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CANOMACULINA, MYELOCHROA, PARMELINELLA, PARMELINOPSIS AND PARMOTREMOPSIS, FIVE NEW GENERA IN THE PARMELIACEAE (LICHENIZED ASCOMYCOTINA)

JOHN A. ELIX

Department of Chemistry, The Faculties, Australian National University, GPO Box 4, Canberra, ACT, 2601, Australia

MASON E. HALE

Department of Botany, Smithsonian Institution, Washington, D.C., 20560, USA

ABSTRACT : The genera *Canomaculina* Elix & Hale gen. nov., *Myelochroa* (Asahina) Elix & Hale stat. nov., *Parmelinella* Elix & Hale gen. nov., *Parmelinopsis* Elix & Hale gen. nov. and *Parmotremopsis* Elix & Hale gen. nov. are here segregated from *Parmelina* s.str. The main differences between the genera lie in the chemical properties of the medulla, the centres of distribution, the habitat requirements, the nature and distribution of the cilia, the lobe and rhizine morphology and the size of the spores and conidia.

Introduction

The lichen genus *Parmelina* Hale was erected in 1974 (Hale 1974) to accommodate those narrow-lobed, marginally ciliate *Parmeliae* previously assigned to *Parmelia* subgenus *Parmelia* section *Imbricaria* (Schreber) E.Fries (Hale & Kurokawa 1964). The genus so defined could not only be recognized by the presence of narrow, adnate lobes and marginal cilia, but also by the simple to sparsely furcate or squarrosely branched rhizines, the adnate to sessile apothecia with imperforate discs and the upper cortex consisting of palisade plectenchyma with a pored epicortex (Hale 1976).

At that time it was recognized (Hale 1976) that *Parmelina* so defined comprised several heterogenous elements differing in lobe width, the production of cilia, medullary pigmentation, and rhizine branching. Two major groups of species were recognised: one where the species contained the medullary triterpenes and the other lacking these substances. These taxa were given the status of sections, namely *Parmelina* section *Parmelina* Hale with *Parmelia tiliacea* (Hoffmann) Hale as type species (lacking triterpenes); and *Parmelina* section *Myelochroa* (Asahina) Hale with *Parmelina aurulenta* (Tuck.) Hale as type species(containing triterpenes).

There have been a number of recent studies on generic segregates of the Parmeliaceae, leading to further development and refinement of the generic concepts in this large family (Elix, Johnston & Verdon 1986; Goward 1985; Hale 1981, 1986a, 1986b; Krog 1982a, 1982b). Characters such as spore size, type of conidia, rhizines and cilia, secondary product chemistry and phytogeographic patterns have been re-evaluated and shown to be consistent and highly correlated. With this background it is now possible to identify and segregate homogeneous entities from *Parmelina* sens. lat.

at the generic level.

Thus *Parmelina* sens.str. only includes a relatively small group of eight species related to *Parmelina tiliacea,* the type of the genus. All but one species [*P . endoleuca* (Taylor) Hale with traces of fatty acids] contain medullary lecanoric acid, while the upper cortex contains atranorin and chloroatranorin. As now conceived this genus is further characterised by small to medium sized spores (5-8 x 8-14 µm), medium sized (4-7 µm) cylindrical to weakly fusiform conidia, and relatively sparse simple marginal cilia which are concentrated in the lobe axils. The lower surface is uniformly black and the rhizines simple. The upper surface is strongly white spotted-maculate in four species (*P. carporrhizans, P. pastillifera, P. quercina, P. tiliacea*) and weakly so in several others (*P. conlabrosa, P. labrosa, P. stevensiana*). By and large *Parmelina* appears to be an Old World genus with centres of speciation in Euroasia and Australasia.

This combination of characters clearly distinguishes *Parmelina* sens.str. from the remaining species previously included in this genus (Hale 1974, 1976). Currently we consider *Parmelina* to comprise the following species : *P. endoleuca, P. carporrhizans, P. conlabrosa, P. labrosa, P. pastillifera, P. quercina, P. stevensiana* and *P. tiliacea.*

Given this new, more restrictive circumscription of the genus *Parmelina,* we now segregate *Parmelina* section *Myelochroa* at the generic level (*Myelochroa*) as well as the *P. wallichiana* group (*Parmelinella*), *P. horrescens* group (*Parmelinopsis*), the *P. pilosa* group (*Canomaculina*) and the *P. antillensis - P. phlyctina* pair (*Parmotremopsis*). These segregates differ from *Parmelina* sens.str. by a combination of morphological, distributional, ecological and chemical characters which we have summarized in the key and in Tables 1 and 2 as discussed below.

Key to the segregate genera of *Parmelina* sens.lat.

Thallus with narrow, adnate lobes, marginal cilia and cortical atranorin and chloroatranorin.

1. Cilia robust, markedly tapered, commonly furcate; upper surface with effigurate maculae; conidia filiform (12-16 µm).....*Canomaculina*

1. Cilia slender, not markedly tapered, simple; upper surface emaculate or with spotted maculae; conidia cylindrical or bifusiform (3-8 µm).....2

2. Medulla yellow at least in part, containing secalonic acids.....*Myelochroa*

2. Medulla white, lacking or rarely traces of secalonic acids.....3

3. Cilia evenly dispersed, apices of lobes truncate; rhizines furcate to weakly dichotomously divided; conidia small (3-5 µm).....*Parmelinopsis*

3. Cilia mainly in lobe axils, apices rotund; rhizines simple, conidia usually larger (4-8 µm).....4

4. Lobes narrow (1-6mm), medulla containing lecanoric acid or fatty acids..... .....*Parmelina*

4. Lobes broad (5-10mm), medulla containing norstictic or salazinic acids.....5

5. Spores large, 8-10 x 15-18 µm; containing salazinic acid.....*Parmelinella*

5. Spores small, 3-6 x 7-8 µm; containing norstictic acid.....*Parmotremopsis*

Morphology

The Spores and Conidia

While the overall morphology of the apothecia and spores are relatively uniform throughout the Parmeliaceae, the size of the spores is quite variable. For example, *Parmotrema* and *Flavoparmelia* consistently possess larger spores (greater than 14 µm long) than do *Xanthoparmelia* and *Relicina* (less than 12 µm long). In the present complex, *Canomaculina* (8-12 x 12-20 µm), *Parmelinella* (8-10 x 15-18 µm) and *Parmelinopsis* (8-12 x 12-18 µm) have significantly larger ellipsoid spores than do *Myelochroa* (5-10 x 8-15 µm) and *Parmelina* sens.str. (5-7 x 8-12 µm) while in *Parmotremopsis* the spores are still smaller and subspherical (4-6 x 6-8 µm).

In several recent circumscriptions of parmelioid genera considerable importance has been attributed to variations in the shape and size of the conidia (Elix, Johnston & Verdon 1986; Krog 1982a). For example, *Punctelia* is the only parmelioid genus to have species with unciform conidia while the related genus *Flavopunctelia* has bifusiform conidia (Krog 1982b; Hale 1984). Similarly *Pseudoparmelia* sens.str. has elongated bifusiform or filiform conidia (12-20 µm) while related *Paraparmelia* has short (5-7 µm) bifusiform conidia.

The conidia of *Parmelina* sens.str. are medium sized (4-7 µm) and cylindrical to weakly fusiform in shape, while the conidia of *Canomaculina* are long (12-16 µm) and filiform, those of *Myelochroa* medium sized (5-7 µm) and bifusiform or cylindrical, those of *Parmelinella* medium sized (5-9 µm) and cylindrical while those of *Parmelinopsis* and *Parmotremopsis* are consistently small (3-5 µm) and cylindrical.

Thalline Characters

There are major morphological distinctions between the segregates of *Parmelina* sens.lat. The characters are consistent amongst the members of a particular segregate.

One particularly prominent and distinctive feature is the nature and distribution of the marginal cilia. In particular, *Canomaculina* is distinguished by the dense, short, robust, evenly distributed, characteristically tapering cilia. The remaining genera all have slender, barely (or not) tapering cilia. The cilia are relatively dense and evenly distributed in *Parmelinopsis*, while they are sparse and more or less restricted to the axils of the lobes in *Parmelina* sens.str., *Parmelinella* and *Parmotremopsis*. Only in *Myelochroa* do the cilia vary from being relatively dense to sparse and restricted to the axils of the lobes.

The nature of the rhizines is another such feature. Simple rhizines are characteristic of *Parmelina* sens.str., *Parmelinella* and *Parmotremopsis* while a combination of simple and squarrosely branched rhizines is typical of *Myelochroa*. *Parmelinopsis* and *Canomaculina* on the other hand invariably have a combination of simple and sparsely furcate (weakly dichotomously branched) rhizines.

One characteristic feature of the genus *Canomaculina* is the presence of distinct, effigurate maculae on the upper surface of the lobes. These maculae are submacroscopic pale spots or areas resulting from discontinuities in the layer immediately below the upper cortex. Such maculae are not observed in the other segregate genera except some species of *Parmelina* sens.str. (*P. carporrhizans, P. pastillifera, P. quercina* and *P. tiliacea*). However species of the latter genus are clearly distinguished from *Canomaculina* by other morphological features (see Table 1), particularly by the short, weakly fusiform or cylindrical conidia.

The configuration of the lobes is also quite distinctive in *Parmelinopsis* and *Parmotremopsis*. The species of *Parmelinopsis* have lobes which are typically sublinear-elongate, dichotomously divided and truncate at the apices while in *Parmotremopsis* the lobes are broad, apically rotund and with simple marginal cilia. Although the lobe configuration is more variable in *Parmelina* sens.str., most species have relatively narrow (1-3 mm wide), irregular lobes with subrotund apices. Broader irregular lobes (1.5-6.0 mm wide) with rotund to subrotund apices are typical of *Canomaculina, Parmelinella* and *Myelochroa.*

Table 1

SEGREGATES OF PARMELINA

Group	*Parmelina*	*Canomaculina*	*Myelochroa*	*Parmelinella*	*Parmelinopsis*	*Parmotremopsis*
Medulla (colour)	white	white	yellow-orange	white	white	white
Substrate	corticolous rarely saxicolous	corticolous rarely saxicolous	corticolous rarely saxicolous	corticolous & saxicolous	corticolous rarely saxicolous	corticolous
Habitat	cool temperate and temperate areas	savannah woodland & montane forests	warm temperate and tropical montane forests	open subtropical & tropical woodland	warm temperate & tropical montane forests	tropical montane rainforests
Distribution	Euroasia, Australasia North America	South America, Africa, Australia (1sp.)	Eastern Asia & North America	Southern Asia, Africa, Australia (1sp.)	Pantemperate & pantropical	Caribbean & Central America
Spores µm	5-7 x 8-12	8-12 x 12-20	5-10 x 8-15	8-10 x 15-18	8-12 x 12-18	4-6 x 6-8
Conidia µm	cylindrical-subfusiform 4-7	filiform 11-16	cylindrical-bifusiform 5-7	cylindrical 5-9	cylindrical-bifusiform 3-5	cylindrical 3-5
Lobes	narrow (1-6mm) apically subrotund	moderate (2-6mm) apically rotund	moderate (2-4mm) apically rotund	broad (4-10mm) apically rotund	narrow (0.5-2mm) apically truncate	broad (5-10mm) apically rotund
Cilia	sparse, in lobe axils simple, slender	dense, even, furcate, tapered	sparse to dense simple, slender	sparse, in lobe axils simple, slender	dense, even simple, slender	sparse, in axils simple, slender
Upper surface	± spotted maculae	effigurate maculae	emaculate or simple maculae	emaculate	emaculate	emaculate ±flaking
Lower surface	black	black	black	black	black to brown-black	black
Rhizines	simple	simple - furcate	simple - squarrose	simple	simple - dichotomous	simple
Vegetative propagules	25% soredia/pustules 25% isidia	60% soredia/pustules no isidia	35% soredia/pustules 20% isidia/lobules	33% isidia	30% soredia/pustules 40% isidia/lobules	50% isidia

Distribution and Ecology

All five segregate genera have well defined centres of distribution and habitat requirements. *Parmelina* sens. str. occurs primarily in Europe and Australasia with *P. carporrhizans* a disjunct in western North America. It is confined to corticolous substrates. *Myelochroa* is mostly corticolous in temperate forests with the greatest number of species in eastern Asia (particularly Japan) and secondarily in eastern North America. One species, *M. aurulenta*, is pantemperate.

Canomaculina is both corticolous and saxicolous in the drier, tropical and subtropical savannah woodland areas of Central America, South America and more rarely southern Africa and Australia. *Parmelinella* has similar habitat requirements to *Canomaculina*, but the centre of distribution of this genus is southern Asia, particularly India. The most widespread species is *P. wallichiana*, which extends from east Africa to Asia and Australia. *Parmotremopsis* is always corticolous, with a restricted distribution in montane tropical forests of the Caribbean and Central America.

Parmelinopsis is the most widespread segregate with significant numbers of species in the Americas, Australia and southern Africa, as well as three pantemperate species, *P. horrescens*, *P. minarum* and *P. spumosa*. Most of the species occur in moist temperate, subtropical and montane tropical woodlands.

Chemistry

The upper cortex of all species of *Parmelina* sens.lat. invariably contain atranorin and chloroatranorin and lack usnic acid.

The main classes of medullary substances encountered in the species of *Canomaculina*, *Myelochroa*, *Parmelina* sens.str., *Parmelinopsis* and *Parmotremopsis* are detailed in Table 2. Although there is some overlap in medullary chemistry of some segregates, definite trends are obvious. Each of the genera exhibit significant chemical differences from oneanother, but considerable uniformity within each genus. *Myelochroa* is characterised by the presence of the yellow-orange medullary pigments, secalonic acid A (entothein) and related compounds. These pigments are not always distributed evenly throughout the medulla of these species; in *M. galbina* for instance the pigment is concentrated below the apothecia. The species of *Myelochroa* (apart from *M. immiscens* and *M. lindmanii*) also contain significant quantities of the hopane triterpenes zeorin, leucotylin, leucotylic acid and related compounds and these two chemical features clearly distinguish them from the other segregate genera (and indeed from virtually all other Parmeliaceae). A subgroup within the genus also contain the ß-orcinol depsidones, galbinic acid and salazinic acid (traces) in addition to the above compounds. Traces of the secalonic acid derivatives also occur in the cortex of *Parmelinella*, but the medulla is not pigmented in this genus and terpenes are either absent or present in only trace quantities.

The orcinol depside, lecanoric acid, occurs in all species of *Parmelina* sens. str. except *P. endoleuca* which contains the aliphatic acid, protolichesterinic acid. A similar combination of medullary chemistries (i.e. lecanoric acid or fatty acids) is observed in other genera in the Parmeliaceae, for instance *Punctelia* and *Flavopunctelia*. In *Parmelinopsis* the orcinol tridepsides of the gyrophoric acid - hiascic acid chemosyndrome are preponderant and occur in various combinations in all but four species. The latter species (*P. jamesii, P. pindarensis, P. radiculata, P. swinscowii*) contain medullary ß-orcinol depsidones, protocetranic acid, stictic acid or salazinic acid.

The ß-orcinol depsidones (salazinic acid, virensic acid and stictic acid) also occur in *Canomaculina* but here two species (*C. pilosa* and *C. consors*) contain only traces of fatty acids in the medulla. Both species of *Parmotremopsis* contain the ß-orcinol depsidones, norstictic acid and connorstictic acid and all three species of *Parmelinella* contain salazinic acid and consalazinic acid.

Generic Interrelationships

Myelochroa, *Parmelinella* and *Parmelina* sens. str. are unique among the genera of the Parmeliaceae. In some respects *Canomaculina* resembles the genus *Parmotrema* and indeed Krog and Swinscow (Krog & Swinscow 1981, 1983) considered *C. pilosa* and *C. consors* to belong to that genus. Thus the marginal cilia and filiform conidia present in *Canomaculina* are also observed in many *Parmotrema* species. *Canomaculina* is

Table 2

CHEMISTRY OF SEGREGATES OF PARMELINA

Group	*Parmelina*	*Canomaculina*	*Myelochroa*	*Parmelinella*	*Parmelinopsis*	*Parmotremopsis*
Chemistry (Medullary)						
Secalonic acids	absent	absent	present	± traces	absent	absent
Lecanoric acid	common	absent	absent	absent	± traces	absent
Orcinol tridepsides	absent	absent	absent	absent	common	absent
ß-Orcinol depsidones	absent	common	common	present	uncommon	present
Fatty acids	uncommon	common	absent	absent	uncommon	common
Triterpenes	absent	absent	common	± traces	absent	absent
Chemistry (Cortical)						
Secalonic acids	absent	absent	present	common	absent	absent
Atranorin & chloroatranorin	present	present	present	present	present	present

distinguished by the short, markedly tapered cilia, the generally narrower lobes (2-6 mm), the effigurate maculae on the upper surface and the presence of furcate as well as simple rhizines. *Parmotrema*, on the other hand generally has much broader lobes (5-10 mm), slender, elongate cilia, simple rhizines and an upper surface with simple or no maculae. The cilia of *Canomaculina* are more reminiscent of weakly inflated bulbate cilia observed in the genus *Bulbothrix*. However *Canomaculina* is clearly distinguished from the latter genus by the large spores (8-12 x 12-20 µm) and filiform conidia while *Bulbothrix* has smaller spores (5-12 µm) and bifusiform conidia.

As the *Parmelinopsis* species have lobes which are typically sublinear-elongate, dichotomously divided and truncate at the apices, they appear superficially similar genus *Hypotrachyna* (Krog &Swinscow 1979). However, *Hypotrachyna* is distinguished by the larger, more rigid thalli and generally broader lobes, the presence of more or less richly dichotomously branched rhizines and the absence of marginal cilia. Furthermore the conidia of *Hypotrachyna* are bifusiform while those of *Parmelinopsis* are generally cylindrical.

In *Parmotremopsis* the broad, apically rotund lobes, with simple marginal cilia are reminiscent of the genus *Parmotrema*. However, speeies of *Parmotrema* are readily distinguished by the presence of much larger spores (12-40 µm long) and the elongate -filiform (10-20 µm), sublageniform conidia (5-8 µm) or large cylindrical conidia (5-9 µm long). In contrast *Parmotremopsis* has small spores (6-8 µm long) and cylindrical conidia (3-5 µm long).

Discussion

The main morphological, chemical, ecological and distributional traits of the species in *Parmelina* sens. str., *Canomaculina*, *Myelochroa* , *Parmelinopsis* and *Parmotremopsis* are outlined in Tables 1 and 2. They indicate that these segregates differ in a number of taxonomically important characters including spore size, conidial size and morphology, medullary chemistry, centres of distribution, lobe configuration and the nature of the rhizines as well as several minor characters. Since relative uniformity can be demonstrated within each of the segregate groups, it provides support for the proposed generic splits.

Canomaculina Elix & Hale gen. nov.

Thallus foliaceus, lobis subirregularibus, pagina superiore cinerea, effigurato-maculata, atranorinum et chloroatranorinum continens; margine ciliatis, ciliis brevibus, furcatis, robustis, contractis; pagina inferior nigra vel brunnescens, rhizinis simplicibus vel furcatis instructa. Apothecia laminalia, substipitata, disco integro vel raro perforato, sporis octonis, ellipsoideis, 8-12 x 12-20 µm. Pycnidia laminalia, conidiis filiformibus.

Typus generis: *Parmelia pilosa* Stizenberger, Ber. Tatig. St. Gall. Naturwiss. Gesell., **1888-1889** , 165. 1890. [*Canomaculina pilosa* (Stizenberger) Elix & Hale]

Thallus foliose, lobes subirregular, subrotund at the apices (1.0) 2.0-4.0 (-5.0) mm broad, densely ciliate, *cilia* short, robust, markedly tapered, commonly furcate. *Upper surface* uniformly grey, conspicuously effigurate - maculate, commonly pruinose towards the apices, with a perforate polysaccharide covering. *Medulla* white. *Underside* black or rarely brown, rhizinate, rhizines simple and sparsely furcate-branched, with a mixture of coarse and fine rhizines. *Apothecia* laminal, disc usually entire b ut occasionally perforate, spores ellipsoid, simple, 8 per ascus, 8-12 x 12-20 µm. Pycnidia laminal, conidia filiform, 12-16 µm. The upper cortex containing atranorin and chloroatranorin.

This new genus is considered to include the following species:

Canomaculina consors (Nyl.) Elix & Hale, comb. nov.
Basionym: *Parmelia consors* Nyl., Flora, Jena **68**, 613. 1885

Canomaculina muelleri (Vain.) Elix & Hale, comb. nov.
Basionym: *Parmelia muelleri* Vain., Acta Soc. Fauna Flora Fennica, **7**, 49. 1890

Canomaculina pilosa (Stiz.) Elix & Hale, comb. nov.
Basionym: *Parmelia pilosa* Stiz., Ber. Tatig. St. Gall. Naturwiss. Gesell., **1888-1889**, 165. 1890

Myelochroa (Asahina) Elix & Hale, stat. nov.
Basionym: *Parmelia* sect. *Hypotrachyna* subsect. *Myelochroa* Asahina, Lichens of Japan, II: Genus *Parmelia*, 74. 1952
Synonym: *Parmelina* sect. *Myelochroa* (Asahina) Hale, Smithsonian Contrib. Bot. **33**, 15, 1976

Type species: *Parmelia aurulenta* Tuck., Am. J. Science & Arts, ser. 2, **25**, 424. 1858. [*Myelochroa aurulenta* (Tuck.) Elix & Hale]

Thallus foliose, corticolous or less commonly saxicolous, adnate to loosely adnate, lobes sublinear to subirregular, apically subrotund, margins ciliate, *cilia* sparse to dense, confined to the axils of the lobes or evenly dispersed, simple, slender. *Upper surface* grey, occasionaly with a yellow tinge, emaculate or with simple maculae, with a perforate polysaccharide covering. *Medulla* yellow - orange at least in part due to the presence of secalonic acid A and/or related compounds. *Lower surface* black, moderately to densely rhizinate, rhizines simple or sparsely furcate and squarrosely branched. *Apothecia* adnate to substipitate, imperforate, spores ellipsoid, simple, 8 per ascus, 5-8 x 8-14 µm. *Pycnidia* laminal, conidia cylindrical or bifusiform, 4-7 µm long. The upper cortex fragile, containing atranorin, chloroatranorin and secalonic acids.

This new genus is considered to include the following species:

Myelochroa amagiensis (Asahina) Elix & Hale, comb. nov.
Basionym: *Parmelia amagiensis* Asahina, J.Jap. Bot., **26**, 228. 1951

Myelochroa aurulenta (Tuck.) Elix & Hale, comb. nov.
Basionym: *Parmelia aurulenta* Tuck., Am. J. Science & Arts, ser. 2, **25**, 424. 1858

Myelochroa crassata (Hale) Elix & Hale, comb. nov.
Basionym: *Parmelina crassata* Hale, Smithsonian Contrib. Bot., **33**, 22. 1976

Myelochroa degelii (Hale) Elix & Hale, comb. nov.
Basionym: *Parmelina degelii* Hale, Smithsonian Contrib. Bot., **33**, 25. 1976

Myelochroa denegans (Nyl.) Elix & Hale, comb. nov.
Basionym: *Parmelia denegans* Nyl., Acta Soc. Sc. Fenn., **26**, 6. 1900

Myelochroa entotheiochroa (Hue) Elix & Hale, comb. nov.
Basionym: *Parmelia enotheiochroa* Hue, Nouv. Arch. Mus. Paris ser. 3, **1**, 161. 1899

Myelochroa galbina (Ach.) Elix & Hale, comb. nov.
Basionym: *Parmelia galbina* Ach., Syn. Meth. Lich., 195. 1814

Myelochroa hayachinensis (Kurok.) Elix & Hale, comb. nov.
Basionym: *Parmelia hayachinensis* Kurok., J. Jap. Bot., **43**, 350. 1968

Myelochroa immiscens (Nyl.) Elix & Hale, comb. nov.
Basionym: *Parmelia immiscens* Nyl., Flora, Jena **68**, 606. 1885

Myelochroa indica (Hale) Elix & Hale, comb. nov.
Basionym: *Parmelina indica* Hale, Smithsonian Contrib. Bot., **33**, 34. 1976

Myelochroa irrugans (Nyl.) Elix & Hale, comb. nov.
Basionym: *Parmelia irrugans* Nyl., Lich. Japon., 26. 1890

Myelochroa leucotyliza (Nyl.) Elix & Hale, comb. nov.
Basionym: *Parmelia leucotyliza* Nyl., Lich. Japon., 27. 1890

Myelochroa lindmanii (Lynge) Elix & Hale, comb. nov.
Basionym: *Parmelia lindmanii* Lynge, Arkiv Bot., **13**, 74. 1914

Myelochroa metarevoluta (Asahina) Elix & Hale, comb. nov.
Basionym: *Parmelia metarevoluta* Asahina, J. Jap. Bot., **35**, 97. 1960

Myelochroa obsessa (Ach.) Elix & Hale, comb. nov.
Basionym: *Parmelia obsessa* Ach., Syn. Meth. Lich., 195. 1814

Myelochroa perisidians (Nyl.) Elix & Hale, comb. nov.
Basionym: *Parmelia perisidians* Nyl., Acta Soc. Sci. Fenn.**26**, 6. 1900

Myelochroa rhytidodes (Hale) Elix & Hale, comb. nov.
Basionym: *Parmelina rhytidodes* Hale, Smithsonian Contrib. Bot., **33**, 43. 1976

Myelochroa subaurulenta (Nyl.) Elix & Hale, comb. nov.
Basionym: *Parmelia subaurulenta* Nyl., Flora, Jena **68**, 606. 1885

Myelochroa xantholepis (Mont. & v.d. Bosch) Elix & Hale, comb. nov.
Basionym: *Parmelia xantholepis* Mont. & v.d. Bosch, in F. Junghuhn, Plantae Junghuhnianae, 428. 1855

Parmelinella Elix & Hale, gen, nov.
Thallus foliaceus, adnatus, pagina superiore epicorticata, cinerea, emaculata, atranorinum et chloroatranorinum continens; lobis irregularibus, 4-10 mm latis, apice rotundatis, margine ciliatis, ciliis brevibus, angustatis, sparsis in axillis loborum; pagina inferior nigra, rhizinis simplicibus parcis vel sparsis. Apothecia adnata, imperforata, sporis octonis, ellipsoideis, 8-10 x 15-18 µm. Pycnidia laminalia, conidiis cylindricis, 5-9 µm longis.

Typus generis: *Parmelia wallichiana* Taylor, Hooker J. Bot., **6**, 176. 1847
[*Parmelinella wallichiana* (Taylor.) Elix & Hale]

Thallus foliose, corticolous or saxicolous, coriaceous, adnate, *lobes* irregular, broad, (3-)4 -10 mm wide, apices rotund, margins ciliate, *cilia* sparse, more or less restricted to the axils, simple, slender. *Upper surface* grey, emaculate, with a perforate polysaccharide covering. *Underside* black, with a relatively broad bare or papillate marginal zone, moderately to sparsely rhizinate, rhizines simple. Apothecia adnate, imperforate, spores ellipsoid, simple, 8 per ascus, 8-10 x 15-18 µm. Pycnidia laminal, conidia cylindrical, 5-9 µm long. The upper cortex thick, coriaceous, containing atranorin and chloroatranorin, ± traces of secalonic acid.

The genus currently contains the following species:

Parmelinella manipurensis (Singh) Elix & Hale, comb. nov.
Basionym: *Parmelina manipurensis* Singh, Bryologist, **83**, 533. 1980

Parmelinella simplicior (Hale) Elix & Hale, comb. nov.
Basionym: *Parmelia simplicior* Hale, Bryologist, **75**, 99. 1972

Parmelinella wallichiana (Taylor) Elix & Hale, comb. nov.
Basionym: *Parmelia wallichiana* Taylor, Hooker J. Bot., **6**, 176. 1847

Parmelinopsis Elix & Hale, gen. nov.
Thallus foliaceus, adnatus vel laxe adnatus, pagina superiore epicorticata, cinerea, emaculata, atranorinum et chloroatranorinum continens; lobis sublinearibus, apice truncatibus, margine ciliatis, ciliis ± elongatis, angustatis, densis vel sparsis; pagina inferior nigra, rhizinis simplicibus vel furcatis instructa. Apothecia adnata, imperforata, sporis octonis, ellipsoideis, 8-12 x 12-18 µm. Pycnidia laminalia, conidiis bifusiformibus vel cylindricis, brevibus, 3-5 µm longis.

Typus generis: *Parmelia horrescens* Taylor in J. T. Mackay, Flora Hibern., 144. 1836
[*Parmelinopsis horrescens* (Taylor) Elix & Hale]

Thallus foliose, corticolous or less commonly saxicolous, adnate to loosely adnate, *lobes* sublinear-elongate, dichotomously or irregularly divided, narrow, 0.5-1.5 (-3.0) mm wide, apices truncate, margins ciliate, *cilia* dense to sparse, more or less evenly distributed, simple, slender. *Upper surface* grey, sometimes darkening with age, with a perforate polysaccharide covering. *Underside* black, moderately to densely rhizinate, rhizines simple or sparsely furcate and dichotomously branched. *Apothecia* adnate, imperforate, spores ellipsoid, simple, with thick walls, 8 per ascus, 8-12 x 12-18 µm. *Pycnidia* laminal, conidia cylindrical or bifusiform, 3-5 µm long. The upper cortex containing atranorin and chloroatranorin.

The genus currently contains the following species:

Parmelinopsis afrorevoluta (Krog & Swinsc.) Elix & Hale, comb. nov.
Basionym: *Parmelia afrorevoluta* Krog & Swinsc., Norw. J. Bot., **26**, 22. 1979

Parmelinopsis cryptochlora (Vainio) Elix & Hale, comb. nov.
Basionym: *Parmelia cryptochlora* Vainio, J. Bot. Brit. & For., **34**, 34. 1896

Parmelinopsis damaziana (Zahlbr.) Elix & Hale, comb. nov.
Basionym: *Parmelia damaziana* Zahlbr., Bull. Herb. Boiss., ser. 2, **5**, 541. 1905

Parmelinopsis expallida (Kurok.) Elix & Hale, comb. nov.
Basionym: *Parmelia expallida* Kurok., Bull. Nat. Sc. Mus., Tokyo **11**, 191. 1968

Parmelinopsis heteroloba (Zahlbr.) Elix & Hale, comb. nov.
Basionym: *Parmelia heteroloba* Zahlbr., Denks. Akad. Wiss. Wien Math.-Natur. Klasse, **83**, 171. 1909

Parmelinopsis horrescens (Taylor) Elix & Hale, comb. nov.
Basionym: *Parmelia horrescens* Taylor in J. T. Mackay, Flora Hibern., 144. 1836

Parmelinopsis jamesii (Hale) Elix & Hale, comb. nov.
Basionym: *Parmelia jamesii* Hale, Phytologia, **23**, 179. 1972

Parmelinopsis melanochaeta (Kurok.) Elix & Hale, comb. nov.
Basionym: *Parmelia melanochaeta* Kurok., in Hale & Kurokawa, Contrib. U.S. Nat. Herb., **36**, 133. 1964

Parmelinopsis microlobulata (Awas.) Elix & Hale, comb. nov.
Basionym: *Parmelia microlobulata* Awas., Biological Memoirs, **1**, 182. (1976) 1977

Parmelinopsis minarum (Vainio) Elix & Hale, comb. nov.
Basionym: *Parmelia minarum* Vainio, Acta Soc. Faun.-Flora Fenn., **7**, 48. 1890

Parmelinopsis neodamaziana (Elix & Johnston) Elix & Hale, comb. nov.
Basionym: *Parmelina neodamaziana* Elix & Johnston, Brunonia, **9**, 155. 1987

Parmelinopsis pindarensis (Awas.& S.Singh) Elix & Hale, comb. nov.
Basionym: *Parmelia pindarensis* Awas. & S.Singh, Biological Memoirs, **1**, 185. (1976) 1977.

Parmelinopsis radiculata (Kurok.) Elix & Hale, comb. nov.
Basionym: *Parmelia radiculata* Kurok., Studies of Cryptogams of Papua New Guinea, 139. 1979

Parmelinopsis schindleri (Hale) Elix & Hale, comb. nov.
Basionym: *Parmelina schindleri* Hale, Smithsonian Contrib. Bot., **33**, 44. 1976

Parmelinopsis spathulata (Kurok.) Elix & Hale, comb. nov.
Basionym: *Parmelia spathulata* Kurok., in Hale & Kurokawa, Contrib. U.S. Nat. Herb., **36**, 133. 1964

Parmelinopsis spumosa (Asahina) Elix & Hale, comb. nov.
Basionym: *Parmelia spumosa* Asahina, J. Jap. Bot., **26**, 259. 1951

Parmelinopsis subfatiscens (Kurok.) Elix & Hale, comb. nov.
Basionym: *Parmelia subfatiscens* Kurok., in Hale & Kurokawa, Contrib. U.S. Nat. Herb., **36**, 134. 1964

Parmelinopsis swinscowii (Hale) Elix & Hale, comb. nov.
Basionym: *Parmelia swinscowii* Hale, Phytologia, **27**, 4. 1973

Parmotremopsis Elix & Hale, gen, nov.
Thallus foliaceus, adnatus, pagina superiore epicorticata, cinerea, emaculata, atranorinum et chloroatranorinum continens; lobis irregularibus, 4-10 mm latis, apice rotundatis, margine ciliatis, ciliis brevibus, angustatis, sparsis in axillis loborum; pagina inferior nigra, rhizinis simplicibus parcis vel densis. Apothecia adnata, imperforata, sporis octonis, ellipsoideis, 3-6 x 7-8 µm. Pycnidia laminalia, conidiis cylindricis, brevibus, 3-5 µm longis.

Typus generis: *Parmelia antillensis* Nyl., Bull. Soc. Linn. Normand., **6**, 264. 1868
[*Parmotremopsis antillensis* (Nyl.) Elix & Hale]

Thallus foliose, corticolous, thin, fragile, adnate to the apices, *lobes* irregular, broad, (3-)4 -10 mm wide, apices rotund, margins ciliate, *cilia* sparse, more or less restricted to the axils, simple, slender. *Upper surface* grey, emaculate, with a perforate polysaccharide covering. *Underside* black, with a very narrow bare or papillate marginal zone, moderately to densely rhizinate, rhizines simple. Apothecia adnate, imperforate, spores ellipsoid, simple, 8 per ascus, 3-6 x 7-8 µm. Pycnidia laminal, conidia cylindrical, 3-5 µm long. The upper cortex ± flaking, containing atranorin and chloroatranorin.

Parmotremopsis antillensis (Nyl.) Elix & Hale, comb. nov.
Basionym: *Parmelia antillensis* Nyl., Bull. Soc. Linn. Normand., **6**, 264. 1868

Parmotremopsis phlyctina (Hale) Elix & Hale, comb. nov.
Basionym: *Parmelia phlyctina* Hale, Bryologist, **62**, 129. 1959

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