

Lecideoid Lichens of Prince Olav Coast and Sôya Coast, Enderby Land, East Antarctica

Masakane INOUE*

南極昭和基地周辺地域のヘリトリゴケ地衣類の分類学的研究

井上正鉄*

要旨: 第27次観測隊に参加した筆者によって採集された標本を中心に基準標本等と比較検討した結果、広義のヘリトリゴケ属地衣類の1新種、1新組み合わせ種を含む3属5種を認めた。すべて、昭和基地周辺地域では新産種である。各々について形態・地衣成分・地理分布を記載し、近縁種との関係を論じた。

(1) *Carbonea capsulata* は亜南極地域に分布する近縁の *C. vorticosa* と、子器殻 excipulum の菌糸の太さ及び地衣成分の異同で区別できる。本種は大陸性南極の数カ所で知られている。本地域では大陸周縁の露岩域に普通にみられる。(2) *Lecidea andersonii* は、北半球に広く分布し南極地域でも数カ所から報告されている *Lecidea auriculata* に酷似するが、これとは子囊下層 hypothecium の着色の有無や孢子サイズで区別できる。本種はウイルクスランドから新種として記載されて以来、他地域からは報告されていないが、昭和基地周辺地域では比較的普通にみられる。(3) *Lecidea cancriformis* は光沢のある褐色の地衣体を有する点で他の種と容易に区別がつく。北半球に広く分布し、亜南極の数カ所にもその生育が知られている近縁の *Lecidea atrobrunnea* とは地衣成分の違い、地衣体髄層のヨード反応で区別できる。本種は大陸性南極に広く分布し、昭和基地周辺地域でも普通にみられる。(4) *Lecidea soyaensis* は子囊下層下部の髄層がクモの巣状の菌糸で構成され、よく発達した子器殻を有する点、また本種と近縁な *Lecidea auriculata* 群にみられない地衣成分スチクチン酸を産する点で新種として区別された。宗谷海岸ラングホブデ産。(5) *Lecidella siplei* は側糸と子器殻を構成する菌糸の形状、及び子囊頂部の構造から *Lecidella* 属のもとに置くのが妥当と考えられる。北半球に広く分布し、亜南極からもその生育が報告されている *Lecidella bullata* に最も近縁と思われるが、これとは地衣体の形状、地衣成分の異同で区別できる。本種は大陸性南極のマリーバードランドとビクトリアランドの2カ所から報告されているにすぎないが、昭和基地周辺地域では普通にみられる。

Abstract: Five species of lecideoid lichens belonging to three genera are reported as new to the flora of the Prince Olav Coast and the Sôya Coast, Enderby Land, East Antarctica; they are *Carbonea capsulata* (DODGE & BAKER) HALE, *Lecidea andersonii* R. FILSON, *Lecidea cancriformis* DODGE & BAKER, *Lecidea soyaensis* M. INOUE and *Lecidella siplei* (DODGE & BAKER) M. INOUE. All are endemic to Antarctica. An examination was made of the collections from the region, which were collected mainly by the author under the project of the 27th Japanese Antarctic Research Expedition (JARE-27, during January 1986 and February 1987). The type and authentic specimens of possibly related species have been restudied. *Lecidea soyaensis* M. INOUE is new to science and

* 秋田大学教育学部, Biological Institute, College of Education, Akita University, 1, Tegatagakuen-chô 1-chôme, Akita 010.

Lecidella siplei (DODGE & BAKER) M. INOUE is proposed as a new combination. Taxonomic and chemical data as well as a key to the known taxa are provided.

1. Introduction

The Prince Olav Coast and the Sôya Coast (68°08'–69°54'S lat., 38°15'–42°42'E long.) are situated on a vast ice sheet of Enderby Land, of which the margin slopes gently down westwards or north-westwards. This area of the continental antarctic zone is characterized by lower precipitation and lower relative humidity especially during the austral summer (HOLDGATE, 1964). The lichen flora of the area is poorer than that of the maritime antarctic. Lichens are growing in the restricted sites where an adequate moisture might be maintained due to snow and ice brought by the "katabatic wind" through the surface of ice cap, while lichens are absent or poorly developed in the dry sites which are buffeted by cyclonic wind through the surface of sea ice (INOUE, 1989). Twenty species of lichens were reported by KASHIWADANI (1982) from the area, though most crustose lichens including lecideoid assemblage were excluded.

In this paper five species of lecideoid lichens, which are the all species found in the present region, are reported. They include one species new to science. On the other hand, one unidentified taxon belonging to *Lecidella*, which was growing on the thallus of *Rhizoplaca melanophthalma* (RAM.) LEUCKERT and POELT, is not treated in this paper, since the specimen is too meager to draw the definite taxonomic conclusions.

I have studied many related species occurring in the Northern Hemisphere, especially in arctic as well as alpine regions. However, I cannot detect any evidences that even one of the species reported here is distributed in extra-antarctic regions as discussed below; all are endemic to Antarctica.

I am grateful to the curators of the following herbaria for the loan of the type and authentic specimens: **BM**, **FH**, **H**, **M**, and **US**. Last but not least, I heartily thank Dr. S. KUROKAWA who kindly read the manuscript and gave critical suggestions.

2. Materials

Under the project of the 27th Japanese Antarctic Research Expedition (JARE-27, during January 1986 and February 1987), I had a chance to collect lichens at fifty ice-free localities of various sizes scattered along the coasts (Fig. 1). Lecideoid lichens comprised 565 herbarium packets among the collections. The type and authentic specimens of possibly related species have been restudied for the purposes of comparison. In the enumeration of localities, the herbarium specimen numbers are indicated in parentheses after the name of localities. The specimens were collected by the author and are deposited at Akita University unless otherwise stated.

3. Chemistry

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 acetone extracts of all

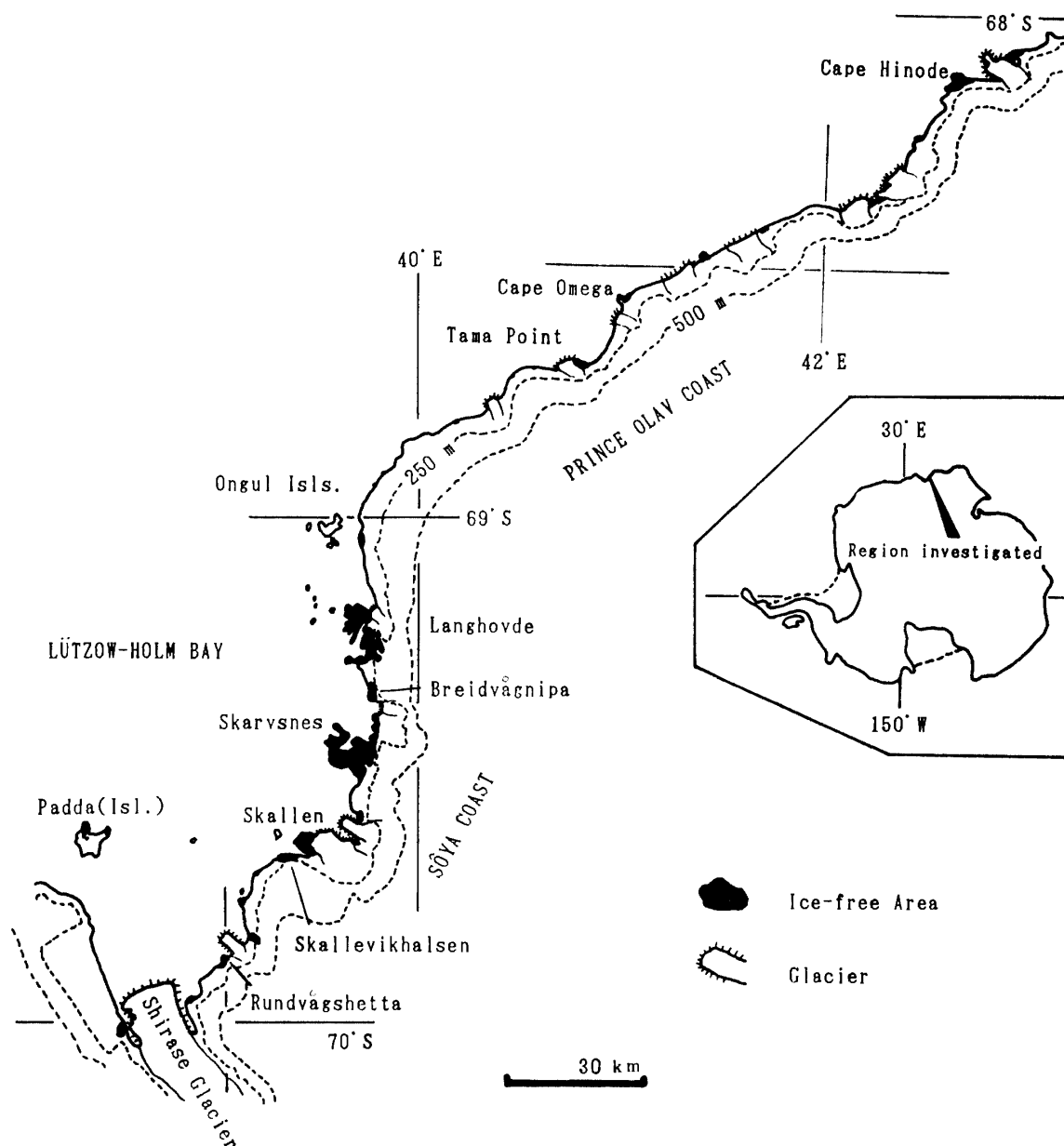


Fig. 1. Map showing Prince Olav Coast and Sôya Coast. Broken line indicates the contour line of ice or snow area.

specimens treated in two solvent systems (solvent A: a mixture of 180 ml of benzene, 45 ml of dioxane, and 5 ml of acetic acid; solvent B: a mixture of 100 ml of *n*-hexane, 80 ml of ethyl ether, and 20 ml of formic acid) using Merck's silica-gel-precoated TLC plates (DC-Fertigplatten Kieselgel 60 F254, 8 cm long). ASAHINA's standard microcrystal methods were used for recognizing confluent acid (CULBERSON, 1966; INOUE, 1982), stictic acid (ASAHINA, 1938a), norstictic acid (ASAHINA, 1938a) and zeorin (ASAHINA, 1938b), which are common substances within the lecideoid lichens.

Figure 2 gives a comparative graphic representation of the substances as revealed on plates run in the above-mentioned solvent systems. Confluent acid and glomel-

liferic acid, which are common substances in *Lecidea* s. str. and *Huilia* (INOUE, 1982), were identified originally by comparing with the authentic samples which were purified by Dr. HUNECK (INOUE, 1982: 15). Unidentified substances (Carbonea-1 and 2) in *Carbonea capsulata* give negative color reactions with the usual reagents, but they are UV (254 nm)+brilliant bluish-white.

Table 1 gives chemical variation found through the present study and shows that there are remarkable chemical variants within each species, except for *Lecidea andersonii*.

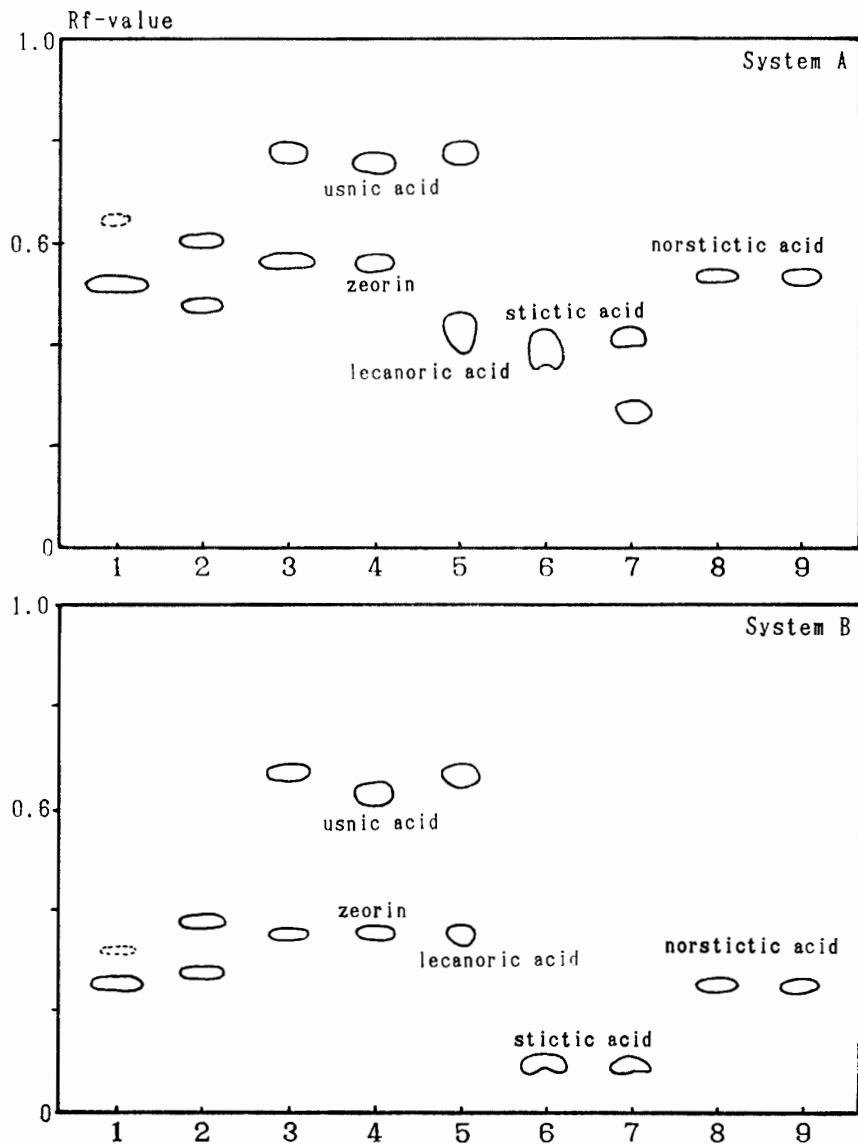


Fig. 2. Chromatograms of lecideoid species in solvent system A and B. 1. *Lecidea andersonii*; 2. *Carbonea capsulata*; 3. *Lecidella sipleyi*; 4. zeorin (*Cladonia pleurota*: M. INOUE no. 3670); 5. atranorin (*Parmelia tinctorum*: M. INOUE no. 1); 6. stictic acid (*Huilia albocaerulescens*: M. INOUE no. 10069); 7. *Lecidea soyaensis*; 8. *Lecidea cancriformis*; 9. norstictic acid (*Lecidea lactea*: M. INOUE no. 11574)

Table 1. Lichen substances found in the present species and the number of specimens producing these substances.

Species	Total	Substances and the number of specimens
<i>Carbonea capsulata</i>	62	TLC—(46); c-1 & c-2(9); c-1(6); atranorin (1)
<i>Lecidea andersonii</i>	125	confluent acid & gromelliferic acid (125)
<i>L. cancriformis</i>	148	TLC—(76); norstictic acid (43); norstictic acid, small amount (29)
<i>Lecidella siplei</i>	202	atranorin & zeorin (123); zeorin (56); TLC—(23)

* Figures in parentheses represent the number of specimens.

4. Taxonomy of the Species

Key to the species treated

1. Thallus brown to dark brown, with an epinecral layer... 3. *Lecidea cancriformis*
1. Thallus whitish or grayish, without an epinecral layer 2
 2. Apothecia small, up to 1 mm wide 3
 2. Apothecia larger, more than 1 mm wide..... 2. *Lecidea andersonii*
3. Paraphyses discrete; tholus well developed, prominently blue with iodine; hypothecium indistinct; subhymenium distinct, colorless..... 5. *Lecidella siplei*
3. Paraphyses coherent; tholus moderately developed, faintly blue with iodine; hypothecium and subhymenium distinct, hypothecium brown or violet brown ... 4
 4. Excipulum brown with green tinge, hyphae pachydermatous 1. *Carbonea capsulata*
 4. Excipulum dark brown to brown with violet tinge, hyphae mesodermatous to leptodermatous 4. *Lecidea soyaensis*

1. *Carbonea capsulata* (DODGE and BAKER) HALE. Fig. 3.

Lichenologist, **19**, 279 (1987). —*Lecidea capsulata* DODGE and BAKER, Ann. Mo. Bot. Gard., **25**, 533 (1938). Type: Antarctica, Marie Byrd Land, Edsel Ford Range, Mt. Stancliff, coll. Siple and Corey 72A-2 (not found, HALE, 1987); —neotype in U. S. (Antarctica, Ellsworth Land, Johnson Nunatak, coll. Molholm 7, selected by HALE, 1987).

Thallus white with brown tinge, effuse, thin, rimose, sometimes furfuraceous; medulla I—. Hypothallus indistinct.

Apothecia black, polished, up to 0.5 (rarely to 0.7) mm wide, adnate, moderately constricted at the base, variable in shape, round or sometimes several small ones clustered in groups; disc plane, later becoming slightly convex, epruinose; margin persistent, thin, flexuose at times convoluted and proliferous. Excipulum 50–100 μ m thick, brown with green tinge in external part and becoming gradually paler towards the center, but not colorless; hyphae radiating, 5–10 μ m thick, pachydermatous. Epithecium blue green or blackish green. Hymenium (35) 40–60 μ m high, pale blue green at least at the upper part. Subhymenium colorless, 10–20 μ m high. Hypothecium brown, reaching 100 μ m high; hyphae irregularly arranged. Paraphyses coherent, simple, or sometimes more or less branched, slightly swollen at the apices. Asci clavate, 30–35 \times 9–11 μ m. Spores 6–11 \times 3–5 (6) μ m, colorless, ellipsoid. Saxicolous or rarely muscicolous.

Reaction: thallus & medulla P—, K—, KC— (KC+ orange in chemical race I), C—, UV— (UV+ intensively fluorescent in chemical race I). Chemical substances: Carbonea-1 and Carbonea-2 (chemical race I); Carbonea-2 (chemical race II); no colorless lichen substances demonstrated in TLC (chemical race III); atranorin (chemical race IV).

Range: Antarctica (Enderby Land, present study; Ellsworth Land, DODGE, 1973; Marie Byrd Land, DODGE and BAKER, 1938; Queen Maud Land, FILSON, 1966; South Victoria Land, HALE, 1983; Victoria Land, HALE, 1987).

The genus *Carbonea* (Type species: *Carbonea atronivea* (ARN.) HERTEL) is characterized by having a carbonaceous excipulum composed of radiating pachydermatous hyphae and coherent simple paraphyses.

The specimens studied agree very well morphologically with the neotype designated by HALE (1987). However, two colorless substances (Carbonea-1 and Carbonea-2) were detected by TLC in the type specimen, whereas they were demonstrated only in a few specimens examined.

Carbonea capsulata is closely related to *C. vorticosa* (FLK.) HERTEL, which is one of the well-known lecideoid lichens in arctic alpine regions in the Northern Hemisphere, and also known from the Antarctic region (Marion Island, HERTEL, 1984; King George Island of South Shetland Islands, ANDREEV, 1988 and my own collections in 1988–89). The small apothecia, the blue green epithecium as well as upper part of hymenium, and brown hypothecium are common characters in these two species. However, *C. capsulata* differs in having thicker hyphae composing excipulum (4–5 μm thick in *C. vorticosa*, 5–10 μm thick in *C. capsulata*). Two colorless substances detected in chemical race I are not known from *C. vorticosa* so far as I know.

Carbonea capsulata is growing in rocky areas abutting on the edge of the continental ice cap in the region, but not known from the coastal islands (Padda is one of the islands but has luxuriant lichens and lichen flora similar to those of the ice-free

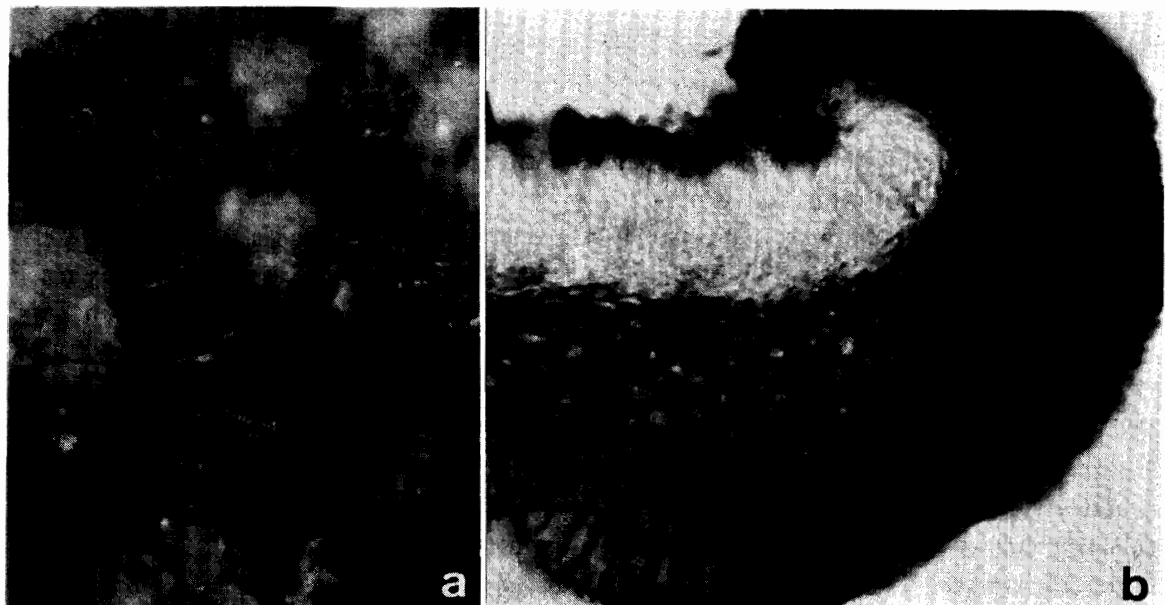


Fig. 3. *Carbonea capsulata* (DODGE & BAKER) HALE (no. 16990). a. Portion of thallus and apothecia, $\times 30$. b. Cross-section of an excipulum, $\times 300$.

areas situated on the edge of the ice cap because of the sufficient supply of snow and ice, INOUE, 1989).

Representative specimens examined. PRINCE OLAV COAST: Cape Hinode (18483, 18517), Cape Omega (18601). SÔYA COAST: Breidvågnipa (18693, 18700, 18742, 18776), Hamnenabben (19411, 19459), Langhovde (16990, 17025, 17079, 17195, 17636, 18809, 19081), Matukawa Rock (18658), Padda (Island) (18374, 18394, 18415, 18468), Rundvågshetta (18870, 18898), Skarvsnes (19122), Skallen (18172, 18175), Skallevikhalsen (18080, 18116–17)

2. *Lecidea andersonii* R. FILSON. Fig. 4.

Muelleria, **3**, 16 (1974). Type: Antarctica, Wilkes Land, Western side of the Haupt Nunataks, coll. R. ANDERSON, MEL 1012035, –holotype in MEL, non vidi.

Thallus epilithic, or at times endolithic, whitish, medium to thick, contiguous, or sometimes evanescent in part, irregularly cracked-areolate; medulla I+ intensively violet-blue. Hypothallus indistinct.

Apothecia black, at first subimmersed to appressed-adnate with a plane disc surrounded by a whitish-suffused pseudothalline margin, finally thickened upwards, constricted at the base, reaching a diameter of 2 mm; disc flat to slightly convex, at times with a thin white pruina; margin prominent, moderate in thickness, flexuose. Excipulum deep green to brownish green externally, while in the interior part paler and with rose tinge, well advanced and developed far below the apothecium, reaching 150 μm thick; far in below part thicker than upper part, hyphae intricate-radiating, 3–5 μm , meso- to leptodermatous. Epithecium blue green or blackish green. Hymenium 30–50 μm high. Subhymenium violet-brown, 50–70 μm high. Hypothecium colorless, 100–150 μm high, I+ intensively violet-blue; hyphae running intricately. Paraphyses simple, 3–3.5 μm thick, moderately thickening towards the apices, 4.5–5 μm thick. Asci clavate, 25–30 \times 7–10 μm . Spores ellipsoid, colorless, 6–11 \times 3–4 (5) μm . Saxicolous.

Reaction: thallus & medulla P–, K–, KC–, C–. Chemical substances: confluent acid and glomelliferic acid.

Range: Antarctica (Enderby Land, present study; Wilkes Land, FILSON, 1974).

Unfortunately I did not have a chance to see the type, but original description as well as accurate drawings of *Lecidea andersonii*, which is known only from the type locality which is near the present region, agrees well with the representatives collected from the region except for the spore dimensions; they are more or less wider (9–10 \times 4–5 μm) in the type.

On account of a well-advanced and developed excipulum far below the apothecium, blue-green epithecium, thinner hymenium, violet-brown subhymenium and minute spores, this species may be placed in the *Lecidea auriculata* group comprising *L. auriculata* TH. FR., *L. brachyspora* (TH. FR.) NYL., *L. diducens* NYL., *L. paratro-poides* MÜLL. ARG., *L. promiscens* NYL. and *L. promiscua* NYL. of which syntypes were restudied by the author. Among them *Lecidea auriculata*, which is one of the well-known lichens in the Northern Hemisphere and has been reported several times from the Antarctic region (McMurdo Bay, DARBISHIRE, 1910; South Georgia Island of South Shetland Islands, DARBISHIRE, 1912 and SKOTTSBERG, 1912; Nelson Island

of the preceding islands, DARBISHIRE, 1923; Graham Land, SKOTTSBERG, 1912), is very much reminiscent of *L. andersonii* from morphological and chemical traits. *L. andersonii* is distinguished from *L. auriculata* by the colorless hypothecium and wider spores ($8-10 \times 2.5-3.5 \mu\text{m}$ in the type of *L. auriculata*); spore dimension is introduced as one of the useful characters within the lecideoid lichens (INOUE, 1982).

Lecidea andersonii is growing mainly in rocky areas abutting on the edge of the continental ice cap in the region, but a few specimens were collected from West Ongul (Island) where lichens and lichen flora are not so luxuriant.

Representative specimens examined. PRINCE OLAV COAST: Capø Hinode (18472), Tottuki Point (18338). SŌYA COAST: Breidvågnipa (18696, 18703, 18716, 18735, 18748, 18771), Langhovde (17077, 17240, 17638, 17817, 17861, 17921, 18000, 21807), Mitu-iwa Rock (18640), Rundvågshetta (18805, 18858, 18882, 18901, 18914,

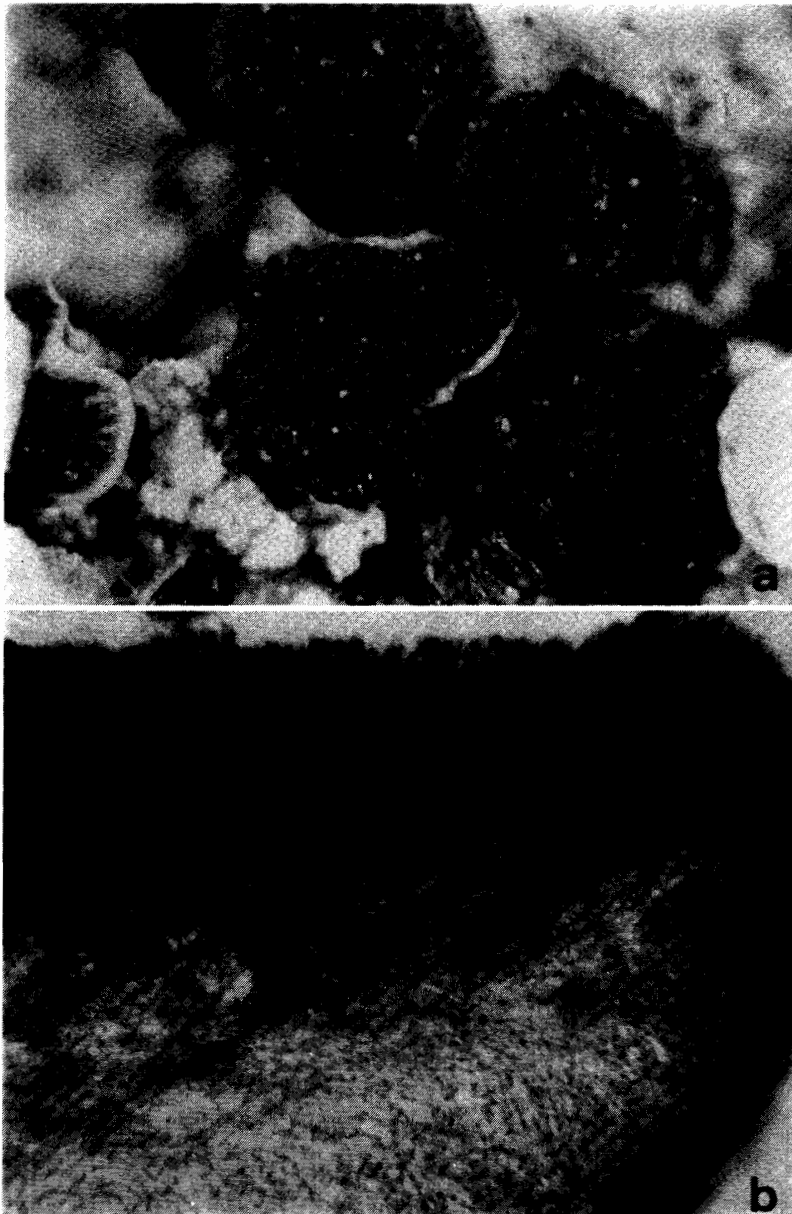


Fig. 4. *Lecidea andersonii* FILSON (no. 18000). a. Portion of thallus and apothecia, $\times 30$. b. Cross-section of an excipulum, stained by lactophenol cotton blue, $\times 300$.

18927), Skallen (18174), Skallevikhalsen (18089, 18095), Skarvsnes (18963, 19010, 19045, 19123, 19146), West Ongul (Island) (19179, 19206, 19471).

3. *Lecidea cancriformis* DODGE and BAKER. Fig. 5a–b.

Ann. Mo. Bot. Gard., **25**, 539 (1938). Type: Antarctica, South Victoria Land, Queen Maud Mts, Sudder Mt., 86°03'S, 150°40'W, coll. BLACKBURN *et al.* QM-6(2), –holotype in FH-DODGE.

Thallus epilithic, or rarely endolithic, indeterminate, medium to thickish, with an epinecral layer, polished, brown, or sometimes fading out, dull white, irregularly cracked-areolate; areolae somewhat scattered, more or less bullate; medulla I–. Hypothallus indistinct.

Apothecia black, adnate, reaching 1 mm in diameter, moderately constricted at the base; disc epruinose, or rarely with a thin pruina, plane at first, then becoming convex, surrounded by a thin margin; margin sometimes evanescent. Excipulum advanced, up to 100 μm thick, dark brown externally, paler or colorless internally; hyphae intricate-radiating, 2–3 μm in diameter, mesodermatous. Epithecium blackish green or deep green. Hymenium 35–50 μm high. Subhymenium colorless or pale, 15–20 μm high. Hypothecium dark brown or brown with violet tinge, reaching 100 μm high, gradually merging into a subhypothecial medulla; subhypothecial medulla I–. Paraphyses coherent, more or less branched, 2–3 μm thick, slightly thickened at the apices. Asci clavate, 37–45 \times 7–10 μm . Spores ellipsoid, colorless, 6–10 \times 3–4 μm . Saxicolous.

Reaction: thallus & medulla P–, K–, KC–, C– (chemical race II); thallus P+ yellowish, K+ yellowish to red, K–, KC– (chemical race I). Chemical substances: norstictic acid (chemical race I), or no colorless substances demonstrated in TLC (chemical race II).

Range: Antarctica (Enderby Land, present study; Dronning Maud Land, LINDSAY, 1971; King Edward VII Land, DODGE and BAKER, 1938; King George V Land, DODGE, 1948; McMurdo Sound, LONGTON, 1973; Marie Byrd Land, SIPLE, 1938; Queen Maud Range, CLARIDGE *et al.*, 1971; South Victoria Land, DODGE and BAKER, 1938, DODGE, 1948, HERTEL, 1984; Victoria Land, HALE, 1987).

The holotype of *L. cancriformis* is poor and not tested with TLC. But the identification to this species seems justifiable, since a great number of specimens studied agree very well with the type morphologically and anatomically. Diagnostic characteristics for this species are: brown polished thallus which has an epinecral layer, marginate apothecia with a constricted base, blue green epithecium, brown hypothallus, and minute spores. This species belongs, according to its thalline structure and apothecial anatomy, to the *L. atrobrunnea*-group characterized by the brown polished thallus with epinecral layer, excipulum composed of intricate-radiating mesodermatous hyphae and rather smaller spores within the genus.

L. atrobrunnea (RAM. ex LAM. et DC) SCHAEERER was reported from several localities in the Antarctic region; Gerlache Strait (VAINIO, 1903), Wiencke Island (DARBI-SHIRE, 1923; HERTEL, 1984), King George Island of South Shetland Islands (ANDREEV, 1988). *L. cancriformis* is distinguished from closely related *L. atrobrunnea*, which produces glomelliferic acid, by producing norstictic acid (or no colorless substances

demonstrated with TLC) and having a thallus with non-amyloid medulla.

HALE (1987) mentioned in *L. cancriformis* of Victoria Land near the Ross Sea that 18 specimens tested by TLC lacked lichen substances except for one, which contained norstictic acid. On the contrary, seventy-two of 148 specimens examined in this region produce norstictic acid as shown in Table 1.

Lecidea cancriformis has been found at many localities of both rocky areas on the edge of the continental ice cap and on the coastal islands in the region; ecological amplitude of this species appears to be wide.

Representative specimens examined. PRINCE OLAV COAST: Cape Hinode (18471, 18493, 18521), Cape Omega (18570, 18586, 18605, 18618), Tensoku Rock (18270). SÔYA COAST: Breidvågna (18708, 18730, 18736, 18752), Hjartöy (Island) (18197–98), Kurumi Island (18679–80), Langhovde (17158, 17181, 17219, 17241, 17561, 17606, 17688, 17893, 17905, 18001, 18013), Mukai Rocks (18318), Matukawa Rock (18672), Padda (Island) (18421, 18422, 18430, 18454, 18460, 18466), Rundvågshetta (18944), Skallen (18189), Skallevikhalsen (18097), Skarvsnes (18570, 18981, 19021, 19035, 19054, 19068, 19083, 19102, 19129), West Ongul (Island) (19184, 19212, 19324, 19330, 19353, 19486, 19496, 19501, 19537).

4. *Lecidea soyaensis* M. INOUE, sp. nov. Fig. 5c–d.

Thallus obsolete, albidus, medulla jodo+caerulescente, hypothallo indistincto. Apothecia adnata, basi constricta, nigra. Excipulum bene evolutum, infra hypothecium continuatum, extus fuliginosum, intus impure subalbidum. Epithecium aeruginosum. Hymenium 30–50 μm crassum. Subhymenium pallidum, 25–30 μm crassum. Hypothecium violaceo-fuliginosum, 60–80 μm crassum. Hypothecium inferius (“subhypothecial medulla”) pallidum, jodo+caerulescens, hyphis arachnoideis. Paraphyses simplices. Asci clavati. Sporae simplices, ellipsoideae, 6–9 μm longae, 3–4 μm crassae.

Thallus obsolete, at times visible around the apothecia, whitish; medulla I+ intensively violet-blue. Hypothallus indistinct.

Apothecia black, up to 0.5 mm wide, appressed adnate in the juvenile stage, then becoming adnate and constricted at the base; disc slightly convex with a \pm obliterated margin, epruinose or thinly pruinose. Excipulum well advanced and far below the apothecium, reaching 150 μm thick, dark brown to brown with violet tinge externally, while becoming paler and adding rose tinge towards the center; hyphae intricate-radiating, 5–8 μm , meso- to leptodermatous. Epithecium blue green or blackish green. Hymenium 30–50 μm high, colorless. Subhymenium colorless, 25–30 μm high. Hypothecium violet-brown, 60–80 μm high, gradually merging into an arachnoid subhypothecial medulla; subhypothecial medulla thick, I+ intensively violet-blue. Paraphyses simple, 2.5–3.5 μm thick, somewhat thickened at the apices. Asci clavate 22–30 \times 6–10 μm . Spores ellipsoid, colorless, 6–9 \times 3–4 μm . Saxicolous.

Chemical substances: stictic acid and constictic acid.

Typus: Antarctica, Enderby Land, Sôya Coast, Langhovde, ca. 190 m alt., on rock, leg. M. INOUE 18003, —holotype in NIPR (Herbarium, National Institute of Polar Research).

Lecidea soyaensis is known only from one gathering, but the material is well de-

veloped. *L. soyaensis* is distinct because of the arachnoid subhypotheical medulla (Fig. 5d), a well-advanced and developed excipulum far below the apothecium, blue green epithecium, thinner hymenium and a production of stictic acid.

This species belongs, according to its apothecial anatomy, to the *Lecidea auriculata* group. Another related species known in the present region, *L. andersonii* FILSON, is distinguished from this species by having a different chemistry, longer spores, colorless subhymenium and violet-brown hypotheicum.

In some degree *L. soyaensis* is reminiscent of *L. cancriformis* DODGE and BAKER

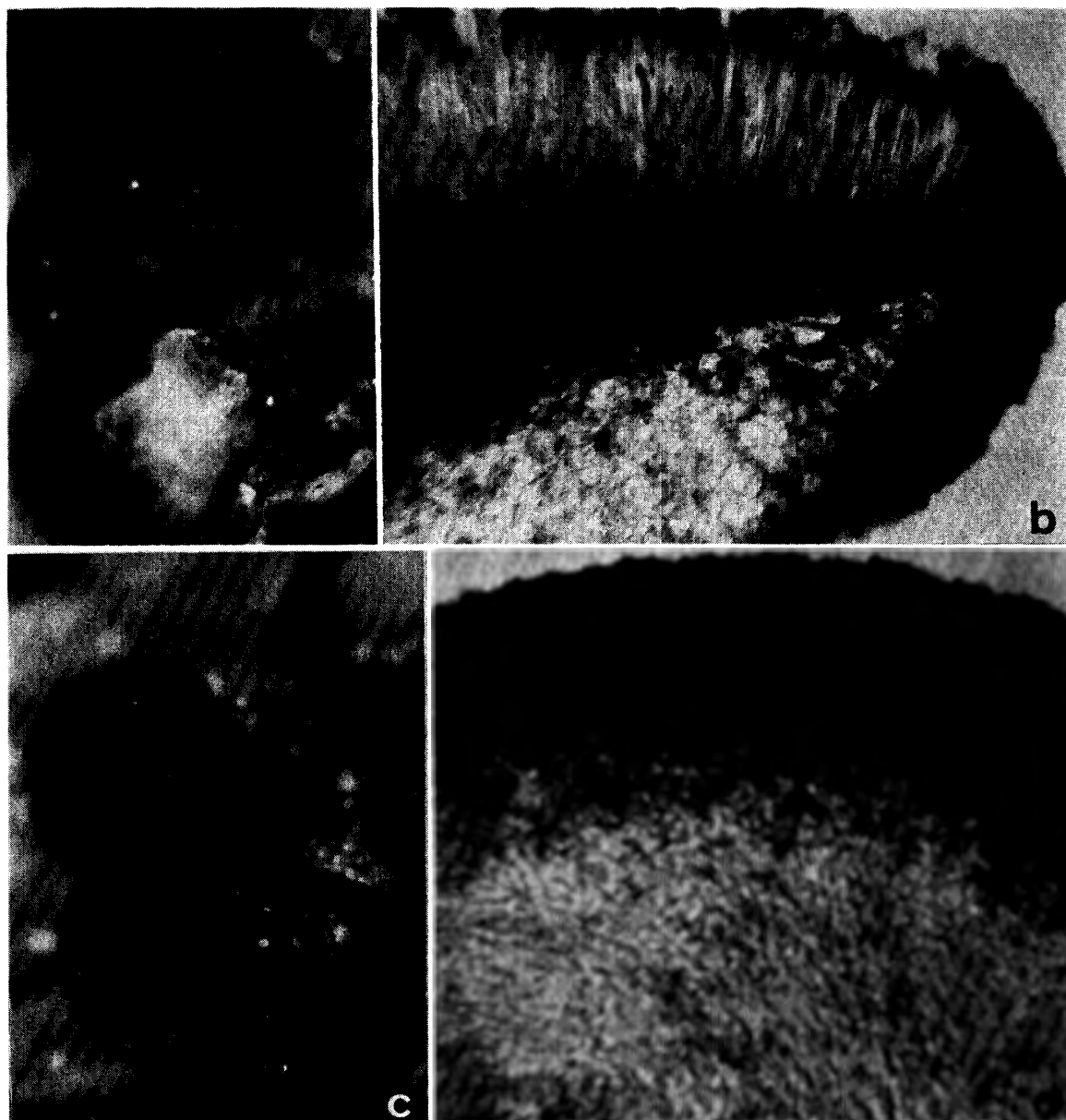


Fig. 5. a-b. *Lecidea cancriformis* DODGE & BAKER (no. 17683). a. Portion of thallus and apothecia, $\times 30$. b. Cross-section of an excipulum, stained by lactophenol cotton blue, $\times 300$.

Fig. 5. c-d. *Lecidea soyaensis* M. INOUE (no. 18003, holotype). c. Portion of thallus and apothecia, $\times 30$. d. Cross-section of an excipulum, stained by lactophenol cotton blue, $\times 300$.

on account of the similar apothecial morphology and spore dimension. Moreover, there is one assumption that *L. soyaensis* producing stictic acid might be a "chemical species" of *L. cancriformis*, which often produces norstictic acid. But the developmental degree of excipulum and its hyphal structure of *L. cancriformis* (hyphae running intricate-radiating, 2–3 μm in diameter, mesodermatous) suggest that both species may be not so close.

5. *Lecidella siplei* (DODGE and BAKER) M. INOUE, comb. nov. Fig. 6.

—*Lecidea siplei* DODGE and BAKER, Ann. Mo. Bot. Gard., **25**, 530 (1938). Type: Antarctica, Marie Byrd Land, Edsel Ford Range, Skua Gull Peak, coll. SIPLE & COREY 72W-4, —lectotype (HALE, 1987) in FH-DODGE.

Thallus indeterminate, contiguous, thin to medium, whitish to gray with brown tinge, subsquamulose; subsquamules with a irregularly divided margin, minute, ascending, congregated; medulla I—, or at times I+ reddish. Hypothallus indistinct.

Apothecia black, up to 1 (or at times 1.5) mm wide, adnate, well constricted at the base, round or irregularly flexuose or even composed; disc epruinose, plane or in old apothecia somewhat convex, surrounded by a prominent margin. Excipulum reaching to 100 μm thick, blackish green in external part, and becoming paler towards the center; hyphae perpendicularly radiating, 5–8 μm thick, meso- to pachydermatous. Epithecium blue green to blackish green. Hymenium 50–80 μm high, sometimes

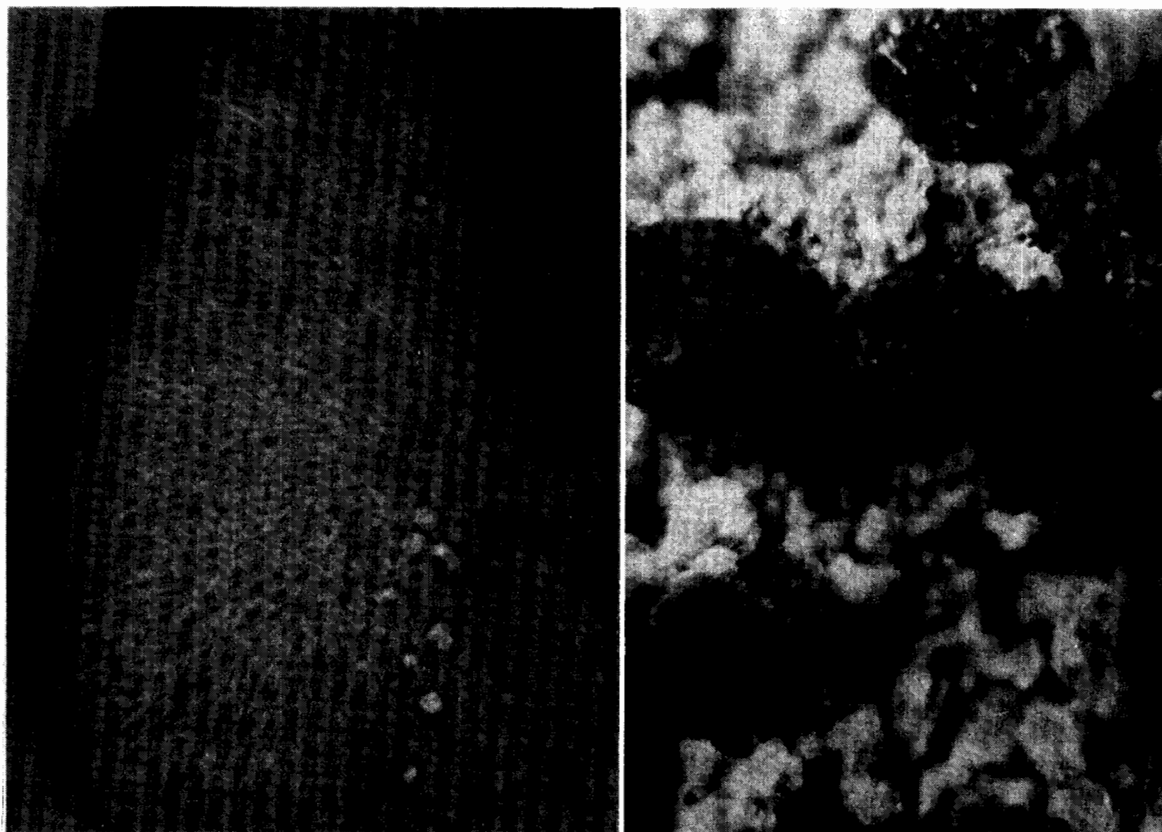


Fig. 6. *Lecidella siplei* (DODGE & BAKER) M. INOUE (no. 18047). a. Cross-section of an excipulum, stained by lactophenol cotton blue, with depositions of crude zeorin crystal, $\times 300$. b. Portion of thallus and apothecia, $\times 30$.

interpenetrated with oily granules. Subhymenium up to 150 μm high, colorless, with irregularly shaped cavities. Hypothecium indistinct. Paraphyses simple or branched (the branches few in number for the most part), discrete. Asci clavate, 40–55 \times 10–13 μm ; tholus well developed. Spores ellipsoid, 9–13 \times 5–8 μm . Growing on sands, or at times on rocks.

Reaction: thallus & medulla P—, K—, KC—, C—. Chemical substances: atranorin and zeorin (chemical race I), no colorless substances demonstrated with TLC (chemical race II), or zeorin (chemical race III).

Range: Antarctica (Enderby Land, present study; Marie Byrd Land, DODGE and BAKER, 1938; Victoria Land, HALE, 1987)

On account of excipulum composed of perpendicularly radiating thick walled hyphae, simple discrete paraphyses and asci with well-developed amyloid tholus, it is plausible that *Lecidea siplei* constitutes the genus *Lecidella*.

The specimens collected from the region agree very well with the lectotype of *L. siplei* both morphologically and anatomically. Even though HALE (1987) reported no lichen substances in the present species, the results of the TLC tests show that three chemical races are present in *L. siplei* as mentioned above. In addition, chemical race "I", to which the lectotype belongs, is commonest in the present region as shown in Table 1. So far as I have learned, no annotation on chemical substances has been given to the lectotype by Dr. HALE.

Lecidella bullata KÖRB., which is one of the well-known representatives of *Lecidella* in the Northern Hemisphere and was reported from the subantarctic region (Bouve Island, ØVSTEDAL, 1986; Signy Island, HUNECK *et al.*, 1984), is most closely related to *L. siplei* in having a deep green epithecium, colorless subhymenium, similar spore dimensions and not producing xanthonenes. *L. bullata*, however, has a bullate-areolate thallus and psoromic acid as a lichen substance.

Other related species, *Lecidella alaiensis* (VAIN.) HERTEL and *L. stigmatea* (ACH.) HERTEL and LEUCKERT, are distinguished from this species by the well-developed thallus and larger spores (13–17 \times 6–9 μm in the holotype of *L. alaiensis*: TUR-VAIN. 25099) and by the higher hymenium and brown epithecium (hymenium 100–110 μm high in the lectotype of *L. stigmatea*: H-ACH 110 C) respectively.

Lecidella siplei is distributed in ice-free areas of both continent and coastal islands.

Representative specimens examined. PRINCE OLAV COAST: Cape Hinode (18485, 18508, 18533), Tama Point (18211), Tottuki Point (18326, 18328, 18334). SÔYA COAST: Breidvågripa (18682, 18699, 18702, 18711, 18784, 18788), Hamnena-bben (19443, 19456), Langhovde (16985, 17258, 17340, 17441, 17544, 17568, 17611, 17784, 17799, 17844, 17857, 17885, 17949), Mitu-iwa Rock (18629, 18631, 18652, 18655), Mukai Rocks (18276), Padda (Island) (18445), Rundvågshetta (18806, 18817, 18827, 18835, 18916), Skallen (18165), Skallevikhalsen (18091), Skarvsnes (18978, 19015, 19024, 19051, 19085, 19112, 19125, 19143), West Ongul (Island) (19180, 19231, 19249, 19280, 19320, 19476, 19494, 19516, 19543).

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