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AN IMPERFECT LICHEN FOUND IN THE ANTARCTICA

BY

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NATIONAL SCIENCE MUSEUM, TOKYO

SIRAHAMA, WAKAYAMA-KEN
JAPAN
MARCH 1961
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This series contains THE BIOLOGICAL RESULTS OF THE JAPANESE ANTARCTIC RESEARCH EXPEDITION and is published by the Seto Marine Biological Laboratory. Parts will appear at irregular intervals as they become ready.
April, 1960, the writer had a good chance to observe the fresh materials of several lower plants collected in Ongul Islands and their neighbouring Antarctic region by Mr. Sadanori MURAUCHI during the Japanese Antarctic Research Expedition in 1959–'60. Among them, an interesting plant, which looks like the white powdery masses, drew the writer’s attention.

This is developing as irregular patches, co-existing with the blue alga "Gloeocapsa sp." upon the polster-like mass of *Bryum antarcticum* Hook. f.

Fig. 1. Plant life on the sandy ground of East Ongul Island (Phot. by H. Fukushima, Feb. 2, 1959). White particles of imperfect lichen are shown on polster-like *Bryum antarcticum*, co-existing with *Gloeocapsa* sp.

et *Wils.*, which is commonly found on the low and moist sandy grounds all over the region. Later, it was found that Mr. H. FUKUSHIMA had also collected this lower plant and photographed its habitat (Fig. 1).

**General appearance.** Externally, this seems to be composed of sterile hyphae which give the white and powdery appearance because of the fact that
Fig. 2. Surface view of imperfect lichen growing on *Bryum antarcticum*. Upper ×3, lower ×10.
An imperfect lichen found in the Antarctica

they are separated in a form of gemmae and aggregate loosely, leaving the
spaces among them. Surrounded with these hyphae, unicellular green algae
are grouping together especially at the lower part of the plant. Frequently,
this plant develops directly on the surface of the polster-like mass of the above
mentioned moss. It seems that the said plant is offered only the suitable
warm and moist substrata by these alga and moss, without having any benefit
in nourishment. Fungal component does not form the special peridial layer,
but expands along the undulating surface of substrata as thin mycelial tomento-
se mat, which is orbicular, lobed or irregularly elongated and sometimes
touches to neighbouring one, attaining 2–15 mm in diameter. Included in these
tomentose mat are formed of many soredia which are sphaeroid, 0.1–0.4 mm
in diameter, upper surface of them being pure white, lower pale green,
internally stuffed with algal cells mingled with fungal gemmae. Some algal
cells are also seen outside of soredia without touching directly to hyphae.

Algal component. Cells sphaeroid or subsphaeroid, rarely ovoid, uniformly
thin-walled, various in size, 5–15μ in diameter; chromatophores extending
nearly to the cell wall, stellate, irregularly lobed or at times with an eclipse
at one side, with a large pyrenoid at center; a nucleus lying on one side of
chloroplast and next to cell wall; chromatophore divided frequently into many
ellipsoidal or subsphaerical small bodies which look like the initial cells of
zoospores; autospores produced 10–20 in each cell, their shape and contents
being same with those of mother cell, enclosed with mother cell membrane
for a long time after maturity. The above mentioned characteristics agree
with those of the genus Trebouxia de Puymaly (Chlorococcaceae). Although
the zoospores of this plant are not yet observed, the writer gives it provisionally
a name “Trebouxia antarctica Y. Kobayasi”. This algal genus has been
known as the gonidia of many genera of lichen such as Xanthoria, Cladonia,
Parmelia and Usnea. It is supposed that this alga may also be surviving alone
irrespective of fungal hyphae in this territory.

Fungal component. Hyphae 2–4μ in thickness, hyaline, tortuous, multi-
septate, easily liberated at each septum, forming gemmae; gemmae ellipsoidal,
bone-shaped or like W, T, U figures, hyaline or pale purplish, thin-walled,
vacuolate; some hyphae entangled with algal cells by their lateral side, with-
out forming haustoria; blastospores rarely produced, germinated apically or
laterally from hyphae or gemmae, commonly single, ovoid, hyaline, 2–3μ long,
budding of them uncertain; hyphae produced from soredia, which were kept
in the moist chamber in refrigerator, tomentose, 2μ in thickness, hyaline,
branched, septate without clamp connection. Considering from the formation
of blastospore as well as the normal septate hyphae, this seems to be near the
members of Trichosporon belonging to the Moniliaceae of imperfect fungi.
Yosio Kobayasi

**Associative effects between algal and fungal components.** The writer tried the hanging drop culture to research the germination of gemmae of fungus and aplanospores of alga by setting the one of soredia on cover-glass and breaking up the components with pressure. After one week's preservation in room temperature, nothing was found to germinate. Although the culture of a bit of plant on malt agar medium was also practiced, the results were negative.

As for the multiplication of plant, the algal component seems to be able to...
An imperfect lichen found in the Antarctica reproduce asexually by zoospores and autospores, and fungal component by gemmae and blastospores respectively, although the soredial formation is also one of the reproductive means.

It is not always true that the fungal component is co-existing with algal component with mutual benefits. Various cases were observed to suppose that

the protoplasm and chromatophores of algal cells are attacked and digested by the fungal hyphae touching to them as illustrated in Fig. 3 E. It seems to be reasonable that in such an Antarctic region where the organic matters for nourishment are very scarce, the heterotrophic fungi can hardly alive without preying upon these lower algae.
BIOLOGICAL RESULTS
OF
THE JAPANESE ANTARCTIC RESEARCH EXPEDITION

1. Tanita, Senji: Sponges. 8 pp. May 1959
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11. Uchio, Takayasu: Planktonic Foraminifera of the Antarctic Ocean. 9 pp., 1 pl. May 1960
12. Uchio, Takayasu: Benthonic Foraminifera of the Antarctic Ocean. 19 pp., 1 pl. May 1960
13. Kobayasi, Yosio: An imperfect lichen found in the Antarctica. 7 pp. March 1961

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