Buellia subfrigida sp. nov. (Lichens, Buelliaceae) from Lützow-Holm Bay Area and Prince Olav Coast, East Antarctica— The Asexual Sorediate Species Forming a Species Pair with *B. frigida* DARB.

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南極昭和基地周辺地域産地衣類の1新種
Buellia subfrigida M. INOUE
—*B. frigida* DARB. と "species pair" を
形成する粉芽を備えた種—

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要旨: 南極大陸周縁の露岩域に広くその生育が知られ，昭和基地周辺地域にも多産する *Buellia frigida* に形態的・成分的に酷似するが，無性生殖器官の粉芽を有する点でこれと区別できる地衣を *Buellia subfrigida* M. INOUE として新種記載した．本種は乾燥した大陸性南極では特異な環境といえる夏期に水に浸る立地に生育していることから，粉芽を獲得することによって有性の *B. frigida* から分化してこのような環境に適応したものと思われる．生育環境を異にする *B. frigida* と "species pair" を形成している．

Abstract: *Buellia subfrigida* growing on rocks in seasonally inundated habitats at the Lützow-Holm Bay area and the Prince Olav Coast of East Antarctica is described as new. Except for the presence of sorediate thallus, it is morphologically and chemically similar to *B. frigida* which is widely distributed in the continental Antarctic. Both species may form a "species pair"; *B. subfrigida* seems to be derived from sexual *B. frigida* by the acquisition of "asexual propagules" soredia. Descriptions including taxonomic and chemical data are provided.

The Prince Olav Coast and the Lützow-Holm Bay area (Syowa Station area; 68°08′–69°54′S lat., 38°15′–42°42′E long.) are situated in East Antarctica. This area belonging to the continental antarctic zone (HOLDGATE, 1964) is characterized by lower precipitation and lower relative humidity especially during the austral summer. Neither phanerogams nor liverworts are known here.

Buellia frigida DARB., 4 unidentified *Buellia*s and *B. pycnogonoides* DARB. have been reported from this area by KASHIWADANI (1970) and INOUE (1991, 1993) respectively.

Buellia is one of the largest lichen genera in the Antarctic and a large number of species had been reported by many authors (*Buellia*, as far as my present knowledge goes, is represented even in the continental Antarctic by 44 species, though most of

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which might be superfluous synomyms). LAMB (1968) in his indispensable work of reference on the Antarctic *Buellia*, especially on the subantarctic and the maritime antarctic taxa, recognized 22 species with 2 varieties and 4 forms and simultaneously reduced 32 species with 2 varieties and a form as synonyms. However, there may be more undescribed species as well as superfluous names in the Antarctic as the fact that LAMB (1968) proposed 3 new species shows.

In this paper I will describe *Buellia subfrigida* as a new species. It forms a species pair with non-sorediate *B. frigida* which is one of the well known representatives in the continental Antarctic.

Thin-layer chromatographic (TLC) methods for identification of lichen substances have been employed. The TLC-techniques given by CULBERSON and KRISTINSSON (1970) were used with slight modifications: I have analyzed aceton extracts of all specimens treated in two solvent systems (solvent A: a mixture of 180 m*l* of benzene, 45 m*l* of dioxane, and 5 m*l* of acetic acid; solvent B: a mixture of 100 m*l* of *n*-hexane, 80 m*l* of ethyl ether, and 20 m*l* of formic acid) using Merck's silica-gel-precoated TLC plates (DC-Fertigplatten Kieselgel 60 F254, 10 cm long). ASAHINA's standard microcrystal methods were used for recognizing norstictic acid (ASAHINA, 1938).

***Buellia subfrigida* M. INOUE, sp. nov.**

Thallus sat crassus aut modice incrassatus, areolatus, sorediis instructus. Areolae tumidulae vel bullato-verrucosae, in centro plus minusve arcte contiguae, peripheriam versus vulgo effiguratae, albido-cinereae vel griseae, hypothallo indistincto. Apothecia non evoluta.

Thallus thick to medium, forming +/− orbicular patches up to 5–7 cm wide, whitish- or ash-gray or gray, sorediate; soralia rotundate, concave or often only with a minute projection at the juvenile stage, then becoming convex and swollen with soredia, reaching 0.8 mm wide; areolae contiguous, bullate or bullate-verrucose in inner part of thallus, lobate-effigurate at periphery; effigurate margin black or whitish, consisting of contiguous, often branching lobes. Hypothallus indistinct. Apothecia not developed.

Chemical substances: norstictic acid and an unidentified minor constituent (+/−) (chemical race I), or no colorless substances demonstrated in TLC (chemical race II).

Habitat: on rocks in seasonally inundated sites

Typus: Antarctica, Lützow-Holm Bay area, Sôya Coast, Skallevikhalsen, *ca.* 90 m alt., on rock, leg. M. INOUE 18077, 1. X. 1986, —holotype in **NIPR** (Herbarium, National Institute of Polar Research).

This species is apparently closely related to *Buellia frigida* DARB., which is widespread in the continental Antarctic and is the commonest lichen in the Syowa Station area, since these two species have a similar thallus forming +/− orbicular patches with distinctly lobate-effigurate periphery and have the same chemistry. Norstictic acid and an unidentified minor substance (+/−) are demonstrated in some specimens of these two species (Fig. 1) and they are deficient in some other specimens of the species.

LAMB (1968) correctly stated that *B. frigida* is the only species of the genus having a thallus with distinctly lobate-effigurate periphery in the Antarctic. *B.*

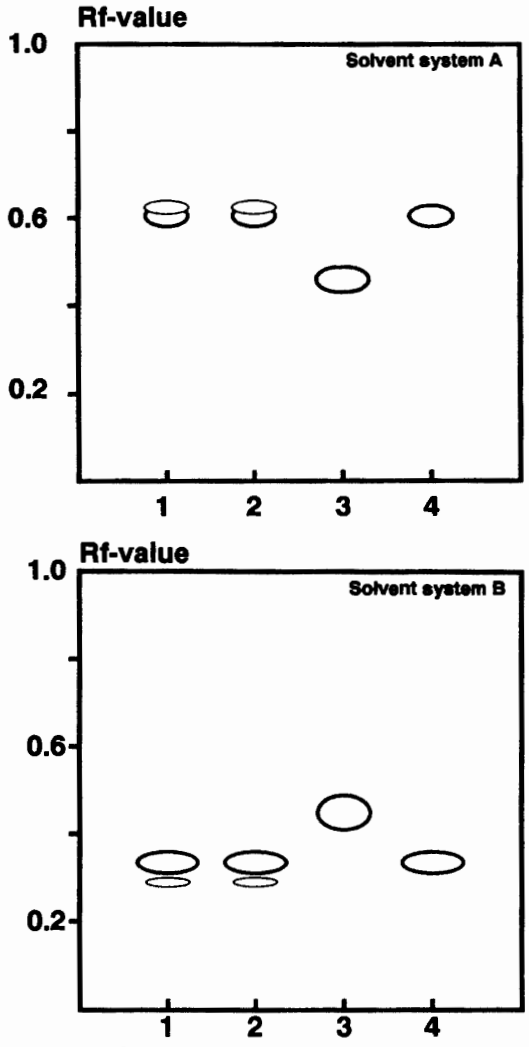

Fig. 1. Chromatograms of Buellia *species in solvent systems A and B comparing with norstictic acid, etc. 1.* Buellia subfrigida; *2.* B. frigida *(M. INOUE no. 18734); 3. divaricatic acid (pure sample supplied by Prof. Emer. S. SHIBATA of Tokyo University); norstictic acid (*Lecidea lactea: *M. INOUE no. 11574).*

subfrigida has a similar lobate-effigurate thallus and the same chemistry as in *B. frigida* and can be distinguished from the latter only by the presence of soredia (Fig. 2). It can be considered as the sorediate or secondary counterpart of *B. frigida,* which is regarded as the primary non-sorediate morphotype according to the "species-pair" hypothesis proposed by POELT (1970). As far as I observed in the field, a habitat of *B. subfrigida* is restricted to rocks in the seasonally inundated sites. Even *B. frigida*, which has a wide ecological amplitude growing in various habitas of the Syowa Station area as INOUE (1989) mentioned, could hardly be seen in such kind of habitat. I suppose *B. subfrigida* has been derived from primary "sexual" *B. frigida* by the acquisition of "asexual propagules" soredia and has adapted to the seasonally inudated habitat.

FILSON (1974) described *Buellia soredians* R. FILSON from the Antarctica (Clarke

Fig. 2. *A–C.* Buellia frigida *DARB. (M. INOUE no. 18045). D–F.* Buellia subfrigida *M. INOUE (M. INOUE no. 18077). A, B, D. a peripheral part of thallus. C. a portion of thallus with apothecia. E, F. a portion of thallus with soredia. (A, D, F: × 60; B, C, E: × 30).*

Peninsula, Wilkes Land) stating that "first sorediose *Buellia* recorded from the Antarctic Continent". Unfortunately, however, I did not have a chance to see the type, but the original description as well as accurate drawings of *B. soredians* does not agree with the present species because the thallus is composed of squamules up to 1.5 mm diam. with eroded concave soralia in *B. soredians*.

In some degree the external feature especially the sorediate thallus of this species is reminiscent of some species of *Pertusaria,* especially of subgenus *Lecanorastrum* (MÜLL. ARG.) ERICHS. But as OSHIO (1968: 82) pointed out in his work on Japanese

Pertusaria, the young soralia of *Pertusaria* are convex and filled with soredia, the old ones being concave and often crateriform. On the contrary, the younger areolae of *B. subfrigida* are with concave soralia or often free and the older ones convex and swollen with soredia.

Representative specimens examined. PRINCE OLAV COAST: Cape Hinode (18497). LÜTZOW-HOLM BAY AREA: Sôya Coast; Langhovde (17100, 17238, 17600, 17978, 18021), Breidvågnipa (18755), Skallen (19643), Skallevikhalsen (18077, 18085, 18124), Rundvågshetta (18932, 18957), Padda (18427).

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