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ON SOME ANTARCTIC TERRESTRIAL AND SUBTERRANEAN ALGAE**

By

Masaru AKIYAMA*

Introduction

From the beginning of the nineteenth century, a good deal of attention has been paid to the study of antarctic freshwater algae concerning with their distribution, ecology and taxonomy. Recently, the details of the studies on the biogeography and ecology of the antarctic freshwater algae have been reviewed by HIRANO, M. (1965). In Japan, several reports on the freshwater algae obtained from the Japanese Antarctic Rearch Expedition in the Ongul Islands and its adjascent regions have been published by several authors. On the algal vegetation of the Ongul Islands, FUKUSHIMA, H. (1959) described the general features of inland water algal flora and cryophytic algal flora. And also HIRANO, M. and NEGORO, K. reported the freshwater algae and diatoms from the Ongul Islands (cited from FUKUSHIMA, 1960). Later in 1964 and 1967 HADA, Y. reported the occurrence of *Chlamydomonas antarcticus* WILLE and *Chrysococcus antarcticus* HADA from Langhovde near the Ongul Islands. and also in 1963 and 1964, FUKUSHIMA, H. reported the ecological notes on some freshwater algae found in the McMurdo Station and the diatoms vegetation of Cape Royds, Antarctica.

We have as yet very little information as to the terrestrial and subterranean algal vegetation of the Antarctica, and also little is known to the cultural study on the antarctic soil.

In this paper the author wishes to make an account of soil terrestrial and subterranean algae found in the cultures of soil samples obtained from the Ongul Islands, Antarctica.

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* Department of Biology, Faculty of Education, Shimane University, Matsue, Japan.

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Materials and Methods

1) **Source of soil samples.** The soil samples used in this study were collected from the districts near the Syowa Station of the Japanese Antarctic Research Expedition in the Ongul Islands, Antarctica (Fig. 1.) by Professor Dr. Hiroshi FUKUSHIMA in January 1966.

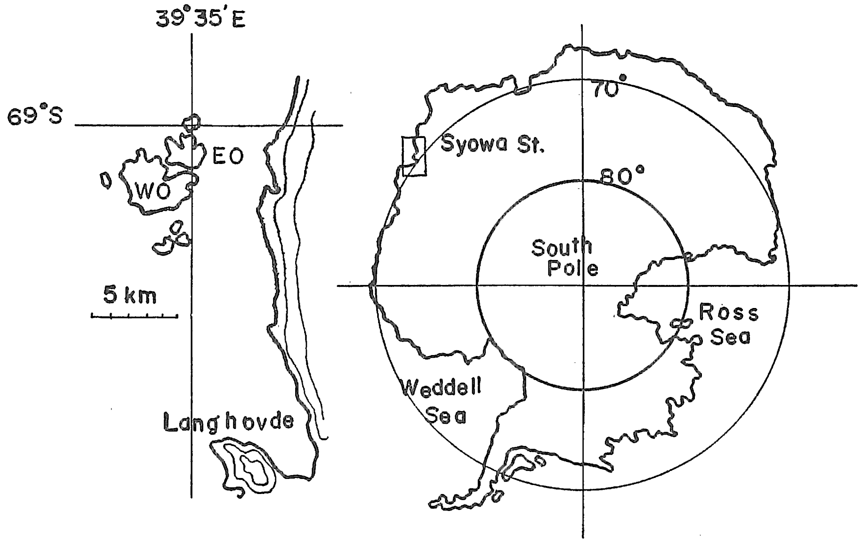

Fig. 1. Map of Antarctica showing the Syowa Station in the Ongul Islands. EO : East Ongul, WO : West Ongul.

2) **Methods of culture.** A crude culture or mixed culture is generally used in this study. Media used in this study are BRISTOL's agar (BOLD, 1949) and BRISTOL's solution containing soil extracts. Both artificial and natural light are used in illuminating the cultures and the intensity of the light reaching the cultures was generally ranging from ca. 200 to 300 lux. The cultures were set up at temperatures between ca. 10°C and 15°C, and 25°C and 30°C, respectively.

3) **Soil analyses.**

i) particle-size distribution is measured by sieving and pipette method.

ii) pH determination was made by means of a grass electrodes pH-meter, and the aqueous exudation of soils are extracted from 10 g of dried soil with 25 cc of distiled water.

iii) chlorinity is tested by MOHR's method.

iv) electric conductivity is tested by the TOA electric company's electric conductivity meter, and the aqueous exudation of soils are treated with the same method in the case of pH determination.

Results and Discussion

1) **Description of the Antarctic sandy soil feature.** Generally speaking, the

feature of surface structure of the antarctic earth composes of sandy elements, and the elementary component of the sand is originated from granite gneiss. As will be seen from table I and text-figures 2 and 3, the most part of examined soils contains scarcely any clayey elements. The certain chemical ingredients and physical conditions of such antarctic sandy soils are also given in table I.

TABLE I. Chemical and physical features of antarctic sandy soils.

station	location	date	pH	Ec μ℧/cm	Cl mg/1g soil	particle size distribution gravel	sand	mud %
3	East O.	24/I	7.6	120	0.10	28.0	68.65	3.35
6	West O.	30/I	6.5	2200	0.20	21.75	74.85	3.40
8	E. O.	29/I	6.4	33	0.05	57.50	42.08	0.42
16	W. O.	25/I	6.7	60	—	1.9	96.95	1.15
20	W. O.	26/I	6.9	170	0.13	25.2	60.55	14.25
24	W. O.	—	9.2	150	0.09	49.8	48.42	1.78
31	W. O.	25/I	5.8	210	0.34	16.5	82.38	1.12
maximum			9.2	2200	0.34	57.50	96.95	14.25
minimum	—	—	5.8	21	0.01	1.90	42.08	0.14
mean			6.6	245	0.14	21.4	75.1	3.5

2) **Results of cultures of antarctic soil algae.** Thirty-seven samples are examined by means of crude culture. And the cultures are started under the different conditions of temperature (from 10 to 15°C and 25 to 30°C). Pass through thirty to fourty days started from the cultures, many colonies of algae are occured under the both low and high temperature conditions. Table II gives the soil algae obtained from the cultures of each soil samples.

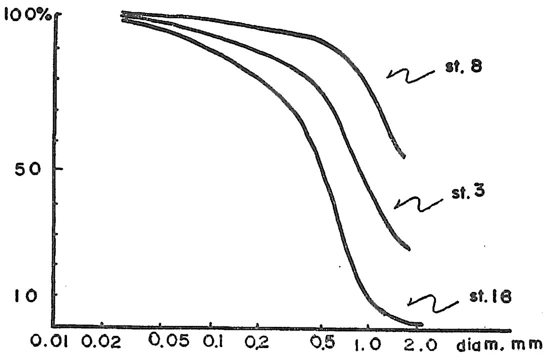

Fig. 2. Cumulative percentage of particle-size of antarctic sandy soils.

According to the table II, it should be noticed that the relatively common algae found in soils of the Ongul Islands are *Phormidium tenue* (MENEG.) GOM., *Nostoc punctiforme* (KUETZ.) HARIOT, *Bumilleria exilis* KLEBS *Stichococcus bacillaris* NAEG. and *Koliella helvetica* (KOL.) HINDÁK (syn. *Rhaphydonema helveticum* KOL.). The majority of the present algae are cosmopolitan species, exception of *Koliella helvetica* (KOL.) HINDÁK, one of the most famous cryophytic algae in alpine districts. On the contrary, such species as *Monodus subterraneus* PETERSEN and *Botrydiopsis arhiza* BORZI, one of the most commonly distributed algae, are relatively rare in this district. It is interest fact that the

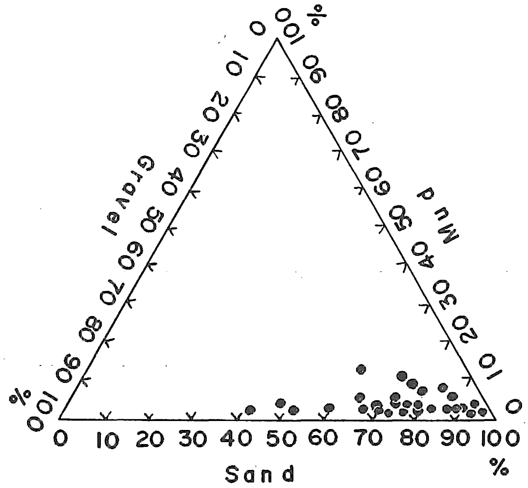

Fig. 3. Triangular graph of the gravel, sand and mud of antarctic sandy soils.

certain cryophytic algae such species as *Stichococcus bacillaris* NAEG., *Koliella helvetica* (KOL.) HINDÁK and *Navicula muticopsis* VAN HEURCK are relatively commonly distributed in this districts.

In quantitatively it is observed that the certain cyanophycean algae such species as *Phormidium tenue* (MENEG.) GOM. and *Nostoc punctiforme* (KUETZ,) HARIOT are remarkably developed in old cultures passed off three to five months. In relation to this fact, it is observed that many, large, natural growths or colonial patches of cyanophycean algae are occured under the natural condition in the Ongul Islands. Such macro-colonial natural growths of algae are generally composed of such cyanophycean algae as *Aphanocapsa grevillei* (HASS.) RABENH., *Synechococcus aeruginosus* NAEG. and *Nostoc punctiforme* (KUETZ.) HARIOT.

TABLE III. Temperature effect on culture of Antarctic algae.

station / condition / algae	14		18		21		25		29	
	−	+	−	+	−	+	−	+	−	+
Chlamydomonas		+	+	+	+				+	
Carteria						+				
Stichococcus	+		+		+		+	+		
Koliella	+		+	+	+		+	+	+	+
Hormidium					+					
Pseudo-Pleurococcus	+				+					
Monodus							+	+		+
Bumilleria	+		+		+			+	+	+
Phormidium		+	+		+	+	+	+		+
Nostoc		+	+		+			+		+
Navicula	+		+	+	+	+				

3) **A general consideration of soil algal vegetation of the Ongul Islands.** In 1965, HIRANO, M. reviewed the biogeography and ecology of the antarctic inland-water and snow algae. According to him, in the comparison between the algal floras of Antarctica and Europe, it is clearly that more than half of all antarctic algal species are also found in Europe. And he states that there is a close relationship between the algal floras of Europe and Antarctica. And he also pointed out that desmids and diatoms which are generally commonly distributed in arctic region are relatively rare in

TABLE II. Distribution of soil algae in the Ongul Islands.

algae \ station no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Chlamydomonas antarcticus																	
Ch. agloeformis														+		+	
Carteria simplex																	
Stichococcus bacillaris	+	+			+			+		+			+	+			
St. exiguus																	
Hormidium subtile	+	+															
Koliella helvetica				+	+							+	+	+		+	+
Chlorococcum sp.	+	+					+							+		+	+
Bracteacoccus irregularis	+																
Chlorella sp.											+						
Kentrosphaera bristolae		+															
Pseudo-Pleurococcus printzii	+											+	+	+			
Dictyosphaerium elegans																	+
Chlorosphaera antarcticus																	
Characium naegerii																	
Cosmarium cucurubita																	
Monodus subterraneus	+	+															
Botrydiopsis arhiza					+												
Bumilleria exilis								+					+	+			+
Monocilia viridis																+	
Pinnularia borealis	+	+												+			
Navicula muticopsis				+	+								+	+			
Hantzschia amphioxys																	
Synechocystis aquatilis																	
Synechococcus aeruginosus																	
Aphanocapsa grevillei		+															
Oscillatoria agardhii				+										+			
Osc. tenuis													+				
Phormidium tenue	+	+		+	+		+	+					+	+		+	+
Nostoc punctiforme	+	+	+	+			+	+		+				+	+	+	+
Tolypothrix bouteillei														+			
Tolypothrix fragilis	+	+						+									
frequency of occured species	10	10	1	5	5	0	3	5	0	2	1	2	7	12	1	6	6

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	Natural Growths
+				+							+									
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											+									
10	7	2	16	7	4	0	11	11	4	3	10	0	2	2	8	2	0	5	0	7

antarctic region.

On the soil algal vegetation, it is also recognized that there is a similarity of the fundamental algal composition of soil communities between Antarctica and northern hemisphare. However, desmidian and diatomaceous species are very rare in antarctic soil. Table IV gives the systematically summerized data of the antarctic soil algae.

From the table IV, it should be noticed that the soil algal community of Antarctica is relatively poor on the composition of that community.

TABLE IV. Comparison of the soil algal floras of Antarctica and the other regions.

CLASSES	England BRISTOL, 1920	England FRITSCH, 1942	Demmark PETERSEN, 1931	Italy GOLI, 1962	Japan AKIYAMA, 1965	Antarctica Ongul Isl.
CHLOROPHYCEAE	15	44(11)	46	11	68	16(1)
XANTHOPHYCEAE	4	10	7		13	4
BACILLARIOPHYCEAE	16	18	60	24	15	3
RHODOPHYCEAE		1			1	
CYANOPHYCEAE	22	21	8	16	34	9
EUGLENOPHYCEAE		1	1		2	
CHRYSOPHYCEAE		3				
Total	57	98 (desmids)	122	51	133	32

On the comparison between the antarctic soil algal flora and cryophytic flora of Japan and United States, it should be noticed from the comparative data given in table V that there is a similarity of the fundamental algal composition of both floras with the exception of Bacillariophyceae. Namely, in details, such algae as *Chlamydomonas antarcticus* WILLE, *Stichococcus bacillaris* NAEG., *Koliella helvetica* (KOL.) HINDÁK, *Pinnularia borealis* EHR. and *Hantzschia amphioxys* (EHR.) GRUN. forma *capitata* O. MUEL. which are commonly found in cryophytic flora, are also commonly recognized in antarctic soil flora. On the contrary, according to FUKUSHIMA (1963), many species of diatoms are recognized from the Japanese alpine snow-flora, however, only two species of diatoms are recognized from antarctic soils. But in the present state, we can not be concluded wether the rarity in the occurence of diatoms in antarctic soils is one of the peculiarity of soil algal community of this region or not.

Catalogue Raisonné

The following catalogue raisonnė includes sixteen species of Chlorophyceae, four species of Xanthophyceae, three species of Bacillariophyceae and nine species of Cyanophyceae. All totals twenty-eight genera and thirty-two species.

The arrangement of the genera, families and orders is generally based upon the system by G. M. SMITH (1950).

CHLOROPHYCEAE

Sixteen species of chlorophycean algae including three species of volvocalean algae, four species of ulotrichalean algae, one species of chaetophoralean alga, six species of

TABLE V. Comparison of the soil algal floras of Antarctica and cryophytic community.

CLASSES / orders	Cryoflora				Soil flora	
	U. S. A. GARRIC, 1965		Japan FUKUSHIMA, 1963		Antarctica	
CHLOROPHYCEAE	20		15		16	
Volvocales		2		4		3
Tetrasporales				1		
Ulotrichales		7		5		4
Chaetophorales						1
Chlorococcales		10		2		6
Chlorosphaerales		1				1
Zygnematales				3		1
CYANOPHYCEAE	2		5		9	
CHRYSOPHYCEAE			2			
BACILLARIOPHYCEAE			33		3	
ANTHOPHYCEAE					4	
Total	22		55		32	

chlorococcalean algae, one species of chlorosphaeralean alga and one species of zygnematalean alga are recognized.

Order Volvocales

Chlamydomonas antarcticus WILLE

HADA, 1964 : *Bull. Suzugamine Women's Coll.* II : 9, fig. 4.

Cells broadly ovate, with a small papilla; chloroplast a parietal cup, with a single basal pyrenoid; eye-spot anterior and lateral; 2 contractile vacuoles in the anterior end of cell; cells 15–22 μ long, 10–16 μ broad.

This alga is already known from the Ongul Islands by WATANABE and FUKUSHIMA in 1961, and by HADA in 1964 (cited from HADA, 1964).

Loc. West Ongul (No. 18, 22, 29).

Chlamydomonas agloeformis PASCHER

PASCHER, 1927 : Volvocales in PASCHER Süsswasserfl. Heft. 4 : 252, fig. 206.

Cells oblong to elliptical in top view and semi-plane-lenticular in side view, without anterior papilla; chloroplast a single parietal H-shaped, with a single central pyrenoid; 2 contractile vacuoles in the anterior end of cell; eye-spot anterior and lateral; cells 13–16 μ long, 6–7 μ broad, 4–5 μ high.

Loc. East and West Ongul (No. 14, 16, 36). New to Antarctica.

Carteria simplex PASCHER

PASCHER, 1927 : Volvocales in PASCHER Süsswasserfl. Heft 4 : 145, fig. 92.

Cells obovoid, with a small papilla, from which four flagella of equal length arise; chloroplast a thin parietal cup, with a single basal pyrenoid ; eye-spot anterior and lateral; cells 14–15 μ long, 8–9 μ broad.

The materials obtained from Antarctica is slightly smaller than the original description.

Loc. West Ongul (No. 25.). New to Antarctica.

Order Ulotrichales

Stichococcus bacillaris NAEG.

HAZEN, 1902 : *Mem. Torr. Bot. Cl.* 11 : 160, pl. 22, figs. 1–3; HEERING, 1914 : Chlorophyceae in PASCHER Süsswasserfl. Heft 6 : 52 ; RAMANATHAN, 1962 : Ulotrichales : 92, pl. 23, fig. D.

Cells cylindrical, short, solitary or united to form a short filament; chloroplast parietal without pyrenoid; cells 5–10 μ long, 2–4 μ broad.

Loc. East and West Ongul (No. 1, 2, 5, 8, 10, 13, 14, 18, 19, 21, 22, 25, 29, 33.).

Stichococcus exiguus GERN.

HEERING, 1914 : Chlorophyceae in PASCHER Süsswasserfl. Heft 6 : 53 ; RAMANATHAN, 1962 : Ulotrichales : 92, pl. 23, fig. E.

Cells cylindrical, straight or curved, with rounded ends; chloroplast parietal without pyrenoid; cells 10–20 μ long, 1–1.5 μ broad.

Loc. East Ongul. (No. 21, 34.). New to Antarctica.

Koliella helvetica (KOL.) HINDÁK

HINDÁK, 1963 : *Nova Hedwig.* 6 : 114, pl. 6, fig. 1. (syn. *Raphidonema helveticum* KOL. in RAMANTHAN, 1962 : Ulotrichales : 103, pl. 26, fig. E.)

Cells short, spindle-shaped with long acute ends; chloroplast parietal without pyrenoid; cells 8–15 μ long, 2–3.5 μ broad.

This alga is one of the most common cryophytic alga found in alpine districts.

Loc. East and West Ongul. (No. 4, 5, 12, 13, 14, 16, 17, 18, 19, 21, 22, 25, 27, 29, 31, 33, 34, 36.).

Hormidium subtile (KUETZ.) HEERING

HEERING, 1914 : Chlorophyceae in PASCHER Süsswasserfl. Heft 6 : 47, fig. 54.

Cells cylindrical, united to form a filament ; chloroplast parietal without pyrenoid; cells 4–10 μ long, 5–6 μ broad.

Loc. East and West Ongul (No. 1, 2, 21, 26, 33.). New to Antarctica.

Order Chaetophorales

Pseudo-Pleurococcus printzii VISCHER

VISCHER, 1933 : *Beich. Bot. Centr.* 51 : 29, Abb. 11, 12. ; PRINTZ, 1964 : *Hydrobiol.* 24 : 278, Tab. 86.

Thalli irregularly branched filaments or few-celled packets ; cells globose to cylindrical, each cell contains a single parietal chloroplast; with a single pyrenoid; cells 5–10 μ broad, 5–25 μ long.

Loc. East and West Ongul (No. 1, 12, 13, 14, 18, 21, 22, 27, 36.).

New to Antarctica.

Order Chlorococcales

Chlorococcum sp.

A number of *Chlorococcum* were obtained but the details of life-cycle and the zoospores were not examined in this study.

Loc. East and West Ongul (No. 1, 2, 7, 14, 16, 17, 19, 20, 21, 22, 23, 25, 26, 33.).

Kentrosphaera bristolae G. M. SMITH

SMITH, 1950 : Freshwat. Alg. U. S. : 229, fig. 142.

Cells irregular, spherical to ovate, with irregularly thickened cell walls; chloroplast stellate with one to several central pyrenoids; cells 70−90 μ long, 60−70 μ broad.

This alga also occurs in the natural growths intermingled with other cyanophycean algae.

Loc. West Ongul (No. 2, 18, 29.). New to Antarctica.

Dictyosphaerium elegans BACHMANN

SKUJA, 1955 : *Nova Acta Soc. et Sci. Upsal.* 16 : 182, pl. 30, figs. 1−4.

Colonies composed of 8−64 cells; cells ellipsoid to ovoid, connected by thin branched thread; each cell contains a single parietal chloroplast with minute pyrenoid; cells 5−6 μ long, 3−4 μ broad.

This species is very like to *D. ehrenbergianum* NAEG. but it differs from the latter species in the cell size. This alga is also recorded from a small moore in Sweden by SKUJA (1955).

Loc. East Ongul (No. 17.). New to Antarctica.

Characium naegelii A. BROUN

BRUNTHALER, 1915 : Chlorophyceae in PASCHER Süsswasserfl. Heft 5 : 82, fig. 29; TIFFANY & BRITTON, 1951 : Alg. Illin. : 108, fig. 284.

Cells solitary, ellipsoid to lanceolate, with rounded apices and short stipes; chloroplast parietal, with a single pyrenoid; cells 10−25 μ long, 5−10 μ broad.

Loc. West Ongul (No. 21, 25.). New to Antarctica.

Chlorella sp.

Loc. West Ongul (No. 11, 25.)

Bracteacoccus irregularis (PETERSEN) STARR

STARR, 1955 : A Comp. Stud. Chlorococcum MENEG. : 65 (syn. *Dictyococcus irregularis* PETERSEN, PETERSEN, 1932 : *Arch. f. Protist.* 76 : 400, figs. 4−8.)

Cells solitary, spherical to ovoid; 1−3 parietal chloroplasts, without pyrenoid; cells 25−35 μ in diameter, 25−40 μ long.

Loc. West Ongul (No. 1, 21, 26, 29.). New to Antarctica.

Order Chlorosphaerales

Chlorosphaera antarcticus FRITSCH

GARRIC, 1965 : *Amer. Journ. Bot.* 52 : 5, fig. 27.

Cells subglobose to globose, united into 4-32-celled small clumps; each cell contains a single parietal chloroplast without a pyrenoid; cells 5−8 μ in diameter.

This alga is known as a cryophytic alga found in the alpine districts in the Pacific Northwest by GARRIC (1965).

Loc. West Ongul (No. 21.).

Order Zygnematales

Cosmarium cucurubita BREB. forma **rotundatum** KRIEG.

SCOTT and PRESCOTT, 1961 : *Hydrob.* 17 : 57, pl. 26, fig. 6.

Cells 30–36 μ long, 17–20 μ broad, isthumus 14–17 μ broad, slightly constricted ; semicells subcylindrical with rounded apex ; each semi-cell contains a single, axial chloroplast with a large central pyrenoid.

This alga has been also recognized in sandy soil of England by FRITSCH and JOHN in 1942.

Loc. West Ongul (No. 26.). New to Antarctica.

XANTHOPHYCEAE

Four species of xanthophycean algae including two species of heterococcalean algae and two species of heterotrichalean algae are recognized.

Order Heterococcales

Monodus subterraneus PETERSEN

PETERSEN, 1932 : *Arch. f. Protist.* 76 : 406, fig. 13 ; PASCHER, 1938 : Heterokontae, in RABENHORSTS Kryptogam. : 445, fig. 308.

Cells solitary, ovoid to oblong ovate ; chromatophores parietal, without pyrenoid ; cells 10–15 μ long, 4–6 μ broad.

This alga is one of the most common elements of soil flora in Japan, however, the alga is relatively rare in Antarctica.

Loc. West Ongul (No. 1, 2, 21, 25, 26, 29.). New to Antarctica.

Botrydiopsis arhiza BORZI

PASCHER, 1925 : Heterokontae in PASCHER Süsswasserfl. Heft 11 : 44, fig. 25. ; PASCHER, 1937 : Heterokontae in RABENHORSTS Kryptogam. : 387, fig. 244.

Cells spherical ; chromatophores many, discoid, without pyrenoid ; cells 6–18 μ in diameter.

Loc. East and West Ongul (No. 5, 23, 27, 33.). New to Antarctica.

Order Heterotrichales

Bumilleria exilis KLEBS

PASCHER, 1925 : Heterokontae in PASCHER Süsswasserfl. Heft 11 : 111, fig. 90.

Cells cylindrical, united to form short, unbranched filament ; each cell contains 2–4, parietal chromatophores without pyrenoid ; cells 5–10 μ long, 3–6 μ broad.

Loc. East and West Ongul (No. 8, 13, 14, 17, 18, 19, 21, 25, 26, 27, 29, 33.).

Monocilia viridis GREN.

SMITH, 1950 : Alg. U. S. : 399, fig. 313. (syn. *Heterococcus viridis* CHODAT in PASCHER, 1925 : Heterokontae in PASCHER Süsswasserfl. Heft 11 : 114, fig. 93.)

Cells spherical to elliptical or cylindrical, united to form a irregularly branched filament ; each cell contains 2 to several, parietal chromatophores without pyrenoid ; cells 6–14 μ broad, 8–16 μ long.

Loc. West Ongul (No. 16, 21, 25.). New to Antarctica.

BACILLARIOPHYCEAE

Three species of pennate diatoms are recognized.

Order Pennales

Navicula muticopsis VAN HEURCK,

HUSTEDT, 1966 : Die Kieselalgen in RABENHORSTS Kryptogam. : 614, fig. 1614. (incl. var. *capitata* CARLSON, 1913)

Valves elliptic with short rostrate and slightly capitate ends ; transverse striations 13–14 in 10 μ ; cells 20–25 μ long, 6–10 μ broad.

This alga is also commonly distributed in small pond of the Ongul Islands and Cape Royds, Antarctica.

Loc. East and West Ongul (No. 4, 5, 13, 14, 18, 21, 22).

Pinnularia borealis EHR.

HUSTEDT, 1930 : Bacillariophyceae in PASCHER Süsswasserfl. : 326, fig. 597.

Valves linear-elliptic, with slightly concave or straight sides ; raphe filiform ; transverse striations parallel, 4–6 in 10 μ ; cells 30–40 μ long, 10–15 μ broad.

Loc. West Ongul (No. 1, 2, 14, 18, 21, 26.).

Hantzschia amphioxys (EHR.) GRUN. forma **capitata** O. MUEL.

HUSTEDT, 1930 : Bacillariophyceae in PASCHER Süsswasserfl. : 394, fig. 748 ; TIFFANY and BRITTON, 1951 : Alg. Illin. : 289, fig. 887.

Valves concave on one side and convex on the other, with capitate poles ; transverse striations 15–20 in 10 μ ; cells 35–40 μ long, 5–8 μ broad.

This alga is also recorded in the Ongul Islands by FUKUSHIMA (1959).

Loc. West Ongul (No. 26.).

CYANOPHYCEAE

Nine species of cyanophycean algae including three species of chroococcalean algae and six species of oscillatorialean algae are recognized.

Order Chroococcales

Synechocystis aquatilis SAUVAG.

TIFFANY and BRITTON, 1951 : Alg. Illin. : 336, pl. 91, fig. 1056 ; DESIKACHARY, 1959 : Cyanophyta : 144, pl. 25, fig. 9.

Cells spherical, blue-green in colour, 8-10 μ in diameter, solitary or two together.

Loc. West Ongul (No. 28.).

Aphanocapsa grevillei (HASS.) RABENH.

SMITH, 1920 : *Wisc. Geol. Nat. Hist. Sur.* 57, Sci. Ser. 12 : 43, pl. 3, fig. 1. : GEITLER, 1925 : Cyanophyceae in PASCHER Süsswasserfl. Heft 12 : 65, fig. 57. DESIKACHARY, 1959 : Cyanophyta : 134, pl. 21, fig. 9.

Thalli gelatinous, spherical to hemispherical ; cells spherical, 3–6 μ in diameter, closely arranged in a homogeneous mucilage.

This alga is also commonly found in natural growths.

Synechococcus aeruginosus NAEG.

GEITLER, 1929 : Cyanophyceae in PASCHER Süsswasserfl. Heft 12 : 111, fig. 132 ; DESIKACHARY, 1958 : Cyanophyta : 143, pl. 25, figs. 6, 12.

Cells cylindrical to oblong, 35–40 μ long, 10–2 μ broad, solitary, or 2–4 together.

Loc. Common, found in intermingled with other algal natural growths.

Order Oscillatoriales

Oscillatoria agardhii GOMONT

TIFFANY and BRITTON, 1951 : Alg. Illin. : 346, fig. 1082 ; DESIKACHARY, 1959 : Cyanophyta : 235,

Trichomes straight, very slightly constricted at cross-walls, at the ends gradually tapering ; cells cylindrical, blue-green, coarsely granulated, with pseudo-vacuoles ; cells 3–5 μ long, 5–6 μ broad.

Loc. East and West Ongul (No. 4, 14.).

Oscillatoria tenuis AGARDH ex GOMONT

GEITLER, 1925 : Cyanophyceae in PASCHER Süsswasserfl. Heft 12 : 362, fig. 427. ; PRESCOTT, 1951 : Alg. West. Great Lak. : 491, pl. 110, figs. 8, 9, 14 ; DESIKACHARY, 1959 ; Cyanophyta : 222, pl. 42, fig. 15.

Trichomes straight, slightly constricted at cross-walls ; cells blue-green, granulate, 4–6 μ long, 8–10 μ broad.

Loc. East Ongul (No. 13.).

Prormidium tenue (MENEGH.) GOMONT

GEITLER, 1925 : Cyanophyceae in PASCHER Süsswasserfl. Heft 12 : 381, fig. 478.

Trichomes bent, densely entangled, slightly constricted at the cross-walls, attenuated at the ends, with thin sheath ; cells 1–2 μ broad, 2–3 μ long ; end-cell acute-conical. This alga is one of the most common species also in Japan.

Loc. East and West Ongul (No. 1, 2, 4, 5, 7, 8, 13, 14, 16, 17, 18, 19, 21, 22, 23, 25, 26, 28, 29, 31, 33, 36.)

Nostoc punctiforme (KUETZ.) HARIOT

GEITLER, 1925 : Cyanophyceae in PASCHER Süsswasserfl. Heft 12 : 295 ; DESIKACHARY, 1959 : Cyanophyta : 375, pl. 69, fig. 2.

Thalli microscopically, punctiform, gelatinous ; trichomes densely coiled, 3–4 μ broad ; cells globose to subglobose, pale blue-green, 3–4 μ in diameter ; heterocyst broader than the vegetative cells, 4–5 μ in diameter.

Loc. East and West Ongul (No. 1, 2, 3, 4, 7, 8, 10, 14, 15, 16, 17, 18, 19, 20, 21, 23, 25, 26, 28, 29, 32, 36.).

Tolypothrix bouteillei (BREB. et DESM.) FORTI

GEITLER, 1925 : Cyanophyceae in PASCHER Süsswasserfl. Heft 12 : 258 ; DESIKACHARY, 1958 : Cyanophyta : 499, pl. 101, fig. 8 and pl. 103, fig. 5.

Filaments with false branches, usually arising from the vicinity of the heterocyst ; trichomes 5–6 μ broad ; constricted at the cross-walls ; cells as long as broad ; heterocyst spherical, 6–8 μ in diameter.

Loc. West Ongul (No. 14.).

Tolypothrix fragilis (GARDNER) GEITLER

DESIKACHARY, 1958 : Cyanophyta : 500, pl. 103, fig. 1.

Filaments with false branches, usualy arising from the vicinity of the heterocyst; trichomes 4−5 μ broad, not constricted at the cross-walls; cells as long as broad; heterocyst spherical, 5−6 μ in diameter.

Loc. East and West Ongul (No. 1, 2, 8, 29.).

Résumé

A floristic study of the soil algae of the Ongul Islands, Antarctica by means of crude cultures has taken. The following results are noteworthy.

1) Twenty-eight genera and thirty-two species including sixteen specis of Chlorophyceae, four species of Xanthophyceae, three species of Bacillariophyceae and nine species of Cyanophyceae are recognized.

2) The following algae are the most abundant species found in the soils of the Ongul Islands; viz. *Stichococcus bacillaris* NAEG., *Koliella helvetica* (KOL.) HINDÁK, *Bumilleria exilis* KLEBS, *Phormidium tenue* (MENEGH.) GOM. and *Nostoc punctiforme* (KUETZ.) HARIOT.

3) The following algae are new records from Antarctica; viz. *Chlamydomonas agloeformis* PASCHER, *Carteria simplex* PASCHER, *Stichococcus exiguus* GREN., *Bracteacoccus irregularis* (PETERSEN) STARR, *Kentrosphaera bristolae* G. M. SMITH, *Dictyosphaerium elegans* BACHMANN, *Cosmarium cucurbita* BREB., *Monodus subterraneus* PETERSEN, *Botrydiopsis arhiza* BORZI, *Bumilleria exilis* KLEBS, *Monocilia viridis* GREN., *Tolypothrix bouteillei* (BREB. et DESM.) FORTI and *Tolypothrix fragilis* (GARDN.) GEITLER.

4) The algal natural growths found in the Ongul Islands are generally composed of such algae as *Synechococcus aeruginosus* NAEG., *Aphanocapsa grevillei* (HASS,) RABENH., *Nostoc punctiforme* (KUETZ.) HARIOT and et. al.

5) A catalogue raisonnê including thirty-two species recognized in soils of the Ongul Islands is given.

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Plates with Explanations

Explanation of plate I.

Fig. A : *Koliella helvetica* (KOL.) HINDÁK

Fig. B : *Bracteacoccus irregularis* (PETERSEN) STARR

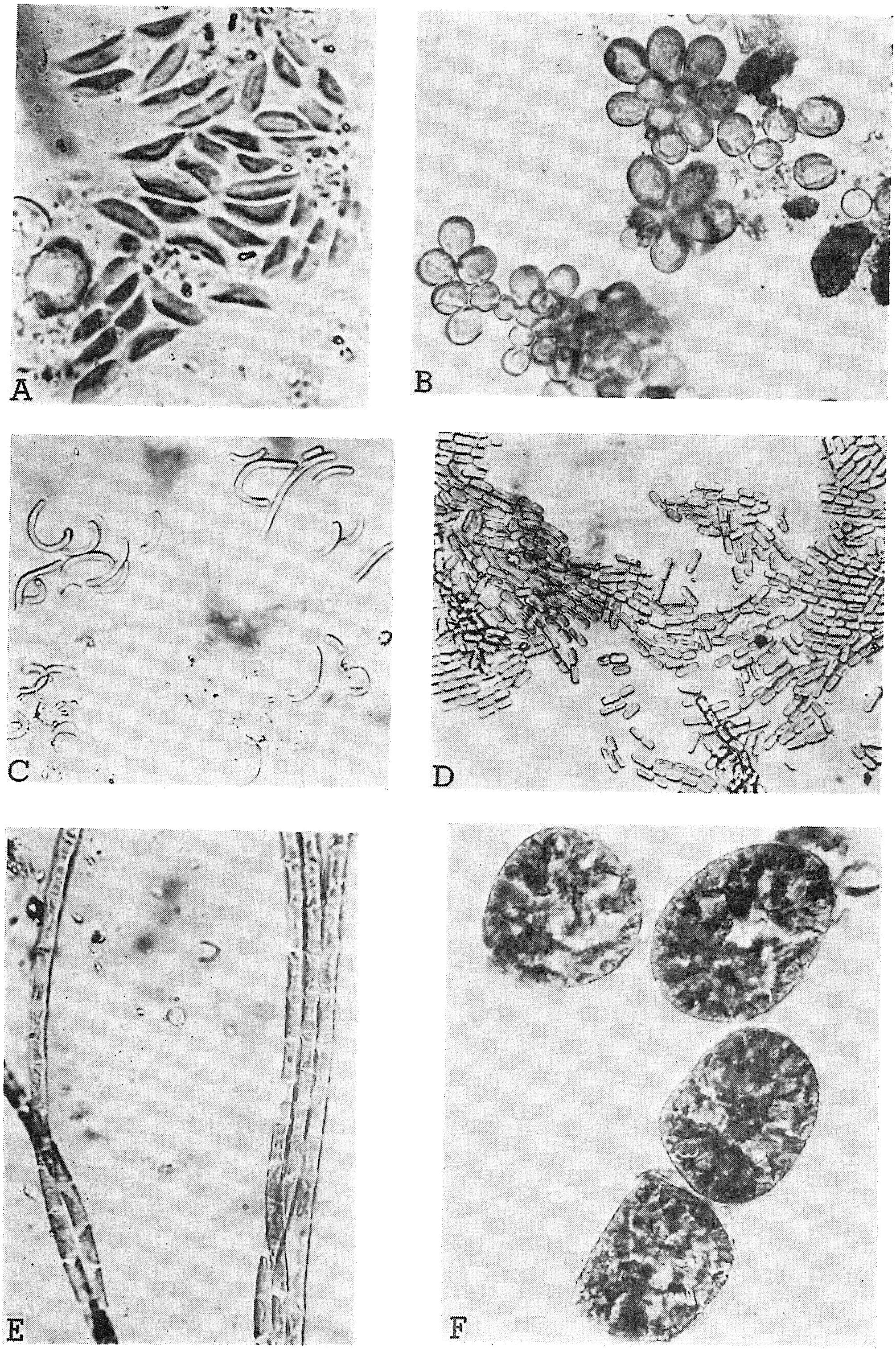
Fig. C : *Stichococcus exiguus* GERN.

Fig D : *Stichococcus bacillaris* NAEG.

Fig. E : *Hormidium subtile* (KUETZ.) HEERING.

Fig. E : *Kentrosphaera bristolae* G. M. SMITH.

PLATE I



Explanation of plate II.

Figs. A, B, C. *Pseudo-Pleurococcus printzii* VISCHER.

A, B : irregularly branched filaments.

C : coccoidal filaments.

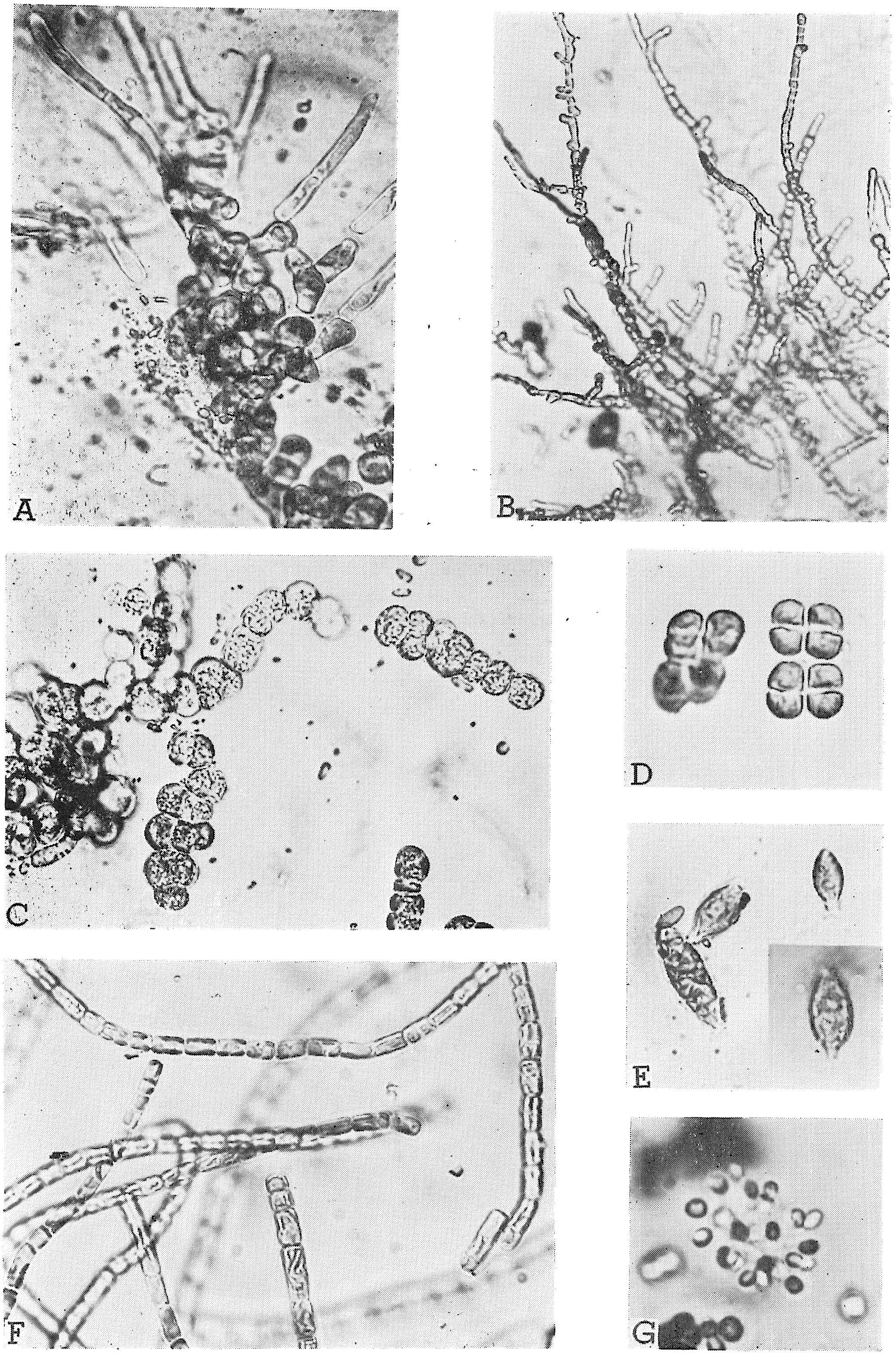
Fig. D : *Chlorosphaera antarcticus* FRITSCH.

Fig. E : *Characium naegelii* A. BROUN.

Fig. F : *Bumilleria exilis* KLEBS.

Fig. G : *Dictyosphaerium elegans* BACHMANN.

PLATE II



Explanation of plate III.

Fig. A : *Tolypothrix bouteillei* (BORN. et DESM.) FORTI.

Fig. B : *Tolypothrix fragilis* (GARDN.) GEITL.

Fig. C : *Nostoc punctiforme* (KUETZ.) HARIOT.

Fig. D : *Aphanocapsa grevillei* (HASS.) RABENH.

Fig. E : *Navicula muticopsis* VAN HEURCK.

Fig.F : *Pinnularia borealis* EHR.

Fig. G : *Hantzschia amphioxys* (EHR.) GRUN.forma *capitata* O. MUEL.

PLATE III