2010). Most of the *Xanthoparmelia* species in this area become rare towards the north, and are absent in northernmost Fennoscandia and the Atlantic and Arctic Islands. Two species have oceanic distributions in Norway. Presence/absence of vegetative diaspores, colour of the lower surface and secondary chemistry are significant characters in species delimitation. The genus is characterized by presence of *Xanthoparmelia*-type of lichenan in the cellwalls.

1. Thallus yellowish green 2
– Thallus olivaceous brown to dark brown 8
2. Soralia or isidia present 3
– Soralia and isidia absent 4
3. Isidia present; lobes at least 1 mm wide 6
– Soralia present; lobes 0.8 mm wide ..... 5. *X. mougeotii*
4. Medulla K– ..... 7. *X. protomatrae*
– Medulla K+ yellow or red 5
5. Medulla K+ yellow; stictic acid present; densely laciniate with age ..... 1. *X. angustiphylla*
– Medulla K+ red; salazinic acid present; without laciniae ..... 6. *X. stenophylla*
6. Lower surface black 7
– Lower surface brown ..... 6. *X. plittii*
7. Isidia cylindrical; medulla K+ yellow. 2. *X. conspersa*
– Isidia spherical; medulla K+ red ..... 10. *X. tinctina*
8. Isidia present 9
– Isidia absent 10
9. Isidia strongly pustulate, 0.1–0.5 mm wide; thallus strongly maculate, often pale ..... 4. *X. loxodes*
– Isidia moderately pustulate, 0.06–0.2 mm wide; thallus moderately maculate, often dark ..... 11. *X. verruculifera*
10. Glomellic, glomelliferic and perlatolic acids; often yellowish brown and strongly maculate ..... 2. *X. delisei*
– Stenosporic or divaricatic acid as major compound; often dark brown ..... 8. *X. pulla*

1. **Xanthoparmelia angustiphylla** (Gyeln.) Hale

Mycotaxon 33: 401 (1988). – *Parmelia conspersa* var. *angustiphylla* Gyeln., Feddes Rep. 29: 153 (1931). – Type: Hungary, Nógrád, Diósjenő, Mt. Csóványos, 1926 Gyelnik (BP 21241 lectotype, Verseghy, Typen-Verzeichn. Flechtensammlung: 87, 1964, as ‘holotypus’; corr. Hale, Smithsonian Contr. Bot. 74: 68, 1990).

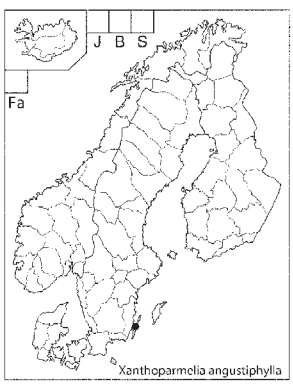
Syn. *Parmelia angustiphylla* (Gyeln.) Gyeln.

Literature: Hale 1990: 68; Nash et al. 2004: 295 (2004); Skult, Graphis Scripta 3: 132–134 (1992).

Figs: Hale 1990: 69.

THALLUS adnate to loosely adnate on rocks, 3–10 cm diam., rather firm, often pulvinate. Lobes subirregular to sublinear, elongate, subascending, flat to subconvex, separate and often forming an imbricate mat, 0.8–1.5 mm wide, dichotomously branched, contiguous to densely imbricate, often densely lobulate and laciniate, the laciniae 0.3–0.5 mm wide; upper surface dull to shiny yellowish green, smooth, emaculate; soralia and isidia lacking; lower surface smooth, black, moderately rhizinate; rhizines black, simple, 0.2–0.8 mm long. APOTHECIA common, substipitate, with a thin, smooth, thalline exciple, 3–10 mm wide; disc reddish brown. Spores ellipsoid, 9–10 × 5–6 µm. PYCNIDIA common, laminal. Conidia dumbbell-shaped, 5–6 × 0.5 µm.

Chemistry. Cortex C–, K–, KC+ yellow, PD–, HNO_3–, UV–; usnic acid. Medulla C–, K+ yellow-orange, KC+ orange-red, PD+ orange, UV–; stictic, constictic, hypostictic and norstictic acids together with traces of cryptostictic and peristictic acids (chemistry identical with that in *X. conspersa*).



Habitat. Saxicolous on siliceous rocks.

Distribution. Distribution incompletely known. **S:** *Öl*. Rather rare in northern and eastern Europe, more common in eastern North America.

Note. Characterized by the very narrow lobes with a black lower surface, the presence of dense laciniae, the lack of isidia and the presence of the stictic acid chemosyndrome. Sometimes regarded as a non-isidiate morphotype of *X. conspersa* (Skult 1992).

2. Xanthoparmelia conspersa (Ach.) Hale

Phytologia 28: 28: 485 (1974). – *Lichen conspersus* Ach., Lichenogr. Suec. Prodr.: 118 (1799 '1798'). – TYPE: Sweden (H-ACH 1346B lectotype, Hale, Smithsonian Contr. Bot. 74: 91, 1990).

Syn. *Parmelia conspersa* (Ehrh. ex Ach.) Ach.

D: messing-skållav **F:** karstakeltakarve **N:** stiftsteinlav **S:** kaklav

Literature: Hale 1990: 91–93; Jølle, Norw. J. Bot. 25: 47–49 (1978); Nash et al. 2004: 298–299; Skult, Graphis Scripta 3: 15−18 (1990).

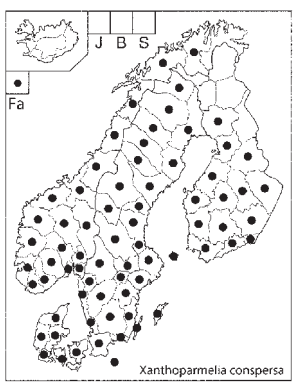
Figs: Brodo et al. 2001: 736; Holien & Tønsberg 2006: 60; Jahns 1980: 187; Moberg & Holmåsen 1990: 88; Sérusiaux et al. 2004: 176; Wirth 1995: 639.

THALLUS foliose, closely adnate, to 15 cm diam., ± rosette forming or expanding to form large patches of irregular lobes. Lobes 1–2 cm wide, slightly broader towards apices, separate to slightly overlapping, margins often indented; upper surface yellowish green, smooth, ± shiny; soralia absent; isidia sparse to frequent, occasionally covering the major part of the thallus, laminal, cylindrical, simple or branched; lower surface black with simple rhizines. APOTHECIA infrequent or absent, with a thin, occasionally isidiate, thalline margin, to 1 cm diam.; disc reddish brown. Spores ellipsoid, 6–10 × 4–5 µm. PYCNIDIA rare, laminal, immersed. Conidia weakly dumbbell-shaped, 4–7 × 1 µm.

Chemistry. Cortex C–, K–, KC+ yellow, PD–, HNO_3–, UV–; usnic acid (rarely with traces of atranorin). Medulla C–, K+ yellow-orange, KC+ orange-red, PD+ orange, UV–; stictic, constictic and norstictic acids, together with traces of cryptostictic, menegazziaic and hypostictic acids and other minor compounds.

Habitat. Saxicolous on siliceous rocks and stones, nitrophilous, rarely on bark or lignum. One of the most common species on siliceous rocks and boulders in open landscapes (especially agricultural and riparian) in southern Fennoscandia.

Distribution. The most common *Xanthoparmelia* species in the Nordic countries, but infrequent north of the southern boreal zone and absent from the northermost parts. **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. **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi.* **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 pantemperate subcosmopolitan species, but absent in Australasia and southern Africa.

Note. Distinguished by the presence of isidia, the black lower surface and the stictic acid complex in the medulla. Variable in the shape of thallus and abundance of isidia.

3. **Xanthoparmelia delisei** (Duby) O.Blanco et al.

Taxon 53: 967 (2004). – *Parmelia olivacea* var. *delisei* Duby, Bot. Gall. 2: 602 (1830). – Type: France, Calvados, Vire, Delise (H-NYL 34451a syntype).

Syn. *Neofuscelia delisei* (Duby) Essl., *Parmelia delisei* (Duby) Nyl., *Parmelia pulla* var. *delisei* (Duby) H.Magn.

F: rannikkoruskokarve

Literature: Coppins et al., Bull. Brit. Lich. Soc. 90: 29–33 (2002); Esslinger 1977: 107–109, 173; Leuckert et al., Decheniana 127: 1–36 (1975); Skult, Graphis Scripta 5: 87–91 (1993).

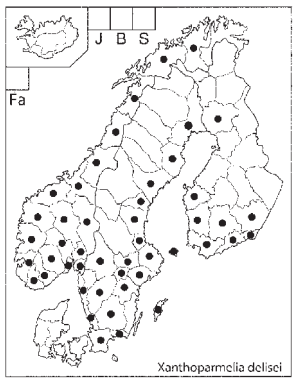
Figs: Elix, Fl. Australia 55: 71 (1994).

Thallus to 15 cm diam., rounded, appressed to moderately adnate. Lobes 1–4 mm wide, flat to weakly convex; upper surface yellowish brown to reddish brown, uneven and rugose, occasionally pruinose, rather dull, strongly maculate; soralia and isidia absent; lower surface dark brown to black with simple rhizines. Apothecia common, sessile or shortly stipitate, mainly in the centre of the thallus, to 12 mm wide, with a smooth thalline margin; disc brown, strongly concave to flat. Spores ellipsoid, 7.5–11 × 5–6 µm. Pycnidia common, immersed. Conidia weakly dumbbell-shaped, 4.5–7 × c. 1 µm.

Chemistry. Cortex C–, K–, KC+ yellow, PD–, UV–, HNO_3+ green to bluish. Medulla C– or C+ faint yellow to red, K–, KC+ red-orange, PD–, UV–, HNO_3–; glomellic, glomelliferic and perlatolic acids, often with gyrophoric acid, and about 10 other minor, accessory compounds.

Habitat. Saxicolous, growing on exposed siliceous rocks along seashores and in agricultural areas.

Distribution. Mostly southern, extending along seashores to the northern end of Gulf of Bothnia and northern Norway, although not known from Denmark. **F:** *A V U EK St EH ES EP PeP.* **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi.* **S:** *Sk Bl Gtl SmI Hl Bh Vg Ög Nrk Srm Vrm Vsm Upl Gst Hls Mpd Ång Vb Nb*. A pantemperate species known from Eurasia, Africa, South America and Australasia.



Note. Morphologically similar to *X. pulla* but differs chemically and is usually paler, commonly yellowish brown rather than dark brown. In addition, the lobes tend to be broader and more strongly maculate. However, several specimens with "hybrid chemistry" have been detected in Finland and Sweden, and morphology and colour overlap strongly with characters of *X. pulla* so that reliable identification requires chemical (TLC) or molecular investigation. So far most of the herbarium material in the Nordic countries has not been properly analyzed. A recent molecular study supported species rank for *X. delisei* (Blanco et al. 2004). The earlier used character, (K)C+ red reaction (presence of gyrophoric acid) of the medulla is not a diagnostic character to separate *X. delisei* and *X. pulla*, since both species may show that reaction.

4. **Xanthoparmelia loxodes** (Nyl.) O.Blanco et al.

Taxon 53: 968 (2004). – *Parmelia loxodes* Nyl., Flora 55: 426 (1872). – Type: France, Calvados, Vire, Delise (H-NYL 34782A lectotype, Ahti, Bryologist 72: 238, 1969).

Syn. *Neofuscelia loxodes* (Nyl.) Essl., *Parmelia isidiotyla* auct.

D: knudret skållav **F:** vainioruskokarve **N:** klubbeskjærgårdslav **S:** knölig sköldlav

Literature: Ahti, Bryologist 72: 238 (1969); Esslinger 1977: 120–122, 173; Laundon, Lichenologist 4: 303–304 (1970); Leuckert et al., Decheniana 127: 1–36 (1975).

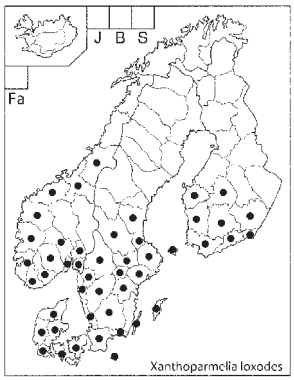
Figs: Brodo et al. 2001: 450; Moberg & Holmåsen 1990: 91.

THALLUS loosely adnate, ± irregular, to 20 cm diam. Lobes 1–5 mm wide, flat, elongate, often overlapping particularly towards the centre; upper surface pale greyish to reddish brown, uneven, frequently wrinkled; soralia absent; isidia usually frequent, developing from rounded outgrowths, clustered on the upper surface, ultimately erumpent at the apices; lower surface black, with ± dense, simple rhizines. APOTHECIA frequent, exciple often isidiate, to 10 mm wide; disc brown. Spores ellipsoid, 7–10 × 4–5 µm. PYCNIDIA rare, immersed. Conidia dumbbell-shaped, 5–6 × 1 µm.

Chemistry. Cortex C–, K–, KC–, PD–, UV–, HNO_3+ green to bluish. Medulla C– or C+ red, K–, KC+ orange-red, PD–, UV+ white, HNO_3–; glomelliferic, glomellic, perlatolic and gyrophoric acids.

Habitat. Saxicolous, growing on exposed siliceous rocks along seashores and in agricultural areas.

Distribution. Reaches temperate and southern boreal zones of the Nordic countries, where it is locally common especially near the coast. **D:** *NJy ØJy VJy SJy Fyn Sjæ Brn*. **F:** *A V U EK St EH ES EP PH*. **N:** *Øf Ak Bu Vf Te AA VA Ro Ho SF MR ST NT*. **S:** *Sk Bl Öl Gtl SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls*. Widely distributed in Eurasia, North Africa, Asia Minor and western North America.



Note. Characterized by the thick thallus and the robust isidia. May be confused with *X. verruculifera*, which usually has a darker thallus, thinner lobes and smaller isidia.

5. Xanthoparmelia mougeotii (Schaer. ex D.Dietr.) Hale

Phytologia 28: 488 (1974). – *Parmelia mougeotii* Schaer. ex D.Dietr., Deutschl. Kryptog. Gewächse: 24 (1846). – TYPE: Icon, ibid., Tab. 288, Fig. 288 (lectotype, Elix & Thell, Nordic Lichen Flora 4: 141, 2011); France, Vosges, Bruyères (Brujerium), Mt. Heledré, Mougeot; Schaerer, Lich. Helv. exs. no. 548 (UPS epitype, Elix & Thell, Nordic Lichen Flora 4: 141, 2011).

Syn. *Parmelia discreta* (Nyl.) Nyl.

D: liten skållav **F:** etelänkeltakarve **N:** steingardslav **S:** dvärgkaklav

Literature: Hale 1990: 151; Malme, Svensk Bot. Tidskr. 31: 181 (1937); Wirth, Dissert. Bot. 17: 78 (1972); Reve, Blyttia 39: 121–124 (1981); Timdal, Blyttia 40: 182 (1982).

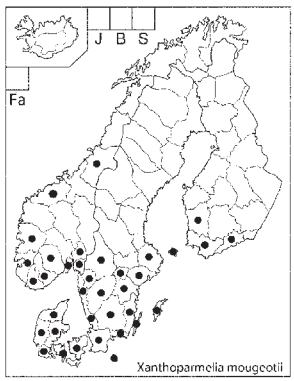
Figs: Jahns 1980: 187; Krog et al. 1994: 309; Sérusiaux et al. 2004: 177; Wirth 1995: 668.

THALLUS centrally subcrustose, usually forming scattered, closely annate rosettes, 0.5–2 cm diam. Lobes elongate, 0.5–1.5 mm wide, radiating from the central, cracked, subcrustose part. Upper surface yellowish green, darker and greyish towards the centre; soralia conspicuous, subcapitate, scattered, whitish yellow, c. 1 mm diam.; lower surface brownish black to black, with simple rhizines. APOTHECIA rare, to 2 mm diam.; disc brown. Spores ellipsoid, 6–11 × 4–6 µm. PYCNIDIA rare, immersed. Conidia weakly dumbbell-shaped, 4–6 × 1 µm.

Chemistry. Cortex C–, K–, KC+ yellow, PD–, HNO_3–; usnic acid. Medulla and soralia C–, K+ orange, KC+ orange, PD+ orange; stictic, constictic, norstictic and usnic acids together with traces of cryptostictic and peristictic acids.

Habitat. On siliceous stones and rocks, especially near seashores.

Distribution. Up to the hemiboreal zone in the Nordic countries. **D:** *NJy ØJy VJy SJy Fyn Sjæ Brn*. **F:** *A V U St*. **N:** *Øf Ak Vf Te AA VA Ro Ho MR NT*. **S:** *Sk Bl Öl Gtl Klm SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Upl*. Mainly pantemperate but reaches rather cool areas in central and northern Europe, North America (mainly west, very rare in east), Middle and South America, South Africa.



Note. Recognized by its small, subcrustose thallus and conspicuous soralia. May be confused with *Parmeliopsis ambigua* growing on rocks, which, however, reacts K−, PD– (divaricatic acid).

6. Xanthoparmelia plittii (Gyeln.) Hale

Phytologia 28: 488 (1974). – *Parmelia plittii* Gyeln., Feddes Repert. Spec. Nov. Regni Veg. 29: 287 (1931). – TYPE: USA, Maryland, Baltimore Co., Liberty Road at Gwynna Falls, Plitt P-5 (BP 23307 lectotype, Verseghy, Typen-Verzeichnis Flechtensammlungen: 103, as "holotype", corr. Hale, Smithsonian Contr. Bot. 74: 175, 1990).

Syn. *Xanthoparmelia dierythra* (Hale) Hale

N: lys steinlav

Literature: Hale 1990: 175; Jølle, Norw. J. Bot. 25: 47–49 (1978); Skult, Graphis Scripta 3: 15–18 (1990); Nash et al. 2004: 315.

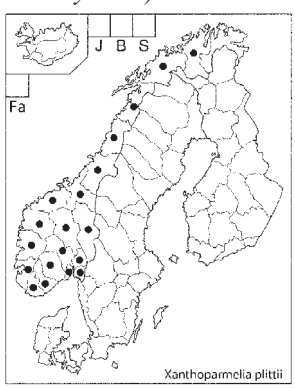
Figs: Brodo et al. 2001: 740; Krog et al. 1994: 309.

THALLUS adnate to loosely adnate, to 10 cm wide. Lobes 1–4 mm wide, ± irregular, contiguous to imbricate; upper surface greenish yellow, greyish yellow towards the centre, shiny; isidia usually abundant, solid, cylindrical, simple or sparsely branched, with darkening tips; lower surface pale brown to darkening; rhizines simple, pale and sparse. APOTHECIA common, 2–7 mm diam., thalline margin usually smooth; disc brown. Spores ellipsoid, 4–5 × 9–10 µm. PYCNIDIA sparse, immersed. Conidia dumbbell-shaped, 5–7 × 1 µm.

Chemistry. Cortex C–, K–, KC+ yellow, PD–, HNO_3–; usnic acid. Medulla C–, K+ yellow, KC–, PD+ orange; stictic, constictic and norstictic acids, together with traces of cryptostictic and menegazziaic acids. Stictic acid group rarely absent ("*X. dierythra*").

Habitat. Saxicolous on exposed lowland rocks, rarely corticolous.

Distribution. Insufficiently known. In Norway it is mainly southern coastal. **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi.* A pantemperate-subtropical species, present in south-western Africa, North America, Central and South America, rarely in Europe (Spain, France, Italy and Norway).



Note. Differs from *X. conspersa* by its pale lower surface and usually broader lobes. Probably much overlooked in Europe. Skult (1990) regarded the species doubtful, and reported some uncertain specimens also from *A St EK EH PK* and *KP* in Finland. Scandinavian material appears to be different from American material and further studies are necessary.

7. Xanthoparmelia protomatrae (Gyeln.) Hale

Phytologia 28: 488 (1974). – *Parmelia protomatrae* Gyeln., Feddes Rep. 29: 155 (1931). – TYPE: Hungary, Budapest, Mt. Vadállókövek, 1926 Gyelnik (BP 21645 lectotype, Verseghy, Typen-Verzeichnis Flechtensammlung: 104 (1964), as "holotypus", Hale, Smithsonian Contr. Bot. 74: 176, 1990).

N: solsteinlav

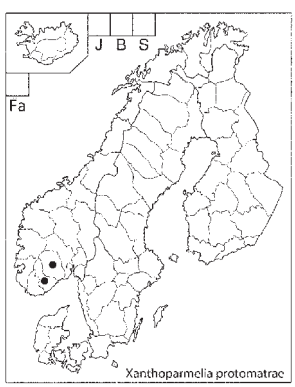
Literature: Hale 1990: 176–177; Krog, Norw. J. Bot. 25: 51–54 (1978).

Figs: Krog et al. 1994: 309; Hale 1990: 178.

THALLUS to 8 cm wide, loosely adnate. Lobes sublinear, 1–6 mm diam., elongate and dichotomously branched, contiguous to imbricate, becoming laciniate in central parts; upper surface pale yellow to greyish yellow, shiny, partly with white maculate; soralia and isidia absent; lower surface pale to dark brown with simple rhizines. APOTHECIA frequent, substipitate, to 5 mm diam., margin usually smooth; disc brown. Spores ellipsoid, 7–9 × 4.5–5.5 µm PYCNIDIA common, immersed. Conidia dumbbell-shaped, 5–7 × 1 µm.

Chemistry. Cortex C–, K–, KC+ yellow, PD–, HNO_3–; usnic acid. Medulla C–, K+ brownish, KC–, PD+ orange to red; fumarprotocetraric and usnic acids, with minor quantities of protocetraric and quaesitic acids.

Habitat. On sun-exposed, siliceous rocks.



Distribution. Known only from few localities in coastal south-eastern Norway. **N:** *Te AA*. Occurs from western and central Europe to China and Saudi Arabia.

Note. Taxonomic status uncertain. Distinguished from *X. stenophylla* mainly by its secondary chemistry. Probably a more restricted distribution but apparently much overlooked. The type specimen is from a lake shore. The Norwegian material appears to be a distinct taxon, not only because of its chemistry but also from its ecology.

8. **Xanthoparmelia pulla** (Ach.) O.Blanco et al.

Taxon 53: 970 (2004). – *Parmelia pulla* Ach., Syn. Meth. Lich.: 206 (1814). – Type: Sweden (H-ACH 1420D lectotype, Esslinger & Ahti, Rev. Fac. Ci. Univ. Lisboa, Sér. 2, C, Ci. Nat. 17: 728, 1975).

Syn. *Neofuscelia perrugata* (Nyl.) Elix, *Neofuscelia pulla* (Ach.) Essl., *Parmelia exasperans* (Nyl.) Gyeln., *Parmelia locarnensis* Zopf ex Rosend., *Parmelia prolixa* (Ach.) Carroll, *Xanthoparmelia perrugata* (Nyl.) O.Blanco et al.

D: mørkebrun skållav **F:** siloruskokarve **N:** skålskjærgårdslav **S:** mörkbrun sköldlav

Literature: Coppins et al., Bull. Brit. Lich. Soc. 90: 29–33 (2002); Elix, Australas. Lichenol. 51: 7–13 (2002); Esslinger 1977: 135–139, 179; Esslinger & Ahti, Rev. Fac. Ci. Univ. Lisboa, ser. 2, C, Ci. Nat. 17: 721–731 (1975); Leuckert et al., Decheniana 127: 1–36, Abb. 17–18 (1975).

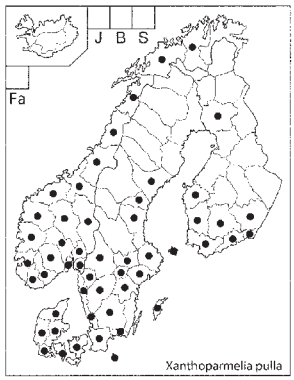
Figs: Krog et al. 1994: 91; Holien & Tønsberg 2006: 55; Moberg & Holmåsen 1990: 93; Sérusiaux et al. 2004: 109; Wirth 1995: 641.

Thallus to 15 cm diam., rounded, often coalesceing to form larger patches, closely adnate. Lobes 1–3 mm wide, flat to weakly convex; upper surface greyish to reddish brown or dark brown, uneven and rugose, occasionally pruinose, rather dull, paler and maculate towards tips; soredia and isidia absent; lower surface black, with simple rhizines. Apothecia common, to 6 mm diam., in central parts of the thallus, sessile to shortly stipitate with a smooth thalline margin; disc brown, usually concave to flat. Spores ellipsoid, 8–10.5 × 4.5–7 µm. Pycnidia common, immersed. Conidia weakly dumbbell-shaped, 4.5–7 × 1 µm.

Chemistry. Cortex C–, K–, KC–, PD–, HNO_3+ green to bluish. Medulla C– or C+ rose to red, K–, KC– or KC+ rose or red, PD–, HNO_3–. Two major chemotypes: 1) stenosporic acid (major), divaricatic acid (minor), perlatolic acid (minor) and seven minor, accessory compounds, including gyrophoric acid (sometimes major), lecanoric acid, atranorin, 4-O-demethylstenosporic and oxostenosporic acids; 2) divaricatic acid (major), stenosporic acid (minor), and some minor, accessory compounds, including gyrophoric and lecanoric acids and atranorin.

Habitat. Saxicolous on exposed siliceous rocks on shores and in agricultural areas.

Distribution. Locally abundant in southern parts of the Nordic countries, but rare in Skåne and Denmark. **D:** *NJy ØJy VJy SJy Fyn Sjæ Brn*. **F:** *A V U EK St EH ES EP PeP*. **N:** *Øf Ak He Op Bu Vf Te AA VA Ro Ho SF MR ST NT SNo NNo Tr VFi*. **S:** *Sk Bl Gtl SmI Hl Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Hls Mpd Ång*. Widespread in Europe, northern and southern Africa and Australasia.



Note. Recognized by the presence of the centrally located apothecia, the lack of vegetative propagules and the dark brown to black lower surface. Differs from *X. delisei* in the darker brown upper surface, thinner and less maculate lobes, in addition to chemical differences, but identification without chemistry is often doubtful. The divaricatic acid chemotype is sometimes regarded as a distinct species, *X. perrugata*. It is apparently much less common in Fennoscandia than the stenosporic acid chemotype. Skult (1993) reported it (as Chemotype II) from *V U* and *EH* in Finland. It is otherwise known from France, Hungary, Ireland, Italy, Romania, Russia (Karelia), Spain and UK.

9. **Xanthoparmelia stenophylla** (Ach.) Ahti & D.Hawksw.

Lichenologist 37: 363 (2005). – *Parmelia conspersa* var. *stenophylla* Ach., Methodus: 206 (1803). – Type: Sweden? (H-ACH 1347A lectotype, Hale, Smithsonian Contr. Bot. 74: 192, 1990).

Syn. *Parmelia somloënsis* Gyeln., *Parmelia stenophylla* (Ach.) Heugel, *Parmelia taractica* auct. non Kremp. *Xanthoparmelia somloënsis* (Gyeln.) Hale

F: silokeltakarve **N:** gul steinlav **S:** smalflikig kaklav

Literature: Ahti & Hawksworth, Lichenologist 37: 363–366 (2005); Hale 1990: 192–193, 195; Krog, Norw. J. Bot. 25: 51–54 (1978); Nash et al. 2004: 316–317.

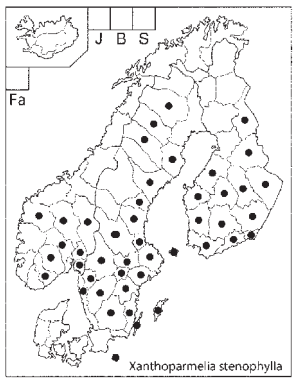
Figs: Ahti & Hawksworth 2005: 364; Brodo et al. 2001: 740; Holien & Tønsberg 2006: 60; Jahns 1980: 187; Krog et al. 1994: 309; Sérusiaux et al. 2004: 177; Wirth 1995: 669.

Thallus loosely adnate, to 20 cm diam. Lobes sublinear, dichotomously to irregularly branched, 1–6 mm wide, with rounded tips, separate or imbricate; upper surface greenish to greyish yellow, smooth, shiny to dull; soredia and isidia absent; lower surface pale brown to brown, with brown simple rhizines. Apothecia frequent, substipitate, margin usually smooth, to 15 mm diam.; disc brown. Spores ellipsoid, 8–9 × 4–5 µm. Pycnidia common, immersed. Conidia dumbbell-shaped, 5–6 × 1 µm.

Chemistry. Cortex C–, K–, KC+ yellow, PD–, HNO_3–; usnic acid. Medulla C– K+ yellow, KC–, PD+ red; consalazinic, salazinic and usnic acids together with traces of norstictic and protocetraric acids.

Habitat. Saxicolous on siliceous rocks, especially in agricultural areas, also at riparian situations.

Distribution. Common in fairly continental areas in Finland, Norway and Sweden northwords to the southern boreal zone, rarer northwards. In western coastal areas less common. **D:** *Brn*. **F:** *A V U EK St EH ES EP PH PS PK KP Kn Ks*. **N:** *Øf Ak He Op Bu Te AA SF.* **S:** *Öl Gtl Klm SmI Bh Dls Vg Ög Nrk Srm Vrm Vsm Upl Dlr Gst Hls Mpd Ång Vb LyL PL LuL*. Widespread in western Eurasia.



Note. Characterized by the loosely adnate thallus, the brown lower surface, the lack of soralia and isidia and the medullary chemistry. The presence of salazinic rather than fumarprotocetraric acid in the medulla distinguishes *X. stenophylla* from *X. protomatrae*, which has a much more restricted distribution.

10. **Xanthoparmelia tinctina** (Maheu & Gillet) Hale

Phytologia 28: 28: 489 (1974). – *Parmelia tinctina* Maheu & Gillet, Bull. Soc. Bot. France 72: 860 (1925). – Type: Morocco, Boulhaut, Gillet 115x (PC lectotype, Hale, Smithsonian Contr. Bot. 74: 213, 1990).

N: kyststeinlav **S:** kustkaklav

Literature: Almborn, Kungl. Svenska Vetenskapsakad. Avh. Naturskyddsärenden 11: 76 (1955); Hale: 1990 213–214; Magnusson, Bot. Notiser 1942: 10–11; Nash et al. 2004: 321–322.

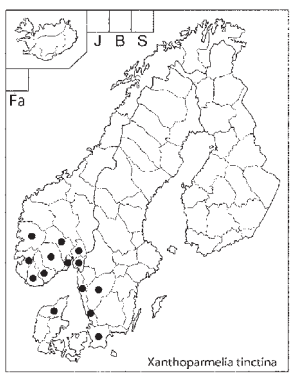
Figs: Hale 1990: 215; Krog et al. 1994: 309.

Thallus adnate, to 6 cm wide. Lobes ± irregular, somewhat elongate, plane to slightly convex, separate, contiguous to slightly imbricate, 2–3 mm wide; upper surface yellow-green, smooth and shiny; isidia frequent, laminal, globose to subcylindrical, rarely inflated and erumpent; lower surface black and smooth, with sparse to frequent, simple black rhizines. Apothecia not observed in Nordic material Pycnidia rare, immersed. Conidia weakly dumbbell-haped, 5–6 × 1 µm.

Chemistry. Cortex C–, K–, KC+ yellow, PD–, HNO_3–; usnic acid. Medulla C–, K+ red, KC–, PD+ red; salazinic, consalazinic and norstictic acids.

Habitat. Saxicolous on siliceous rocks.

Distribution. Mainly southern and western in the Nordic countries. **D:** *NJy*. **N:** *Øf Ak Bu Vf Te AA VA Ro Ho.* **S:** *Sk Hl Bh Vg.* Occurs in temperate Europe to southern Fennoscandia, northern Africa, Macaronesia, Eurasia and Pakistan.



Note. The globose or barrel-shaped isidia combined with the K+ red medulla distinguish *X. tinctina* from other *Xanthoparmelia* species in the Nordic countries.

11. **Xanthoparmelia verruculifera** (Nyl.) O. Blanco et al.

Taxon 53: 972 (2004). – *Parmelia verruculifera* Nyl, Flora 61: 247 (1878). – TYPE: France, Ille-et-Vilaine, Fougères, Delise (H-NYL 34393 lectotype, Laundon, Lichenologist 4: 303, 1970).

Syn. *Neofuscelia verruculifera* (Nyl.) Essl., *Parmelia glomellifera* (Nyl.) Nyl., *Parmelia isidiotyla* var. *glomellifera* (Nyl.) Maas Geest., *Parmelia loxodes* var. *verruculifera* (Nyl.) Clauzade & Cl.Roux

D: småknoppet skållav **F:** karstaruskokarve **N:** stiftskjærgårdslav **S:** stiftsköldlav

Red-listed in: **F**

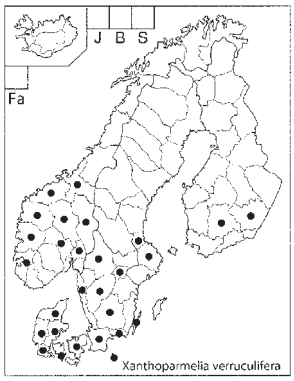
Literature: Esslinger 1977: 154–156; Laundon, Lichenologist 4: 303–304 (1970); Leuckert et al., Decheniana 127: 1–36, Abb. 20 (1975); Tønsberg et al., Sommerfeltia 23: 119–121 (1996).

Figs: Sérusiaux et al. 2004: 109; Wirth 1995: 658.

THALLUS ± closely appressed to the substrate, to 10 cm diam. Lobes flat, short and rounded, 1–2 mm wide; upper surface greyish brown to dark brown, rugose or fissured, sometimes distinctly yellowish towards the lobe apices, smooth and maculate, occasionally pruinose; soredia and pseudocyphellae absent; isidia frequent, globose, eventually becoming erumpent, exposing the white medulla; lower surface black, with simple rhizines. APOTHECIA rare, sessile to somewhat stipitate, to 3.5 mm diam., margin often isidiate; disc brown. Spores ellipsoid, 8–10 × 4.5–6 µm. PYCNIDIA rare, immersed. Conidia weakly dumbbell-shaped, 5–6.5 × 1 µm.

Chemistry. Cortex C–, K–, KC–, PD–, HNO_3+ green to bluish. Medulla C–, K–, KC+ rose or red, PD–; divaricatic and stenosporic acids, occasionally with accessory gyrophoric acid.

Habitat. Saxicolous on siliceous rocks.



Distribution. Restricted to the southern part of Fennoscandia of the Nordic countries. **D:** *NJy ØJy VJy SJy Fyn Sjæ Brn*. **F:** *EH ES.* **N:** *Ak He Op Bu Ro Ho SF MR ST.* **S:** *Sk Bl Öl SmI Bh Vg Nrk Vrm Upl Gst.* Occurs in Europe, northern Africa and North America.

Note. The pustulate isidia are characteristic of both *X. loxodes* and *X. verruculifera*, but *X. verruculifera* usually has a darker thallus, thinner lobes and smaller isidia. The two species also differ chemically.

APPENDIX

Nomenclatural novelties

Allocetraria Kurok. & M.J.Lai
T. Randlane & A. Thell

Allocetraria madreporiformis (Ach.) Kärnefelt & A.Thell

Nova Hedwigia 62: 508 (1996). – *Dufourea madreporiformis* Ach., Lichenogr. Universalis: 525 (1810). – Type: Switzerland, Schleicher, Pl. Crypt. Helv. 2, no. 67 (UPS lectotype, here designated).

Arctoparmelia Hale
R. Moberg & A. Thell

Arctoparmelia incurva (Pers.) Hale

Mycotaxon 25: 252 (1986). – *Lichen incurvus* Pers., Ann. Bot. (Usteri) 7 (sic!): 24 (1794). Type: Sweden, Fries, Lich. Suec. exs. no. 260 (UPS neotype, here designated).

Cetraria Ach.
A. Thell & I. Kärnefelt

Cetraria aculeata (Schreb.) Fr.

Nov. Sched. Crit. Lich. Suec. 4: 32 (1826). – *Lichen aculeatus* Schreb., Spic. Fl. Lips.: 125 (1771). – Type: Icon in Dillenius, Hist. Musc.: tab. 17, Fig. 31B (1742) (lectotype, Laundon, Lichenologist 16: 216, 1984); without locality, corresponding specimen in Herb. Dillenius (OXF epitype, here designated).

Cetraria sepincola (Ehrh.) Ach.

Methodus: 297 (1803). – *Lichen sepincola* Ehrh., Hannover Mag. 21: 203 (1783) [= Beiträge zur Naturkunde 2(14): 95 (1788)]. – Type: [Sweden] Upsaliae, Ehrhart, Phytophylacium Ehrhartianum no. 90 (UPS neotype, here designated)

Evernia Ach.
R. Moberg & A. Thell

Evernia illyrica (Zahlbr.) Du Rietz

Svensk Bot. Tidsk. 20: 90 (1926). – *Evernia divaricata* subsp. *illyrica* Zahlbr., Ann. K. K. Naturhist. Hofmus. 19: 418 (1904). – Type: Slovenia, Nova Gorica, ('Österreich, Litorale austriacum, sylva "Trnovaner Wald" prope Görtz'), Loitlesberger in Zahlbruckner, Krypt. exs. Vindob. no. 1049 (UPS lectotype, here designated).

Evernia mesomorpha Nyl.

Lich. Scand.: 74 (1861). – Type: Finland, Etelä-Savo ('Savolaxia'), Taipalsaari, 1852 E. Nylander (H-NYL 35772, lectotype, here designated).

Flavocetraria Kärnefelt & A.Thell
T. Randlane & A. Thell

Flavocetraria cucullata (Bellardi) Kärnefelt & A.Thell

in Kärnefelt et al., Acta Bot. Fenn. 150: 81 (1994). – *Lichen cucullatus* Bellardi, Osserv. Bot.: 54 (1788). – Type: [Italy] "Al monte Ritten presso Bolzano, nel Tirolo meridionale l'esempl. inferiore, il superiore dalla Valdobbia", 1862. Hausmann & Carestia, Erbar. Crittogam. Ital. no. 926 (FI neotype, here designated).

Hypogymnia (Nyl.) Nyl.
M. Westberg, T. Ahti & A. Thell

Hypogymnia austerodes (Nyl.) Räsänen

Ann. Bot. Soc. Zool.-Bot. Fenn. Vanamo 18(1): 13 (1943). – *Parmelia austerodes* Nyl., Flora 64: 537 (1881). – Type: [Norway, Sør-Trøndelag] Dovre Oppdal, Kongsvoll, 1881, Norrlin 654 (H-NYL 34147 lectotype, here designated).

Hypogymnia bitteri (Lynge) Ahti

Ann. Bot. Fenn. 1: 20 (1964). – *Parmelia bitteri* Lynge, Videnskapsselsk. Skr., ser. 1, Mat. Naturvet. Kl. 7: 138 (1921). – Type: Switzerland, Schleicher 279a (H-ACH 1384B lectotype, here designated).

Hypogymnia farinacea Zopf

Ann. Chemie 352: 42 (1907). – Type: Sweden, Fries, Lich. Suec. exs. no. 291 (UPS lectotype, here designated).

Hypogymnia subobscura (Vain.) Poelt

Mitt. Bot. Staatssamml. München 4: 298 (1962). – *Parmelia subobscura* Vain., Ark. Bot. 8 (4): 33 (1909). – Type: Russia. Chukchi National Okrug, Jinretlen, 1878–1879 Almquist, (S lectotype, here designated).

Hypogymnia tubulosa (Schaer.) Hav.

Bergens Mus. Årbog 2: 31 (1918). – *Parmelia ceratophylla* var. *tubulosa* Schaer., Lich. Helv. Spicil. 10: 459 (1840). – Type: France, 'De l'ouest de la France', 1836 Delise (G lectotype, Ahti & Clerc, here designated).

Hypogymnia vittata (Ach.) Parrique

Acta Soc. Linn. Bordeaux 53: 34 (1898). – *Parmelia physodes* var. *vittata* Ach., Methodus: 251 (1803). – Type: Without locality (H-ACH 1398A lectotype, here designated).

Melanelia Essl.

M. Westberg & A. Thell

Melanelia disjuncta (Erichsen) Essl.

Mycotaxon 7: 46 (1978). – *Parmelia disjuncta* Erichsen, Ann. Mycol. 37: 78 (1939) (nom. nov. for P. *sorediata* var. *coralloidea* Lynge). – Type: Germany. Bavaria, am Wege von Krottensee nach Neuhaus in der Oberpfalz, Arnold, Lich. exs. 743b (M lectotype, here designated).

Menegazzia A.Massal.

M. Westberg & A. Thell

Menegazzia terebrata (Hoffm.) A.Massal.

Neagen. Lich.: 1 (1854). – *Lobaria terebrata* Hoffm., Deutschl. Flora: 151 (1796). – Type: [Switzerland] Schaerer, Lich Helv. exs. no. 365 (UPS neotype, here designated).

Parmelina Hale

A. Thell

Parmelina tiliacea (Hoffm.) Hale

Phytologia 28: 483 (1974). – *Lichen tiliaceus* Hoffm., Enum. Lich.: 96 (1784). – Type: Europe, icon in Hoffmann, Enum. Lich.: 1784, tab. 16, Fig. 2 (lectotype, here designated); Sweden, Skåne, Eslöv par., Ellinge, at the castle, 2010 Thell 1001 (to be distributed in Moberg, Lich. exs. Ups) (LD epitype, here designated).

Parmeliopsis (Nyl.) Nyl.

T. Ahti, R. Moberg & A. Thell

Parmeliopsis ambigua (Wulfen) Nyl.

Lich. Lapp. Orient. 121 (1866). – *Lichen ambiguus* Wulfen in Jacquin, Collectanea 4: 239 (1791). – Type: Icon in Jacquin, Collectanea 4: tab. 20, Fig. 2a (lectotype, here designated); [Germany, Bavaria], München (Munich), "längs der Römerstrasse zwischen Sauerlach und Hofolding", 1893 Arnold in Arnold, Lich. Monac. exs. no. 283 (UPS epitype, here designated).

Pleurosticta Petr.

M. Westberg & A. Thell

Pleurosticta acetabulum (Neck.) Elix & Lumbsch

in Lumbsch & Elix, Mycotaxon 33: 453 (1988). – *Lichen acetabulum* Neck., Delic. Gallo-Belg. 2: 506 (1768). – Type: France, Vosges, Docelles, H. & V. Claudel in Claudel & Harmand, Lich. Gall. exs. no. 119 (UPS neotype, here designated).

Pseudephebe M.Choisy

L. Myllys, S. Velmala & T. Ahti

Pseudephebe minuscula (Nyl. ex Arnold) Brodo & D.Hawksw.

Opera Bot. 42: 140 (1977). – *Imbricaria lanata* var. *minuscula* Nyl. ex Arnold, Verh. K. K. Zool.-Bot. Ges. Wien 28: 293 (1878). – Type: Austria, Tirol, summit of Kreuzspitze by Vent in Ötztal (Oezthale), 11000 ft., Arnold 83 (H-NYL 34356 lectotype, here designated).

Tuckermannopsis

T. Ahti & A. Thell

Tuckermannopsis chlorophylla (Willd.) Hale

in Egan, Bryologist 90: 164 (1987). – *Lichen chlorophyllus* Willd. in Humboldt, Fl. Friberg. Specim.: 20 (1793). – Type: Germany, "In cortice *Pyni sylvestris* beym Vorwerk Hals copiose", Willdenow; Denmark, Jylland, Vendsyssel, W of Råbjerg Mile, on trunks of *Pinus mugo* on NW margin of a small thicket in dune, 1994 Sten N. Christensen, Lich. Danici exs. no 34 (C neotype, here designated).

Usnea
P. Clerc

Usnea cylindrica P.Clerc sp. nov.

Thallus pendulus, longiusculus, usque ad 50 cm; ramificationes plus minusve typo filamentoso, ramulis valde parallelis, plus minusve isodiametricis; basi nigrescens; ramuli cylindrici, segmentati; segmenta cylindrica, teretia; soralia punctiformia vel demum accrescentia, distincte stipitata, summo fiberculatorum enascentia; isidiomorphae vulgo frequentes. Cortex crassus (9–16%), in sectione longitudinali opacus; medulla satis tenuis (10–19%), densa vel compacta, albida; axis centralis crassus (38–54%). Ascomata rara, plerumque lateralia. Acidum usnicum et acidum salazinicum continens.

Type: Sweden, Småland, Norra Hestra par., Kyrkebol, 12.VII.1938 Stenholm (UPS L-184352 holotype).

For detailed description see p. 115.

Usnea dasypoga (Ach.) Nyl.

in Norrlin, Meddel. Soc. Fauna Fl. Fenn. 1: 14 (1876) – *Usnea plicata* β [var.] *dasypoga* Ach., Methodus: 312 (1803). – Type: [Switzerland] Helvetia, Schleicher (H-ACH lectotype, here designated).

Xanthoparmelia
J. A. Elix & A. Thell

Xanthoparmelia mougeotii (Schaer. ex D.Dietr.) Hale

Phytologia 28: 28: 488 (1974). – *Parmelia mougeotii* Schaer. ex D.Dietr., Deutschl. Kryptog. Gewächse: 24 (1846) – Type: Icon, ibid., Tab. 288, Fig. 288 (lectotype, here designated); France, Vosges, Bruyères (Brujerium), Mt. Heledré, Mougeot; Schaerer, Lich. Helv. exs. no. 548 (UPS epitype, here designated).

Alectoria ochroleuca

Alectoria sarmentosa subsp. *sarmentosa*

Alectoria sarmentosa subsp. *sarmentosa*

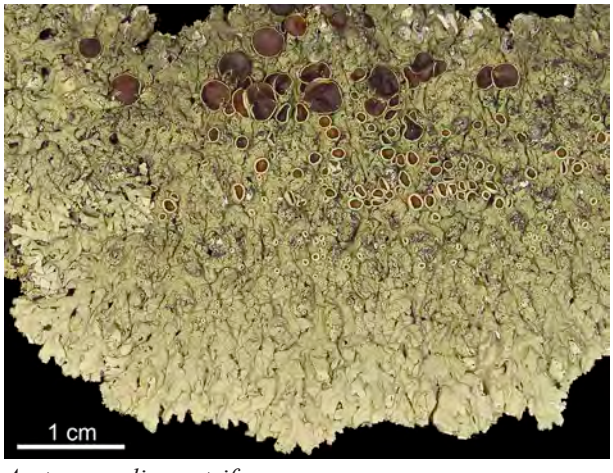
Alectoria sarmentosa subsp. *vexillifera*

Allantoparmelia alpicola

Allocetraria madreporiformis

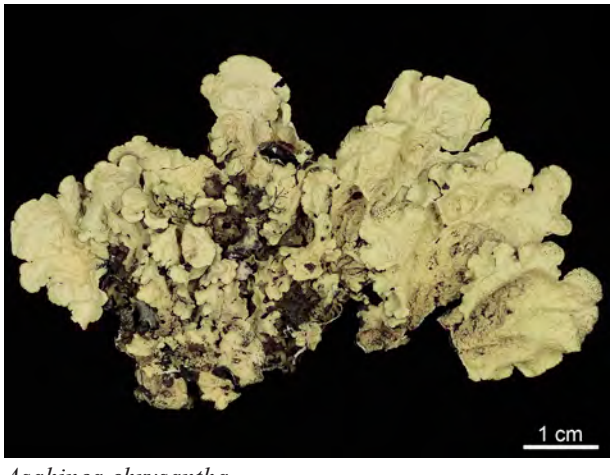
Arctocetraria andrejevii

Arctocetraria nigricascens

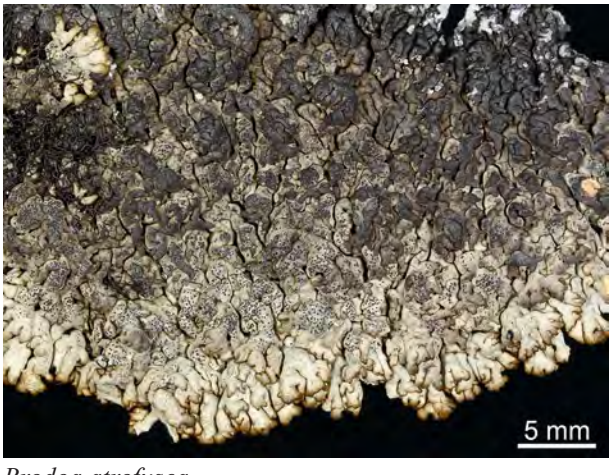


Arctoparmelia centrifuga

Arctoparmelia incurva



Asahinea chrysantha



Brodoa atrofusca

Brodoa intestiniformis

Brodoa oroarctica

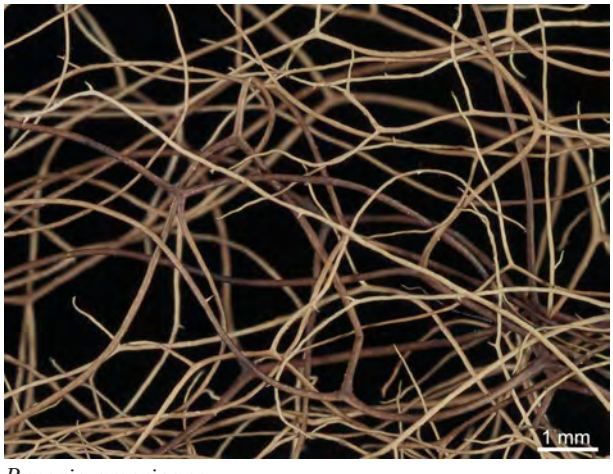
Bryocaulon divergens

Bryocaulon divergens

Bryocaulon hyperborea

Bryocaulon hyperborea

Bryoria americana



Bryoria americana

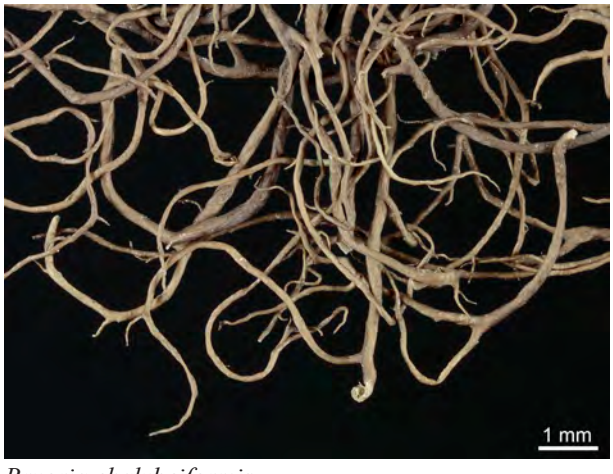
Bryoria bicolor

Bryoria bicolor

Bryoria capillaris

Bryoria capillaris

Bryoria chalybeiformis



Bryoria chalybeiformis

Bryoria fremontii

Bryoria fremontii

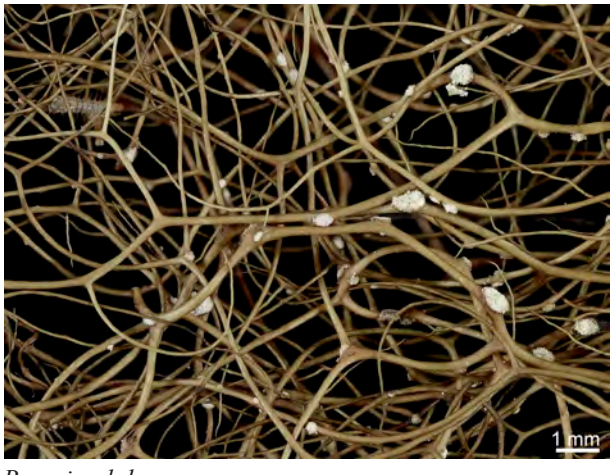
Bryoria furcellata

Bryoria furcellata

Bryoria fuscescens

Bryoria fuscescens

Bryoria glabra



Bryoria glabra

Bryoria implexa

Bryoria implexa

Bryora lanestris

Bryora lanestris

Bryoria nadvornikiana

Bryoria nadvornikiana

Bryoria nitidula

Bryoria nitidula

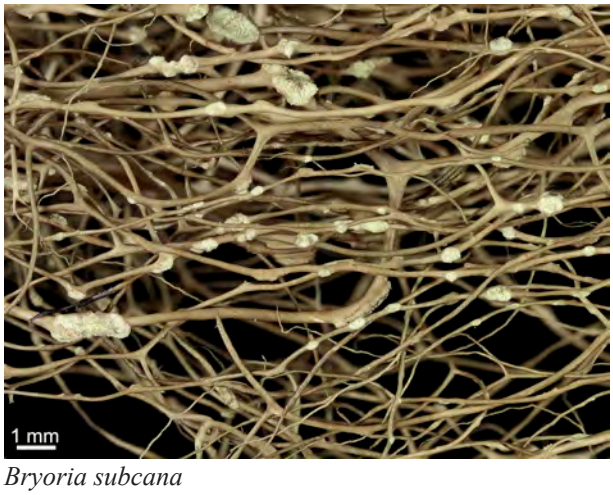
Bryoria simplicior

Bryoria simplicior

Bryoria smithii

Bryoria smithii

Bryoria subcana



Bryoria subcana

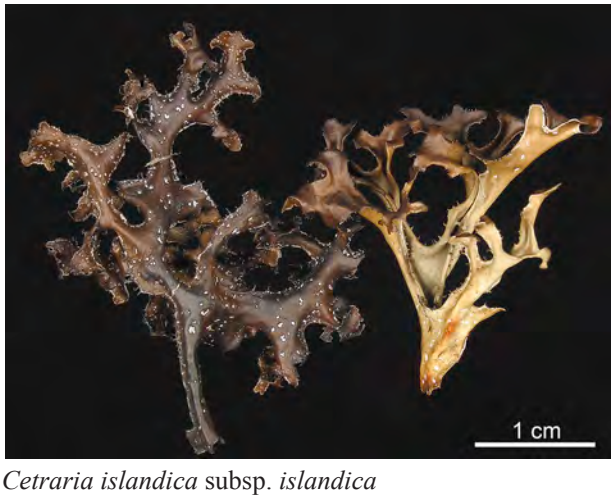
Bryoria tenuis

Bryoria tenuis

Cetraria aculeata

Cetraria ericetorum

Cetraria islandica subsp. *crispiformis*

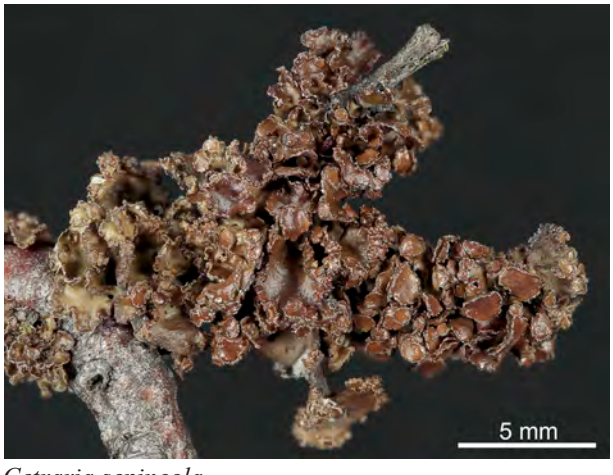


Cetraria islandica subsp. *islandica*

Cetraria muricata

Cetraria nigricans

Cetraria odontella



Cetraria sepincola

Cetrariella commixta

Cetrariella delisei

Cetrariella fastigiata

Cetrelia olivetorum

Cornicularia normoerica

Dactylina arctica

Dactylina ramulosa

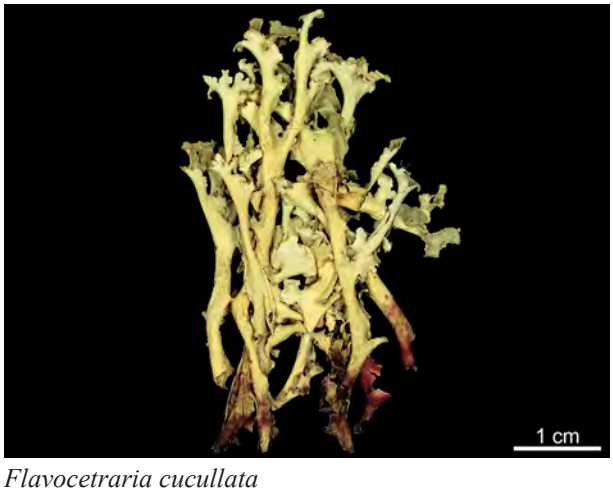
Evernia divaricata

Evernia divaricata

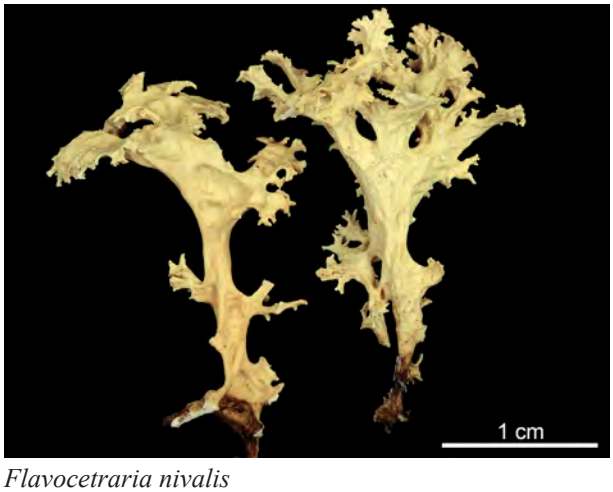
Evernia illyrica

Evernia mesomorpha

Evernia prunastri



Flavocetraria cucullata



Flavocetraria nivalis

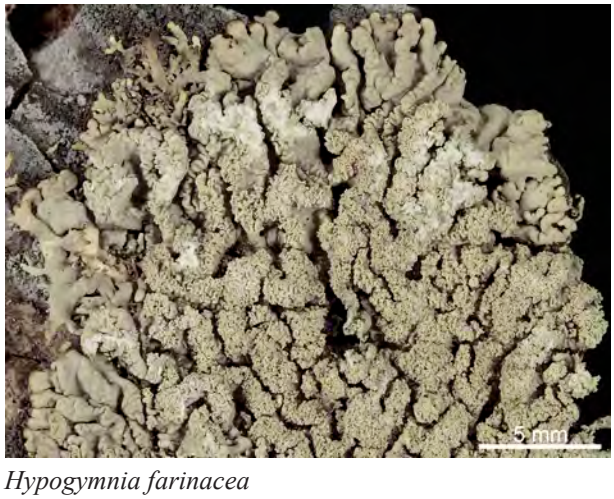
Flavoparmelia caperata

Flavoparmelia soredians

Gowardia nigricans

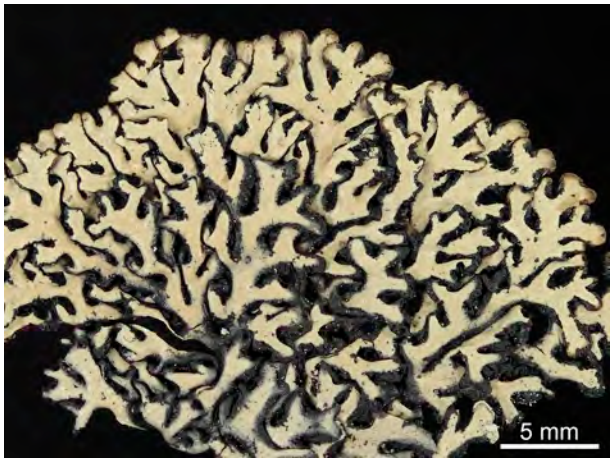
Hypogymnia austerodes

Hypogymnia bitteri

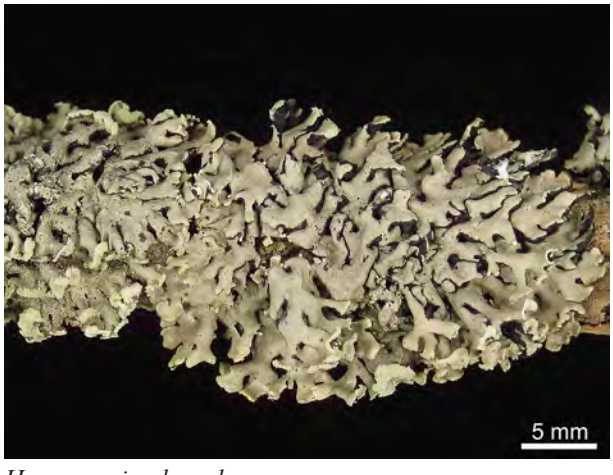


Hypogymnia farinacea

Hypogymnia hultenii



Hypogymnia incurvoides



Hypogymnia physodes

Hypogymnia subobscura

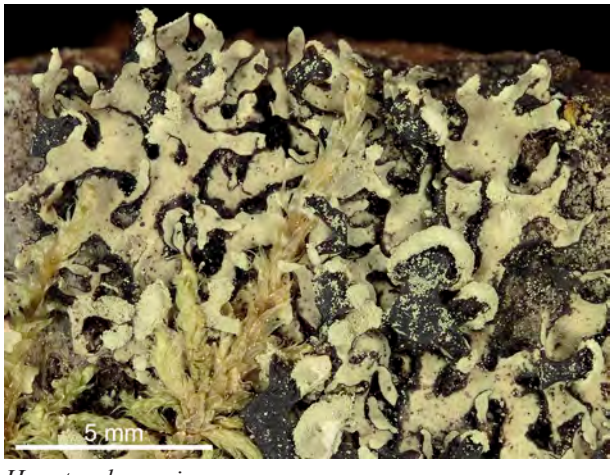
Hypogymnia tubulosa

Hypogymnia vittata

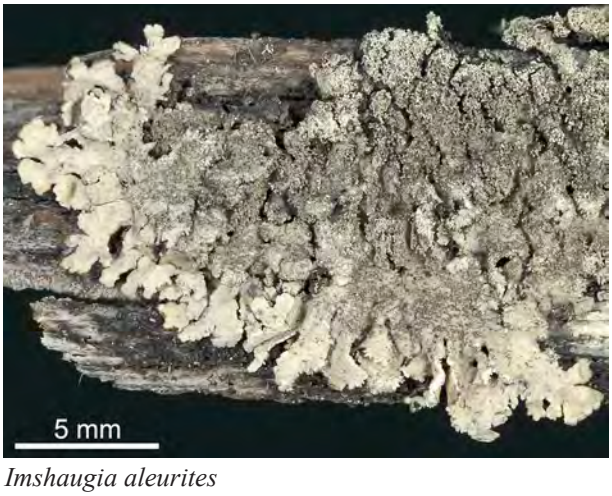
Hypotrachyna afrorevoluta

Hypotrachyna laevigata

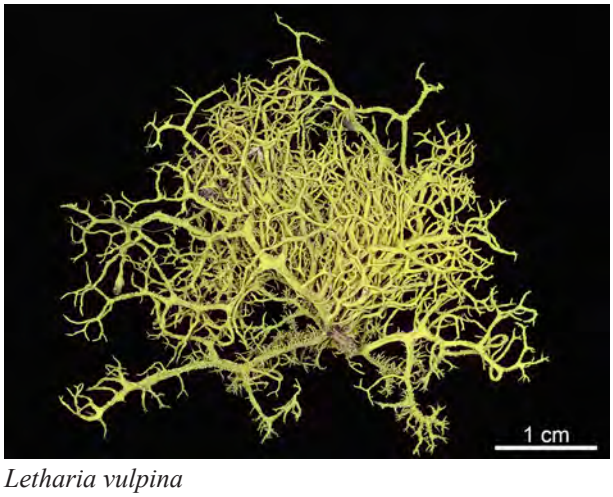
Hypotrachyna revoluta



Hypotrachyna sinuosa



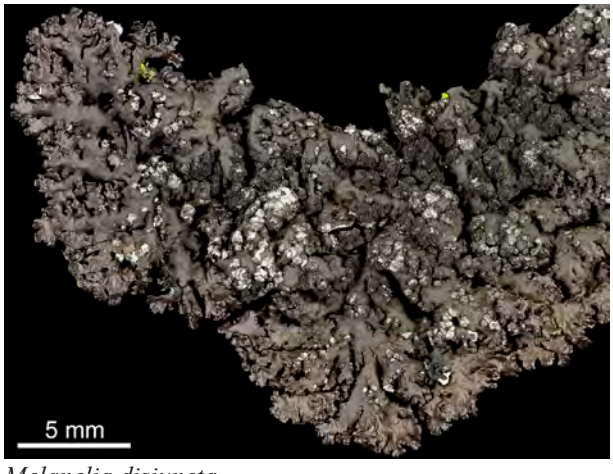
Imshaugia aleurites



Letharia vulpina

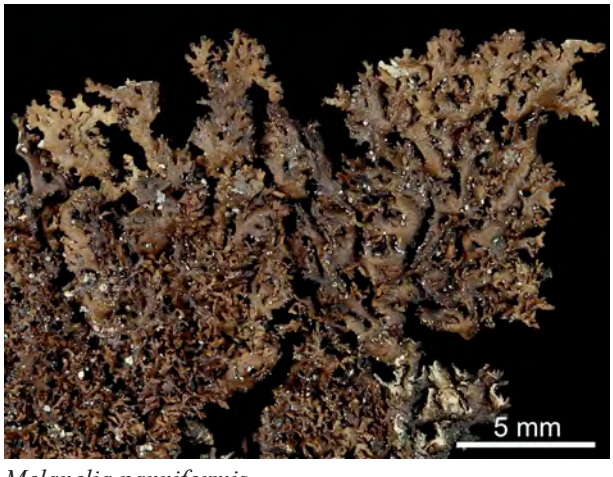
Masonhalea inermis

Melanelia agnata



Melanelia disjuncta

Melanelia hepatizon



Melanelia panniformis

Melanelia sorediata

Melanelia stygia

Melanelia tominii

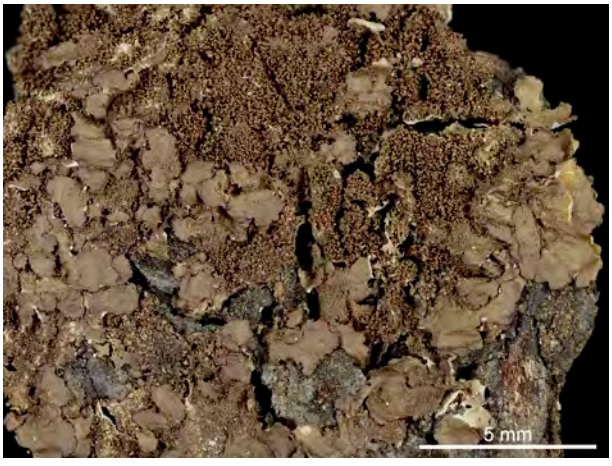
Melanelixia fuliginosa

Melanelixia glabra

Melanelixia glabratula

Melanelixia subargentifera

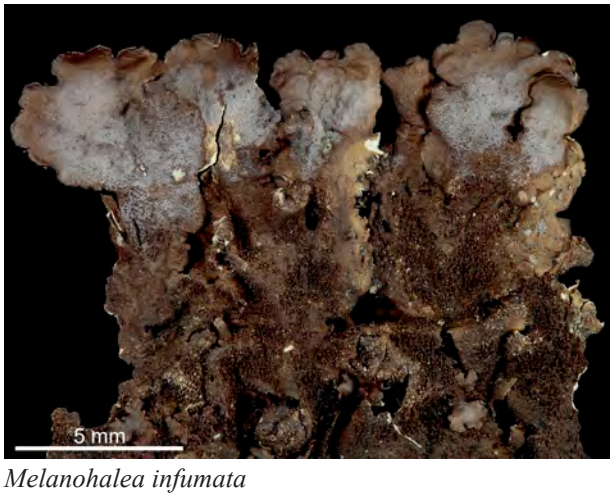
Melanelixia subaurifera



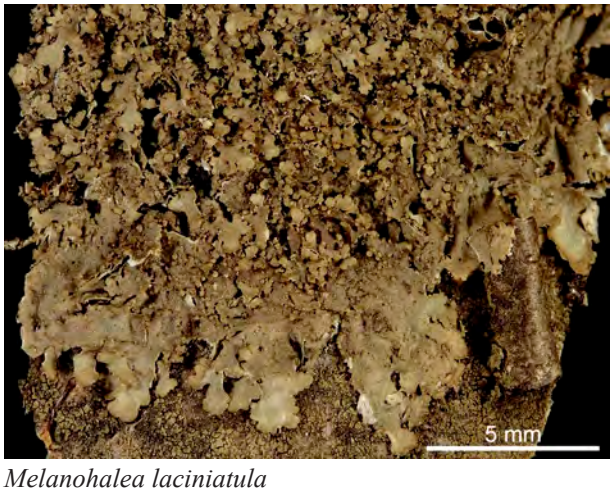
Melanohalea elegantula

Melanohalea exasperata

Melanohalea exasperatula



Melanohalea infumata



Melanohalea laciniatula

Melanohalea olivacea

Melanohalea septentrionalis

Menegazzia subsimilis

Menegazzia terebrata

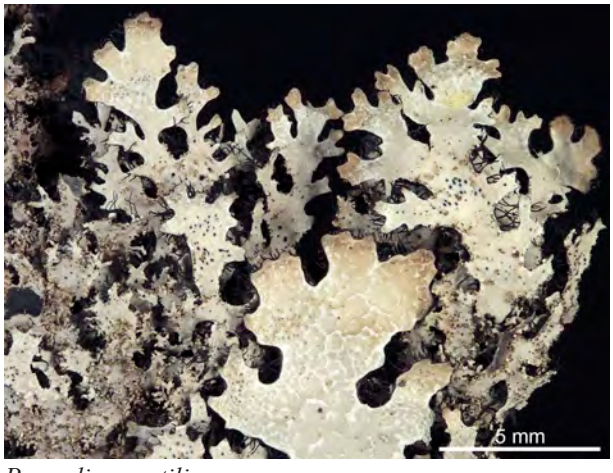
Parmelia ernstiae

Parmelia fraudans

Parmelia omphalodes subsp. *discordans*

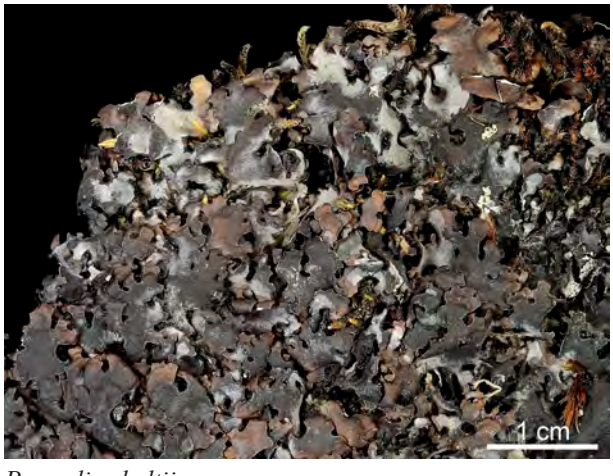
Parmelia omphalodes subsp. *omphalodes*

Parmelia pinnatifida



Parmelia saxatilis

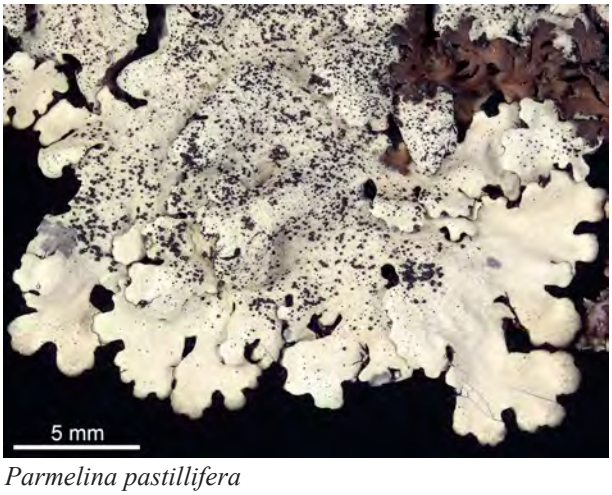
Parmelia serrana



Parmelia skultii

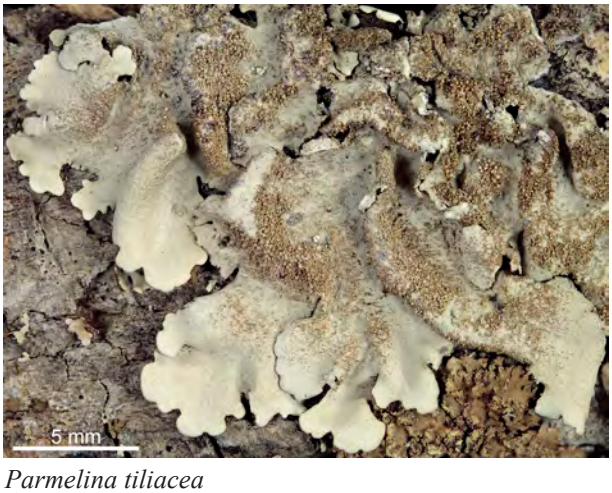
Parmelia submontana

Parmelia sulcata

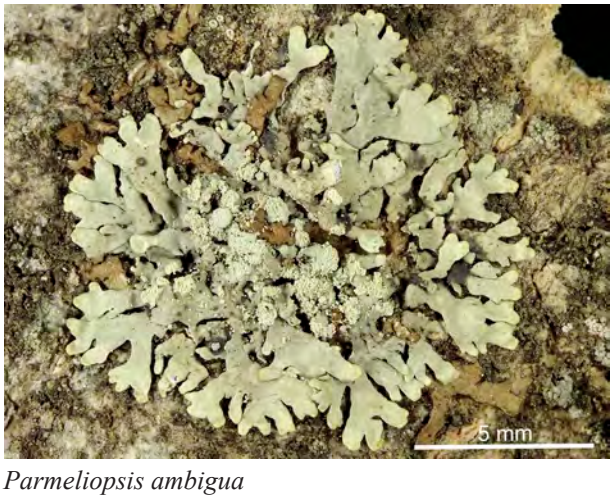


Parmelina pastillifera

Parmelina quercina

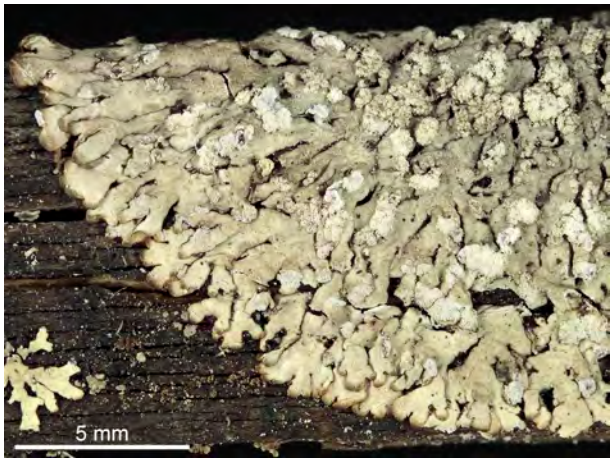


Parmelina tiliacea

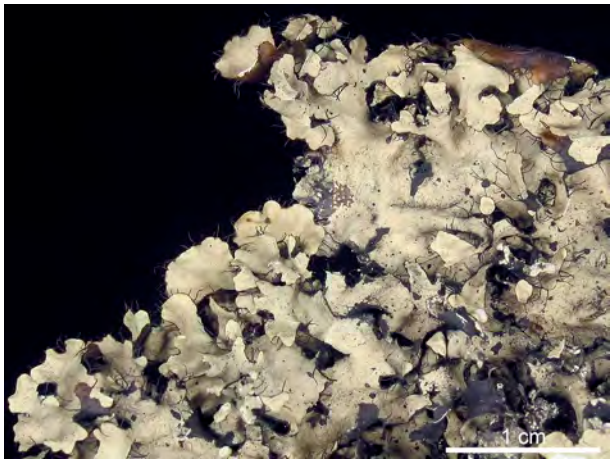


Parmeliopsis ambigua

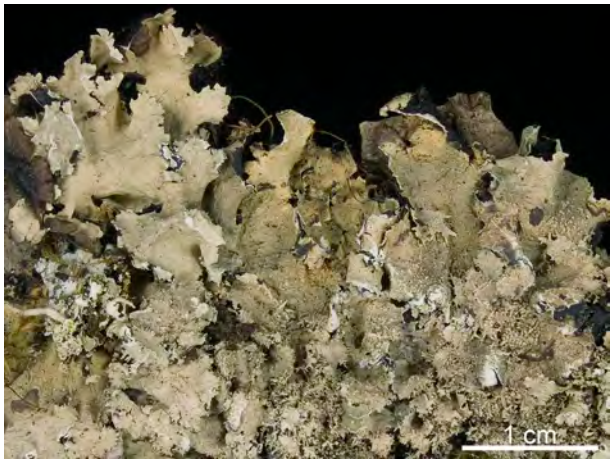
Parmeliopsis esorediata



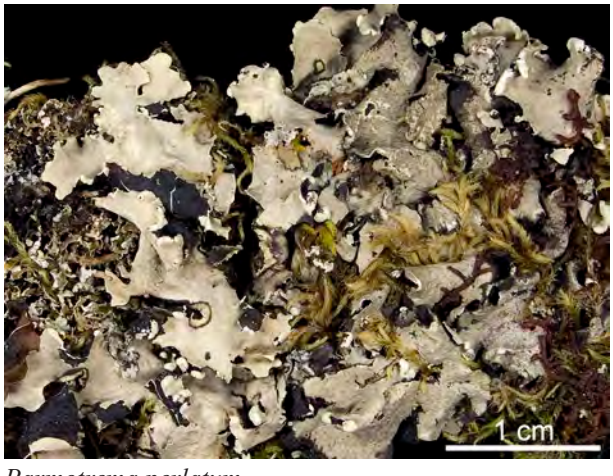
Parmeliopsis hyperopta



Parmotrema arnodii

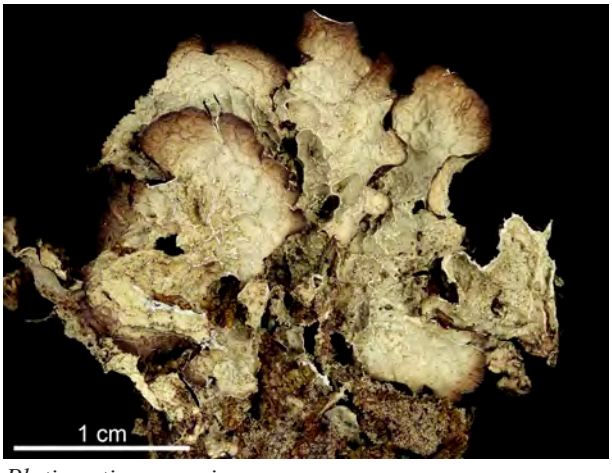


Parmotrema crinitum

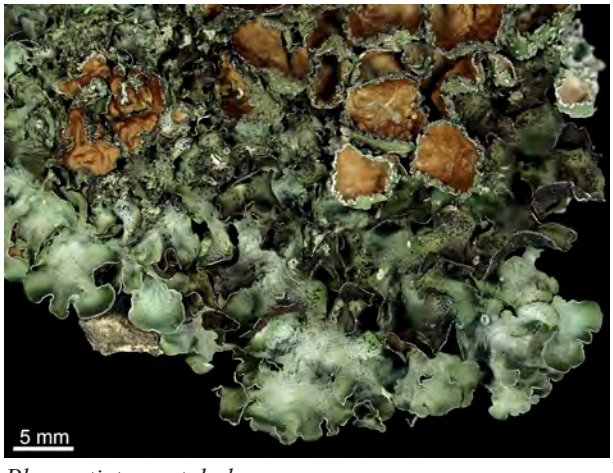


Parmotrema perlatum

Platismatia glauca



Platismatia norvegica



Pleurosticta acetabulum

Pseudephebe minuscula

Pseudephebe pubescens

Pseudevernia furfuracea

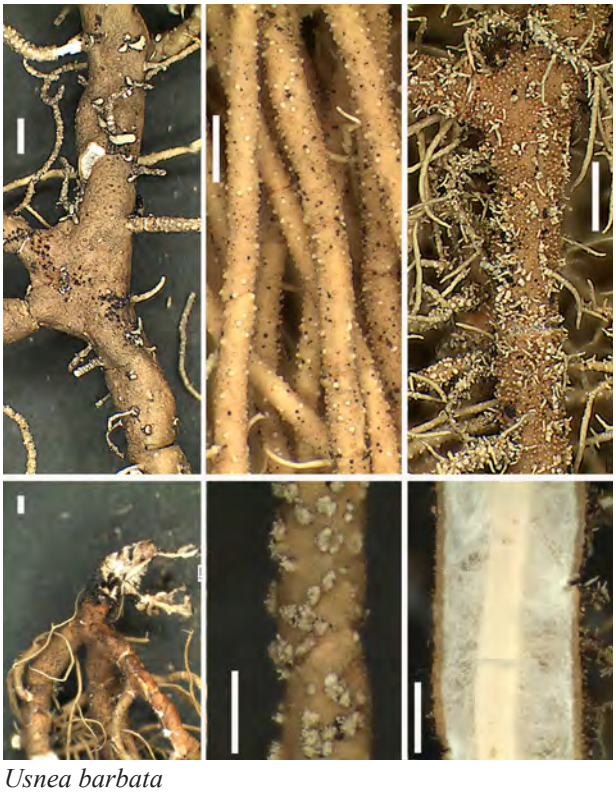
Punctelia jeckeri

Punctelia stictica

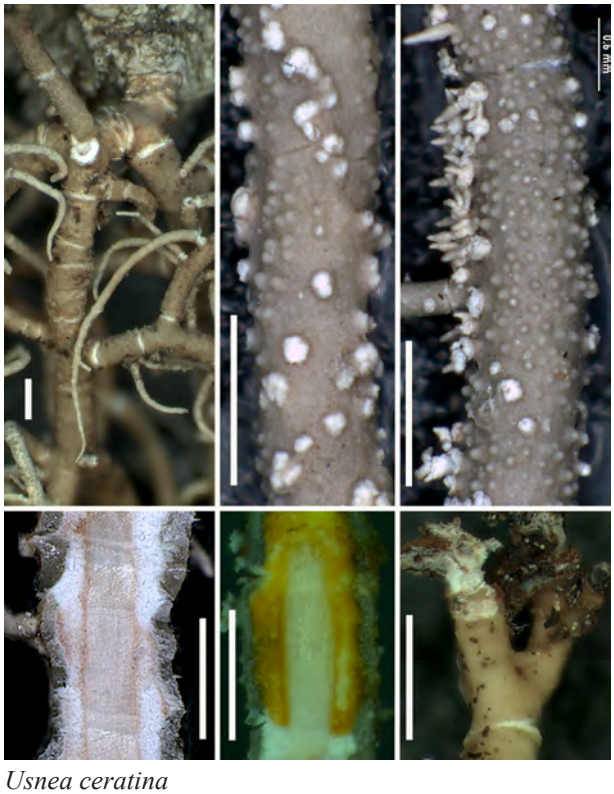
Punctelia subrudecta

Tuckermannopsis chlorophylla

Tuckermannopsis ciliaris

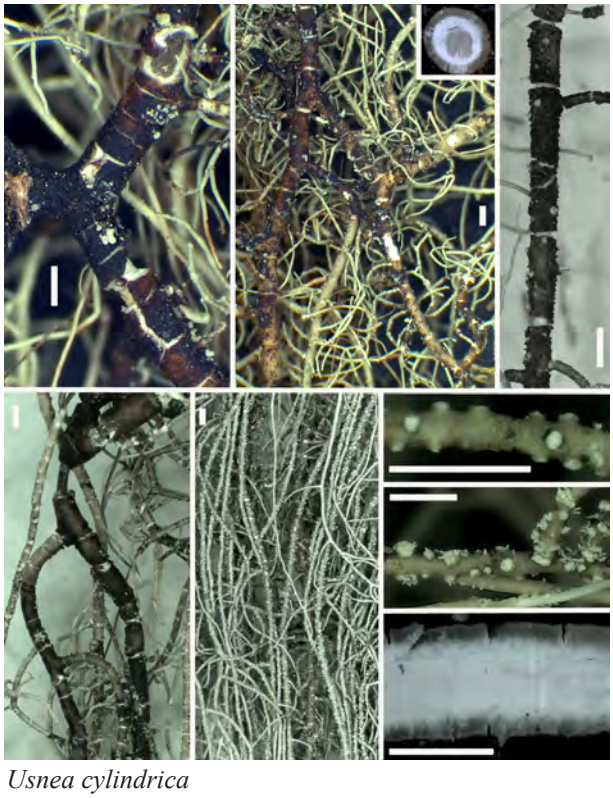


Usnea barbata

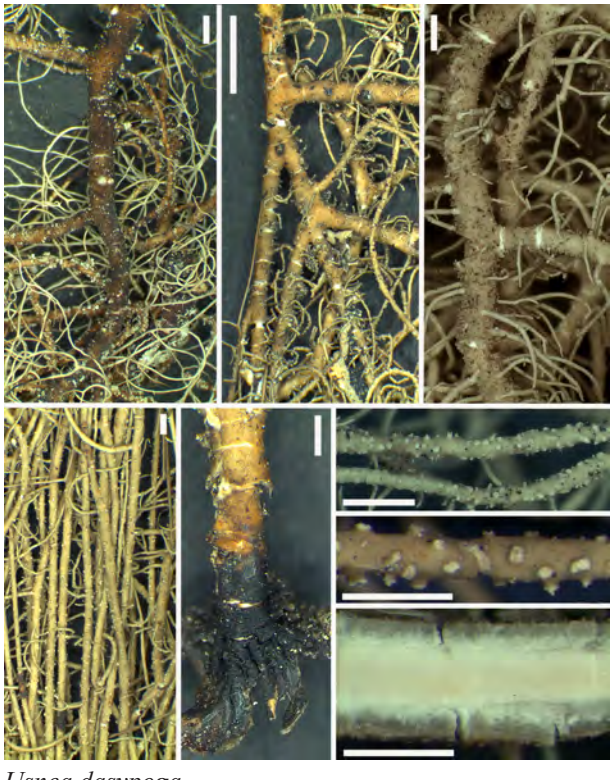


Usnea ceratina

Usnea cornuta

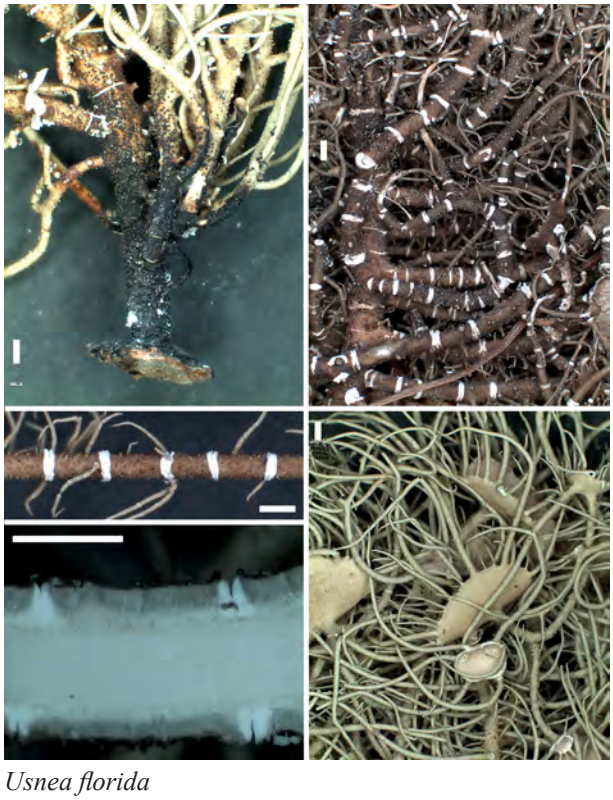


Usnea cylindrica

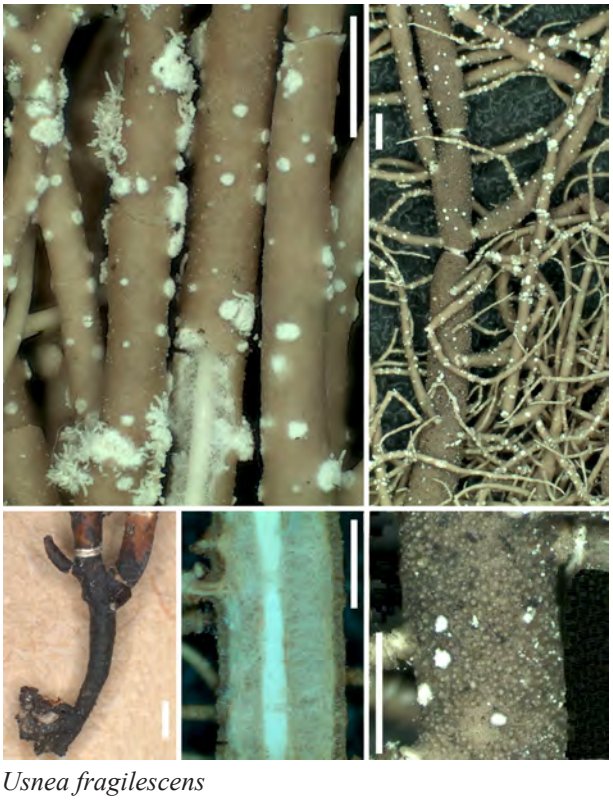


Usnea dasypoga

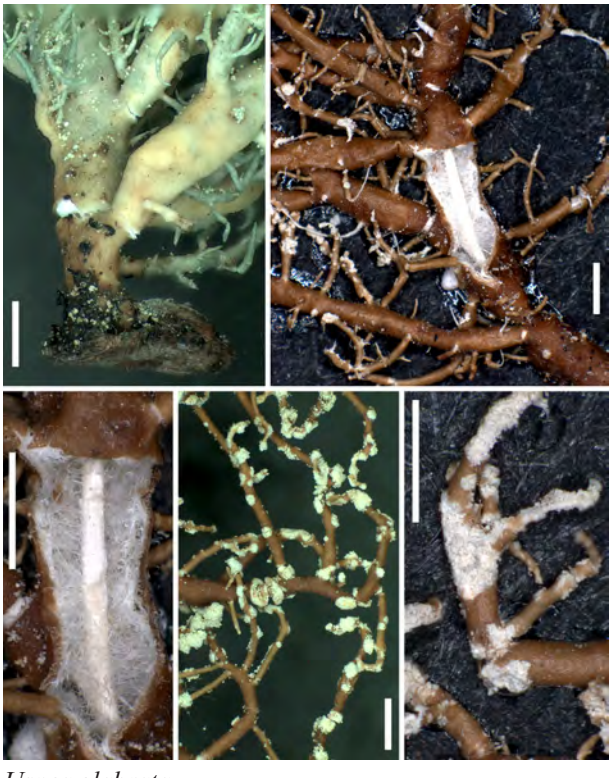
Usnea flammea



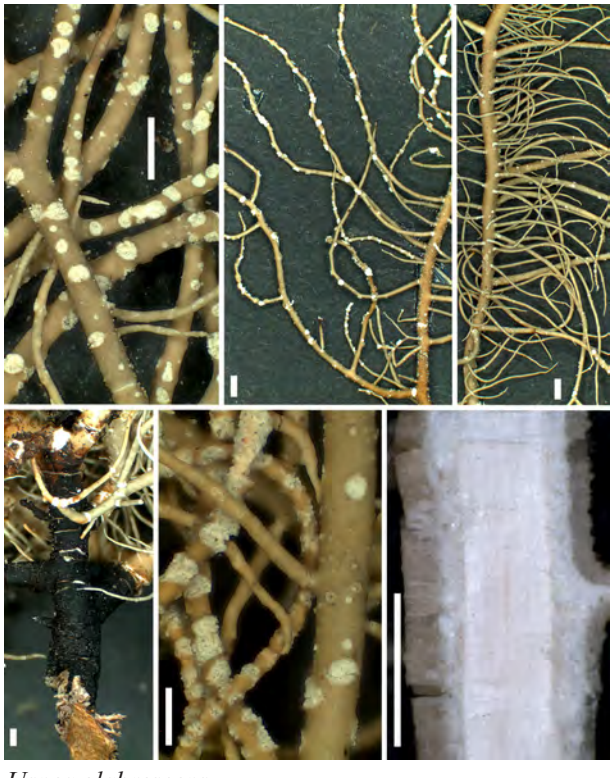
Usnea florida



Usnea fragilescens

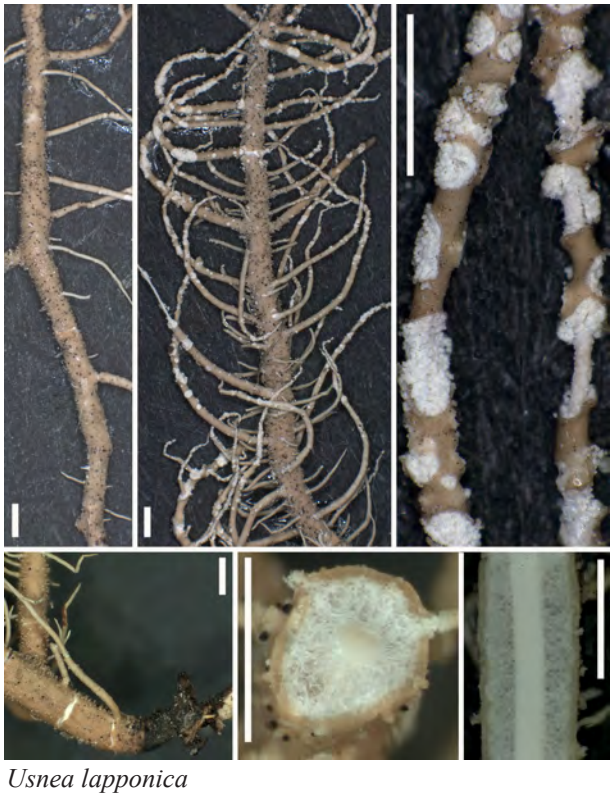


Usnea glabrata

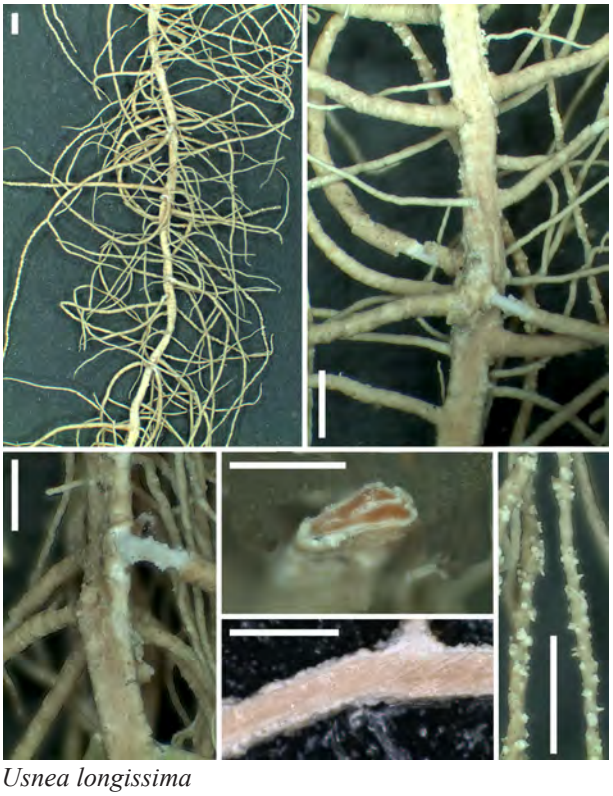


Usnea glabrescens

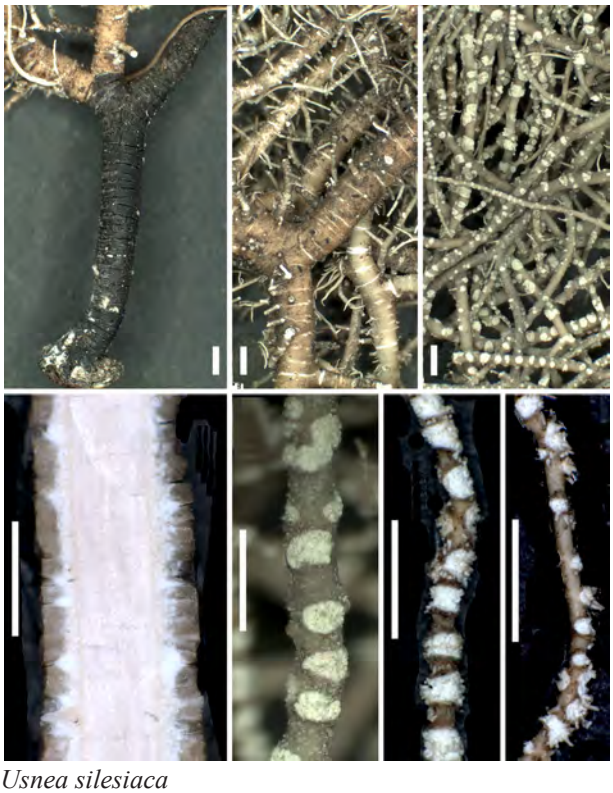
Usnea hirta



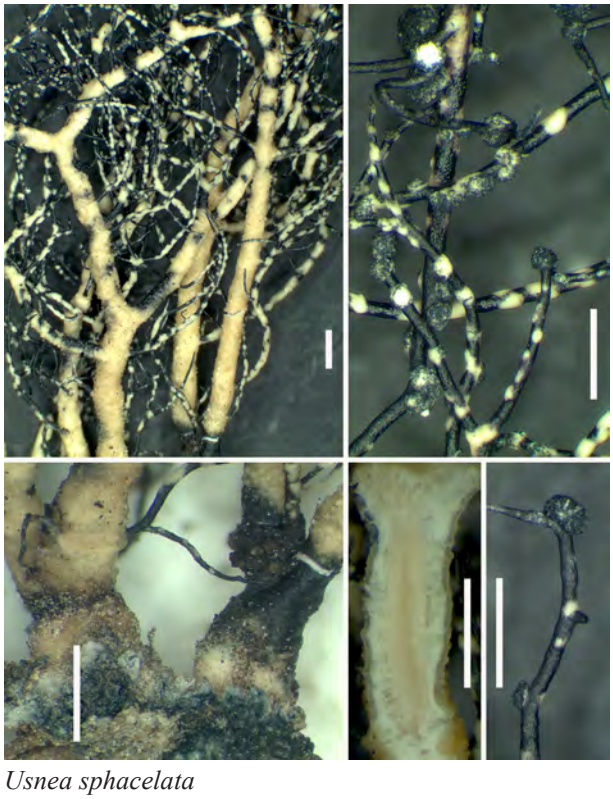
Usnea lapponica



Usnea longissima

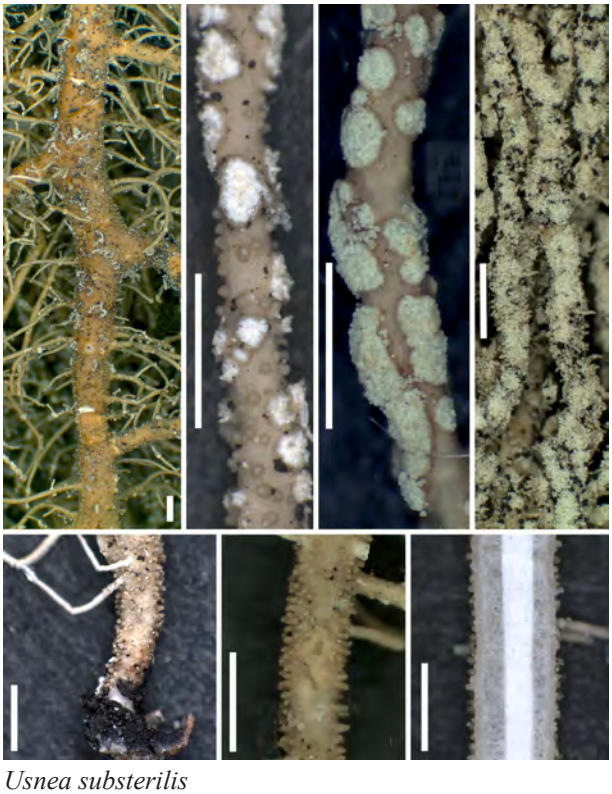


Usnea silesiaca

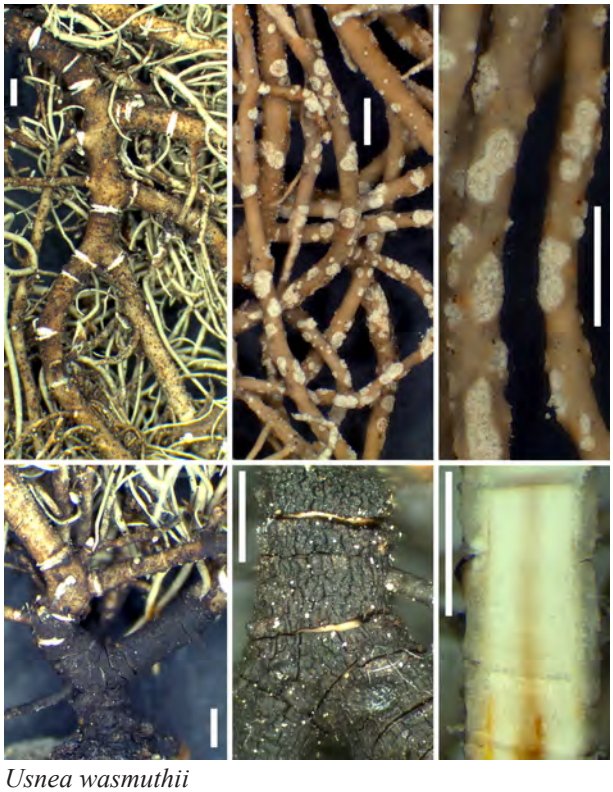


Usnea sphacelata

Usnea subfloridana

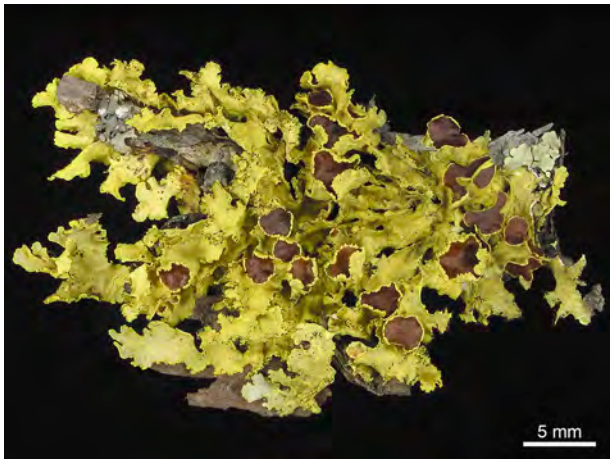


Usnea substerilis



Usnea wasmuthii

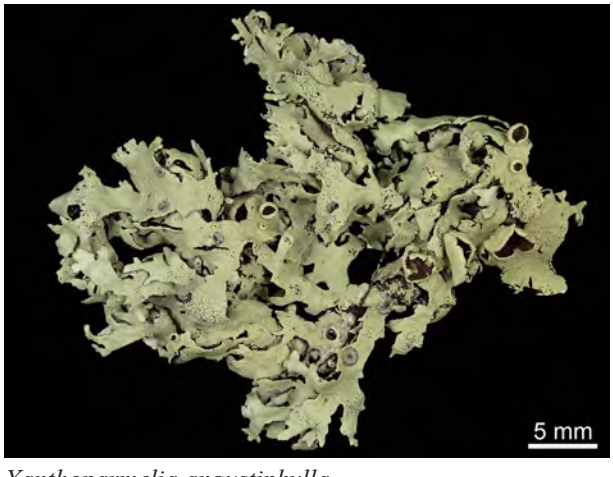
Usnocetraria oakesiana



Vulpicida juniperinus

Vulpicida pinastri

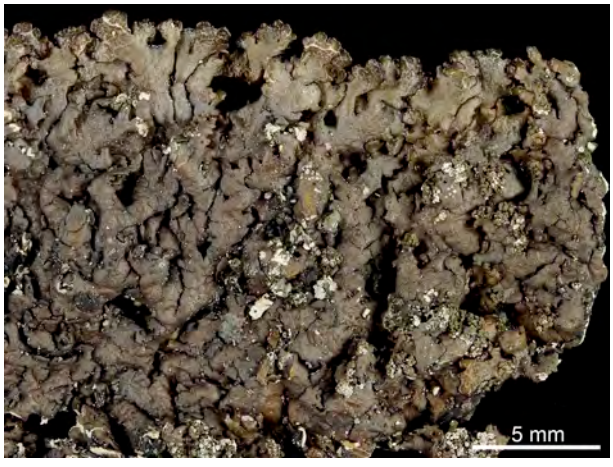
Vulpicida tubulosus



Xanthoparmelia angustiphylla

Xanthoparmelia conspersa

Xanthoparmelia delisei



Xanthoparmelia loxodes

Xanthoparmelia mougeotii

Xanthoparmelia plittii

Xanthoparmelia protomatrae

Xanthoparmelia pulla

Xanthoparmelia stenophylla

Xanthoparmelia tinctina

Xanthoparmelia verruculifera

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Alectoria sarmentosa subsp. *sarmentosa*, Finland, Lapponia kemensis [KemL], Muonio, M. Kuusinen 532 (H)

Alectoria sarmentosa subsp. *vexillifera*, Lapponia ponojensis [Russian Federation, Murmanskaya oblast], Orloff, 1889 A.O. Kairamo, Nyl. & Norrl. Herb. lich. Fenn. 469 (H)

Allantoparmelia alpicola, Sweden, Lule lappmark, Kvikkjokk, 1871 P.J. Hellbom s.n. (LD1966930)

Allocetraria madreporiformis, Russian Federation, Gornyi-Altay, Kosh-Agach, 1993 M. Zhurbenko 933 (LD)

Arctocetraria andrejevii, USA, Alaska, St Lawrence Island, 1973 I. Kärnefelt 28c.1913 (LD)

Arctocetraria nigricascens, Russian Federation, Taymyr Peninsula, Chelyuskin Peninsula, 1994 E.I. Kärnefelt TE94222 (LD)

Arctoparmelia centrifuga, Sweden, Värmland, Ölme 1872 H. Falk s.n. (LD)

Arctoparmelia incurva, Sweden, Torne lappmark, Jukkasjärvi, 1936 O. Almborn s.n. (LD1035265)

Asahinea chrysantha, Norway, Finnmark, Nesseby, 1973 R. Alava 12891 (LD)

Brodoa atrofusca, Norway. Oppland, 1985 O. Vitikainen 11538 (H)

Brodoa intestiniformis, Sweden, Småland, Jungfrun, 1914 G.E. Du Rietz (LD1066498)

Brodoa oroarctica, Greenland, Nanortalik, 60°09'N 45°15'W. 2004 E.S. Hansen, Lich. Groenl. exs. 953 (LD)

Bryocaulon divergens, Norway, Troms, Storfjord, 2003 M. Westberg 2809b (LD)

Bryocaulon hyperboreum, Svalbard, Kong Karls Land, 1936 E. Dahl, (O, holotype)

Bryoria americana, Norway, Nord-Trøndelag, Steinkjer, 2003 H. Holien 9362 (TRH)

Bryoria bicolor, Norway, Møre og Romsdal, Nesset, E of Mardalen, 2008 H. Holien 11536 (TRH)

Bryoria capillaris, Norway, Nord-Trøndelag, Overhalla, N of Navarsholhaugen, 2005 H. Holien 10056 (TRH)

Bryoria chalybeiformis, Sweden, Skåne [Torekov], Hallands Väderö, N. Alvthin s.n. (LD10114557)

Bryoria fremontii [habit], Finland, Koillismaa (Ks), Kuusamo, Oulanka National Park, on *Pinus sylvestris*, 2005 S. Velmala 32, P. Halonen & Leena Myllys (H)

Bryoria fremontii [close-up], Sweden, Gotland, Fårö, 1937 T.E. Hasselrot s.n. (LD1090370)

Bryoria furcellata, Finland, Koillismaa (Ks), Kuusamo, Oulanka National Park, 2005 S. Velmala, 34, P. Halonen & L. Myllys (H)

Bryoria fuscescens, Finland, Uusimaa (N), Kirkkonummi, Kvarnby, 2005 S. Velmala, 10 & L. Myllys (H)

Bryoria glabra, Norway, Nord-Trøndelag, Steinkjer, Strukstadmyra, Alt. 70-80 m. On *Picea abies* in humid forest, 2003 H. Holien 9361b (TRH)

Bryoria implexa, Norway, Nord-Trøndelag, Overhalla, N of Navarsholhaugen, 2005 H. Holien 10055 (TRH)

Bryoria lanestris, Sweden, Pite lappmark, Arjeplog, Galtispouda, 1936 O. Almborn s.n. (LD1031602)

Bryoria nadvornikiana, Finland, Kainuu [Ok], Hyrynsalmi Paljakka Nature Reserve, 2005 S. Velmala 67 & P. Halonen (H)

Bryoria nitidula, Greenland, Narsarsuaq, Signalhøjen, 61°09'39''N 45°24'05''W, 2005 F. Högnabba 752 (H)

Bryoria simplicior [habit], Norway, Troms, Målselv, Dividalen National Park, 2005 H. Holien 10328 (TRH)

Bryoria simplicior [close-up], Sweden, Lycksele lappmark, Tärna par, 6 km N of Umasjö, alt. 522 m, on Betula, 2003 M. Westberg 2668 (LD)

Bryoria smithii, Finland, Etelä-Häme (Ta). Tuulos, Juttila, 1989 M. Kuusinen 2356 & I. Ahlholm (H)

Bryoria subcana, Norway, Møre og Romsdal, Nesset, Mardalen, 2008 H. Holien 11496 (TRH)

Bryoria tenuis, Kainuu (Kn), Hyrynsalmi, Paljakka Nature Reserve, 2005 P. Halonen, P. Keihäs & S. Velmala 64 (H)

Cetraria aculeata, Sweden, Skåne, Maglehem, Olseröd, Nyagrop, 1996 A. Thell SK-9606 (LD)

Cetraria ericetorum, Sweden, Dalarna, 5 km S of Särna, 1973 I. Kärnefelt 49a-1796 (LD)

Cetraria islandica subsp. *crispiformis* Norway, Oppland, Otta, Rondvassbu, 1971 I. Kärnefelt 580 (LD).

Cetraria islandica subsp. *islandica* Sweden, Skåne, Simrishamn, Vårhallarna 1974 I. Kärnefelt 2340 (LD).

Cetraria muricata, Sweden, Öland, Resmo, Gynge alvar, 2006 A. Thell & T. Feuerer s.n. (LD1175414)

Cetraria nigricans, Greenland, Ilulissat, 69°13'N 51°06'W, 1992 E.S. Hansen, Lich. groen. exs. 490 (LD)

Cetraria odontella, Sweden, Uppland, Funbo, Hallkved, 59°51'N 17°52'E, 1986 R. Santesson 31444 (LD)

Cetraria sepincola, Sweden, Härjedalen, Ljungdalen, Flatruet, 2009 P. Frödén 1905 (LD)

Cetrariella commixta Sweden, Småland, Almesåkra, Vikskvarnen, 1926 G. Haglund (LD1084834)

Cetrariella delisei, Greenland, Narsarsuaq, Sutuluaqqap Qaqqaa, 61°07-09'N 45°24-26W, 2005 A. Thell & T. Feuerer s.n. (LD1037304)

Cetrariella fastigiata, Sweden, Lycksele lappmark, Tärna, between the peak Strimaknösen and Mt. Långfjället, 2003 M. Westberg 2695 (LD)

Cetrelia olivetorum, Norway, Rogaland, Sokndal, Seljuåsen, 1953 R. Santesson s.n. (LD1084049)

Cornicularia normoerica, Norway, Hordaland, Finsehögen, 1927, G. Nilsson [Degelius] s.n. (LD1016945)

Dactylina arctica, Greenland, Rensselaer Bugt, 78°36'N 70°50'W. 1999 E.S. Hansen, Lich. groen. exs. 820 (LD)

Dactylina ramulosa, Canada, Nunavut, 1999 M. Westberg 2438 (LD)

Evernia divaricata, Norway, Oppland, Gausdal, ca. 500 m. SE of Kittilbu, 1976 H. Krog & H. Østhagen 3642 (LD)

Evernia illyrica, Gallia, Corsica, Evisa, alt. 1200 m., 1969 J. Lambinon, Y. Rondon & A Vezda, Lich. sel. exs. 818 (LD)

Evernia mesomorpha, Finland, Tavastia australis [EH], Jämsä, Seppola, Hiidenmäki, 1943 A. Koskinen, Lich. Fenn. exs. 870 (LD)

Evernia prunastri, Sweden, Skåne, Eslöv, 1,5 km NW of Kristineberg, 1995 P. Frödén 22 (LD)

Flavocetraria cucullata, Sweden, Öland, Resmo, 1 km SE Möckelmossen, 1997 P. Frödén 307 (LD)

Flavocetraria nivalis, Iceland, Suður-Þingeyjarsýsla, Mývatn, 65°35'N 16°57'W, 1997 Frödén 646 (LD)

Flavoparmelia caperata, Sweden, Skåne, Hällestad, on Salix at the old railroad, photographed in situ by P. Frödén 2010

Flavoparmelia soredians, Sweden, Lund, Ö. Torn, on Sorbus, photographed in situ by P. Frödén 2010

Gowardia nigricans, Russia, Murmansk Region, Kirovsk District, 67°45'76''N 33°40'71''E, 1998 K. Kärkkäinen 45 (H)

Hypogymnia austerodes, Norway, Oppland, Vågå, S side of Mt Nordheradsfjell, 1948 S. Ahlner s.n. (LD1025042)

Hypogymnia bitteri, Sweden, Åsele lappmark, Vilhelmina, 20 km ESE Saxnäs, 64°56'N 15°44'E, 1988 J.-E. Mattsson 14 (LD)

Hypogymnia farinacea, Finland, Varsinais-Suomi [Ab], Masku, Härmä, 1968 T. Laine s.n. (LD1027538)

Hypogymnia hultenii, Sweden, Jämtland, Frostviken, Jormlien, 1938 S. Österlind s.n. (LD1097217)

Hypogymnia incurvoides, Canada, Newfoundland, 1956 T. Ahti 9603 (H)

Hypogymnia physodes, Sweden, Skåne, Torekov, Hallands Väderö, 56°26'N 12°34'E, 1990 U. Arup & S. Ekman L1231 (LD)

Hypogymnia subobscura, Canada, Nunavut, Melville Island, 1999 M. Westberg 1668 (LD)

Hypogymnia tubulosa, Sweden, Blekinge, Hjortsberga, Stensjömåla, 1989 U. Arup & S. Ekman L378 (LD)

Hypogymnia vittata, Sweden, Värmland, Dalby, 5 km N of Sysslebäck, 60°45'N 12°50'E, 1981 L.-E. Muhr 4149 (LD)

Hypotrachyna afrorevoluta, Norway, Hordaland [today in Rogaland], Ølen, between Ølen and Ølensvåg, 1978 T. Tønsberg s.n. (LD1018178)

Hypotrachyna laevigata, Norway, Rogaland, Sandnes, Höle, 1968, P.M. Jørgensen 2280 (LD).

Hypotrachyna revoluta, Sweden, Halland, Söndrum, 800 m W of Nygård, 1990 U. Arup & S. Ekman L1459 (LD).

Hypotrachyna sinuosa, Norway, Hordaland, Stord, Hysstad, 1980 T. Tønsberg 5028 (BG)

Imshaugia aleurites, Sweden, Skåne, Matteröd, close to the church, 1945 O. Almborn s.n. (LD1036226).

Letharia vulpina, Sweden, Dalarna, Idre, Töfsingdalen National Park, 1936 T.E. Hasselrot s. n. (LD)

Masonhalea inermis, U.S.A., Alaska, Seward Peninsula, Nome area, 1973 I. Kärnefelt 21-2367 (LD)

Melanelia agnata, Sweden, Lule lappmark, Jokkmokk, Padjelanta National Park, 2004 M. Westberg 3014 (LD)

Melanelia disjuncta, Sweden, Västmanland, Arboga, Västerby, 1947 G. Kjellmert s.n. (LD1041217)

Melanelia hepatizon, Sweden, Lycksele lappmark, Tärna, Rivovardo, 2003 M. Westberg 2617 (LD)

Melanelia panniformis, Sweden, Värmland, Munkfors, Bryngelstorp, 1951 S. W. Sundell 140-51 (LD)

Melanelia sorediata, Sweden, Lycksele lappmark, Tärna, Yttervik, 2003 M. Westberg 2596 (LD)

Melanelia stygia, Sweden, Hälsingland, Bjuråker, Dalaberget, 2003 M. Westberg 2927 (LD).

Melanelia tominii, Norway, Troms, 2003 M. Westberg 2799 (LD)

Melanelixia fuliginosa, Sweden, Närke, Svennevad, Bäcktorp, 1947 G. Kjellmert s.n. (LD1023330)

Melanelixia glabra. Finland, Varsinais-Suomi [Ab], Nagu, the vicarage, on Acer platanoides, 1991 A. Puolasma (H)

Melanelixia glabratula, Sweden, Skåne, Lund, Ö. Torn, on Acer platanoides. 55°42.6 N 13°13.8 E, 2011 P. Frödén 1907 (LD)

Melanelixia subargentifera, Sweden, Öland, Algutsrum, Hönstorp, 1995 U. Arup L95015 (LD)

Melanelixia subaurifera, Sweden, Skåne, S. Åsum, Tolångavägen, 2009 E. Sandler Berlin 09017 (LD)

Melanohalea elegantula, Sweden, Skåne, Genarp, Häckeberga, 1987 U. Arup L87062 (LD).

Melanohalea exasperata, Sweden, Skåne, V. Karup, Svenstad, på lönn, 1942 O. Almborn s.n. (LD1037633)

Melanohalea exasperatula Sweden, Skåne, Lund, Ö. Torn, on Acer platanoides. 55°42.6 N 13°13.8 E, 2011 P. Frödén 1908 (LD)

Melanohalea infumata, Sweden, Dalarna, Vänjan, 1939 T.E. Hasselrot s.n. (LD1001025)

Melanohalea laciniatula, Sweden, Skåne, Genarp, Nötabo, 1995 U. Arup & S. Ekman L1654 (LD)

Melanohalea olivacea, Sweden, Lycksele lappmark, Tärna, Vilasund, 2003 M. Westberg 2635 (LD)

Melanohalea septentrionalis, Finland, Nyland [U], 1965 T. Ahti 17031 (H).

Menegazzia subsimilis, Russian Federation, Primorsky Kray, 1991 E.I. Kärnefelt 910813 (LD).

Menegazzia terebrata, USA, Tennessee, Carter Co., Doe River Gorge, on Liriodendron, 1993 R.C. Harris 30994 (LD)

Parmelia ernstiae, Denmark, southern Jutland, Nørre Rangstrup, Agerskov, 2005 A. Thell s.n. (LD1057615)

Parmelia fraudans, Sweden, Dalarna, Malung, Vallerås, 1957 P.A. Eriksson s.n. (LD1066834)

Parmelia omphalodes subsp. *discordans*, Finland, Åland [A], Sund, Sibby, 1984 H. Skult s.n. (H)

Parmelia omphalodes subsp. *omphalodes*, Sweden, Bohuslän, Uddevalla, S of the town, close to Bohusgården, 2002 M. Westberg s.n. (LD 1185132)

Parmelia pinnatifida, Finland, Savonia australis [Sa], 1987 O. Vitikainen 11906 (H)

Parmelia saxatilis, Sweden, Skåne, Örkened, S. Esseboda, Tulla-Pellas, 2000 A. Thell SK0010 (LD)

Parmelia serrana, Sweden, Skåne, Lomma, Alnarp Park, 2008 A. Thell, SK0801, I. Kärnefelt & S.Y. Kondratyuk (LD)

Parmelia skultii, Rusian Federation, Krasnoyarsky kray 1996 M. Zhurbenko 96233 (H)

Parmelia submontana, Sweden, Skåne, Fågeltofta, on Tilia in the churchyard, 2002 D. Göransson L02014 (LD)

Parmelia sulcata, Sweden, Skåne, Lund, The Botanical Garden, 2011 P. Frödén & A. Thell 11001 (LD)

Parmelina pastillifera, Norway, Hordaland, Lindås, the beach beneath Helltveit farm, 1998 P. Frödén 1045 (herb. Frödén)

Parmelina quercina, Denmark, Lolland [Vesterborg], Rosningen, 1871 E. Rostrup s.n. (LD1040226)

Parmelina tiliacea, Sweden, Skåne, Brösarp, on Ulmus and Acer at the church, 1988 U. Arup L88264 (LD)

Parmeliopsis ambigua, Sweden, Skåne, Ö. Sönnarslöv, Maltesholm, 1989 U. Arup & S. Ekman L437, (LD)

Parmeliopsis esorediata, Norway, Buskerud, Sigdal, S side of Mt Kvelvsanatten, 1980 E. Timdal 2307 (LD)

Parmeliopsis hyperopta, Sweden, Östergötland, Tjällmo, Trolleflod, 1947 G. Kjellmert s.n. (LD1039490)

Parmotrema arnoldii, Norway, Rogaland, Sokndal, Skarås, on the ground, 1947 O. Almborn s.n. (LD1060321)

Parmotrema crinitum, Norway, Rogaland, Sokndal, Skarås, 1947 O. Almborn s.n. (LD1064786)

Parmotrema perlatum, Norway, Rogaland, Sandnes, Höle, Osaland, on Quercus, 1968 P.M. Jørgensen 2024 (LD)

Platismatia glauca, Sweden, Skåne, Örkened, S. Esseboda, Tulla-Pellas, 56°21'N 14°24'E, 1996 A. Thell SK9613 (LD)

Platismatia norvegica, Norway, Hordaland, Sund, Sotra Tælavåg, N-facing rock, 1997 S. Ekman (LD1022417)

Pleurosticata acetabulum, Sweden, Skåne, Torrlösa, Trolleholm, on Acer pseudoplatanus, 2011 A. Thell 11003 (LD)

Pseudephebe minuscula, Sweden, Småland, Näs-sjö, Gamlarp, on a stone fence, 1929 B. Hedvall s.n. (LD1094370)

Pseudephebe pubescens, Sweden, Lycksele lappmark, Tärna, Rivovardo, 2003 M. Westberg 2621 (LD)

Pseudevernia furfuracea, Sweden, Skåne, Torekov, Hallands Väderö, 56°26'N 12°34'E, 1990 U. Arup & S. Ekman L1245 (LD)

Punctelia jeckeri, Sweden, Skåne, Lund, St Lars hospital, photographed in situ by P. Frödén 2010

Punctelia stictica, Norway, Oppland, Vestre Slidre, Lomen, 1937 S. Ahlner s.n. (LD1072048)

Punctelia subrudecta, Sweden, Skåne, Lund, The Botanical Garden, photographed in situ by P. Frödén 2005

Tuckermanopsis chlorophylla, Sweden, Skåne, Örkened, S. Esseboda, Tulla-Pellas, 1996 A. Thell SK9603 (LD)

Tuckermanopsis ciliaris, [Russian Federation] Karelia ladogensis, Salmi, between Palojärvi and Kaunoselkä, 1939 S. Ahlner s.n. (LD1097857)

Usnea: A mixture of samples housed in G and UPS

Usnocetraria oakesiana, Norway, Buskerud, Krøderen, 2008, J. Klepsland JK08-L128 (O)

Vulpicida juniperinus, Sweden, Jämtland, Frostviken, Jetnemsälven, 65°03'N 14°20'E, 1988 J.-E. Mattsson 32 (LD)

Vulpicida pinastri, Sweden, Åsele lappmark, 6 km ESE Saxnäs, 1988 J.-E. Mattsson 34 (LD)

Vulpicida tubulosus, Sweden, Gotland, Sundre, Hallbjärs stone mine, W of Vaktbackars Nature Reserve, 2010 P. Frödén 1906 (LD).

Xanthoparmelia angustiphylla, USA, Illinois, Jackson, 1999, T.H. Nash 43241 (LD).

Xanthoparmelia conspersa, Sweden, Skåne, Torekov, Hallands Väderö, 56°26'N 12°34'E, 1990 U. Arup & S. Ekman L1239 (LD).

Xanthoparmelia delisei, Sweden, Skåne, Ivö, E of the church village, on a stone fence, 1938 O. Almborn s.n. (LD1094002).

Xanthoparmelia loxodes, Finland, Varsinais-Suomi [Ab], Korpo, 1963 L. Kärenlämpi s.n. (LD1917026).

Xanthoparmelia mougeotii, Sweden, Skåne, Örkened, Gylsboda stone mine, on black granite, 2004 A. Thell & T. Feuerer s.n. (LD1057456)

Xanthoparmelia plittii, Finland, Varsinais-Suomi [Ab], 1971 Kvist s.n. (H)

Xanthoparmelia protomatrae, Norway, Aust-Agder, Tvedestrand, 2005 E. Timdal 9920 (O)

Xanthoparmelia pulla, Sweden, Västmanland, Arboga, mountain N of the block Linnean, 1947 G. Kjellmert s.n. (LD1060146)

Xanthoparmelia stenophylla, Sweden, Småland, Eksjö, 1927 G. Haglund s.n. (LD1076849)

Xanthoparmelia tinctina, Sweden, Bohuslän, Lycke, W of Nordön, 1956 S.W. Sundell 735 (LD).

Xanthoparmelia verruculifera, Sweden, Skåne, Torekov, Hallands Väderö, 56°26'N 12°34'E, 1989 U. Arup & S. Ekman L1174 (LD).

Index Vol. 4 – Parmeliaceae

The lichen flora of the Nordic countries, containing about 2000 species, is regarded as one of the best known in the world. Lichenological research of the region has been continuous since the time of Erik Acharius (1757–1819), the ”father of lichenology”, but it is a sad fact that there is no modern treatment of the region’s impressive lichen flora, the last attempt in the 1870s being that of Th. M. Fries, his major work, Lichenographia scandinavica, unfortunately remained unfinished.

A number of specialist lichenologists have united forces to produce this much needed Nordic Lichen Flora. This, the fourth volume dedicated to the family Parmeliaceae, includes 152 species, the editors, Arne Thell and Roland Moberg, together with 11 colleagues, treating the 41 genera as separate chapters.

The corticolous lichens of the Parmeliaceae are often dominant in the landscape of northern boreal forests, as are members of the terricolous Cladoniaceae, the reindeer lichens, the family to be treated in the next volume of the Nordic Lichen Flora.