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FLORISTIC STUDIES ON ALGAE FROM INLAND WATERS OF ONGUL ISLANDS AND VICINITY, ANTARCTICA: I. EAST ONGUL ISLAND

Akinobu OGUNI[1], Yuko TANAKA[1], Momoko UEMURA[1], Makiko YAMAMOTO[2] and Eiji TAKAHASHI[3]

[1]*Kobe Tokiwa College, 6–2, Otani-cho 2-chome, Nagata-ku, Kobe 653*
[2]*Graduate School of Science and Technology, Kobe University, Rokkodai-cho, Nada-ku, Kobe 657*
[3]*Faculty of Science, Kobe University, Rokkodai-cho, Nada-ku, Kobe 657*

Abstract: A freshwater algal flora of East Ongul Island is described. Nine water samples and 9 algal mat samples were collected from various inland waters in the summer of 1983–1984. A total 14 species were found in the water samples: Cyanophyceae, 7 species; Chrysophyceae, 1 species; Bacillariophyceae, 4 species and Chlorophyceae, 2 species. *Paraphysomonas vestita* (STOKES) DE SAEDELEER of the Chrysophyceae was found for the first time in Antarctica. This alga was dominant in a lake (L. Midori) in the summer of 1983 and amounted to 20 cells per m*l* of water. Total 31 taxa were found in algal mat samples: Cyanophyceae, 20 species; Bacillariophyceae, 4 species and Chlorophyceae, 7 taxa. Altogether a total 34 taxa were recorded from water and mat samples examined in the present study. Cyanophyceae was most abundant in the number of species representing some 65%.

The following 21 taxa in addition to *Paraphysomonas vestita* mentioned above, are first records of occurrence in the Ongul Islands; *Chroococcus dispersus*, *Dichothrix orsiniana*, *Hydrocoryne spongiosa*, *Lyngbya aerugineo-coerulea*, *L. martensiana*, *L. semiplana*, *L. purpurea*, *Nodularia quadrata*, *Phormidium antarcticum*, *P. bohneri*, *P. fragile*, *P. frigidum*, *P. incrustatum*, *P. uncinatum*, *Schizothrix coriacea*, *Xenococcus schousboei*, *Ulothrix mucosa*, *Palmodictyon viride*, *Microspora stagnorum*, *Pleurococcus antarcticus* and *Sphaerocystis schroeteri* var. *nivalis*.

1. Introduction

Taxonomic studies of freshwater algae, epiphytic algae, and terrestrial and subterranean algae in the Ongul Islands have been carried out by FUKUSHIMA (1959, 1961), HIRANO (1961, 1965), NEGORO (1961), WATANABE *et al.* (1961), AKIYAMA (1967), KARASAWA and FUKUSHIMA (1977), OHTANI (1986), and several others. About 140 taxa have been so far reported to occur in these islands.

In our attempt to contribute to floristic studies on the freshwater algal flora in the Ongul Islands and the vicinity, we have made a systematic survey on water samples and algal mat samples from the bottom of the waters. Water samples were examined using both light microscope and electron microscope. We describe here 34 taxa of freshwater algae from East Ongul Island including one species new to Antarctica.

2. Materials and Methods

Water samples and algal mat samples were collected at selected locations of East Ongul Island as shown in Tables 1 and 2, respectively. See the map (Fig. 1). Water samples were taken in 0.5 *l* polyethylene bottles, either fixed immediately with Formalin or glutaraldehyde, or cultured for a short period and then fixed with Formalin. These samples were examined using both light microscope and electron microscope. Algal mat samples were collected from bottom surface and substrata of the waters. They were teased to pieces using fine needles and forceps, and examined using light microscope.

Table 1. Water samples examined in the present study.

Sample No.	Location of collection	Date of collection
1	Dam of Mizukumi Stream	March 15, 1983
2	Dam of Mizukumi Stream	January 22, 1984
3	Pond 1	January 22, 1984
4	Lake Midori	December 26, 1983
5	Lake Midori	January 22, 1984
6	Lake Ebosi	January 22, 1984
7	Lake Kamome	January 22, 1984
8	Lake Kamome-kami-ike	January 22, 1984
9	Lake Taratine	January 22, 1984

Table 2. Algal mat samples examined in the present study.

Sample	Location of collection	Site of sampling	Date of collection
1	Mizukumi Stream	Bottom of dam	March 15, 1983
2	Mizukumi Stream	Bottom of dam	March 15, 1983
3	Mizukumi Stream	Bottom of dam	January 22, 1984
4	Lake Ebosi	Surface of sand	January 22, 1984
5	Pond 2	Surface of sand	January 22, 1984
6	Pond 3	Surface of sand	January 22, 1984
7	Lake Kamome	Surface of sand	January 22, 1984
8	Lake Kamome-kami-ike	Surface of sand	January 22, 1984
9	Lake Taratine	Surface of sand	January 22, 1984

3. Results and Discussion

3.1. Algae in water samples

A total of 14 species of freshwater algae were identified (Table 3): Cyanophyceae, 7 species; Chrysophyceae, 1 species; Bacillariophyceae, 4 species; and Chlorophyceae, 2 species.

Lake Kamome was most abundant in the number of species, 10 species compared to 1–3 species at the other locations. This would mean that the physico-chemical conditions of water in Lake Kamome was particularly favorable for algal growth. The reason is not clear and remains to be elucidated.

Paraphysomonas vestita of the Chrysophyceae was found for the first time in Antarctica. Five species, *Chroococcus dispersus*, *Phormidium bohneri*, *P. incrustatum*,

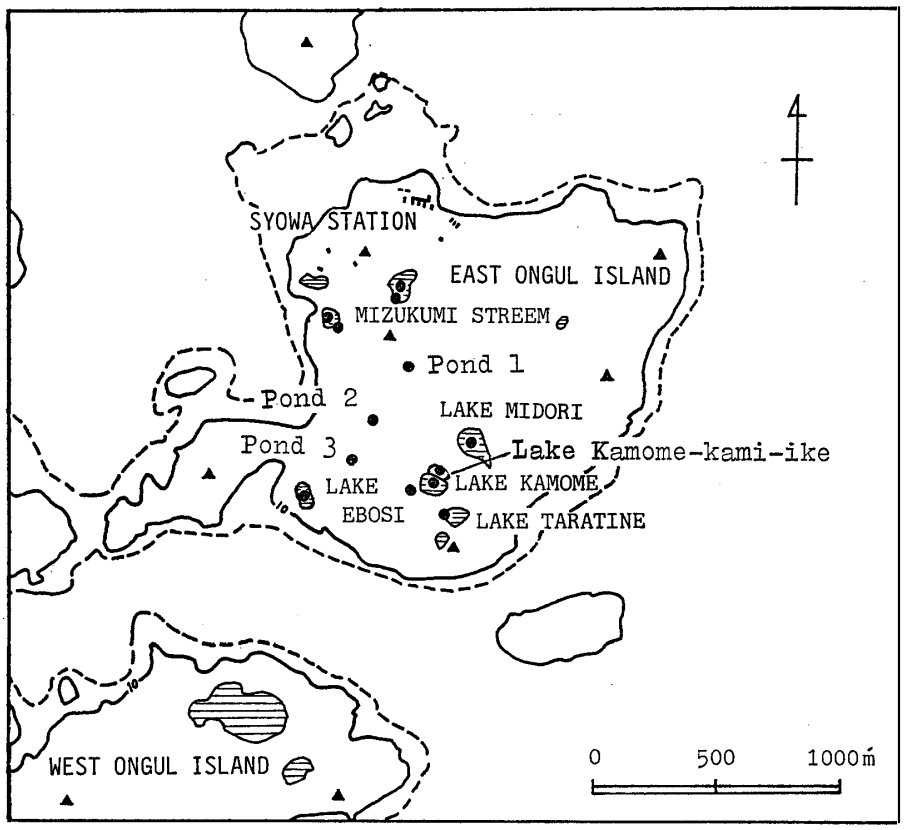

Fig. 1. Map showing sampling sites (●) in East Ongul Island, Antarctica.

P. uncinatum of the Cyanophyceae and *Pleurococcus antarcticus* of the Chlorophyceae were found newly in the Ongul Islands (Table 3). Since the latter 5 species have been recorded from Yukidori Valley, Langhovde (HIRANO, 1979), they are probably widely distributed in the vicinity of the Ongul Islands.

As for the other species, *Synechococcus aeruginosus* and *Oscillatoria tenuis* of the Cyanophyceae, and *Cosmarium cucurbita* of the Chlorophyceae have been recorded from the soil (AKIYAMA, 1967) and *Synechococcus maior* of the Cyanophyceae has been recorded from moss mats (OHTANI, 1986) both in East Ongul Island, and *Navicula muticopsis*, *Hantzschia amphioxys* and *Pinnularia borealis* of the Bacillariophyceae have been recorded from freshwater and soil in the Ongul Islands (FUKUSHIMA *et al.*, 1975; AKIYAMA, 1967, 1968).

Paraphysomonas vestita, the species new to Antarctica, was dominant in the phytoplankton in Lake Midori, amounting to about 20 cells per m*l* of water in December 1983, and 4 cells per m*l* in January 1984. It seems that this species multiplies mainly during a short period of summer in Lake Midori. *Synechococcus maior* was dominant in the phytoplankton in Lake Kamome in January 1984, amounting to about 5400 cells per m*l* of water, but occurred only in small numbers in Lake Kamome-kami-ike (tentative name) in the same period. All other species were found in less than 4 cells per m*l* of water in every sample.

3.2. Algae in algal mat samples

A total of 31 taxa were identified: Cyanophyceae, 20 species; Bacillariophyceae,

Table 3. Species found in 9 water samples collected from East Ongul Island, Antarctica, 1983–1984.

Species identified	Water sample No.								
	1	2	3	4	5	6	7	8	9
Cyanophyceae									
Synechococcus aeruginosus								+	
S. maior							+	+	
*Chroococcus dispersus**		+					+		+
Oscillatoria tenuis							+		
*Phormidium bohneri**							+		
*P. incrustatum**							+		
*P. uncinatum**							+		
Chrysophyceae									
*Paraphysomonas vestita***				+	+				
Bacillariophyceae									
Hantzschia amphioxys	+		+						
Navicula muticopsis			+				+		
N. sp.				+	+	+	+		+
Pinnularia borealis	+	+							
Chlorophyceae									
*Pleurococcus antarcticus**							+		+
Cosmarium cucurbita							+		
Total	2	2	2	2	2	1	10	2	3

* New to Ongul Islands.
** New to Antarctica.

4 species; and Chlorophyceae, 6 species and a variety. Of these, 15 species of the Cyanophyceae and 5 of the Chlorophyceae were found for the first time in the Ongul Islands (Table 4). Seventeen species of the Cyanophyceae and 5 species and a variety of the Chlorophyceae among 31 taxa identified in the present samples were also recorded from Yukidori Valley, Langhovde (HIRANO, 1979).

Of the 15 Cyanophyceae species new to the Ongul Islands, two species, *Xenococcus schousboei* and *Hydrocoryne spongiosa*, have not been known before not only in the Ongul Islands but in the vicinity. *X. schousboei* has been recorded from a somewhat remote Staten Island (PRESCOTT, 1979). This species was found attached to *Schizothrix coriacea* in the present material. *H. spongiosa* has been recorded from Southern Patagonia and South Victoria Land (PRESCOTT, 1979).

Each algal mat sample examined revealed the presence of 4 to 10 taxa, and in each case the Cyanophycean species, found in every sample, were the major component. In fact, three samples (Nos. 4, 5 and 7) consisted of Cyanophycean species only. The remaining 6 mat samples contained either two families, Bacillariophyceae and Chlorophyceae or all three families (the two families above and Cyanophyceae).

3.3. Characteristics of taxa

Altogether, a total 34 taxa of freshwater algae were found in water samples and algal mat samples from East Ongul Island. Characteristics of these taxa are as follows.

Table 4. Taxa found in 9 algal mat samples collected from East Ongul Island, Antarctica, 1983–1984.

Taxon identified	Algal mat sample No.								
	1	2	3	4	5	6	7	8	9
Cyanophyceae									
Synechococcus aeruginosus				+		+		+	
S. maior							+	+	
*Chroococcus dispersus**				+					+
Gloeocapsa ralfsiana							+		
*Xenococcus schousboei**					+				
*Dichothrix orsiniana**					+			+	
*Hydrocoryne spongiosa**	+								
Nodularia harveyana		+							
*N. quadrata**		+		+			+	+	
Nostoc sphaericum					+				
*Phormidium antarcticum**	+		+						+
*P. bohneri**	+	+	+						+
*P. fragile**			+			+			
*P. frigidum**		+				+			+
*P. uncinatum**							+		
*Lyngbya aerugineo-coerulea**				+					
*L. martensiana**								+	
*L. semiplana**						+			
*L. purpurea**					+				
*Schizothrix coriacea**					+			+	+
Bacillariophyceae									
Hantzschia amphioxys	+	+							+
Navicula muticopsis	+	+							+
N. sp.			+						
Pinnularia borealis			+						
Chlorophyceae									
Sphaerocystis schroeteri var. *nivalis**			+						
*Palmodictyon viride**			+						
*Ulothrix mucosa**			+						
Hormidium sp.	+	+							
*Microspora stagnorum**	+	+							
*Pleurococcus antarcticus**	+		+					+	+
Cosmarium cucurbita			+			+			
Total	8	8	10	4	5	5	4	7	8

* New to Ongul Islands.

Cyanophyceae

Synechococcus aeruginosus NÄG.: GEITLER, Süsswasserflora. **12**, 111, Fig. 132, (1925). (Pl. 1, Fig. 1; Pl. 3, Figs. 1–3).

Cells elliptical or cylindrical in shape, 6.9–14.5 μm in width, 17–26 μm in length. Pond 2, L. Ebosi, L. Kamome and L. Kamome-kami-ike (water sample Nos. 7 and 8; mat sample Nos. 3, 6 and 8).

Synechococcus maior SCHROETER: GEITLER, Kryptogamen-Flora. **14**, 274, (1932).

(Pl. 1, Fig. 2; Pl. 3, Figs. 4, 5).
Cells elliptical, 17–18.8 μm in width, 23.8–26 μm in length. L. Kamome and L. Kamome-kami-ike (water sample Nos. 7 and 8; mat sample Nos. 7 and 8).

Chroococcus dispersus (KEISSLER) LEMM.: GEITLER, Süsswasserflora. **12**, 84, Fig. 84, (1925). (Pl. 1, Fig. 3; Pl. 3, Fig. 6).
Cells small number in a colony, with a diffluent mucous envelope; each cell 3.1–4.4 μm in diameter; usually 2 cells form a pair. Mizukumi Stream, L. Ebosi, L. Kamome and L. Taratine (water sample Nos. 2, 7, and 9; mat sample Nos. 4 and 9).

Gloeocapsa ralfsiana (HARV.) KÜTZ.: GEITLER, Kryptogamen-Flora. **14**, 204, Figs. 96, 97, (1932). (Pl. 1, Fig. 4; Pl. 3, Fig. 7).
Cells 4–4.5 μm in diameter, 5–6.2 μm in diameter with envelope. L. Kamome-kami-ike (mat sample No. 7).

Xenococcus schousboei THUR.: FORTI, Myxophyceae. 133–134, (1907). (Pl. 1, Fig. 5; Pl. 3, Fig. 8).
Colony spherical or prostrate; cells of the stratum are loosely associated; cells 3.1–5.6 μm in diameter. Found on *Schizothrix coriacea.* Pond 2 (mat sample No. 5).

Dichothrix orsiniana (KÜTZ.) BORN. *et* FLAH.: GEITLER, Süsswasserflora. **12**, 215, Fig. 254, (1925). (Pl. 1, Fig. 6; Pl. 3, Figs. 9, 10).
Colony like writing brush, 2–3 μm in height; filaments form subdichotomous false branches, 19 μm in width with sheath; colored yellowish brown at the base, colorless at apical parts; trichomes gradually attenuated to the apical part, 12 μm in width. Pond 2 and L. Kamome-kami-ike (mat sample Nos. 5 and 8).

Hydrocoryne spongiosa SCHWABE: GEITLER, Süsswasserflora. **12**, 277, Fig. 328, (1925). (Pl. 1, Figs. 7, 8; Pl. 3, Figs. 11, 12).
1–6 trichomes within a common sheath; the sheath fast, colorless, 20 μm in width; trichomes form dichotomous fals branches, distinctly constricted at the junction; cells 3.8 μm in width, 3.8 μm in length; heterocyst intercalary, not at the terminal position, 4.5 μm in width, 4.5–5 μm in length. Mizukumi Stream (mat sample No. 1).

Nodularia harveyana THUR.: GEITLER, Kryptogamen-Flora. **14**, 864, Fig. 551, (1932). (Pl. 1, Fig. 9; Pl. 3, Fig. 13).
Trichome 4.2–4.5 μm in diameter, heterocyst slightly broader than vegitative cell, 5.7 μm in width, 4.5 μm in length. Mizukumi Stream (mat sample No. 2).

Nodularia quadrata FRITSCH: GEITLER, Süsswasserflora. **12**, 288, Fig. 340, (1925). (Pl. 1, Fig. 10; Pl. 3, Fig. 13).
Trichomes straight, 4 μm in width, constricted at the junction; cells barrel-shape, 3.1–4.4 μm in length; heterocyst quadrate, 3.8–5.6 μm in width; sheath distinct. Mizukumi Stream, L. Kamome, L. Kamome-kami-ike and L. Ebosi (mat sample Nos. 2, 4, 7 and 9).

Nostoc sphaericum VAUCH.: GEITLER, Süsswasserflora. **12**, 303, Fig. 352, (1925). (Pl. 1, Fig. 11; Pl. 3, Fig. 15).
Colony spherical, yellowish brown; trichomes loosely entangled in the envelope; each cell without an individual sheath; cells 3–4.6 μm in width; heterocyst spherical, 6 μm in width. Pond 2 (mat sample No. 5).

Oscillatoria tenuis AG.: GEITLER, Süsswasserflora. **12**, 362, Figs. 427, 428a, (1925). (Pl. 1, Fig. 12; Pl. 3, Fig. 16).

Trichomes straight, slightly constricted at the junction, 8 μm in width; cells 2–5 μm in length and with granules along the cross wall. L. Kamome (water sample No. 5).

Phormidium antarcticum W. & G. S. WEST: GEITLER, Süsswasserflora. **12**, 381, Fig. 480, (1925). (Pl. 1, Fig. 13; Pl. 3, Fig. 17).
Trichomes twisted irregularly, not constricted at the junction; cells 0.5 μm in width, 1.5 μm in length. Mizukumi Stream and L. Taratine (mat sample Nos. 1, 3 and 9).

Phormidium bohneri SCHMIDLE: GEITLER, Süsswasserflora. **12**, 382, (1925). (Pl. 1, Fig. 14; Pl. 4, Fig. 1).
Trichomes curved, not constricted at the junction and without granules; cells 1.1–1.8 μm in width, 1.2–1.8 μm in length. Mizukumi Stream, L. Kamome and L. Taratine (water sample No. 7; mat sample Nos. 1, 2, 3 and 9).

Phormidium fragile (MENEGH.) GOM.: GEITLER, Süsswasserflora. **12**, 378, Fig. 470, (1925). (Pl. 1, Fig. 15; Pl. 4, Figs. 2, 3).
Trichomes nearly straight, constricted at the junction, attenuated toward the end; cells 1.5 μm in width, 1.5–3 μm in length and with granules at the cross wall. Mizukumi Stream and Pond 3 (mat sample Nos. 3 and 6).

Phormidium frigidum FRITSCH: GEITLER, Süsswasserflora. **12**, 377, Fig. 468, (1925). (Pl. 1, Fig. 16; Pl. 4, Fig. 4).
Trichomes distinctly constricted at the junction, not attenuated toward the end; cells 0.5–0.8 μm in width, 1.8–2 μm in length, with granules along the cross walls. Mizukumi Stream, Pond 2 and L. Taratine (mat sample Nos. 2, 6 and 9).

Phormidium incrustatum (NÄG.) GOM.: GEITLER, Süsswasserflora. **12**, 386, Fig. 490, (1925). (Pl. 1, Fig. 17; Pl. 4, Fig. 5).
Trichomes not constricted at the junction; cells 4–4.4 μm in width, 2.5–4.5 μm in length, nearly quadrate in shape. L. Kamome (water sample No. 7).

Phormidium uncinatum (AG.) GOM.: GEITLER, Süsswasserflora. **12**, 388, Fig. 493, (1925). (Pl. 1, Fig. 18; Pl. 4, Figs. 6, 7).
Trichomes 5–7.5 μm in width, not constricted at the junction, gradually attenuated toward the end, the end cell forms a calyptra; the length of the cells 1/2–1/5 times the width. L. Kamome (water sample No. 7; mat sample No. 7).

Lyngbya aerugineo-coerulea (KÜTZ.) GOM.: GEITLER, Süsswasserflora. **12**, 408, Fig. 524, (1925). (Pl. 1, Fig. 19; Pl. 4, Fig. 8).
Trichomes straight, about 4.4 μm in width, not constricted at the junction and not attenuated toward the end; the length of the cells 1–1/2 times the width; sheath thick, 8.8 μm in width. L. Ebosi (mat sample No. 4).

Lyngbya martensiana MENEGH.: GEITLER, Süsswasserflora. **12**, 405, Fig. 521a, (1925). (Pl. 1, Fig. 20; Pl. 4, Fig. 9).
Trichomes straight, 9.5 μm in width, not constricted at the junction and not attenuated; cells with or without granules along the cross walls; the length of the cells 1/2–1/4 times the width. L. Kamome-kami-ike (mat sample No. 8).

Lyngbya purpurea (HOOK. *et* HARV.) GOM.: GEITLER, Süsswasserflora. **12**, 403, (1925). (Pl. 1, Fig. 21; Pl. 4, Fig. 10).
Trichomes violet in color, not constricted at the junction; cells about 1.5 μm in width. Pond 2 (mat sample No. 5).

Lyngbya semiplana AG.: GEITLER, Kryptogamen-Flora. **14**, 1061, Fig. 672a,

(1932). (Pl. 1, Fig. 22; Pl. 4, Fig. 11).
Trichomes straight, 7.5 μm in width, without constriction at the junction and not attenuated toward the end; the length of the cells slightly shorter than that in Geitler's description, being about 1/7–1/8 of the width. Pond 3 (mat sample No. 6).

Schizothrix coriacea (KÜTZ.) GOM.: GEITLER, Süsswasserflora. **12**, 417, Fig. 534, (1925). (Pl. 1, Fig. 23; Pl. 3, Fig. 6; Pl. 4, Fig. 12).
Mucous sheath distinct, colorless, contains a few trichomes; trichomes constricted at the junction and rarely branched; cells about 1.2 μm in width, 2.5–3 μm in length. Pond 2, L. Kamome and L. Taratine (mat sample Nos. 5, 8 and 9).

Chrysophyceae

Paraphysomonas vestita (STOKES) DE SAEDELEER: TAKAHASHI, Electron microscopical studies of the Synuraceae (Chrysophyceae) in Japan. 81, Fig. 60, Pl. 62, Figs. 266–270, (1978). (Pl. 6, Fig. 1).
Cells spherical or elliptical, 7.7–11.5 μm across, colorless, each cell covered with numerous scales with long straight central spines, spine longer than that of type, 5.6–10 μm, basal disk of scale 1.2–1.7 μm across. L. Midori (water sample Nos. 4 and 5).

Bacillariophyceae

Hantzschia amphioxys (EHR.) GRUN.: HUST., Süsswasser-Flora. **10**, 394, Fig. 747, (1930). (Pl. 2, Fig. 1; Pl. 4, Fig. 13).
Transverse striations 15 in 10 μm; cells about 65 μm in length, 7.5 μm in width. Mizukumi Stream, Pond 1 and L. Taratine (water sample Nos. 1 and 3; mat sample Nos. 1, 2 and 9).

Navicula muticopsis VAN HEURCK: FUKUSHIMA *et al.*, A preliminary report on the diatom from East Ongul Island. Nankyoku Shiryô (Antarct. Rec.). **46**, 127, Pl. 2, Figs. A–E, (1973). (Pl. 2, Fig. 2; Pl. 4, Fig. 14).
Transverse striations 13–14 in 10 μm; cells 20–25 μm in length, 6–10 μm in width. Mizukumi Stream, Pond 1, L. Kamome and L. Taratine (water sample Nos. 3 and 7; mat sample Nos. 1, 2 and 9).

Navicula sp. (Pl. 2, Fig. 3; Pl. 4, Fig. 15).
Cells 21–36 μm in length, 10.6–12.5 μm in width. Mizukumi Stream, L. Ebosi, L. Midori, L. Kamome and L. Taratine (water sample Nos. 4, 5 and 6; mat sample No. 3).

Pinnularia borealis EHR.: HUST. Süsswasser-Flora. **10**, 326, Fig. 597, (1930). (Pl. 2, Fig. 4; Pl. 4, Fig. 16).
Transverse striations 5 in 10 μm; cells 33 μm in length, 11 μm in width. Mizukumi Stream (water sample Nos. 1 and 2; mat sample No. 3).

Chlorophyceae

Sphaerocystis schroeteri CHODAT var. *nivalis* FRITSCH, J. Linn. Soc. London, Bot., **11**, 123, (1910). (Pl. 2, Fig. 5; Pl. 4, Figs. 17, 18).
Colony spherical, contains 4–16 cells in the common envelope; cells elliptical in shape, 7–13.8 μm in length, 8.1–10 μm in width; chloroplast with one pyrenoid. Mizukumi Stream (mat sample No. 3).

Palmodictyon viride KÜTZ.: PRESCOTT, Algae of the Western Great Lakes area. 85, Pl. 4, Figs. 5–6, (1951). (Pl. 2, Fig. 6; Pl. 5, Fig. 1).

Colony filamentous; cells spherical or elliptical in shape, 4–5 μm in diameter, arranged in 1–2 rows; each cell with an individual envelope. Mizukumi Stream (mat sample No. 3).

Hormidium sp. (Pl. 2, Fig. 7; Pl. 5, Fig. 2).
Threads cylindrical, 6.5–7 μm in diameter; cells 12 μm in length, chloroplast parietal with one pyrenoid. Mizukumi Stream (mat sample No. 3).

Ulothrix mucosa THURET: PRINTZ, Die Chaetophoralen der Binnengewässer. Hydrobiologia, **26**, 11, Tab. I, 6, (1964). (Pl. 2, Fig. 8; Pl. 5, Figs. 3, 4).
Cells with thick and mucous sheath, cylindrical in shape, 3.2–9.6 μm in width; the length about 0.5–2 times the width; threads 8–16 μm in width. Mizukumi Stream (mat sample No. 3).

Microspora stagnorum (KÜTZ.) LAGERH.: HEERING, Süsswasserflora. **6**, 151, Fig. 212, (1914). (Pl. 2, Fig. 9; Pl. 5, Figs. 5, 6).
Cells 7.5 μm in width, 17 μm in length; cell wall thin; H shape structure indistinct. Mizukumi Stream (mat sample Nos. 1 and 2).

Pleurococcus antarcticus W. & G. S. WEST, Rep. Sci. Invest. Br. Antarct. Exped., 1907–09, **1**(7), 276, Pl. 24, Figs. 49–51, (1911). (Pl. 2, Fig. 10; Pl. 5, Figs. 7, 8).
Cells about 13.8–21.5 μm in diameter without the mucous envelope, up to 27.5 μm in diameter with the envelope; each cell with one pyrenoid; mucous envelope thick and stratified. Present species found in the gelatinous substratum. Mizukumi Stream, L. Kamome and L. Taratine (water sample Nos. 7 and 9; mat sample Nos. 1, 2, 3, 8 and 9).

Cosmarium cucurbita BRÈB.: W. & G. S. WEST, Monogr. Br. Desm., **3**, 106, Pl. 73, Figs. 31–33, (1908). (Pl. 2, Fig. 11; Pl. 5, Figs. 9, 10).
Cells subcylindrical, with shallow median constriction, 34–40 μm in length and 17.5–20 μm in width. Mizukumi Stream, Pond 3, L. Kamome and L. Kamome-kami-ike (water sample Nos. 3 and 7; mat sample No. 6).

Of the 34 taxa of freshwater algae identified in the present study, 11 taxa were common to both water samples and algal mat samples, 20 taxa (15 Cyanophycean taxa and 5 Chlorophycean taxa) were found only in algal mat samples, and three taxa (*Oscillatoria tenuis*, *Phormidium incrustatum* and *Paraphysomonas vestita*) were found only in water samples. *O. tenuis* was described as a free-floating or epiphytic alga by GEITLER (1925), and *P. incrustatum* was found on the surface of sands at Yukidori Valley (HIRANO, 1979). These 2 species, therefore, were not euplankton. *Paraphysomonas vestita* also has an epiphytic stage somewhere in its life cycle. Although only the planktonic form was detected in the present study in water samples from Lake Midori, the present results confirm the observations by previous workers that the algal flora in Antarctic inland waters in composed mainly of epiphytic or epipelic algae (FUKUSHIMA, 1959; HEYWOOD, 1972; AKIYAMA, 1974; SEABURG *et al.*, 1979; SIMMONS *et al.*, 1979).

FUKUSHIMA (1959) recorded *Chlamydomonas* from some ponds in East Ongul Island, and AKIYAMA (1974) noted the occurrence of *Staurastrum* spp. and *Cosmarium* spp. from ponds in East Ongul Island, Langhovde, Skarvsnes and Skallen. *Chlamydomonas* and *Staurastrum*, both planktonic, were not observed in the present water samples. This would indicate either the specificity among the inland waters with

respect to the algal flora, or simply the limitations in the sampling procedures to provide reasonably complete list of algae. No single procedures would be sufficient to provide full information on the algal flora and its seasonal and yearly changes. Although we have made extensive examinations using both light microscope and electron microscope on samples fixed immediately after collection, some species represented by very small numbers might, for example, have escaped the detection. Cultivation of samples and enrichment of individual species, possibly in forms of the colonies, might become desirable in the future.

References

AKIYAMA, M. (1967): On some Antarctic terrestrial and subterranean algae from the Ongul Islands, Antarctica. Shimane Daigaku Kyôiku Gakubu Kiyô (Mem. Fac. Educ. Shimane Univ.), **1**, 36–56.

AKIYAMA, M. (1968): Nankyoku Onguru Tô san dojô sôrui mokuroku (A list of terrestrial and subterranean algae from the Ongul Islands, Antarctica). Nankyoku Shiryô (Antarct. Rec.), **32**, 71–77.

AKIYAMA, M. (1974): Nankyoku Ryutsuo-Horumu Wan engan rogan-tai no sôrui shokusei (yohô) (A preliminary note on some algae found in the ice-free area of the coastal region of Lützow-Holm Bay, Antarctica). Shimane Daigaku Kyôiku Gakubu Kiyô (Mem. Fac. Educ. Shimane Univ.), **8**, 37–50.

FORTI, A. (1907): Myxophyceae. Sylloge Algarum, ed. by J. B. DE TONI. Padova, 761 p.

FRITSCH, F. E. (1910): Freshwater algae collected in the South Orkney by Mr. R. N. Rudmose Brown. B., Sc., of the Scottish National Antarctic Expedition, 1902–1904. J. Linn. Soc. London, Bot., **11**, 293–338.

FUKUSHIMA, H. (1959): Onguru Tô no seibutsu gaihô. Tokuni tansui sôrui ni tsuite (General report on fauna of the Ongul Islands, Antarctica, especially on freshwater algae). Yokohama Shiritsu Daigaku Kiyô (J. Yokohama Munic. Univ., Ser. C), **31**, 1–10.

FUKUSHIMA, H. (1961): Algal vegetation in the Ongul Islands, Antarctica. Nankyoku Shiryô (Antarct. Rec.), **11**, 149–151.

FUKUSHIMA, H., WATANUKI, T. and KO-BAYASHI, T. (1973): Higasi-Onguru Tô yori eta keisô (yohô) (A preliminary report on the diatom from East Ongul Island). Nankyoku Shiryô (Antarct. Rec.), **46**, 125–129 with 3 pl.

FUKUSHIMA, H., WATANUKI, T. and KO-BAYASHI, T. (1974): Nisi-Onguru Tô Ô-ike yori eta keisô (Diatoms from Ô-ike, West Ongul Island, Antarctica). Nankyoku Shiryô (Antarct. Rec.), **50**, 35–39 with 2 pl. and 1 fig.

FUKUSHIMA, H., WATANUKI, T. and KO-BAYASHI, T. (1975): Higasi-Onguru Tô yori eta keisô (yohô) 2 (Preliminary report on the diatom from East Ongul Island). Nankyoku Shiryô (Antarct. Rec.), **53**, 82–87 with 2 pl.

GEITLER, L. (1925): Cyanophyceae. Die Süsswasserflora Deutschlands, Österreichs und der Schweiz, **12**, ed. by A. PASCHER. Jena, G. Fischer, 450 p.

GEITLER, L. (1932): Cyanophyceae. Kryptogamen-Flora, von Deutschland, Österreich und der Schweiz, **14**, ed. by RABENHORST. Leipzig, Akademische Verlagsgesellschaft, 1196 p.

HEERING, W. (1914): Ulotrichales, Mikrosporales, Oedogoniales. Die Süsswasserflora Deutschlands, Österreichs und der Schweiz, **6**, Chlorophyceae, 3, ed. by A. PASCHER. Jena, G. Fischer, 250 p.

HEYWOOD, R. B. (1972): Antarctic limnology; A review. Br. Antarct. Surv. Bull., **29**, 35–65.

HIRANO, M. (1959): Notes on some algae from the Antarctic collected by the Japanese Antarctic Research Expedition. Biol. Results Jap. Antarct. Res. Exped., **3**, 1–13.

HIRANO, M. (1961): Onguru Tô oyobi Ranguhobude fukin no tansuisô (The algae of Syowa Base and Langhovde area (Abstract)). Nankyoku Shiryô (Antarct. Rec.), **11**, 162–164.

HIRANO, M. (1965): Freshwater algae in the Antarctic regions. Biogeography and Ecology in Antarctica, ed. by J. VAN MIEGHEM and P. VAN OYE. The Hague, Dr. W. Junk, 127–193 (Monogr. Biol., Vol. 15).

HIRANO, M. (1979): Freshwater algae from Yukidori Zawa, near Syowa Station, Antarctica. Mem. Natl Inst. Polar Res., Spec. Issue, **11**, 1–25 with 9 pl.

HUSTEDT, F. (1930): Bacillariophyta (Diatomeae). Die Süsswasser-Flora Mitteleuropas, **10**, ed. by A. PASCHER. Jena, G. Fischer, 466 p.

KARASAWA, S. and FUKUSHIMA, H. (1977): Diatom flora and environmental factors in some fresh water ponds of East Ongul Island. Nankyoku Shiryô (Antarct. Rec.), **59**, 46–53.

NEGORO, K. (1961): Diatoms from some inlandwaters of Antarctica (preliminary report). Nankyoku Shiryô (Antarct. Rec.), **11**, 152–153.

OHTANI, S. (1986): Epiphytic algae on mosses in the vicinity of Syowa Station, Antarctica. Mem. Natl Inst. Polar Res., Spec. Issue, **44**, 209–219.

PRESCOTT, G. W. (1951): Algae of the Western Great Lakes area. Cranbrook Inst. Sci. Bull., **31**, 946 p.

PRESCOTT, G. W. (1979): A contribution to a bibliography of Antarctic and subantarctic algae. Bibliot. Phycolog., Bd. **45**, Vaduz, J. Cramer, 312 p.

PRINTZ, H. (1964): Die Chaetophoralen der Binnengewässer, Eine systematische Übersicht. Hydrobiologia, **24**, 1–376.

SEABURG, K. G., PARKER, B. C., PRESCOTT, G. W. and WHITFORD, L. A. (1979): The algae of Southern Victoria Land, Antarctica. Bibliot. Phycolog., Bd. **46**, Vaduz, J. Cramer, 169 p.

SIMMONS, G. M., Jr., PARKER, B. C., ALLUNUTT, F. C. T., BROWN, D. P., CATHEY, D. D. and SEABURG, K. G. (1979): Ecosystem comparisons of oasis lakes and soils. Antarct. J. U. S., **14**, 181–183.

TAKAHASHI, E. (1978): Electron microscopical studies of the Synuraceae (Chrysophyceae) in Japan. Taxonomy and Ecology. Tokyo, Tokai Univ. Press, 194 p.

WATANABE, A., FUKUSHIMA, H., FUJITA, Y., KIYOHARA, T. and ISHIKAWA, M. (1961): Some remarks on the cultivation of microalgae collected in the Ongul Islands and adjacent areas. Nankyoku Shiryô (Antarct. Rec.), **11**, 154–155.

WEST, W. and WEST, G. S. (1908): A monograph of the British Desmidiaceae. **3**. London, Ray Soc., 273 p.

WEST, W. and WEST, G. S. (1911): Freshwater algae. Rep. Sci. Invest. Br. Antarct. Exped., 1907–09, **1**(7), 263–298.

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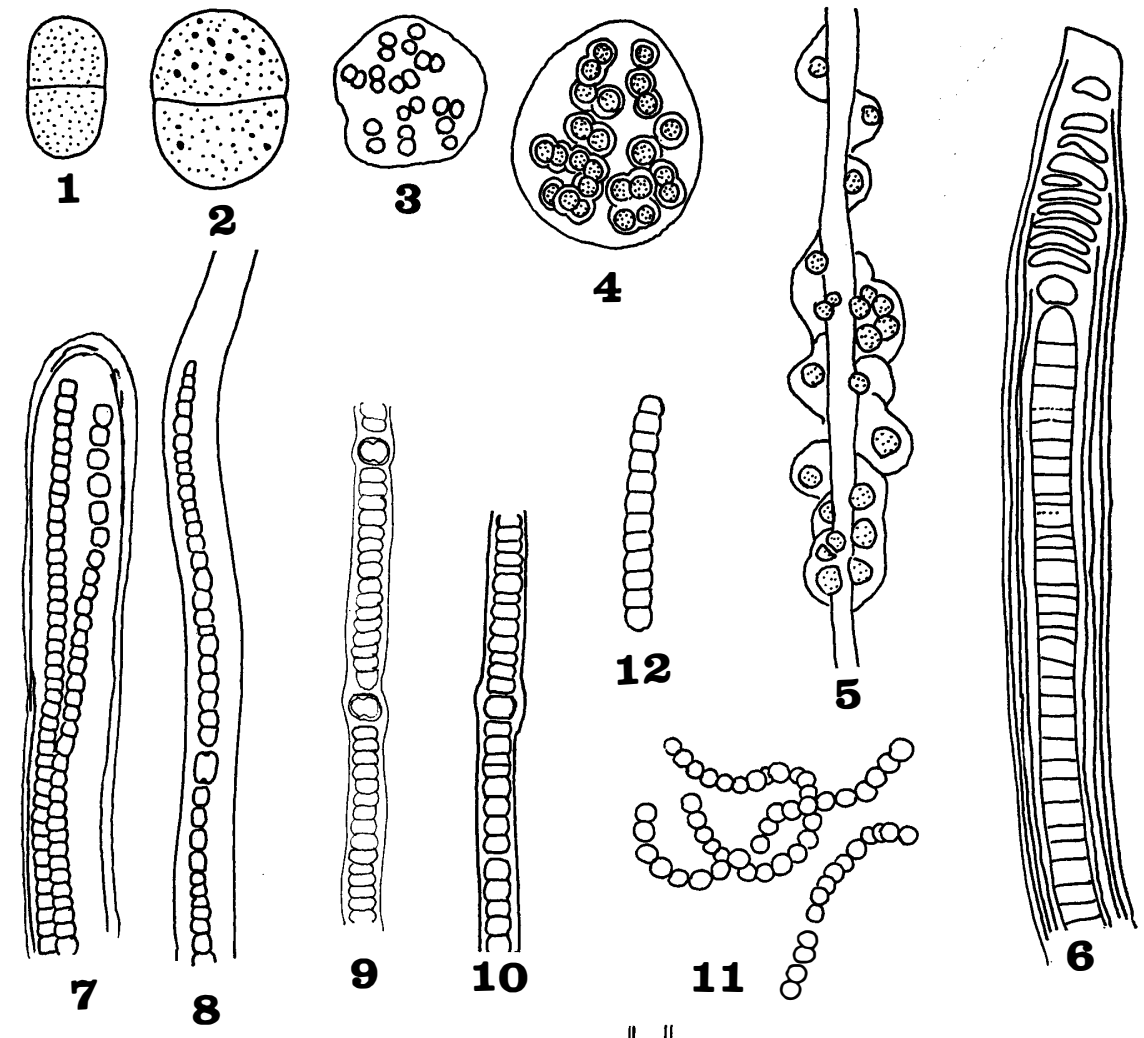
Plate 1

Fig. 1. *Synechococcus aeruginosus* NÄG.
Fig. 2. *S. maior* SCHROETER
Fig. 3. *Chroococcus dispersus* (KEISSLER) LEMM.
Fig. 4. *Gloeocapsa ralfsiana* (HARV.) KÜTZ.
Fig. 5. *Xenococcus schousboei* THUR.
Fig. 6. *Dichothrix orsiniana* (KÜTZ.) BORN. *et* FLAH.
Figs. 7–8. *Hydrocoryne spongiosa* SCHWABE
Fig. 9. *Nodularia harveyana* THUR.
Fig. 10. *N. quadrata* FRITSCH
Fig. 11. *Nostoc sphaericum* VAUCH.
Fig. 12. *Oscillatoria tenuis* AG.
Fig. 13. *Phormidium antarcticum* W. & G. S. WEST
Fig. 14. *P. bohneri* SCHMIDLE
Fig. 15. *P. fragile* (MENEGH.) GOM.
Fig. 16. *P. frigidum* FRITSCH
Fig. 17. *P. incrustatum* (NÄG.) GOM.
Fig. 18. *P. uncinatum* (AG.) GOM.
Fig. 19. *Lyngbya aerugineo-coerulea* (KÜTZ.) GOM.
Fig. 20. *L. martensiana* MENEGH.
Fig. 21. *L. purpurea* (HOOK. & HARV.) GOM.
Fig. 22. *L. semiplana* AG.
Fig. 23. *Schizothrix coriacea* (KÜTZ.) GEITLER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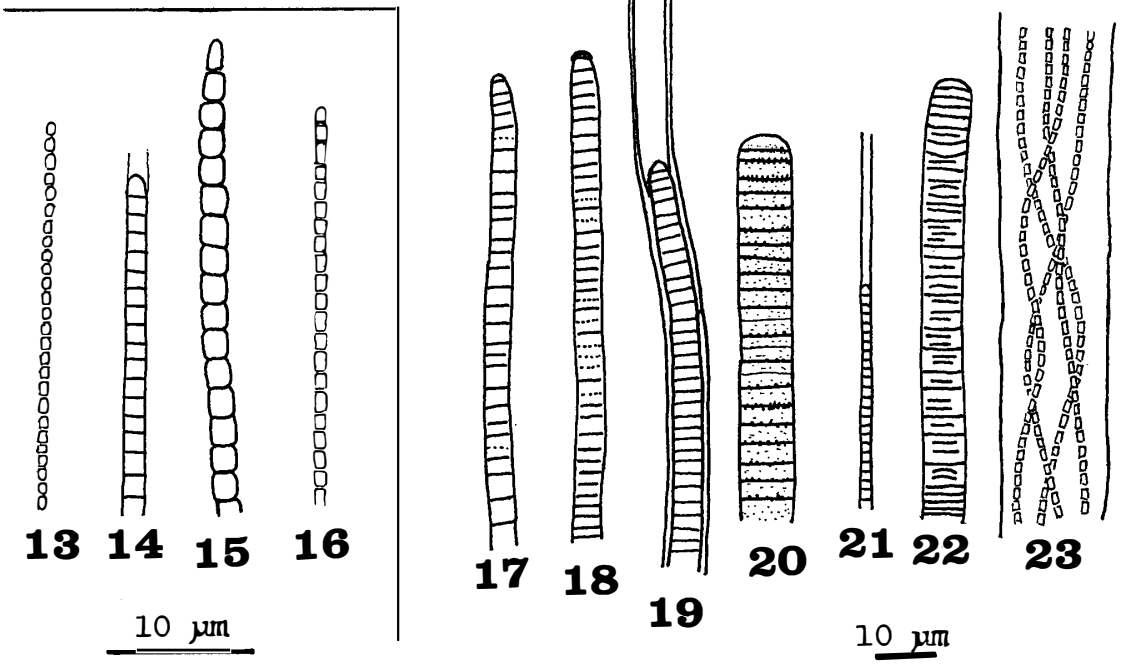
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Plate 2

Fig. 1. *Hantzschia amphioxys* (EHR.) GRUN.
Fig. 2. *Navicula muticopsis* VAN HEURCK
Fig. 3. *N.* sp.
Fig. 4. *Pinnularia borealis* EHR.
Fig. 5. *Sphaerocystis schroeteri* CHODAT var. *nivalis* FRITSCH
Fig. 6. *Palmodictyon viride* KÜTZ.
Fig. 7. *Hormidium* sp.
Fig. 8. *Ulothrix mucosa* THURET
Fig. 9. *Microspora stagnorum* KÜTZ.
Fig. 10. *Pleurococcus antarcticus* W. & G. S. WEST
Fig. 11. *Cosmarium cucurbita* BRÈB.

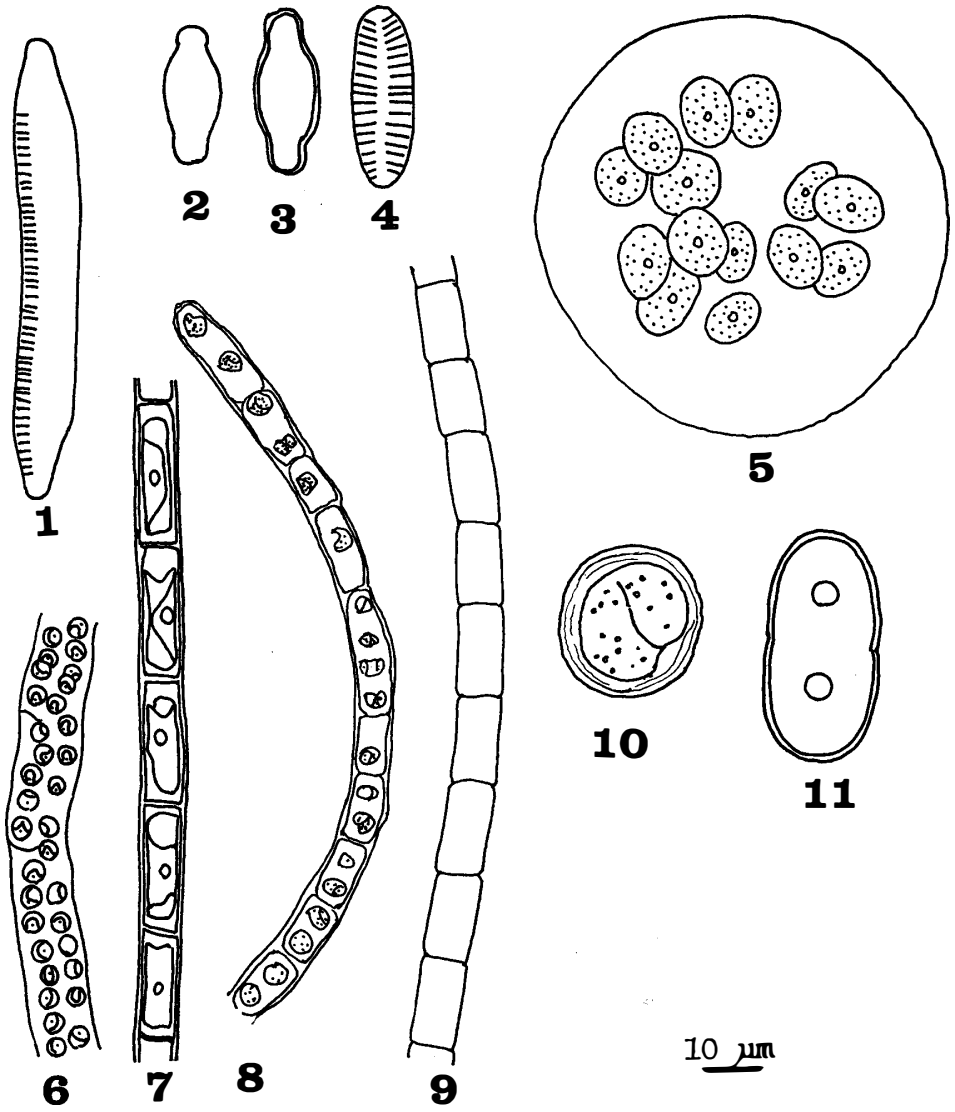
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Plate 3

Figs. 1–3. *Synechococcus aeruginosus* NÄG.
Figs. 4–5. *S. maior* SCHROETER
Fig. 6. *Chroococcus dispersus* (KEISSLER) LEMM.
Fig. 7. *Gloeocapsa ralfsiana* (HARV.) KÜTZ.
Fig. 8. *Xenococcus schousboei* THUR., attached to *Schizothrix coriacea.*
Figs. 9–10. *Dichothrix orsiniana* (KÜTZ.) BORN. & FLAH.
Fig. 11–12. *Hydrocoryne spongiosa* SCHWABE
Fig. 13. *Nodularia harveyana* THUR.
Fig. 14. *N. quadrata* FRITSCH
Fig. 15. *Nostoc sphaericum* VAUCH.
Fig. 16. *Oscillatoria tenuis* AG.
Fig. 17. *Phormidium antarcticum* W. & G. S. WEST

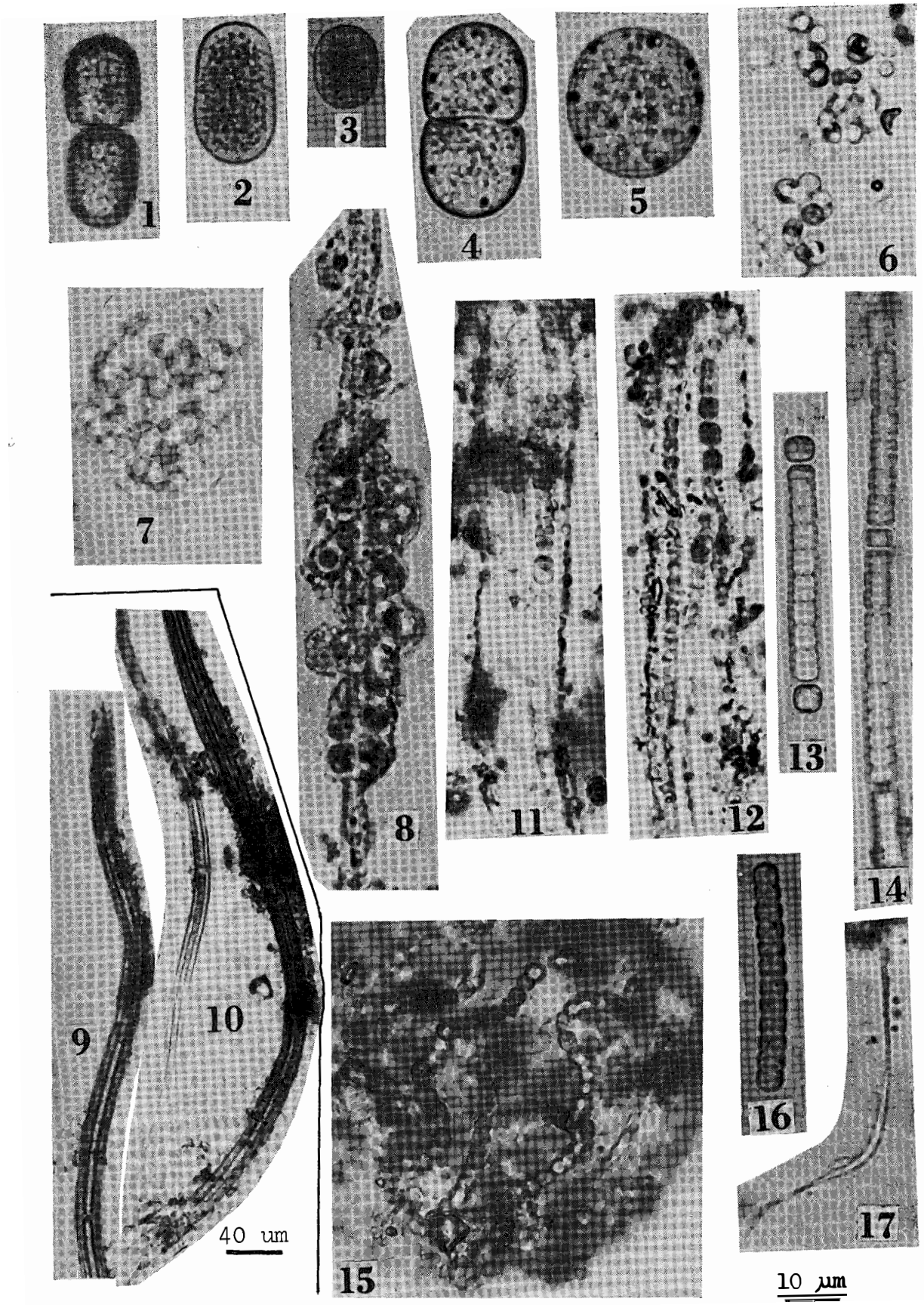
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Plate 4

Fig. 1. *Phormidium bohneri* SCHMIDLE
Figs. 2–3. *P. fragile* (MENEGH.) GOM.
Fig. 4. *P. frigidum* FRITSCH
Fig. 5. *P. incrustatum* (NÄG.) GOM.
Figs. 6–7. *P. uncinatum* (AG.) GOM.
Fig. 8. *Lyngbya aerugineo-coerulea* (KÜTZ.) GOM.
Fig. 9. *L. martensiana* MENEGH.
Fig. 10. *L. purpurea* (HOOK. & HARV.) GOM.
Fig. 11. *L. semiplana* AG.
Fig. 12. *Schizothrix coriacea* (KÜTZ.) GEITLER
Fig. 13. *Hantzschia amphioxys* (EHR.) GRUN.
Fig. 14. *Navicula muticopsis* VAN HEURCK
Fig. 15. *Navicula* sp.
Fig. 16. *Pinnularia boralis* EHR.
Figs. 17–18. *Sphaerocystis schroeteri* CHODAT var. *nivalis* FRITSCH

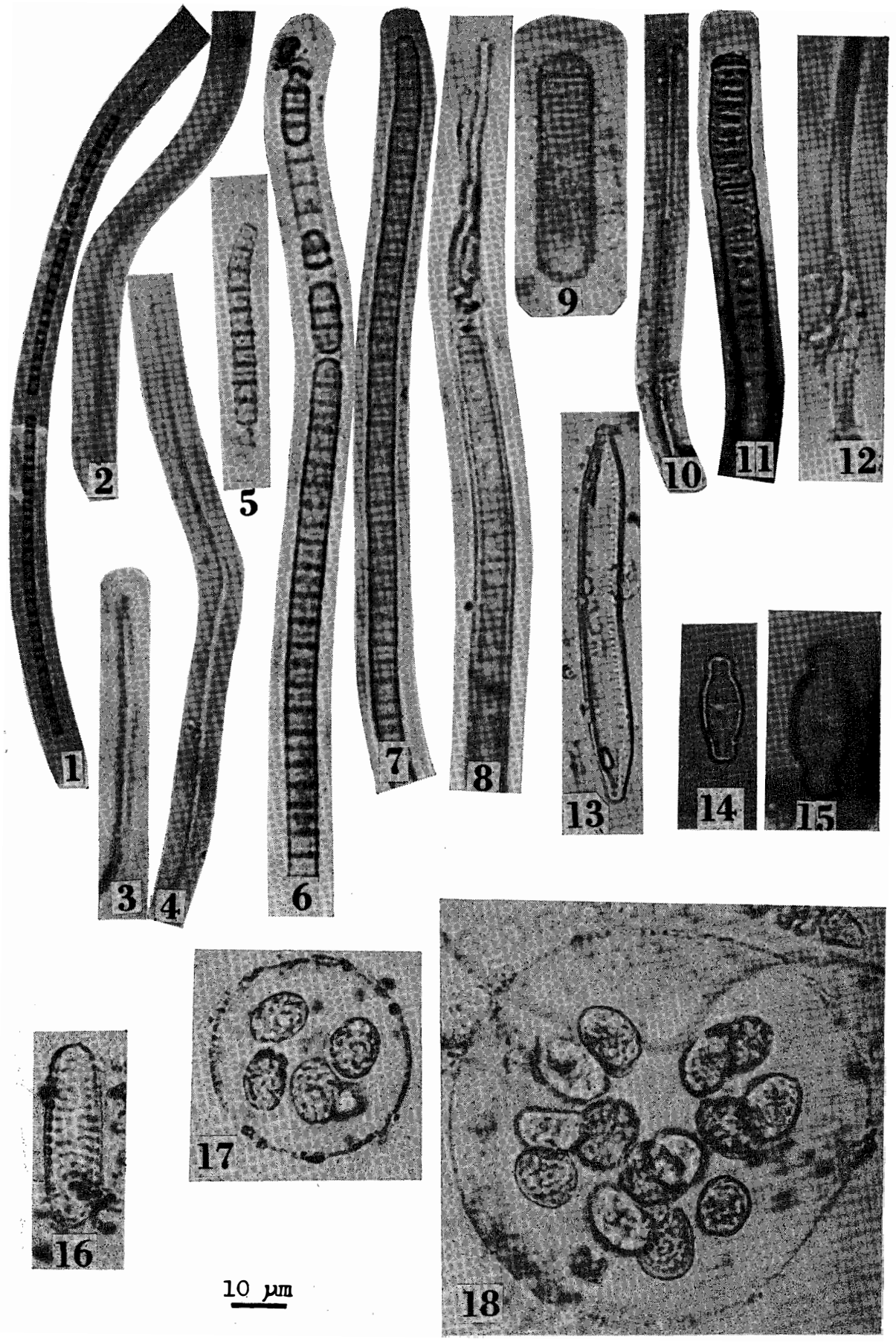
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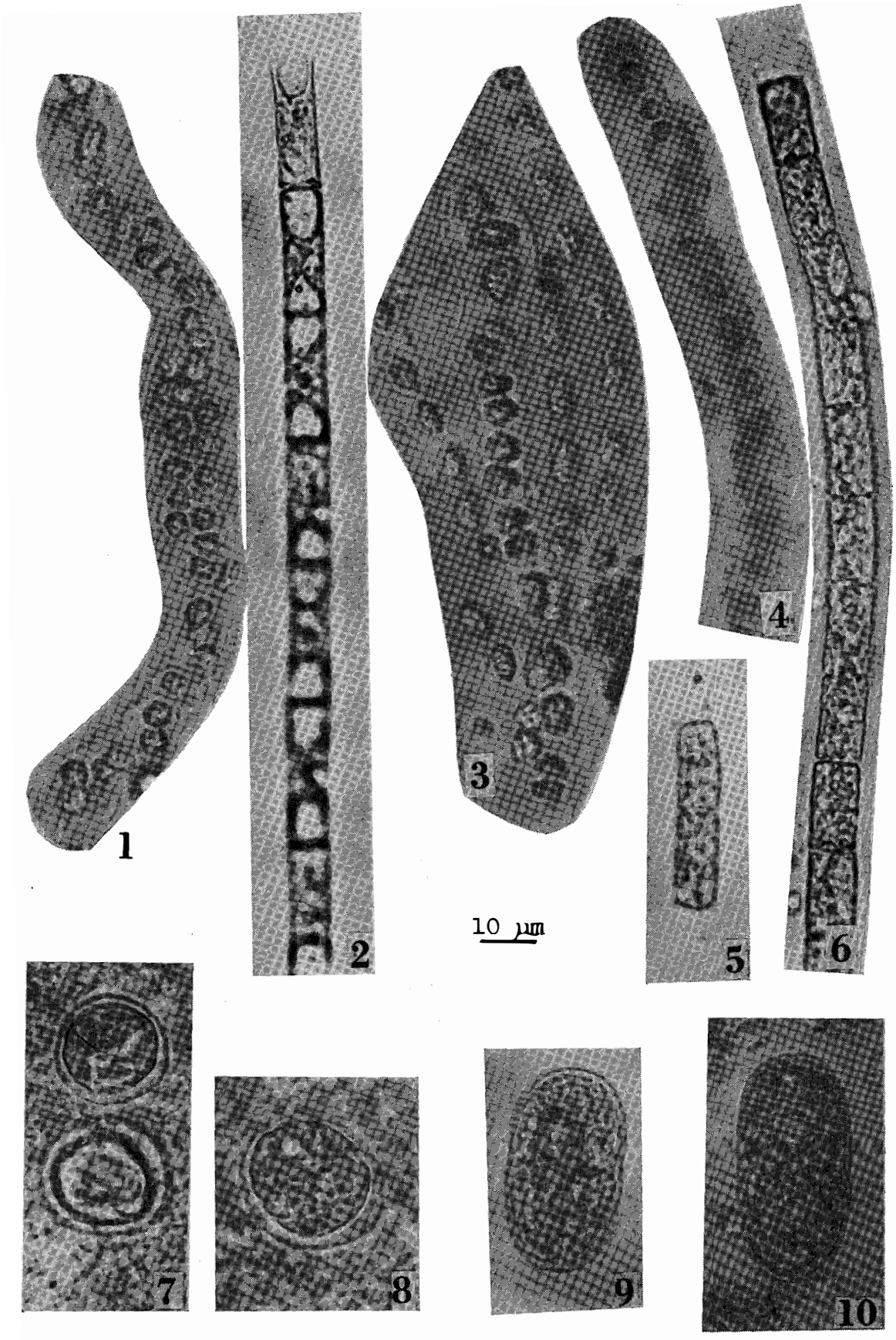
Plate 5

Fig. 1. *Palmodictyon viride* KÜTZ.
Fig. 2. *Hormidium* sp.
Figs. 3–4. *Ulothrix mucosa* THURET
Figs. 5–6. *Microspora stagnorum* KÜTZ.
Figs. 7–8. *Pleurococcus antarcticus* W. & G. S. WEST
Figs. 9–10. *Cosmarium cucurbita* BRÈB.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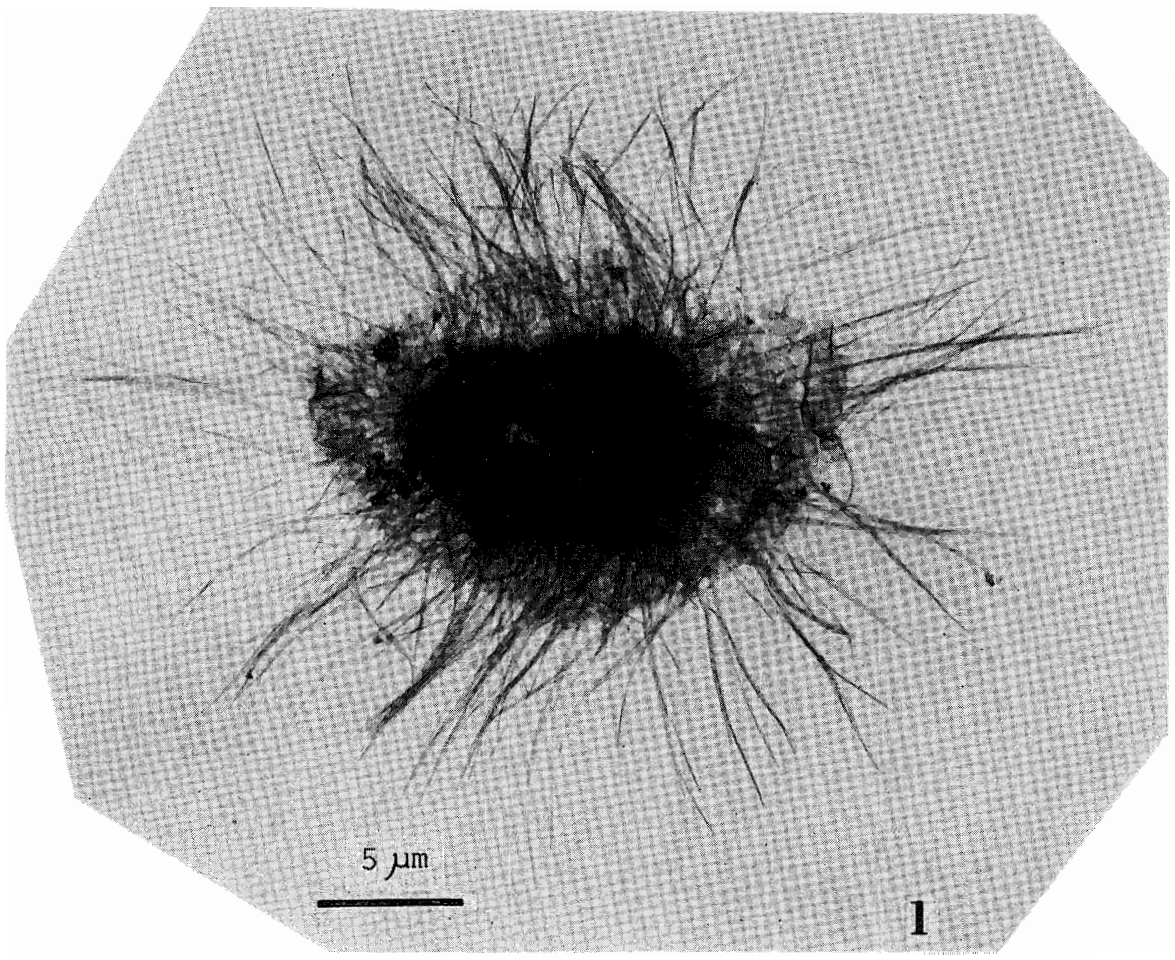

Plate 6

Fig. 1. *Paraphysomonas vestita* (STOKES) DE SAEDELEER