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QUANTITATIVE DISTRIBUTION OF NET PHYTOPLANKTON IN GREAT WALL BAY, ANTARCTICA

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Abstract Samples of phytoplankton were obtained in February, 1985, in Great Wall Bay, Antarctica. Among the 31 species of phytoplankton identified, the cold — water species rank highest in proportion. The cell number of phytoplankton averaged 162.5×10^4 cells/m^3 in the bay. The most dominant species are *Chaetoceros socialis* Lauder, *Rhizosolenia alata f. inermis* (Castr.) Hustedt and *Biddulphia striatas* Karsten. The former species mainly appeared in the bay and the latter two species aggregated at the bay mounth.

Key words Great Wall Bay, phytoplankton, dominant species, patchy distribution of plankton

Introduction

A comprehensive investigation of marine organisms was made in Great Wall Bay in Feb., 1985. Great Wall Bay is located in the South—West of King George Island (about 58°55' W, 62° 13' S), its shape is just like a human head and the overall area is less than 1 square nautical mile. It connects with Maxwell Bay in the south and with Ardley Bay in the north. But because of the water being shallow in the north, it connects with Ardley Bay only on the flood tide and sand beach appears on the ebb tide. The bay exchanges water with two adjacent bays through the tide wave. In summer, the temperature is high, the ice and snow in the lake and on the bank melt, and the thawing snow water flows into the bay. The above—mentioned natural enviroments decide the ecological features and community structure of the marine organisms of that bay. In this paper we only discuss and analyse net phytoplankton samples.

Many papers on the study of phytoplankton in Antarctica have been published (Baker, 1954; Balech and El-sayed, 1965; Bunt, 1960; Ealey and Chittleborough, 1954; Krebs, 1983; Li *et al.*, 1986), but there seems no report on the phytoplankton in Great Wall Bay, Antarctica.

Materials and Methods

In the bay nine stations were set up and at four of them phytoplankton were sampled with a plankton net for special use in coastal zone investigation (mouth area: 0.1 m^2; net length 1.2 m; mesh: 0.078mm) by vertical hauling from the bottom to the surface, and were fixed with Lugol's iodine solution in the field. After being brought home, they were preserved in 5% Formalin solution. On analysis, the samples were diluted to 50ml, 0.5 ml was taken and put in the counter frame to make counting under the microscope. The counting was converted into cell number per cubic meter of water body to express the stock

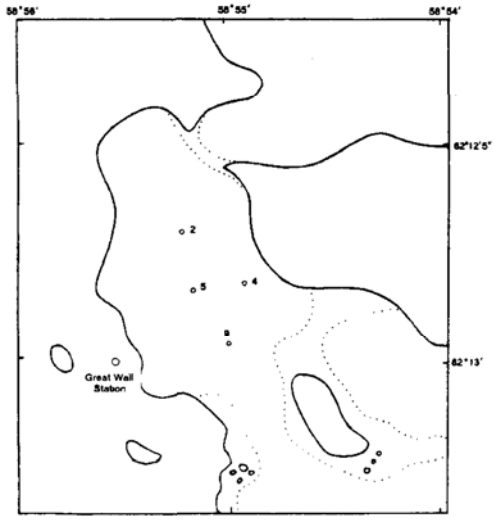

Fig. 1. Sampling stations of phytoplankton in Feb. 1985.

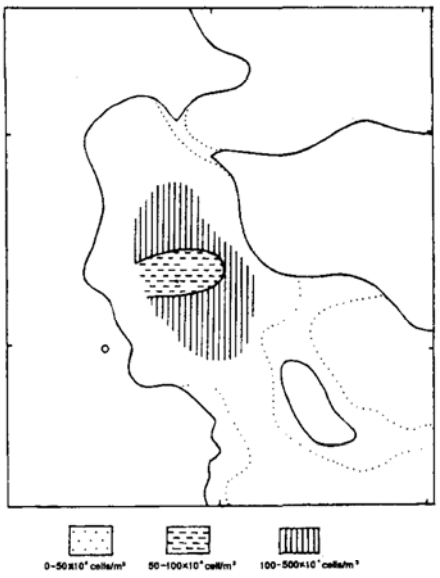

Fig. 2. Distribution of phytoplankton in Feb. 1985.

of phytoplankton.

Results

In this paper only diatoms, dinoflagellates and silicoflagellates (green and blue algae to be unidentified) samples in this investigation were recorded. 7 genera and 31 species were tentatively identified (not including several unidentidied species). The diatom accounted for 93% of the total, one species each of the silicoflagellate and dinoflagellate was indentified. The species composition was characterized by the cold — water species being the main component and this type of ecological species occupied absolute predominance in both species number and cell number. Its representative species were *Rhizosolenia alata* f. *inermis* (Castr.) Hustedt, *Chaetoceros socialis* Lauder, *Biddulphia striata* Karsten, *Chaet. covolutus* Castr. and *Chaet. concavicornis* Mangin etc. *Rhiz. styliformis* var. *longispina* Hustedt,

Chaet tortissimus Gran, *Nitzschia longissima* (Breb) Ralfs ranked next. In a word, in Great Wall Bay the species of phytoplankton was less in February, the dominant species were remarkable and the composition of species was relatively simple.

Table 1. The cell number of phytoplankton and dominant species in Great Wall Bay, Antarctica.

stations		2	4	5	9	mean	Percentage
cell number		148.0	100.6	56.7	344.5	162.5	100
dominant species	Chaet. socialis	136.6	93.8	50.4		70.2	43.2
	Rhiz. alata f. inermis	6.1	3.4	2.6	184.8	49.2	30.3
	Bidduphia striata	<1	<1	<1	112.2	28.1	17.3
	Rhiz. styliformis var. longispina	2.0	1.5	1.5	26.9	8.1	4.9

In Great Wall Bay, the total cell number of phytoplankton each station averaged 162.5×10^4 cells/m^3 in February. In Station 9 of the bay mouth, it was the highest, being 344.5×10^4 cells/m^3. In Station 5, it was the lowest, being 56.7×10^4 cells/m^3, 6 times lower than that of Station 9. The cell number of Station 2 was a little more than that of Station 4 (Table 1). With respect to the distribution of the dominant species of

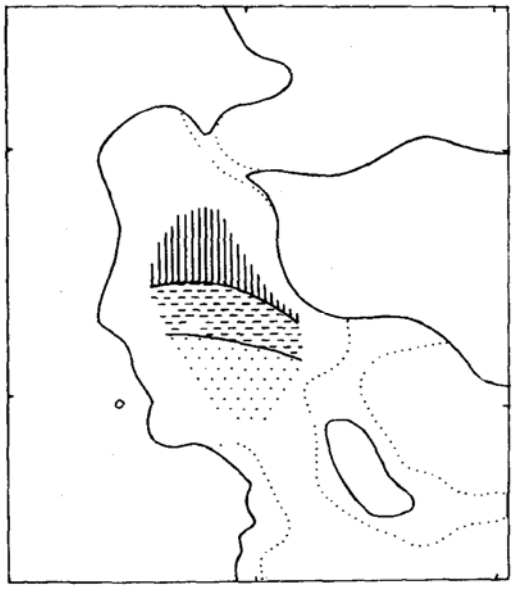

Fig. 3. Distribution of the cell number of *Chaetoceros socialis*.

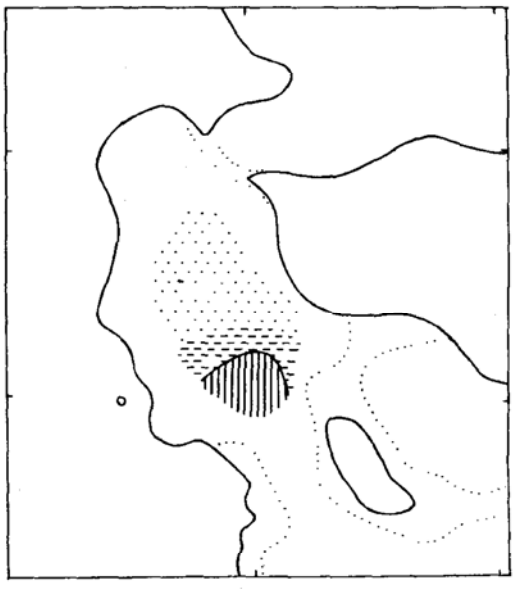

Fig. 4. Distribution of the cell number of *Rhiz. alata* f. *inermis*.

phytoplankton, the stations differed from one another. The phytoplankton in Stations 2. 4 and 5 consisted mainly of *Chaetoceros socialis* Lauder, reaching, respectively, 92.3%, 93.2% and 88.9%. The distribution of this species tended to decrease gradually from within the bay to the bay mouth, and nearly disappeared in Station 9 (Figure 3). The distribution of *Biddulphia striata* Karsten was contrany to that of *Chaetoceros socialis* Lauder, its area of aggregation was in Station 9 and its number reaches as high as 112.2×

10^4 cells/m^3 amounting to 32. 6% of the total cell number in this station, only next to *Rhizosolenia alata* f. *inermis* (Castr.) Hustedt, but in view of its relatively big cell body, undoubtedly it is also the most important contributor to the chlorophyll content of this station and the cell number of the other 3 station all did not exceed 1500 cells/m^3. The distributional trends of *Rhizosolenia alata* f. *inermis* (Castr.) Hustedt and *Rhiz. styliformis* var. *longispina* Hustedt were basically the same, their amounts in the bay mouth were more than within the bay. *Rhiz. alata* f. *inermis* averaged 49. 2×10^4 cells/m^3, amounting to 30. 3 % of the total amount, and merely in Station 9 to 53. 6 % of the total cell number of this station. The cell numbers of the other three stations all did not exceed 7×10^4 cells/m^3. The average cell number of *Rhiz. styliformis* var. *longispina* Hustedt was 8. 1×10^4 cells/m^3. Even though its number was not equal to that of the other three cold — water species mentioned above, it was also one of the dominant species in that month.

To sum up, in Great Wall Bay the cell number of phytoplankton was relatively high in February, being more than 7 times that of Davis Station, Antarctica in Feb. 1982; and the dominant species in these two regions were completely different and those in Great Wall Bay were to some extent from those of other Antarctic regions (Table 2). Though the area of Great Wall Bay is small, the horizontal distribution of phytoplankton was very uneven, and the dominant species also showed distinctive patchiness. *Chaetoceros socialis* Lauder displayed typically littoral features, but the oceanic species, such as *Rhiz, alata* f. *inermis* (Castr). Hustedt, *Rhiz. styliformis* var. *longispina* Hustedt, *Biddulphia striata* Karsten, all aggregated in the bay mouth, and evidently were brought there by the inveding oceancic water. Thus, it can be seen that the water exchange in Great Wall Bay was not violent. The insufficiency in this investigation is that we lack on hand the synchronous data on the enviromental parameters of hydrology, chemistry and so on. so that we are unable to analyse and discuss the phytoplankton of the bay and further research needs to be done in the future.

Table 2. Comparison between the phytoplankton in Great Wall Bay and that in other Antarctic regions (Li et al., 1986; Bunt, 1960; Krebs, 1983).

Region	date	cell number(cells/m^3)	dominant species
Great Wall Bay	1985. 2	162.5×10^4	*Chaet socialis*, *Bidd. striata*, *Rhiz alata* f. *inermis* *Rhiz. styliformis var. longispina*
Coast of Davis Station	1982. 2	24.4×10^4	*Amphiprora Kjellmanii*, *Nitz. delicatissima*, *Navicula* sp., *Cos. asteromphalus*
Coast of Mawson Station	1957. 2	1.72×10^9	*Bidd. striata*, *Cos.* sp., *Fragilaria sublinearis.* *Eucampia balaustium*
Arthur Harbor	1972. 2~3	5×10^4	*Porasira glacialis*, *Nitzschia* spp.

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Appendix: Species of the phytoplankton in the Great Wall Bay

Bacillariophyta

Amphiprora Kjelmanii Cleve
Arachnioidiscus ehrenbergii Bailey
Biddulphia litigiosa H. V. H. vista valor.
Chaetoecros atlanticus Cleve
Chaet. concavicornis Margin
Chaet. socialis Lauder
Cocconeis costata Greg.
Cocconeis sp.
Cos. spp.
Eucampia antarticus (Castr.) Mangin
Fragilaria sp.
Gyrosigma fasciola (Ehr.) Griffith et Henfrey
Hemiaulus sp.
Navicula sp.
Nitz. delicatissima Cleve
Nitz. sp.
Rhiz. setigera Brightwell
Rhiz. styliformis var. bidens (Karsten)
Thalassiosira hyalina (Grunow) Gran
Thal. sp.
Thal. sp.
Tropidoneis sp.
Amphora sp.
Asteromphalus robustus Castracane
Bidd. striata Karsten
Chaet. bullbosus (Ehrenberg) Heiden
Chaet. convolutus Castracane
Chaet. tortissimus Gran
Cocconeis pinnata Greg.
Coscinodiscus asteromphalus Ehrenberg
Dactyliosolen antarcticus Castrancane
Eucampia balaustium Castracane
Gomphonema cymbelloides Franguelli et Orlando
Gyrosigma sp.
Licmophora sp.
Nitzschioides closterium Ehreberg
Nitz. longissima (Breb) Ralfs
Rhizosolenia alata f. inermis (Castr.) Hustedt
Rhiz. styliformis var. longispina Hustedt
Rhiz. sp.
Thal. subtilis (Ostf) Gran
Thalassiothrix longissima Cleve et Grum
Trachyneis sp.

Pyrrophyta

Peridinium parallelum Broch

Chrysophyta

Distephanus speculum (Ehr.) Haeckel