



Notes on species of *Lecanora* (lichenized Ascomycotina) from the Antarctic

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ABSTRACT: New information about presence and features of some *Lecanora* species as well as their ecology and distribution in Antarctica are provided. *Lecanora dispersa* (Pers.) Sommerf. is confirmed to occur in the Antarctic region; *L. sverdrupiana* Øvst. is recorded for the first time from maritime Antarctica; *L. torrida* Vain. is reported as new for that Antarctic area and for the southern hemisphere. An attempt to summarize the present state of knowledge for the genus *Lecanora* in the Antarctic region is made. Several species, which require more in depth studies, are briefly discussed and an up-to-date list of species occurring in Antarctica is included.

Key words: Antarctic, *Lecanora*, taxonomy, distribution.

Introduction

Lichens of the Antarctic region, especially the crustose species are poorly known. *Lecanora* is a large genus of lichenized fungi including about one thousand species and is worldwide in distribution. Although the genus has been of great interest to many lichenologists in recent years and some species groups have received considerable systematic treatment (Brodo 1984, Lumbsch 1994, Dickhauser *et al.* 1995, Poelt and Leuckert 1995, Lumbsch *et al.* 1995, 1996, 1997; Ryan and Nash 1997), collections from Antarctica were not involved in any of the recently published taxonomic studies.

The most significant step towards better understanding of Antarctic lichens, and also the first reasonable treatment of the genus *Lecanora* was done by Øvstedal and Lewis Smith (2001) based on thorough revision of worldwide collections of Antarctic lichens. The authors recognized 19 species and 4 undescribed taxa of *Lecanora* in the book.

The Antarctic species of *Lecanora* were also treated by Dodge (1973) in a book covering the entire lichen flora of the continent. Dodge recognized 20 species of *Lecanora*, many of them described by Dodge himself or his collaborators. Unfortunately, this first monograph of Antarctic lichens was found to be almost unusable due to poor taxonomic criteria and evaluations. Castello and Nimis (1995), however, made successfully clarified the taxonomic position of many taxa named by Dodge, among them the species of *Lecanora*.

There were 89 species in total recorded from Antarctica and considered to belong to this genus over the entire history of lichenological studies in this area according to the checklist of Antarctic lichens (Olech 2001). Several taxa were subsequently placed elsewhere. For example, *Lecanora babingtonii* was transferred to *Buellia babingtonii* (Hook. et Tayl.) Lamb ex Dodge and *L. egentissima* Hue was found to be *Rinodina turfacea* (Wahlenb.) Körb. (Lamb 1968). Others, such as *L. carbonacea* Dodge et Baker and *L. lilacinofusca* Dodge et Baker, were found to be synonyms of presently accepted species: *L. mons-nivis* Darb. and *L. expectans* Darb., respectively (Castello and Nimis 1995). Finally some were moved to genera now excluded from *Lecanora*, e.g., *Protoparmelia badia* (Hoffm.) Hafellner and *Tephromela atra* (Huds.) Hafellner.

Given that so many names applied, it is surprising that for many years only a few species of *Lecanora* were cited in any single study of Antarctic lichens (e.g., Øvstedal 1983 – 2 taxa, 1986 – 2 taxa, Andreev 1988 – 12 taxa, Olech 1989 – 4 taxa, 1994 – 4 taxa, Aptroot and Knaap 1993 – 5 taxa, Seppelt *et al.* 1995 – 3 taxa, Upreti 1997 – 2 taxa, Sancho *et al.* 1999 – 8 taxa). The number of *Lecanora* species occurring in Antarctica is still not clear. Øvstedal and Lewis Smith (2001) recognized 23 species. Olech (2001) considered 24 as possibly occurring in this region. The species lists, however, vary considerably. This obviously indicates that this group of lichenized fungi in Antarctica is in need of further thorough investigations.

Here we include new information about the presence and features of some *Lecanora* species as well as their ecology and distribution. We also attempt to summarize the present state of knowledge of *Lecanora* in the Antarctic region.

Material and methods

This study is based on materials collected by M. Olech during the XI (1986–88), XIII (1989/90), XVI (1991–93) and XX (1995/96) Polish Antarctic scientific expeditions to the *Arctowski* Station. The collections originate mainly from South Shetland Islands (West Antarctica). The specimens have been deposited in the lichen herbarium of Institute of Botany of the Jagiellonian University (KRA-L). Collections from the following herbaria were studied for reference: AAS, FH, GZU, H, S. An Antarctic collection from MIN and MSC was also investigated for comparison.

Apothecial anatomy was investigated with hand made sections mounted in water. Measurements of tissues were rounded off to whole numbers and spores to 0.5 μm . The paraphyses and spores were studied and measured in 25% KOH. The presence and distribution of granules were observed in polarized light. Solubility of granules in KOH (25%) and HNO_3 (concentrated) was observed on separate slides. Spot tests of thallus and/or apothecia with K, C and P refer to colors seen under the dissecting microscope and were made on the cortex. Chemistry was studied with thin layer chromatography (TLC) using solvent system A (Culberson 1972, 1974; Culberson *et al.* 1981).

Results

Below are the species listed that were identified so far from Polish collections. Descriptions of the species are based on the specimens we examined.

Lecanora atromarginata (H. Magn.) Hertel et Rambold

Thallus forming more or less continuous, rosette like crust; whitish, cream or slightly yellowish colored. Apothecia 0.4–0.6 μm in diameter, slightly immersed in thallus; margin dark; discs black, epruinose. Apothecial anatomy: thalline margin excluded; parathecium distinct; epihymenium brownish green; hymenium 40 μm ; hypothecium distinct; paraphyses septate; spores 10–11 \times 5–5.5 μm . Spot test reactions: thallus and apothecial margin K –, C –, P –; UV –. Usnic acid detected by TLC.

Ecology. — *Lecanora atromarginata* occurs on inland rocks at high altitudes in shaded sites. It is usually accompanied by *Rhizocarpon geminatum* Körb. and *Staurothele gelida* (Hook and Taylor) I.M. Lamb.

Specimens examined. — King George Island, Admiralty Bay region. Ezcurra Inlet: Italia Valley, alt. 80 m, 5 August 1987, M.A. Olech, *s.n.*; Dutkiewicz Cliff, above Italia Valley, alt. 60 m, 29 August 1987, M.A. Olech, *s.n.*; Dutkiewicz Cliff, above Italia Valley, alt. 100 m, 5 August 1987, M.A. Olech, *s.n.* (all KRA-L).

Reference material studied. — *Lecanora atromarginata*, det. Øvstedal (AAS). This is a bipolar species. It was known from the Arctic region but it recently was reported from Antarctica as well (Øvstedal and Lewis Smith 2001).

Lecanora dancoensis Vain.

Thallus dispersed, consisting of convex verrucae, or almost continuous and composed of flattened areoles; beige to dark brown, sometimes with grayish tinge; prothallus distinct and black. Apothecia 0.8–1.5 mm in diameter, round, broadly attached; margin concolorous with thallus, sometimes slightly crenate; discs brown to reddish, bare, often convex. Apothecial anatomy: amphithecium



Fig. 1. *Lecanora dancoensis* Vain.

120–140 μm thick, with abundant algae, very dense in structure; cortex very thin, uniform (row of cells?); epihymenium brown; hymenium 60–80 (120) μm ; hypothecium ca. 160 μm ; paraphyses thin, simple; spores 15.0–17.0 \times 7.5–9.5 μm . Spot test reactions: thallus and apothecial margin K + yellow, C –, P + orange; UV –. Stictic acid detected by TLC. Conidia ca. 3.5 μm . Fig. 1.

Ecology. — The taxon occupies snow bed localities and is associated with *Buellia anisomera* Vain., *B. russa* (Hue) Darb., *Huea cerussata* (Hue) Dodge and Baker, *H. coralligera* (Hue) Dodge et Baker, *Rhizoplaca aspidophora* (Vain.) Redon and *Usnea antarctica* Du Rietz.

Specimens examined. — King George Island, Admiralty Bay region, Bransfield Strait: Blue Dyke, alt. 10 m, 4 February 1987, M.A. Olech, *s.n.*; Demay Point SE, 50–55 m, 13 December 1987, M.A. Olech, *s.n.*; Ecology Glacier: Sphinx Hill, alt. 40 m, 8 December 1987, M.A. Olech, *s.n.* (all KRA-L).

Reference material studied. — *Lecanora dancoensis*, det. Øvstedal (AAS). This is an Antarctic endemic relatively common in the region.

***Lecanora dispersa* (Pers.) Sommerf.**

Thallus endolithic, or superficial and then visible as a very thin, membranaceous layer. Apothecia variable in size (0.3–0.7 mm in diameter), shape, margin structure and disc color; margin thin, corticate and in some way dentate, or thick and more-or-less powdery, usually white but in very sunny localities dark to black-



Fig. 2. *Lecanora dispersa* (Pers.) Sommef.

ened; discs pale greenish-gray, brownish or blackish, bare. **Apothecial anatomy:** amphithecium variable in thickness and abundance of algae; cortex not well delimited, varying in thickness, cellular, more or less densely filled with granules (K insoluble, N soluble); epithecium granulose, granules very fine, in a gelatinous matrix (K insoluble, N insoluble), the same granules interspersed between paraphyses tips or throughout the hymenium; epihymenium brownish or olive; hymenium 50 μm ; hypothecium variable in thickness, sometimes with adglutinated hyphae or almost cellular; paraphyses thin, septate, branched and transversely connected; spores 8–12 \times 5–6 μm . **Spot test reactions:** thallus and apothecial margin K –, C –, P – or parts of apothecial margin P+ orange (due to traces of pannarin, which are often undetectable by TLC); UV –. No lichen substances detected by TLC. Reported: xanthonenes and +/- pannarin (Poelt and Leuckert 1995). Fig. 2.

Ecology. — The species is a main component of epilithic communities of recent glacier moraines and is one of the most important pioneer taxa of lichens. It is usually accompanied by *Amandinea coniops* (Wahlenb.) M. Choisy, *Caloplaca johnstonii* (Dodge) Søchting et Olech, *C. sublobulata* (Nyl.) Zahlbr., *Candelariella aurella* (Hoffm.) Zahlbr., *Lecidella sublapicida* (C. Knight) Hertel, *Verrucaria elaeoplaca* Vain. *Lecanora dispersa* occurs also on wood.

Specimens examined. — King George Island, Admiralty Bay region. Ecology Glacier: Sphinx Glacier moraines, (alt. 15 m, 22 January 1996, M.A. Olech, *s.n.* and alt. 5 m, 26 January 1996, M.A. Olech, *s.n.*; Sphinx Hill, rock ridge, alt. 5 m, 8

August 1987, M.A. Olech, *s.n.*; Sphinx Hill, beach, on wood, 13 December 1987, M.A. Olech, *s.n.*; Point Thomas: moraines by the northern edge of Ecology Glacier, 60 m, M.A. Olech, *s.n.*; Martel Inlet: Szafer Ridge, moraine, alt. 10 m, M.A. Olech, *s.n.* (all KRA-L).

Reference material studied. — *Lecanora dispersa*, det. Poelt (GZU). The cosmopolitan *Lecanora dispersa* is a heterogeneous species and is until now considered to be a complex of taxa. Significant progress was made in the last few years in understanding this taxon and consequently some species were well circumscribed (Poelt and Leuckert 1995, Fröberg 1997). However, there are still some misunderstandings concerning *L. dispersa sensu stricto* and related taxa (Śliwa, *unpubl.*). This is probably why Øvstedal and Lewis Smith (2001) assumed the species might not occur in Antarctica. The authors mentioned the taxon in the text but hesitated to include it on the species list. *Lecanora dispersa* does indeed occur in the Antarctic region and, moreover, plays an important role as a pioneer species that colonizes newly deglaciated moraines.

***Lecanora expectans* Darb.**

Thallus areolate, restricted to the close vicinity of apothecia. Apothecia 0.4–0.8 mm in diameter, with margins concolorous with thallus; discs brown to blackened, epruinose or clearly pruinose. Apothecial anatomy: amphithecium thick, with abundant algae; cortex not well delimited, uniform, ca. 30 µm wide, or distinct and expanded at the base, gelatinous, granules very sparse or abundant (K insoluble, N soluble); epithecium not granulose to sparsely granulose; epihymenium red-brown to almost black; hymenium 60 µm; hypothecium with distinct subhymenium, prosoplectenchymatous; paraphyses brown capitate; spores 11–15 × 4.5–6 µm. Spot test reactions: apothecial margin K –, C –, P –; UV –. No lichen substances detected by TLC. Fig. 3a.

Ecology. — *Lecanora expectans* is an epibryophytic species occupying mosses and *Deschampsia antarctica* debris and occurs in nitrophilous communities mainly along the sea shore. It grows abundantly in the presence of bird and penguin nests. The most common accompanying species are *Caloplaca tirolensis* Zahlbr., *Ochrolechia frigida* (Sw.) Lynge, *Physcia caesia* (Hoffm.) Fürnr., *Physconia muscigena* (Ach.) Poelt and *Xanthoria candelaria* (L.) Th. Fr. The species was also found on seashore rocks, on shells of *Nacella concinna* and there was accompanied by *Caloplaca cirrochrooides* (Vain.) Zahlbr. and *C. sublobulata* (Nyl.) Zahlbr.

Specimens examined. — King George Island, Admiralty Bay region. Bransfield Strait: Blue Dyke, cliff rocks, alt. 10 m, 3 February 1987, M.A. Olech, *s.n.*; Blue Dyke, alt. 5–10 m, on shells, 3 February 1987, M.A. Olech, *s.n.*; Blue Dyke, alt. 120 m, 3 February 1987, M.A. Olech, *s.n.*; Blue Dyke, alt. 110 m, 11 December 1987, M.A. Olech, *s.n.* Ecology Glacier: Sphinx Hill, N, alt. 180 m, 8 December

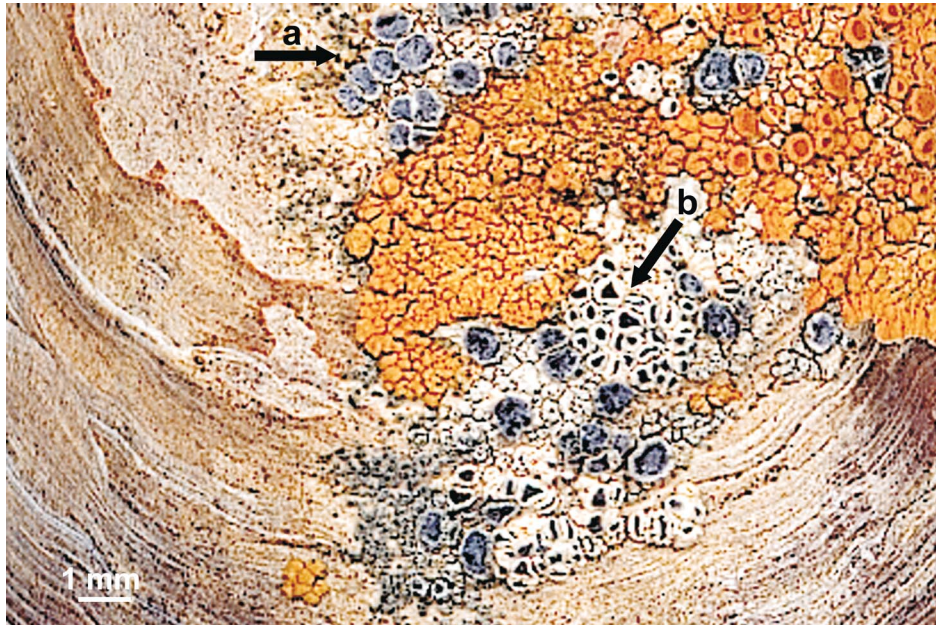


Fig. 3. *Lecanora expectans* Darb. (a) and *Lecanora torrida* Vain. (b)

1987, M.A. Olech, *s.n.*; Rescuers Hills, NE, alt. 50 m, 2 December 1987, M.A. Olech, *s.n.*. Point Thomas: Moraines by the northern edge of Ecology Glacier, alt. 15 m, 23 January 1988, M.A. Olech, *s.n.*; Point Thomas, alt. 5 m, 24 January 1987, M.A. Olech, *s.n.*; King George Bay region. Lions Rump, alt. 10 m and 40–55 m, 18 January 1988, M.A. Olech, *s.n.* (all KRA-L).

Reference material studied. — *Lecanora expectans*, det. Øvstedal (AAS).

Lecanora expectans is an endemic species known to occur on the southern Antarctic Peninsula and continental Antarctica (Øvstedal and Lewis Smith 2001). The material from the archipelago seems the same in all details studied. We hesitated using the name for specimens in the collection with entire epruinose apothecial discs since they also had some anatomical differences (e.g., expanded cortex, lack of any granules). We considered those particular specimens as conforming more closely to *L. griseomarginata* Dodge et Baker. Since the type of the latter species was not available for loan when we requested it, and the two taxa were found to be the same by Castello and Nimis (1995), we finally decided not to separate them.

Lecanora intricata (Ach.) Ach.

Thallus forming rosettes consisting of flat areoles; yellow-green. Apothecia 0.3–1.0 mm in diameter, crowded on thallus surface and more or less immersed; thalline margin concolorous with thallus, distinct or disappearing; discs pale yellow.

lowish-green to blackened, bare. Spot test reactions: thallus and apothecial margin K –, C –, P –; UV –. Chemistry not investigated. Reported: usnic acid, zeorin, unidentified triterpenes and rangiformic acid (Øvstedal and Lewis Smith 2001).

Ecology. — The species usually accompanies *L. polytropa* in snow bed communities. Other associated taxa: *Candelariella vitellina* (Ehrh.) Müll. Arg., *Carbonea assentiens* (Nyl.) Hertel., *Poeltidea pertusa* (Nyl.) Hertel and Hafellner, *Pseudophebe pubescens* (L.) M. Choisy, *Staurothele gelida* (Hook and Taylor) I.M. Lamb, *Tremolecia atrata* (Ach.) Hertel.

Specimens examined. — King George Island, Admiralty Bay region. Ecology Glacier: Sphinx Hill ridge, alt. 100 m, 8 December 1987, M.A. Olech, *s.n.*; MacKellar Inlet: Crepin Point, N, alt. 50 m, 25 January 1988, M.A. Olech, *s.n.*; Martel Inlet: Stenhouse Bluff, alt. 30 m, 22 November 1987, M.A. Olech, *s.n.*; Ullman Spur, N, alt. 100 m, 20 December, M.A. Olech, *s.n.*; Hennequin Point, alt. 30 m, 30 January 1990, M.A. Olech, *s.n.*; Smok, N, alt. 15 m, 20 m, 1 November 1987, M.A. Olech, *s.n.*; Ardley Bay region. Fildes Peninsula: near Marsh Station, 12 January 1988, M.A. Olech, *s.n.* Livingston Island, South Bay region. Johnsons Dock: above Spanish Base, alt. 10 m, 11 January 1988, M.A. Olech, *s.n.*; Ballester Point, W, 80 m, 27 December 1986, M.A. Olech, *s.n.*; Sophia Regina Hill: NE, alt. 80 m, 11 January 1988, M.A. Olech, *s.n.*, N, alt. 30 m, 11 January 1988, M.A. Olech, *s.n.* (all KRA-L).

This taxon is not well understood and, along with *L. polytropa*, requires taxonomic revision.

***Lecanora mawsonii* Dodge**

Thallus produces small (1–2 cm) rosettes of thick, convex areoles, beige to brownish; prothallus present, cottony, white to grey. Apothecia 0.3–0.8 mm in diameter, immersed in thallus areoles when young, widely attached (some narrowly attached) when mature; margin at first prominent, then even with discs, concolorous with thallus (only top slightly whitish); discs brown, epruinose. Apothecial anatomy: amphithecium with abundant algae; cortex not uniform (30 µm laterally, and up to 70 µm at base), gelatinous, with some granules in upper part (K insoluble, N soluble); epihymenium brown; hymenium 40 µm; hypothecium 20 µm, colourless; paraphyses simple, thick, straight, end cells enlarged and with brown cap; spores 9.5–11.5 × 4.5–5.5 µm. Spot test reactions: thallus and apothecial margin K –, C –, P –; UV + yellowish spots. Chemistry not investigated. Conidia ca. 9 µm long.

Ecology. — *Lecanora mawsonii* can be found on cliff rocks close to the sea shore. It seems to be a nitrophilous species and was found with *Caloplaca regalis* (Vain.) Zahlbr. and *Physcia* spp.

Specimens examined. — King George Island, Admiralty Bay region. Point Thomas: Shag Point, NE, alt. 5 m, M.A. Olech, *s.n.* (KRA-L).

Reference material studied. — *Lecanora mawsonii*, det. Dodge (holotype, FH). It is possible that this is the only specimen of the taxon other than the holotype.

***Lecanora mons-nivis* Darb.**

Thallus present only under and near apothecia; yellowish. Apothecia 0.5–1.3 mm in diameter, compressed few together; thalline margin very thin to almost excluded, yellowish; discs black, bare. Apothecial anatomy: amphithecium with abundant algae; cortex not well delimited, uniform, filled with granules (K insoluble, N soluble); parathecium distinct, thin; epithecium granulose (K soluble, N insoluble); epihymenium bluish-green (N+ red); hymenium 60 µm; hypothecium distinct; paraphyses slightly branched, thin; spores 10–11 × 5–5.5 µm. Spot test reactions: thallus and apothecial margin K –, C –, P –; UV –. Chemistry not investigated. Reported: unidentified xanthone (Øvstedal and Lewis Smith 2001).

Ecology. — The species was found in snow bed communities and it was associated with *Lecanora intricata* and *Staurothele gelida* (Hook et Taylor) I.M.Lamb.

Specimens examined. — King George Island, Admiralty Bay region. Bransfield Strait: Blue Dyke, SE, alt. 110 m, 11 December 1987, M.A. Olech, *s.n.* (KRA-L).

Reference material studied. — *Lecanora mons-nivis*, det. Øvstedal (AAS). This is a very characteristic species because of the blackish apothecia elevated on distinct yellowish thallus areoles. Due to the presence of thallus only under and close to apothecia, the species is similar to *L. torrida*. The latter species, however, belongs to the *L. dispersa* group, whereas *L. mons-nivis* is much more closely related to the *L. polytropha* group. Evidence for its relationship with the latter group includes the distinctly yellowish colour of thallus, its chemistry and features of the apothecial granules. In the case of *L. mons-nivis*, granules located in both the epithecium and amphithecial cortex are soluble in KOH. The solubility of epithecial granules within the *L. dispersa* group is variable but the amphithecial granules are always persistent in KOH.

***Lecanora parmelinoides* Lumbsch**

Thallus inconspicuous. Apothecia 0.4–1.5 mm in diameter, sessile or partly immersed in substrate; margin whitish or beige on outer side and blackish on top and inner side, shiny; discs pale brown to black, epruinose. Apothecial anatomy: amphithecium with sparse algae; cortex thick, distinct with sparse granules (K soluble); epithecium granulose (K soluble); epihymenium brownish green; hypothecium distinct; paraphyses simple, adglutinated; spores 12–13 × 6–7.5 µm. Spot test reactions: margin of apothecia K + yellow, C –, P –; UV –. Chemistry not investigated. Reported: atranorin and different lichen xanthenes (Øvstedal and Lewis Smith 2001).

Ecology. — *Lecanora parmelinoides* occurs in inland localities, on nunataks and grows mostly on soil and also over mosses. It is usually associated with the follow-

ing taxa: *Andreaea* spp., *Caloplaca psoromatis* Olech et Søchting, *Cystocoleus ebeneus* (Dillw.) Thwaites, *Pannaria austro-orcadensis* Øvstedal, *P. hookeri* (Borrer ex Sm.) Nyl., *Psoroma* spp., *Usnea aurantiaco-atra* (Jacq.) Bory.

Specimens examined. — King George Island, Admiralty Bay region. Bransfield Strait: The Tower, S, alt. 260 m, 280 m, 290 m, 12 December 1987, M.A. Olech, *s.n.*; Point Thomas: Jersak Hills, N, alt. 150 m, 30 November 1987, M.A. Olech, *s.n.*, S, alt. 150 m, 27 November 1987, M.A. Olech, *s.n.*, N, alt. 180 m, 30 November 1987, M.A. Olech, *s.n.*. (all KRA-L).

Reference material studied. — *Lecanora parmelinoides*, det. Lumbsch (AAS). This newly described species (Lubmsch 1994) is closely related to *L. epibryon* from which it differs by a much less distinct thallus, apothecia that are widely sessile or slightly immersed in the substrate with dark, matt discs, and by smaller spores. These new localities are important to better understand its distribution range.

Lecanora physciella (Darb.) Hertel

Thallus forming a more or less continuous, rosette-like crust, distinctly cracked into smaller areoles, areoles elongated at the edge of thallus; dark yellow to almost brownish or with slightly greenish tinge; prothallus distinct and black. Apothecia (0.3) 0.4–0.6 mm in diameter, slightly immersed in thallus; margin black, distinct or excluded; discs black, bare. Apothecial anatomy: thalline margin excluded; parathecium distinct; epihymenium brownish green; hypothecium distinct; paraphyses simple, end cell not enlarged; spores 10–11 × 4.5–5.5 µm. Spot test reactions: thallus K –, C –, P –; UV –. Usnic acid detected by TLC.

Ecology. — *Lecanora physciella* grows on inland rocks at higher altitudes in sun exposed habitat and is usually associated with *Himantormia lugubris* (Hue) I.M. Lamb, *Ochrolechia parella* (L.) A. Massal., *Lecanora polytropa*, *Lecidea* spp., *Rhizocarpon* spp., and *Usnea aurantiaco-atra* (Jacq.) Bory.

Specimens examined. — King George Island, Admiralty Bay region. Bransfield Strait: The Tower, alt. 310 m, 12 December 1987, M.A. Olech, *s.n.*; Ecology Glacier: Czajkowski Needle, N, alt. 200 m and 294 m, 5 January 1987, M.A. Olech, *s.n.*; Point Thomas: Ubocz, E, alt. 180 m, 26 December 1987, M.A. Olech, *s.n.*; Ezcurra Inlet: Panorama Ridge, alt. 65 m, 16 March 1987, M.A. Olech, *s.n.*; Jardine Peak, N, alt. 250 m, 17 December 1987, M.A. Olech, *s.n.* Livingston Island, South Bay region. Johnsons Dock: Juan Carlos I, alt. 80 m, M.A. Olech, *s.n.* (all KRA-L).

Reference material studied. — *Lecanora physciella*, det. Øvstedal (AAS). This is very characteristic and relatively common Antarctic endemic.

Lecanora polytropa (Hoffm.) Rabenh.

Thallus absent or consisting of dispersed, convex granules; yellowish. Apothecia (0.3) 0.4–1.5 (2) mm in diameter, dispersed or crowded, yellow-green. Thalline

margin concolorous with thallus, persistent or excluded; discs pale yellow, orangish to blackened, bare. **Spot test reactions:** thallus and apothecial margin K –, C –, P –; UV –. Chemistry not investigated. Reported: usnic acid and zeorin, sometimes also rangiformic acid (Øvstedal and Lewis Smith 2001).

Ecology. — This is a characteristic species of snow bed communities. Associated taxa: *Candelariella vitellina* (Ehrh.) Müll. Arg., *Carbonea assentiens* (Nyl.) Hertel, *Lecanora intricata*, *Lecidea lapicida* (Ach.) Ach., *Leptogium puberulum* Hue, *Poeltidea pertusa* (Nyl.) Hertel et Hafellner, *Pseudephebe pubescens* (L.) M. Choisy, *Rhizocarpon geographicum* (L.) DC., *Rh. geminatum* Körb., *Tremolecia atrata* (Ach.) Hertel.

Specimens examined. — King George Island, Admiralty Bay region. Bransfield Strait: Bastion, NE, alt. 220 m, 12 December 1987, M.A. Olech, *s.n.*; moraine below Brama, S, alt. 90 m, 12 December 1987, M.A. Olech, *s.n.*; Ecology Glacier: Sphinx Hill, N, alt. 120 m, 8 December 1987, M.A. Olech, *s.n.*; Rescuers Hills, E, alt. 80 m, 8 December 1987, M.A. Olech, *s.n.*; Point Thomas: Ornithologists Creek, alt. 60 m, 26 January 1987; Point Thomas, S, alt. 160 m, 19 February 1987, M.A. Olech, *s.n.*; Petrified Forest Creek, alt. 60 m, 24 March 1987, M.A. Olech, *s.n.*; Ubocz, E, alt. 70 m and 90 m, 3 November 1987, M.A. Olech, *s.n.* alt. 150 m, 15 January 1987, M.A. Olech, *s.n.*; Jardine Peak, NE, alt. 250 m, 4 December 1987, M.A. Olech, *s.n.*; Kasprowy Hill, alt. 190 m, 29 August 1987, M.A. Olech, *s.n.*; Dutkiewicz Cliff, alt. 300 m, 2 January 1987, M.A. Olech, *s.n.*; Cytadela, alt. 10 m, 13 March 1987, M.A. Olech, *s.n.*; Martel Inlet: Stenhouse Bluff, alt. 60 m, 22 November 1987, M.A. Olech, *s.n.*; Mount Wawel, NE, alt. 50 m, 12 February 1987, M.A. Olech, *s.n.*; alt. 150 m, 6 February 1987, M.A. Olech, *s.n.* King George Bay region. Lions Rump, alt. 50 m, 1 February 1990, M.A. Olech, *s.n.*; Sukiennice Hills, alt. 10 m, 1 February 1990, M.A. Olech, *s.n.* Livingston Island, South Bay region. Johnsons Dock: Ballester Point, NW, alt. 20 m, 21 December 1986, M.A. Olech, *s.n.* (all KRA-L).

The material studied is not uniform and it is very likely that more than one taxon is involved here.

Lecanora sverdrupiana Øvst.

Thallus crustose, white-grey. **Apothecia** 0.4–1.3 mm in diameter, slightly stalked, with a thick margin, curled over discs and concolorous with thallus; discs brown to blackened, finely pruinose. **Apothecial anatomy:** **amphithecium** 120–280 µm thick; **cortex** not well delimited, thin; **parathecium** distinct but thin, 20 µm; **epithecium** granulose, granules fine (K insoluble, N soluble); **epihymenium** bluish-olive; **hypothecium** distinct; **paraphyses** unbranched, end cells not enlarged; **spores** 9–11 × 7.5–9.5 µm. **Spot test reactions:** thallus and apothecial margin K –, C –, P –; UV –. No lichen substances detected by TLC. Fig. 4.

Ecology. — The species was found on cliff rocks where it grows along with *Verrucaria racovitzae* Vain.



Fig. 4. *Lecanora sverdrupiana* Øvst.

Specimen examined. — King George Island, Admiralty Bay region. Ezcurra Inlet: Kasprowy Hill, WN, alt. 5 m, on stone, 29 July 1987, M.A. Olech, *s.n.* (KRA-L).

Reference material studied. — *Lecanora sverdrupiana*, det. Øvstedal (AAS). *Lecanora sverdrupiana* was described as a result of intensive studies on Antarctic lichens made during the last few decades (Øvstedal 1983). The species is an Antarctic endemic known only from the Continent. This is the first record of the taxon from maritime Antarctica.

***Lecanora torrida* Vain.**

Thallus present only under apothecia, rarely wider than apothecia; white. **Apothecia** (0.3) 0.4–1.0 mm in diameter, apparently stalked or sessile on single areole of thallus, sometimes slightly immersed in the areolae; with distinct thalline margin, or thalline margin excluded leaving a distinct dark proper exciple; discs brown or black, epruinose. **Apothecial anatomy:** **amphithecium** lower than discs, consisting of loose hyphae, algae sparse; **cortex** not well delimited, filled with granules (K insoluble, N soluble); **parathecium** distinct, wide, bluish on top; **epihymenium** bluish-brown or brown (N+ red); **hymenium** 50 µm; **hypothecium** distinct; **paraphyses** with enlarged end cell, pigmented with a brown cap; **spores** 12–13 × 4.5–5 µm. **Spot test reactions:** thallus and apothecial margin K –, C –, P –, or margin of apothecia P+ orange (pannarin); UV –. Chemistry not investigated. Reported: xanthonones and +/- pannarin (Poelt and Leuckert 1995). Fig. 3b.

Ecology. — *Lecanora torrida* occurs in nitrophilous epilithic communities and is accompanied by *Caloplaca lucens* (Nyl.) Zahlbr., *C. regalis* (Vain.) Zahlbr., *Haematomma erythromma* (Nyl.) Zahlbr., *Physcia caesia* (Hoffm.) Fűrnr., *Tephromela* spp. and *Xanthoria elegans* (Link) Th. Fr.

Specimens examined. — King George Island, Admiralty Bay region. Bransfield Strait: Blue Dyke, shells on shore sea rocks, alt. 5–10 m, 3 February 1987, M.A. Olech, *s.n.*; Ecology Glacier: Sphinx Glacier moraine, alt. 10 m, 26 January 1996, M.A. Olech, *s.n.* (KRA-L).

Reference material studied. — *Lecanora torrida*, det. Vainio (holotype, S). *Lecanora torrida* was known to occur in the Arctic but was never considered to be a bipolar species. This is the first record of the taxon from the Southern Hemisphere and the Antarctic area.

Checklist of *Lecanora* species accepted as occurring in Antarctica

L. alutacea Hue
L. atromarginata (H. Magn.) Hertel et Rambold
L. dancoensis Vain.
L. dispersa (Pers.) Sommerf.
L. epibryon (Ach.) Ach.
L. expectans Darb.
L. flotowiana Spreng.
L. frustulosa (Dicks.) Ach.
L. fuscobrunnea Dodge et Baker
L. geophila (Th.Fr.) Poelt
L. griseosorediata Øvst.
L. hagenii (Ach.) Ach.
L. handelii Steiner
L. intricata (Ach.) Ach.
L. lilacina Dodge
L. mawsonii Dodge
L. mons–nivis Darb.
L. orosthea (Ach.) Ach.
L. parmelinoides Lumbsch
L. physciella (Darb.) Hertel
L. polytropa (Hoffm.) Rabenh.
L. sverdrupiana Øvst.
L. symmicta (Ach.) Ach.
L. torrida Vain.

Excluded taxa

L. varia (Hoffm.) Ach. — According to our present state of knowledge, it is not likely to occur in Antarctic region (Śliwa and Wetmore 2000, Śliwa *unpubl.*).

***L. umbrina* auct.** — Poelt and Leuckert (1995) assumed the taxon should be considered as a synonym of *L. dispersa*, and we are able to confirm that the name has been applied to different forms of the latter species (Śliwa *unpubl.*).

It is very likely that this list is still incomplete. Furthermore, among the 24 species listed above there are some taxa that need more detailed studies.

***L. expectans*.** — There are problems concerning delimitation of this species and *L. grisoemarginata* (Olech 2001). Castello and Nimis (1995), during their critical revision of Antarctic lichens named by Dodge, decided the two taxa are synonyms. We observed, however, a significant variability among specimens studied concerning both morphology and anatomical characters. It is likely that specimens called *L. expectans* are not uniform and they may require reexamination.

***L. flotowiana*.** — The species is a widely distributed and distinctive member of the *L. dispersa* group *sensu lato*, but it seems the name has been considerably overused (Śliwa *unpubl.*). The only specimen of the taxon from Antarctica we saw until now, however, indeed represents *L. flotowiana* (AAS, Smith 7668B). To estimate frequency of the species in the Antarctic region investigations on some more material are necessary.

***L. fuscobrunnea*.** — The taxon was considered to be a good species by Castello and Nimis (1995) but was synonymized with *Rhizoplaca melanophthalma* (Ram.) Leuckert and Poelt by Øvstedal and Lewis Smith (2001). In our opinion the type represents taxon of *Lecanora* genus but because of its extremely modified form (due to habitat conditions) it is difficult to estimate if it is a separate, good species or a member of presently accepted taxa.

***L. hagenii*.** — Like *L. umbrina* the species is considered to be an infraspecific member of *L. dispersa sensu stricto* (Poelt and Leuckert 1995, Fröberg 1997). In this case, however, there are some significant differences in anatomical characters, and the taxon is likely to be a good species (Śliwa *unpubl.*). The occurrence of *L. hagenii* in Antarctica needs to be confirmed based on detailed studies of more material.

***L. lilacina*.** — Despite the poor condition of the sample represented by type specimen (FH), *L. lilacina* seems to be distinct species, but, as it was concluded by Castello and Nimis (1995), the material needs more detailed study. Since there were no similar specimens found in the collection we studied, a closer examination of the type was not undertaken in order to preserve this historical material for a more suitable occasion.

***L. polytropa*.** — As we mentioned under *L. intricata*, *L. polytropa* is in need of thorough taxonomic studies because its extreme variability, especially impressive in Antarctica.

***L. symmicta*.** — The species was reported from Antarctica as an introduced taxon occurring on wood that was brought in from elsewhere (Andreev 1988, Olech 1996, Øvstedal and Lewis Smith 2001). All the specimens we reexamined so far,

however, appear to belong to other taxa. The specimen from KRA-L was *L. dispersa*, and the one from AAS was *L. polytropa*. To confirm the presence of the species in the Antarctic region, a revision of all samples on wood is necessary.

Conclusions

The observations presented here show how difficult it is to estimate complete species diversity within the genus *Lecanora* in Antarctica. A few serious difficulties worth mentioning arose during the studies. To begin with, the difficulties investigators have with Antarctic material are due most especially to the extreme climate and environmental conditions (e.g., ice blasting) under which the lichens grow, often producing bizarre and unnatural modifications. This would include many of the types. If large series of specimens are not available for study, it is hard to evaluate those modifications. And, large series of species are rarely available because the Antarctic is such a remote and inaccessible region. Secondly, apart from the Antarctic endemics, many names applied to Antarctic species of *Lecanora* are based on collections from other parts of the world. In most of those cases, material from other continents had to be compared and given the high ecological variability of most of the species, the identity of Antarctic specimens with material from other parts of the world is often not easy to establish. Moreover, for some species groups, studies would have to include a thorough investigation of material from a wide geographical range because of the lack of any taxonomic treatment of the group until now.

As a result the data presented are based only on a part of the polar lichen collection available in KRA-L. Unfortunately a revision for the whole collection was totally beyond the scope of this study. More interesting results as well as a solution for some of indicated problems are expected when the entire collection is thoroughly studied. It is obvious that Antarctic members of *Lecanora* genus require further intense investigations, especially, since several of the species are important components of the Antarctic terrestrial ecosystems. Some of them act as pioneer species, e.g., *L. dispersa*, which is the first to colonize newly deglaciated moraines, whereas others such as *L. expectans* are characteristic components of tundra communities.

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