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# Additions to the lichen flora of Victoria Land, Antarctica

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**Abstract**: Lichens of relict penguin colonies and sites affected by active penguin colonies were investigated in Victoria Land, Ross Sea sector, continental Antarctica. A total of 17 coastal sites, seven in northern and ten in southern Victoria Land, have been investigated across 7° of latitude from 71° to 78°S. Altogether 40 taxa of lichens have been identified. Four of the recorded species are new to the Antarctic – *Caloplaca erecta*, *C. soropelta*, *C. tominii* and *Physcia tenella*; two species are new to the Victoria Land area – *Lecania nylanderiana* and *Lecanora polytropa*. The first lichen records from Beaufort Island are also provided. Data presented here expand the knowledge on the occurrence, diversity and distribution of Victoria Land lichens.

Key words: Antarctica, Victoria Land, lichenized fungi, Ascomycota, penguin colonies.

## Introduction

The first collection and investigation of lichens in Victoria Land (VL), Ross Sea sector, continental Antarctica, was made at the end of 19th century during Borchgrevink's expeditions to northern VL in January 1895 and 1899. Further collections were undertaken during a series of British Antarctic Expeditions from 1901–1913. However, due to the nature of those expeditions, the paucity of vegetation and a dearth of taxonomic knowledge their contributions on the VL lichen diversity and distribution was minimal. Since then numerous opportunistic collections from VL have been made but until recently there were only very few published reports on the lichen flora and vegetation of this region (see Adams *et al*. 2006).

It was not until 1990s that studies of VL lichens received more attention. Notable collections and published accounts have been made by Italian researchers who investigated lichens from several localities along the VL coast from Cape Hallett in the north (72°76'S) to Marble Point in the south (77°11'S). These data were published in several articles (Castello and Nimis 1995, 2000; Castello 2003a; Cannone 2004, 2006; Cannone and Seppelt 2008; Cannone and Guglielmin 2010) and organized in an on-line database, VICTORIA, that provides taxonomic, distributional and ecological data of the VL lichens (Castello 2003b; Castello *et al*. 2006). However, the area of VL has not been fully investigated as most of the published sites are located in its central territories with only scant attention to its northernmost (Kappen 1985) or southernmost (Longton 1973; Seppelt *et al*. 1995, 2010) localities. Thus, despite over a century of scientific exploration, there are still many unknowns on the occurrence and distribution of lichens in the entire VL region.

Previous studies conducted in the area of VL indicate that the type of plant community is mostly related to the soil properties. Water and nutrients derived from active and/or relict penguin colonies are having the most visible influence. Sites affected by penguins are colonized by often well-developed communities of nitrophilous lichens (Cannone and Seppelt 2008; Cannone *et al*. 2008; Seppelt *et al*. 2010). Similarly, nutrient enrichment from penguin colonies has been shown to influence lichen distribution and diversity also in other Antarctic localities, supporting nitrophilous lichen communities in areas adjacent to active penguin colonies (Olech 1990, 2002; Smykla *et al*. 2007) and on recently abandoned colonies (Tatur *et al*. 1997; Smykla, unpublished data).

Here, we present baseline data on the composition of lichens found at sites affected by current and past activities of penguins in the area of VL. More detailed information on the distribution of lichens in relation to local environmental gradients (soil properties) and the latitudinal gradient along VL will be given in forthcoming papers. This study forms a part of an interdisciplinary research project aimed at assessing the ecological role of current and relict penguin colonies in the Antarctic terrestrial ecosystems, in particular their influence on vegetation and soil biota patterns and diversity, which is our contribution to the Scientific Committee on Antarctic Research (SCAR) program: Evolution and Biodiversity in the Antarctic (EBA). Exploring variability of terrestrial ecosystems across a wide range of latitude along the VL coast also significantly contributes to the SCAR program: Latitudinal Research Project (LGP).

## Study area

Victoria Land extends for *ca.* 800 km along the west coast of the Ross Sea from Cape Adare at 70°30'S to McMurdo Sound at 78°00'S, and westward from

the Ross Sea to the edge of the polar plateau. This vast area is traditionally divided in two biogeographical regions, northern and southern VL, with the border running along the Drygalski Ice Tongue at 76°S (Adams *et al*. 2006). The region includes largely snow and/or glacier-covered coastal areas, ranges of the Transantarctic Mountains (raising above 4 000 m a.s.l.), the McMurdo Dry Valleys and several offshore islands located on the Ross Sea.

The climate of VL is frigid, typical of costal areas in the continental Antarctic, with low temperatures, low humidity and low precipitation. Average monthly temperatures never exceed freezing. In the central part of VL the temperatures range from -2° to -5°C in January and -26° to -30°C in August, with average yearly temperatures ranging from -17° to -19°C. Precipitation, always as snow, averages 100–200 mm per year. A major feature of this area is the cold and dry katabatic winds, predominantly westerly and northerly, which often reach hurricane force with a speed of more than 160 km/h (Grigioni *et al*. 1992). However, due to great latitudinal range and altitudinal differences climatic parameters along VL vary considerably, with southern and higher localities being drier and colder (Howard-Wiliams *et al*. 2010).

Vegetation of VL is entirely cryptogamic and vascular plants are absent. The recorded flora comprises 57 lichens, 11 mosses, one liverwort and various species of algae and cyanobacteria (Castello 2003a, b; Cannone 2004; Adams *et al*. 2006). Although it seems very poor in species, VL supports some of the most diverse vegetation on the continental Antarctic and several types of plant communities are found in this region (Longton 1973; Castello and Nimis 1995; Cannone and Seppelt 2008).

Along the VL coast where ice-free terrain exists today, there are numerous raised beaches, marine terraces, and islands with active and relict Adélie penguin colonies (Baroni and Orombelli 1994; Emslie *et al*. 2007). Radiocarbon dating of these colonies indicate that penguins have occupied the Ross Sea region continuously since at least the past 8,000 years when the Ross Ice Shelf began retreating to its current position beginning ~13,000 years ago (Emslie *et al*. 2007).

## Material and methods

Lichens at active and relict penguin colonies and areas affected by these colonies in Victoria Land have been investigated by the senior author during four austral summer seasons: 2003/04, 2004/05, 2009/10 and 2010/11. A total of 17 coastal sites were investigated, including seven sites located in northern and ten in southern VL. All 17 localities were distributed across 7° of latitude, with the northernmost at Cape Adare (71°18'S 170°12'E) and the southernmost at Cape Chocolate (77°54'S 164°34'E). The following sites were investigated (Fig. 1):

1) Cape Adare, northern VL, 71°18'S 170°12'E. Active and relict penguin colonies. 25 and 30 January 2005.

2) Cape Hallett, northern VL, 72°19'S 170°14'E. Active and relict penguin colonies and their surroundings. 20 and 30 January 2004, 25 January 2005.

3) Edmonson Point, Botany Bay, northern VL, 74°20'S 165°08'E. Active and relict penguin colonies and their surroundings. 15 and 22 January 2004, 20 and 24 January 2005.

4) Campo Icarus, Northern Foothills, northern VL, 74°42'S 164°07'E. Relict penguin colonies and their surroundings. 4 and 5 January 2004, 28 January 2005.

5) North Adelie Cove (= Unnamed headland), Northern Foothills, northern VL, 74°44'S 164°07'E. Relict penguin colonies and their surroundings. 6 and 19 January 2004.

6) Adelie Cove, Northern Foothills, northern VL, 74°46'S 164°01'E. Active and relict penguin colonies and their surroundings. 9 January 2004, 21 January 2005.

7) Inexpressible Island, northern VL, 74°54'S 163°43'E. Active and relict penguin colonies and their surroundings. 14, 16, 26 and 29 January 2004, 23 January 2005.

8) Prior Island, southern VL, 75°41'S 162°53'E, Relict penguin colonies and their surroundings. 23 January 2004, 27 January 2005.

9) Cape Hickey, western end, southern VL, 76°05'S 162°38'E. Small pockets of relict penguin colonies emerging from melting snow fields. 23 January 2004, 27 January 2005.

10) Franklin Island, southern VL, 76°08'S 168°15'E. Active penguin colony and plateau on the top of the island above the colony. 2 February 2005, 28 January 2011.

11) Beaufort Island, southern VL, 76°56'S 166°55'E. Active and relict penguin colonies and their surroundings. 11 and 14 January 2005, 29 January 2010, 29 January 2011.

12) Marble Point, southern VL, 77°28'S 163°46'E. Relict penguin colonies and their surroundings. 25 and 26 January 2010.

13) Cape Bird, Ross Island, southern VL, 77°16'S 166°22'E. Active and relict penguin colonies and their surroundings. 16–20 January 2010.

14) Cape Crozier, Ross Island, southern VL, 77°27'S 169°14'E. Active and relict penguin colonies and their surroundings. 1 and 3 February 2010.

15) Cape Royds, Ross Island, southern VL, 77°33'S 166°09'E. Active and relict penguin colonies and their surroundings. 3 February 2004, 15 January 2005 and 14 January 2010.

16) Tent Island, southern VL, 77°41'S 166°23'E. Small volcanic island without penguin colonies. 27 January 2010.

17) Cape Chocolate, southern VL, 77°54'S 164°34'E. Glacier moraines, without penguin colonies. 23 January 2010.

At each investigated site vegetation was surveyed within the area of relict and active penguin colonies when present. Some of these surveys also extended to ar-

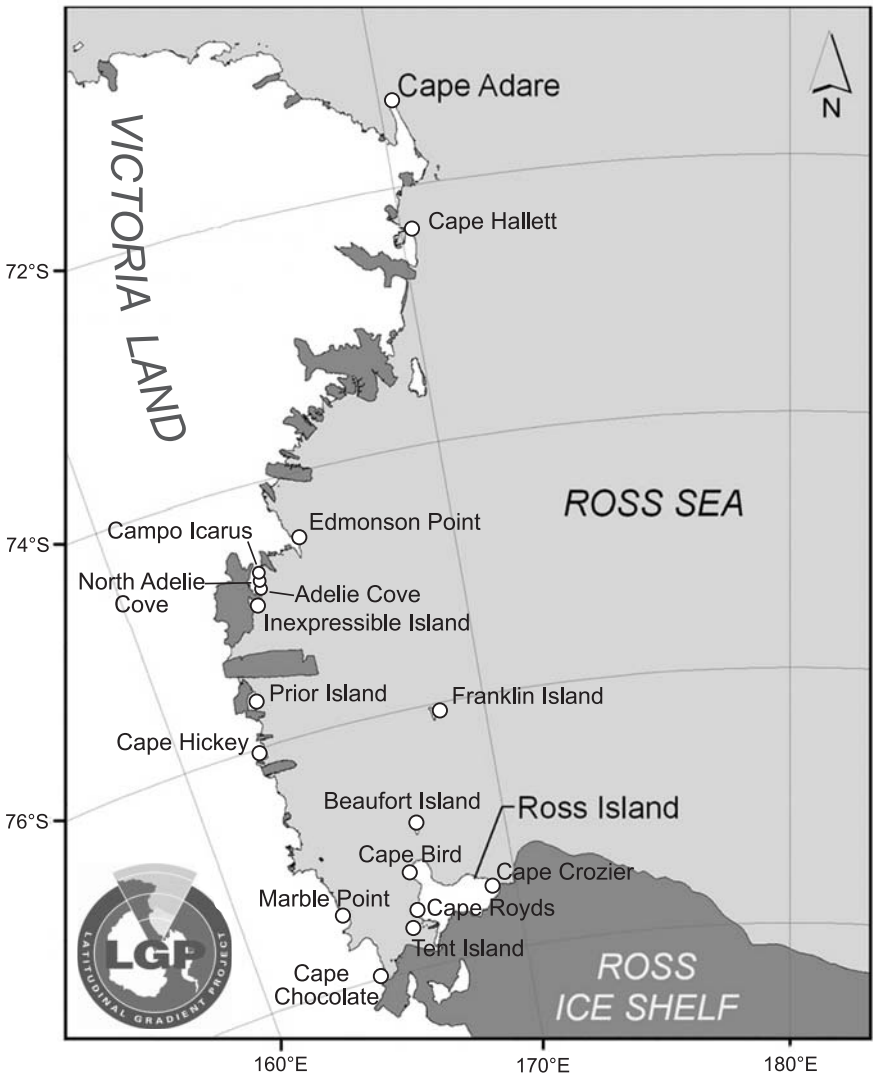


Fig. 1. Map of Victoria Land (Antarctica) showing location of the investigated sites.

eas immediately surrounding active and relict colonies so that vegetation in non-penguin areas could be compared to that within the colonies. Stands of relatively homogenous vegetation (plant communities *sensu* Longton 1979) were identified and investigated to determine their species composition and abundance. Species abundance was estimated visually within plots of 50 × 50 cm$^2$ as the percentage cover for each species. After obtaining the cover data, specimens from all the taxa were collected to check identity.

Lichens were identified using routine microscopic and laboratory techniques. When necessary thin layer chromatography (TLC) analysis was per-

formed in solvent system C (methods followed Orange *et al.* 2001). For each reported species a list of collecting sites is given as well as habitat data. Short taxonomic notes are provided for selected species and distribution of newly reported taxa is discussed in two categories: world distribution in case of the species new to the Antarctic and Antarctic distribution in case of the species new to the VL area. Information on distribution of other species in VL is available in Castello (2003a) and in the continuously updated on-line database VICTORIA (Castello 2003b; Castello *et al*. 2006).

Voucher specimens are housed at the herbarium of W. Szafer Institute of Botany of the Polish Academy of Sciences in Kraków (KRAM).

## Results and discussion

Lichens were recorded at 11 of 17 investigated localities; among sites lacking lichens five were located in southern and only one in northern Victoria Land. A total of 40 taxa of lichens have been identified, of which 21 were found both in northern and southern VL, 11 were found only in northern and 8 only in southern VL. Four of the recorded species are new to the Antarctic – *Caloplaca erecta*, *C. soropelta*, *C. tominii* and *Physcia tenella*; two species are new to the VL area – *Lecania nylanderiana* and *Lecanora polytropa*. The first reported lichens from Beaufort Island are: *Caloplaca citrina*, *C. saxicola*, *C. tominii* and *Xanthoria candelaria*; previously, this island was known to be lacking of lichens (Seppelt *et al.* 1996).

The total number of species found in northern and southern VL is similar, 32 and 29 respectively. This result is consistent with data presented by Cannone (2004) who indicated that although lichen diversity in VL is characterized by high variability in number of species occurring at different sites, the latitudinal gradient does not exert a significant effect on the total number of lichen taxa. The investigated sites differed considerably, however, in species abundance which is in general higher on sites in northern compared to southern VL.

Differences in species diversity among investigated sites are mainly related to the intensity and history of penguin influence. Relict penguin colonies showed higher diversity and species abundance than sites affected by active colonies. The highest numbers of species were found at relict penguin colonies at North Adelie Cove (20 taxa) and Campo Icarus (17 taxa) on Northern Foothills and Prior Island (18 taxa). Relatively high species numbers were also found at moderately matured areas near active colonies (*i.e.*, Cape Crozier, where 13 taxa were found). In contrast sites heavily impacted by large active colonies were characterized by a lack of lichens (*i.e.*, Cape Adare, Franklin Island, Cape Bird and Cape Royds) or low number of species (*i.e.*, Cape Hallett, where only 4 taxa were found).

## List of recorded species

***Acarospora gwynnii*** C.W. Dodge *et* E.D. Rudolph

Collecting sites: Northern VL – Campo Icarus, North Adelie Cove, Adelie Cove, Inexpressible Island. On siliceous rocks, along rock crevices, around relict penguin colonies.

***Acarospora williamsii*** Filson

Collecting site: Northern VL – Edmonson Point. On volcanic rocks, around active and at relict penguin colonies.

***Amandinea coniops*** (Wahlenb.) Scheid. *et* H. Mayrhofer

Collecting sites: Northern VL – Cape Hallett, Edmonson Point, Campo Icarus, North Adelie Cove. On different types of rocks and stones, around active and at relict penguin colonies.

***Buellia darbishirei*** Lamb

Collecting site: Northern VL – Edmonson Point; southern VL – Cape Hickey, Cape Crozier. On siliceous and volcanic rocks, around active and at relict penguin colonies.

***Buellia frigida*** Darb.

Collecting sites: Northern VL – Campo Icarus, North Adelie Cove, Adelie Cove, Inexpressible Island; southern VL – Prior Island, Cape Hickey. On different types of rocks, around active and at relict penguin colonies.

***Buellia grimmiae*** Filson

Collecting site: Northern VL – Campo Icarus. On mosses, at relict penguin colonies.

***Buellia lignoides*** Filson

Collecting site: Northern VL – Adelie Cove. On siliceous rocks, around active and at relict penguin colonies.

***Buellia pallida*** Dodge *et* Baker

Collecting sites: Northern VL – Edmonson Point, Inexpressible Island; southern VL – Cape Crozier. On siliceous and volcanic rocks, around active and at relict penguin colonies.

***Buellia papillata*** (Sommerf.) Tuck.

Collecting sites: Northern VL – North Adelie Cove, Inexpressible Island; southern VL – Prior Island. On mosses and moss debris, around active and at relict penguin colonies.

***Caloplaca athallina*** Darb.

Collecting sites: Northern VL – Campo Icarus, North Adelie Cove; southern VL – Prior Island. On mosses and moss debris, at relict penguin colonies.

***Caloplaca citrina*** (Hoffm.) Th. Fr.

Collecting sites: Northern VL – Edmonson Point, Campo Icarus, North Adelie Cove; southern VL – Prior Island, Beaufort Island, Cape Crozier. On siliceous and volcanic rocks and rarely on mosses, around active and at relict penguin colonies and at skua nests.

***Caloplaca erecta*** Arup *et* H. Mayrhofer

Collecting site: Southern VL – Cape Crozier. On volcanic rocks, around active penguin colonies.

This is the first record of this species in Antarctica. It is characterized by yellow orange, dwarf-fruticose thallus with upright and branched lobes and by apothecia (up to 1.2 mm) and numerous pycnidia formed terminally on the terete lobes. The apothecia have relatively low hymenium (*ca.* 70 µm) and produce ascospores of size 11–12 × 5 µm with isthmus 2.5–3.5 µm wide.

**Distribution and ecology**. — The species is known from New Zealand at present (Arup and Mayrhofer 2000; Galloway 2007). *Caloplaca erecta* is known growing on bird-perch siliceous rocks, in subalpine to high-alpine grassland (Galloway 2007).

**Affinities**. — The only other fruticose species of this genus known from Antarctic is *C. regalis* (Vain.) Zahlbr. The latter species differs from *C. erecta* in having a larger thallus, abundant and conspicuous pseudocyphellae, larger apothecia (up to 8 mm), thicker hymenium (100–30 µm) and different dimensions of spores (for details see Arup and Mayrhofer 2000).

***Caloplaca saxicola*** ( Hoffm.) Nordin

Collecting sites: Northern VL – Cape Hallett, Edmonson Point; southern VL – Beaufort Island, Cape Crozier. On volcanic rocks, around active and at relict penguin colonies and at skua nests.

***Caloplaca schofieldii*** C.W. Dodge

Collecting site: Southern VL – Cape Crozier. On volcanic rocks, around active penguin colonies.

***Caloplaca soropelta*** (E.S. Hansen, Poelt *et* Søchting) Søchting

Collecting site: Southern VL – Cape Crozier. On calcareous rocks, around active penguin colonies.

This is the first record of this species in Antarctica and also for the Southern Hemisphere. It is characterized by yellow, peltate thalline areoles with marginal soralia. The soralia develop from lower surface of areoles and produce relatively fine soredia (20–30 µm). The apothecia are rare in this species. They are lecanorine to zeorine, with sorediate margins (see Søchting 1992).

**Distribution and ecology**. — It is known from the Arctic and has been reported from Greenland, Iceland, and Svalbard (Hansen *et al.* 1987; Søchting 1992). *Caloplaca soropelta* is known growing on eutrophicated, calcareous rocks; the species prefers cracked surface (Søchting 1992).

**Affinities**. — The species is likely to be confused with *C. citrina* (Hoffm.) Th. Fr. The latter differs from *C. soropelta* in having adpressed, not peltate areoles and irregular soralia produced from different parts of areoles, which are often almost completely dissolved into soredia. Two other taxa, *C. tominii* and *C. elvebakkiana* Søchting, Lorentsen and Arup have also marginal soralia. The first taxon differs from *C. soropelta* by incised, effigurate areoles of thallus, larger soredia (30–60 µm) and different ecology since it occurs on soil or detritus. In comparison to *C.*

*soropelta*, *C. elvebakkiana* has soralia that may spread also to the uppermost parts of thallus and the areoles that are softly folded-lobate (for details see Søchting *et al.* 2008).

### ***Caloplaca tominii*** (Sav.) Ahlner

Collecting sites: Northern VL – Edmonson Point, Campo Icarus, North Adelie Cove, Inexpressible Island; southern VL – Prior Island, Cape Hickey, Beaufort Island, Marble Point. On bare soil and overgrowing mosses, at relict penguin colonies and at skua nests.

This is the first record of this species in Antarctica. It is characterized by yellow-orange, incised, effigurate squamules or areoles of thallus and marginal (rarely also laminal) soralia. The soralia are paler than the rest of the thallus and produce coarsely granular soredia (30–60 µm). The species predominantly occurs in sterile form. According to literature the apothecia have brownish orange discs and distinct, persistent yellowish orange margins. Spores are widely ellipsoid with thin isthmus: 13–16.5 × 6.5–9 µm, isthmus 1–1.5 (–2) µm wide (Søchting *et al.* 2008).

**Distribution and ecology**. — The species is reported from western North America (Wetmore 2001), Greenland (Hansen *et al.* 1987), Norway: Svalbard (Søchting *et al.* 2008), Austria (Hafellner and Türk 2001), Ukraine (Kondratyuk *et al.* 1998), several countries in Central Asia (*e.g.*, Poelt and Wirth 1968; Kudratov and Mayrhofer 2002; Cogt 1995), and Peru (Thomson 1982). *Caloplaca tominii* is predominantly known as occurring on bare calcareous or noncalcareous soil (Wetmore 2001). Most recently it also has been observed on detritus in the Arctic (Søchting *et al.* 2008). It is known growing in dry situations, with low annual precipitation (Wetmore 2001; Søchting *et al.* 2008).

**Affinities**. — The species is most similar to *C. citrina* and it can be easily mistaken with the latter species (therefore in fact, it is likely that many of the previous Antarctic records of the latter species were mistakenly identified and may actually refer to *C. tominii*). But *C. tominii* differs in having simple, not incised thalline areoles and soralia irregularly produced from different parts of areoles. Moreover, the thallus of *C. citrina* is usually completely dissolved into soredia or nearly so. It also produces smaller spores with a distinctly thicker isthmus than in *C. tominii*. Both taxa differ in their ecology: contrary to *C. tominii*, *C. citrina* while growing on the ground never occurs directly on soil, but occupies mosses, plant debris or other lichens.

### ***Candelaria murrayi*** Poelt

Collecting site: Northern VL – Cape Hallett. On volcanic rocks, around active penguin colonies.

### ***Candelariella flava*** (Dodge *et* Baker) Castello *et* Nimis

Collecting sites: Northern VL – Edmonson Point, Campo Icarus, North Adelie Cove, Inexpressible Island; southern VL – Prior Island, Cape Hickey. On mosses or directly on rocks, around active and at relict penguin colonies.

***Lecania nylanderiana*** A. Massal

Collecting site: Southern VL – Cape Crozier. On volcanic rocks, around active penguin colonies.

This is the first record of this species in VL. It is characterized by crustose thallus composed of dispersed, convex and grey areoles. Apothecia are large, up to 0.8 mm in diameter, sessile to constricted at the base. Thalline margin is distinct and concolorous with the thallus. Apothecial disc is black, and usually pruinose. The species has 3-septate, narrowly ellipsoid ascospores that are colourless and of size 12–14 × 4–5 µm.

**Distribution and ecology**. — Previously this species has been reported from the maritime Antarctic only, where it was found mostly on vertical or overhanging calcareous rocks (Øvstedal and Lewis Smith 2001; Olech 2004).

**Affinities**. — *Lecania nylanderiana* is not likely to be confused with any other known Antarctic species, however, considerably abundant thallus and lack of pruina on apothecial disc of the VL specimen makes it somewhat different in comparison to European material.

***Lecanora expectans*** Darb.

Collecting sites: Northern VL – Edmonson Point, Campo Icarus, North Adelie Cove, Inexpressible Island; southern VL – Prior Island, Cape Hickey, Marble Point, Cape Crozier. On mosses and moss debris, around active and at relict penguin colonies.

***Lecanora fuscobrunnea*** Dodge *et* Baker

Collecting sites: Northern VL – Edmonson Point, Campo Icarus, Inexpressible Island; southern VL – Prior Island, Cape Hickey. On different types of rocks, around active and at relict penguin colonies.

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

Collecting sites: Northern VL – Cape Hallett, Edmonson Point; southern VL – Cape Crozier. On volcanic rocks, often along rock crevices, around active penguin colonies.

***Lecanora polytropa*** (Ehrh.) Rabenh.

Collecting site: Northern VL – Adelie Cove. On siliceous rocks, at relict penguin colonies.

This is the first record of this species in VL. It is characterized by immersed and inconspicuous thallus or sometimes by continuous and areolate crust. Areoles when present are yellow-green to grey-green, rounded and flat, with upper surface smooth. Apothecia are dispersed, sessile, constricted below, tending to arise singly on areoles which are then obscured. Thalline exciple initially is well-developed and entire but next becomes crenulate and excluded. Disc is pale yellow to pale yellow-green, occasionally pale brown, finally convex.

**Distribution and ecology**. — The species is known from the maritime and continental Antarctic, where it has been recorded in Antarctic Peninsula and Queen Mary Land (Olech 1989; Andreev 1990; Øvstedal and Lewis Smith 2001;

Olech 2004). *Lecanora polytropa* grows on siliceous rocks but it may also rarely occur on wood.

**Affinities**. — The species is likely to be mistaken with *L. fuscobrunnea*. The latter species, however, differs in having considerably large apothecia (up to 1.6 mm), that are often substipitate and usually partly blackened to entirely black. It is worthy to note that apothecia of *L. polytropa* are somewhat smaller (up to 1 mm), usually sessile and always pale, never blackened. The thalline margin is often more distinct in *L. fuscobrunnea*, whereas it is soon excluded in *L. polytropa* with a thick parathecium exposed. Moreover, the difference in spore size is also significant: (9–)10–14 × 4–5 µm in *L. fuscobrunnea* and (8–)9–10(–12) × 4–5 µm in *L. polytropa* (in VL specimen). Finally, the thallus of *L. fuscobrunnea* is composed of granular to squamulose areoles that tend to be crowded in pulvinate clumps even up to 3 mm tall and the thalline areoles of *L. polytropa* are flat and more or less scattered.

***Lecidea cancriformis*** Dodge *et* Baker

Collecting site: Northern VL – Adelie Cove. On siliceous rocks, at relict penguin colonies.

***Lecidella siplei*** (C.W. Dodge *et* G.E. Baker) May. Inoue

Collecting sites: Northern VL – Campo Icarus, North Adelie Cove; southern VL – Prior Island, Cape Hickey, Cape Crozier. On mosses, soil and different types of rocks, around active and at relict penguin colonies.

***Lepraria alpina*** (de Lesd.) Tretiach *et* Baruffo

Synonyms: *Lepraria cacuminum* (A. Massal.) Lohtander, *Leproloma cacuminum* (A. Massal.) J.R. Laundon (Baruffo *et al.* 2006).

Collecting sites: Northern VL – Edmonson Point, Campo Icarus; southern VL – Prior Island. On mosses and soil, around active and at relict penguin colonies.

**Note**. — There are a few species, which are morphologically similar to and might be confused with *L. alpina* in Antarctica. All of them belong to *L. neglecta* group, including the species of very similar morphology, but chemically distinct (Osyczka *et al.* 2010). The identification of the specimens studied here was confirmed by chemical analysis: atranorin, porphyrilic acid, angardianic/roccellic acid were detected by TLC.

***Physcia caesia*** (Hoffm.) Fürnr.

Collecting sites: Northern VL – Campo Icarus, North Adelie Cove; southern VL – Prior Island, Cape Hickey. On mosses and different types of rocks, at relict penguin colonies.

***Physcia dubia*** (Hoffm.) Lettau

Collecting sites: northern VL – North Adelie Cove; southern VL – Prior Island, Cape Crozier. On mosses growing on soil or rocks, around active relict penguin colonies and skua nests.

***Physcia tenella*** (Scop.) DC

Collecting sites: Southern VL – Prior Island. On siliceous rocks, at relict penguin colonies.

This is the first record of this species in Antarctica. It is characterized by pale grey orbicular thallus, loosely appressed with marginal cilia that are often grey- or dark brown at their tips and 0.4–2 mm long. Lobes are 0.3–1 mm wide, ascending, upper surface whitish to pale grey, not pruinose, lower surface whitish with sparse, slender rhizines. Soralia are lip-shaped on the underside of the spreading lobe ends. Apothecia are rare with ascospores 16–23 × 7–10 µm.

**Distribution and ecology**. — It is one of the most common species in this genus occurring on most continents including Europe, North and South America, Asia and Africa (Edwards and Coppins 2009). With this new record it may be considered a cosmopolitan species. The species occurs on well-lit and nutrient-enriched substrata including calcareous rocks but most usually on tree bark. *Physcia tenella* is regarded as a pioneer species increasing in abundance in response to rising levels of nitrogenous compounds (Edwards and Coppins 2009).

**Affinities**. — It is distinguished from other species reported from Antarctic: *P. caesia* and *P. dubia*, by presence of ascending thallus with marginal cilia. *Physcia caesia* and *P. dubia* are having appressed thallus with considerably broader lobes. Additionally *P. caesia* is characterized by K+ yellow reaction of medulla. The species most similar to *P. tenella* is *P. adscendens*, however, the latter species differs in presence of helmet-shaped soralia.

***Pleopsidium chlorophanum*** (Wahlenb.) Zopf

Collecting sites: Northern VL – North Adelie Cove, Adelie Cove. On siliceous rocks, around active and at relict penguin colonies.

***Pseudephebe minuscula*** (Arnold) Brodo *et* Hawksw.

Collecting sites: Northern VL – Campo Icarus, North Adelie Cove. On siliceous rocks at relict penguin colonies.

***Rhizoplaca melanophthalma*** (Ram.) Leuckert *et* Poelt

Collecting site: Southern VL – Cape Crozier. On volcanic rocks, around active penguin colonies.

***Rinodina olivaceobrunnea*** Dodge *et* Baker

Collecting site: Northern VL – North Adelie Cove; southern VL – Prior Island. On mosses moss debris, at relict penguin colonies.

***Rinodina* sp. 1** – according to Castello (2003a, b)

Collecting site: Southern VL – Cape Crozier. On volcanic rocks, around active penguin colonies.

***Umbilicaria decussata*** (Vill.) Zahlbr.

Collecting sites: Northern VL – North Adelie Cove, Adelie Cove; southern VL – Prior Island. On siliceous rocks, around relict penguin colonies.

***Usnea antarctica*** Du Rietz

Collecting sites: Northern VL – Campo Icarus, North Adelie Cove; southern VL – Prior Island. On siliceous rocks and mosses, around relict penguin colonies.

***Usnea sphacelata*** R. Br.

Collecting sites: Northern VL – North Adelie Cove; southern VL – Prior Island. On siliceous rocks and mosses, around relict penguin colonies.

***Xanthomendoza borealis*** (R. Sant. *et* Poelt) Søchting, Kärnefelt *et* S. Kondratyuk

Synonyms: *Xanthoria borealis* R. Sant. *et* Poelt, *Xanthoria mawsonii* auct. non C.W. Dodge (Lindblom and Søchting 2008).

Collecting sites: Northern VL – Edmonson Point, Campo Icarus, North Adelie Cove, Inexpressible Island; southern VL – Prior Island, Cape Hickey. On siliceous and volcanic rocks and mosses, around active and at relict penguin colonies.

***Xanthoria candelaria*** (L.) Th. Fr.

Synonym: *Xanthoria mawsonii* C.W. Dodge (Lindblom and Søchting 2008).

Collecting site: Southern VL – Beaufort Island. On volcanic rocks, around relict penguin colonies and at skua nests.

***Xanthoria elegans*** (Link) Th. Fr.

Collecting sites: Northern VL – Campo Icarus, North Adelie Cove. On siliceous rocks, at relict penguin colonies.

## Conclusions

Victoria Land supports one of the richest lichen floras within the continental Antarctic with 57 taxa recorded during all previous investigations (Castello 2003a, b; Adams *et al*. 2006). The present study added six new species to this region; four of them are also reported for the first time from the Antarctic. Species recorded during the present study represent ~70% of all the taxa known to occur in this area. Such a high number of recorded taxa indicates the importance of relict penguin colonies and surroundings of active colonies moderately affected by penguin activities as biodiversity hot spots in this region of the world.

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