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Rinodina peloleuca (Physciaceae), a maritime lichen with a distinctive austral distribution

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Abstract *Rinodina peloleuca* (Physciaceae) is an austral, maritime lichen species occurring in Tasmania and New Zealand, in southern South America, on subantarctic islands, and in maritime Antarctica. Together with other species, it indicates an austral connection in maritime lichens of the Southern Hemisphere. Chemically, the species is characterised by the presence of skyrin and triterpenes. *Rinodina antarctica*, *R. deceptionis*, *R. endochrysoides*, *R. philomelensis*, and, possibly, *R. aspicilina* are synonyms of *R. peloleuca*. The lichenicolous fungi *Muellerella lichenicola*, *Polycoccum* sp., *Pyrenidium actinellum*, and an unidentified coelomycete occur on the species.

Keywords lichens; *Rinodina peloleuca*; taxonomy; biogeography; Southern Hemisphere botany; ecology; lichen chemistry; lichenicolous fungi

INTRODUCTION

While staying in Chile in November and December 1994, the first author visited many coastal localities in southern parts of the country to undertake field observations and lichen collecting. One of the most common saxicolous lichens encountered there was a species of the genus *Rinodina*. Subsequent taxonomic and literature studies showed this South American taxon to be *Rinodina peloleuca*, a lichen which was first described as *Lecanora peloleuca* by Nylander (1865) from collections made in Otago, New Zealand by the Scottish lichenologist William Lauder Lindsay. It is now apparent that this species is widely distributed in the Southern Hemisphere, and it is the first *Rinodina* species for which an austral or southern circumpolar distribution can accurately be documented. Southern Hemisphere lichenology often faces the problem that the taxonomy, and hence the phytogeography and ecology, of many species is not accurately circumscribed. This was also true for *R. peloleuca*, where our taxonomic studies disclosed four (or possibly five) synonyms. Another focus in the present work was on the rather complex chemistry of *R. peloleuca*, with lichen compounds (skyrin and triterpenes) which are rare or unknown in other taxa of the genus *Rinodina*. An unexpected bonus in our studies was the discovery of four lichenicolous fungi growing on *R. peloleuca*.

METHODS

Standard light microscope techniques were employed. The terminology of ascospore types follows Matzer & Mayrhofer (1996), that of ascospore ontogeny Giralto & Mayrhofer (1995).

Lichen substances were identified by thin layer chromatography (TLC), high performance liquid chromatography (HPLC), and lichen mass spectrometry (LMS). Methods were applied as described in Culberson & Ammann (1979) and Culberson & Johnson (1982) for TLC, Feige et al. (1993) for HPLC, and Santesson (1969) for LMS.

THE SPECIES

Rinodina peloleuca (Nyl.) Müll. Arg., Nuov. Giorn. Bot. Ital. 23: 125 (1891)

Basionym: *Lecanora peloleuca* Nyl., Flora 48: 338 (1865).

Types: New Zealand, South Island, Otago, Dunedin, on columnar basalt, *L. Lindsay*, Oct 1861, H-NYL 28504!, lectotype, selected by Mayrhofer (1983); H-NYL p.m. 2900!, isotype.

Lecanora endochrysodes Nyl. in Cromb., J. Linn. Soc., Bot. 15: 232 (1876).

Rinodina endochrysodes (Nyl. in Cromb.) Müll. Arg., Nuov. Giorn. Bot. Ital. 21: 43 (1889).

Holotype: Fuegia, Swallow Bay, *R. Cunningham*, 30 Dec 1868, H-NYL 28562!.

Rinodina antarctica Müll. Arg., Mission Scientifique Cap Horn 1882–1883, 5, Botanique. Lichens: 163 (1888).

Holotype: Terre de Feu, *P. Hariot*, 1886, G!.

Rinodina philomelensis Zahlbr., Kongl. Svenska Vetenskapsakad. Handl. 57(6): 54 (1917).

Types: Falkland Islands, West Island, Port Philomel, Halfway Cove, on sandstone sea cliffs, *C. Skottsberg*, 24 Feb 1907, UPS!, holotype; W!, isotype.

Rinodina deceptionis Lamb, Brit. Antarc. Surv. Sci. Rep. 61: 65 (1968).

Types: South Shetland Islands, Deception Island, Port Foster, Bahía Primero de Mayo, about 200 m behind the Argentine station, on hillside, alt. c. 10 m.s.m., on sloping upper side of an agglomerate bird-rock, *I.M. Lamb 7883a*, 23 Nov 1964, FH, holotype; 7883, BM, isotype!.

? *Rinodina aspicilina* Zahlbr., Deutsche Südpolar-Expedition 1901–1903, 8, Botanik: 50 (1906).

Type: Kerguelen Islands, an Steinen an der Pinguinbucht, an der Hochwassergrenze, *Werth*.

Type material was lodged in B and probably destroyed during the Second World War (H. Hertel pers. comm.). The species is tentatively included as a synonym of *R. peloleuca*.

EXSICCATES: Plant. Graec. Lich. 333; Obermayer, Lichenoth. Graec. 77; Vězda, Lich. sel. exs. 2175; Vězda, Lich. rar. exs. 270.

DESCRIPTION: Thallus (Fig. 1A) saxicolous, crustose, usually thick, continuous, rimose, white, sordid white, light grey to grey, more rarely brownish; in longitudinal section with an upper phenocortex, algal layer thick, medulla, particularly the lower me-

dulla, often (but not always!) with (dispersed patches of) an orange pigment (skyrin). Prothallus mostly absent, occasionally well developed at the margin of the thallus, dark brown, with a whitish pruina at the periphery.

Apothecia (Fig. 1B, C) to 1(–1.3) mm diam., numerous, cryptolecanorine, lecanorine, or (pseudo-) biatorine, innate or adnate; disc plane or slightly convex, dark brown to blackish, usually with a lighter coloured proper margin surrounding the disc which is often visible as a thin line especially in moistened apothecia. Exciple outwardly brown, internally hyaline. Epithymenium 15–35 µm tall, brown or yellowish brown; yellow colour intensifying in K; epithymenium often covered by a hyaline epipsamma. Hymenium 100–115 µm tall. Hypothecium 100–170 µm deep, usually hyaline, rarely yellow; yellow colour intensifying in K, a hyaline hypothecium may yellowing in K. Paraphyses 1–3 µm wide, unbranched, more rarely with single branches in the upper parts; apices to 6 µm wide. Asci (Fig. 2A) corresponding to the *Lecanora* type, with 8, or rarely less than 8 spores. Ascospores (Fig. 2B) (12–)15–23(–27) × (8–)10–13(–15) µm, of the *Physconia* type; cell lumina in mature spores surrounded by a distinct inner wall layer; spore ontogeny of type A (in young spores the septum is inserted before internal wall thickenings become distinct); during spore ontogeny slight apical internal wall thickenings may occur in some spores for a time; torus small, diffuse, or absent; spore surface finely scabrid.

Spermogonia usually present, immersed in the thallus; ostiolar region brownish or blackish; spermogonia in longitudinal section ± cup-shaped or cylindrical, 160–300 µm tall, 110–180 µm wide; spermogonial wall hyaline at the base of spermogonia and laterally, above brown, rarely with an orange pigment reacting K+ red-violet. Spermato-phores (Fig. 2C) short, septate, usually unbranched. Spermatiogenous cells (Fig. 2C) usually terminal, rarely intercalar; terminal spermatiogenous cells oblong to flask-shaped, forming spermatia apically; intercalar spermatiogenous cells cylindrical and with a lateral projection on which spermatia are formed. Spermatia (Fig. 2D) 4–5 × (1–)1.5(–2) µm, bacilliform, hyaline, simple.

CHEMISTRY: Lichen substances present in the thallus: skyrin and triterpenes (including an isomer of zeorin); spot tests: thallus K-, KC-, C-, P-; medulla: orange pigment (skyrin) K+ red-violet, medulla otherwise K-, KC-, C-, P-, I-.

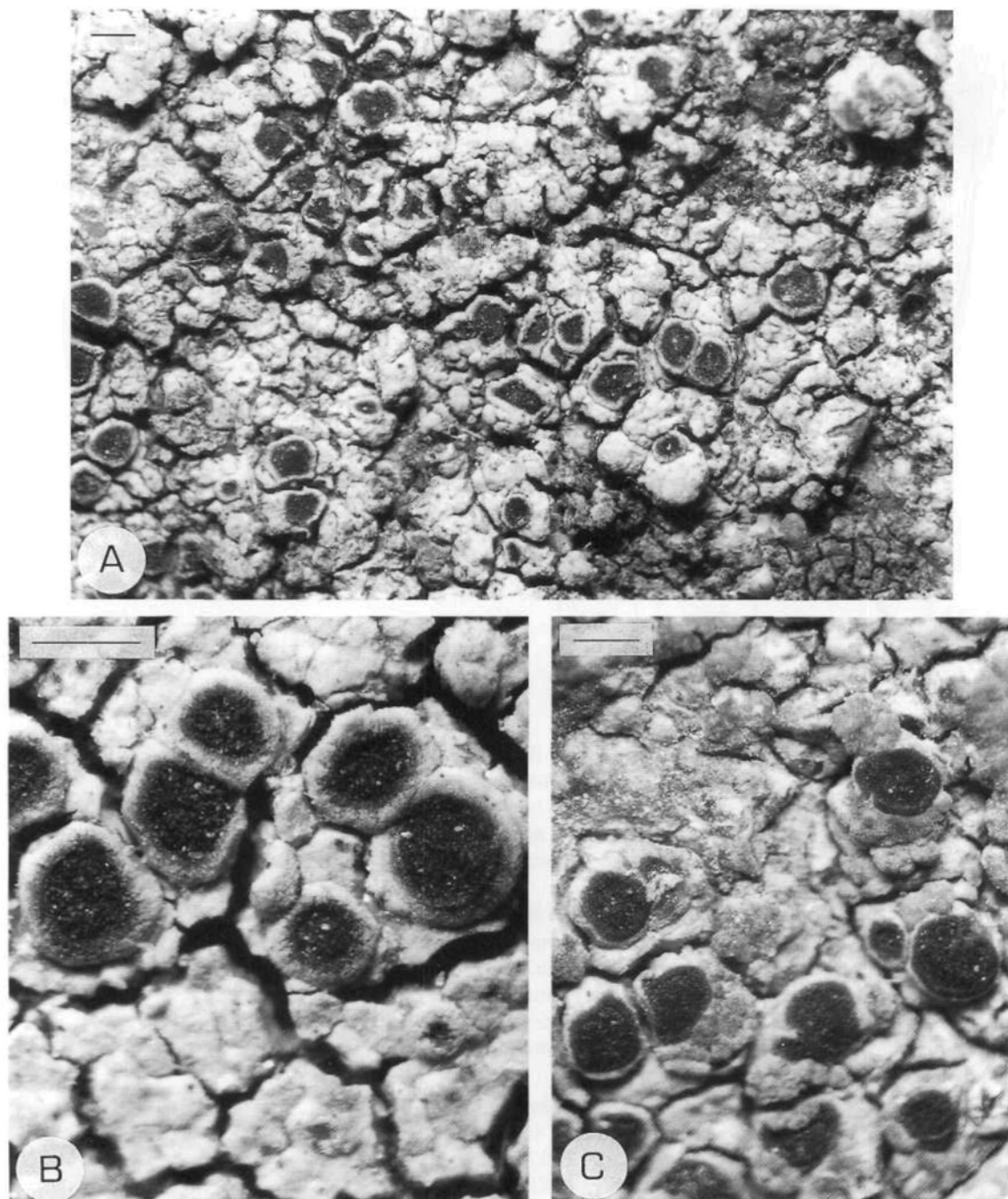


Fig. 1 *Rinodina peloleuca*: A, thallus with apothecia (Mayrhofer 10874, GZU); B-C, variation in apothecial morphology: lecanorine and adnate in B (hb. Mayrhofer 2230), becoming (pseudo-)biatorine with distinct proper margin in C (Matzer 1694, GZU). Scale bars = 0.5 mm.

The major triterpenes present in *Rinodina peloleuca* do not correspond with any of the stand-

ards known to us. One of the triterpenes was confirmed as being an isomer of zeorin, as has been

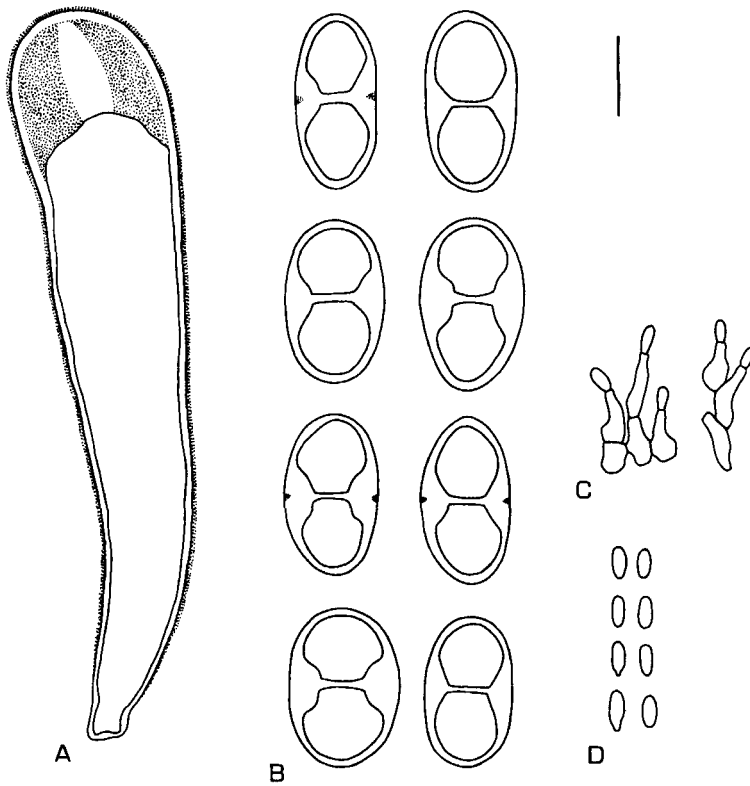


Fig. 2 *Rinodina peloleuca*: anatomical characters (Matzer 1691, GZU). **A**, young ascus without spores in dilute Lugol's solution; **B**, ascospores; **C**, spermatophores, terminal and intercalary spermatogenous cells forming spermatia; **D**, spermatia. **B-D** in aqua dest. Scale bar = 10 μ m.

reported by Mayrhofer (1983) and Leuckert & Mayrhofer (1984). The occurrence of zeorin and two other terpenes was recorded by Øvstedal (1986, as *Rinodina deceptionis*). Up to the present time, no other *Rinodina* species has been shown to contain the triterpenes present in *R. peloleuca*.

The other major lichen compound detected in *R. peloleuca* is the quinone, skyrin. This orange pigment is also known from *Rinodina mniaraea* (Ach.) Körb. var. *cinnamomea* Th. Fr. (unpubl. data) and within the Physciaceae also from the genera *Hyperphyscia* Müll. Arg. (Moberg 1987) and *Phaeophyscia* Moberg (e.g., Moberg 1977).

DISTRIBUTION: A number of different biogeographical groupings or elements can be recognised in Southern Hemisphere lichens (Galloway 1979, 1987, 1988a, 1988b, 1991, 1992a, 1996; Jørgensen 1983; Rogers 1992). *Rinodina peloleuca* belongs to the austral element. It occurs widely in southern circumpolar regions including the cool temperate zone and extending further south to maritime Antarctica (Fig. 3A). We have seen material from Tasmania, New Zealand (North and South Island), southern South America (Chile, Tierra del Fuego),

southern oceanic islands (Falklands, South Georgia, Bouvetøya (Bouvet), Prince Edward, Macquarie, Auckland, Campbell), and the maritime Antarctic islands (South Shetlands and South Orkneys) (Fig. 3B). In addition, this species has been reported for the Snares Islands by Fineran (1969). The records of *Rinodina aspicilina* from Crozet, Kerguelen, and Heard Islands (Zahlbruckner 1906, 1931; Dodge 1948, 1966; Dodge & Rudolph 1955) may also belong to *R. peloleuca*.

Although *R. peloleuca* is known from the South Shetland and South Orkney Islands (maritime Antarctica), we could not trace any literature reference for its occurrence on the Antarctic continent. However, it is likely that this species is present on the Antarctic Peninsula, an area characterised climatically by more oceanic conditions and phytogeographically separated from continental Antarctica with a more continental climate (Nimis 1991).

The specimen recorded from Japan by Müller Argoviensis (1891) does not belong to *R. peloleuca* and has been referred to *Rinodina teichophila* (Nyl.) Arnold by Mayrhofer (1984a). A record from an inland locality in Argentinian Patagonia (Chubut, Gaimán) given by Grassi (1950, as *Rinodina*

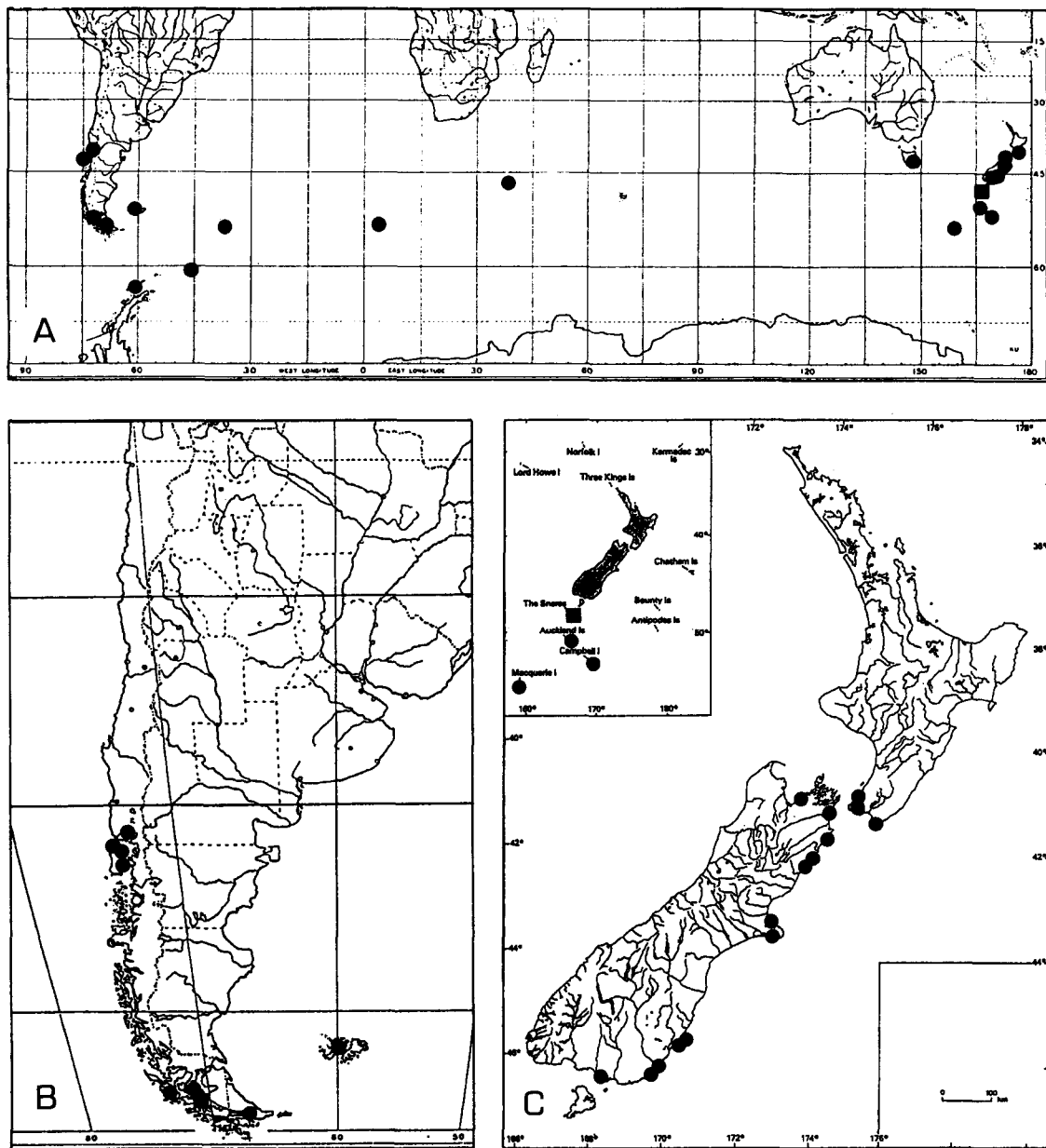


Fig. 3 *Rinodina peloleuca*: distribution maps. A, world distribution; B, southern South America; C, New Zealand and adjacent islands. ● = examined specimens, ■ = according to Cengia Sambo (1926, 1930) and Fineran (1969). Records of *Rinodina aspicilina* which may also belong to *R. peloleuca* (see text) are not included in the maps.

philomelensis) is obviously based on the misinterpretation of a note in Cengia Sambo (1930). *Rinodina antarctica* was (with some hesitation) repeatedly reported from the Hawaiian Islands (Magnusson 1942, 1955; Magnusson & Zahlbruckner 1945), but these specimens definitely belong to another species (Lamb 1968, p. 84).

Rinodina peloleuca exhibits a remarkable geographic distribution. Although there exists a considerable number of lichen genera which occur in both Australia and New Zealand and South America, the number of species shared between the two regions is relatively small. Galloway (1979) enumerates several such species with the main focus on

macrolichens (see also Arvidsson & Galloway 1981; Galloway & Jørgensen 1987; Tibell 1987, 1994; Galloway 1988a, 1991, 1992a; Jørgensen & James 1990; Stenroos 1993; Wedin 1995). The distribution patterns of Southern Hemisphere crustose lichens are in many cases poorly documented, but some examples of lecideoid saxicolous species which (probably) have a similar distribution to *R. peloleuca* have been reported (Hertel 1985, 1987, 1989; Rambold 1989). This includes *Poeltiaria corralensis* (Räsänen) Hertel (also reported from South Africa), *Poeltidea perusta* (Nyl.) Hertel & Hafellner, and *Stephanocyclos henssenianus* Hertel (not known from New Zealand). A southern South American – Australian and New Zealand connection is also documented for the saxicolous *Pertusaria melanospora* Nyl. (Archer & Elix 1993), a species which has also been recorded from South Africa by Stizenberger (1890).

Particularly worth mentioning is an austral connection in maritime lichens of the Southern Hemisphere. There exists a group of crustose species which occur on sea-shore rocks and have a wide austral distribution. Known examples in addition to *R. peloleuca* include *Caloplaca sublobulata* (Nyl.) Zahlbr. (Santesson 1944) and *Verrucaria durietzii* I.M. Lamb (Lamb 1948; McCarthy 1991).

ECOLOGY: *Rinodina peloleuca* is a maritime species occurring on coastal rocks and boulders of various types including basalt, dolerite, greywacke, mudstone, sandstone, and schist. It grows in exposed situations near high tide mark. The climate within the distribution area of the species, that is, the austral, cool temperate zone and maritime Antarctica, can be described as oceanic to hyperoceanic. In the subantarctic and antarctic islands the species is reported as being "nitrophilous" as it grows on bird-perching, eutrophicated rocks (Lamb 1968; Lindsay 1973, as *Rinodina deceptionis*). These statements are confirmed by Mayrhofer (1987) who recorded *R. peloleuca* as accompanying *Thelenella antarctica* (I.M.Lamb) O.E.Erikss. in collections from the South Shetland Islands. The latter species is also known to occur on rocks manured by birds. Among the several *Rinodina* species which may occur on coastal rocks in Tasmania and New Zealand (Matzer & Mayrhofer 1994; Mayrhofer 1983, 1984b, 1985), *R. peloleuca* is the species which usually occurs closer to the waterline. On rare occasions, *R. peloleuca* was found to be associated with the maritime *Rinodina blastidiata* or with *Rinodina gennarii*, a species with a broad ecological amplitude occurring both in coastal sites and inland localities. In

southern Chile, around Puerto Montt, on the island of Chiloé, and along the Strait of Magellan, the coastal plain has very few scattered boulders or large stones convenient for lichen colonisation. In several such localities environmental conditions seem to be too harsh for the growth of any lichens. Redón (1973) has also reported that the lichen flora is poorly developed on coastal rocks in the region of the Valdivian rain forest (including the Puerto Montt area and Chiloé). Where the rocks are covered with lichens, *R. peloleuca* was often found to be present in well-developed thalli. Indeed, it is one of the most common and dominant coastal, saxicolous species in these areas (Fig. 4).

The collections from Prince Edward Island (*Hertel 24377*, M) and Bouvetøya (*Engelskjøn 325.1*, BG) are worthy of discussion as they were the only specimens studied which were not from coastal localities. The specimen from Prince Edward Island was collected on stones of black lava at an altitude of 100–120 m. Although this sample with its brown, thin thallus looks somewhat atypical in external appearance, we have no doubt that it is *R. peloleuca*. On Bouvetøya (Bouvet Island), *R. peloleuca* was only found at a single locality at 80 m above sea level (Øvstedal 1986, as *Rinodina deceptionis*). The atypical ecological behaviour of *R. peloleuca* on these islands may be a consequence of the highly oceanic climate and strong winds (Lindsay 1977) which effect widespread salt spray and simulate maritime conditions in inland localities. Hertel (1985) refers to *Carbonea phaeostoma* (Nyl.) Hertel, *Buellia coniops* (Wahlenb. in Ach.) Th. Fr. (= *Amandinea coniops* (Wahlenb. in Ach.) M. Choisy ex Scheid. & H. Mayrhofer), and *Verrucaria maura* Wahlenb. in Ach. as additional examples of primarily coastal lichens which can occur in localities distant from the coast on storm-swept subantarctic islands.

Species accompanying *R. peloleuca* include *Amandinea lecideinalotagensis*, *Amandinea* sp., *Caloplaca cribrata* (Hue) Zahlbr., *Caloplaca* sp., *Lecanora* sp., cf. *Rinodina blastidiata* Matzer & H. Mayrhofer, and *Rinodina gennarii* Bagl. in Tasmania and New Zealand, and *Caloplaca* sp., *Rinodina* aff. *subcrustacea* (Müll. Arg.) Zahlbr., and *Xanthoria* sp. in southern South America. From the South Shetland Islands, Mayrhofer (1987) recorded *Caloplaca* sp., *Ramalina* sp., and *Thelenella antarctica* as associated species.

ADDITIONAL SPECIMENS EXAMINED (additional material from New Zealand is cited by Mayrhofer 1983): CHILE: Lake District, X Región: Puerto Montt, road along the coast SW of Puerto Montt to

Fig. 4 Typical coastal habitat of *Rinodina peloleuca* in southern South America (Chile, Chiloé, Puntilla de Ten Ten near Castro, 24 Nov 1994); single stones and rock boulders on plain beaches are often covered by the species. (Photo: M. Matzer)



Chinquihue, c. 8 km behind Puerto Montt, *M. Matzer 1671* & *B. Pelzmann*, 27 Nov 1994; Obermayer, Lichenoth. Graec. 77, GZU, other herbaria receiving the exsiccat; *ibid.*, *M. Matzer 1693* & *B. Pelzmann*, 27 Nov 1994, VALPL; 1694, 1698, GZU; 1695, CANB; 1696, M; 1697, UPS; Chiloé: North coast, road W of Ancud to Quetalmahue, beach between Lechagua and Ancud, *M. Matzer 1690* & *B. Pelzmann*, 22 Nov 1994, VALPL; 1691, GZU; 1692, CANB; East coast, beach 4 km S of Quemchi, *M. Matzer 1681*, 1684 & *B. Pelzmann*, 25 Nov 1994, GZU; 1682, M; 1683, VALPL; Castro, Puntilla de Ten Ten NE of Castro, beach opposite the Palafitos of Castro, *M. Matzer 1676* & *B. Pelzmann*, 24 Nov 1994, GZU; Castro, Puntilla de Ten Ten NE of Castro, *M. Matzer 1677* & *B. Pelzmann*, 24 Nov 1994, M; 1678, GZU; 1679, VALPL; East coast, Pto Huichas SE of Chonchi, *M. Matzer 1680* & *B. Pelzmann*, 24 Nov 1994, GZU; Road E of Quellón to Chaiguao, beach area after the second bridge, *M. Matzer 1685*, 1689 & *B. Pelzmann*, 24 Nov 1994, GZU; 1686, VALPL; 1687, M; 1688, UPS; Patagonia, XII Region (Magallanes): Strait of Magallanes, Fuerte Bulnes c. 50 km S of Punta Arenas, c. 53°36'S, 70°56'W, *M. Matzer 1670* & *B. Pelzmann*, 13 Dec 1994; Vězda, Lich. rar. exs. 270, GZU, other herbaria receiving the exsiccat; 1699, CANB.

ARGENTINA: Tierra del Fuego: Dept. Ushuaia, Estancia Moat, etwa 4 km W von Pampa de los Indios, *J. Poelt TF 21/11*, 12 Jan 1989, GZU, as *Rinodina* aff. *subcrustacea*; *TF 21/12*, *TF 21/13*, GZU.

SOUTH SHETLAND ISLANDS: Deception Island:

Whalers Bay, near the abandoned whaling station, *I. M. Lamb*, 6 Feb 1944, BM.

SOUTH ORKNEY ISLANDS: Signy Island: Tern Cove, 60°42'S, 45°W, *T. N. Hooker 268*, 24 Oct 1973, AAS; West side of Berntsen Point, Borge Bay, 60°43'S, 45°36'W, *D. C. Lindsay 1559*, 23 Jan 1967, AAS; Billie Rocks, Borge Bay, 60°43'S, 45°36'W, *T. N. Hooker 214*, 8 Oct 1973, AAS; NE Waterpipe Beach, *R. I. L. Smith 8199*, 20 March 1989, AAS.

SOUTH GEORGIA: South end of Binder Beach, Right Whale Bay, GR 054 154, *D. C. Lindsay 3783*, 3786, 3 Jan 1972, AAS; Hope Point, Cumberland East Bay, GR 133 124, *D. C. Lindsay 3094*, 18 Nov 1971, AAS; South shore of Rogged Bay, GR 157 058, *D. C. Lindsay 4405*, 10 Apr 1972, AAS.

BOUVETØYA (BOUVET ISLAND): Kapp Valdivia, slope of pass culmination towards outer summit of promontory, wind-exposed rhyolite boulder, 54°25'S, 3°18'E, *T. Engelskjøn 325.1*, 30 Dec 1978, BG.

PRINCE EDWARD ISLAND: Vicinity of Kent Crater, 46°37'–38'S, 37°53'–55'E, young black lava flows W before the crater, c. 100–120 m, *H. Hertel 24377*, 28 Apr–2 May 1982, M.

AUSTRALIA: Tasmania: Mayfield Bay Coastal Reserve, Mayfield Beach c. 14 km S Swansea, 42°15'S, 148°0.5'E, *H. Mayrhofer 12048*, 4 Aug 1992, GZU, HO, UPS; Kingston, 42°58'S, 147°20'E, *G. C. Bratt & M. H. Bratt*, 1920, 3 Jan 1965, HO 38766; Blackmans Bay near Kingston south of Hobart, Flowerpot Point south-east of Blackmans Bay Beach, 43°00'40''S, 147°19'30''E, *H. Mayrhofer 7289* & *H. Hertel*, 19 Feb 1985, GZU,

hb. Mayrhofer; 7314, CANB; Clifton Beach (southern end), 43°01'S, 147°32'E, *G. C. Bratt & J. A. Cashin*, 1555, 27 Sep 1964, HO 38770; Tinderbox Road (Margate side), 43°02'S, 147°18'E, *G. C. Bratt & J. A. Cashin*, 68/825, 17 Aug 1968, HO 41239; Tasman Peninsula, coastal heath between Safety Cove and Crescent Bay near Standup Point south of Port Arthur, 43°12'S, 147°52'E, *H. Mayrhofer* 3357, 24 Oct 1981, GZU; Surprise Bay, 43°32'S, 146°28'E, *A. Blackman* 74/291 & 292, Feb 1974, HO 39076.

MACQUARIE ISLAND: Hasselborough Bay Beach, *R. Waterhouse* A54, 10 Apr 1972, MEL 1020939; A57, MEL 1020946; Below Mt Elder, *K. Simpson* E4, 1 Oct 1965, MEL 26020; The Brothers, *R. Hnatiuk* 11687, 8 Jan 1972, MEL 1027217; North-eastern side of Cape Star, *R. Filson & Ph. Atkinson*, 6074, 12 Feb 1964, MEL 231633; Hard Point, station 15, *R. Filson & Ph. Atkinson*, 11 Feb 1964, MEL 231634; East side, Wireless Hill, *D. McVean* 6929, 5 Dec 1968, COLO-L 47987.

NEW ZEALAND: North Island: Wellington: Titahi Bay N of Porirua, 41°07'S, 174°50'E, *H. Mayrhofer* 12261 et al., 23 Aug 1992, CANB, GZU, 3 specimens; Wellington Harbour, Mokopuna Island, *P. N. Johnson* 683 & *C. J. West*, 2 June 1993, GZU; Cape Palliser, Rocky Point S of the Cape Palliser Lighthouse, 41°37'S, 175°17.5'E, *H. Mayrhofer* 10896 & *E. Hierzer*, 18 Aug 1992, GZU; Manurewa Point W of Tora, S of Martinborough, 41°30'S, 175°32'E, *H. Mayrhofer* 13271 & *E. Hierzer*, GZU, WELT; South Island: Nelson: Cable Bay NE of Nelson, Ataata Point, 41°09.5'S, 173°24'E, *H. Mayrhofer* 10749 et al., 25 Aug 1992, GZU; Marlborough: Whites Bay NE of Rangai, NE of Blenheim, 41°22.5'S, 174°04.5'E, *H. Mayrhofer* 10820, 30 Aug 1992, CANB, WELT; 10825, GZU; Rangai Monkey Bay, 41°23.5'S, 174°03'E, *H. Mayrhofer* 12200, 29 Aug 1992, GZU; Ward Beach E Ward, SW of Cape Campbell, 41°50'S, 174°11'E, *H. Mayrhofer* 12200a, 30 Aug 1992, GZU; NE of Kaikoura, NE of Irongate Stream, 42°16.5'S, 173°47'E, *H. Mayrhofer* 10874 & *C. D. Meurk*, 31 Aug 1992, GZU; Kaikoura Peninsula SE of Kaikoura, W of Whaler's Bay, 42°26'S, 173°43'E, *H. Mayrhofer* 12173, 12200b & *C. D. Meurk*, 31 Aug 1992, GZU; Goose Bay SW of Kaikoura, 42°28'S, 173°32.5'E, *H. Mayrhofer* 12141 & *C. D. Meurk*, 1 Sep 1992, CHR, GZU, WELT; Canterbury: Taylors Mistake SE of Christchurch, 43°35'S, 172°47'E, *H. Mayrhofer* 10801, 4 Sep 1992, CHR, GZU, WELT; Lyttelton Harbour, Cass Bay W of Lyttelton,

43°36.5'S, 172°41.5'E, *H. Mayrhofer* 10789, 4 Sep 1992, GZU, WELT; 10790, GZU; Banks Peninsula, Tumbledown Bay on the road to Te Oka, 43°51'20''S, 172°46'20''E, *H. Mayrhofer* 6840 et al., 19 Jan 1985, GZU; Vězda, Lich. sel. exs. 2175, GZU; Otago: Otago Peninsula, Wellers Rock near Otakou, 45°48'S, 170°43'E, *H. Mayrhofer* 10158 & *H. Hertel*, 13 Feb 1985, GZU, as *Amandinea* sp.; 10159, GZU; *ibid.*, *H. Mayrhofer* 10190 & *H. Hertel*, 13 Feb 1985, GZU, as *Pyrenidium actinellum*; Brighton S Dunedin, 45°57'S, 170°20'E, *H. Mayrhofer*, 23 Sep 1981, Plant. Graec. Lich. 333, BM, GZU; *ibid.*, *H. Mayrhofer* 2230, 23 Sep 1981, GZU, hb. Mayrhofer; Kaka Point south-east of Balclutha, *H. Mayrhofer* 6924 & *H. Hertel*, 13 Feb 1985, CANB, hb. Mayrhofer; 6936, GZU; 9706, GZU; Jacks Bay E of Owaka, *H. Mayrhofer* 6904 & *H. Hertel*, 13 Feb 1985, CANB, GZU, hb. Mayrhofer; Southland: Howells Point near Riverton, 46°23'S, 168°02'E, *H. Mayrhofer* 7270 & *H. Hertel*, 11 Feb 1985, GZU.

AUCKLAND ISLANDS: Ocean Island, Port Ross, *C. D. Meurk*, 5 Apr 1980, CHR; Port Ross, south-east end of Davis Island, *C. D. Meurk*, 6 Apr 1980, hb. Meurk; *Krone*, 1874, M.

CAMPBELL ISLAND: E Dent Islands, *C. D. Meurk*, 14 Feb 1984, GZU, hb. Mayrhofer.

DISCUSSION: *Rinodina peloleuca* was first described as *Lecanora peloleuca* by Nylander (1865) from New Zealand and was later transferred to *Rinodina* by Müller Argoviensis (1891). Subsequent lichenological activities in southern South America, on the islands in the southern oceans, and in maritime Antarctica led to the repeated description of this species, and it has been recorded under at least five (or possibly six) different species epithets in widely scattered literature. The name *Rinodina* (resp. *Lecanora*) *peloleuca* has been used in publications referring to specimens from Tasmania/New Zealand and islands from this area (Nylander 1865, 1867, 1888a; Lindsay 1866, 1867; Hooker 1867; Hue 1891; Müller Argoviensis 1891, 1894; Hellbom 1896; Zahlbruckner 1931; Dodge 1948; Martin 1966, 1970; Fineran 1969, 1971; Filson 1981, 1996; Mayrhofer 1983, 1984b, 1985; Leuckert & Mayrhofer 1984; Anonymous 1985; Vězda 1987; Kantvilas 1989, 1994; Selkirk et al. 1990; Galloway 1992b; Kantvilas & Seppelt 1992). Material from Tierra del Fuego has been treated under *Rinodina* or *Lecanora endochrysoides* (Crombie 1876; Darbishire 1912; Grassi 1950; Hue 1891; Müller Argoviensis 1889; Nylander 1888b; Zahlbruckner 1931),

Rinodina antarctica (Darbishire 1912; Grassi 1950; Hariot 1891; Lamb 1968; Müller Argoviensis 1888, 1889; Zahlbruckner 1931), or *Rinodina philomelensis* (Cengia Sambo 1926, 1930; Grassi 1950). *Rinodina philomelensis* is based on the type collection from the Falkland Islands (Cengia Sambo 1926, 1930; Grassi 1950; Lamb 1968; Zahlbruckner 1917, 1931). Specimens with provenance from subantarctic and antarctic islands were mostly named *Rinodina deceptionis* (Dodge 1973; Engelskjøn & Jørgensen 1986; Hawksworth 1972; Hertel 1988; Inoue 1993; Lamb 1968; Lindsay 1973; Øvstedal 1986; Redón 1985; Seppälä 1991), and only rarely was the epithet *peloleuca* used (Mayrhofer 1987, p. 28). *Rinodina aspicipilina*, which was originally described from Kerguelen Island (Zahlbruckner 1906, 1931) and later reported from there and other southern oceanic islands (Dodge 1948, 1966; Dodge & Rudolph 1955), may also represent *R. peloleuca* (see list of synonyms above).

Rinodina peloleuca is mainly characterised by ascospores of the Physconia type and, chemically, by the presence of skyrin and triterpenes. For rapid identification of this species the orange, K⁺ red-violet pigment (skyrin) in the medulla is often very helpful, although this pigment is often unevenly distributed in the medulla, and it was not found in all of the specimens examined.

In Tasmania and New Zealand, *R. peloleuca* was repeatedly found to be associated with species having similar ascospores, but belonging to the genus *Amandinea* Choisy ex Scheid. & H. Mayrhofer. This includes the *Amandinea lecideinalotagensis* complex which needs further study (Matzer & Mayrhofer unpubl. data). The *Amandinea* species are separated from *R. peloleuca* by filiform spermatia, truly lecideine apothecia with a dark brown exciple, and a dark brown epihymenium. *Rinodina tubulata* (Knight) Zahlbr. is another species with Physconia type ascospores which occurs on coastal rocks in New Zealand (Mayrhofer 1983). It differs from *R. peloleuca* in having black, lecideine apothecia which are (?always) covered by a whitish pruina and, particularly, by the brown hypothecium. Other *Rinodina* species which were found to be associated with *R. peloleuca* include the cosmopolitan *R. gennarii* Bagl. and cf. *R. blastidiata* Matzer & Mayrhofer (material sterile and determination therefore uncertain) in Tasmania and New Zealand, and *Rinodina* sp. in Tierra del Fuego. *Rinodina gennarii* is easily separated from *R. peloleuca* by its Dirinaria type ascospores (e.g., Matzer & Mayrhofer 1996; Mayrhofer 1983, 1984a, 1984b; Rambold et al.

1994). *Rinodina blastidiata* (Matzer & Mayrhofer 1994) is distinguished by its blastidiate thallus and ascospores with internal wall-thickenings of the Mischoblastia type or, occasionally, of the Pachysporaria type. The specific identity of the *Rinodina* species from Tierra del Fuego mentioned above cannot satisfactorily be solved with the material presently available. It is similar (or possibly identical) to *R. subcrustacea* (Müll. Arg.) Zahlbr. from Australia (Mayrhofer 1984b) and can readily be separated from *R. peloleuca* by the finely lobate thallus.

The saxicolous *Rinodina infuscata* (Nyl.) Zahlbr., described from the Coquimbo region in Chile (Nylander 1855, as *Lecanora infuscata*), is based on extremely scanty type material (H-NYL p. m. 2587!). Below the apothecia of this species we observed an evenly distributed, orange, K⁺ reactive pigment which looks different from that present in *R. peloleuca*. Additional distinguishing characters of *R. infuscata* include the longer ascospores with pronounced apical, internal wall-thickenings.

LICHENICOLOUS FUNGI ON *RINODINA PELOLEUCA*

Muellerella lichenicola (Sommerf.: Fr.) D.Hawksw.

This species grows primarily on representatives of the Physciaceae and Teloschistaceae. It has already been found in New Zealand growing on *Rinodina tubulata* (Knight) Zahlbr. (Triebel 1989).

SPECIMENS EXAMINED: NEW ZEALAND: South Island: Marlborough: Whites Bay NE of Rarangi, NE of Blenheim, 41°22.5'S, 174°04.5'E, *H. Mayrhofer 10825*, 30 Aug 1992, GZU, as *Rinodina peloleuca*; Canterbury: Banks Peninsula, Tumbledown Bay on the road to Te Oka, 43°51'20"S, 172°46'20"E, *H. Mayrhofer 6840* et al., 19 Jan 1985, Vězda, Lich. sel. exs. 2175, *Rinodina peloleuca*, GZU.

Polycoccum sp.

The specimens of this lichenicolous fungus could not be assigned to any of the known species currently placed in *Polycoccum*. Morphologically similar species such as *Polycoccum kernerii* J. Steiner and *P. microsticticum* (Leight. ex Mudd) Arnold are based on material occurring on other host genera than *Rinodina*; *P. kernerii* on ?*Lecidea* and *P. microsticticum* on *Acarospora* (Hawksworth & Diederich 1988; Triebel 1989). On the other hand, *Polycoccum* species known from representatives of the Physciaceae differ markedly from the specimens

occurring on *Rinodina peloleuca*. *Polycoccum evae* Calatayud & Rico on *Dimelaena oreina* (Ach.) Norm. (Calatayud & Rico 1995) is distinguished by larger ascospores whereas *Polycoccum pulvinatum* (Eitner) R. Sant. (syn. *P. galligenum* Vězda causes gall-like malformations on species of *Physcia* s. str. The formation of galls was not observed in *R. peloleuca* specimens infected by the *Polycoccum* sp. Several literature references to *P. pulvinatum* are listed in Hafellner (1996). *Didymosphaeria bryonothae* (Arnold) G. Winter var. *stellulatae* Vouaux, tentatively synonymised with *Polycoccum arnoldii* (Hepp) D. Hawksw. by Hawksworth & Diederich (1988), has, according to the protologue (Vouaux 1913), some similarities with the *Polycoccum* sp. occurring on *R. peloleuca*. *Buellia stellulata* (Taylor) Mudd, *Rinodina exigua* (Ach.) Gray, and *Urceolaria actinostoma* (= *Diploschistes actinostomus* (Pers. ex Ach.) Zahlbr.) are cited as host lichens for the species.

SPECIMENS EXAMINED: ARGENTINA: Tierra del Fuego: Dept. Ushuaia: Estancia Moat, etwa 4 km W von Pampa de los Indios, *J. Poelt TF 21/11*, 12 Jan 1989, GZU, as *Rinodina* aff. *subcrustacea*.

NEW ZEALAND: South Island: Otago: Kaka Point south-east of Balclutha, *H. Mayrhofer 10160 & H. Hertel*, 13 Feb 1985, GZU.

Pyrenidium actinellum Nyl.

A wide range of different host lichens has been reported for *Pyrenidium actinellum* (e.g., Hawksworth 1980 as *Dacampiosphaeria rivana*, 1983; Lumbsch 1989; Triebel 1989; Matzer & Hafellner 1990; Mies & Lumbsch 1990; Triebel et al. 1991; Rambold et al. 1993; Santesson 1993; Kondratyuk & Galloway 1994; Hafellner 1996). However, there are indications that a number of different, host specific species are involved (Diederich in Hafellner 1996). Previous records of this fungus from New Zealand are given by Matzer & Hafellner (1990, p. 70) and Kondratyuk & Galloway (1994).

SPECIMEN EXAMINED: NEW ZEALAND: South Island: Otago: Otago Peninsula, Wellers Rock near Otakou, 45°48'S, 170°43'E, *H. Mayrhofer 10190 & H. Hertel*, 13 Feb 1985, GZU.

Lichenicolous Coelomycete

The black conidiomata of this fungus closely resemble the spermogonia of *Rinodina peloleuca* but are distinguished by the darker coloured ostiolar region and the brown conidiomatal wall. In the spermogonia of *R. peloleuca* this wall is hyaline at the base and

laterally, and only brown above. The conidiophores, conidiogenous cells, and conidia of the lichenicolous fungus are also very similar to the corresponding elements in the spermatogenous apparatus of *R. peloleuca*, the main difference being that the conidia of the Coelomycete are slightly longer and narrower (c. 6 × 1 µm).

SPECIMENS EXAMINED: MACQUARIE ISLAND: Hasselborough Bay Beach, *R. Waterhouse A54*, 10 Apr 1972, MEL 1020939, as *Rinodina peloleuca*.

NEW ZEALAND: South Island: Otago: Kaka Point south-east of Balclutha, *H. Mayrhofer 9706 & H. Hertel*, 13 Feb 1985, GZU, as *Rinodina peloleuca*.

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