

Lichen communities in Larsemann Hills, East Antarctica

India has conducted scientific experiments, both at Dakshin Gangotri and Maitri stations in Antarctica in various disciplines. It now intends to broaden the scope of its scientific research by complementing the existing studies from an additional location. The proposed location for the new research base is at Larsemann Hills, Prydz Bay area, East Antarctica¹, which is about seven days away by ship from Maitri. However, it is mandatory to have some background ecological information prior to the initiation of station activity in the proposed area. Hence, the lichens, one of the major biological elements of Antarctica and highly privileged environmental indicators, are studied to generate baseline information for future biomonitoring studies in the area.

The Larsemann Hills (69°20'–69°30'S lat: 75°55'–76°30'E long.), named after Larsemann Christensen, is an ice-free coastal oasis with exposed rock and low rolling hills. The Larsemann Hills contain hundreds of freshwater lakes of varying sizes, depth and biology^{2,3}. It is the second largest (50 sq. km) of only four major ice-free oases found along the 5000 km coastline of East Antarctica. It consists of two main peninsulas on the two extremities, namely the Broknes and the Stornes. Between these two peninsulars, there are a number of islands of varying dimensions and some unnamed promontories. McLeod is one such island situated about 2 km north of the Stornes Peninsula from where lichens for the present study were collected by one of the authors (S.M.S.) during the Indian expedition to Larsemann and Southern Ocean in February 2006.

The vegetation of Larsemann Hills was initially studied by Misha Andreev from Russia; however his data remained unpublished. The draft of the Antarctic Specially Managed Protected Area management plan for the Larsemann Hills area (currently being considered by the Antarctic Treaty Consultative Meeting) is the most succinct summary of the vegetation of the area⁴, which also reports 25 species of lichens from the region. The flora and fauna in the one-degree area of McLeod Island⁵ was earlier studied by Australian researchers who reported 18 lichen species (Table 1). Rod Seppelt (unpublished data) studied the lichen flora of whole Ingrid Christensen Coast,

Prydz Bay and listed 25 species of lichens, including only four species (*Acarospora gwynnii*, *Buellia frigida*, *Candelariella flava* and *Umbilicaria decussata*) from Larsemann Hill. The lichenometry has also been used to estimate the age of nunataks recently covered by the ice shelf Amery and Dalk outlet glacier in the area of Larsemann Hills⁶.

In the present study a total of 114 rock, moss and soil samples containing lichens were collected from McLeod Island in Larsemann Hills (69°21.83'S, 76°07.91'E, 69°21.68'S, 76°07.76'E, 69°21.68'S, 76°07.70'E and 69°22.43'S, 76°08.940'E; Figure 1). Identification of the samples resulted in 196 colonies of 25 lichen species (Table 1). Among these, 12 species are the new records to the McLeod area. The identified specimens are archived at the museum of National Centre for Antarctic and Ocean Re-

search, Goa. The field guide of Øvstedal and Smith⁷ was followed for identification of lichens.

In the present study the lichen flora of the McLeod Island was found to be dominated by crustose lichens with 19 species. *Physcia* spp., *P. caesia*, *P. dubia* (Hoffm.) Lettau, *Xanthoria elegans* and *X. mawsonii* were the only foliose lichens collected in the present study, while *Pseudephebe minuscula* was the only fruticose lichen. *Buellia frigida* with 53 colonies was the most dominant lichen in the island, followed by *Candelariella flava* (29 colonies), *Rhizoplaca melanophthalma* (23 colonies) and *Caloplaca citrina* (18 colonies; Figure 2). Rock is the major substratum in the island accommodating as many as 18 lichen species followed by moss with ten species. True soil is virtually absent in the studied area, but a thin soil may be

Table 1. List of lichens from McLeod Island, Larsemann Hills, East Antarctica

Lichen taxa	Substratum	Growth form
<i>Acarospora gwynnii</i> C. W. Dodge & E. D. Rudolph	Rock	Crustose
<i>Arthonia lapidicola</i> (Taylor) Branth & Rostr.*	Rock	Crustose
<i>Buellia frigida</i> Darb.	Rock	Crustose
<i>Buellia grimmiae</i> Filson [#]	Moss, soil	Crustose
<i>Caloplaca athallina</i> Darb. [#]	Moss	Crustose
<i>Caloplaca</i> sp. A	Moss	Crustose
<i>Caloplaca citrina</i> (Hoffm.) Th. Fr.	Rock	Crustose
<i>C. lewis-smithii</i> Søchting & Øvstedal*	Moss	Crustose
<i>C. saxicola</i> (Hoffm.) Nordin*	Rock, soil	Crustose
<i>Candelariella flava</i> (C. W. Dodge & Baker) Castello & Nimis	Rock, soil, moss	Crustose
<i>Carbonea vorticosa</i> (Flörke) Hertel*	Rock	Crustose
<i>Huea coralligera</i> (Hue) C. W. Dodge & G. E. Baker*	Moss	Crustose
<i>Lecanora expectans</i> Darb.	Soil, moss	Crustose
<i>L. geophila</i> (Th. Fr.) Poelt*	Moss	Crustose
<i>Lecidea cancriformis</i> C. W. Dodge & G. E. Baker	Rock, soil	Crustose
<i>Lecidella patavina</i> (A. Massal.) Knoph & Leuckert*	Rock, soil	Crustose
<i>L. siplei</i> (C. W. Dodge & G. E. Baker) May. Inoue*	Rock	Crustose
<i>Lepraria</i> sp. [#]	Rock, soil, moss	Crustose
<i>Physcia</i> sp.*	Rock, soil	Foliose
<i>P. caesia</i> (Hoffm.) Furnr.	Rock, moss	Foliose
<i>P. dubia</i> (Hoffm.) Lettau*	Rock	Foliose
<i>Pseudophebe minuscula</i> (Nyl. ex Arnold) Brodo & D. Hawksw.	Rock, soil	Fruticose
<i>Pseudephebe minuscula</i> (Nyl. ex Arnold) [#]	Rock	Fruticose
<i>Rhizoplaca melanophthalma</i> (Ram.) Leuckert & Poelt	Rock, soil, moss	Crustose
<i>Rinodina olivaceobrunea</i> C. W. Dodge & G. E. Baker	Soil, moss	Crustose
<i>R. peloleuca</i> (Nyl.) Mull. Arg.*	Rock	Crustose
<i>Sarcogyne privigna</i> (Ach.) A. Massal.*	Rock, soil	Crustose
<i>Umbilicaria decussata</i> (Vill.) Zahlbr. [#]	Rock	Foliose
<i>Usnea antarctica</i> Du Rietz [#]	Rock	Foliose
<i>Xanthoria elegans</i> (Link) Th. Fr.	Rock	Foliose
<i>Xanthoria mawsonii</i> C. W. Dodge	Rock	Foliose

*New record.

[#]Species from Australian Gazetteer Id 1002 is also integrated in the present list.

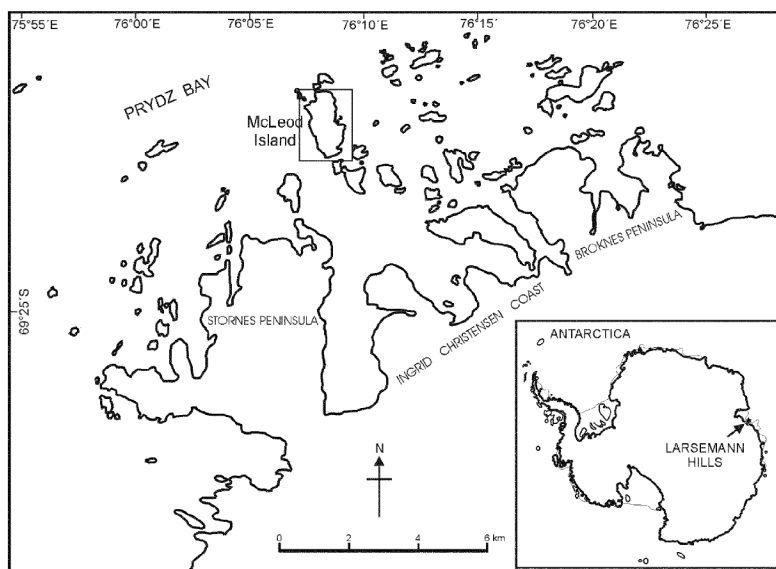


Figure 1. Map of Larsemann Hills, East Antarctica showing lichen collection sites in McLeod Island.

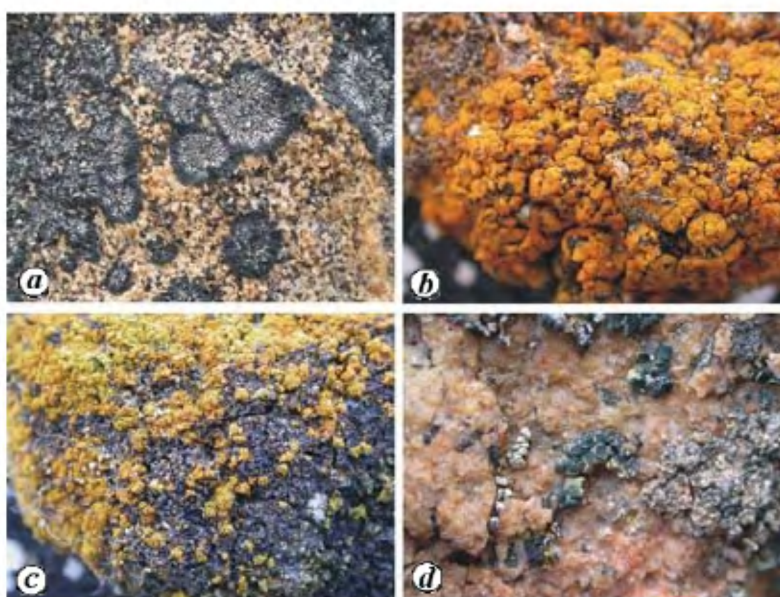


Figure 2. Most common lichens in McLeod Island, Larsemann Hills. **a**, *Buellia frigida*; **b**, *Caloplaca citrina*; **c**, *Candeleriella flava*, and **d**, *Rhizoplaca melanophthalma*.

accumulated in rocks crevices, base of the rocks or in moss beds. The closely packed soil grains form a hard crust, a suitable habitat for lichens, as ten different species have been collected from such habitats. Organic matter comprising dead birds was frequent in the island and *C. citrina* was found growing luxuriantly in such habitats. Most of the lichens are substrate-specific, while some were found growing on all available substrate.

Association of lichens was most common in case of McLeod Island. About two to six different lichen species were found growing on a single piece of substratum collected for the study. It clearly indicates luxuriant growth of lichens in the island. Similar requirement for nutrients and microclimatic conditions may result in such association, however, in-depth study is required to draw any further conclusions. *B. frigida* along with *C.*

flava is the most common association seen in the study area.

The present study was compared with the lichen flora of Schirmacher Oasis⁸, which revealed that the McLeod Island consists of interesting lichen communities with rare species such as *Arthonia lapidicola*, *Caloplaca lewis-smithii*, *Huea coralligera* and *Rinodina peloleuca*. The present study adds a total of 12 new records to the existing list of lichens of

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McLeod Island and Larsemann Hills. Comparatively, Larsemann Hills area has richer biodiversity than Schirmacher Oasis as indicated by the number of plant communities and their compositions. A more extensive and intensive exploration in the Larsemann Hills area will further add many species to the present list. The present lichen record will act as a baseline in conducting future biomonitoring studies to assess anthropogenic activities in the area after the construction of the third Indian research station in Larsemann Hills.

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