**Rinodina capensis** and three other **Rinodina** species from Chile

*Rinodina capensis* y otras tres especies de *Rinodina* de Chile

Ulf Schiefelbein¹ & John W. Sheard²

¹University of Rostock, Botanical Garden, Schwaansche Straße 2, 18055 Rostock, Germany.
²University of Saskatchewan, Department of Biology, 112 Science Place, Saskatoon, SK S7N 5E2, Canada.

*E-mail: ulf.schiefelbein@uni-rostock.de*

**ABSTRACT**

Records of four *Rinodina* species and *Orcularia insperata* from the Los Lagos region and Aysén Region in Chile are presented. *Orcularia insperata* and *Rinodina capensis* are new to Chile. Information on the worldwide distribution of these species and three others is provided. Furthermore, a key is provided to the *Rinodina* and related species currently known from Chile.

**Keywords**: distribution, lichens, new records, Physciaceae.

**RESUMEN**

Se presentan registros de cuatro especies de *Rinodina* y *Orcularia insperata* de la región de Los Lagos y de la región de Aysén en Chile. *Orcularia insperata* y *Rinodina capensis* son nuevas para Chile. Se proporciona información sobre la distribución mundial de estas especies y de otras tres. Además, se proporciona una clave de las especies de *Rinodina* y afines conocidas actualmente en Chile.

**Palabras clave**: distribución, líquenes, nuevos registros, Physciaceae.

**INTRODUCTION**

The checklist of lichens and lichenicolous fungi by Galloway & Quilhot (1998) contains 1383 lichen species for Chile, thirteen of them belonging to the genus *Rinodina*. After publication of the checklist, *R. pyrina* (Ach.) Arnold from the surroundings of Santiago de Chile (Vargas et al. 2013) and *R. sophodes* (Ach.) A. Massal. from the Bio-Bío Region (Pereira et al. 2016) were found. Vargas et al. (2017) recorded *R. intrusa* (Nyl.) Malme from the Atacama, but this specimen may have been confused with *R. viridis* Müll. Arg. Additionally, Trinkaus et al. (1999) collected *Rinodina gennarii* Bagl. on coastal rocks near Puerto Montt and verified the occurrence of this species in South America. However, the knowledge about the genus *Rinodina* in general and especially the geographical distribution, frequency and habitat requirements of its species is still rather poor in Chile.

Here we present further records of four *Rinodina*, and one *Orcularia* species, collected during field excursions by the first author in 2013 and 2019 and a key for *Rinodina* and closely related species known from Chile.

**MATERIAL AND METHODS**

For identification, the specimens were studied in the usual way with stereo microscope and compound microscope. Measurements were taken on thin hand-cut sections mounted in water. Lichen substances were analyzed by spot tests and polarized light. Cited specimens are kept in the private herbarium of the first author.

An asterisk (*) represents species reported as new to Chile in the list below.
**Figure 1.** Localities of the studied specimens. / Localidades de los especímenes estudiados.
**SPECIES LIST**

*Orcularia insperata* (Nyl.) Kalb & Giralt
A corticolous or lignicolous species. The specimen has the typical *Orcularia*-type spores of the genus. The size of the spores is 15–17 × 8–9 μm, n=8. The hypothecium and thalline margin are darkly pigmented.

*Orcularia insperata* is widely distributed in both hemispheres and occurs mainly in (sub-)oceanic regions. The distribution area on the Northern Hemisphere comprises the temperate and meridional vegetation zone. It is known from Europe (British Islands: Kalb & Giralt 2011, Russia: Caucasus: Urbanavichus et al. 2020, Spain: Kalb & Giralt 2011), Africa (Macaronesia: Kalb & Giralt 2011) and North America (North Carolina: Lendemer et al. 2008). In the Southern Hemisphere, the species spreads over the Austrostriboreal and Austral vegetation zone. It has been found in New Zealand (Mayrhofer et al. 1999), eastern Australia (GBIF.org 2020a, Mayrhofer et al. 1999), South Africa (GBIF.org 2020a) and eastern South America (Argentina, Brazil, Paraguay, Uruguay: Kalb & Giralt 2011, Osorio 2000). Furthermore, *O. insperata* grows at high altitudes in tropical regions (Costa Rica, Colombia: GBIF.org 2020a, Equador, Réunion: Kalb & Giralt 2011) and on New Zealand’s subantarctic islands (Elix 2018).

CHILE, Aysén Region, Aysén Prat Province, Chacabuco valley, Los Gatos Trail, c. 3.5 km N of the Alta Valle Campground, old forest, 72°04'20,4''W, 47°08'39''S, c. 670 m, 20-II-2019, U. Schiefelbein 5166.

*Cfr. Rinodina endophragmia* I. M. Lamb
A saxicolous species with relatively thick white to light brown thallus and spores of the *Bicincta*-type, 18.0–21.0 × 11.0–12.5 μm, n=16. The identification is tentative because of the light orange-brown color of the epithecium, which is not typical for this species or of their occurrence on the coast in the littoral zone. Because of the spore type and the color of the epithecium it may be close to *R. lecanorina* but this species differs in possessing smaller spores and occurring on calcareous rocks.

This species grows in the so-called black zone together with a *Hydropunctaria* species and other “marine” lichens.

CHILE, Los Lagos Region, Palena Province, Chaitén, Santa Bárbara, northern edge of the beach, coastal rocks, on horizontal surface, in lower part of the rock, above the barnacle zone, on schist, 72°48’03.8”W, 42°51’10.8”S, c. 5 m, 25–II-2019, U. Schiefelbein 5231. Los Lagos Region, Provincia de Palena, Conta, Seno de Reloncavi, beach c. 1.3 km NE of Contao, boulder beach, upper part of the beach, together with *Hydropunctaria*, on schist, 72°41’49.1”W, 41°47’00.8”S, c. 2 m, 26-II-2019, U. Schiefelbein 5720.

*Rinodina gennarii* Bagl.
The examined specimen has spore development of type B that belong to the *Dirinaria*-type, c. 15.5 × 8.0 μm, n= 8,
Rinodina species from Chile: Schiefelbein U. & J.W. Sheard

Rinodina gennarii, Región de los Lagos (X), Chiloé Province, Chiloé, the coast c. 5,5 km SW of Chepu, rocky coast, on schist, 74°01'50"W, 42°04'25"S, c. 5 m, 24-II-2013, U. Schiefelbein 5285.

Rinodina peleoleuca (Nyl.) Müll. Arg.
A saxicolous species. Spores of the examined specimens are of the Physcia-Physconia-type, sometimes Dirinaria-like, 18.5–24.0 × 10.5–14.0 μm, n=15, without apical thickening. Skyrin is not always seen as a medullary pigment but K+ red-violet patches are always present in the medulla.

Rinodina peleoleuca is a well-known southern South America species occurring in Tasmania, New Zealand, southern South America, on subantarctic islands, and in maritime Antarctica (Kaschik 2006, Matzer et al. 1998). In Chile, it was already found in the Los Lagos region (Región de los Lagos) and along the strait of Magellan (Matzer et al. 1998).

CHILE, Los Lagos Region, Chiloé Province, Chiloé, coast W of Tenaun, boulders at the coast, on granite, 73°22'S, 42°19'56"W, c. 1 m, 17-II-2013, U. Schiefelbein 5284. Los Lagos Region, Chiloé Province, Chiloé, coast c. 5,5 km SW of Chepu, rocky coast, on schist, 74°01'50"W, 42°04'25"S, c. 5 m, 24-II-2013, U. Schiefelbein 5286. Los Lagos Region, Chiloé Province, Chiloé, national park Chiloé, rocky coast c. 5 km NNW of Cucao, rocks adjacent to the sandy beach, on schist, 74°06'S, 42°37'05"S, c. 20 m, 21-II-2013, U. Schiefelbein 5287.

KEY TO Rinodina and related species in Chile

1a. Ascospores 3-septate at maturity ................................................................. Rinodina conradii Körb.  2  
1b. Ascospores 1-septate at maturity ................................................................. 2  
2a. Growing on wood, or bark (corticolous, lignicolous) .................................... 3  
2b. Growing on rock (saxicolous), or on soil, terricolous mosses or decaying plant debris (terricolous) ......................................................... 6  
3a. Ascospores Orcaria-type ............................................................................. Orcaria insperata (Nyl.) Kalb & Giralt  
3b. Ascospores of another type ........................................................................ 4  
4a. Ascospores Milvina-type ............................................................................ Rinodina sophodes (Ach.) A. Massal.  
4b. Ascospores of another type ........................................................................ 5  
5a. Ascospores Physcia-type, atranorin in cortex ............................................. Rinodina capensis Hampe  
5a. Ascospores Physconia-like, atranorin absent ............................................. Rinodina pyrina (Ach.) Arnold  
6a. Growing on rock (saxicolous) ................................................................. 7  
6b. Growing on soil (terricolous), terricolous mosses or decaying plant debris ................................................................. 13  
7a. Thallus yellow or yellowish .................................................................... Rinodina thiomela (Nyl.) Müll. Arg.  
7b. Thallus not yellow/yellowish (whitish-grey or brown) .................................. 8  
8a. Ascospores Dirinaria-type ....................................................................... Rinodina gennarii Bagl.  
8b. Ascospores of another type ..................................................................... 9  
9a. Ascospores Pachysporaria-type .............................................................. Rinodina viridis Müll. Arg.  
9b. Ascospores of another type ..................................................................... 10  
10a. Ascospores Bicincta-type cfr. Rinodina endophragma I. M. Lamb  
10b. Ascospores Physcia- or Physconia-type ................................................ 11  
11a. Thallus containing atranorin, K+ yellow ........................................... Rinodina occulta (Körb.) Sheard

slightly swollen at septum and without a torus.

A saxicolous species. Rinodina gennarii is often included in R. oleae (e.g. Kaschik 2006, Giavarini et al. 2009) in the recent past, but in our opinion, this species is restricted to corticolous substrata, in contrast to R. gennarii, which grows primarily on coastal and more rarely on inland rocks.

In the Northern hemisphere, the distribution area of R. gennarii reaches from the boreal (Mayrhofer 1984, Mayrhofer & Moberg 2002) to the meridional vegetation zone (Egea 1996, Mayrhofer 1984), and it occurs on both coasts of North America (Sheard 2010, GBIF.org 2020c) as well as the Old World (Africa: Egea 1996, Mayrhofer 1984, Asia: Sheard et al. 2017, Europe: e.g. Giralt 2010, Mayrhofer 1984, Mayrhofer & Moberg 2002, Wirth et al. 2013), but because of its integration into R. oleae and its maritime preference, it is uncertain how far inland it occurs within the continents.

In the Southern Hemisphere, the distribution area of R. gennarii seems to be almost restricted to austral vegetation zone. The species is so far known from Australia, New Zealand (Trinkaus et al. 1999), South Africa (Matzer & Mayrhofer 1996), Île Saint-Paul, an island in the Indian Ocean, (Mayrhofer 1984) and Chile (Trinkaus et al. 1999). In Chile it was found in coastal habitats on Isle of Chiloé and north of that island (Trinkaus et al. 1999).

CHILE, Región de los Lagos (X), Chiloé Province, Chiloé, coast c. 5,5 km SW of Chepu, rocky coast, on schist, 74°01'50"W, 42°04'25"S, c. 5 m, 24-II-2013, U. Schiefelbein 5285.
11b. Thallus not containing atranorin, K - ................................................................. 12
12a. Medulla with dispersed patches of an orange pigment containing skyrin, K+ red-violet, ascospores 15-23 × 10–13 µm, without pronounced apical, internal wall-thickenings .............. *Rinodina peloeuca* (Nyl.) Müll. Arg. [syn. *Rinodina endochryseodes* (Nyl.) Müll. Arg., *Rinodina deceptionis* I. M. Lamb.]
12b. Medulla with an evenly distributed orange pigment not containing skyrin, K+ red, ascospores 20–30 × 10–12 µm, with pronounced apical, internal wall-thickenings ...................................... *Rinodina infuscata* (Nyl.) Zahlbr.
13a. Thallus squamulose ........................................................................................................ 13b. Thallus crustose ........................................................................................................ 14
13a. Cortex of apothecial margin 40–70 µm, sphaerophorin present .............................................. *Rinodina turfeacea* (Wahlenb.) Körb.
13b. Cortex of apothecial margin 20–40 µm, sphaerophorin absent ................................................ *Rinodina olivaceobrunnea* C. W. Dodge & G. E. Baker

**ACKNOWLEDGEMENT**

The first author is most grateful to Reinaldo Vargas Castillo (Santiago), Cristóbal Felipe Ivanovich Hichins (Frankfurt/M.) and Götz Palfner (Concepción) for help in organization of the excursions. Furthermore, the first author is indebted to CONAF Región de los Lagos and CONAF Región de Aysen for permission to collect lichens in protected areas.

**REFERENCES**

Abbott, B.F.M. 2009. Checklist of the Lichens and Lichenicolous Fungi of Greece. Bibliotheca Lichenologica 103: 1-368.

Bilovitz, P.O., Mayrhofer, H. 2010. Lichenized and lichenicolous fungi from the Sutjeska National Park (Bosnia and Herzegovina), with species emphasis on the virgin forest reserve Perućica. Bibliotheca Lichenologica 104: 65-76.

Doidge, E.M. 1950. The South African fungi and lichens to the end of 1945. Bothalia 5: 1-1094.

Egea, J.M. 1996. Catalogue of lichenized and lichenicolous fungi of Morocco. Bocconea 6: 19-114.

Elix, J.A. 2018 Three new species and five new records of corticolous and lichenicolous buellioi lichens (Caliciaceae, Ascomycota) from New Zealand’s subantarctic islands. Australasian Lichenology 82: 60-67.

Faltynowicz, W., Sulma, T. 1994. Materials to the flora of lichenized Ascomycotina of the Czywezyn Mts. (Eastern Carpathians, Ukraine). Part II. Herzogia 10: 93-98.

Galloway, D.J., Quilhot, W. 1998. Checklist of Chilean lichen-forming and lichenicolous fungi. Gayana Botanica 55: 111-185.

GBIF.org 2020a. *Orcularia insperata* (Nyl.) Kalb & Giralt. GBIF Occurrence Download https://doi.org/10.15468/dl.fswaz5. Accessed: October 8, 2020.

GBIF.org 2020b. *Rinodina capensis* Hampe. GBIF Occurrence Download https://doi.org/10.15468/dljy6w34. Accessed: October 7, 2020.

GBIF.org 2020c. *Rinodina gennarii* Bagl. GBIF Occurrence Download https://doi.org/10.15468/dl.2au4x5. Accessed: October 7, 2020.

Giavarini, V., James, P.W., Purvis, O.W. 2009. *Rinodina* (Ach.) Gray (1821). In: Smith, C.W., Aptroot, A., Coppins, B.J., Fletcher, A., Gilbert, O.L., James, P.W., Wolseley, P.A. (Eds.) The lichens of Great Britain and Ireland, pp. 812-825. British Lichen Society, London.

Giralt, M. 2010. Flora Lichenológica Ibérica, Vol. 5: Physciaceae I. *Endothyalina, Rinodina y Rinodinella*. Sociedad Española de Lichenología (SEL), Barcelona.

John, V., Türk, A. 2017. Türkiye Likenleri Listesi. Nezahat Gökyiğit Botanik Bahçesi Yayım, Istanbul.

Kalb, K., Giralt, M. 2011. *Orcularia*, a segregate from the lichen genera *Buella* and *Rinodina* (Lecanoromycetes, Caliciaceae). Phytotaxa 38: 53-60.

Kaschik, M. 2006. Taxonomic Studies on Saxicolous Species of the Genus *Rinodina* (Lichenized Ascomycetes, Physciaceae) in the Southern Hemisphere with Special Emphasis in Australia and New Zealand. Bibliotheca Lichenologica 93: 1-162.

Lendemer, J.C., Kocourková, J., Knudsen, K. 2008. Studies in lichens and lichenicolous fungi: notes on some taxa from North America. Mycotaxon 105: 379-386.

Maliček, J., Palice, Z. 2015. Epifytické lišejníky Jilmové skály na Šumavě. Bryonora 56: 56-71.

Magnusson, A.H. 1947. Studies in non-saxicolous species of *Rinodina* mainly from Europe and Siberia. Meddelanden
from Göteborgs Botaniska Trädgård 17: 191-338.
Matzer, M., Mayrhofer, H. 1996. Saxicolous species of the genus *Rinodina* (lichenized Ascomycetes, Physciaceae) in southern Africa. Bothalia 26(1): 11-30.
Matzer, M., Mayrhofer, H., Elix, J.A. 1998. *Rinodina peloleuca* (Physciaceae), a maritime lichen with a distinctive austral distribution. New Zealand Journal of Botany 36: 175-188.
Mayrhofer, H. 1984. Die saxicolens Arten der Flechtengattungen *Rinodina* und *Rinodinella* in der Alten Welt. Journal of the Hattori Botanical Laboratory 55: 327-493.
Mayrhofer, H., Moberg, R. 2002. *Rinodina*. In: Ahti, T., Jørgensen, P.M., Kristinsson, H., Moberg, R., Söchting, U., Thor, G. (Eds.) Nordic Lichen Flora, Vol. 2: Physciaceae, pp. 41-69. Nordic Lichen Society, Uddevalla.
Mayrhofer, H., Denchev, C.M., Stoykov, D.Y., Nikolova, S.O. 2005. Catalogue of the lichenized and lichenicolous fungi in Bulgaria. Mycologia Balcanica 2(1): 3-61.
Mayrhofer, H., Obermayer, W., Wetschnig, W. 2014. Corticolous species of the genus *Rinodina* (lichenized Ascomycetes, Physciaceae) in southern Africa. Herzogia 27: 1-12.
Nimis, P.L. 2016. ITALIC - The Information System on Italian Lichens. Version 5.0. University of Trieste, Dept. of Biology. http://dryades.units.it/italic. Accessed: October 8, 2020.
Osorio, H.S. 2000. Contribución a la flora liquénica del Uruguay. XXXII. Liquenes de la Estancia Madeiros, Departamento de Lavalleja. Comunicaciones Botánicas del Museo de Historia Natural de Montevideo 6(114): 1-8.
Pereira, I., Wang, X.Y., Oh, S.-O., Sánchez, P., Hur, J.-S. 2016. Lichens of the surrounding areas of Termas de Chillán and Las Trancas, Bio-Bio Region, Chile. Gayana Botanica 73(1): 104-112.
Pišút, I., Guttové, A., Lackovičová, A., Lisická, E. 1998. Lichenizované huby (lišajníky). In: Marhold, K., Hindák, F. (Eds.) Zoznam nižších a vyšších rastlín Sovenska, pp. 229-295. Veda, Bratislava.
Ravera, S. 2001. Contribution to Mediterranean lichen flora. New or interesting epiphytic species from Morocco. Flora Mediterranea 11: 295-302.
Ropin, K., Mayrhofer, H. 1993. Zur Kenntnis corticoler Arten der Gattung *Rinodina* (lichenisierte Ascomyceten) in den Ostalpen und angrenzenden Gebieten. Herzzgia 9: 779-835.
Roux, C. 2014. Catalogue des lichens et champignons lichénicoles de France métropolitaine. Henry des Abbayes. Fougeres.
Sheard, J.W. 2004. *Rinodina*. In: Nash, T.H. III, Ryan, B.D., Diederich, P., Gries, C., Bungartz, F. (Eds.) Lichen Flora of the Greater Sonoran Desert Region, Vol. 2., pp. 467-502. Lichens Unlimited, Arizona State University, Tempe, Arizona, United States.
Sheard, J.W. 2010. The Lichen Genus *Rinodina* (Ach.) Gray (Lecanoromycetidae, Physciaceae) in North America, North of Mexico. NRC Research Press, Ottawa.
Sheard, J.W., Ezehkim, A.K., Galanina, I.R., Himelbrant, D., Kuznetsova, E., Shimizu, A., Stepanchikova, I., Thor, G., Tonsberg, T., Yakovchenko, L.S., Spribille, T. 2017. The lichen genus *Rinodina* (Physciaceae, Caliciales) in northeastern Asia. The Lichenologist 49(6): 617-672.
Suppan, U., Prügger, J., Mayrhofer, H. 2000. Catalogue of the lichenized and lichenicolous fungi of Slovenia. Bibliotheca Lichenologica 76: 1-215.
Trinkaus, U., Mayrhofer, H., Matzer, M. 1999. *Rinodina gennarii* (Physciaceae), a widespread species in the temperate regions of the Southern Hemisphere. Australasian Lichenology 45: 15-21.
Urbanavichus, G.P., Andreev, M.P. 2010. A checklist of the lichen flora of Russia. Nauka, St. Petersburg.
Urbanavichus, G., Vondrák, J., Urbanavichene, I., Palice, Z., Maliček, J. 2020. Lichens and allied non-lichenized fungi of virgin forests in the Caucasus State Nature Biosphere Reserve (Western Caucasus, Russia). Herzogia 33: 90-138.
Vargas, Castro, R., Ibaceta, A., Vergara, E. 2013. *Rinodina pyrina* (Physciaceae, Ascomycota) new to Chile. Gayana Botanica 70(2): 398-400.
Vargas, Castro, R., Stanton, D., Nelson, P.R. 2017. Aportes al conocimiento de la biota liquénica del oasis de neblina de Alto Patache, Desierto de Atacama. Revista de Geografía Norte Grande 68: 49-64.
Wirth, V., Hauck, M., Schultz, M. 2013. Die Flechten Deutschlands. Eugen Ulmer, Stuttgart. 2 vol.

Received: 25.11.2020
Accepted: 28.10.2021