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GELATINOPSIS, GELTINGIA AND PHAEOPYXIS: three helotialean genera with lichenicolous species

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ABSTRACT. The helotialean genera *Gelatinopsis* Rambold & Triebel, *Geltingia* Alstrup & D. Hawksw. and *Phaeopyxis* Rambold & Triebel, all comprising species formerly included in *Nesolechia* Massal. or *Phacopsis* Tul., are presented. *Phaeopyxis* Rambold & Triebel is described as new, *Gelatinopsis* Rambold & Triebel replaces *Micropyxis* Seeler (nom. illegit.). The following combinations are proposed: *Gelatinopsis ericetorum* (Körber) Rambold & Triebel, *comb. nov.*, *Gelatinopsis geoglossi* (J. B. Ellis & Everhart) Rambold & Triebel, *comb. nov.*, *Phaeopyxis punctum* (Massal.) Rambold, Triebel & Coppins, *comb. nov.*, *Phaeopyxis carniolica* (Arnold) Rambold & Triebel, *comb. nov.*, *Unguiculariopsis lettaui* (Grummann) Coppins, *comb. nov.* and *Unguiculariopsis refractiva* (Coppins) Coppins, *comb. nov.* Two new species, *Phaeopyxis varia* Coppins, Rambold & Triebel from Europe and *Phaeopyxis australis* Rambold & Triebel from Australia are described. The main characteristics of helotialean genera with lichenicolous species, including one with hepaticolous species, are given. A key to the lichenicolous helotialean species discussed is provided.

INTRODUCTION

Lichenicolous fungi with dark pigmented apothecia, 8-spored asci and colourless, non-septate spores have traditionally been placed in the genera *Phacopsis* Tul. emend. Körber (species with immarginate apothecia), *Nesolechia* Massal. (e.g. Vouaux, 1914; Keissler, 1930), or *Lecidea* Ach. (e.g. Olivier, 1905, 1907) (species with marginate apothecia). Mainly by means of ascus characters a more natural concept for these lecanoralean genera has been offered by Hertel (e.g. 1984) for *Lecidea* and by Hafellner (1987) for *Phacopsis*. The widely used name *Nesolechia* has recently fallen into synonymy, because Triebel & Rambold (1988) established that its type (*N. oxyspora* (Tul.) Massal.) is referable to *Phacopsis*.

Several other species placed by Keissler (1930) in *Nesolechia* or *Phacopsis* are now regarded as belonging to the pyrenocarpous genus *Discocera* A. L. Sm. & Ramsb., *Cecidonia* Triebel & Rambold (Lecanorales; Triebel & Rambold, 1988), *Carbonea* (Hertel) Hertel (Lecanorales; Hertel, 1983) or *Rhymbocarpus* Zopf (Ostropales; Triebel, 1989) Among the remaining members of *Nesolechia* and *Phacopsis* sensu Keissler (1930), there are several species, which, according to their ascus characters, obviously belong to the Helotiales s.l. They can be segregated into the genera *Gelatinopsis, Geltingia,* and *Phaeopyxis* (Fig. 1).

Gelatinopsis Rambold & Triebel, **nom. nov.**

Syn.: *Micropyxis* Seeler in Farlowia 1: 125 (1943)—nom. illegit.—non *Micropyxis* Duby in DC., Prodr. 8: 71 (1844).

Typus generis: *Gelatinopsis geoglossi* (J. B. Ellis & Everhart) Rambold & Triebel.

Apothecia small, gelatinous, brown to black-brown, indistinctly marginate, immersed or sessile, roundish or elongate, fungicolous or lichenicolous.

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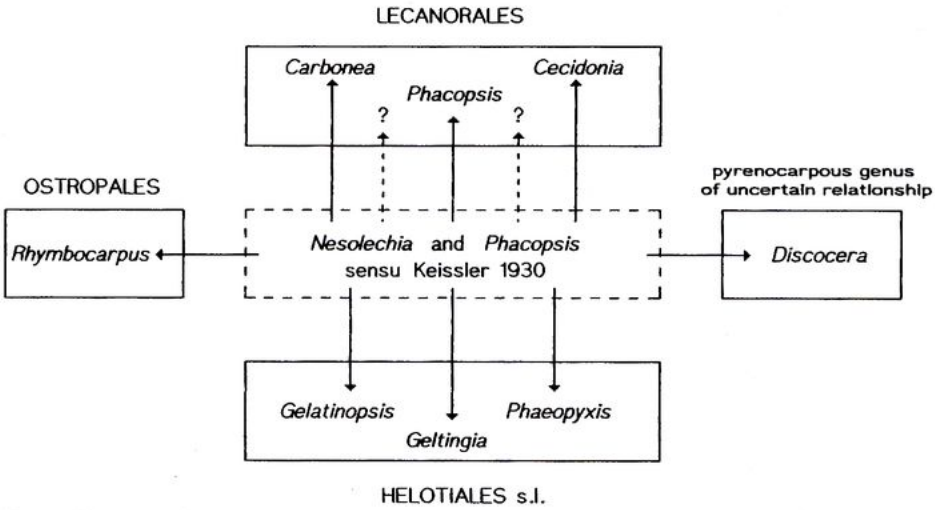

FIG. 1. The currently accepted generic position of species placed in *Nesolechia* and *Phacopsis* by Keissler (1930).

Excipulum thin, yellowish brown or olivaceous, built up by parallel, conglutinate hyphae. *Hypothecium* colourless, pale brown or yellowish brown; hyphae plectenchymatous. *Hymenium* colourless to tinged pale yellow or greenish. Paraphyses septate, mostly not branched, 2–2.5μm thick, often not distinct; apically swollen; lumina 1–1.5(–2)μm wide. Epihymenium yellowish-brown or olivaceous. *Asci* cylindrical to clavate, with short stalk, 8-spored; ascus wall apically slightly thickened, up to 1.5μm, laterally thin, c.0.5 (–1)μm, I-. Spores non-septate, colourless, smooth, ellipsoid to oblong.

Conidiomata: not observed.

Gelatinopsis is characterized by gelatinous apothecia (hence our choice of name) with a diffuse pale yellow or pale green inner pigmentation, by relatively thick paraphyses and the ascus type. The asci have a thin lateral wall, apically the wall is slightly thickened (Fig. 2a, 2b). The hosts of this genus are fungi or lichens belonging to the Helotiales s.l. Table 1 lists the distinguishing characters of it and other helotialean genera.

Gelatinopsis ericetorum (Körber) Rambold & Triebel, **comb. nov.**

Syn.: *Nesolechia ericetorum* Körber, Parerga Lich.: 461 (1865).
Lecidea ericetorum (Körber) H. Olivier, Princ. Par. Lich. Fr., Suppl.: 6 (1907).
Phacopsis ericetorum (Körber) Vouaux in Bull. Soc. Mycol. France 30: 144 (1914).

Lectotype (designated here): Körber, *Lich. Sel. Germ.* no. 300 (M).

Apothecia small, black-brown, turgescent black-brown, indistinctly marginate, up to 0.45mm diam, plane, immersed, roundish to elongate, indistinctly limited, crowded, partly confluent. *Excipulum* laterally 15–20μm thick, olivaceous. *Hypothecium* colourless to pale brown, c.60μm tall. *Hymenium* 40–50μm tall, colourless to tinged green-brown. Paraphyses 2–2.5μm thick; apices swollen (–4μm); lumina 1–1.5 (–2)μm wide. Epihymenium olivaceous, (7.5–)10–15μm tall. *Asci* cylindrical to clavate, (35–)40–50

(–55) × 7–11μm; ascus wall apically c.1–1.5μm thick, laterally c.0.5–1μm thick. Spores oblong, partly curved, 10–14 (–15) × (2.5–) 3–4 (–4.5)μm.

Colour reactions: Pigmentation K- (or green pigment fading to pale brownish green); N-.

Hosts: *Baeomyces roseus* Pers., *Baeomyces* sp. (thallus).

Distribution: Europe.

It is with some hesitation that this species is transferred to *Gelatinopsis*, showing in contrast to *G. geoglossi* a slightly less differentiated apical delimitation of the inner ascus wall (Fig. 2a). Both species however have a very thin lateral ascus wall and similar paraphyses. Notable characters of *G. ericetorum* are the greenish internal pigmentation, the relatively thick paraphyses, and the completely immersed, often elongate apothecia. Hertel (1970), Honegger (1983), and Cannon et al. (1985) regard the host genus *Baeomyces* as belonging to the Helotiales s.l.

SPECIMENS EXAMINED:

ENGLAND: Cumberland (V.C. 70): Garrigill, 35/73.41, ix 1988, *A. Fryday* (E). Yorkshire: North-West Yorkshire (V.C. 65), Sedbergh, Cautley Spout, 34/68.97, x 1988, *A. Fryday* (E).

WALES: Brecon, NE of Beaufort, xi 1984, *R. G. Woods* 3273 (E).

POLAND: Silesia: '. . . prope praedium "Paulinum" circa Hirschbergam . . .', 1862, *G. W. Körber* (Körber, *Lich. Sel. Germ.* no. 300, '*Nesolechia ericetorum*'; M); 'prope Rybnik Silesiae superioris', [no date], *B. Stein* (Körber, *Lich. Sel. Germ.* no 390, '*Nesolechia ericetorum*'; M).

TABLE 1

The main diagnostic characters of the helotialean genera *Gelatinopsis* Rambold & Triebel, *Geltingia* Alstrup & D. Hawksw., *Mniaecia* Boud., *Phaeopyxis* Rambold & Triebel, *Skyttella* D. Hawksw. & R. Sant., *Unguicularіopsis* Rehm (characters partly according to Zhuang, 1988), and *Pezizella* Fuckel (characters partly according to Dennis, 1956 and Hawksworth, 1980; ecology according to Hawksworth & Hill, 1984: 11, tab. 1.3).

Code to abbreviations: alg, algicolous; an, annular structure; ell, ellipsoid; er, erumpent; fu, fungicolous; glob, globose; hep, hepaticolous; im, immersed; lc, lichenicolous; li, lichenized; my, plant mycorrhizae; obl, oblong; ov, ovoid, sap, saprophytic; se, sessile; st, stalked; verruc, verruculose.

	Gelat.	Geltin.	Mniaec.	Phaeop.	Skytt.	Unguic.	Peziz.
Adnation	se/im	se (er)	se	se (er)	se (er)	se/st	st (er)
Margination	±	+	+	+	–	+	+
Hair-like processes	–	–	–	–	–	+	+
Pigm. granular	–	–	–	+	–	–	–
Par. lum. ⩾2μm	–	–	–	–	+	–	–
Ascus wall lat. [μm]	0.5–1	1–1.5	1.5–2	1–1.5	0.5–1	0.5–1	>0.5
Ascus wall ap. [μm]	1–1.5	1–1.5(–2)	3–8	1.5–3	1.5–2	c.1	1–3
Ascus wall amyloid	–	–	–	±	–	–	+ (an)
Spore shape	ell/obl	glob	ov/ell	ov/ell	obl	glob/ell	ell
Epispore verruc.	–	(+)	–	–	–	–	–
Ecology	fu/lc	lc	hep	lc/alg	lc	fu/lc	sap/fu/lc my/li (?)

Gelatinopsis geoglossi (J. B. Ellis & Everhart) Rambold & Triebel, **comb. nov.**

Syn.: *Hypomyces geoglossi* J. B. Ellis & Everhart in J. Mycol. 2: 73: (1886).
Peckiella geoglossi (J. B. Ellis & Everhart) Sacc., Syll. Fung. 9: 944 (1891).
Eleutheromyces geoglossi (J. B. Ellis & Everhart) Seaver in Mycologia 1: 48, pl. iv, fig. 10–11 (1909).

Micropyxis geoglossi (J. B. Ellis & Everhart) Seeler in Farlowia 1: 126 (1943).

Type: U.S.A., New Jersey, Newfield, ix 1876, *J. B. Ellis* s.n. (holo. NY? n.v.); *ibid.*, ix 1879 (topo. FH).

Apothecia small, brown, turgescent yellow-brown, indistinctly marginate, c.0.1–0.15mm diam, plane to convex, sessile, roundish, mostly discrete. *Excipulum* laterally c.10µm thick, yellowish-brown. *Hypothecium* yellowish-brown, 20–30µm tall. *Hymenium* 35–40µm tall, colourless to tinged pale yellow. Paraphyses c.2µm thick; apices scarcely swollen (c.2,5µm); lumina 1–1.5µm wide. Epihymenium yellowish-brown. *Asci* subcylindrical, 30–40 × 6–7.5µm; ascus wall apically c.1–1.5µm thick, laterally c.0.5µm thick. Spores ellipsoid, (8–)9–11(–12) × (2.5–)3–4(–4.5)µm.

Colour reactions: Pigmentation K-.

Hosts: Trichoglossum farlowii (Cooke) Durand; according to Pfister (1976) also on *T. rasum* Pat., *T. walteri* (Berk.) Durand and *Geoglossum* sp. (ascomata).

Distribution: U.S.A. (further specimens—also from Tennessee and North Carolina—cited by Seeler, 1943); Jamaica (according to Pfister, 1976).

The very small, sessile apothecia of this species abundantly colonize the ascomata of the host fungi, which belong to the Geoglossaceae (Helotiales—according to Cannon et al., 1985). The ascus apices of *G. geoglossi* show a concave delimitation of the inner wall (Fig. 2b), similarly shaped as in *Phaeopyxis*.

SPECIMENS EXAMINED:

U.S.A.: Massachusetts: Nantucket, Hidden Forest, 5 viii 1938, *E. V. Seeler* 450B (FH). New Jersey: Newfield, ix 1879, *J. B. Ellis* s.n. (FH).

Geltingia Alstrup & D. Hawksw. in Meddel. Grønland 31: (in press).

Apothecia small, black, with distinct margin, erumpent, sessile, roundish to elongate, lichenicolous. *Excipulum* brown, built up by parallel hyphae. *Hypothecium* colourless to pale brown; hyphae plectenchymatous. *Hymenium* colourless to pale brown. Paraphyses septate, not conglutinate, not branched, up to 2µm thick; apices mostly not swollen; lumina 1–1.5µm wide. Epihymenium brown. *Asci* cylindrical, with long stalk, 8-spored; ascus wall apically slightly thickened, up to 2µm, I-; inner ascus wall typically with small apical pore-like indentation. Spores non-septate, colourless, broadly ovoid to globose, mostly uniseriate in the ascus; epispore more or less verruculose.

Conidiomata: not observed.

Geltingia is characterized by cylindrical asci apically with a small pore-like indentation of the inner wall (Fig. 2c), and non-conglutinate paraphyses. Further notable characters are the globose to broadly ovoid spores, which are arranged mostly uniseriately in the ascus and have a more or less verruculose epispore (see also Table 1). The apices of the asci of *Mniaecia* Boud. and *Skyttella* D. Hawksw. & R. Sant. are similar concerning the development of a pore-like indentation of the inner wall. The apical dome of the first genus however is very thick, in the latter the pore-like structure is significantly broader (Fig. 2e, 2g). The two genera *Schaereria* Körber (lichenized species) and *Unguiculariopsis* Rehm (fungicolous or lichenicolous species) also include species with globose spores, located uniseriately in the ascus, but show no differentiated apical delimitation of the inner ascus wall (Fig. 2f, 2h). *Discocera*

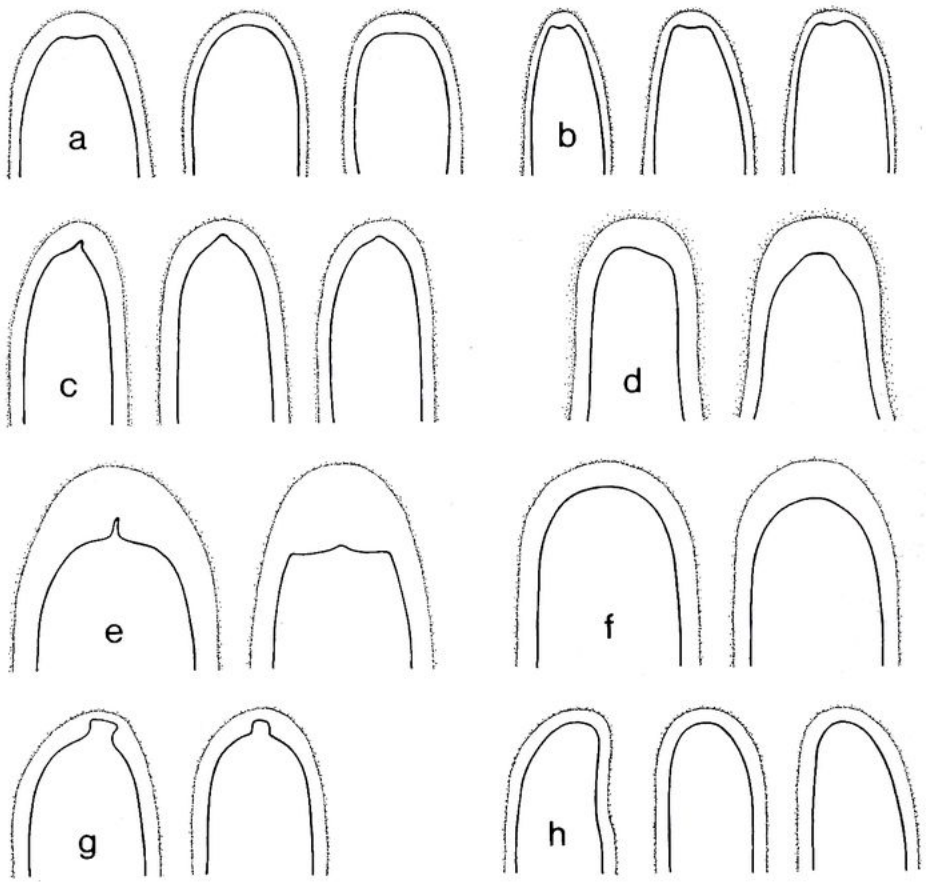

FIG. 2. Ascus apices. a, *Gelatinopsis ericetorum* (*Woods* 3273, E); b, *G. geoglossi* (*Seeler* 450B, FH); c, *Geltingia associata* (*Kalb*, hb. Poelt 12890); d, *Discocera lichenicola* (holo. of *Thrombium cretaceum* W. Wats., BM); e, *Mniaecia jungermanniae* (Fr.) Boud. (*Plant. Graec. Fungi* no. 54, M); f, *Schaereria tenebrosa* (Flotow) Hertel & Poelt (Hertel, *Lecideac. Exs.* no. 176, M); g, *Skyttella mulleri* (Santesson, *Fungi Lichenic. Exs.* no. 29, M); h, *Unguiculariopsis thallophila* (Mustiala, xii 1869, *P. A. Karsten* s.n., M). Scale = 10μm.

A. L. Sm. & Ramsb., which has been placed into the synonymy of *Nesolechia* by Keissler (1930), is another genus with non-amyloid asci. It comprises *D. lichenicola* A. L. Sm. & Ramsb. (= *Thrombium cretaceum* W. Wats., according to Hawksworth 1978) as the only species. The type of *T. cretaceum* is considered to be a pyrenocarpous lichen of uncertain relationship. It shows non-carbonized ascomata, which resemble apothecia, verrucarioid asci (Fig. 2d), an I(conc.)+orange-red hymenial gel, numerous branched and anastomosing paraphysoids and periphysoids.

Geltingia associata (Th. Fr.) Alstrup & D. Hawksw. in Meddel. Grønland 31: (in press).

Syn.: *Lecidea associata* Th. Fr., in Kongl. Svensk Vetenskapsakad. Handl. 7(2): 42 (1867).

Leciographa associata (Th. Fr.) Zopf in Herzogia 35: 341 (1896).

Nesolechia associata (Th. Fr.) Sacc. & D. Sacc., Syll. Fung. 18: 171 (1906).

Lecidea leptostigma Nyl. in Flora 51: 344 (1868). Type: Scotland, 'Supra saxa micacea', *J. M. Crombie* (n.v.).

Nesolechia leptostigma (Nyl.) Sacc. & D. Sacc., Syll. Fung. 18: 172 (1906).

Lithographa andrewii Stirton in Scottish Naturalist 4: 300 (1878). Type: Scotland, New Galloway, Cairn Edward, 300–500ft, *J. M'Andrew* s.n. (iso. BM).

Xylographa andrewii (Stirton) Redinger in Rabenh., Krypt. Fl. Deutschl. 9, 2 Abt., 1 Teil, no. 2: 204 (1938).

Lectotype (designated here): Spitsbergen, Danskön, 1861, *A. J. Malmgren* s.n. (UPS).

Apothecia small, black, nitid, turgescent black, with distinct margin, roundish to elongate, 0.25–0.4mm diam, concave to plane, erumpent, sessile, crowded, rarely confluent. *Excipulum* laterally 20–40µm thick, brown. *Hypothecium* colourless to pale yellow-brown, c.40µm tall. *Hymenium* 55–70µm tall, colourless to pale brown. Paraphyses (1.5–)2µm thick; apices mostly not swollen; lumina 1–1.5µm wide. Epihymenium 10–20µm tall, brown. *Asci* cylindrical, with long stalk, (45–)50–60(–75) × 7–9(–11)µm; ascus wall apically 1–1.5(–2)µm thick, laterally 1–1.5µm thick; inner ascus wall with a small pore-like indentation at the apex. Spores broadly ovoid to globose, mostly uniseriate in the ascus, (6.5–)8–9(–9.5) × (5–)5.5–6(–7)µm; epispore more or less verruculose.

Colour reactions: Brown pigmentation in excipulum, hypothecium, and epihymenium K-.

Hosts: *Ochrolechia androgyna* (Hoffm.) Arnold, *O. frigida* (Sw.) Lynge, *O. tartarea* (L.) Massal., *Ochrolechia* sp.; according to Walker (1970) and Cannon et al. (1985) also on *Thamnolia vermicularis* (Sw.) Schaerer (thallus).

Distribution: Northern Europe.

SPECIMENS EXAMINED:

SPITSBERGEN: Danskön: 1861, *A. J. Malmgren* s.n. (UPS); Amsterdamöya, near 'Smeerenburg', c.79°45'N, 11°00'E, 15–19 vii 1975, *H. Hertel* 16257 & *H. Ullrich* (M).

SWEDEN: Torne Lappmark: Gem. Kiruna, Torneträsk-Gebiet, Weg von Abisko nach Björkliden, 350m, 10 vii 1970, *K. Kalb* (hb. Poelt 12890). Härjedalen: Tännäs parish, the valley of the river Ljusnan, c.1km ESE of Hotel Ramundberget, 800m, 6 viii 1982, *R. Santesson* 30650 (UPS). Bohuslän: Dragsmark par., Källviken, 58°15'N, 11°31'E, 4 viii 1915, *A. H. Magnusson* (Santesson, *Fungi Lichenic. Exs.* no. 110, '*Lecidea associata*'; M).

SCOTLAND: West Sutherland (V. C. 108), c.2km SW of Tongue, woods between An Garbh-chnoc and Creag an t-Tralghean, 29/57.54 (–5), 10–100m, 31 viii 1984, *B. J. Coppins* 10385 (E). Westerness (V. C. 97), Knoydart, valley between Stob na Muicraidh and Bochd Mhic an Tosaich, 18/86–.02–, 22 v 1975, *B. J. Coppins* 1208 & *F. Rose* (E). Argyll Main (V. C. 98): Beinn Dothaidh, 27/33.41, 2500ft., 22 vii 1978, *P. B. Topham* s.n. (E). Kirkcudbright: New Galloway, Cairn Edward, 300–500ft., [no date], *J. M'Andrew* s.n. (BM, 2 specimens).

Phaeopyxis Rambold & Triebel, **gen. nov.**

Apothecia parva vel minuta, fusca vel atro-fusca, marginata, sessilia, in thallo lichenum crescentia vel in ligno habitantia (? algicola). Excipulum fuscum vel violaceo-fuscum ('carbonaceum'). Hypothecium fuscum vel violaceo-fuscum, pseudoparenchymaticum. Hymenium hyalinum usque ad subfuscum. Paraphyses septatae, usque ad 2µm crassae, vix ramosae anastomosantesque, apice leniter incrassatae. Epihymenium fuscum vel violaceo-fuscum. Pigmentum fuscum excipuli et hypothecii et epihymenii granulatum et in kalii caustico purpurascens. Asci (sub-) cylindracei vel clavati, octospori. Ascosporae incoloratae, unicellulatae, ovoideae aut ellipsoideae.

Typus generis: *Phaeopyxis punctum* (Massal.) Rambold, Triebel & Coppins.

Apothecia small, black-brown, more or less distinctly marginate, sessile, roundish, lichenicolous or (?) algicolous. *Excipulum* dark brown to dark violet-brown ('carbonized'). *Hypothecium* pseudoparenchymatous (with 1 thick-walled hyphae), brown to violet-brown, or colourless to mottled dark brown. *Hymenium* colourless to pale brown. Paraphyses septate, sparingly branched and anastomosing, 1–2μm thick; apices scarcely swollen; lumina 1–1.5μm wide. Epihymenium dark brown, violet-brown to black-brown. Brown pigment of epihymenium, excipulum and hypothecium coarsely granular. *Asci* clavate to (sub-) cylindrical, with short stalk, 8-spored; ascus wall apically up to 3μm thick, laterally c.1–1.5μm thick, I+ pale bluish or I–. Spores non-septate, colourless, ellipsoid to ovoid, smooth, often badly developed.

Colour reactions: Brown pigmentation in excipulum, hypothecium, and epihymenium K ± violet-brown.

Conidiomata: not observed.

Etymology: from *phaios* (Gr. = dark or dusky) and *pyxis* (Gr. = a box).

Phaeopyxis is characterized by asci, typically showing a distinct concave apical delimitation of the inner ascus wall (Fig. 3a–d) and a dark, quite coarsely granular pigmentation of excipulum, hypothecium and epihymenium, reacting K ± violet-brown (see also Table 1). Its paraphyses seem somewhat thinner than in *Gelatinopsis*. *Phaeopyxis* shows an ascus type similar to that in *Leotia* Pers. (Leotiaceae, Leotiales—see Carpenter, 1988) (Fig. 3e), but differs in developing no stipitate ascomata, more conglutinate paraphyses and a granular pigmentation. *Agyrium* Fr., *Saccomorpha* Elenk., *Trapelia* Choisy, and *Trapeliopsis* Hertel & G. Schneider (Agyriaceae incl. Saccomorphaceae and Trapeliaceae) which also have asci with an apical dome similarily shaped as in *Phaeopyxis* and *Leotia*, however show a more or less distinct amyloid cap-like structure in the tholus (Fig. 3f–h).

The four species here assigned to *Phaeopyxis* are rather similar to each other and can be separated mainly by their spore size and shape (Fig. 4), the amyloid reaction of the ascus wall (observable only in diluted Lugol's solution), and by their hosts or substratum.

Phaeopyxis australis Rambold & Triebel, **sp. nov.**

Phaeopyxis variae similis, sed sporibus latioribus et in *Paraporpidia leptocarpa* parasitans.

Type: Australia, New South Wales, Kioloa State Forest, Durras North–Princess Highway road, 35°37′S, 150°16′E, rocks on road cutting in tall wet *Eucalyptus* forest, 70m, 22 i 1986, *G. Rambold* 3787 (holo. M; iso. M, UPS).

Apothecia small, black-brown, nitid, turgescent brown, more or less distinctly marginate, 0.2–0.25mm diam, plane, sessile, crowded, partly confluent. *Excipulum* laterally c.20μm thick, dark brown to dark violet-brown. *Hypothecium* brown to violet-brown, up to 30μm tall. *Hymenium* c.50μm tall, pale brown. Paraphyses c.2μm thick; lumina 1–1.5μm wide. Epihymenium dark brown to violet-brown, c.10μm tall. *Asci* clavate to subcylindrical, 40–50 × 7.5–10μm; ascus wall apically c.2–3μm thick, laterally c.1–1.5μm thick, I-. Spores ellipsoid to ovoid, 7.5–10.5 × (4–)5–5.5μm.

Colour reactions: Brown pigmentation in excipulum, hypothecium, and epihymenium K + violet-brown.

Host: *Paraporpidia leptocarpa* (Nyl. ex Bab. & Mitt.) Rambold & Hertel (thallus).

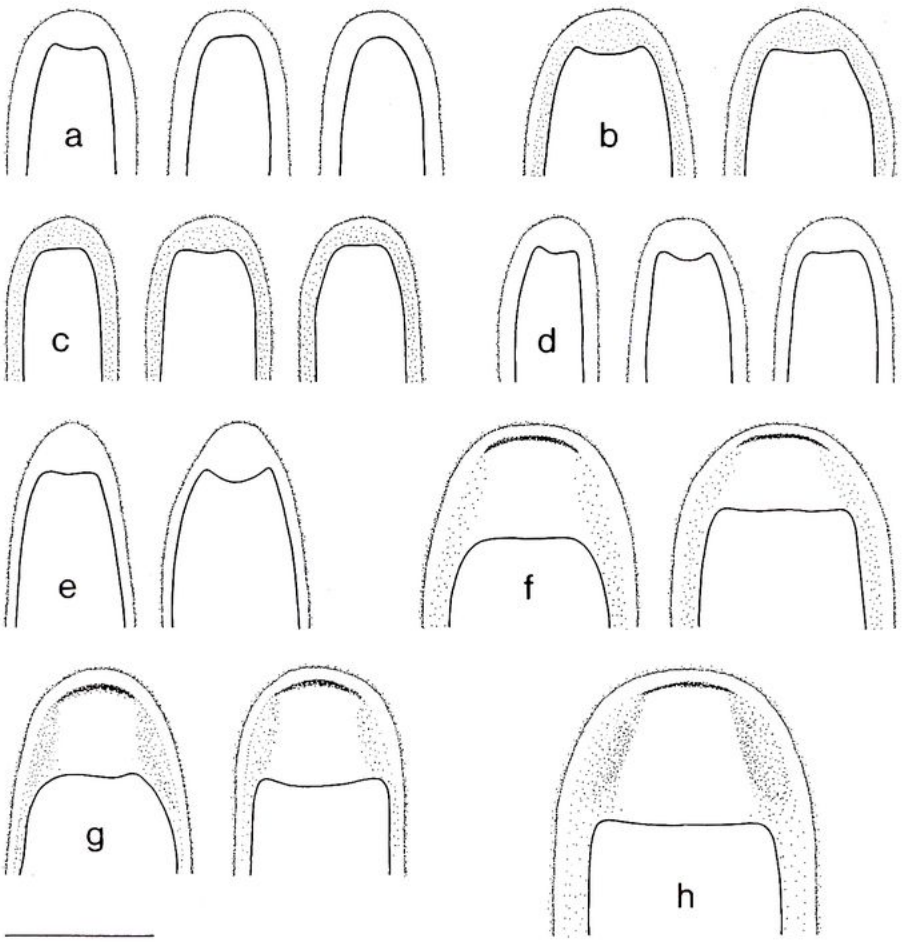

FIG. 3. Ascus apices. a, *Phaeopyxis australis* (holo. M); b, *P. carniolica* (holo. M); c, *P. punctum* (Santesson, *Fungi Lichenic. Exs.* no. 15, M); d, *P. varia* (*Coppins* 8985, M); e, *Leotia lubrica* (Scop.) Pers. (*H. Schmid-Heckel* 880, M); f, *Saccomorpha uliginosa* (Schrader) Hafellner (iso lecto. M); g, *Agyrium rufum* (Pers.) Fr. (Anzi, *Lich. Langob. Exs.* no. 466, M); h, *Trapelia coarctata* (Sm.) M. Choisy (Hertel, *Lecideac. Exs.* no. 179, M). Scale = 10μm.

Distribution: Australia, known only from the type locality.

P. australis is well distinguished from the other two lichenicolous species by its somewhat larger and relatively broader spores (Fig. 4). The ascus wall is I- as in *P. varia*. The host *Paraporpidia leptocarpa* is a member of the Porpidiaceae (Rambold, 1989).

Phaeopyxis carniolica (Arnold) Rambold & Triebel, **comb. nov.**

Syn.: *Biatora carniolica* Arnold in Glowacki, in Verh. K. K. Zool.-Bot. Ges. Wien 20: 453, tab. VIII, fig. 3 (1870).
Lecidea carniolica (Arnold) Zahlbr., Catal. Lich. Univ. 3: 745 no. 6931 (1925).

Type: Yugoslavia, Slovenia, 'Krain, Idria [= Idrija], Hudo polje', 1869, *J. Glowacki* s.n. (holo. M, iso. M).

Apothecia small, black, nitid, turgescent black-brown, more or less distinctly marginate, 0.1–0.3mm diam, plane to convex, sessile, crowded to dispersed,

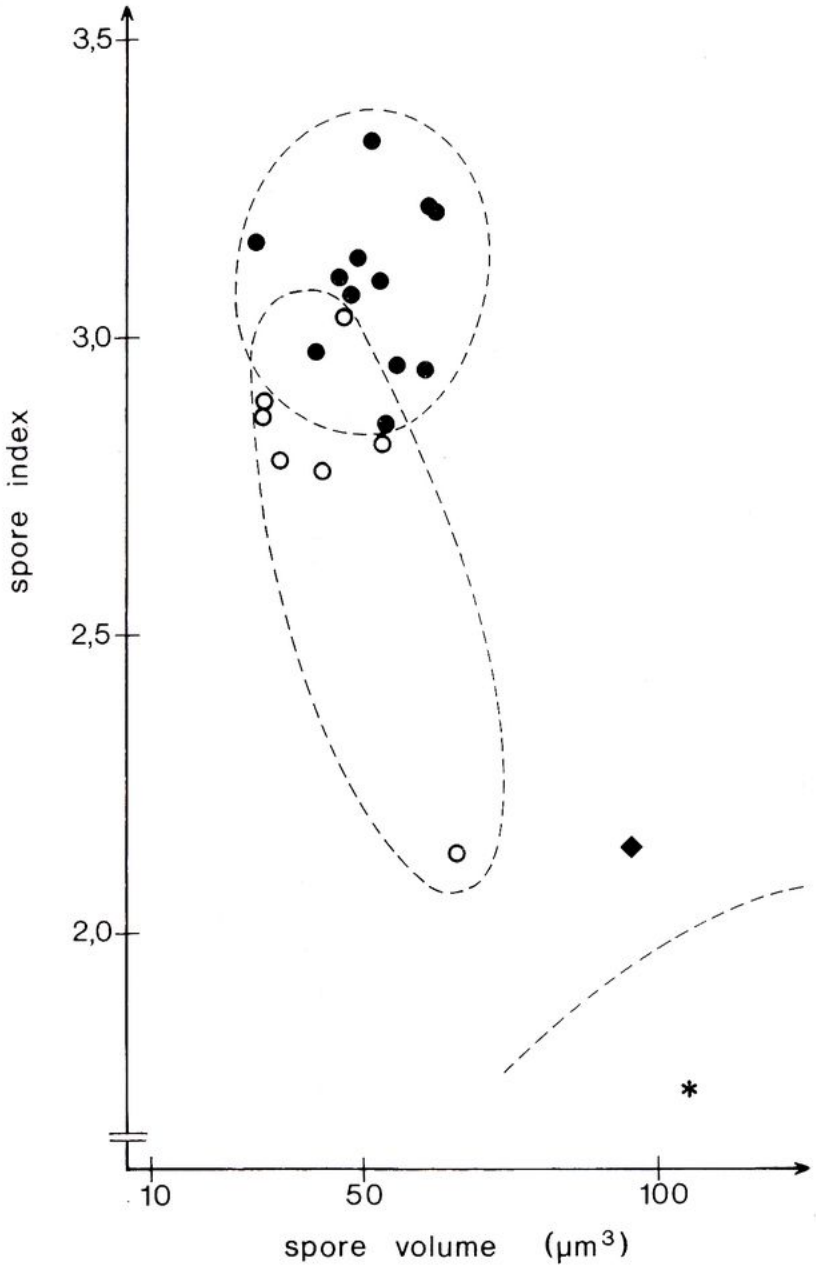

FIG 4. Size and shape of ascospores. ★ *Phaeopyxis australis*; ◆ *P. carniolica*; ● *P. punctum*; ○ *P. varia*.

roundish, rarely confluent. *Excipulum* laterally 12–15μm thick, dark brown to black-brown. *Hypothecium* colourless to mottled dark brown, c.50μm tall. *Hymenium* 50–55μm tall, colourless. Paraphyses 1.5–2μm thick; lumina c.1μm wide. Epihymenium dark brown to black-brown, 10–15μm tall. *Asci* (sub-) cylindrical to clavate, 40–45 × 11–13μm; ascus wall apically c.1.5–3μm thick, laterally up to 1.5μm thick, I+pale bluish. Spores ellipsoid, subhalonate, 7.5–9.5 × 4–5(–5.5)μm.

Colour reactions: Brown pigmentation in excipulum, hypothecium and epihymenium K+violet-brown.
Substratum: Decorticated wood (*Fagus*), perhaps algicolous.
Distribution: Europe, known only from the type locality.

P. carniolica, which is known only from the type specimens, grows on decorticated wood, colonized by various green and blue-green algae. On the basis of this material it is impossible to decide, whether the species is lignicolous (saprophytic) or algicolous (parasitic). Regarding the ecology of the other three species, a parasitic life-form of *P. carniolica* seems more likely. The ascus wall is I+pale bluish as in *P. punctum*, but the spores are larger and relatively broader (Fig. 4).

Phaeopyxis punctum (Massal.) Rambold, Triebel & Coppins, **comb. nov.**
Syn.: *Nesolechia punctum* Massal., Sched. Crit. 5: 96 (1856).
Lecidea punctum (Massal.) Jatta, Syll. Lich. Ital.: 353 (1900).
[non *Spolverinia punctum* Massal. in Flora 39: 282 (1856).]
[non *Verrucaria punctum* (Massal.) H. Olivier in Bull. Acad. Int. Géogr. Bot. 16: 123 (1907).]
? *Lecidea cladoniaria* Nyl. in Mém. Soc. Impér. Sci. Nat. Cherbourg 5: 339 (1857). Type: France, 'Supra *Cladoniam uncialem* . . . lecta ad Mortain' (n.v.).
Nesolechia cladoniaria (Nyl.) Arnold in Flora 57: 99 (1874).
? *Lecidea cladonioica* Nyl. in Compte. Rend. Hebd. Acad. Sci. 83: 90 (1876). Type: New Zealand, Campbell Island, 'Parasite sur les squames thallines du *Cladonia subdigitata*', *M. Filhol* (n.v.).
Type: Italy (no locality, date or collector), Massalongo, *Lich. Ital. Exs.* no. 153 (iso. M).

Apothecia small, black-brown, nitid, turgescent black-brown, more or less distinctly marginate, 0.1–0.25(–0.3)mm diam, plane, sessile, crowded, roundish, partly confluent. *Excipulum* laterally 10–20μm thick, dark brown to black-brown. *Hypothecium* brown, 20–35μm tall. *Hymenium* 35–40(–45)μm tall, colourless to pale brown. Paraphyses 1–2μm thick; lumina 1–1.5(–2)μm wide. Epihymenium dark brown to black-brown, 5–10μm tall. *Asci* (sub-) cylindrical, (30–)35–50 × 7.5–8.5μm; ascus wall apically c.(1–)1.5–2(–2.5)μm, laterally 1–1.5μm thick, I+pale bluish. Spores ellipsoid, (7–)8.5–10.5(–12) × 2.5–3.5 (–4)μm.

Colour reactions: Brown pigmentation in excipulum, hypothecium, and epihymenium K ± violet-brown.
Hosts: *Cladonia bacillaris* Nyl., *C. coccifera* (L.) Willd., *C. coniocraea* auct., *C. fimbriata* (L.) Fr., *Cladonia* sp. (thallus squamules).
Distribution: Europe, North America, Australasia.

P. punctum is a rather well-known lichenicolous fungus, growing on several species of *Cladonia*. It occasionally induces gall-like deformations, as already indicated by Grummann (1960). The species constantly shows a I + pale bluish reaction of the ascus wall as in *P. carniolica,* but has much smaller spores (Fig. 4). *Nesolechia cetrariicola* (Lindsay) Arnold on *Cetraria islandica* (L.) Ach. is not related to *P. punctum,* as assumed by Cannon et al.(1985).

SPECIMENS EXAMINED:

CANADA: Newfoundland: Upper Sandy Points. 7 ix 1895, *A. C. Waghorne* 156 (M).

SWEDEN: Jämtland: Åre par., Storlien, c.1km NW of the waterfall of Brudslöjan, c.500m, 15 viii 1948, *R. Santesson* 48453 (Santesson, *Fungi Lichenic. Exs.* no. 15, '*Lecidea punctum*'; M); Härjedalen: Tännäs par., the valley of the river Ljusnan, c.1km ESE of Hotel Ramundberget, 62°42′N, 12°24′E, 730m, 29 vii 1987, *R. Santesson* 31858 (Santesson, *Fungi Lichenic. Exs.* no. 135, '*Lecidea punctum*'; M); Uppland: Vänge par., Fiby Urskog, S of lake Fibysjön, NW of Getryggen, 28 ix 1948, *R. Santesson* 4856 (Santesson, *Fungi Lichenic. Exs.* no. 83, '*Lecidea punctum*'; M); Södermanland: Dunkers prästgård (?), 1890, *O. G. Blomberg* s.n. (M).

FRANCE: Vendée: Petit-Bourg, près La Roche sur Yon, 27 ii 1877, *O. J. Richard* s.n. (M, UPS).

GERMAN FEDERAL REPUBLIC:Niedersachsen: Oldenburg, Richtmoor bei Zwischenahn, iv 1889, *H. Sandstede* (Arnold, *Lich. Exs.* no. 1481, '*Nesolechia punctum*'; M); Richtmoor bei Zwischenahn, iv 1889, *H. Sandstede* s.n. (M, 3 specimens): 'prope Zwischenahn', [no date], *H. Sandstede* (*Krypt. Exs. Vind.* no. 627, '*Nesolechia punctum*'; M); Zwischenahn, [no date], *H. Sandstede* s.n. (M). Bayern: Keuperregion bei Bayreuth, ii 1863, *A. Walther* (Arnold, *Lich. Exs.* no. 252, '*Nesolechia punctum*'; M, 2 specimens); Bayreuth, 1862, *A. Walther* s.n. (M); Oberpfalz, westlich Auerbach gegen Fischstein, ix 1884. *F. Arnold* s.n. (M); Erlangen, bei Tennenlohe, vii. 1865, *F. Arnold* s.n. (M); Bei den Schwalbmühlen unweit Wemding, ix 1885, *F. Arnold* s.n. (M); München, Emeringer Leiten südlich von Olching, 10 ix 1890, *F. Arnold* s.n. (M); Bayrische Alpen, Gindelalm zwischen Schliersee und Tegernsee, vi 1882, *F. Arnold* s.n. (M).

GERMAN DEMOCRATIC REPUBLIC: Prignitz, Triglitz [N Pritzwalk], 18 iv 1908, *O. Jaap* (Jaap, *Fungi Sel. Exs.* no. 311, '*Nesolechia punctum*'; M).

AUSTRIA: Steiermark: Schladminger Tauern, Lassachtal oberhalb der Breitlahnhütte in der Kleinsölk, 1300–1500m, 9 vii 1973, *J. Poelt* 12300 (hb. Poelt). Burgenland: nahe der Grenze SE Deutsch-Bieling, c.200m, 18 iv 1981, *J. Poelt* (*Plant. Graec. Lich.* no. 321, '*Nesolechia punctum*'; M).

ITALY: [no locality or date or collector]. (Massalongo, *Lich. Ital. Exs.* no. 153, '*Nesolechia punctum*'; M, 2 specimens).

AUSTRALIA: Victoria: Baw Baw National Park, 6km ESE of Mt Erica, beside Mt Erica Road, 37°35′S, 146°23′E, 900–1000m, 10 i 1986, *G. Rambold* 3253 (M).

NEW ZEALAND: Campbell Island: 52°33′S, 169°09′E, xi 1960, *G. Poppleton* (UPS ex COLO—S 26.230).

Phaeopyxis varia Coppins, Rambold & Triebel, **sp. nov.**

Apothecia 0.2–0.3(–0.35)mm in diametro, in thallo lichenis *Trapeliopsis gelatinosae* crescentia. Hymenium (30–)35–45µm crassum. Asci (25–) 30–40 × 5–8µm magni, iodo non reagentes. Ascosporae (6–)8–9.5(–10.5) × (2.5–)3–4(–5)µm magnae.

Type: Scotland, Easterness (V. C. 96), Drumnadrochit, by Divach Burn, S of Divach, 28/48.26, 20 vi 1976, *B. J. Coppins* 3917 (holo. E, iso. M).

Apothecia small, black-brown, turgescent black-brown, more or less distinctly marginate, 0.2–0.3(–0.35)mm diam, plane to convex, sessile, crowded, partly confluent. *Excipulum* laterally c.25µm thick, dark orange-brown to dark violet-brown. *Hypothecium* orange-brown to violet-brown, up to 30µm tall. *Hymenium* (30–)35–45µm tall, pale brown. Paraphyses c.1–2µm thick; lumina 1–1.5µm wide. Epihymenium dark orange-brown to violet-brown, c.10µm tall. *Asci* cylindrical to clavate, (25–)30–40 × 5–8µm; ascus wall apically 2–3µm thick, laterally 1–1.5µm thick, I-. Spores ellipsoid, (6–)8–9.5(–10.5) × (2.5–)3–4 (–5)µm.

Colour reactions: Brown pigment in excipulum, hypothecium, and epihymenium K + violet-brown.

Host: Trapeliopsis gelatinosa (Flörke) Coppins & P. W. James (thallus).
Distribution: Europe.

This mostly overlooked species is characterized by a non-amyloid ascus wall, relatively small spores (Fig. 4) and its host selection. The specific epithet refers to the varied colouration of the dark orange-brown to violet-brown tinged epihymenium, excipulum and hypothecium.

SPECIMENS EXAMINED:
SWEDEN: Bohuslän: Norum, St. Askerön, northern part, 21 vi 1947, *A. H. Magnusson* 20240 (UPS). Västergötland, Bollebygd, Haltafors, 9 vii 1941, *A. H. Magnusson* 17668 (UPS).
SCOTLAND: West Sutherland (V. C. 108), Strathnaver, near Lochan Dùinte, 29/7.5, 10m, 29 viii 1984, *B. J. Coppins* 10437 (E). Easterness (V. C. 96), Drumnadrochit, SW of Divach, 28/48.26, 24 vi 1976, *B. J. Coppins* 3904 (E); Drumnadrochit, by Divach Burn, S of Divach, 28/48.26, 20 vi 1976, *B. J. Coppins* 3917 (E, M). Westerness (V. C. 97), Ardgour, Glen Gour, Sallachan, 17/97.62, 20m, 29 vi 1978, *B. J. Coppins* 3490 (E). Mid Perthshire (V. C. 88), Glen Lyon, Càrn Gorm, 27/63.50, c.800m, 29 vi 1977, *B. J. Coppins* 3491 (E). West Perthshire (V. C. 87), Balquhidder, Kirkton Glen, 27/5.2, 4 iv 1986, *B. J. Coppins* 11264 (E). Kirkcudbright (V. C. 73): Dalbeattie Forest, 25/84.60, 6 iv 1982, *B. J. Coppins* 8985 (E, M).
WALES: Radnor (V. C. 43): Elan Valley, above shore of Carreg Dhu Reservoir, 22/90.63, 16 vii 1983, *B. J. Coppins* 9777 *& R. G. Woods* (E). Brecknock (V. C. 42): Builth Wells, Allt Cynhelyg, 32/0.4, 4 v 1979, *B. J. Coppins* 4097 (E). Llangynidr, Cwm Claisfer, 32/14.17, 18 viii 1977, *R. G. Woods* s.n. (E).
FRANCE: Vosges: Aux environs de Bruyères, [no date], (?) *J. B. Mougeot* (Roumeguère, *Lich. Gallici Exs.* no. 98 sub *Lecidea viridescens* var. *gelatinosa*, M).
SWITZERLAND: Kt. Graubünden: Chur, [no date], *G. L. Theobald* s.n. (M).

KEY TO LICHENICOLOUS HELOTIALEAN SPECIES

1. Apothecia pale orange to yellowish; on *Peltigera* sp. 2
× Apothecia dark brown or black 3
2. Apothecia 0.3–0.7(–1)mm diam, immarginate, sessile, arthonioid; apices of asci I–; ascospores (8.5–)10–12(–14) × 2.5–3.5(–5)µm **Skyttella mulleri** (Willey) D. Hawksw. & R. Sant. (Hawksworth & Santesson, 1988)
× Apothecia (0.25–)0.3–0.4mm diam, with distinct, pale margin, shortly stalked; apices of asci with I + blue annular structure; ascospores (7–)8–10 (–12) × 2–3(–3.5)µm .....**Pezizella epithallina** (Phill. & Plowr.) Sacc (Hawksworth, 1980, 1983)
3. Apothecia urceolate, margin enrolled, with unicellular hair-like processes; apices of asci thin-walled, ascus wall I–.....4
× Apothecia not urceolate, margin not enrolled, without hair-like processes; ascus wall I– or I + pale bluish 6
4. Hair-like processes with a solid apex, mostly not curved, refractive, c.3.5–4.5(–5)µm thick, up to c.60µm long; ascospores 7–9 × 2.5–3.5µm; on *Mycobilimbia* sp. (e.g. *M. lobulata* (Sommerf.) Hafellner, *M. sabuletorum* (Schreber) Hafellner) ....**Unguiculariopsis refractiva** (Coppins) Coppins* (Coppins, 1988)
× Hair-like processes with a lumen at apex, hooked, c.2–3µm thick, up to 35µm long 5

***Unguiculariopsis refractiva** (Coppins) Coppins, **comb. nov.**
Basionym: *Skyttea refractiva* Coppins in Notes RBG Edinb. 45: 171 (1988).

5. Ascospores (6–)7–9 × (2–)2.5–3.5μm; on corticolous *Lecanora* sp. (e.g. *L. carpinea* (L.) Vainio).....**Unguiculariopsis thallophila** (Karsten) Zhuang (Zhuang, 1988)

× Ascospores 6–7.5(–8) × 2.5–3.5μm; on *Evernia prunastri* (L.) Ach.; often cecidogenous .....**Unguiculariopsis lettaui** (Grummann) Coppins** (Coppins, 1988)

6. Asci long cylindrical, inner ascus wall typically with small pore-like indentation at the apex; ascospores broadly ovoid to globose, uniseriate in the ascus, (6.5–) 8–9(–9.5) × (5–)5.5–6(–7)μm, with more or less verruculose epispore; hymenium > 55μm tall; on *Ochrolechia* sp.
Geltingia associata (Th. Fr.) Alstrup & D. Hawksw.

× Asci clavate to cylindrical, with a concave apical delimitation of the inner ascus wall or apices of asci thin-walled; ascospores ovoid, ellipsoid or oblong, smooth-walled; hymenium < 55μm tall 7

7. Pigmentation of epihymenium and excipulum greenish to olivaceous, diffuse; hypothecium colourless to pale brown, apothecia immersed, often elongate, indistinctly marginate; ascospores oblong, 10–14(–15) × (2.5–) 3–4(–4.5)μm; on *Baeomyces* sp.
Gelatinopsis ericetorum (Körber) Rambold & Triebel

× Pigmentation of epihymenium, excipulum and hypothecium (orange-) brown to violet-brown, K ± violet-brown, coarsely granular; apothecia erumpent to sessile, more or less distinctly marginate; ascospores ellipsoid to ovoid 8

8. Ascus wall I + pale bluish; ascospores (7–)8.5–10.5(–12.5) × 2.5–3.5(–4)μm; on *Cladonia* sp.; occasionally cecidogenous
Phaeopyxis punctum (Massal.) Rambold, Triebel & Coppins

× Ascus wall I–.....9

9. Ascospores (6–)8–9.5(–10.5) × (–2.5)3–4(–5)μm; on *Trapeliopsis gelatinosa*
Phaeopyxis varia Coppins, Rambold & Triebel

× Ascospores 7.5–10.5 × (4–)5–5.5μm; on *Paraporpidia leptocarpa*
Phaeopyxis australis Rambold & Triebel

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Basionym: *Pyrenopeziza lettaui* Grummann in Bot. Jahrb. Syst. 80: 140 (1960).

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