

## ***Rinodina gennarii* Bagl., a new record of lichenized fungi for Antarctica**

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### **Abstract**

In a project aiming to determine the lichen biodiversity of James Ross Island which is located in the NE Antarctic Peninsula, 3 specimens growing on basaltic rocks were identified as *Rinodina gennarii*, a cosmopolite bipolar species which was never reported from Antarctica. This species is characteristic by having *Dirinaria*-type ascospores lacking a distinct torus and swelling around the septa in KOH. Detailed morphological and anatomical properties of this species along with photographs based on the Antarctic specimens are provided here. Our study and newly reported *R. gennarii* suggest that the lichen biodiversity of Antarctica is far from being fully known and detailed floristic and taxonomical revision studies should be carried to determine it.

**Key words:** Antarctic Peninsula, biodiversity, James Ross Island, lichens, Physciaceae

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### **Introduction**

Lichens are the most dominant elements of the terrestrial vegetation of Antarctica and they are represented by c. 500 species in the white continent (Øvstedal and Lewis-Smith 2001). Although, studies aiming to determine the lichen biodiversity of Antarctica have been carried out for nearly a century, number of lichen species and their particular distribution in Antarctica is definitely not completely known. Unfortunately, there are a lot of wrong reports from Antarctica especially by Dodge. There-

fore, some of the reports given by this author were revised by Castello and Nimis (1995). In a project aiming to determine the lichen biodiversity of James Ross Island (which is located NE of the Antarctic Peninsula), the first author has described 4 new lichen species (Halıcı et al. 2021a, 2022a-c) and reported 9 taxa which were previously not known from Antarctica (Halıcı et al. 2017, 2018, 2020, 2021b, 2022d; Halıcı and Barták 2019, Kahraman and Halıcı 2021). It is apparent that more de-

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tailed studies using modern techniques based on molecular approaches should be carried out to understand the lichen biodiversity of Antarctica.

The genus *Rinodina* (ach.) Gray is a large genus of lichenized fungi in the family Physciaceae and represents 265 species distributed world-wide. Identification keys to this large genus for north-eastern and far eastern Asia were published recently (Sheard et al. 2017, Lee and Hur 2022). Nadyeina et al. (2010) studied the taxonomy of the genus *Rinodina* using combined ITS and mtSSU data and suggested that

both excipulum type and ascospore characters are rather dynamic in the evolution of *Rinodina* species. Within the group, 11 species are reported for Antarctica. According to morphological characters; 3 epilithic lichen samples collected on basaltic rocks by the first author in 2017 were identified as *Rinodina gennarii* Bagl. Although this species is a bipolar cosmopolitan species (Trinkaus et al. 1999); it was never reported from Antarctica. This study brings details of this record from James Ross Island.

## Material and Methods

The lichen samples were collected by the first author in the Southern Hemisphere during the austral summer season of 2016/2017 in order to determine the biodiversity of lichenized fungal biodiversity of James Ross Island in the NE of the Antarctic Peninsula. The collected samples are currently stored in the ERCH (Erciyes University Herbarium, Turkey). All the lichen specimens were examined by standard microscopic techniques. Hand-cut sections were studied in water, potassium hydroxide (KOH) and/or Lugol's solution (I). Measurements of anatomical structures

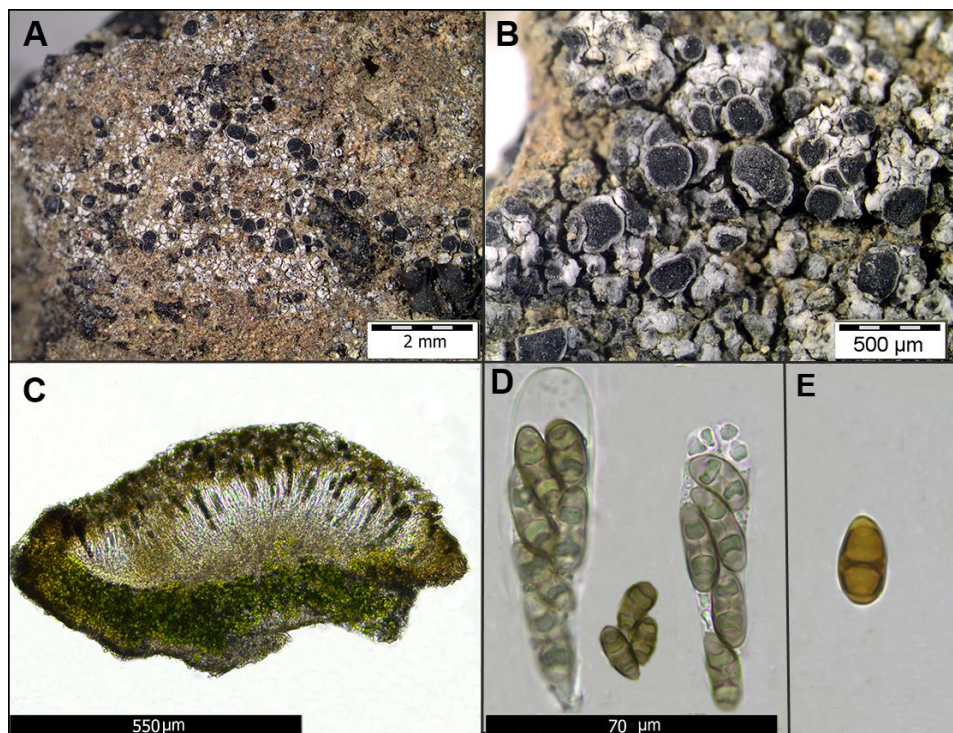
such as ascospores *etc.* were made in water. Standard spot tests were carried out to determine the lichen secondary metabolites present in the thalli. Ascospores were measured from five different ascomata. The measurements are reported in the format: (minimum) mean minus standard deviation – mean – mean plus standard deviation (maximum), from N measurements. The description of *Rinodina gennarii* given below is based on the specimens collected by the first author at James Ross Island in three geographically close locations.

## Results

### *Rinodina gennarii* Bagl.

**Description:** Thallus crustose, areolate to verruculose, white or sometimes dirty white. Areoles flat or sometimes strongly convex, angular, up to 0.4 mm thick and 0.2 mm diam. Vegetative propagules absent. Apothecia lecanorine, flat, sessile, roundish or angular, (0.15–)0.25–0.3–0.35(–0.5) mm (n=25). Apothecial disc flat, black, whitish pruinose. Apothecial margin flat, prominent, distinct, concolorous with thallus. Epithymenium and outer part of excipulum proprium golden yellow to pale golden brown, 15–40 µm, K-, N-. Hymenium hyaline to pale brownish, 75–110 µm, Hypothecium pale brown, 60–120 µm, K-, N-. Paraphyses simple, tips slightly enlarged, 1.5–6 µm. Algal cells present under hypothecium. Asci 8-spored, 45–75 × 15–25 µm. Ascospores brown,

one septate, ellipsoid, (14–)15–17–19(–22) × (6–)6.5–7.5–8.5(–10) μm (n=30), a distinct thorus absent, in KOH ascospores swell around the septa (*Dirinaria*-type), ascospores l/w ratio: (1.78–)1.82–2.23–2.64(–3,5) μm. Thallus cortex and medulla K-, KC-, KI-, I-, C-, Pd-. Pycnidium not observed.



**Fig. 1.** *Rinodina gennarii*. Note: **A** – Habitus, **B** – Close up view of apothecia and areoles, **C** – Section of apothecium, **D** – Asci and *Dirinaria*-type ascospores, **E** – Ascospore in KOH solution showing the swelling around the septum.

**Ecology and Distribution:** *Rinodina gennarii* is common on basaltic rocks at low altitudes without sea spray (Fig. 2). The species co-occurs with lichens such as *Austroplaca johnstonii*, *Calogaya saxicola*, *Candelariella aurella*, *Leptogium puberulum*, *Physconia muscigena* and *Lecidella stigmatae* in James Ross Island located in the NE Antarctic Peninsula.

**Specimens examined:** Antarctica, Antarctic Peninsula, James Ross Island, Pukao, 63° 48' 24.9" S, 57° 50' 27.6" W, alt. 142 m., on rock (JR 0.084); Cape Lachman, 63° 47' 22.5" S, 57° 48' 12" W, alt. 36 m., on rock (ERCH JR 0.084; 0.143), Leg. M. G. Halıcı.



Fig. 2. Vesicular basaltic rocks where *Rinodina gennarii* was collected.

## Discussion

As the specimens collected by the first author from James Ross Island have *Dirinaria*-type ascospores which is characterized by lacking a distinct torus and swelling around the septa in KOH and numerous, often crowded and small apothecia, we report the species *Rinodina gennarii* which is new to Antarctica. This species belongs to the pan-temperate element according to Kantvilas (1996) and has a bipolar distribution. It is known to be common in Europe, North Africa and N. America (Mayrhofer 1984, Esslinger and Egan 1995), and later it was also reported from Chile, New Zealand and Australia (Trinkausk et al. 1999) but never from Antarctica. *Rinodina* cf. *diplocheila* Vain. which was reported from Antarctica by Lamb (1968) may refer to *R. gennarii* according to Helmut Mayrhofer (pers. comm.). From the other epilithic *Rinodina* species previously reported from Antarctica; *R. occulta*

(Körb.) Sheard has shorter ascospores, *R. peloleuca* (Nyl.) Müll. Arg. and *R. endophragma* I. M. Lamb have different types of ascospores (Øvstedal and Lewis-Smith 2001). Other epilithic species such as *R. deceptionis* I. M. Lamb differs by having apothecia finally appearing lecideine and *R. antarctica* Müll. Arg. differs by having much broader ascospores and brown to brown-blackish apothecia (Lamb 1968). There are also 4 species described under the genus *Rinodina* by Dodge and his colleagues (Dodge and Baker 1938, Dodge 1948, 1973). These species were revised by Castello and Nimis (1995) and two of them are epilithic. From these species; *R. sordida* C.W. Dodge & G.E. Baker is a badly developed *Buellia frigida* Darb. and *R. floccosa* (C.W. Dodge & G.E. Baker) C.W. Dodge is probably a *Dactylospora* sp. a non lichenized parasite but certainly not a member of *Rinodina*.

## References

- CASTELLO, M., NIMIS, P. L. (1995): A critical revision of Antarctic lichens described by CW Dodge. *Bibliotheca Lichenologica*, 57: 71-92.
- DODGE, C. W. (1948): Lichens and lichen parasites. British and New Zealand Antarctic Research Expedition 1929–1931. *Reports, Series B (Zoology and Botany)*, 7: 1-276.
- DODGE, C. W. (1973): Lichen flora of the Antarctic Continent and adjacent islands. Phoenix Publishing, Cannan, 399 p.
- DODGE, C. W., BAKER, G. E. (1938): The second Byrd Antarctic expedition: Botany. II. Lichens and lichen parasites. *Annals of the Missouri Botanical Garden*, 25(2): 515-718.
- ESSLINGER, T. L., EGAN, R. S. (1995): A sixth checklist of the lichen-forming, lichenicolous, and allied fungi of the continental United States and Canada. *Bryologist*, 98(4): 467-549.
- HALICI, M. G., BARTÁK, M. (2019): *Sphaerellothecium reticulatum* (Zopf) Etayo, a new lichenicolous fungus for Antarctica. *Czech Polar Reports*, 9(1): 13-19.
- HALICI, M. G., BARTÁK, M. and GÜLLÜ, M. (2018): Identification of some lichenised fungi from James Ross Island (Antarctic Peninsula) using nrITS markers. *New Zealand Journal of Botany*, 56(3): 276-290.
- HALICI, M. G., GÜLLÜ, M. and BARTÁK, M. (2017): First record of a common endolithic lichenized fungus species *Catenarina desolata* Schting, Sgaard & Elvebakk. from James Ross Island (Antarctic Peninsula). *Czech Polar Reports*, 7(1): 11-17.
- HALICI, M. G., GÜLLÜ, M., BÖLÜKBAŞI, E. and KAHRAMAN YİĞİT, M. (2022c): *Shackletonia backorii* (Teloschistaceae) - A new species of lichenised fungus from James Ross Island (Antarctic Peninsula). *Turkish Journal of Botany* 46: 500-506.
- HALICI, M. G., GÜLLÜ, M., YİĞİT, M. K. and BARTÁK, M. (2022d): Three new records of lichenised fungi for Antarctica. *Polar Record*, 58: e22.
- HALICI, M. G., KAHRAMAN, M., KISTENICH, S. and TIMDAL, E. (2021a): *Toniniopsis bartakii*-A new species of lichenised fungus from James Ross Island (Antarctic Peninsula). *Turkish Journal of Botany*, 45(3): 216-223.
- HALICI, M. G., KAHRAMAN, M., OSMANOĞLU, O. and BARTÁK, M. (2021b): New records of lichenized fungi for Antarctica. *Polish Polar Research*, 42(3): 203-219.
- HALICI, M. G., KAHRAMAN, M., SCUR, M. C. and KITAURA, M. J. (2022a): *Leptogium Pirireisii*, a new species of lichenized Ascomycota (Collembataceae) from James Ross Island in Antarctica. *New Zealand Journal of Botany*, 60(1): 68-76.
- HALICI, M. G., MÖLLER, E., TIMDAL, E., YİĞİT, M. K. and BÖLÜKBAŞI, E. (2022b): *Rhizocarpon ozsoyae* sp. nova (Rhizocarpaceae, lichenized Ascomycetes) from James Ross Island (Antarctic Peninsula). *Herzogia*, 35(1): 105-114.
- HALICI, M. G., OSMANOĞLU, O. M. and KAHRAMAN, M. (2020): A new record of lichenized fungus species for Antarctica: *Peltigera castanea* Goward, Goffinet & Miqđl. *Czech Polar Reports*, 10(1): 50-58.
- KAHRAMAN, M., HALICI, M. G. (2021): *Buellia epigaea* (Pers.) Tuck, a new record of lichenized fungus species for Antarctica. *Czech Polar Reports*, 11(1): 9-15.
- KANTVILAS, G. (1996): Tasmania: Its vegetation and lichens. *British Lichen Society Bulletin*, 78: 1-10.
- LAMB, I. M. (1968): Antarctic lichens: II. The genera *Buellia* and *Rinodina*. *British Antarctic Survey Scientific Reports*, London 61: 1-129.
- LEE, B. G., HUR, J. S. (2022): Two new *Rinodina* lichens from South Korea, with an updated key to the species of *Rinodina* in the far eastern Asia. *MycKeys*, 87: 159-182.
- MAYRHOFER, H. (1984): Die saxicolen Arten der Flecht gattungen *Rinodina* und *Rinodinella* in der Alten W. *Journal of the Hattori Botanical Laboratory*, 55: 32-493.
- NADYEINA, O., GRUBE, M. and MAYRHOFER, H. (2010): A contribution to the taxonomy of the genus *Rinodina* (Physciaceae, lichenized Ascomycotina) using combined ITS and mtSSU rDNA data. *Lichenologist*, 42(5): 521-531.
- ØVSTEDAL, D. O., LEWIS-SMITH, R. (2001): Lichens of Antarctica and South Georgia: A guide to their identification and ecology. Cambridge University Press, Cambridge, 411 p.
- SHEARD, J. W., EZHKIN, A. K., GALANINA, I. A., HIMELBRANT, D., KUZNETSOVA, E., SHIMIZU, A., STEPANCHIKOVA, I., THOR, G., TØNSBERG, T., YAKOVCHENKO, L. S. and SPRIBILLE, T. (2017): The lichen genus *Rinodina* (Physciaceae, Caliciales) in north-eastern Asia. *Lichenologist*, 49(6): 617-672.