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Spatial structure of phytoplankton in the Scotia Front west Elephant Island (BIOMASS III, October — November 1986)

ABSTRACT: Low concentrations of phytoplankton (average 2.5×10^4 to 6.0×10^5 cells l^{-1}) were found at ten stations surveyed in the region of the Weddell-Scotia Confluence. Phytoflagellates represented mainly by 1—3 μm picoplankton were prevalent among the algae, contributing 65—100% to the total numbers: this group is observed to dominate over diatoms in areas of intensive water mixing. Maximum concentrations of phytoplankton at one station, reaching down to 200 m, were due to a physical aggregation of cells by confluencing and downwelling waters. The average for the water column quantities of the same algal groups were nearly identical at most stations, but peak numbers occurred in the 0—75 m surface layer. Differences in diatom assemblages were associated with the complex hydrography of the WSC region.
Key words: Antarctica, Weddell-Scotia Confluence, phytoflagellates, diatoms, BIOMASS III.

1. Introduction

Frontal zones in the Southern Ocean are often the scanes of enhanced phytoplankton biomass (Steyaert 1973; Plancke 1977; Lutjeharms, Walters and Allanson 1985). Increases of phytoplankton cell concentrations at frontal stations were recorded in the Pacific Ocean by Hasle (1969) and in the Indian Ocean by Kopczyńska, Weber and El-Sayed (1985, 1986). Such phenomena are attributed either to increased water column stability, a renewal of nutrients supply, or to a physical accumulation of cells in the areas of converging water masses (for summary see Lutjeharms, Walters and Allanson 1985). The areas of oceanic fronts may also form an effective physical barrier for the

distribution of phytoplankton species (Koslova 1966; Sournia, Grall and Jacques 1979; Kopczyńska, Weber and El-Sayed 1985, 1986). More recent studies on phytoplankton composition in the Scotia Front area of the Wedell-Scotia Confluence (WSC) are those of Kopczyńska and Ligowski (1985), Priddle (1985) and Brandini and Kutner (1986). Only the works of the two latter authors and of Kopczyńska (SIBEX 1983/84 data, unpubl.) are based on quantitative whole water samples and thus include the nannoplankton (cells < 20 μm) and picoplankton (< 1—3 μm) organisms which often account for a high proportion of the Antarctic phytoplankton biomass and primary production (Böckel 1981; Weber and El-Sayed 1987). Brandini and Kutner (1986) found rather high phytoplankton populations ($0.5—2.0 \times 10^6$ cells l^{-1}) in surface (0 m) waters of the WSC region in January 1983 with however no any distinct increase in cell concentrations at any particular station. Comparatively very low algal numbers were found in January 1984 by Kopczyńska (unpubl.) at a station located south-west of Elephant Island. Other quantitative phytoplankton studies in localities nearest the WSC were carried out in Ezcurra Inlet at King George Island (Kopczyńska 1980, 1981) and in the southern Drake Passage and the Bransfield Strait during the Polish FIBEX and SIBEX investigations (Kopczyńska, unpubl.).

The study reported here was conducted during a coarse scale (1 to 100 km) survey of ten stations located in the Scotia Front whose general hydrodynamical structure has been described by Patterson and Silvers (1980), Stein and Rakusa-Suszczewski (1983), and Stein (1986).

The purpose of the present study was to examine the quantitative spatial variations and species composition of phytoplankton in relation to the hydrodynamical conditions of the WSC area determined on the basis of STD and XBT measurements (Grelowski and Wojewódzki 1988).

2. Material and methods

Whole water quantitative samples of phytoplankton were collected along with other biological, physical and chemical oceanography data at ten stations occupied near Elephant Island by the Polish r/v "Profesor Siedlecki" (Rakusa-Suszczewski 1988). The stations were located at the Scotia Front (Patterson and Sievers 1980; Stein and Rakusa-Suszczewski 1983; Stein 1986) of the Weddell-Scotia Confluence (WSC) in a grid of closely spaced points (in coarse scale; 1 to 100 km) surveyed between 31 October and 3 November 1986 (Fig. 1).

Phytoplankton samples were obtained with a plastic bathometer of the Van Dorn type from standard depths of 0, 20, 50, 75, 100, 150, 200, 500, 1000, 1500 and 1850 m Aliquots of 100 ml samples were preserved

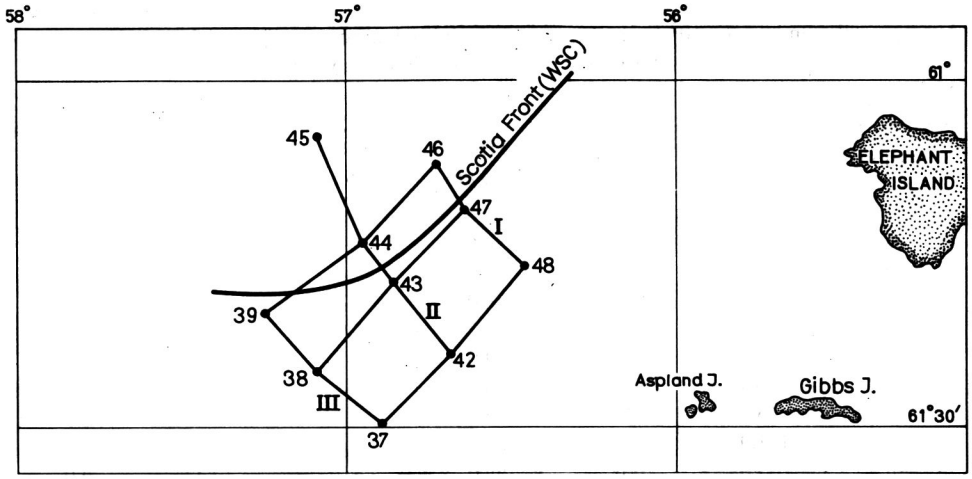

Fig. 1. Location of the sampling stations at Scotia Front 31 October — 3 November 1986. I, II, III — transects

with 4% formalin (final concentration). Either 10 or 50 ml of the served with 4% formalin (final concentration). Either 10 or 50 ml of the samples from all depths were settled for 24 h in a Utermöhl-type sedimentation chamber. Algal cells were examined and counted with a Zeiss inverted microscope at 500× magnification. At least 300 cells were counted along one to four transects made across the counting chamber and the numbers were related to the quantities of algae contained in one litre of water.

3. Results

3.1. Vertical distribution of major phytoplankton groups

At all sampling stations (Tab. 1, Figs. 2—4) phytoflagellates and within this group mainly picoflagellates 1 to 3 µm in size, were the dominant algae, which contributed between 65 to 90 or even 100% of the total phytoplankton numbers at discrete depths. Diatoms made up 3 to 31% of the total counts.

Peak numbers of diatoms and flagellates (Figs. 2—4) were found in the 0—75 m surface layer either at 0, 20 or 50 m. However at one station 47, which had the highest cell counts, in addition to a maximum at 20 m (diatoms: 260×10^3 cells l^{-1}; flagellates 1080×10^3 l^{-1}), a secondary peak was noted at 150 m and still appreciable numbers (diatoms 67×10^3 l^{-1}) were present at 200 m. Generally, at all other stations the cell concentrations below 75 m were nearly uniformly distributed down to about 200 m and they were much less than in the surface 0—75 m layer. Below 200 m only trace concentrations (diatoms 0.3 to 3.5×10^3 cells l^{-1}; flagellates usually 2 to

Table 1

Average cell numbers ($\times 10^3$ l^{-1}) of the major phytoplankton groups in the 0—75 m surface layer (A) and in the 100—200 m layer (B)

A

Station	Diatoms	Total [1] MF	MF [2] 1—3 μm	CR [3] 6—9 μm	PR [4] 6—12 μm	DN [5]
37	40.0	122.0	98.0	2.8	10.4	1.2
38	39.6	200.1	150.0	7.1	37.6	3.8
39	57.0	232.1	178.0	7.4	32.0	9.4
42	77.0	366.0	316.0	5.4	35.5	2.6
43	89.2	114.0	76.2	8.0	22.4	2.8
44	43.8	219.0	164.0	6.5	32.0	2.1
45	50.4	179.2	138.0	8.4	22.3	2.3
46	63.0	129.2	103.0	7.2	15.6	2.1
47	121.0	472.0	424.0	5.6	35.2	4.7
48	39.0	126.2	99.0	3.0	12.3	4.0
B						
37	4.6	31.8	24.3	0.7	2.2	1.1
38	5.4	35.6	25.0	1.9	1.3	2.8
39	8.0	67.3	40.0	2.8	6.4	2.0
42	3.4	39.0	32.0	2.0	2.9	1.9
43	2.6	65.3	55.0	1.0	4.7	0.5
44	5.4	42.4	39.0	1.5	1.2	0.8
45	2.0	23.0	21.0	0.6	0.4	1.3
46	22.0	38.0	34.2	1.9	3.6	1.9
47	91.0	309.0	260.0	7.0	42.1	1.4
48	6.0	30.1	26.0	1.3	0.1	1.6

1 — total phytoflagellates and monads (includes groups 2, 3, 4 and a group of monads 3—9 μm not shown separately in Table 1); 2 — picoplankton flagellates 1—3 μm; 3 — cryptomonads 6—9 μm; 4 — prasinophytes 6—12 μm; 5 — dinoflagellates.

25×10^3 cells l^{-1}) were found, observable however at such great depths as 1000 m (st. 45) or 1500 m (st. 44).

In spite of the obvious vertical variations in cell distributions shown in Fig. 2, the average concentrations of the same algal groups are strikingly similar within the surface 0—75 m layer of all but two or three stations (47, 43, 42; Tab. 1). Thus except for diatom maxima at station 47 (average 120×10^3 l^{-1}), st. 43 (average 89×10^3 l^{-1}) and also at st. 42 (average 77×10^3 l^{-1}), the average diatom numbers at all remaining seven stations are within the range 39.0 to 63.0×10^3 l^{-1}. The average concentrations of parasinophytes in the surface layer of most stations are 22.0 to 37.0×10^3 l^{-1}; those of cryptomonads 5.0 to 8.0×10^3 l^{-1}; and of dinoflagellates 1.0 to 4.0×10^3 l^{-1}. Perhaps the greatest differences between stations were noted for the most abundant phytoflagellates 1 to 3μm in size, where peak numbers (st. 47: average 424×10^3 l^{-1}; st. 42: average 316×10^3 l^{-1}) exceeded two or four-fold the concentrations present at the

remaining stations (98.0 to 178.0 × 10^3 l^{-1}). Similar comments can be made about the 100—200 m subsurface layer (Tab. 1B). Except for the maxima at station 47 (diatoms 91 × 10^3 l^{-1}; picoflagellates 260 × 10^3 l^{-1}; Prasino-

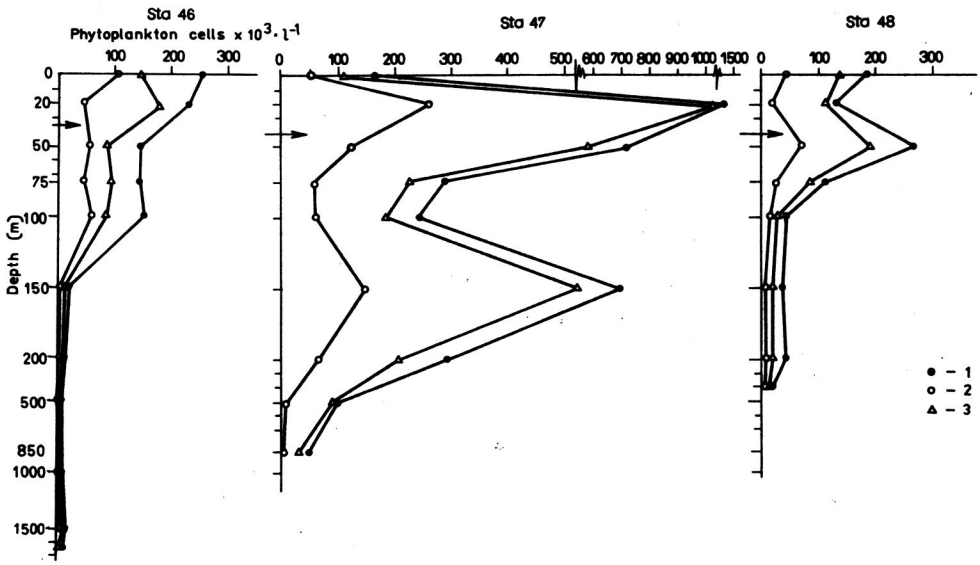

Fig. 2. Vertical distribution of major phytoplankton groups at the sampling stations in transect I; 1 — total algae; 2 — diatoms; 3 — total phytoflagellates and monads

Arrows indicate depths of the euphotic zone

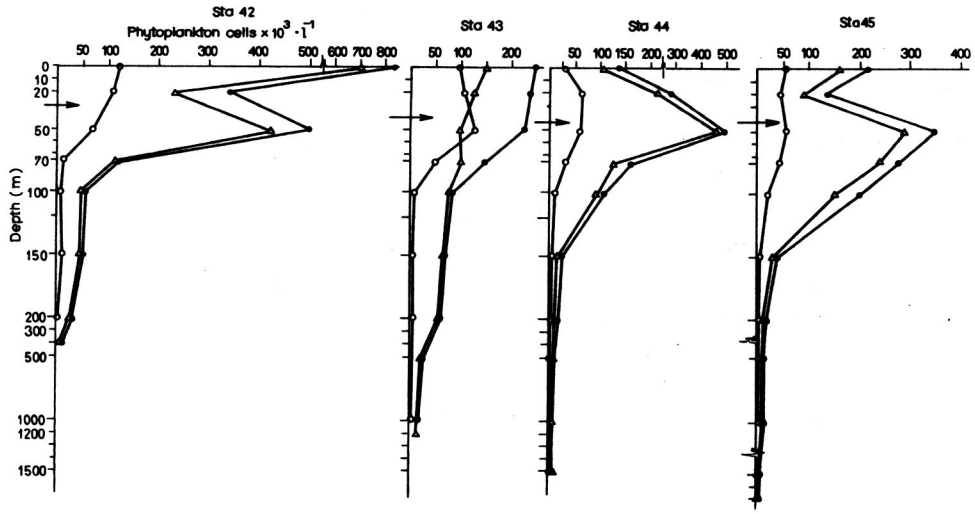

Fig. 3. Vertical distribution of major phytoplankton groups at the sampling stations in transect II. Explanations as in Fig. 2.

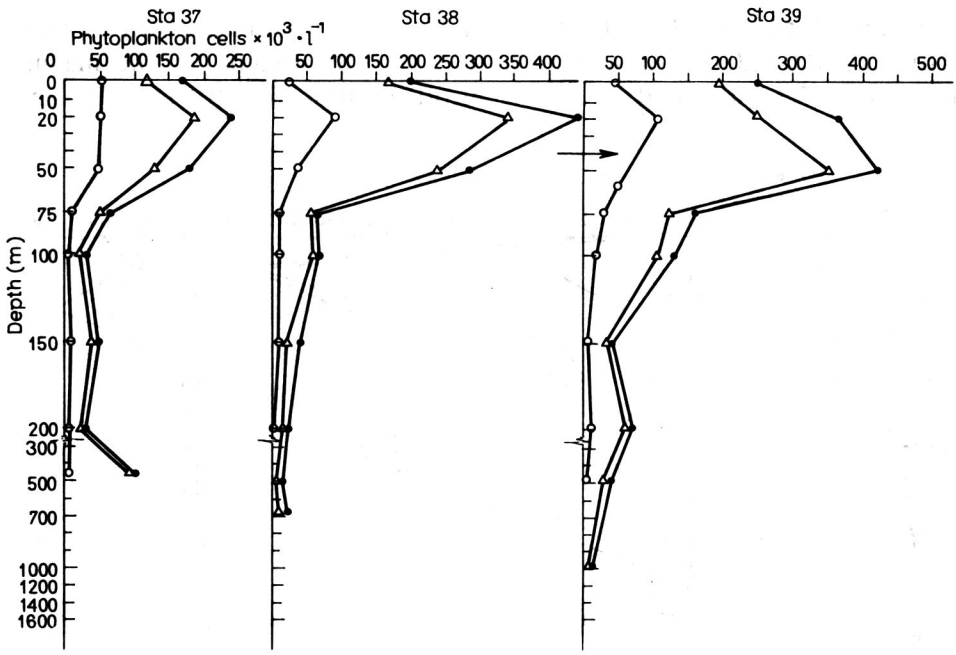

Fig. 4. Vertical distribution of major phytoplankton groups at the sampling stations in transect III. Explanations as in Fig. 2

phytes 42×10^3 l $^{-1}$) and somewhat greater diatom numbers at st. 46 and of flagellates at st. 43 and 39, the average cell counts of the same algal groups in this layer below the euphotic zone are very much alike and they are much less than in the surface 0—75 m layer.

3.2. Diatom assemblages

Corethron criophilum Castr., *Thalassiosira* spp. (mostly 12—20 μm cells of *T. antarctica* Comber) and *Nitzschia "nana"* (cells of both *N. cylindrus* (Grun.) Hasle and *N. pseudonana* Hasle, 3—6 μm length) were most ubiquitous diatoms in the studied area (Figs. 5, 6) with the two latter taxa reaching greater depths than other diatoms. *N. "nana"* was found at 1500 m (st. 44) and 1000 m (st. 45, 46, 47) while *Thalassiosira* spp. at 500 m in a few stations. At least some of *N. "nana"* cells were still viable and capable of further cell divisions as shown by growth experiments performed by Simm (unpubl.).

Chaetoceros socialis Lauder was very common in stations of transects I and II (Fig. 1) and displayed a peak abundance of $> 100 \times 10^3$ cells l $^{-1}$ at 20 m of st. 47. Except for small quantities at st. 37 it was absent from transect III. At the stations of its highest abundance its occurrence was

associated with *C. neglectus* Karst., but not at st. 45 where the latter species was not observed. In contrast to *C. socialis*, *C. neglectus* was also present among dominant species of transect III (st. 37, 38, 39) with greater concentrations in the 1—50 m stratum. Maximal abundance of 20 to 50×10^3 cells l^{-1} was reached at stations 39, 47 and 43.

A group of *Chaetoceros* spp. was represented mainly by *C. atlanticus* Cl. (especially at st. 37, 43 and 48), *C. flexousus* Manguin, *C. peruvianus* Brightw., *C. tortissinus* Gran., *C. neogracilis* Van Lund. and *C. criophilus* Castr. (mainly at stations of transects I and II).

Species of *Nitzschia* (group *Pseudonitzschia*) were found in highest abundance at stations of transect I (st. 46, 47) where they were uniformly distributed vertically down to 200 m (st. 47). The group included *N. turgiduloides* Hasle, *N. heimii* Manguin and *N. prolongatoides* Hasle.

Nitzschia cylindrus (Grun.) Hasle and *N. curta* (Van Heurck) Hasle of the *Fragilariopsis* group were mainly found at stations 44 and 45 of transect II.

Rhizosolenia spp., especially *R. alata* with the forms *inermis* (Castr.) Hust and *indica* (Perag.) Hust, were present at st. 43, 44 and 47 in higher numbers than at other stations.

Generally transects I and II (Figs. 5, 6) were characterized by the presence of *C. socialis*, *C. neglectus*, *Chaetoceros* ssp. and *Nitzschia* spp. of both

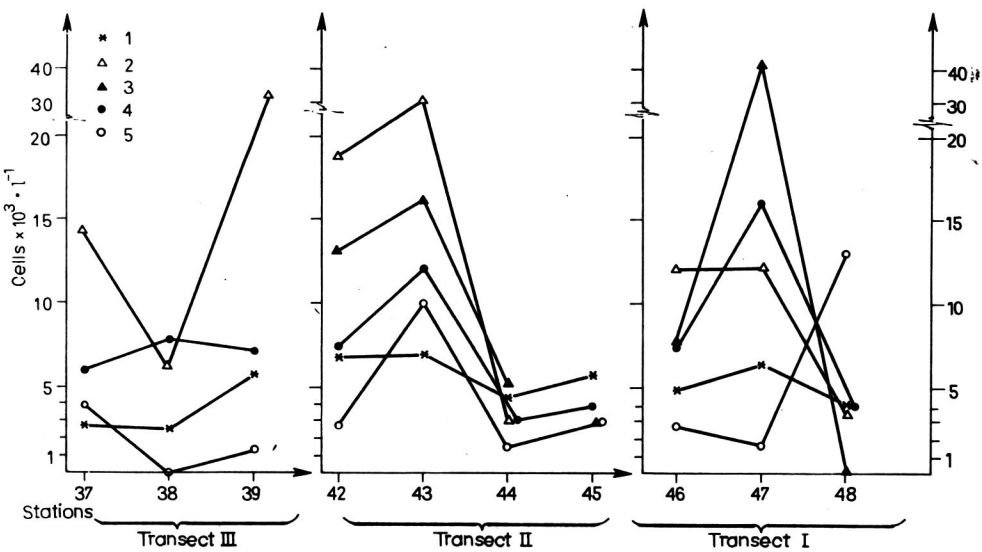

Fig. 5. Horizontal distribution ob major diatoms at ten stations of three transects in the vicinity of the Scotia Front. Average cell numbnrs are for the 0—75 m surface layer. 1 — *Corethron criophilum*; 2 — *Chaetoceros neglectus*; 3 — *Chaetoceros socialis*; 4 — *Thalassiosbrë* spp.; 5 — *Chaetoceros* spp.

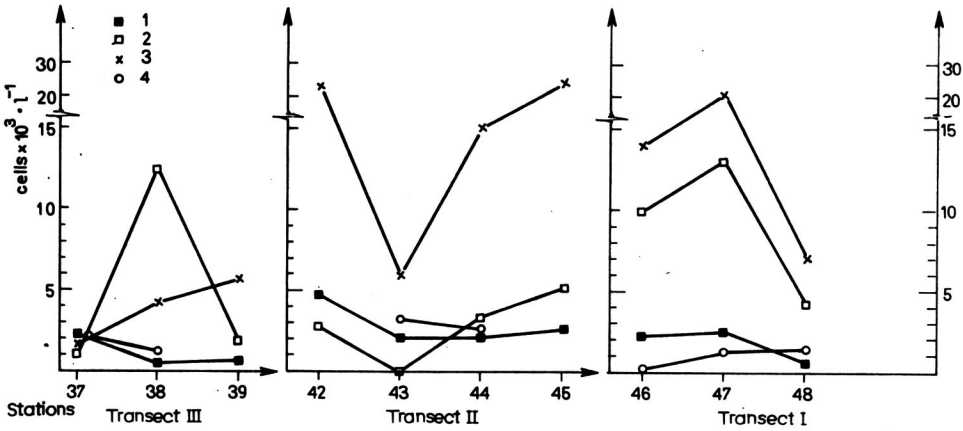

Fig. 6. Horizontal distribution of major diatoms at ten stations of three transects in the vicinity of the Scotia Uront. Average cell numbers are for the 0—75 m surface layer. 1 — *Nitrschia* spp. (*Pseudonitzschia*); 2 — *Nitzschia* spp. (*Fragilariopsis*); 3 — *Nitzschia* "*nana*"; 4 — *Rhizosolenia* spp.

groups; stations of transect III were similar in not having *C. socialis*, while stations located north of the Scotia Front in the vicinity of pack ice (Lipski and Zieliński 1988) contained *N. cylindrus* and *N. curta* uniformly distributed down to 150 m.

4. Discussion

The most characteristic feature of phytoplankton populations found at the October—November stations in the area of the Scotia Front is the predominance of phytoflagellates over diatoms. I have observed similar situations on a few previous occasions such as during the four summer months study period (December—March 1977/78) in the homogeneous and upwelling waters of Ezcurra Inlet, Admiralty Bay (Kopczyńska 1980, 1981) and during the FIBEX and SIBEX quantitative studies in the southern Drake Passage and Bransfield Strait (Kopczyńska, unpubl.). During these study periods, as in the present study, phytoflagellates were consistently found to exceed diatoms in numbers in areas of intensified water mixing such as the central part of the Bransfield Strait, but were found in concentrations lesser than diatoms in waters with clearly defined physical-chemical parameters (temperature, salinity, major nutrients) typical of the Bellingshausen Sea or the Weddell Sea. The mixing water areas were also characterized by the lowest cell counts of both algal groups. All these observations and others (in the Scotia Front during SIBEX) suggest that areas of particularly complex hydrography and intensive mixing processes may greatly affect the phytoplankton populations

present there not only by reducing the quantities of cells, but also by altering the proportions between major phytoplankton groups in favour of phytoflagellates. Flagellates capable of an active movement, as much as it might be limited, are apparently in a better position than diatoms to survive in areas of intensive mixing. The hypothesis is supported, at least partly, by the heavy sedimentation of intact diatom frustules and resting spores as recorded in free drifting sediment traps suspended at 100 m in the vertically homogeneous water of the Bransfield Strait at the Antarctic Peninsula in November—December 1980 (v. Bodungen et al. 1986). This heavy sinking of diatoms in the Bransfield Strait appears to be a well established phenomenon reported as early as 1934 (Neaverson 1934). One of the most important direct causes negatively affecting diatoms in nearshore areas of intensive mixing such as Ezcurra Inlet at King George Island, seems to be the obliteration of light in surface waters by high amounts of mineral particles in suspension (Kopczyńska 1980, 1981).

Just one station 47 located in the centre of a downwelling area (Grelowski and Wojewódzki 1988; Rakusa-Suszczewski 1988) had concentrations of cells visibly greater than in other stations and present throughout the water column down to 200 m. The most plausible explanation of this situation would be a mechanical advection and aggregation of cells by confluencing water masses. Physical accumulation of cells seems to be the prefered explanation of phytoplankton enhancement in Antarctic frontal zones (Lutjeharms, Walters and Allanson 1985) or areas of water-eddies formations (Heywood and Priddle 1987) since growth-triggering mechanisms such as an inflow of nutrients would hardly be applicable in waters already abounding in essential nutrients (Holm-Hansen et al. 1977; Heywood and Whitaker 1984). The levels of ambient nutrients at our stations were typically high for Antarctic waters (Ballester, pers. comm.). Consistent with the results of greater cell quantities at st. 47 is the chlorophyll *a* maximum recorded at the same station (Lipski and Zieliński 1988), as well as the maximum of wet and dry net phytoplankton biomass (Ligowski 1988). As with the cell counts, also chlorophyll *a* and net phytoplankton showed increased values at stations 43 and 39. Since st. 47, 43 and 39 were situated in the downwelling area (Grelowski and Wojewódzki 1988, Rakusa-Suszczewski 1988), the purely physical-mechanical effect of the hydrodynamical conditions on phytoplankton populations is evident.

The almost identical average cell concentrations found at the remaining stations have apparently reflected the homogeneity of the surface waters where a certain degree of positive stability in the upper water column (Grelowski and Wojewódzki 1988, Rakusa-Suszczewski 1988) has evidently helped to retain the peak algal quantities at 20 or 50 m.

Trace numbers of cells were present at great depths of 1500 or 1800 m, and at least *Nitzschia "nana"* and phytoflagellates turned out to be still viable

as shown by growth experiments of Simm (unpubl.). This provides an evidence for rather fast rates of sinking of intact algal cells in the WSC area.

Differences between diatom assemblages encountered at stations located in the pack ice zone north of the Scotia Front (*Flagilariopsis* group and no *C. neglectus*) from those characteristic of transect III (no *C. socialis* and fewer *Nitzschia* spp.) or transects I and II (*Chaetoceros* spp., *Nitzschia* spp. and *Rhizosolenia* spp.) seem to have reflected the complex hydrography of the area of confluence of various water masses such as the East Bransfield Strait Water, the Weddell Sea Water and the Scotia Sea. Dominant diatoms found at all three transects are typical of this area (Hart 1942; Frenquelli and Orlando 1958; Kopczyńska and Ligowski 1982, 1985; Priddle 1985; Brandini and Kutner 1986).

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5. References

Bodungen von B., V. S. Smetacek, M. M. Tilzer and B. Zeitzschel. 1986. Primary production and sedimentation during spring in the Antarctic Peninsula region. — Deep-Sea Res., 33: 177—194.

Brandini F. P. and M. B. B. Kutner. 1986. Composition and distribution of summer phytoplankton in the Bransfield Strait, Antarctica. — An. Acad. brasil. Cienc., 58 (suppl.): 3—11.

Bröckel von K. 1981. The importance of nannoplankton within the pelagic Antarctic ecosystem. — Kieler Meeresforsch. (Sonderh.), 5: 61—67.

Frenquelli J. and H. A. Orlando. 1958. Diatomeas y Silicoflagelados del sector antartico sudamericano. — Publ. Inst. Antart. Argent., 5: 1—191.

Grelowski A. and T. Wojewódzki. 1988. Hydrography of the region between the King George and Elephant Islands (BIOMASS III. October—November 1986). — Pol. Polar Res., 9: 165—180.

Hart T. J. 1942. Phytoplankton periodicity in Antarctic surface waters. — Discovery Rep., 21: 261—356.

Hasle G. R. 1969. An analysis of the phytoplankton of the Pacific Southern Ocean: abundance, composition and distribution during the Brategg Exp. 1947—48. — Hvalrådets Skr., 52: 1—168.

Heywood R. B. and J. Priddle. 1987. Retention of phytoplankton by an eddy. — Contin. Shelf Res., 7: 937—955.

Heywood R. B. and T. M. Whitaker. 1984. The Antarctic marine flora. In: R. M. Laws (ed.), Antarctic ecology. — Acad. Press. London: 373—419.

Holm-Hansen O., S. Z. El-Sayed, G. A. Franceschini and K. Cuhel. 1977. Primary production and the factors controlling phytoplankton growth in the Antarctic seas. In: G. A. Llano (ed.), Adaptations within Antarctic ecosystems: Proceedings of the third SCAR Symposium on Antarctic biology. — Smithsonian Institution, Washington: 11—50.

Kopczyńska E. E. 1980. Small-scale vertical distribution of phytoplankton in Ezcurra Inlet, Admiralty Bay, South Shetland Islands. — Pol. Polar Res., 1: 77—96.

Kopczyńska E. E. 1981. Periodicity and composition of summer phytoplankton in Ezcurra Inlet. Admiralty Bay. South Shetland Islands. — Pol. Polar Res., 2: 55—70.

Kopczyńska E. E. and R. Ligowski. 1982. Phytoplankton abundance and distribution in the southern Drake Passage and the Bransfield Strait in February—March 1981 (BIOMASS--FIBEX). — Pol. Polar Res., 3: 193—202.

Kopczyńska E. E. and R. Ligowski. 1985. Phytoplankton composition and biomass distribution in the southern Drake Passage, the Bransfield Strait and the adjacent waters of the Weddell Sea in December 1983 — January 1984 (BIOMASS-SIBEX). — Pol. Polar Res., 6: 65—77.

Kopczyńska E. E., L. H. Weber and S. Z. El-Sayed. 1985. Phytoplankton data from the February—April 1980 cruise of the MV SA "Agulhas": quantitative species counts and net tow data from the Indian sector of the Antarctic Ocean. — Texas A & M Research Foundation Project RF-4539, Techn. Rep.: 77 pp.

Kopczyńska E. E., L. H. Weber and S. Z. El-Sayed. 1986. Phytoplankton species composition and abundance in the Indian Sector of the Antarctic Ocean. — Polar Biol., 6: 161—169.

Koslova O. G. 1966. Diatoms in the Indian and Pacific sectors of the Antarctic. — Nauka, Moscow, (Engl. transl., Jerusalem, Israel Progr. Sci. Transl.): 191 pp.

Ligowski R. 1988. Distribution of net phytoplankton in the Scotia Front west of Elephant Island (BIOMASS III, October—November 1986). — Pol. Polar Res., 9: 243—264.

Lipski M. and K. Zieliński. 1988. Coarse-scale structure of chlorophyll *a* distribution in Scotia Front west of Elephant Island (BIOMASS III, October—November 1986). — Pol. Polar Res., 9: 195—201.

Lutjeharms J. R. E., N. M. Walters and B. R. Allanson. 1985. Oceanic Frontal Systems and Biological Enhancement. In: W. R. Siegfried, P. R. Condy and R. M. Laws (eds.), Antarctic nutrient cycles and food webs. — 11—21.

Neaverson E. 1934. The sea floor deposits. I — General characteristics and distribution. — Discovery Rep., 9: 295—350.

Patterson S. L. and H. S. Sievers. 1980. The Weddell-Scotia Confluence. — J. Phys. Oceanogr., 10: 1584—1610.

Plancke J. 1977. Phytoplankton biomass and productivity in the Subtropical Convergence area and shelves of the western Indian subantarctic islands. In: G. A. Llano (ed.), Adaptaions within Antarctic ecosystems; Proceedings of the third SCAR Symposium on Antarctic Biology. — Smithsonian Institution, Washington: 51—73.

Priddle J. 1985- Species cmmposition of net phytoplankton from Drake Passage, Bransfield Strait and Scotia Sea durinc summer 1982. — Meeresforsch., 30: 240—250.

Rakusa-Suszczewski S. 1988. Coarse-scale structure of the water column between King George and Elephant Islands (BIOMASS III, October—November 1986). — Pol. Polar Res., 9:

Stern M. 1986. Variability of water masses and currents off the Antarctic Peninsula during SIBEX. — Arch. Fisch Wiss., 37: 25—50.

Stein M. and S. Rakusa-Suszczewski. 1983. Geostrophic currents in the Smuth Shetland Islands urea during FIBEX. — Mem. Nat. Inst. Polar Res., Tokyo, 27: 24—34.

Steyaert J. 1973. Distribution of plankton diatoms along an African—Antarctic transncs. — Invest. Pesq., 48B 295—328.

Sournia A., J. R. Grall and G. Jacques. 198;- Plankton diatoms und dinoflacnllates along a meridian transect in the Southern Indian Ocean (Campagne "Antiprod I" du Marion Dufresne, mars 1977). — Bot. Mar., 22: 183—198.

Weber L. H. and S. Z. El-Sayed. 1987. Contribution of the net, nanno- and picoplankton to the phytoplankton ssanding crop and primary productivity in the Southern Ocean. — J. Plankton Res., 9: 984—994.

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6. Streszczenie

W okresie od 31 października do 3 listopada 1986 r. badano ilościowy i jakościowy skład fitoplanktonu i jego rozkład pionowy na 10-ciu stacjach usytuowanych w rejonie Frontu Scotia (Konfluencja Mórz Weddella i Scotia), na zachód od Wyspy Elephant (rys. 1). Próby fitoplanktonu uzyskano wraz z innymi danymi biologicznymi i fizyko-chemicznymi z pokładu statku naukowego "Profesor Siedlecki". Pobrano je butlą typu Van Dorn ze standardowych głębokości: 0, 20, 50, 75, 100, 150, 200, 500, 1000, 1500 i 1850 m. Utrwalone 4% formaliną próby przeglądano i liczono pod mikroskopem odwróconym Zeissa (metoda Utermöhla).

Koncentracje komórek fitoplanktonu na wszystkich stacjach były niewielkie; średnie ilości w kolumnie wody wynosiły $2{,}5 \times 10^4$ do $6{,}0 \times 10^5$ l^{-1} (tab. 1). Tylko na jednej stacji (st. 47), położonej w centrum rejonu zapadania się wód powierzchniowych maksymalne ilości komórek (na głębokości 20 m: okrzemki $2{,}6 \times 10^5$ l^{-1}; wiciowce $1{,}08 \times 10^6$ l^{-1}) znacznie przewyższały koncentracje fitoplanktonu na pozostałych stacjach. Na tej samej stacji znaleziono znaczne ilości komórek (okrzemki $6{,}7 \times 10^4$ l^{-1}) do głębokości 200 m. Ogólnie charakterystyczną cechą rozkładu pionowego fitoplanktonu (rys. 2—4) było występowanie największej koncentracji komórek w górnej warstwie wody (0—75 m), głównie na głębokości 0, 20 i 50 m. W warstwie od 75 do 200 m rozmieszczenie komórek było jednolite, a koncentracje dużo mniejsze, niż w górnej warstwie wody. Poniżej 200 m znaleziono tylko śladowe ilości komórek, sięgające jednakże aż do 1800 m. Rozkład pionowy glonów związany był z niemal homogennym charakterem warstwy wody powierzchniowej (0—150 m) na wszystkich stacjach. Największa koncentracja glonów na stacji 47 spowodowana była mechanicznym napływem i nagromadzeniem się komórek w rejonie zapadania się wód.

Dominującą grupą fitoplanktonu były wiciowce reprezentowane głównie przez picoplankton (o wielkości 1—3 μm), Prasinophyceae (6—12 μm) i kryptomonady (6—9 μm). Stanowiły one 65—100% glonów we wszystkich próbach. Obserwacje autorki wskazują na to, że wiciowce dominują nad okrzemkami w rejonach intensywnego mieszania się różnych mas wodnych. Okrzemki stanowiły 3—31% fitoplanktonu. Reprezentowane były grupy *Corethron criophilum* Castr. i gatunki z rodzajów *Thalassiosira*, *Nitzschia* (grupy *Fragilariopsis* i *Pseudonitzschia*), *Chaetoceros* i *Rhizosolenia* (rys. 5, 6). Różnice w występowaniu gatunków na stacjach położonych na północ i na południe od Frontu Scotia, jak również na stacjach zachodnich i wschodnich odzwierciedlały skomplikowane warunkr hydrograficzne tego rejonu konfluencji różnych mas wodnych.