

Algae from the Antarctica

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We do not know much about the microvegetation of the fresh waters, soil, and snow fields of the Antarctica. Thus the material, collected for me by E. TITKOS in that area, is most valuable. E. TITKOS was the first Hungarian to have worked in the Antarctica, making meteorological observations for a whole year (TITKOS, 1966).

E. TITKOS's collections consist of two parts:

I. Snow samples gathered near Mirnij (conserved material), 1. 4 April, 1964 (-20°C); 2. 4. July, 1964 (-22°C); 8 October, 1964 (-20°C); 17 January, 1965, 2 km to the south of Mirnij (0°C);

II. Five soil samples from Haswel Island, 20 January, 1964.

It is my agreeable duty to thank my colleague E. TITKOS also in this place for his endeavours to secure for me the research material from this remote Continent.

The algae of the snow samples

As is to be seen from the snow samples listed above, there live microorganisms, algae, on the snow surfaces even in the dark winter season at temperatures about -20°C . In material No. 1, there were also some fungous filaments aside of the *Chlorella ellipsoidea* f. *antarctica* cells. Material No. 2 also contained *Chlorella* cells and filaments of *Oscillatoria* sp. Most algal cells occurred in material No. 4, mainly owing to the fact that this collection was made already in the light season and temperature fluctuated around 0°C . This material comprised *Gloeoetila contorta*, *Chlorella ellipsoidea* f. *antarctica*, *Prasiola crispa* (young plants) and filaments of fungi.

The algal species found in the snow samples were: *Chlorella ellipsoidea* f. *antarctica* WILLE, *Gloeoetila contorta* CHOD., *Oscillatoria* sp., and *Prasiola crispa* (LIGHTF.) MENEGH.

The algae of the soil samples

I have set up cultures from the soil samples deriving from Haswel Island. At first, the algae developed but poorly. Notably, the algal species still retained in the cultures their developmental periods as evolved under the Antarctic conditions, and they proliferated in masses mainly during the winter also in Hungary, but they were just vegetating in our summer. I found the following 13 algal species in the soil sample cultures: Chlorophyta: *Chlorella ellipsoidea* f. *antarctica* WILLE, *Fernandielia alpina* CHOD., *Kentrosphaera antarctica* sp. n., *Prasiola crispa* (LIGHTF.) MENEGH., *Scenedesmus bijugatus* β *alternans* (REINSCH) HANSG., *Sc. obliquus* (TURPIN) KG., *Stichococcus nivalis* CHOD.; Cyanophyta: *Lyngbya murrayi* W. & G. S. WEST, *Oscillatoria pristleyi* W. & G. S. WEST, *Phormidium glaciale* W. & G. S. WEST, *Ph. frigidum* FRITSCH, *Ph. pristleyi* FRITSCH; Chrysophyta: *Chlorocloster minimus*

PASCHER, *Monodus subterraneus* BOYE—PETERSEN, *Pleurochloris anomala* var. *antarctica* var. n. Besides the algal species, Chlorobacteria, fungous filaments, and moss protonema also live in the cultures.

Among the algal species mentioned above, there are some which have first been described from the water of the Antarctica, e.g.: *Oscillatoria pristleyi*, *Phormidium glaciale*, *Ph. frigidum*, *Ph. pristleyi*. The following species are shown now for the first time from the Antarctica: *Fernandiella alpina*, *Kentrosphaera antarctica* sp., n., *Chlorocloster minimus*, *Monodus subterraneus*, *Pleurochloris anomala* var. *antarctica* var. n.

The detailed discussion of the algal species follows below, in the systematic part.

Algae Chlorophyta

Chlorella ellipsoidea f. *antarctica* WILLE

Sphaerical or oval cells, 2—8 μ diam., or 3—4 μ wide and 4—6 μ long.

Collected first by GAIN in the Antarctica, from the green snow of Peterman Island (GAIN, 1912, p. 183—4).

Found in the soil of Haswel Island and on the snow near Mirnij.

Fernandiella alpina CHOD.

Forming small cell-groups comprising 4—8 cells; exterior surface of cells elongated, cell pyriform, 6—8 μ diam.

Reproduction by autospores and zoospores.

This algal species is known from cultures; R. CHODAT extracted it from the soil of the Alps (1921, p. 106) and BOYE—PETERSEN (1928, p. 19) from Island.

Found in the soil of Haswel Island.

Gloeotila contorta CHOD.

Short, sigmoid filaments, 1.5—2.5 μ wide.

A *Gloeotila* species was first collected in the Antarctica on the Falkland Island (GAIN, 1912, p. 197).

Found on the snow surface,, 2 km from Mirnij.

Kentrosphaera antarctica sp. n.

Table I, Figs. 1—11

Sphaerical (Table I, Figs. 2, 6), elliptical, or irregularly shaped cells, 54—100 μ in diam. Singly or rarely in smaller groups. Cell-wall smooth, rather thick, outer surface of older or resting cell-walls with a nail- or horn-shaped, stratified thickening (Table I, Figs. 4, 1, 8—10). Young cells with numerous granuliform, minute chloroplasts, older cells with ribbonshaped, radially arranged, dark green chloroplasts (Table I, Figs. 2, 6). Cells abounding in starch.

Reproduction: by cell-division, autospores, zoospores, and aplanospores. Auto-sporangium 60—80 μ wide and 90—110 μ long, forming 8—16—32—64 autospores.

Sphaerical, 15–30 μ diam. wide autospores with one chloroplast (Table I, Fig. 7). Zoosporangium 105 μ wide 120 μ long, its wall 2–3 μ thick (Table I, Fig. 3). Many hundreds of zoospores form, freed by the gelatinization of the zoosporangial wall, and immediately develop into vegetative cells.

Resting cells thick-walled, 60–90 μ wide and 100–120 μ long, protoplast dark orange red or brownish. Autospores and aplanospores liberated by the gelatinization of the mother-cell wall.

Isolated in Cultures from the soil of Haswel Island, Antarctica. The species occurred among filaments of *Phormidium pristleyi*. It is a terrestrial alga.

Kentrosphaera antarctica *sp. nova*

Tab. I, Figs. 1–11

Cellulae solitariae, globosae, ellipticae, vel forma irregulari, saepe inter filamenta Phormidiorum. Membrana modice crassa. Membrana sporarum perdurantium irregulariter incrassata. Chromatophora granulosa, in cellulis senioribus superficies eorum in lobulos plurimos producta. Diam. cellularum 54–100 μ .

Propagatio: aut divisione cellulae, aut productione zoosporarum vel autosporarum vel aplanosporarum. Sporae perdurantes membranibus localiter irregulariter valde incrassatis at continent adipem flaventem, vel brunneo-aurantiacam. Crassitudo membranae 2–3 μ . Sporae perdurantes: 60–80 μ latae, 100–120 μ longae.

Habit. in terra Antarctica Insula Haswel.

Prasiola crispa (LIGHTF.) MENEGH.

Only young plants, smaller or larger cell-groups found.

This plant is known from a number of localities in the Antarctica, collected by several expeditions, usually in thawing snow, on cliffs, among mosses (GAIN, 1912, p. 178; FRITSCH, 1912, p. 128; DE WILDEMANN, 1935, p. 21). Isolated from the soil of Haswel Island, and collected on the snow surface 2 km from Mirnij.

Scenedesmus bijugatus β alternans (REINSCH) HAHSG.

Known from the fresh waters of South Georgia, Antarctica (GAIN, 1912, p. 196). Isolated in culture from the soil of Haswel Island.

Scenedesmus obliquus (TURPIN) KG.

GAIN collected it from the fresh waters of Kerguelen in the Antarctica (1912, p. 199). Both *Scenedesmus* species are frequent in the Antarctic fresh waters. Isolated from the soil of Haswel Island.

Stichococcus nivalis CHOD.

Table I, Fig. 13

Syn.: *Stichococcus bacillaris* NÄG. var. *genuinus* KIRCHN. f. *minor* NÄG., f. *major* (NÄG.) ROTH (KOL, 1968, p. 147).

Collected in numerous localities from the snow of Antarctica: green snow on Petermann Island, red snow on Wiencke Island, green snow on Booth-Wandel Island (GAIN, 1912, p. 184, 185, 188–190); and Détroit de Gerlach (DE WILDEMANN, 1935, p. 19).

Isolated from the soil of Haswel Island.

Cyanophyta

Lyngbya murrayi W. & G. S. WEST

3—3.2 μ thick filaments.

The plant was first collected by J. MURRAY on the Ross Island, Antarctica (GAIN 1912, p. 157). Isolated from the soil of Haswel Island.

Oscillatoria pristleyi W. & G. S. WEST

2—3 μ thick filaments.

Known from fresh waters in the Antarctica (GAIN, 1912, p. 158). Isolated from the soil of Haswel Island.

Phormidium glaciale W. & G. S. WEST

1 μ thick filaments.

First collected on Ross Island by J. MURRAY (GAIN, 1912, p. 158). Isolated from the soil of Haswel Island.

Phormidium frigidum FRITSCH

1.5—2 μ thick filaments.

FRITSCH described it from fresh water in the Antarctica (1917, in: Brit. Antaret. Exp., London). Isolated from the soil of Haswel Island.

Phormidium pristleyi FRITSCH

Table I, Fig. 14

2—3 μ thick filaments.

FRITSCH described it from fresh water in the Antarctica; it is known from several localities (FRITSCH, 1917, in: Brit. Antarctic Exp., London). Isolated from the soil of Haswel Island.

Chrysophyta

Xanthophyceae

Chlorocloster minimus PASCHER

Table I, Fig. 12

Irregularly fusiform, 3 μ wide and 4—6 μ long cells.

Heretofore unknown from the Antarctica. Isolated from the soil of Haswel Island.

Monodus subterraneus BOYE—PETERSEN

Elliptical or irregularly oviform, 3—4 μ wide and 4—5 μ long cells.

Hitherto unknown from the Antarctica. Isolated from the soil of Haswel Island.

Pleurochloris anomala var. **antarctica** var. n.

Table I, Figs. 15—19

Diameter of globular cells 6—12 μ (Table I, Fig. 16). Cell wall thin, orange red. One or more chloroplasts, without pyrenoid (Table I, Figs. 16—18).

Reproduction: by asexual spores and zoospores. Asexual sporangium 20—25 μ in diameter, forming 16—64 asexual spores, liberated by irregular bursting or gelatinization of asexual sporangial wall (Table I, Fig. 15). Innumerable zoospores forming in zoosporangium; this latter 22 μ in diam. (Table I, Fig. 19).

The new variety stands nearest to the species *Pleurochloris anomala*, but differs by 1. the smaller cells, 2. the number of chloroplasts, 3. the number of asexual spores, and 4. the colour of the cell-wall.

Isolated from the soil of Haswel Island. It is a terrestrial alga.

Summary

The paper discusses 16 algal species, partly found in snow samples partly isolated in cultures from soil samples; the samples were collected by E. TITKOS in Antarctica. Three algal species derive from the snow samples, thirteen from the cultures of soil samples. Among the terrestrial algae, there is a new species (*Kentrosphaera antarctica*: Table I, Figs. 1—11) and a new variety (*Pleurochloris anomala* var. *antarctica*: Table I, Figs. 15—19). The species *Fernandiella alpina* CHOD., *Chlorocloster minimus* PASCHER, and *Monodus subterraneus* BOYE—PETERSEN proved to be new for the Antarctica.

A number of algal species were isolated in cultures of soil samples which have been first described from the fresh waters of Antarctica, namely: *Lyngbya murrayi* W. & G. S. WEST, *Oscillatoria pristleyi* W. & G. S. WEST, *Phormidium frigidum* FRITSCH, *Ph. glaciale* W. & G. S. WEST, *Ph. pristleyi* FRITSCH.

It is worthy of note that the algae had retained, also in the second year, their vegetational periods habitual in the Antarctica.

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Explanation of figures

Figs. 1—11. *Kentrosphaera antarctica* sp. n. — Figs. 1, 4, 8, 9, 10: variously shaped permanent cells with uni- or bilateral incrassation of the cellular wall, and with 8—32 aplanospores; 1, 4, 8 ($\times 375$), 9, 10 ($\times 250$); Fig. 2: globular vegetative cell, with radially arranged chloroplasts ($\times 560$); Fig. 3: oval zoosporangium with many hundreds of zoospores and grey cellular wall ($\times 750$); Fig. 5: young autospore with a chloroplast ($\times 75$); Fig. 6: young vegetative cell with granuliform chloroplasts ($\times 750$); Fig. 7: autospore with many chloroplasts ($\times 750$); Fig. 11: young, globular permanent cell without incrassate walls ($\times 250$). — Fig. 12: *Chlorocloster minimus* PASCHER ($\times 1500$). — Fig. 13: *Stichococcus nivalis* CHOD. ($\times 1500$). — Fig. 14: *Phormidium pristleyi* FRITSCH ($\times 1500$). — Figs. 15—19. *Pleurochloris anomala* var. *antarctica* var. n. — Fig. 15: autosporangium ($\times 1125$); Fig. 16: vegetative cell with thick, orange red cellular wall ($\times 1125$); Fig. 17: autospore with chloroplast ($\times 750$); Fig. 18: vegetative cell with many chloroplasts ($\times 750$); Fig. 19: zoosporangium ($\times 1500$).



