# *A Brief Note on Diatom Flora of Antarctic Inland Waters*

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***Abstract:*** We examined diatom flora of Kasumi Rock and Shinnan Rocks around Syowa Station, and found that Kasumi Rock had 31 species of diatoms including 14 endemic species, and Shinnan Rocks had 32 species of diatoms including 6 endemic species. Comparing with total number of species, the number of endemic ones was rather small. On the other hand, at Cape Royds near McMurdo Station, the total number of species was 21, including 13 endmic species. At Cape Evans, the total number of species was 15, including 9 endemic species. At Cape Barne, the total number was 11, including 9 endemic species, and near McMurdo Station the total number was 16, including 10 endemic species. Although the total number of species around McMurdo Station is small, the rate of endemic species is much higher.

Dominant species near Syowa Station were *Hantzschia amphioxys*, *Navicula cryptocephala*, *Nitzschia palea* and *Tropidoneis leavissima*, and cosmopolitan species were more but endemic species were less. Around McMurdo Station, dominant species were *Tropidoneis laevissima*, *Pinnularia cymatopleura*, *Navicula muticopsis* and *Navicula peraustralis*, but these were all endemic species and there were no cosmopolitan species.

These facts indicate that around Syowa Station, cosmopolitan species were more numerous than endemic species and there was not so Antarctic vegetation, but that around McMurdo Station located in latitude 80°S, which is 10° higher than Syowa Station almost all species were endemic species and few cosmopolitan species were found and there was almost completely Antarctic vegetation. We found that the difference of only 10° in latitude causes such remarkable variation of diatom flora.

## Introduction

Fresh-water diatom flora of Antarctica was studied by E. F. Fristch, W. and G. S. West, G. W. F. Carlson and others, but their reports dealt merely with taxonomical descriptions or lists of the species found, and referred very little to ecology of the species. The present writer has been investigating the inland water diatoms of Antarctica and neighbouring islands, with a hope to clarify their distribution and dominant species. The purpose of this report is to summarize the facts so far obtained by the writer.

The materials used in the investigation were a part of those collected by the writer himself when he participated in the 3rd, 5th and 7th Japanese Antarctic Research Expeditions as a member in charge of biological research, and when

he visited McMurdo Station as an observer under the Antarctic Treaty. The materials of South Georgia were those collected by the late Captain TAKEHARU KUMAGORI *et al.*, the materials of Mirny Station were those collected by Dr. TATSURO MATSUDA of the National Science Museum, and the materials of Cape Barne in Ross Island were those collected by Mr. MASSON of California University. The writer expresses his grateful acknowledgements to these people who supplied him with the materials for study.

**South Georgia** (34°13′S, 36°33′W)

The writer found forty-nine taxa of diatoms. Among these, endemic species

*Table 1. Diatoms from Shinnan Rocks.*

| Species \ Lake number | | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| | *Achnanthes brevipes* v. *intermedia* | rr | | | rr |
| | *Asterionella gracillima* | | rr | | rr |
| | *Caloneis bacillum* f. *fontinalis* | | | | rr |
| | *Ceratoneis arcus* | | | | rr |
| | *Cyclotella comta* | rr | | | |
| | *Cymbella tumida* | | r | | |
| | *C. ventricosa* | | | | rr |
| | *Diatoma hiemale* | | | | rr |
| | *Eunotia pectinalis* v. *minor* | rr | | | |
| (A•M) | *Fragilariopsis antarctica* | | rr | | rr |
| (A•M) | *F. cylindrus* | | | | rr |
| (A•M) | *F. obliquecostata* | | rr | | rr |
| | *Frustulia rhomboides* v. *saxonica* | rr | rr | | |
| (A) | *Gomphonema kerguelensis* ? | | rr | | |
| | *G. olivaceum* | | rr | | |
| | *G. parvulum* | | rr | | |
| | *Hantzschia amphioxys* v. *maior* | + | rr | | rr |
| | *Navicula cryptocephala* | rr | rr | | rr |
| | *N. gibbula* | | | | + |
| (A) | *N. muticopsis* | rr | rr | | rr |
| | *Nitzschia amphibia* | rr | r | | |
| | *N. palea* | rr | + | | |
| | *N. romana* | | rr | | |
| | *Pinnularia borealis* | | | | rr |
| | *Rhopalodia gibba* | | rr | | |
| | *R. gibberula* v. *van heurckii* | rr | | | |
| | *Stauroneis anceps* | rr | rr | rr | rr |
| | *Surirella angustata* ? | | rr | | |
| | *Synedra affinis* | | | | rr |
| | *S. ulna* | | | | rr |
| | *S. u.* v. *oxyrhynchus* | | rr | | |
| (A) | *Tropidoneis laevissima* | rr | rr | rr | rr |

A: Endemic species; M: Marine species.

of this island was *Achnanthes mulleri* only, and that of this island and Terra del Fuego was *Navicula megacuspidata* only. Antarctic endemic species was *Navicula muticopsis* only, but the writer found that South Georgia is the north limit of this diatom's distribution.

From the above fact, one can see that fresh-water diatoms of South Georgia have a slight Antarctic factor and a very few endemic species, and they are occupied for the most part by cosmopolitan species.

**Shinnan Rocks** (67°57′S, 44°29′E)

The writer found thirty-two species of diatoms, of which six were Antarctic endemic species. CARLSON (1913) already reported that marine diatoms are often found in Antarctic inland fresh waters. Dominant species in the four lakes were *Hantzschia amphioxys*, *Navicula gibbula* and *Nitzschia palea*, all being cosmopolitan species.

In the diatoms of Shinnan Rock, cosmopolitan species were larger in the number of species and individuals than Antarctic endemic species. It can be assumed, therefore, that fresh-water diatom flora of Shinnan Rocks has a slight Antarctic factor.

**Kasumi Rock** (67°57′S, 49°29′E)

The writer found thirty-three species of diatoms in eight lakes. Among them, fourteen were Antarctic endemics species and others were cosmopolitan species. Among the fourteen Antarctic endemic species, four were inland water species and the remaining ten were salt-water species.

From the fact that four marine cosmopolitan species were included, it can be said that fourteen out of the thirty-three were salt-water species and that salt-water species constitute the greater part. This seems to be related to the fact that the water of most of the lakes examined at this time contained much salt. Dominant species were *Navicula muticopsis*, *Tropidoneis laevissima* and *Navicula cryptocephala*, and the first two species were Antarctic endemic species whereas the last species was cosmopolitan. Of the eight lakes examined, one was of the *Navicula muticopsis* association, six were of the *Navicula cryptocephala–Tropidoneis laevissima* association, and one was of the association in which dominant species could not be determined.

Judging from the above, it seems that in Kasumi Rock, cosmopolitan species and Antarctic endemic species are evenly distributed.

**Molodezhnaya Station** (67°40′S, 45°50′E)

Among the five identified species, three were Antarctic endemic species and two were cosmopolitan species. In one of the two lakes examined, dominant species was cosmopolitan *Stauroneis perminuta*, but in the other no dominant species could be determined.

From the above fact, it can be assumed that around Molodezhnaya Station, the cosmopolitan factor is predominant, although the Antarctic endomic factor

*Table 2. Diatoms from Kasumi Rock.*

| Species | Lake number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|
| | *Achnanthes brevipes* | | | r | rr | r | | rr | rr |
| | *A. b.* v. *intermedia* | + | | | | | | | |
| | *Amphora angusta* v. *ventricosa* | | rr | | | | | | |
| | *Asterionella gracillima* | | rr | | | | | | |
| (M•A) | *Charcotia australis* | | + | rr | | | | | |
| (M•A) | *Cocconeis schuettii* v. *minor* | | | | | | | rr | |
| | *C. placentula* v. *euglypta* | | rr | | | | | | |
| (M•A) | *C. imperatrix* | | rr | r | rr | + | | rr | |
| (M•A) | *Coscinodiscus minimus* | | | | | | rr | r | |
| | *Cyclotella comta* | | | | | | | rr | |
| | *C. kützingiana* | rr | rr | | | | | | |
| | *C. sterigella* | | | | | | | rr | |
| | *Diatoma hiemale* v. *mesodon* | | | | | | | rr | |
| | *Diploneis subcincta* | | | rr | | rr | | rr | |
| (M) | *Eucampia balaustium* f. *balaustium* | | | rr | | | | | |
| (M•A) | *Fragilariopsis antarctica* | rr | rr | | | | | rr | |
| (M•A) | *F. curta* | | | rr | | rr | | | |
| (M•A) | *F. cylindrus* | | | | | | rr | | |
| (M•A) | *F. obliquecostata* | rr | rr | rr | | rr | rr | rr | |
| (M•A) | *F. rhombica* | | rr | | | | | | |
| (A) | *Gomphonema kamtschatica* v. *antarctica* | | r | rr | | rr | rr | rr | |
| | *Hantzschia amphioxys* v. *maior* | rr | | | | | | | |
| (M) | *Melosira sol* | rr | rr | r | | rr | rr | rr | |
| (M•A) | *M. s.* v. *omma* f. *polaris* | | | r | rr | | | rr | |
| | *Navicula cryptocephala* | rr | cc | cc | c | c | c | cc | |
| | *N. directa* v. *incus* | | | | | | | rr | |
| (A) | *N. muticopsis* | c | r | rr | | rr | | rr | r |
| | *N. quadrata* | | | | | | | rr | |
| | *N. radiosa* | | | | | | rr | rr | |
| (M) | *Synedra aderiae* | | | | | | | rr | |
| (M) | *Tracyneis aspera* | | | rr | | rr | rr | rr | |
| (A) | *Tropidoneis laevissima* | rr | + | cc | + | + | c | cc | |
| (A) | *T. l.* f. *nagatae* | | | | | | | rr | |

also exists.

**Mirny Station** (66°33′S, 93°01′E)

Among the ten identified species, six were Antarctic endemic species, in which four were Antarctic Ocean endemic species. The materials in which dominant species could be determined were three, two of them were of the Antarctic endemic *Navicula muticopsis* association and one was of the cosmopolitan *Pinnularia borealis* association. In the locality of Mirny Station, the Antarctic endemic factor seems predominant, but the cosmopolitan factor also predominates.

*Table 3. Diatoms from Molodezhnaya Station.*

| Species \ Lake number / Sample number | 1 | | 2 | | | | |
|---|---|---|---|---|---|---|---|
| | 640 | 641 | 642 | 643 | 644 | 645 | 646 |
| *Achnanthes* sp. | | r | r | | | | |
| (M•A) *Fragilariopsis antarctica* | | | | | | | rr |
| (M•A) *F. obliquecostata* | | rr | | | | | |
| *Navicula* sp. | rr | rr | rr | rr | | rr | rr |
| (A) *N. muticopsis* | | | | | | | rr |
| *Pinnularia* sp. | | | | r | | | |
| *Stauroneis anceps* | | | rr | | rr | | |
| *S. perminuta* | c | c | cc | | | r | r |

*Table 4. Diatoms from Mirny Station.*

| Species \ Sample number | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| *Cymbella* sp. | rr | | | | |
| (M•A) *Fragilariopsis curta* | rr | | | | |
| (M•A) *F. cylindrus* | rr | | | | |
| (M•A) *F. obliquecostata* | rr | | | | rr |
| (M•A) *F. rhombica* | rr | | | | |
| *Navicula* sp. | | | | rr | |
| *N. cryptocephala* | rr | | | | |
| (A) *N. muticopsis* | + | r | rr | r | + |
| (A) *N. m.* v. *capitata* | | | | | rr |
| *Nitzschia* sp. | rr | | | | |
| *Pinnularia borealis* | | | + | rr | rr |

**McMurdo Station on Ross Island** (77°32′S, 166°12′E)

Thirteen taxa were identified, among which eight were Antarctic endemic species and five were cosmopolitan. In the first material in which dominant species could be found, Antarctic endemic *Navicula muticopsis* was dominant. Thus, it may be stated that diatoms found around McMurdo Station have a stronger Antarctic endemic factor than a cosmopolitan factor.

**Cape Barne of Ross Island** (77°32′S, 166°12′E)

Among the eleven diatoms found, nine were Antarctic endemic species. In one of the two materials in which the dominant species could be found, *Navicula peraustralis* was dominant and in the other *Tropidoneis laevissima* was dominant,

*Table 5. Diatoms from McMurdo Station.*

| Species \ Lake number / Sample number | Station 1 | | | | Station 2 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 |
| *Achnanthes brevipes* v. *intermedia* | | rr | | | | | | | | |
| *Hantzschia amphioxys* v. *maior* | rr | rr | r | rr | rr | rr | rr | | | rr |
| *Navicula* sp. | | | rr | rr | rr | | | rr | | |
| *N. cryptocephala* | | rr | | | | | | | | |
| (A) *N. muticopsis* | rr | | + | rr | rr | r | rr | rr | | |
| (A) *N. m.* f. | | | rr | | | | | | | |
| (A) *N. m.* f. *capitata* | | | rr | | | | | | | |
| (A) *N. m.* f. *evoluta* | | | | | | rr | rr | | | |
| (A) *N. m.* v. *murrayi* | | | | | | rr | | | | |
| (A) *N. peraustralis* | rr | rr | r | rr | | | | | | |
| (A) *N. shackletonii* | | | | | rr | | | | | |
| *Nitzschia palea* | | | | rr | | | | | | |
| (A) *Pinnularia cymatopleura* | | | | | rr | r | | rr | rr | rr |
| *Stauroneis anceps* | rr | rr | r | rr | | | | | | |
| (A) *Synedra* sp. | | | | rr | | | | | | |

*Table 6. Diatoms from Cape Barne.*

| | Species \ Sample number | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| (M•A) | *Fragilariopsis antarctica* | rr | | | |
| | *Hantzschia amphioxys* v. *maior* | | r | | |
| (A) | *Navicula molesta* | | rr | | |
| (A) | *N. muticopsis* | rr | rr | | rr |
| (A) | *N. m.* f. *capitata* | | | | rr |
| (A) | *N. m.* f. | | | | rr |
| (A) | *N. peraustralis* | | + | | |
| (A) | *N. shackletonii* | | | rr | |
| (A) | *Pinnularia cymatopleura* | rr | | rr | rr |
| | *Stauroneis anceps* | rr | | | |
| (A) | *Tropidoneis laevissima* | | | + | |

both being Antarctic endemic species. Thus, it can be stated that diatoms of Cape Barne have a strong Antarctic endemic factor and very little of a cosmo-

politan factor.

**Cape Evans of Ross Island** (77°32′S, 166°12′E)

Among the fifteen diatoms found, nine were Antarctic endemic species. Dominant species were determined in seven lakes.

The *Navicula muticopsis–Pinnularia cymatopleura* association was recognized in three lakes and the *Tropidoneis laevissima* association was recognized in four lakes. Thus, it can be said that diatoms of Cape Evans are mostly of the Antarctic endemic factor and very few are of the cosmopolitan factors.

*Table 7. Diatoms from Cape Evans.*

| | Species \ Lake number | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Achnanthes brevipes* v. *intermedia* | rr | | rr | rr | rr | rr | | | | | |
| | *Cyclotella comta* | rr | rr | rr | | rr | | | rr | | | |
| (A) | *Fragilaria tenuicola* v. *antarctica* | rr | | rr | | rr | | | | | | |
| (M•A) | *Fragilariopsis antarctica* | rr | rr | | | | | | | | | |
| (M•A) | *F. curta* | rr | | | | | | | | | | |
| | *Hantzschia amphioxys* v. *maior* | rr | | rr | rr | rr | rr | | rr | | | |
| | *Navicula cryptocephala* | rr | | | | | | | | | | |
| (A) | *N. muticopsis* | + | rr | rr | rr | + | + | | rr | rr | rr | |
| (A) | *N. m.* f. *capitata* | rr | | rr | | rr | | | | | | |
| (A) | *N. m.* f. *murrayi* | rr | | | | | | | | | | |
| (A) | *N. shackletonii* | rr | rr | rr | rr | rr | rr | rr | rr | rr | | rr |
| | *Nitzschia palea* | rr | | | | | | | | | | |
| (A) | *Pinnularia cymatoplula* | + | | rr | rr | + | + | | | rr | | |
| | *Stauroneis anceps* | r | rr | rr | | rr | | | | | | |
| (A) | *Tropidoneis laevissima* | rr | + | rr | + | rr | rr | rr | c | + | rr | rr |

**Cape Royds of Ross Island** (77°32′S, 166°12′E)

The writer identified twenty-one species of diatoms in seven lakes. Among them, twelve were Antarctic endemic species and nine were cosmopolitan species. Dominant species were determined in three lakes; they were *Navicula muticopsis–Pinnularia cymatopleura*, *Nitzschia* sp. and *Tropidoneis laevissima*, all being supposedly Antarctic endemic species. Thus, it can be stated that diatoms of Cape Royds are mostly of the Antarctic endemic factor and a few are of the cosmopolitan factor.

**Distribution of Cosmopolitan Species and Antarctic Endemic Species**

Table 9 shows the locations and the number of cosmopolitan species and Antarctic endemic species found at each locality.

*Table 8. Diatoms from Cape Royds.*

| | Locality / Species | Home Lake | Lake | Green Lake | Coast Lake | Clear Lake | Lake | Blue Lake |
|---|---|---|---|---|---|---|---|---|
| | *Achnanthes brevipes* v. *intermedia* | rr | | | rr | rr | rr | rr |
| (M•A) | *Cocconeis imperatrix* | | | rr | rr | | | |
| | *Cyclotella comta* | | | | rr | | | |
| | *C. Kützingiana* | rr | | | | | | |
| (M•A) | *Fragilariopsis curta* | rr | rr | | rr | | | |
| (M•A) | *F. cylindrica* | rr | | | | | | |
| (M•A) | *F. obliquecostata* | rr | rr | rr | | | | rr |
| (M•A) | *F. rhomboides* | rr | | | | | | |
| | *Frustulia rhomboides* | rr | rr | | | | | |
| | *Hantzschia amphioxys* v. *maior* | | | rr | rr | rr | rr | rr |
| | *Navicula gothlandica* | | | | rr | | | |
| (A) | *N. molesta* | rr | | | rr | | | rr |
| (A) | *N. muticopsis* | rr | | rr | c | rr | rr | rr |
| (A) | *N. m.* f. *murrayi* | | | | rr | | | |
| | *N. salinarum* | | | | | | rr | |
| (A) | *N. shackletonii* | | | | rr | | | |
| (A) | *N.* sp. | | | | | | c | rr |
| (A) | *Nitzschia antarctica* | rr | | | | rr | rr | rr |
| (A) | *Pinnularia cymatopleura* | | | rr | c | rr | rr | rr |
| | *Stauroneis anceps* | | | rr | rr | | | rr |
| | *Surirella ovata* | rr | | | rr | | | |
| (A) | *Tropidoneis laevissima* | rr | rr | c | rr | rr | + | rr |

At South Georgia, Shinnan Rocks and Kasumi Rock, cosmopolitan species were remarkably more abundant than Antarctic endemic species ; whereas at Molodezhnaya Station, Mirny Station, McMurdo Station, Cape Evans, Cape Barne and Cape Royds, Antarctic endemic species were much more abundant than cosmopolitan species. In view of the number of individuals, however, cosmopolitan species were abundant at South Georgia, Shinnan Rocks, Kasumi Rock, Molodezhnaya Station, and Mirny Station, whereas Antarctic endemic species were abundant at McMurdo Station, Cape Evans, Cape Barne and Cape Royds. At South Georgia, Shinnan Rocks, Kasumi Rock, Molodezhnaya Station and Mirny Station, cosmopolitan species were often dominant, whereas at McMurdo

Station, Cape Evans, Cape Barne and Cape Royds, they were rarely dominant. In all cases Antarctic endemic species were the dominant species.

Thus, the cosmopolitan factor is predominant at South Georgia, Shinnan Rocks, Kasumi Rock, Molodezhnaya Station and Mirny Station, and at McMurdo Station, Cape Evans, Cape Barne and Cape Royds the Antarctic factor is noticeably predominant.

Diatoms of Antarctic inland waters are, as mentioned above, divided into two types, those growing in the area where the cosmopolitan factor is predominant and those growing in the area where the Antarctic endemic factor is remarkably predominant. The former can be distinguished from the latter by the ice-bound period when the lakes are frozen and by the difference of temperature which is ascribed to the difference in height from sea-level and in latitude. However, since the places where the materials examined this time were collected were all located near the seashore, difference in temperature can be represented by difference in latitute.

The south limit of predominance of the cosmopolitan factor lies at 67°57′S, at Shinnan Rocks and Kasumi Rock, and the ice-free area of Ross Island where the Antarctic factor is predominant lies at 77°32′S. Therefore, the boundary between the area where the cosmopolitan facter is predominant and the area where

*Table 9. The location and respective number of cosmopolitan species and Antarctic endemic species found in each locality.*

| | Latitude | Longitude | Cosmopolitan species | | Endemic species | | Totals |
|---|---|---|---|---|---|---|---|
| | | | Fresh-water | Marine | Fresh-water | Marine | |
| South Georgia | 54–16S | 36–30W | 43 (92%) | 0 | 3 (6%) | 1 (2%) | 47 |
| Shinnan Rocks | 67–57S | 44–29E | 26 (82%) | 0 | 3 (9%) | 3 (9%) | 32 |
| Kasumi Rock | 67–57S | 49–29E | 11 (34%) | 9 (27%) | 5 (15%) | 8 (24%) | 33 |
| Molodezhnaya | 67–40S | 45–50E | 2 (40%) | 0 | 1 (20%) | 2 (40%) | 5 |
| Mirny | 66–33S | 93–01E | 2 (25%) | 0 | 2 (25%) | 4 (50%) | 8 |
| McMurdo | 77–32S | 93–01E | 5 (40%) | 0 | 8 (60%) | 0 | 13 |
| Cape Barne | 77–32S | 93–01E | 2 (18%) | 0 | 8 (73%) | 1 (9%) | 11 |
| Cape Evans | 77–32S | 93–01E | 6 (40%) | 0 | 7 (47%) | 2 (13%) | 15 |
| Cape Royds | 77–32S | 93–01E | 8 (38%) | 1 (5%) | 7 (33%) | 5 (24%) | 21 |

the Antarctic factor is predominant is considered to lie between 68°S and 77°S.

## Dominant Species

One-hundred and fifty-three materials were used in this investigation. Dominant species could be determined in sixty-four materials out of the one-hundred and fifty-three, but in the others there were not a sufficient number of diatoms. Table 10 shows the associations and the number of samples in each association found in the fifty-seven materials. The symbol (*) before the specific name denotes Antarctic endemic species. As seen in the table, the *Navicula cryptocephala* association was most frequently observed, occurring in eleven materials; the *Navicula muticopsis* association, *Tropidoneis laevissima* association, and *Navicula cryptocephala – Tropidoneis laevissima* association were found in ten materials; the *Pinnularia cymatopleura* association was found in four materials; and the *Nitzschia* sp. association, *Stauroneis perminuta* association and *Pinnularia cymatopleura – Navicula muticopsis* associations, were found in three materials.

*Navicula cryptocephala* was dominant, or one of the dominant species, in twenty-one materials. As this species has the largest quantity, it can be regarded as

*Table 10. Diatom communities in Antarctica.*

| Locality / Sample number / Diatoms community | Shinnan Rocks | Kasumi Rock | Molodezhnaya | Mirny | McMurdo | Cape Evens | Cape Barne | Cape Royds | Totals |
|---|---|---|---|---|---|---|---|---|---|
| | 28 | 30 | 7 | 5 | 10 | 40 | 4 | 29 | 153 |
| *Achnanthes brevipes* v. *intermedia* –**Navicula muticopsis* | | 1 | | | | | | | 1 |
| *Hantzschia amphioxys* v. *maior* | 1 | | | | | | | | 1 |
| *Navicula cryptocephala* | | 11 | | | | | | | 11 |
| *N. c.* – **Synedra* sp. | | 1 | | | | | | | 1 |
| *N. c.* – **Tropidoneis laevissima* | | 10 | | | | | | | 10 |
| *N. gibbula* | 1 | | | | | | | | 1 |
| **N. muticopsis* | | 1 | | 2 | 1 | | | 6 | 10 |
| **N. m.* – *Stauroneis anceps* | | | | | | 1 | | | 1 |
| **N. peraustralis* | | | | | | | 1 | | 1 |
| *Nitzschia palea* | 3 | | | | | | | | 3 |
| *Pinnularia borealis* | | | | 1 | | | | | 1 |
| **P. cymatopleura* | | | | | | 4 | | | 4 |
| **P. c.* – *N. muticopsis* | | | | | | 3 | | | 3 |
| *Stauroneis perminuta* | | | 3 | | | | | | 3 |
| **Tropidoneis laevissima* | | 1 | | | | 6 | 12 | | 19 |

* Endemic species.

the most numerous species among the ones examined this time. This is probably due to the fact that the materials examined were collected mostly from the brackish-water lakes on the sea shore.

Antarctic endemic *Tropidoneis laevissima* was dominant, or one of the dominant species, in twenty materials. This species is nearly as numerous as *Navicula cryptocephala*. This species, as will be mentioned later, is especially abundant in Antarctic brackish-waters.

Antarctic endemic *Navicula muticopsis* was dominant, or one of the dominant species, in fifteen materials. As this species occurs in abundance in fresh waters it can be regarded as the most common species in Antarctic fresh waters.

Antarctic endemic *Pinnularia cymatopleura* was dominant, or one of the dominant species, in seven materials. As this specis is also seen in fresh waters, it can be considered a common species in Antarctica, along with *Navicula muticopsis*.

## Salt Density and Dominant Species

The water of a few lakes was examined for the salinity, as well as for the diatom vegetation. For correlation of the salinity of lake water with diatom vegetation, available data were very few. Table 11 shows the salinity of water of a few lakes and the dominant species of diatoms in these lakes.

The *Navicula muticopsis* (inclusive of varieties and forms) association, *Pinnularia cymatopleura* association and *Stauroneis anceps* association were found in water of less than 535 mg Cl/*l* in salinity.

*Table 11. Salinity of water and dominant species of diatoms.*

| mg Cl/*l* / Diatom association | 126 | 358 | 535 | 1,033 | 3,017 | 5,176 | 13,687 |
|---|---|---|---|---|---|---|---|
| | 112 | 333 | 532 | 622 | 1,365 | 4,952 | 9,523 |
| *Navicula cryptocephala* Ass. | | | | | | | — |
| *N. c.* – **Synedra* sp. Ass. | | | | | | | — |
| *N. c.* – **Tropidoneis laevissima* Ass. | | | | | | — | — |
| **N. muticopsis* Ass. | — | — | | | | | |
| **N. m.* f. *capitata* Ass. | — | | | | | | |
| **N. m.* – *Achnanthes brevipes* v. *intermedia* Ass. | | — | | | | | |
| **N. m.* – **N. m.* f. *capitata* Ass. | — | | | | | | |
| **N. m.* – *Pinnularia cymatopleura* Ass. | | — | — | | | | |
| **N. m.* – *Stauroneis anceps* Ass. | | | — | | | | |
| **Nitzschia* sp. Ass. | | | | | — | | |
| **Pinnularia cymatopleura* Ass. | | — | — | | | | |
| **Tropidoneis laevissima* Ass. | | | | — | | — | — |
| **T. l.* – **Nitz.* sp. Ass. | | | | | | | — |

* Endemic spesies.

The *Tropidoneis laevissima* association was found in water of 622–13,687 mg Cl/*l* in salinity which correspondes to areas of brackish water to salt water.

The *Navicula cryptocephala* association was found in the saline water of 4952–9523 mg Cl/*l*.

From the above, it can be concluded that *Navicula muticopsis* and *Pinnularia cymatopleura* are dominant in the fresh-water areas, and *Tropidoneis laevissima* and *Navicula cryptocephala* are dominant in the areas of brackish water or salt water.

## Summary

The examination was made on the diatom vegetation at South Georgio, Shinnan Rocks, Kasumi Rock, Molodezhnaya Station, Mirny Station, McMurdo Station, Cape Evans, Cape Barne and Cape Royds.

In the diatoms of South Georgia, Shinnan Rocks, Kasumi Rock, Molodezhnaya Station and Mirny Station, the cosmopolitan factor was predominant, whereas in the diatoms of McMurdo Station, Cape Evans, Cape Barne and Cape Royds, the Antarctic factor was remarkably predominant. The line dividing these two areas seems to lie between 68°S and 77°S.

The most common species in the Antarctic fresh water areas were *Navicula muticopsis* and *Pinnularia cymatopleura*. The most common species in brackish water or inland salt water areas were cosmopolitan *Navicula cryptocephala* and Antarctic endemic *Tropidoneis laevissima*.

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