Lichenologist **26**(1): 39–46 (1994)

NOTES ON *AMANDINEA PETERMANNII* COMB. NOV. (PHYSCIACEAE) FROM ANTARCTICA

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Abstract: The new combination *Amandinea petermannii* (Hue) Matzer, Mayrh. & Scheidegger is proposed. The taxonomy, morphology, anatomy, chemistry, ecology and distribution of this lichen are discussed. *Rinodina convoluta* D. C. Lindsay is a synonym of *A. petermannii*.

Introduction

In connection with a revision of material of the genus *Rinodina* (Ach.) Gray from Antarctica we consider the position of *Rinodina petermannii* to be somewhat aberrant within the genus because of its curved filiform spermatia and the presence of norstictic acid. The latter character is also known from *R. calculiformis*, which together with *R. angelica*, constitutes the new genus *Mobergia* (Mayrhofer *et al.* 1992). Because of the filiform spermatia, *Amandinea* Choisy ex Scheidegger & Mayrh. is considered to be the appropriate genus for *Rinodina petermannii*. Spermatia of *Rinodina* s. str. are bacilliform (see Figs 13–14).

Choisy (1950) separated the new genus *Amandinea* from *Buellia* De Not. because of the presence of filiform spermatia in the former. He included two species (*A. myriocarpa* and *A. coniops*). However, since a Latin diagnosis was not provided, *Amandinea* was not validly published (Art. 36.1 of the ICBN). Scheidegger & Mayrhofer in Scheidegger (1993) present a valid description and three new combinations: *Amandinea coniops* (Wahlenb. in Ach.) Scheidegger & Mayrh., *A. lecideina* (Mayrh. & Poelt) Scheidegger & Mayrh. and *A. punctata* (Hoffm.) Scheidegger & Coppins.

Within the family Physciaceae the form of the spermatia was also used as one of the delimitating characters between the genera *Physcia* and *Phaeophyscia* (Moberg 1977), *Physcia* and *Physciopsis* (=*Hyperphyscia*) (Choisy 1950, Hafellner *et al.* 1979), and for *Mobergia* (Mayrhofer *et al.* 1992).

Taxonomy

Amandinea petermannii (Hue) Matzer, Mayrh. & Scheidegger comb. nov.

Lecanora petermannii Hue, *Deux. Expéd. Antarct. Franç. (1908–10), Sciences Naturelles, Documents Scientifiques*: 96 (1915).—*Rinodina petermannii* (Hue) Darbishire, *Lichens, Brit. Antarct. ('Terra Nova') Exped., 1910, Nat. Hist. Rep., Botany.* **3**: 61 (1923).—*Beltraminia*

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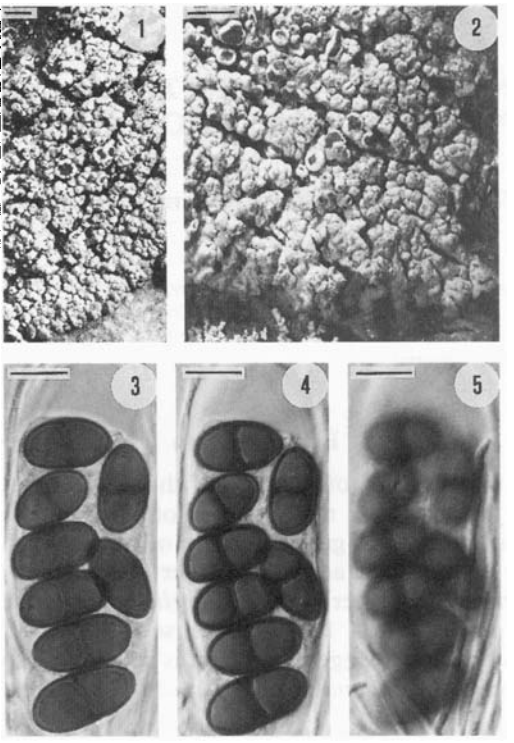


FIGS 1–5. *Amandinea petermannii*. Figs 1–2. Habit photographs showing thallus with lobate-effigurate margin and lecanorine apothecia. (Fig. 1: *Smith* 2252, AAS; Fig. 2: *Longton* 672, AAS). Figs 3–5. Ascospores (*Longton* 672, AAS; squash mounts in water). Fig. 3. Transmitted light; note the slight internal wall thickenings around the septum and the diffuse torus. Figs 4–5. Differential interference contrast in different focusing showing the spore-wall ornamentation in Fig. 5. Scales: Figs 1–2 = 2 mm; Figs 3–5 = 10 μm.

petermannii (Hue) Dodge, *Lichen Flora Antarctic Continent Adjacent Islands*: 368 (1973); type: Petermann Island, on granodioritic rock, FAE 1908–10 No. 304 p. p. (PC—lectotype), not seen, citation after Lamb (1968: 68).

Rinodina convoluta D. C. Lindsay, *Br. Antarct. Surv. Bull.* **37:** 86 (1973); type: Antarctica, South Georgia, on rocks by shore, alt. *c.* 10 ft, near Koppen Point, Royal Bay, GR 162 098, 19 February 1961, *S.W. Greene* 2230 (AAS!—holotype).

Icon.: Lamb (1968: 61, fig. 14a; pl. XII and XIV), Redón (1985, pl. 19, fig. 81), Figs 1–12 in the present paper. The illustrations in Filson (1974: 26, figs 6g–j) are based on a *Rinodina* sp. (MEL 1012047) and therefore do not show *A. petermannii* (see also below under 'distribution').

Thallus (Figs 1–2) thickly crustose to mostly squamulose, squamules partly nodulose, ascendent or imbricate, lobate-effigurate at periphery, not pruinose to strongly white pruinose, alutaceous to (light) ochraceous, when pruinose ± light grey to whitish, when moistened reddish brown, on pruinose thalli the apices of the peripheral lobes lack pruina and, therefore, appear darker. *Hypothallus* distinct or not, dark brown to black, partly rimose-areolate.

Apothecia (Figs 1–2) to 2·5 mm diam., sessile, constricted at the base, mostly distinctly lecanorine, very seldom zeorine to lecideine, thalline margin strongly

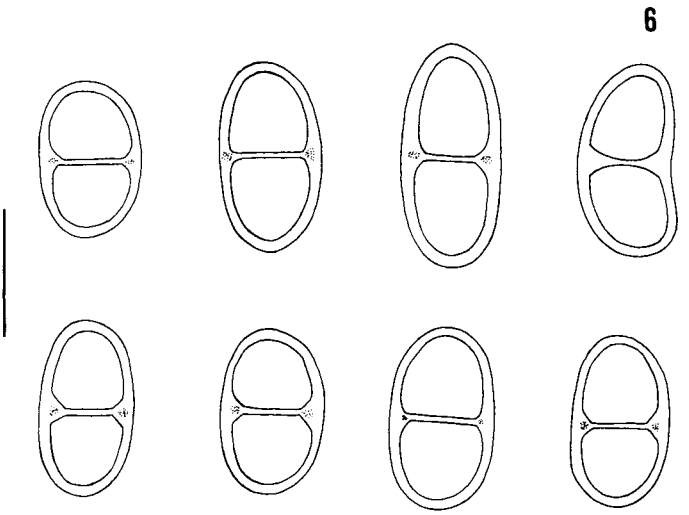
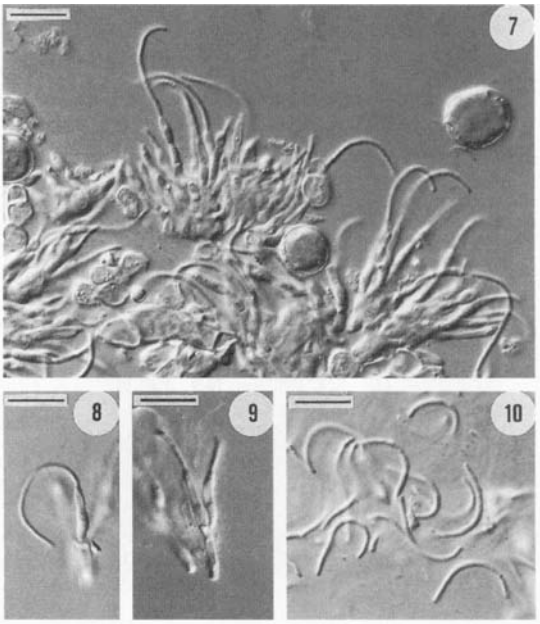


FIG. 6. *Amandinea petermannii*. Ascospores; the diffuse torus (not always distinct) is indicated by fine dots. (*Smith* 1607, AAS). Scale = 10 μm.

developed, entire or crenate, mostly persistent, disc plane, becoming (strongly) convex in older apothecia, dark brown to black, epruinose or slightly white pruinose. *Hymenium* 90–130 (–160) μm tall. *Epihymenium* (15–)20–30 μm tall, reddish brown. *Hypothecium* to 250 μm thick, nearly hyaline, (sordid) yellowish, more seldom brownish, often attenuated towards the base. *Parathecium* thin, hyaline, broadened and reddish brown above. *Paraphyses* 1–6 μm wide, occasionally somewhat branched, upper cells often distinctly broadened and doliform or globose, with brown cell walls, apices 5–10 μm wide, globose to clavate, reddish brown. *Asci* 70–100(–130) × 14–19 μm, clavate, occasionally with a very long stipe, with 8 or fewer ascospores. *Ascospores* (Figs 3–6) brown, 1-septate, with a slight, annular, internal wall-thickening at the septum, torus diffuse, not always obvious, spore wall distinctly scabrid, (12–)13–15·4–18(–22) × (7–)8–8·6–10 μm (sample size = 70; length: SD = 1·6; breadth: SD = 0·6; l/b = 1·8).

Spermogonia frequently present, immersed in the thallus, often in minute swellings of the thallus, with a minute, reddish brown to blackish ostiole, unilocular, in longitudinal section cylindrical to somewhat cuneiform, *c.* 70–115 μm wide and 80–230 μm tall. *Spermatiophores* (Figs 7, 9, 11) septate, branched or unbranched, *c.* 1·5–3 μm wide. *Spermatiogenous cells* (Figs 7–9, 11) usually terminally arranged, solitary or paired, oblong, *c.* 1–3 μm wide. *Spermatia* (Figs 7–12) are produced apically, filiform, curved, hyaline, non-septate, *c.* 19–30 × 1 μm.

Chemistry: Norstictic acid (compare Lamb 1968: 69; Piovano *et al.* 1991). Ten specimens from different localities were tested by TLC. Norstictic acid was detected in low or trace concentrations in seven specimens. Where no norstictic acid was found it is likely that the concentration of the substance in the thallus and, especially, the thalline margin of the apothecia was too low.



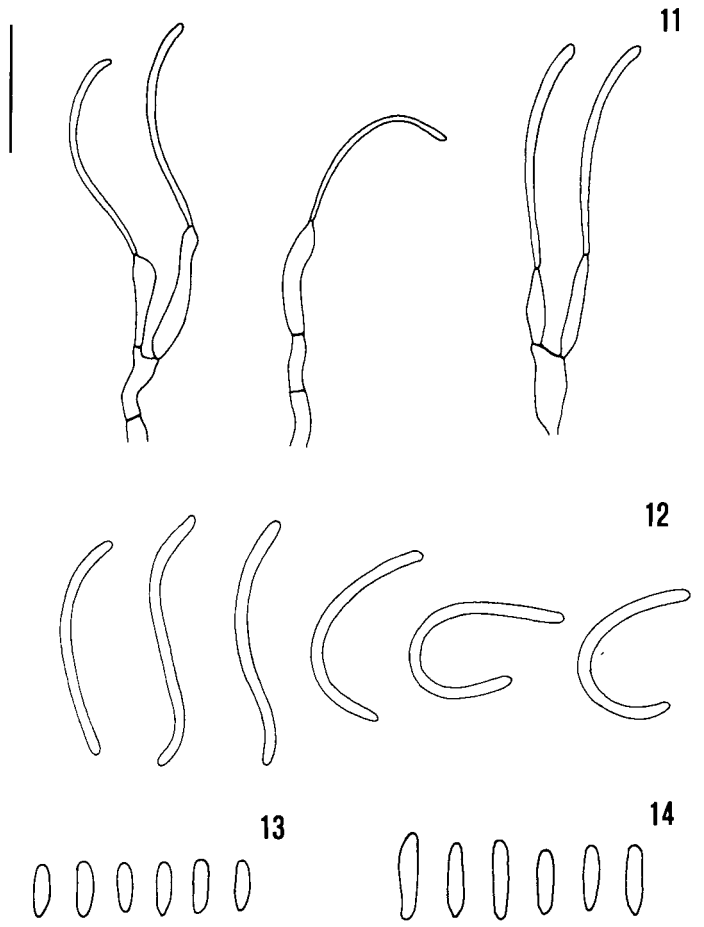
FIGS 7–10. *Amandinea petermannii*. Fig. 7. Spermatiophores with apically arranged spermatiogenous cells and filiform spermatia, intermingled with algal cells. Fig. 8. Spermatiogenous cell with spermatium. Fig. 9. Uppermost cell of a spermatiophore with two spermatiogenous cells and immature spermatia. Fig. 10. Released spermatia. (Figs 7, 9–10: *Lindsay* 3686, AAS; Fig. 8: *Lindsay* 3560, AAS; squash preparations in water; differential interference contrast). Scale = 10 μm.

Ergosterol peroxide was found by Piovano *et al.* (1991).

Discussion: Amandinea petermannii is characterized by its thickly crustose to mostly squamulose thallus, lecanorine apothecia, ascospores with a slight internal wall-thickening around the septum, curved filiform spermatia and the presence of norstictic acid.

Rinodina convoluta is a new synonym of *A. petermannii*. Lindsay (1973: 85) distinguished *R. convoluta* from *R. petermannii* by the grey thallus and pruinose apothecial discs of the former. However, not only is the colour of the thallus largely determined by the thickness of the pruina, the apothecial disc of *R. petermannii* may or may not be slightly pruinose. We examined many specimens that, according to Lindsay, represent *R. convoluta* and *R. petermannii* and found a continuum of thallus colour and a presence or absence of apothecial pruina.

Amandinea petermannii is the only one of four known species of the genus to possess lecanorine apothecia. The other three species (see Scheidegger 1993), together with further taxa to be recombined by the authors as *Amandinea* spp. have lecideine or, occasionally, cryptolecanorine apothecia. Norstictic acid is the only lichen substance found in the genus and is limited to a few taxa, e.g. '*Buellia*' *augusta* Vain., '*B.*' *fulvonitescens* M. Lamb and '*B.*' *latemarginata* Darb. (Lamb 1968).



FIGS 11–14. *Amandinea petermannii*. Spermatiophores with terminally arranged spermatiogenous cells and filiform spermatia. (*Lindsay* 3560, AAS). Figs 12–14. Spermatia of different genera and species. Fig. 12. *Amandinea petermannii*. (*Lindsay* 3560, AAS). Fig. 13. *Rinodina sophodes*. (Corse, Col de Prato, 10 May 1990, *Mayrhofer & Ropin*, GZU). Fig. 14. *Rinodina confragosa*. (Spain, El Connio, *Hafellner* 9744, GZU). Scale = 10 μm.

Amandinea petermannii has frequently been confused with other superficially similar taxa, and incorrect determinations have been reported in the literature. Thus Lindsay (1973: 87) cited the specimen *Lindsay* 4296 (AAS) as *R. convoluta*; it is, in fact, *Pannaria hookeri*. Moreover, *Lindsay* 3907, 3909 and 3916 (all in AAS) do not represent *R. petermannii* as indicated by Lindsay (1973: 88) but *Acarospora macrocyclos*. *Lindsay* 87 (AAS) was incorrectly reported as *R. petermannii* (Lindsay 1971*a*: 18); it is '*Buellia*' *augusta*. The specimens *Lindsay* 4066 and *Greene* 3256 (both in AAS), cited as *Rinodina convoluta* and *R. petermannii* respectively in Lindsay (1973: 87, 88; *Greene* 3256 also in Lindsay 1971*a*: 18), are somewhat dubious. They resemble

A. petermannii in many respects but their often zeorine or lecideine apothecia are striking. Some specimens of *Thamnolecania gerlachei* were also misidentified as *A. petermannii*. Lamb (1948) retracted *T. gerlachei* as a synonym into *T. brialmontii* whereas Øvstedal (1986: 46) regarded the two species as distinct. Hafellner (1984: 290) indicated that *Thamnolecania* should probably be reduced to synonymy with *Lecania*, a view that was confirmed by Øvstedal (1986: 46) and Timdal (1991: 28).

Whereas the stipes of the asci in the holotype of *Rinodina convoluta* may be more than 30 μm long, in most of the collections the stipes are shorter but quite distinct. Thus, in the above description, maximum values for ascus length and the height of the hymenium are given in parentheses.

Ecology: Amandinea petermannii is a 'nitrophilous', mainly saxicolous lichen occurring in coastal regions on bird-perching stones and boulders or cliffs adjacent to coastal bird aggregations. Although usually growing on eutrophicated rocks, there exist a few records of non-saxicolous specimens. Lamb (1968: 71) cited mosses (Graham Land, Doumer Island; specimen in BM!) and weathered wood as substrata, and Lindsay (1971*a*: 17) reported one specimen from soil. Lamb (1968: 53, 71), Lindsay (1971*a*: 17; *b*: 68; 1975: 64, 65) and Smith (1972: 39–41; 1988), all provided information concerning other lichens which may be associated with *A. petermannii*.

Distribution: Amandinea petermannii is a common and conspicuous species in South Georgia, South Sandwich Islands, South Orkney Islands, South Shetland Islands, the Antarctic Peninsula and its adjacent islands. However, the record for the Windmill Islands, Wilkes Land, Continental Antarctica given by Filson (1974) must be rejected. A re-examination of the specimen (Peterson Island, 1970, *Anderson*, MEL 1012047) demonstrated that it is not *A. petermannii* but a species of *Rinodina*. A further record for *A. petermannii* from Wilkes Land was given by Smith (1988: 156, as *Rinodina* cf. *petermannii*).

Several authors have mentioned *A. petermannii*: e.g. Hue (1915), Darbishire (1923), Dodge & Baker (1938), Lamb (1968), Lindsay (1971*a*, *b*, 1973, 1975, 1977), Smith (1972, 1988), Dodge (1973), Filson (1974), Kappen (1985), Redón (1985), Jacobsen & Kappen (1988). Kappen (1985: 223, table 5) listed two erroneous literature references concerning further localities for *A. petermannii* on the Antarctic Continent, viz. Filson (1966) and Schofield & Ahmadjian (1973). Filson did not report *A. petermannii* from Mac Robertson Land. Schofield & Ahmadjian (1973: 135) did not cite specimens of *A. petermannii*, collected in the Ellsworth Mountains; rather they referred to Lamb's (1968: 53) inclusion of *R. petermannii* among lichens said to be associated with '*Buellia*' *latemarginata*. The distribution map of *A. petermannii* provided by Lamb (1968: 70) is not in accordance with current knowledge.

Additional selected specimens examined: **South Georgia:** Serling Valley, 1971, *Smith* (AAS); Nuñez Peninsula, 1970, *Smith* 1607 (AAS); Leith whaling station, Stromness Bay, 1972, *Lindsay* 4343 (AAS); Maiviken, Cumberland West Bay, 1972, *Lindsay* 4257 (AAS); Suza Point, Cumberland East Bay, 1971, *Lindsay* 3334 (AAS); Hope Point, Cumberland East Bay, 1971, *Lindsay* 3096 (AAS); Moltke Harbour, Royal Bay, 1972, *Lindsay* 3896 (AAS, S); Iris Bay, 1971, *Lindsay* 3634 (AAS); Gold Harbour, 1971, *Lindsay* 3585 (AAS); Bjornstadt Bay, 1971, *Lindsay* 3560 (ASS); Wirik Bay, 1971, *Lindsay* 3686 (AAS).—**South Sandwich Islands:** *Candlemas*

Island, 1964, *Longton* 672 (AAS).—**South Orkney Islands:** *Coronation Island:* Lynch Island, 1972, *Hooker* 34 (AAS). *Signy Island:* North Point, 1973, *Hooker* 220 (AAS); Thulla Point, 1966, *Smith* 1066 (AAS); Berntsen Point, Borge Bay, 1967, *Lindsay* 1565 (AAS); Knife Point, Borge Bay, 1966, *Lindsay* 1438 (AAS); Factory Cove, 1973, *Hooker* 411 (AAS); Observation Bluff, 1973, *Hooker* 451 (AAS); Paal Harbour, 1989, *Smith* (GZU); Pageant Point, 1973, *Hooker* 420 (AAS); Gourley Peninsula, 1973, *Hooker* 415 (AAS). *Laurie Island:* Cape Geddes, 1946, Falkland Islands Dependencies Survey C3-1001 (BM).—**South Shetland Islands:** *Kind George Islands:* Ardley, 1985, *Peter* (JE); Pinguinera, 1984, *Kappen*, A 772 (GZU). *Livingston Island:* Peninsula de Byers, 1990, *Sancho* (MAF). *Deception Island:* Baily Head, on rocks, 1961, *Killingbeck* 49 (AAS, as *Arthonia* spec. ined.).—**Antarctic Peninsula:** Astrolabe Is., 1981, *Smith* 4067 *a*/*b* (AAS); Trinity Peninsula, Hope Bay, between Scar Hills South and Mount Flora, 1961, *Brading* 44 (AAS); Cape Roquemaurel, 1981, *Smith* 3946 (AAS); Young Pt, Bone Bay, 1981, *Smith* 3917 *a*,*b* (AAS); Caleta Brialmont, Cabo Spring, Base Argentina 'Primavera', 1991, *Scutari*, BAFC 36816 (dupl.) (GZU); Cuverville Is., 1981, *Smith* 4206 (AAS); Graham Land, Palmer Archipelago, Port Lockroy, Goudier Island, 1945, *Lamb* A 2256 (BM); Palmer Archipelago, Doumer Island, over mosses, 1944, *Lamb* A 1929 (BM); Galindez Island, 1935, Brit. Graham Land ('Penola') Exped. 1116–84 (BM); Piñero Is., 1981, *Smith* 4816 (AAS); Rothera Pt, Adelaide Is., Loubet Coast, 1977, *Smith* 2262 (AAS); B.A.S. station, south-west Adelaide Is., Falliéres Coast, 1977, *Smith* 2252 (AAS), Graham Land, Marguerite Bay, between Horseshoe Island and Camp Point, 1948, *Stonehouse & Blaiklock* (BM).

We are indebted to the directors and keepers of the following herbaria: AAS, BM, JE, GZU, KIEL-HA, MAF, MEL and S for arranging loans. We are especially grateful to Dr R. I. Lewis Smith (Cambridge) for providing the huge collections of AAS, Prof. Dr L. Kappen (Kiel) for his help with literature, and Dr P. M. McCarthy (Melbourne) for correcting the English text. The support of the Fonds zur Förderung wissenschaftlicher Forschung (Projekt P 8500-BIO) is acknowledged by M.M. and H.M.

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Accepted for publication 6 *December* 1992