

**Two new corticolous species of *Rinodina*
(Physciaceae, Ascomycota) from New Zealand**

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Abstract

The corticolous *Rinodina fineranii* Elix, Ch.Edler & H.Mayrhofer and *R. malcolmii* Elix, Ch.Edler & H.Mayrhofer, both characterized by the presence of *Mischoblastia*-type ascospores, are described as new to science. In addition, *Rinodina australiensis* Müll.Arg. is reported for the first time from New Zealand

Introduction

The corticolous and lignicolous species of *Rinodina* (Ach.) S.F.Gray in New Zealand are not well known. In the revised second edition of the *Flora of New Zealand Lichens, Lichen-forming and Lichenicolous Fungi*, eight species were recorded from bark or wood (Mayrhofer *et al.* 2007). These included the widespread *R. capensis* Hampe, *R. conradii* Körb., *R. ficta* (Stizenb.) Zahlbr. (as *R. boleana* Giralt & H.Mayrhofer), *R. inflata* Kalb, *R. oleae* Bagl., *R. pyrina* (Ach.) Arnold and *R. septentrionalis* Malme, as well as *R. exigua* (Ach.) S.F.Gray, but the latter record remains doubtful because the specimens cited were unavailable (Mayrhofer *et al.* 2007). Corticolous or lignicolous species of *Rinodina* with *Mischoblastia*-type ascospores are rare worldwide. The North American endemic, *R. wetmorei* Sheard, is one such species where the *Mischoblastia*-type spores become inflated at maturity and more *Pachysporaria*-type (Sheard 2010). *Rinodina australiensis* Müll.Arg. from the Southern Hemisphere exhibits a similar transition of the spore lumina with age (Mayrhofer *et al.* 1999, 2014), whereas the European *R. euskadiensis* A.Crespo & M.B.Aguirre has persistently *Mischoblastia*-type spores (Giralt 2001). *Rinodina colobina* (Ach.) Th.Fr., widespread in the Northern Hemisphere and characterized by its blue-grey K+ purplish red epihymenium, also has *Mischoblastia*-type spores at maturity after transitioning from a *Physcia*-type stage during development (Ropin & Mayrhofer 1995). In this paper, we describe two new corticolous species of *Rinodina* from New Zealand with *Mischoblastia*-type spores, and report the occurrence of *Rinodina australiensis* from the South Island.

Methods

Observations and measurements of photobiont cells, thallus and apothecium anatomy, asci and ascospores were made on hand-cut sections mounted in water and 10% KOH (K). Asci were also observed in Lugol's Iodine (I), with and without pretreatment in K. Medullary sections were treated with 10% sulfuric acid (H₂SO₄) and apothecial sections with 50% nitric acid (N). Chemical constituents were investigated by thin-layer chromatography (Elix 2014).

The new species

Rinodina fineranii Elix, Ch.Edler & H.Mayrhofer, sp. nov.
Mycobank number: **MB 832607**

Figs 1, 2

Similar to *Rinodina australiensis*, but differs in having smaller *Physcia*- to *Mischoblastia*-type ascospores, 17–25 × 7–10 µm.

Type: New Zealand, Bird Island, Foveaux Strait, [41°45'52"S, 168°25'06"E], on twig of

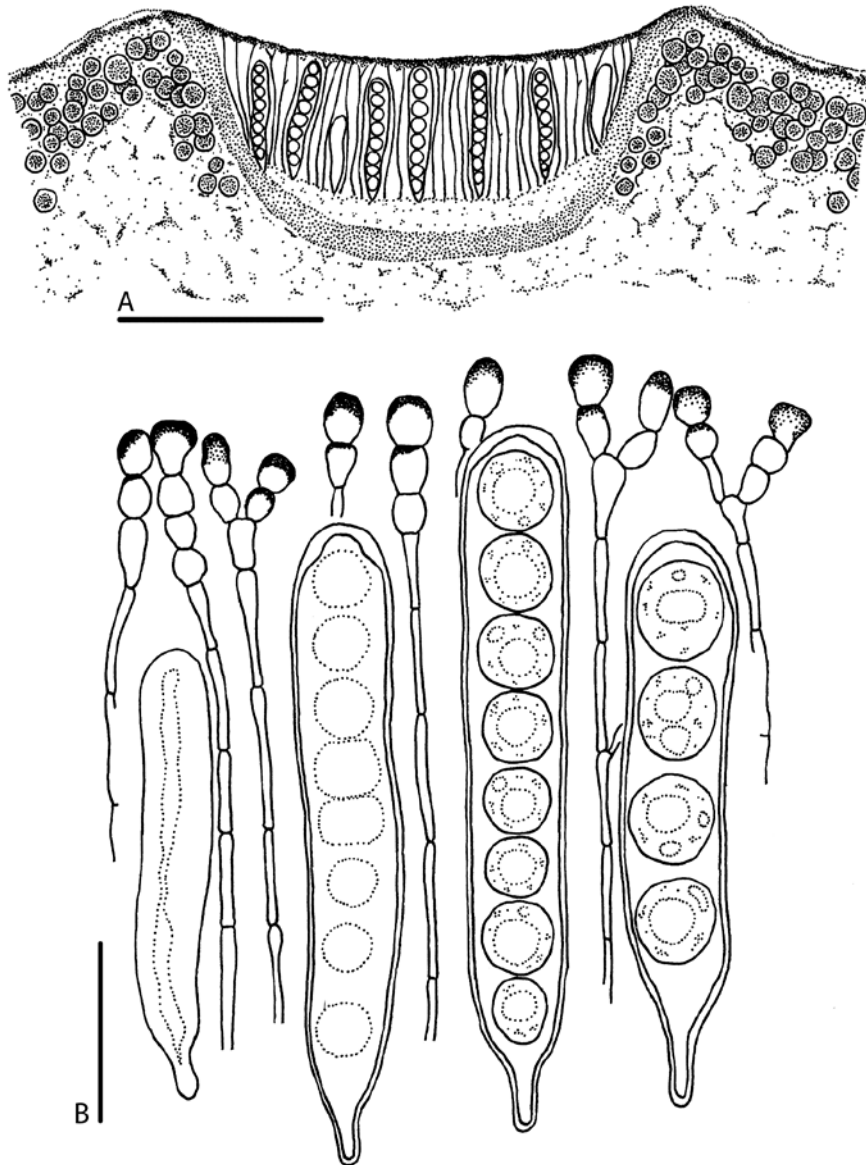


Figure 2. *Circinaria deminuta* (holotype). A, Section of apothecium and adjacent thallus (semi-schematic); B, Immature and mature asci, with ascospores and paraphyses. Scales: A = 0.1 mm; B = 20 µm.

Myrsine chatamica, B.A. Fineran 1304, ii-iii.1965 (CANU – holotype).

Thallus to 15 mm wide, crustose, membranaceous to verruculose, areolate or coarsely granular; individual areoles 0.05–0.2 mm wide, to 0.05 mm thick; upper surface matt, smooth or granular, esorediate, off-white to pale grey; prothallus not apparent; medulla white, lacking calcium oxalate (H₂SO₄–), I–; photobiont cells 8–14 µm diam. *Apothecia* 0.1–0.7 mm wide, scattered or crowded, lecanorine, broadly adnate to sessile and basally constricted; disc pale brown to black, epruinose, weakly concave to plane; thalline exciple thick and raised above the disc at first, becoming thinner and excluded in older apothecia, concolorous with the thallus; proper excipulum brown to pale yellow-brown, persistent, thick, in section 35–50 µm thick; outer zone brown, K–, N–; inner zone colourless. *Epihymenium* 10–15 µm thick, pale brown, K–, N–. *Hypothecium* 20–30 µm thick, colourless, K–, N–. *Hymenium* 90–110 µm thick, colourless, not interspersed; paraphyses 1.5–2.5 µm wide, simple to branched, capitate, with apices 3–5 µm wide and brown caps, with scattered oil paraphyses 4–6 µm wide; asci of the *Lecanora*-type, 8-spored. *Ascospores* with internal wall thickenings transitioning from *Physcia*- to *Mischoblastia*-types at different stages of development, 1-septate, brown, broadly ellipsoid, 17–[20.5]–25 × 7–[8.5]–10 µm, neither constricted nor dilated at the septum; ontogeny of type-A; outer spore-wall finely ornamented. *Pycnidia* not seen.

Chemistry: Thallus K–, C–, P–, UV–; no lichen substances detected by TLC

Etymology: The species is named after the collector of the type material, the New Zealand botanist Dr Brian A. Fineran.

Remarks

In many respects this new species closely resembles the well-known *R. australiensis*, which is widespread in Australia and southern Africa (Mayrhofer *et al.* 1999, 2014; Mayrhofer & Wirth 2011). Both have broadly adnate to sessile, lecanorine apothecia and *Mischoblastia*-type ascospores at different stages of development. However, the spore lumina of *R. australiensis* and *R. fineranii* differ subtly, those of *R. fineranii* transitioning from *Physcia*- to mainly *Mischoblastia*-type, whereas those of *R. australiensis* transition from *Mischoblastia*- to mainly *Pachysporaria*-types. In addition, the ascospores of *R. australiensis* are consistently larger, 18–[25.5]–33 × 9–[12.3]–16 µm.

At present, the new species is known from Bird Island in Foveaux Strait, c. 3 km west of West Point, Ruapuke Island. Associated lichens include *Caloplaca flavorubescens* (Huds.) J.R.Laundon and *C. subpyracea* (Nyl.) Zahlbr.

ADDITIONAL SPECIMEN EXAMINED

New Zealand. ● Type locality, on dead twig of *Myrsine chatamica*, B.A. Fineran 1276, ii-iii.1965 (CANU).

Rinodina malcolmii Elix, Ch.Edler & H.Mayrhofer, sp. nov.

Figs 3, 4

Mycobank number: MB 832608

Similar to *Rinodina euskadiensis*, but differs in having lecanorine apothecia, smaller ascospores and in lacking lichen substances.

Type: New Zealand, South Island, Nelson, Wairoa Gorge Road, 6 km from Lee Valley junction, 41°29'54"S, 173°05'24"E, 135 m alt., on twigs of *Podocarpus totara*, W. Malcolm 2024, 25.ix.1994 (GZU – holotype).

Thallus to 12 mm wide, crustose, membranaceous to verruculose, areolate or granular; individual areoles 0.05–0.1 mm wide, to 0.05 mm thick; upper surface matt, smooth to granular, esorediate, off-white to pale grey; prothallus not apparent; medulla white, lacking calcium oxalate (H₂SO₄–), I–; photobiont cells 8–16 µm diam. *Apothecia* 0.1–0.8 mm wide, scattered or crowded, lecanorine, broadly adnate, disc brown to dark brown, epruinose, plane

to convex; thalline exciple thick and raised above the disc at first, becoming thinner and excluded in older apothecia, concolorous with the thallus; proper excipulum brown, persistent, in section 20–25 µm thick; outer zone brown, K–, N–; inner zone colourless. *Epihymenium* 10–12 µm thick, pale brown to pale red-brown, K–, N–. *Hypothecium* 30–50 µm thick, colourless, K–, N–. *Hymenium* 60–90 µm thick, colourless, not interspersed; paraphyses 1.5–2.5 µm wide, simple to branched, capitate, with apices 3.5–4.5 µm wide and brown caps, with scattered oil paraphyses 5–7 µm wide; asci of the *Lecanora*-type, 8-spored. *Ascospores* with internal wall thickenings transitioning from *Pachysporaria*-type when young to *Mischoblastia*-type at maturity, 1-septate, brown, broadly ellipsoid, 14–[16.6]–21 × 7–[8.6]–10 µm, not constricted but often dilated at the septum; ontogeny of type-A; outer spore-wall finely ornamented. *Pycnidia* not seen.

Chemistry: Thallus K–, C–, P–, UV–; no lichen substances detected by TLC.

Etymology: The species is named after the New Zealand cryptogamist, botanical photographer and collector of the type specimen, Dr W.M. (Bill) Malcolm.

Remarks

This new species is characterized by the thin, off-white to pale grey membranaceous to areolate or granular thallus, the lecanorine apothecia, the relatively small, *Mischoblastia*-type ascospores, 14–21 × 7–10 µm and the absence of lichen substances. The European *R. euskadiensis* has pseudolecanorine apothecia with persistently *Mischoblastia*-type ascospores, but its spores are larger, 19–26 × 10–13 µm, and do not become inflated at the septum. It also differs in containing atranorin (Giralt 2001).

At present, the new species is known from twigs of trees in both North and South Islands of New Zealand. Associated lichens include *Bactrospora metabola* (Nyl.) Egea & Torrente, *Bacidia* sp., *Lecanora* sp., *Megalaria grossa* (Pers. ex Nyl.) Hafellner and *Podotara pilophoriformis* Malcolm & Vězda.

ADDITIONAL SPECIMENS EXAMINED

New Zealand. North Island. ● Bay of Plenty, Opatiki, Waioko Rivers, 145 m alt., on *Salix* sp., Ch. Edler s.n., 19.iv.2001 (GZU); ● Wellington, Botanical Gardens, 41°17'29"S, 174°46'15"E, 31 m alt., on *Tilia* sp., Ch. Edler s.n., 14.iv.2001 (GZU). South Island. ● Nelson, Golden Bay, Kaihoka Lakes, 40°33'S, 172°36'18"E, on twig and leaves of *Podocarpus totara*, W. Malcolm 1132, 24.ix.1993 (GZU); ● NE of Nelson, Okiwi Bay, camping ground, 7 m alt., on *Sophora* sp., Ch. Edler, 8.iv.2001 (GZU). ● Westland. Route 6, 16 km N of Franz Josef, on twigs of *Podocarpus totara*, W. Malcolm 1353, 17.xi.1993 (GZU).

New record

Rinodina australiensis Müll.Arg., *Hedwigia* 32, 123 (1893)

Type: Australia, Victoria, by seaside on *Banksia serrata*, F.R.M. Wilson 368, 1892 (lectotype - G! *vide* H.Mayrhofer, G.Kantvilas & K.Ropin, *Muelleria* 12, 177 (1999)).

This species was previously known from Australia (Mayrhofer *et al.* 1999) and southern Africa (Mayrhofer & Wirth 2011; Mayrhofer *et al.* 2014). It is characterized by a thick, well-developed areolate-crustose to subsquamulose thallus and comparatively large ascospores, 18–[25.5]–33 × 9–[12.3]–16 µm, where the spore lumina transition from *Mischoblastia*- to mainly *Pachysporaria*-types. A detailed description is provided in Mayrhofer *et al.* (1999).

SPECIMEN EXAMINED

New Zealand. ● South Island, Southland, Cosy Nook Bay, E of Riverton, 46°19'54"S, 167°42'46"E, 5 m alt., on wooden paling, Ch. Edler s.n., 25.iii.2001 (GZU).

A nomenclatural change

Rinodina freyi H. Magn., *Acta Horti Gothob.* **17**, 236 (1947)
Mayrhofer *et al.* (2007) recorded *R. septentrionalis* Malme from twigs of *Malus domestica* in the South Island of New Zealand. The specimen was originally identified as *R. glauca* Ropin (Ropin & Mayrhofer 1993), but that species was subsequently synonymized with *R. septentrionalis*, as was *R. freyi* (Giralt & Mayrhofer 1995). In 2010 Sheard resurrected *Rinodina freyi* with *Rinodina glauca* as a new synonym. He distinguished two morphotypes, one with more distinctly grey thalli corresponding to the type of *R. glauca*. The species is a characteristic pioneer of the twigs of a wide range of shrubs and trees in Europe and North America (Ropin & Mayrhofer 1993; Sheard 2010), Japan and north-eastern Asia (Sheard *et al.* 2017). It has been confused with *R. septentrionalis*, which has very similar ascospores, but the apothecia of the latter are more scattered and narrowly attached. According to Sheard (2010), *R. septentrionalis* is widespread in the Arctic and northern Scandinavia, and more rarely in the boreal zone in North America, but it has often been confused with *R. freyi* in central and southern Europe. A detailed description of it is given in Mayrhofer *et al.* (2007, as *R. septentrionalis*) and Sheard (2010).

Key to the corticolous and lignicolous species of *Rinodina* in New Zealand

- 1 Ascospores 3-septate at maturity; lignicolous or rarely corticolous **R. conradii**
1: Ascospores persistently 1-septate 2
- 2 Thallus K+ yellow; atranorin present 3
2: Thallus K–; atranorin absent 5
- 3 Thallus sorediate **R. inflata**
3: Thallus esorediate 4
- 4 Apothecial cortex distinct; I + pale-blue **R. capensis**
4: Apothecial cortex indistinct; I – **R. exigua**
- 5 Ascospores *Physconia*-type; lacking apical thickenings when mature **R. pyrina**
5: Ascospores *Physcia*-, *Dirinaria*-, *Mischoblastia*- or *Pachysporaria*-type; with apical thickenings when mature 6
- 6 Ascospores *Physcia*-type **R. freyi**
6: Ascospores *Dirinaria*-, *Mischoblastia*- or *Pachysporaria*-type 7
- 7 Ascospores *Dirinaria*-type, lignicolous and more rarely corticolous **R. oleae**
7: Ascospores *Mischoblastia*- or *Pachysporaria*-type 8
- 8 Mature ascospores *Pachysporaria*-type 9
8: Mature ascospores *Mischoblastia*-type 10
- 9 Ascospores 12–18 µm long **R. ficta**
9: Ascospores 18–25 µm long **R. australiensis**
- 10 Ascospores 17–[20.5]–25 µm long, transitioning from *Physcia*- to *Mischoblastia*-type, not dilated at the septum **R. fineranii**
10: Ascospores 14–[16.6]–21 µm long, transitioning from *Pachysporaria*-type to *Mischoblastia*-type, often dilated at septum **R. malcolmii**

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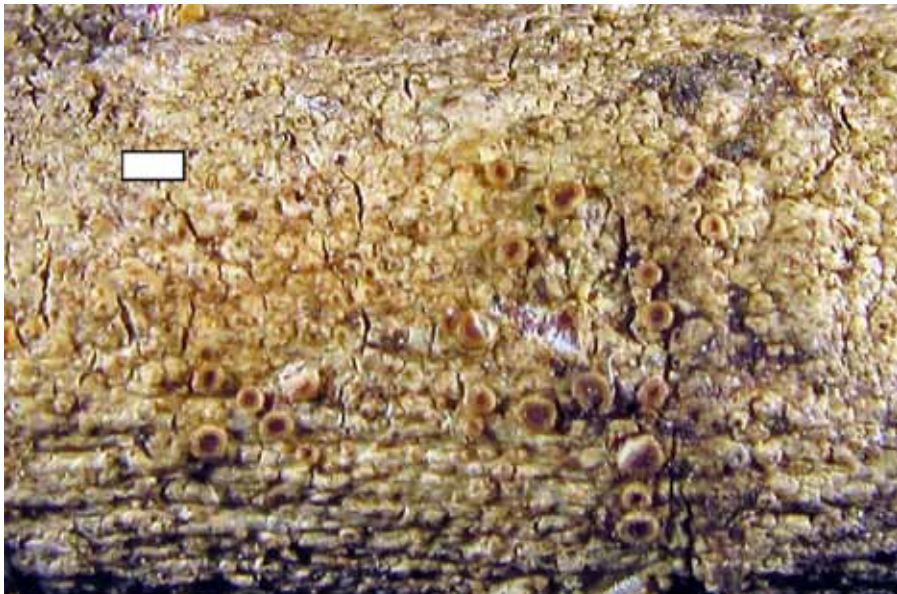


Figure 1. *Rinodina fineranii* (holotype in CANU). Scale = 1 mm.



Figure 3. *Rinodina malcolmii* (holotype in GZU). Scale = 2 mm.



Figure 2. Ascospore ontogeny of *R. fineranii*. Scale = 10 μ m.



Figure 4. Ascospore ontogeny of *R. malcolmii*. Scale = 10 μ m.