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Pelagic Diatom Fluxes I: Size Fractioned Time-Series Results from Subarctic Pacific Station PAPA During 1982-1983

by

Kozo Takahashi, Danielle N. Povio,
John D. Billings, and Steven J. Manganini

December 1985

Technical Report

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FROM SUBARCTIC PACIFIC STATION PAPA
DURING 1982-1983.

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Kozo Takahashi, Danielle N. Povio,
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Woods Hole, Massachusetts 02543

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TECHNICAL REPORT

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Approved for Distribution:

David A. Ross

David A. Ross, Chairman
Department of Geology and Geophysics

Table of Contents

	Page
List of Figures	2
List of Tables	3
Abstract	4
Introduction	4
Methods	7
Results	8
Acknowledgments	9
References	10

List of Figures

<u>Figure:</u>	<u>Page</u>
1 A map showing the location of PARFLUX Station PAPA.	6
2 <u>Coscinodiscus marginatus</u> (total).	34
3 <u>Coscinodiscus marginatus</u> (1 valve).	35
4 <u>Coscinodiscus marginatus</u> (2 valves).	36
5 <u>Coscinodiscus oculus-iridis</u>	37
6 <u>Coscinodiscus</u> sp. A	38
7 <u>Thalassiosira trifurcata</u> group.	39
8 <u>Actinocyclus curvatulus</u>	40
9 Unidentified small-sized (<25µm) Coscinodiscids	41
10 <u>Asteromphalus robustus</u>	42
11 <u>Asteromphalus heptactis</u>	43
12 <u>Pseudopodosira elegans</u>	44
13 <u>Corethron criophilum</u>	45
14 <u>Rhizosolenia styliformis</u>	46
15 <u>Rhizosolenia styliformis</u> (auxospore, process).	47
16 <u>Rhizosolenia styliformis</u> (auxospore, base).	48
17 <u>Rhizosolenia hebetata hiemalis</u>	49
18 <u>Rhizosolenia alata gracillima</u>	50
19 <u>Rhizosolenia alata curvirostris</u>	51
20 <u>Chactoceros atlanticus</u> (total).	52
21 <u>Chactoceros atlanticus</u> (1 valve).	53
22 <u>Chactoceros atlanticus</u> (2 valves).	54
23 <u>Chactoceros concavicornis</u>	55
24 <u>Chactoceros concavicornis</u> (1 valve).	56
25 <u>Chactoceros concavicornis</u> (2 valves).	57
26 <u>Denticulopsis seminae</u> (total).	58
27 <u>Denticulopsis seminae</u> (1 valve).	59
28 <u>Denticulopsis seminae</u> (2 valves).	60
29 <u>Denticulopsis seminae</u> (chains).	61
30 <u>Nitzschia</u> spp. group.	62

Two illustrations are normally presented in each figure as a and b which represent:

a: PAPA deployment II, 1000 m (6 months).

b: PAPA deployment I and II, 3800 m (1 year).

List of Tables

	Page
Table 1. Sampling intervals for PAPA I and II deployments of PARFLUX time-series sediment trap experiments at subarctic Station PAPA. Dates represent the opening and closing times of sample cups which are placed with a tight seal under the conical PARFLUX Mark 5 traps (aperture area = 1.167 m^2).	11
Table 2. Information for sample split size, counting strategies, and resulting multiplication factors. The factors account for sample periods and aperture size of the traps listed in Table 1. [Multiplication factor] x [raw counts] = [flux] ($\text{No. m}^{-2}\text{day}^{-1}$). Census Group A includes all taxa other than those listed in Census Group B. Census Group B includes: <u>Rh. alata curvirostris</u> , <u>Rh. alata gracillima</u> , <u>Ch. atlanticus</u> , <u>Ch. concavicornis</u> , and <u>D. seminae</u> .	12
Table 3. PAPA I and II diatom counts (see Table 2 for details of traverse/areas examined).	15
Table 4. Time-series fluxes (values $\text{m}^{-2}\text{day}^{-1}$) of diatom taxa at subarctic Station PAPA during September, 1982 through September, 1983. See Table 1 for details of specific dates and duration of each sample.	24
Table 5. Number of mean counted specimens (valves) per sample. The means were computed every 6-month time-series period. Each value represents a mean of the sum of microscopic counts performed on four microslides each representing size fractions: $250\text{-}1000\mu\text{m}$, $125\text{-}250\mu\text{m}$, $63\text{-}125\mu\text{m}$, and $<63\mu\text{m}$.	33

PELAGIC DIATOM FLUXES I: SIZE FRACTIONED TIME-SERIES RESULTS FROM
SUBARCTIC PACIFIC STATION PAPA DURING 1982-1983.

by

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Abstract

A time series vertical flux assessment of pelagic diatoms was conducted during September, 1982 through September, 1983 at subarctic Pacific Station PAPA (50°N, 145°W; water depth 4200 m) using PARFLUX sediment traps deployed at 1000 and 38000 m. The time series sediment trap samples were collected for 11 to 16-day periods during the year; a total of 24 samples represent a full year's record of flux. Eighteen taxonomic groups of diatoms were enumerated, based on a census of four wet-sieved size fractions: 250-1000 μ m, 125-250 μ m, 63-125 μ m, and <63 μ m. In order to study the sinking processes of diatoms, detailed information on frustule integrity was acquired. For example, counts of single valves were separated from frustules. Size-fractioned fluxes of all the counting groups are graphically presented, which provides a data base for further investigations.

Introduction

Diatoms are one of the major phytoplankton groups which contribute significantly to primary production in oceanic environments. In pelagic ecosystems, diatoms play one of the most fundamental roles in the lower end of the complex pelagic food web. Signals contained in diatom frustules or in their assemblages can be extracted and correlated with environmental parameters for a better understanding of oceanic ecosystems (e.g., Sancetta, 1981). The presence of their siliceous frustules makes preservation of these environmental signals in the fossil record possible. Therefore, diatoms in present-day oceans and in geologic records can be studied in order to better understand productivity of present and past oceans.

The role of diatom production and sedimentation in the biogeochemical cycle of silicon is considered to be significant in high latitude oceans: high diatom abundance, both in the waters and sediments, has been recognized previously. Their high vertical fluxes have been inferred from consistently high biogenic silica fluxes ($16\text{--}189\text{ mg m}^{-2}\text{day}^{-1}$) collected throughout a one-year sediment trap experiment in the subarctic Pacific (Honjo, 1984).

We conducted a high resolution time-series study of the vertical flux of pelagic diatoms at PARFLUX Station PAPA (Fig. 1; 50°N , 145°W ; water depth 4200 m) located in the Alaskan current gyre throughout one year from September, 1982 to September, 1983 (Table 1). Station PAPA has been the site of Canadian Weather Station P. From this station a wealth of hydrographic data had been collected from 1956 to 1981 (Anonymous; Tabata and Peart, 1985). Subsequent frequent cruises since 1981 (after termination of the weather station) by the Institute of Ocean Sciences, Patricia Bay, British Columbia, Canada, have yielded additional hydrographic data which are still to be published. These time series diatom flux data are not only important in documenting intra-annual flux variability but also for future studies in interannual flux comparison.

The major objective of this report is to provide a detailed data base for time-series diatom fluxes, most of which cannot be published in international journals due to space limitations. Much of the information that we wish to present here is size fractioned representations of the flux data. We intend to study fluxes in all of the four size fractions mentioned below for an initial two years, thus providing enough information for subsequent studies at Station PAPA in terms of minimizing effort and yet yielding a similar level of information. Interpretations based on present data will be published elsewhere.

Fig. 1. A map showing the location of PARFLUX sediment trap station PAPA. Bathymetric contours are shown in meters.

Methods

The microslide preparation method was similar to that employed for radiolarian (e.g., Takahashi and Honjo, 1981) and silicoflagellate (e.g., Takahashi, in press) studies. Briefly, a sample was sieved through 1000 and 63 μm mesh stainless screens. Both 63-1000 and <63 μm size fractions were split into four aliquots (1/4 of original size) using an Erez-Honjo precision liquid rotary splitter. The splitting was repeated until a desirable aliquot size was obtained, requiring several repetitions. For example, splitting was performed 5 times in order to generate a 1/1024 aliquot. Because diatom fluxes varied greatly with seasons, the aliquot size had to be changed often in consecutive samples. An appropriately split aliquot of 63-1000 μm was wet sieved through 250 and 125 μm mesh. The size fractioned aliquot of the appropriate sample size (see Table 2 for details) was filtered through a 47 mm HA Millipore[®] grid membrane filter with a nominal 0.45 μm pore size using a rectangular stainless steel filtration funnel with a 19 x 42 mm opening. The filter was rinsed with distilled water to remove salts and then dried in an oven. After trimming off the excess margins, the dried filter was mounted with Gargile[®] type B immersion oil on a standard glass microslide.

Diatom counts were performed on an Olympus[®] BH microscope with wide-field, 10X eyepiece lenses and S Plan Apochromat objective lenses of two different magnifications, mentioned below. Two counting methods were established using two magnifications for the diatom census:

(A) Traverse method with a 20X objective lens: A traverse of a vertical strip (along the minor axis of a microslide) was studied for diatom counts using a 20X objective lens for relatively large-sized taxa, such as C. marginatus and Rh. styliformis (Table 2). Each strip represents $15.1 \times 10^6 \mu\text{m}^2$ which is equal to 1/35.9th of an

entire filtered area of the membrane filter on a slide. Only one traverse was counted on slides greater than 63 μm fractions. In order to improve reproducibility, a total of four traverses for the 1000 m sample and three traverses for the 3800 m sample were considered dependable (the 63 μm size fraction is where most diatoms are located) (Tables 2, 5).

(B) Area method with a 40X objective lens: A circular area of microscopic view was studied for counts of relatively small size and abundant taxa. These taxa included Rh. alata curvirostris, Rh. alata gracillima, Ch. atlanticus, Ch. concavicornis and D. seminae (Table 2). One circular area under the magnification corresponds to $184 \times 10^3 \mu\text{m}^2$ which is 1/2735th of an entire filter area of the slide. Normally, four areas per slide were studied (Table 2) in order to generate reproducible data.

Raw counts for a sample combining all of the four slides ranged from 884 to 2670 with a mean of 2023 (Table 5). Possible major sources of errors in diatom counts reported here include (i) splitting; (ii) imperfectly homogeneous distribution of filtered diatoms; and (iii) counting errors. The second category of the sources of errors is determined to be the largest, based on statistical assessments performed on the representative samples. The first and third categories caused less than 5 percent of the errors, each. Overall reproducibility for diatom flux assessment reported here is considered better than 80 percent.

Results

Eighteen taxa were encountered during the diatom flux census (Table 3). As a result, twenty-five counting groups were generated in order to differentiate single valves from frustules as well as vegetative valves from auxospores (Table 3). There are additional taxa that were not encountered during the census but were found during morphological

investigations, especially under the scanning electron microscope (SEM). Such additional taxa contributed negligible fluxes ($\ll 1$ percent of total diatom fluxes) and thus were not reported here. They will be illustrated elsewhere. Time-series fluxes of the counted taxa were computed and reported with a unit of [No. of valves $\text{m}^{-2}\text{d}^{-1}$] (Table 4).

A very high intra-annual variability has been observed for all of the taxa studied (Figs. 2-30).

Acknowledgments

We are most grateful to Dr. Susumu Honjo at Woods Hole Oceanographic Institution for his enthusiastic and continuous encouragement throughout all phases of this study. Without his PARFLUX program, this study could not have been accomplished. We thank Vernon Asper for discussions and technical assistance on board ship and in the laboratory throughout the study. Thanks are also due to Ron Bellegay, Rindy Ostermann, other members of the scientific party, the Captains and crews of the C.F.A.V. Endeavour and Parizeau which cruise regularly to Station PAPA. We appreciate the skillful typing of Emily Evans.

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Table 1. Sampling intervals for PAPA I and II deployments of PARFLUX time-series sediment trap experiments at subarctic Station PAPA. Dates represent opening and closing times of sample cups which are placed with a tight seal under the conical PARFLUX Mark 5 traps (aperture area = 1.167 m²).

Deployment	Sample #	Date Open	Date Closed	Duration (days)
PAPA I	# 1	9/23/82	10/8/82	15
	# 2	10/8/82	10/23/82	15
	# 3	10/23/82	11/7/82	15
	# 4	11/7/82	11/22/82	15
	# 5	11/22/82	12/7/82	15
	# 6	12/7/82	12/22/82	15
	# 7	12/22/82	1/6/83	15
	# 8	1/6/83	1/21/83	15
	# 9	1/21/83	2/5/83	15
	#10	2/5/83	2/20/83	15
	#11	2/20/83	3/7/83	15
	#12	3/7/83	3/18/83	11
PAPA II	# 1	3/27/83	4/12/83	16
	# 2	4/12/83	4/28/83	16
	# 3	4/28/83	5/14/83	16
	# 4	5/14/83	5/30/83	16
	# 5	5/30/83	6/15/83	16
	# 6	6/15/83	7/1/83	16
	# 7	7/1/83	7/17/83	16
	# 8	7/17/83	8/2/83	16
	# 9	8/2/83	8/18/83	16
	#10	8/18/83	9/3/83	16
	#11	9/3/83	9/19/83	16
	#12	9/19/83	10/5/83	16

Table 2. Information for sample split size, counting strategies, and resulting multiplication factors. The factors account for sample periods and aperture size of the traps listed in Table 1.

[Multiplication factor] $\times$ [raw counts] = [flux] ($\# \text{ m}^{-2} \text{ day}^{-1}$).

Census Group A includes all taxa other than those listed in Census Group B.

Census Group B includes: Rh. alata curvirostris, Rh. alata gracillima, Ch. atlanticus, Ch. concavicornis, and D. seminag.

PAPA I, 3800 m

Size fraction (μm)	Sample #	Census Group A		Census Group B		Sample #	Aliquot size	20X Objective lens # of traverses counted	Census Group A		Census Group B	
		20X Objective lens # of traverses counted	Multipl. factor	20X Objective lens # of traverses counted	Multipl. factor				20X Objective lens # of traverses counted	Multipl. factor	20X Objective lens # of traverses counted	Multipl. factor
250-1000	# 1	1	131	7	1429	# 7	64	1	131	4	2500	4
125-250		1	131	7	1429		64	1	131	4	2500	4
63-125		1	525	7	5714		64	1	131	4	2500	4
< 63		3	700	7	22857		1024	3	700	4	40000	4
250-1000	# 2	1	131	5	2000	# 8	64	1	131	7	1429	7
125-250		1	131	5	2000		64	1	131	7	1429	7
63-125		1	525	5	8000		64	1	131	7	1429	7
< 63		3	2800	5	12800		1024	3	700	7	22857	7
250-1000	# 3	1	131	4	2500	# 9	64	1	66	4	2500	4
125-250		1	131	4	2500		64	1	131	4	2500	4
63-125		1	525	4	10000		64	1	131	4	2500	4
< 63		3	700	4	40000		256	3	175	4	10000	4
250-1000	# 4	1	131	4	2500	# 10	64	1	66	4	2500	4
125-250		1	131	4	2500		64	1	66	4	2500	4
63-125		1	525	4	10000		64	1	131	4	2500	4
< 63		3	700	4	40000		256	3	175	4	10000	4
250-1000	# 5	1	131	4	2500	# 11	64	1	66	4	2500	4
125-250		1	131	4	2500		64	1	66	4	2500	4
63-125		1	525	4	10000		64	1	131	4	2500	4
< 63		3	700	4	40000		256	3	175	4	10000	4
250-1000	# 6	1	131	4	2500	# 12	64	1	89	4	3409	4
125-250		1	131	4	2500		64	1	179	4	3409	4
63-125		1	525	4	10000		64	1	179	4	13636	4
< 63		3	700	4	40000							

Table 2 continued.

PAPA II, 3800 mJ.

Size fraction (μm)	Sample #	Census Group A			Census Group B			Sample #	Census Group A			Census Group B		
		Aliquot size	# of traverses counted	Multipl. factor	Aliquot size	# of traverses counted	Multipl. factor		Aliquot size	# of traverses counted	Multipl. factor	Aliquot size	# of traverses counted	Multipl. factor
250-1000	# 1	64	1	123	64	1	2344	# 7	64	1	123	64	1	2344
125-250		64	1	123	64	1	2344		64	1	123	64	1	2344
63-125		64	1	123	64	1	2344		64	1	123	64	1	2344
< 63		1024	3	656	1024	3	37500		1024	3	656	1024	3	37500
250-1000	# 2	64	1	123	64	1	2344	# 8	64	1	123	64	1	2344
125-250		64	1	123	64	1	2344		64	1	123	64	1	2344
63-125		64	1	123	64	1	2344		64	1	123	64	1	2344
< 63		1024	3	656	1024	3	37500		4096	3	2625	4096	3	150001
250-1000	# 3	64	1	123	64	1	2344	# 9	64	1	123	64	1	2344
125-250		64	1	123	64	1	2344		64	1	123	64	1	2344
63-125		64	1	123	64	1	2344		64	1	123	64	1	2344
< 63		1024	3	656	1024	3	37500		4096	3	2625	4096	3	150001
250-1000	# 4	64	1	123	64	1	2344	# 10	64	1	123	64	1	2344
125-250		64	1	123	64	1	2344		64	1	123	64	1	2344
63-125		64	1	123	64	1	23244		64	1	131	64	1	2500
< 63		1024	7.5 *	1640 **	1024	7.5 *	93750		4096	3	2625	4096	3	150001
250-1000	# 5	64	1	123	64	1	2344	# 11	64	1	123	64	1	2344
125-250		64	1	123	64	1	2344		64	1	123	64	1	2344
63-125		64	1	123	64	1	2344		64	1	123	64	1	2344
< 63		1024	6.3 *	1378 **	1024	6.3 *	78750		1024	3	656	1024	3	37500
250-1000	# 6	64	1	123	64	1	2344	# 12	64	1	123	64	1	2344
125-250		64	1	123	64	1	2344		64	1	123	64	1	2344
63-125		64	1	123	64	1	2344		64	1	123	64	1	2344
< 63		1024	3	656	1024	3	37500		1024	3	656	1024	3	37500

* 3 for *C. marginatus*** 656 for *C. marginatus*

Table 2 continued.

PAPA II, 1000 m:

Size fraction (μm)	Sample	Census Group A			Census Group B			Census Group A			Census Group B		
		1	Aliquot traverses size	# of factor counted	20X Objective lens	Multipl.	# of factor counted	1	Aliquot traverses size	# of factor counted	20X Objective lens	Multipl.	# of factor counted
125-1000	# 1	64	1	123	4	2344	4	# 7	64	1	123	4	2344
63-125		64	1	123	4	2344	4		64	1	123	4	2344
< 63		1024	4	492	4	37500	4		64	1	123	4	2344
									4096	4	1969	4	150001
125-1000	# 2	64	1	123	4	2344	4	# 8	64	1	123	4	2344
63-125		64	1	123	4	2344	4		64	1	123	4	2344
< 63		1024	4	492	4	37500	4		64	1	123	4	2344
									4096	4	1969	4	150001
250-1000	# 3	64	1	123	4	2344	4	# 9	64	1	123	4	2344
125-250		64	1	123	4	2344	4		64	1	123	4	2344
63-125		64	1	123	4	2344	4		64	1	123	4	2344
< 63		1024	4	492	4	37500	4		1024	4	492	4	37500
250-1000	# 4	64	1	123	4	2344	4	# 10	64	1	123	4	2344
125-250		64	1	123	4	2344	4		64	1	123	4	2344
63-125		64	1	123	4	2344	4		64	1	131	4	2500
< 63		4096	4	1969	4	150001	4		1024	4	492	4	37500
250-1000	# 5	64	1	123	4	2344	4	# 11	64	1	123	4	2344
125-250		64	1	123	4	2344	4		64	1	123	4	2344
63-125		64	1	123	4	2344	4		64	1	123	4	2344
< 63		1024	4	492	4	37500	4		1024	4	492	4	37500
250-1000	# 6	64	1	123	4	2344	4	# 12	64	1	123	4	2344
125-250		64	1	123	4	2344	4		64	1	123	4	2344
63-125		64	1	123	4	2344	4		64	1	123	4	2344
< 63		1024	4	492	4	37500	4		1024	4	492	4	37500

Table 3. PAPA I & II diatoms counts (See Table 2. for details of traverse/areas examined).

Taxon	Coscinodiscus marginatus (1 valve)				Coscinodiscus marginatus (2 valve)				Coscinodiscus oculus-iridis			
Size fraction (μm)	250-1000	125-250	63-125	(63 μm)	250-1000	125-250	63-125	(63 μm)	250-1000	125-250	63-125	(63 μm)
P2 #1 1000m*		0	5	14		0	2	6		1	0	0
P2 #2 1000m*		1	4	12		2	4	4		0	0	0
P2 #3 1000m	0	2	1	8	0	2	2	0	0	0	1	0
P2 #4 1000m	0	1	4	3	2	4	0	0	0	0	0	0
P2 #5 1000m	0	1	2	9	0	2	6	0	0	0	0	0
P2 #6 1000m	0	0	6	4	0	2	4	4	0	0	1	0
P2 #7 1000m	1	2	9	4	0	0	10	2	0	0	1	0
P2 #8 1000m	0	2	61	1	0	2	72	4	0	0	2	0
P2 #9 1000m	1	4	96	14	0	10	252	2	0	0	2	0
P2 #10 1000m	0	5	13	4	0	10	110	14	0	0	0	0
P2 #11 1000m	0	3	67	23	0	0	134	12	0	0	0	0
P2 #12 1000m	2	6	63	62	0	2	82	22	0	0	0	0
P1 #1 3800m	1	49	32	49	0	49	23	4	0	4	1	0
P1 #2 3800m	119	75	78	16	78	77	54	0	7	11	4	1
P1 #3 3800m	100	75	133	80	40	73	83	34	4	6	2	1
P1 #4 3800m	3	10	146	97	0	17	128	36	0	1	5	2
P1 #5 3800m	8	26	99	170	4	24	57	48	0	2	7	4
P1 #6 3800m	3	16	93	156	2	18	45	55	0	1	5	0
P1 #7 3800m	4	9	211	70	0	11	172	24	0	0	7	2
P1 #8 3800m	3	1	135	78	0	2	99	41	0	2	14	2
P1 #9 3800m	3	11	166	147	3	13	121	73	0	0	6	1
P1 #10 3800m	8	5	107	137	15	7	144	68	3	0	7	0
P1 #11 3800m	3	1	103	92	10	2	177	58	0	0	6	1
P1 #12 3800m	1	5	52	66	0	16	74	36	0	3	2	0
P2 #1 3800m	14	39	19	12	6	20	60	6	0	3	3	0
P2 #2 3800m	13	6	63	19	7	4	41	7	1	0	3	0
P2 #3 3800m	9	11	107	17	6	0	75	12	0	2	2	0
P2 #4 3800m	8	27	59	30	2	5	32	15	0	0	1	0
P2 #5 3800m	9	11	69	34	6	12	38	29	0	0	1	0
P2 #6 3800m	6	11	31	15	2	0	20	15	0	0	0	0
P2 #7 3800m	2	0	52	22	0	9	17	14	0	0	1	0
P2 #8 3800m	4	1	92	2	2	2	76	0	0	0	2	0
P2 #9 3800m	3	2	104	10	0	2	105	4	0	0	5	0
P2 #10 3800m	0	2	40	7	7	11	189	4	0	0	1	0
P2 #11 3800m	5	1	69	28	7	0	113	12	0	0	1	0
P2 #12 3800m	1	4	49	22	0	0	75	4	0	0	1	0

* Treated as 125-1000 μm (250-1000 & 125-250 μm were not separated).

Table 3. (cont.)

Taxon	Coscinodiscus sp. A			Thalassiosira trifulta group				Unidentified small-sized (<25µm)				
Size fraction (µm)	250-1000	125-250	63-125	(63	250-1000	125-250	63-125	(63	Coscinodiscids			(63
									250-1000	125-250	63-125	
P2 #1 1000m*		0	0	0		67	33	968		1	3	139
P2 #2 1000m*		0	0	4		37	51	857		4	10	133
P2 #3 1000m	0	0	0	0	35	214	57	883	11	17	3	123
P2 #4 1000m	0	0	0	0	72	59	114	530	8	14	17	135
P2 #5 1000m	0	0	0	0	19	23	61	737	2	5	21	124
P2 #6 1000m	0	0	0	0	25	29	18	511	9	10	7	157
P2 #7 1000m	0	0	0	0	43	28	69	265	18	15	20	79
P2 #8 1000m	0	0	0	0	19	21	67	256	11	9	21	55
P2 #9 1000m	0	0	0	0	13	29	37	444	5	13	21	102
P2 #10 1000m	0	0	0	0	10	24	6	126	1	13	14	103
P2 #11 1000m	0	0	0	0	5	52	17	268	5	11	10	105
P2 #12 1000m	0	0	0	0	25	29	23	279	15	6	14	175
P1 #1 3800m	0	0	0	0	10	18	14	391	0	0	0	100
P1 #2 3800m	2	1	0	0	43	62	26	294	0	0	0	47
P1 #3 3800m	0	0	0	0	49	32	51	461	4	0	15	99
P1 #4 3800m	0	0	0	0	12	6	24	441	5	3	3	77
P1 #5 3800m	0	0	1	0	13	20	19	445	18	0	4	57
P1 #6 3800m	0	0	0	0	5	12	2	338	11	0	4	101
P1 #7 3800m	0	0	0	0	5	11	18	346	12	0	5	123
P1 #8 3800m	0	0	0	0	5	3	3	270	0	0	0	41
P1 #9 3800m	0	0	0	0	26	19	16	423	9	5	7	26
P1 #10 3800m	0	0	0	0	19	9	10	381	1	0	0	28
P1 #11 3800m	0	0	0	0	6	2	7	353	0	1	0	18
P1 #12 3800m	0	0	0	0	4	4	10	350	0	0	0	9
P2 #1 3800m	0	0	0	0	80	55	207	482	5	8	48	78
P2 #2 3800m	0	0	0	0	77	108	73	390	5	15	6	65
P2 #3 3800m	0	0	0	0	70	121	20	256	11	13	2	51
P2 #4 3800m	0	0	3	0	22	103	59	338	17	27	12	78
P2 #5 3800m	1	1	2	0	69	81	65	380	16	7	5	50
P2 #6 3800m	0	1	1	0	88	79	23	261	30	17	33	53
P2 #7 3800m	0	1	0	1	63	33	37	458	15	7	2	40
P2 #8 3800m	0	0	0	0	71	23	79	334	3	2	17	44
P2 #9 3800m	0	1	0	0	43	41	83	313	27	12	9	56
P2 #10 3800m	1	0	0	0	51	20	36	225	31	9	39	81
P2 #11 3800m	0	0	2	0	48	45	39	421	17	14	18	74
P2 #12 3800m	0	0	0	1	26	42	63	385	15	10	22	47

* Treated as 125-1000µm (250-1000 & 125-250µm were not separated).

Table 3. (cont.)

Taxon	Actinocyclus curvatus				Asteromphalus robustus				Asteromphalus heptactis				
Size fraction	250-1000	125-250	63-125	(63	250-1000	125-250	63-125	(63	250-1000	125-250	63-125	(63	
(μ m)													
P2 #1 1000m*		10	4	138		0	1	6		0	0	7	
P2 #2 1000m*		8	9	101		2	1	7		0	2	2	
P2 #3 1000m	1	29	2	90	0	2	0	31	3	0	0	4	
P2 #4 1000m	1	3	3	118	1	1	0	21	1	1	0	7	
P2 #5 1000m	4	5	8	105	4	0	4	41	0	1	3	13	
P2 #6 1000m	3	6	4	102	1	1	1	47	1	0	1	14	
P2 #7 1000m	6	6	9	35	18	3	33	116	6	2	16	20	
P2 #8 1000m	3	6	4	42	13	5	51	108	2	3	26	35	
P2 #9 1000m	2	4	5	51	1	1	3	23	0	0	2	8	
P2 #10 1000m	5	4	2	28	0	0	0	8	0	1	1	3	
P2 #11 1000m	4	8	3	60	3	2	0	17	0	1	1	9	
P2 #12 1000m	8	2	3	69	3	0	2	24	0	0	2	22	
P1 #1 3800m	1	1	1	59	0	2	0	18	1	0	1	2	
P1 #2 3800m	3	1	0	21	4	1	9	15	1	0	1	3	
P1 #3 3800m	0	4	18	52	5	4	5	19	0	1	1	0	
P1 #4 3800m	7	0	9	55	3	0	8	9	0	0	1	1	
P1 #5 3800m	6	2	3	70	1	4	3	10	0	1	6	5	
P1 #6 3800m	0	2	1	57	0	1	3	26	0	1	1	11	
P1 #7 3800m	1	0	2	58	2	0	3	12	1	3	3	11	
P1 #8 3800m	2	0	0	28	2	0	1	7	1	0	1	9	
P1 #9 3800m	3	0	2	53	2	2	1	12	2	1	0	11	
P1 #10 3800m	3	0	1	65	2	0	0	9	0	0	1	12	
P1 #11 3800m	0	0	2	79	0	0	2	11	0	0	0	6	
P1 #12 3800m	1	0	1	78	0	0	0	7	0	0	0	9	
P2 #1 3800m	9	9	36	47	0	0	1	5	0	3	0	1	
P2 #2 3800m	15	7	7	55	0	1	1	3	1	1	2	1	
P2 #3 3800m	11	14	6	56	0	0	2	11	1	0	0	2	
P2 #4 3800m	3	31	17	62	2	2	5	14	0	1	0	5	
P2 #5 3800m	18	27	11	82	4	2	6	11	0	1	0	2	
P2 #6 3800m	39	38	12	90	3	1	1	8	2	0	4	4	
P2 #7 3800m	8	4	6	127	1	1	2	37	3	3	2	5	
P2 #8 3800m	10	9	8	48	2	1	16	85	1	0	5	20	
P2 #9 3800m	10	9	25	62	14	4	1	47	2	0	3	10	
P2 #10 3800m	7	5	8	50	2	1	4	16	1	2	1	5	
P2 #11 3800m	11	7	14	72	0	5	6	15	1	3	2	5	
P2 #12 3800m	4	8	10	78	6	0	1	11	1	0	1	2	

* Treated as 125-1000 μ m (250-1000 & 125-250 μ m were not separated).

Table 3. (cont.)

Taxon	Pseudopodosira elegans			Corethron criophilum				Rhizosolenia styliformis				
Size fraction (μm)	250-1000	125-250	63-125	(63	250-1000	125-250	63-125	(63	250-1000	125-250	63-125	(63
P2 #1 1000m*		1	2	3		32	14	4		0	0	0
P2 #2 1000m*		0	0	0		17	29	0		0	0	0
P2 #3 1000m	0	1	0	0	8	46	72	4	0	0	0	1
P2 #4 1000m	1	0	0	1	20	30	146	7	3	2	0	2
P2 #5 1000m	0	0	0	0	23	86	121	6	10	12	8	21
P2 #6 1000m	0	0	0	0	10	42	133	11	11	19	8	49
P2 #7 1000m	0	0	0	0	52	215	413	26	124	62	116	68
P2 #8 1000m	0	1	0	0	110	406	359	44	214	203	155	107
P2 #9 1000m	0	0	0	0	55	452	245	12	81	53	53	48
P2 #10 1000m	0	0	0	0	3	152	67	8	0	13	18	20
P2 #11 1000m	0	0	0	1	10	77	310	150	5	34	23	39
P2 #12 1000m	0	0	0	0	1	9	26	112	4	10	9	32
P1 #1 3800m	0	0	1	0	0	3	1	6	109	135	4	145
P1 #2 3800m	0	0	1	0	3	0	2	1	166	110	27	101
P1 #3 3800m	1	1	0	1	0	0	1	2	91	104	37	87
P1 #4 3800m	0	1	0	0	0	1	0	0	37	140	48	87
P1 #5 3800m	1	0	0	0	0	0	0	0	58	31	21	41
P1 #6 3800m	0	0	0	1	0	1	1	0	18	53	8	43
P1 #7 3800m	0	0	0	0	0	0	0	0	16	29	15	33
P1 #8 3800m	0	0	0	0	0	0	0	0	8	4	21	30
P1 #9 3800m	0	0	0	0	0	0	0	0	3	4	3	22
P1 #10 3800m	0	0	0	0	0	0	0	0	0	0	3	22
P1 #11 3800m	0	0	0	0	0	0	0	0	0	0	1	13
P1 #12 3800m	0	0	0	0	0	0	0	0	0	1	2	11
P2 #1 3800m	0	0	0	0	18	9	2	0	1	1	0	3
P2 #2 3800m	0	0	0	0	2	7	1	2	1	0	3	5
P2 #3 3800m	0	0	0	0	3	25	37	2	1	1	5	3
P2 #4 3800m	0	0	0	0	0	0	30	4	0	0	3	2
P2 #5 3800m	1	0	1	0	6	24	0	5	6	4	7	3
P2 #6 3800m	3	0	0	0	8	21	32	5	8	13	1	7
P2 #7 3800m	1	0	1	0	12	31	43	2	17	8	8	14
P2 #8 3800m	0	1	2	0	84	122	181	9	253	107	146	36
P2 #9 3800m	1	0	0	1	72	82	121	41	152	122	179	44
P2 #10 3800m	0	0	0	0	27	38	87	44	124	69	70	24
P2 #11 3800m	1	2	0	1	4	24	83	30	56	39	46	41
P2 #12 3800m	1	1	0	0	2	11	29	42	9	12	55	22

* Treated as 125-1000 μm (250-1000 & 125-250 μm were not separated).

Table 3. (cont.)

Taxon	Rhizosolenia styl. (auxospore base)				Rhizosol. styl. (auxospore process)				Rhizosolenia hebetata			
Size fraction (μm)	250-1000	125-250	63-125	(63	250-1000	125-250	63-125	(63	250-1000	125-250	63-125	(63
P2 #1 1000m*		0	0	0		0	0	0		1	0	3
P2 #2 1000m*		0	0	0		0	0	0		1	3	2
P2 #3 1000m	0	0	0	0	0	0	0	0	0	0	0	0
P2 #4 1000m	0	0	0	0	0	0	0	0	0	0	0	4
P2 #5 1000m	0	0	0	0	0	1	1	0	0	0	0	1
P2 #6 1000m	0	0	0	0	0	2	0	1	0	1	0	1
P2 #7 1000m	0	1	2	0	3	2	1	0	0	0	0	1
P2 #8 1000m	0	1	0	0	6	7	5	1	0	0	0	1
P2 #9 1000m	1	0	1	0	1	2	1	0	1	0	0	3
P2 #10 1000m	0	0	0	0	0	1	1	1	1	0	0	1
P2 #11 1000m	0	0	0	0	1	0	1	0	0	0	0	4
P2 #12 1000m	0	0	0	0	0	1	0	0	0	0	0	3
P1 #1 3800m	0	1	0	1	0	0	0	1	1	13	0	42
P1 #2 3800m	4	2	1	0	7	1	1	1	30	20	2	30
P1 #3 3800m	0	0	0	0	4	4	0	1	10	5	5	64
P1 #4 3800m	0	0	0	0	0	5	1	1	0	3	6	67
P1 #5 3800m	0	0	0	0	2	0	0	1	0	2	6	52
P1 #6 3800m	0	0	0	0	1	1	0	0	1	7	6	35
P1 #7 3800m	0	0	0	0	0	0	0	0	0	6	15	20
P1 #8 3800m	0	0	0	0	0	0	2	0	0	0	7	21
P1 #9 3800m	0	0	0	0	0	0	0	1	9	6	4	47
P1 #10 3800m	0	0	0	0	0	0	0	0	2	0	2	42
P1 #11 3800m	0	0	0	0	0	0	0	0	0	1	0	29
P1 #12 3800m	0	0	0	0	0	0	0	0	2	2	1	27
P2 #1 3800m	0	0	0	0	0	0	0	0	1	4	5	16
P2 #2 3800m	0	0	0	0	0	0	0	0	1	2	5	5
P2 #3 3800m	0	0	0	0	0	0	1	0	0	0	1	9
P2 #4 3800m	0	0	0	0	0	0	2	0	0	1	3	5
P2 #5 3800m	0	0	0	0	1	0	0	0	3	1	2	7
P2 #6 3800m	0	0	0	0	0	1	0	0	2	2	4	6
P2 #7 3800m	0	0	0	0	0	0	2	0	1	0	0	9
P2 #8 3800m	3	4	2	0	14	3	4	0	1	0	1	4
P2 #9 3800m	1	1	1	0	4	2	1	0	0	2	2	3
P2 #10 3800m	2	2	1	0	1	0	0	0	2	1	1	1
P2 #11 3800m	0	0	0	0	2	1	1	0	2	1	1	13
P2 #12 3800m	0	0	0	0	0	1	1	0	2	1	2	7

* Treated as 125-1000 μm (250-1000 & 125-250 μm were not separated).

Table 3. (cont.)

Taxon	Nitzschia spp. group			Rhizosolenia alata curvirostris				Rhizosolenia alata gracillima				
Size fraction	250-1000	125-250	63-125	(63	250-1000	125-250	63-125	(63	250-1000	125-250	63-125	(63
(μm)												
P2 #1 1000m*		0	4	1		2	2	3		2	0	0
P2 #2 1000m*		0	0	2		0	1	2		0	1	0
P2 #3 1000m	5	0	1	2	0	0	0	1	1	2	3	1
P2 #4 1000m	2	2	0	6	0	0	0	0	1	0	6	4
P2 #5 1000m	3	1	3	4	0	0	0	0	2	1	4	0
P2 #6 1000m	2	5	5	3	0	0	0	1	0	0	1	1
P2 #7 1000m	1	3	6	22	0	0	0	0	0	0	1	0
P2 #8 1000m	3	7	15	5	0	0	0	0	0	2	2	0
P2 #9 1000m	6	1	7	3	0	0	0	2	0	1	3	0
P2 #10 1000m	1	2	10	8	0	0	1	0	0	0	1	0
P2 #11 1000m	4	2	7	2	0	0	1	0	0	1	0	1
P2 #12 1000m	0	2	3	4	0	0	0	1	0	0	0	0
P1 #1 3800m	0	0	0	0	0	0	0	5	14	63	41	62
P1 #2 3800m	0	0	0	3	2	1	4	1	127	205	127	41
P1 #3 3800m	0	0	3	2	2	1	1	1	109	86	80	16
P1 #4 3800m	0	0	1	0	1	0	0	0	4	22	71	25
P1 #5 3800m	0	2	0	7	3	1	0	3	8	20	36	23
P1 #6 3800m	0	0	0	1	0	0	1	0	1	1	6	31
P1 #7 3800m	2	0	0	1	0	1	2	1	3	3	16	7
P1 #8 3800m	0	0	0	3	0	0	2	1	5	0	7	30
P1 #9 3800m	0	3	0	2	0	0	0	0	0	1	0	16
P1 #10 3800m	0	0	0	2	0	0	0	1	0	0	0	4
P1 #11 3800m	0	0	0	2	0	0	0	1	0	0	0	0
P1 #12 3800m	1	0	0	0	0	0	0	0	0	1	0	1
P2 #1 3800m	0	2	0	0	1	2	2	2	1	0	0	1
P2 #2 3800m	0	0	2	0	0	1	0	0	0	0	1	0
P2 #3 3800m	3	0	0	3	1	2	1	0	0	0	0	0
P2 #4 3800m	4	4	2	1	1	0	0	1	0	1	1	0
P2 #5 3800m	3	0	2	4	1	0	1	0	1	1	1	0
P2 #6 3800m	2	7	3	9	0	0	1	2	0	0	2	0
P2 #7 3800m	3	4	2	3	0	0	0	1	0	0	0	0
P2 #8 3800m	0	2	2	8	0	0	0	0	0	0	1	1
P2 #9 3800m	8	9	3	11	0	0	0	1	0	0	0	0
P2 #10 3800m	2	1	3	3	1	0	2	0	0	1	0	0
P2 #11 3800m	2	0	1	8	0	0	0	0	1	0	0	1
P2 #12 3800m	1	3	5	6	1	0	0	0	0	0	0	0

* Treated as 125-1000 μm (250-1000 & 125-250 μm were not separated).

Table 3. (cont.)

Taxon	Chaetoceros atlanticus (1 valve)				Chaetoceros atlanticus (2 valves)				Chaetoceros concavicornis (1 valve)			
Size fraction (μm)	250-1000	125-250	63-125	63	250-1000	125-250	63-125	63	250-1000	125-250	63-125	63
P2 #1 1000m*		15	12	3		46	22	6		2	0	1
P2 #2 1000m*		7	22	0		40	32	2		3	2	0
P2 #3 1000m	2	4	5	3	14	16	16	0	3	1	0	2
P2 #4 1000m	8	1	8	0	30	0	26	6	0	1	4	0
P2 #5 1000m	1	5	3	0	10	4	18	2	2	0	1	1
P2 #6 1000m	0	2	1	2	12	2	4	4	0	2	0	0
P2 #7 1000m	5	19	10	1	26	104	50	6	1	8	10	0
P2 #8 1000m	7	13	15	0	30	88	66	12	1	3	2	1
P2 #9 1000m	4	9	6	0	14	34	16	2	3	0	4	0
P2 #10 1000m	0	4	3	0	0	8	4	0	0	3	3	1
P2 #11 1000m	0	1	2	1	0	8	2	0	0	0	2	0
P2 #12 1000m	0	3	0	1	0	0	0	2	0	0	0	0
P1 #1 3800m	13	23	13	7	2	6	14	4	21	43	13	11
P1 #2 3800m	72	56	40	7	26	12	10	0	141	111	17	7
P1 #3 3800m	35	31	14	4	12	8	6	0	98	51	21	6
P1 #4 3800m	1	7	14	3	0	12	8	0	1	21	21	16
P1 #5 3800m	10	11	19	2	12	6	6	0	10	15	15	4
P1 #6 3800m	4	11	4	3	14	26	2	0	4	3	3	6
P1 #7 3800m	2	3	16	2	4	6	10	0	2	1	7	4
P1 #8 3800m	0	2	9	3	4	0	14	0	0	0	7	10
P1 #9 3800m	0	1	0	1	0	0	0	0	0	0	0	5
P1 #10 3800m	0	0	0	0	0	0	0	0	0	0	0	2
P1 #11 3800m	0	0	0	0	0	0	0	0	0	0	0	0
P1 #12 3800m	0	0	0	0	0	0	0	0	0	0	0	1
P2 #1 3800m	12	16	11	4	44	36	46	8	4	6	5	8
P2 #2 3800m	3	9	19	2	14	38	36	2	1	0	0	1
P2 #3 3800m	3	4	20	1	24	18	28	0	0	0	4	0
P2 #4 3800m	1	3	10	0	10	14	18	0	0	1	1	0
P2 #5 3800m	3	2	2	0	20	12	8	0	1	3	0	1
P2 #6 3800m	2	2	3	0	2	2	10	0	2	0	0	0
P2 #7 3800m	2	1	3	0	8	2	6	0	0	2	1	0
P2 #8 3800m	4	9	13	0	36	58	68	18	0	5	2	0
P2 #9 3800m	2	7	6	1	28	16	88	6	1	4	6	0
P2 #10 3800m	2	7	2	0	0	12	24	4	3	1	2	0
P2 #11 3800m	4	4	6	1	0	8	26	4	2	2	7	0
P2 #12 3800m	0	0	0	1	0	0	0	0	0	0	1	0

* Treated as 125-1000 μm (250-1000 & 125-250 μm were not separated).

Table 3. (cont.)

Taxon	Chaetoceros concavicornis (2 valves)				Denticulopsis seminae (1 valve)				Denticulopsis seminae (2 valves)			
Size fraction (μm)	250-1000	125-250	63-125	(63)	250-1000	125-250	63-125	(63)	250-1000	125-250	63-125	(63)
P2 #1 1000m*		2	0	0		49	55	298		26	24	240
P2 #2 1000m*		0	14	0		32	113	219		20	128	334
P2 #3 1000m	8	0	8	0	31	51	54	212	18	110	66	306
P2 #4 1000m	2	0	6	0	61	27	62	126	36	38	42	152
P2 #5 1000m	4	2	0	0	39	15	54	239	14	12	38	202
P2 #6 1000m	0	0	0	0	39	16	17	186	12	14	10	194
P2 #7 1000m	6	14	6	0	81	32	127	84	42	30	88	74
P2 #8 1000m	0	6	8	0	29	37	83	126	20	34	64	124
P2 #9 1000m	0	2	4	0	38	34	81	204	30	12	72	180
P2 #10 1000m	4	4	0	0	5	44	16	84	2	22	6	90
P2 #11 1000m	0	0	2	0	16	29	66	177	8	18	30	112
P2 #12 1000m	0	0	0	0	25	38	73	129	20	32	50	112
P1 #1 3800m	2	10	6	2	11	10	6	205	2	18	20	170
P1 #2 3800m	24	24	0	0	70	42	13	160	58	14	6	122
P1 #3 3800m	30	8	2	0	78	28	11	174	32	30	18	142
P1 #4 3800m	0	6	0	4	6	9	13	179	0	4	2	126
P1 #5 3800m	6	0	4	2	18	22	12	180	12	16	18	140
P1 #6 3800m	4	2	0	2	5	11	8	143	2	0	4	180
P1 #7 3800m	0	0	2	0	14	8	25	130	0	2	8	96
P1 #8 3800m	0	0	4	0	17	7	18	199	6	2	2	164
P1 #9 3800m	0	0	0	0	7	14	15	170	6	2	2	98
P1 #10 3800m	0	0	0	0	6	1	8	103	8	0	6	80
P1 #11 3800m	0	0	0	0	1	2	0	63	4	0	0	38
P1 #12 3800m	0	0	0	0	1	1	4	72	0	0	0	28
P2 #1 3800m	6	6	0	0	28	62	169	190	18	58	166	142
P2 #2 3800m	0	2	4	0	51	42	50	162	38	32	34	160
P2 #3 3800m	0	0	0	0	28	67	71	122	46	92	90	156
P2 #4 3800m	0	2	2	0	34	102	86	170	38	103	84	202
P2 #5 3800m	4	0	4	0	75	71	72	196	54	44	50	198
P2 #6 3800m	2	2	6	0	100	87	85	164	70	92	64	216
P2 #7 3800m	0	0	4	0	63	38	33	215	42	18	22	194
P2 #8 3800m	2	4	4	0	73	20	79	101	48	18	72	86
P2 #9 3800m	8	4	24	0	75	35	77	133	28	36	54	104
P2 #10 3800m	0	4	8	0	58	23	54	74	14	20	26	80
P2 #11 3800m	0	0	0	0	50	43	78	153	28	30	46	122
P2 #12 3800m	0	0	0	0	33	26	86	122	10	28	66	104

* Treated as 125-1000 μm (250-1000 & 125-250 μm were not separated).

Table 3. (cont.)

Taxon	D. seminae (# of valves in chains)**				D. seminae (# of occurrence in different sized-chains)		
	Size fraction 250-1000 (μ m)	125-250	63-125	63	2-5 cells	6-10 cells	>10 cells
P2 #1 1000m*		0	4	20	6	0	0
P2 #2 1000m*		0	16	80	24	0	0
P2 #3 1000m	4	40	16	52	22	5	1
P2 #4 1000m	4	16	4	20	10	1	0
P2 #5 1000m	0	0	0	44	10	1	0
P2 #6 1000m	0	0	4	36	8	2	0
P2 #7 1000m	0	0	0	4	1	0	0
P2 #8 1000m	0	0	4	12	4	0	0
P2 #9 1000m	0	0	4	4	2	0	0
P2 #10 1000m	0	0	0	12	3	0	0
P2 #11 1000m	0	4	4	0	2	0	0
P2 #12 1000m	4	0	4	8	3	1	0
P1 #1 3800m	0	4	4	32	9	1	0
P1 #2 3800m	12	0	4	12	5	2	0
P1 #3 3800m	4	4	4	12	4	1	1
P1 #4 3800m	0	0	4	12	4	0	0
P1 #5 3800m	8	4	8	20	10	0	0
P1 #6 3800m	0	0	4	68	17	0	1
P1 #7 3800m	0	0	0	20	5	0	0
P1 #8 3800m	4	0	0	24	6	1	0
P1 #9 3800m	0	0	0	16	4	0	0
P1 #10 3800m	4	0	4	8	4	0	0
P1 #11 3800m	4	0	0	12	4	0	0
P1 #12 3800m	0	0	0	8	2	0	0
P2 #1 3800m	4	4	32	32	16	1	1
P2 #2 3800m	4	0	0	16	4	1	0
P2 #3 3800m	8	16	8	28	14	0	1
P2 #4 3800m	0	20	8	16	11	0	0
P2 #5 3800m	4	4	0	48	14	0	0
P2 #6 3800m	4	44	20	60	29	3	0
P2 #7 3800m	8	0	0	36	10	1	0
P2 #8 3800m	8	0	8	12	6	1	0
P2 #9 3800m	4	12	4	16	8	1	0
P2 #10 3800m	4	4	4	20	7	1	0
P2 #11 3800m	4	0	0	20	6	0	0
P2 #12 3800m	0	4	8	24	8	1	0

* Treated as 125-1000 μ m (250-1000 & 125-250 μ m were not separated).

** The presented data in this category is included in D. seminae (2 valves).

Table 4. Time-series fluxes (valves $m^{-2}d^{-1}$) of diatom taxa at subarctic Station PAPA during September 1982 through September 1983. See Table 1 for details of specific dates and duration of each sample.

Taxon	Coscinodiscus marginatus (1 va)				TOTAL	Coscinodiscus marginatus (2 va)				TOTAL	Coscinodiscus oculus-iridis				TOTAL
Size fraction (μm)	250-1000	125-250	63-125	63 μm	FLUX	250-1000	125-250	63-125	63	FLUX	250-1000	125-250	63-125	63	FLUX
P2 #1 1000m*		0	615	6891	7506		0	246	2953	3199		123	0	0	123
P2 #2 1000m*		123	492	5906	6522		246	492	1969	2707		0	0	0	0
P2 #3 1000m	0	246	123	3938	4307	0	246	246	0	492	0	0	123	0	123
P2 #4 1000m	0	123	492	5906	6522	246	492	0	0	738	0	0	0	0	0
P2 #5 1000m	0	123	246	4430	4799	0	246	738	0	984	0	0	0	0	0
P2 #6 1000m	0	0	738	1969	2707	0	246	492	1969	2707	0	0	123	0	123
P2 #7 1000m	123	246	1107	7875	9352	0	0	1231	3938	5168	0	0	123	0	123
P2 #8 1000m	0	246	7506	1969	9721	0	246	8860	7875	16981	0	0	246	0	246
P2 #9 1000m	123	492	11813	6891	19319	0	1231	31009	984	33224	0	0	246	0	246
P2 #10 1000m	0	615	1600	1969	4184	0	1231	13536	6891	21657	0	0	0	0	0
P2 #11 1000m	0	369	8244	11321	19934	0	0	16489	5906	22395	0	0	0	0	0
P2 #12 1000m	246	738	7752	30517	39253	0	246	10090	10828	21165	0	0	0	0	0
P1 #1 3800m	131	6431	16801	34301	57664	0	6431	12075	2800	21307	0	525	525	0	1050
P1 #2 3800m	15619	9844	40951	44801	111216	10238	10107	28351	0	48695	919	1444	2100	2800	7263
P1 #3 3800m	13125	9844	69827	56002	148798	5250	9582	43576	23801	82209	525	788	1050	700	3063
P1 #4 3800m	394	1313	76652	67902	146261	0	2231	67202	25201	94634	0	131	2625	1400	4156
P1 #5 3800m	1050	3413	51977	119004	175443	525	3150	29926	33601	67202	0	263	3675	2800	6738
P1 #6 3800m	394	2100	48826	109203	160524	263	2363	23626	38501	64752	0	131	2625	0	2756
P1 #7 3800m	525	1181	27695	49001	78402	0	1444	22576	16801	40820	0	0	919	1400	2319
P1 #8 3800m	394	131	17719	54602	72846	0	263	12994	28701	41958	0	263	1838	1400	3500
P1 #9 3800m	197	1444	21788	25726	49155	197	1706	15882	12775	30560	0	0	788	175	963
P1 #10 3800m	525	328	14044	23976	38873	984	459	18901	11900	32245	197	0	919	0	1116
P1 #11 3800m	197	66	13519	16100	29882	656	131	23232	10150	34170	0	0	788	175	963
P1 #12 3800m	89	895	9307	15750	26042	0	2864	13245	8591	24700	0	537	358	0	895
P2 #1 3800m	1723	4799	2338	7875	16735	738	2461	7383	3938	14520	0	369	369	0	738
P2 #2 3800m	1600	738	7752	12469	22559	861	492	5045	4594	10993	123	0	369	0	492
P2 #3 3800m	1107	1354	13166	11157	26784	738	0	9229	7875	17842	0	246	246	0	492
P2 #4 3800m	984	3322	7260	19688	31255	246	615	3938	9844	14643	0	0	123	0	123
P2 #5 3800m	1107	1354	8490	22313	33265	738	1477	4676	19032	25923	0	0	123	0	123
P2 #6 3800m	738	1354	3815	9844	15750	246	0	2461	9844	12551	0	0	0	0	0
P2 #7 3800m	246	0	6399	14438	21083	0	1107	2092	9188	12387	0	0	123	0	123
P2 #8 3800m	492	123	11321	5250	17186	246	246	9352	0	9844	0	0	246	0	246
P2 #9 3800m	369	246	12797	26251	39663	0	246	12920	10500	23667	0	0	615	0	615
P2 #10 3800m	0	246	4922	18376	23544	861	1354	23257	10500	35972	0	0	123	0	123
P2 #11 3800m	615	123	8490	18376	27604	861	0	13905	7875	22641	0	0	123	0	123
P2 #12 3800m	123	492	6029	14438	21083	0	0	9229	2625	11854	0	0	123	0	123

* Treated as 125-1000 μm (250-1000 & 125-250 μm were not separated).

Table 4. (cont.)

Taxon Size fraction (μm)	Coscinodiscus sp. A				TOTAL FLUX	Thalassiosira trifulta group				TOTAL FLUX	Unidentified small-sized ($\geq 25\mu\text{m}$) Coscinodiscids				TOTAL FLUX
	250-1000	125-250	63-125	(63)		250-1000	125-250	63-125	(63)		250-1000	125-250	63-125	(63)	
P2 #1 1000m*		0	0	0	0		8244	4061	476452	488757		123	369	68416	68908
P2 #2 1000m*		0	0	1969	1969		4553	6276	421817	432646		492	1231	65463	67186
P2 #3 1000m	0	0	0	0	0	4307	26333	7014	434615	472268	1354	2092	369	60541	64355
P2 #4 1000m	0	0	0	0	0	8860	7260	14028	1043469	1073616	984	1723	2092	265789	270588
P2 #5 1000m	0	0	0	0	0	2338	2830	7506	362753	375427	246	615	2584	61033	64478
P2 #6 1000m	0	0	0	0	0	3076	3568	2215	251515	260375	1107	1231	861	77276	80475
P2 #7 1000m	0	0	0	0	0	5291	3445	8490	521734	538961	2215	1846	2461	155536	162058
P2 #8 1000m	0	0	0	0	0	2338	2584	8244	504015	517181	1354	1107	2584	108284	113330
P2 #9 1000m	0	0	0	0	0	1600	3568	4553	218538	228259	615	1600	2584	50205	55004
P2 #10 1000m	0	0	0	0	0	1231	2953	738	62017	66940	123	1600	1723	50697	54142
P2 #11 1000m	0	0	0	0	0	615	6399	2092	131910	141016	615	1354	1231	51681	54881
P2 #12 1000m	0	0	0	0	0	3076	3568	2830	137324	146799	1846	738	1723	86135	90442
P1 #1 3800m	0	0	0	0	0	1313	2363	7350	273708	284734	0	0	0	70002	70002
P1 #2 3800m	263	131	0	0	394	5644	8138	13650	823225	850657	0	0	0	131604	131604
P1 #3 3800m	0	0	0	0	0	6431	4200	26776	322710	360117	525	0	7875	69302	77702
P1 #4 3800m	0	0	0	0	0	1575	788	12600	308709	323672	656	394	1575	53902	56527
P1 #5 3800m	0	0	525	0	525	1706	2625	9975	311509	325816	2363	0	2100	39901	44364
P1 #6 3800m	0	0	0	0	0	656	1575	1050	236607	239888	1444	0	2100	70702	74246
P1 #7 3800m	0	0	0	0	0	656	1444	2363	242207	246670	1575	0	656	86103	88334
P1 #8 3800m	0	0	0	0	0	656	394	394	189006	190449	0	0	0	28701	28701
P1 #9 3800m	0	0	0	0	0	1706	2494	2100	74027	80327	591	656	919	4550	6716
P1 #10 3800m	0	0	0	0	0	1247	591	1313	66677	69827	66	0	0	4900	4966
P1 #11 3800m	0	0	0	0	0	394	131	919	61777	63221	0	66	0	3150	3216
P1 #12 3800m	0	0	0	0	0	358	716	1790	83525	86389	0	0	0	2148	2148
P2 #1 3800m	0	0	0	0	0	9844	6768	25471	316322	358405	615	984	5906	51189	58695
P2 #2 3800m	0	0	0	0	0	9475	13289	8983	255945	287692	615	1846	738	42658	45857
P2 #3 3800m	0	0	0	0	0	8614	14889	2461	168005	193969	1354	1600	246	33470	36669
P2 #4 3800m	0	0	369	0	369	2707	12674	7260	554548	577189	2092	3322	1477	127973	134863
P2 #5 3800m	123	123	246	0	492	8490	9967	7998	523703	550159	1969	861	615	68908	72354
P2 #6 3800m	0	123	123	0	246	10828	9721	2830	171286	194666	3692	2092	4061	34782	44626
P2 #7 3800m	0	123	0	656	779	7752	4061	4553	300572	316937	1846	861	246	26251	29204
P2 #8 3800m	0	0	0	0	0	8737	2830	9721	876776	898064	369	246	2092	115503	118211
P2 #9 3800m	0	123	0	0	123	5291	5045	10213	821650	842199	3322	1477	1107	147004	152911
P2 #10 3800m	123	0	0	0	123	6276	2461	4430	590643	603809	3815	1107	4799	212631	222352
P2 #11 3800m	0	0	246	0	246	5906	5537	4799	276290	292532	2092	1723	2215	48564	54593
P2 #12 3800m	0	0	0	656	656	3199	5168	7752	252664	268783	1846	1231	2707	30845	36628

* Treated as 125-1000 μm (250-1000 & 125-250 μm were not separated).

Table 4. (cont.)

Taxon	Actinocyclus curvatus				TOTAL Asteromphalus robustus				TOTAL Asteromphalus heptactis				TOTAL		
Size fraction	250-1000	125-250	63-125	63	FLUX	250-1000	125-250	63-125	63	FLUX	250-1000	125-250	63-125	63	FLUX
(um)															
P2 #1 1000um*		1231	492	67924	69647		0	123	2953	3076		0	0	3445	3445
P2 #2 1000um*		984	1107	49712	51804		246	123	3445	3815		0	246	984	1231
P2 #3 1000um	123	3568	246	44298	48236	0	246	0	15258	15504	369	0	0	1969	2338
P2 #4 1000um	123	369	369	232319	233181	123	123	0	41345	41591	123	123	0	13782	14028
P2 #5 1000um	492	615	984	51681	53773	492	0	492	20180	21165	0	123	369	6399	6891
P2 #6 1000um	369	738	492	50205	51804	123	123	123	23134	23503	123	0	123	6891	7137
P2 #7 1000um	738	738	1107	68908	71492	2215	369	4061	228382	235027	738	246	1969	39376	42329
P2 #8 1000um	369	738	492	82690	84290	1600	615	6276	212631	221122	246	369	3199	68908	72723
P2 #9 1000um	246	492	615	25102	26456	123	123	369	11321	11936	0	0	246	3938	4184
P2 #10 1000um	615	492	246	13782	15135	0	0	0	3938	3938	0	123	123	1477	1723
P2 #11 1000um	492	984	369	29532	31378	369	246	0	8367	8983	0	123	123	4430	4676
P2 #12 1000um	984	246	369	33962	35562	369	0	246	11813	12428	0	0	246	10828	11075
P1 #1 3800um	131	131	525	41301	42089	0	263	0	12600	12863	131	0	525	1400	2056
P1 #2 3800um	394	131	0	58802	59327	525	131	4725	42001	47383	131	0	525	8400	9057
P1 #3 3800um	0	525	9450	36401	46376	656	525	2625	13300	17107	0	131	525	0	656
P1 #4 3800um	919	0	4725	38501	44145	394	0	4200	6300	10894	0	0	525	700	1225
P1 #5 3800um	788	263	1575	49001	51627	131	525	1575	7000	9232	0	131	3150	3500	6781
P1 #6 3800um	0	263	525	39901	40689	0	131	1575	18201	19907	0	131	525	7700	8356
P1 #7 3800um	131	0	263	40601	40995	263	0	394	8400	9057	131	394	394	7700	8619
P1 #8 3800um	263	0	0	19601	19863	263	0	131	4900	5294	131	0	131	6300	6563
P1 #9 3800um	197	0	263	9275	9735	131	263	131	2100	2625	131	131	0	1925	2188
P1 #10 3800um	197	0	131	11375	11703	131	0	0	1575	1706	0	0	131	2100	2231
P1 #11 3800um	0	0	263	13825	14088	0	0	263	1925	2188	0	0	0	1050	1050
P1 #12 3800um	89	0	179	18614	18883	0	0	0	1671	1671	0	0	0	2148	2148
P2 #1 3800um	1107	1107	4430	30845	37489	0	0	123	3281	3404	0	369	0	656	1025
P2 #2 3800um	1846	861	861	36095	39663	0	123	123	1969	2215	123	123	246	656	1148
P2 #3 3800um	1354	1723	738	36751	40566	0	0	246	7219	7465	123	0	0	1313	1436
P2 #4 3800um	369	3815	2092	101722	107997	246	246	615	22969	24077	0	123	0	8203	8326
P2 #5 3800um	2215	3322	1354	113010	119900	492	246	738	15160	16636	0	123	0	2756	2879
P2 #6 3800um	4799	4676	1477	59064	70016	369	123	123	5250	5865	246	0	492	2625	3363
P2 #7 3800um	984	492	738	83346	85561	123	123	246	24282	24774	369	369	246	3281	4266
P2 #8 3800um	1231	1107	984	126004	129326	246	123	1969	223132	225470	123	0	615	52502	53240
P2 #9 3800um	1231	1107	3076	162755	168169	1723	492	123	123379	125717	246	0	369	26251	26866
P2 #10 3800um	861	615	984	131254	133715	246	123	492	42001	42863	123	246	123	13125	13618
P2 #11 3800um	1354	861	1723	47251	51189	0	615	738	9844	11198	123	369	246	3281	4020
P2 #12 3800um	492	984	1231	51189	53896	738	0	123	7219	8080	123	0	123	1313	1559

* Treated as 125-1000µm (250-1000 & 125-250µm were not separated).

Table 4. (cont.)

Taxon	Pseudopodosira elegans				TOTAL Corethron criophilum				TOTAL Rhizosolenia styliformis				TOTAL		
Size fraction	250-1000	125-250	63-125	(63)	FLUX	250-1000	125-250	63-125	(63)	FLUX	250-1000	125-250	63-125	(63)	FLUX
(μm)															
P2 #1 1000m*		123	246	1477	1846		3938	1723	1969	7629		0	0	0	0
P2 #2 1000m*		0	0	0	0		2092	3568	0	5660		0	0	0	0
P2 #3 1000m	0	123	0	0	123	984	5660	8860	1969	17473	0	0	0	492	492
P2 #4 1000m	123	0	0	1969	2092	2461	3692	17965	13782	37900	369	246	0	3938	4553
P2 #5 1000m	0	0	0	0	0	2830	10582	14889	2953	31255	1231	1477	984	10336	14028
P2 #6 1000m	0	0	0	0	0	1231	5168	16366	5414	28179	1354	2338	984	24118	28794
P2 #7 1000m	0	0	0	0	0	6399	26456	50820	51189	134863	15258	7629	14274	133879	171040
P2 #8 1000m	0	123	0	0	123	13536	49959	44175	86628	194297	26333	24979	19073	210663	281047
P2 #9 1000m	0	0	0	0	0	6768	55619	30147	5906	98440	9967	6522	6522	23626	46636
P2 #10 1000m	0	0	0	0	0	369	18704	8244	3938	31255	0	1600	2215	9844	13659
P2 #11 1000m	0	0	0	492	492	1231	9475	38146	73830	122681	615	4184	2830	19196	26825
P2 #12 1000m	0	0	0	0	0	123	1107	3199	55127	59556	492	1231	1107	15750	18581
P1 #1 3800m	0	0	525	0	525	0	394	525	4200	5119	14307	17719	2100	101503	135629
P1 #2 3800m	0	0	525	0	525	394	0	1050	2800	4244	21788	14438	14175	282808	333210
P1 #3 3800m	131	131	0	700	963	0	0	525	1400	1925	11944	13650	19426	60902	105922
P1 #4 3800m	0	131	0	0	131	0	131	0	0	131	4856	18376	25201	60902	109335
P1 #5 3800m	131	0	0	0	131	0	0	0	0	0	7613	4069	11025	28701	51408
P1 #6 3800m	0	0	0	700	700	0	131	525	0	656	2363	6956	4200	30101	43620
P1 #7 3800m	0	0	0	0	0	0	0	0	0	0	2100	3806	1969	23101	30976
P1 #8 3800m	0	0	0	0	0	0	0	0	0	0	1050	525	2756	21001	25332
P1 #9 3800m	0	0	0	0	0	0	0	0	0	0	197	525	394	3850	4966
P1 #10 3800m	0	0	0	0	0	0	0	0	0	0	0	0	394	3850	4244
P1 #11 3800m	0	0	0	0	0	0	0	0	0	0	0	0	131	2275	2406
P1 #12 3800m	0	0	0	0	0	0	0	0	0	0	0	179	358	2625	3162
P2 #1 3800m	0	0	0	0	0	2215	1107	246	0	3568	123	123	0	1969	2215
P2 #2 3800m	0	0	0	0	0	246	861	123	1313	2543	123	0	369	3281	3774
P2 #3 3800m	0	0	0	0	0	369	3076	4553	1313	9311	123	123	615	1969	2830
P2 #4 3800m	0	0	0	0	0	0	0	3692	6563	10254	0	0	369	3281	3651
P2 #5 3800m	123	0	123	0	246	738	2953	0	6891	10582	738	492	861	4134	6226
P2 #6 3800m	369	0	0	0	369	984	2584	3938	3281	10787	984	1600	123	4594	7301
P2 #7 3800m	123	0	123	0	246	1477	3815	5291	1313	11895	2092	984	984	9188	13248
P2 #8 3800m	0	123	246	0	369	10336	15012	22272	23626	71246	31132	13166	17965	94503	156766
P2 #9 3800m	123	0	0	2625	2748	8860	10090	14889	107628	141467	18704	15012	22026	115503	171245
P2 #10 3800m	0	0	0	0	0	3322	4676	10705	115503	134207	15258	8490	8614	63002	95364
P2 #11 3800m	123	246	0	656	1025	492	2953	10213	19688	33347	6891	4799	5660	26907	44257
P2 #12 3800m	123	123	0	0	246	246	1354	3568	27563	32731	1107	1477	6768	14438	23790

* Treated as 125-1000 μm (250-1000 & 125-250 μm were not separated).

Table 4. (cont.)

Taxon	Rhizosolenia styl. (aux. base) TOTAL					Rhizosolenia styl(aux. process) TOTAL					Rhizosolenia hebetata					TOTAL
Size fraction	250-1000	125-250	63-125	(63	FLUX	250-1000	125-250	63-125	(63	FLUX	250-1000	125-250	63-125	(63	FLUX	
(μm)																
P2 #1 1000 μm *		0	0	0	0		0	0	0	0		123	0	1477	1600	
P2 #2 1000 μm *		0	0	0	0		0	0	0	0		123	369	984	1477	
P2 #3 1000 μm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
P2 #4 1000 μm	0	0	0	0	0	0	0	0	0	0	0	0	0	7875	7875	
P2 #5 1000 μm	0	0	0	0	0	0	123	123	0	246	0	0	0	492	492	
P2 #6 1000 μm	0	0	0	0	0	0	246	0	492	738	0	123	0	492	615	
P2 #7 1000 μm	0	123	246	0	369	369	246	123	0	738	0	0	0	1969	1969	
P2 #8 1000 μm	0	123	0	0	123	738	861	615	1969	4184	0	0	0	1969	1969	
P2 #9 1000 μm	123	0	123	0	246	123	246	123	0	492	123	0	0	1477	1600	
P2 #10 1000 μm	0	0	0	0	0	0	123	123	492	738	123	0	0	492	615	
P2 #11 1000 μm	0	0	0	0	0	123	0	123	0	246	0	0	0	1969	1969	
P2 #12 1000 μm	0	0	0	0	0	0	123	0	0	123	0	0	0	1477	1477	
P1 #1 3800 μm	0	131	0	700	831	0	0	0	700	700	131	1706	0	29401	31238	
P1 #2 3800 μm	525	263	525	0	1313	919	131	525	2800	4375	3938	2625	1050	84003	91615	
P1 #3 3800 μm	0	0	0	0	0	525	525	0	700	1750	1313	656	2625	44801	49395	
P1 #4 3800 μm	0	0	0	0	0	0	656	525	700	1881	0	394	3150	46901	50445	
P1 #5 3800 μm	0	0	0	0	0	263	0	0	700	963	0	263	3150	36401	39814	
P1 #6 3800 μm	0	0	0	0	0	131	131	0	0	263	131	919	3150	24501	28701	
P1 #7 3800 μm	0	0	0	0	0	0	0	0	0	0	0	788	1969	14000	16757	
P1 #8 3800 μm	0	0	0	0	0	0	0	263	0	263	0	0	919	14700	15619	
P1 #9 3800 μm	0	0	0	0	0	0	0	0	175	175	591	788	525	8225	10128	
P1 #10 3800 μm	0	0	0	0	0	0	0	0	0	0	131	0	263	7350	7744	
P1 #11 3800 μm	0	0	0	0	0	0	0	0	0	0	0	66	0	5075	5141	
P1 #12 3800 μm	0	0	0	0	0	0	0	0	0	0	179	358	179	6443	7159	
P2 #1 3800 μm	0	0	0	0	0	0	0	0	0	0	123	492	615	10500	11731	
P2 #2 3800 μm	0	0	0	0	0	0	0	0	0	0	123	246	615	3281	4266	
P2 #3 3800 μm	0	0	0	0	0	0	0	123	0	123	0	0	123	5906	6029	
P2 #4 3800 μm	0	0	0	0	0	0	0	246	0	246	0	123	369	8203	8696	
P2 #5 3800 μm	0	0	0	0	0	123	0	0	0	123	369	123	246	9647	10385	
P2 #6 3800 μm	0	0	0	0	0	0	123	0	0	123	246	246	492	3938	4922	
P2 #7 3800 μm	0	0	0	0	0	0	0	246	0	246	123	0	0	5906	6029	
P2 #8 3800 μm	369	492	246	0	1107	1723	369	492	0	2584	123	0	123	10500	10746	
P2 #9 3800 μm	123	123	123	0	369	492	246	123	0	861	0	246	246	7875	8367	
P2 #10 3800 μm	246	246	123	0	615	123	0	0	0	123	246	123	123	2625	3117	
P2 #11 3800 μm	0	0	0	0	0	246	123	123	0	492	246	123	123	8532	9024	
P2 #12 3800 μm	0	0	0	0	0	0	123	123	0	246	246	123	246	4594	5209	

* Treated as 125-1000 μm (250-1000 & 125-250 μm were not separated).

Table 4. (cont.)

Taxon	Nitzschia spp. group				TOTAL Rhizosolenia alata curvirostris				TOTAL Rhizosolenia alata gracillima				TOTAL		
Size fraction	250-1000	125-250	63-125	(63)	FLUX	250-1000	125-250	63-125	(63)	FLUX	250-1000	125-250	63-125	(63)	FLUX
(μm)															
P2 #1 1000 μm^*		0	492	492	984		4688	4688	112501	121876		4688	0	0	4688
P2 #2 1000 μm^*		0	0	984	984		0	2344	75000	77344		0	2344	0	2344
P2 #3 1000 μm	615	0	123	984	1723	0	0	0	37500	37500	2344	4688	7031	37500	51563
P2 #4 1000 μm	246	246	0	11813	12305	0	0	0	0	0	2344	0	14063	600003	616409
P2 #5 1000 μm	369	123	369	1969	2830	0	0	0	0	0	4688	2344	9375	0	16406
P2 #6 1000 μm	246	615	615	1477	2953	0	0	0	37500	37500	0	0	2344	37500	39844
P2 #7 1000 μm	123	369	738	43314	44544	0	0	0	0	0	0	0	2344	0	2344
P2 #8 1000 μm	369	861	1846	9844	12920	0	0	0	0	0	0	4688	4688	0	9375
P2 #9 1000 μm	738	123	861	1477	3199	0	0	0	75000	75000	0	2344	7031	0	9375
P2 #10 1000 μm	123	246	1231	3938	5537	0	0	2344	0	2344	0	0	2344	0	2344
P2 #11 1000 μm	492	246	861	984	2584	0	0	2344	0	2344	0	2344	0	37500	39844
P2 #12 1000 μm	0	246	369	1969	2584	0	0	0	37500	37500	0	0	0	0	0
P1 #1 3800 μm	0	0	0	0	0	0	0	0	114286	114286	20000	90000	234287	1417150	1761437
P1 #2 3800 μm	0	0	0	8400	8400	4000	2000	32000	128001	166001	254001	410002	1016005	5248026	6928035
P1 #3 3800 μm	0	0	1575	1400	2975	5000	2500	10000	40000	57500	272501	215001	800004	640003	1927510
P1 #4 3800 μm	0	0	525	0	525	2500	0	0	0	2500	10000	55000	710004	1000005	1775009
P1 #5 3800 μm	0	263	0	4900	5163	7500	2500	0	120001	130001	20000	50000	360002	920005	1350007
P1 #6 3800 μm	0	0	0	700	700	0	0	10000	0	10000	2500	2500	60000	1240006	1305007
P1 #7 3800 μm	263	0	0	700	963	0	2500	20000	40000	62500	7500	7500	160001	280001	455002
P1 #8 3800 μm	0	0	0	2100	2100	0	0	2857	22857	25714	7143	0	10000	685718	702861
P1 #9 3800 μm	0	394	0	350	744	0	0	0	0	0	0	2500	0	160001	162501
P1 #10 3800 μm	0	0	0	350	350	0	0	0	10000	10000	0	0	0	40000	40000
P1 #11 3800 μm	0	0	0	350	350	0	0	0	10000	10000	0	0	0	0	0
P1 #12 3800 μm	89	0	0	0	89	0	0	0	0	0	0	3409	0	13636	17046
P2 #1 3800 μm	0	246	0	0	246	2344	4688	4688	75000	86719	2344	0	0	37500	39844
P2 #2 3800 μm	0	0	246	0	246	0	2344	0	0	2344	0	0	2344	0	2344
P2 #3 3800 μm	369	0	0	1969	2338	2344	4688	2344	0	9375	0	0	0	0	0
P2 #4 3800 μm	492	492	246	1641	2871	2344	0	0	93750	96094	0	2344	2344	0	4688
P2 #5 3800 μm	369	0	246	5513	6128	2344	0	2344	0	4688	2344	2344	2344	0	7031
P2 #6 3800 μm	246	861	369	5906	7383	0	0	2344	75000	77344	0	0	4688	0	4688
P2 #7 3800 μm	369	492	246	1969	3076	0	0	0	37500	37500	0	0	0	0	0
P2 #8 3800 μm	0	246	246	21001	21493	0	0	0	0	0	0	0	2344	150001	152345
P2 #9 3800 μm	984	1107	369	28876	31337	0	0	0	150001	150001	0	0	0	0	0
P2 #10 3800 μm	246	123	369	7875	8614	2344	0	4688	0	7031	0	2344	0	0	2344
P2 #11 3800 μm	246	0	123	5250	5619	0	0	0	0	0	2344	0	0	37500	39844
P2 #12 3800 μm	123	369	615	3938	5045	2344	0	0	0	2344	0	0	0	0	0

* Treated as 125-1000 μm (250-1000 & 125-250 μm were not separated).

Table 4. (cont.)

Taxon	Chaetoceros atlanticus (1 va.)				TOTAL	Chaetoceros atlanticus (2 va.)				TOTAL	Chaetoceros concavicornis(1 va)				TOTAL
Size fraction (μm)	250-1000	125-250	63-125	63	FLUX	250-1000	125-250	63-125	63	FLUX	250-1000	125-250	63-125	63	FLUX
P2 #1 1000 μm *		35156	28125	112501	175782		107813	51563	225001	384377		4688	0	37500	42188
P2 #2 1000 μm *		16406	51563	0	67969		93750	75000	75000	243751		7031	4688	0	11719
P2 #3 1000 μm	4688	9375	11719	112501	138282	32813	37500	37500	0	107813	7031	2344	0	75000	84375
P2 #4 1000 μm	18750	2344	18750	0	39844	70313	0	60938	900005	1031255	0	2344	9375	0	11719
P2 #5 1000 μm	2344	11719	7031	0	21094	23438	9375	42188	75000	150001	4688	0	2344	37500	44531
P2 #6 1000 μm	0	4688	2344	75000	82032	28125	4688	9375	150001	192188	0	4688	0	0	4688
P2 #7 1000 μm	11719	44531	23438	150001	229689	60938	243751	117188	900005	1321882	2344	18750	23438	0	44531
P2 #8 1000 μm	16406	30469	35156	0	82032	70313	206251	154688	1800009	2231261	2344	7031	4688	150001	164063
P2 #9 1000 μm	9375	21094	14063	0	44531	32813	79688	37500	75000	225001	7031	0	9375	0	16406
P2 #10 1000 μm	0	9375	7031	0	16406	0	18750	9375	0	28125	0	7031	7031	37500	51563
P2 #11 1000 μm	0	2344	4688	37500	44531	0	18750	4688	0	23438	0	0	4688	0	4688
P2 #12 1000 μm	0	7031	0	37500	44531	0	0	0	75000	75000	0	0	0	0	0
P1 #1 3800 μm	18572	32857	74286	160001	285716	2857	8571	80000	91429	182858	30000	61429	74286	251430	417145
P1 #2 3800 μm	144001	112001	320002	896004	1472007	52000	24000	80000	0	156001	282001	222001	136001	896004	1536008
P1 #3 3800 μm	87500	77500	140001	160001	465002	30000	20000	60000	0	110001	245001	127501	210001	240001	822504
P1 #4 3800 μm	2500	17500	140001	120001	280001	0	30000	80000	0	110001	2500	52500	210001	640003	905005
P1 #5 3800 μm	25000	27500	190001	80000	322502	30000	15000	60000	0	105001	25000	37500	150001	160001	372502
P1 #6 3800 μm	10000	27500	40000	120001	197501	35000	65000	20000	0	120001	10000	7500	30000	240001	287501
P1 #7 3800 μm	5000	7500	160001	80000	252501	10000	15000	100001	0	125001	5000	2500	70000	160001	237501
P1 #8 3800 μm	0	2857	12857	68572	84286	5714	0	20000	0	25714	0	0	10000	228573	238573
P1 #9 3800 μm	0	2500	0	10000	12500	0	0	0	0	0	0	0	0	50000	50000
P1 #10 3800 μm	0	0	0	0	0	0	0	0	0	0	0	0	0	20000	20000
P1 #11 3800 μm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P1 #12 3800 μm	0	0	0	0	0	0	0	0	0	0	0	0	0	13636	13636
P2 #1 3800 μm	28125	37500	25781	150001	241407	103126	84375	107813	300002	595315	9375	14063	11719	300002	335158
P2 #2 3800 μm	7031	21094	44531	75000	147657	32813	89063	84375	75000	281251	2344	0	0	37500	39844
P2 #3 3800 μm	7031	9375	46875	37500	100782	56250	42188	65625	0	164063	0	0	9375	0	9375
P2 #4 3800 μm	2344	7031	23438	0	32813	23438	32813	42188	0	98438	0	2344	2344	0	4688
P2 #5 3800 μm	7031	4688	4688	0	16406	46875	28125	18750	0	93750	2344	7031	0	78750	88125
P2 #6 3800 μm	4688	4688	7031	0	16406	4688	4688	23438	0	32813	4688	0	0	0	4688
P2 #7 3800 μm	4688	2344	7031	0	14063	18750	4688	14063	0	37500	0	4688	2344	0	7031
P2 #8 3800 μm	9375	21094	30469	0	60938	84375	135938	159376	2700014	3079703	0	11719	4688	0	16406
P2 #9 3800 μm	4688	16406	14063	150001	185157	65625	37500	206251	900005	1209381	2344	9375	14063	0	25781
P2 #10 3800 μm	4688	16406	4688	0	25781	0	28125	56250	600003	684378	7031	2344	4688	0	14063
P2 #11 3800 μm	9375	9375	14063	37500	70313	0	18750	60938	150001	229689	4688	4688	16406	0	25781
P2 #12 3800 μm	0	0	0	37500	37500	0	0	0	0	0	0	0	2344	0	2344

* Treated as 125-1000 μm (250-1000 & 125-250 μm were not separated).

Table 4. (cont.)

Taxon	Chaetoceros concavicornis(2 va.)				TOTAL	Denticulopsis seminae (1 va.)				TOTAL
Size fraction	250-1000	125-250	63-125	(63	FLUX	250-1000	125-250	63-125	(63	FLUX
(um)										
P2 #1 1000m*		4688	0	0	4688		114844	128907	11175056	11418808
P2 #2 1000m*		0	32813	0	32813		75000	264845	8212541	8552387
P2 #3 1000m	18750	0	18750	0	37500	72657	119532	126563	7950040	8268792
P2 #4 1000m	4688	0	14063	0	18750	142969	63282	145313	18900095	19251659
P2 #5 1000m	9375	4688	0	0	14063	91407	35156	126563	8962545	9215671
P2 #6 1000m	0	0	0	0	0	91407	37500	39844	6975035	7143786
P2 #7 1000m	14063	32813	14063	0	60938	189845	75000	297658	12600063	13162566
P2 #8 1000m	0	14063	18750	0	32813	67969	86719	194532	18900095	19249316
P2 #9 1000m	0	4688	9375	0	14063	89063	79688	189845	7650039	8008634
P2 #10 1000m	9375	9375	0	0	18750	11719	103126	37500	3150016	3302360
P2 #11 1000m	0	0	4688	0	4688	37500	67969	154688	6637533	6897691
P2 #12 1000m	0	0	0	0	0	58594	89063	171095	4837524	5156276
P1 #1 3800m	2857	14286	34286	45715	97143	15714	14286	34286	4685738	4750024
P1 #2 3800m	48000	48000	0	0	96000	140001	84000	104001	20480102	20808104
P1 #3 3800m	75000	20000	20000	0	115001	195001	70000	110001	6960035	7335037
P1 #4 3800m	0	15000	0	160000	175001	15000	22500	130001	7160036	7327537
P1 #5 3800m	15000	0	40000	80000	135001	45000	55000	120001	7200036	7420037
P1 #6 3800m	10000	5000	0	80000	95000	12500	27500	80000	5720029	5840029
P1 #7 3800m	0	0	20000	0	20000	35000	20000	250001	5200026	5505028
P1 #8 3800m	0	0	5714	0	5714	24286	10000	25714	4548594	4608595
P1 #9 3800m	0	0	0	0	0	17500	35000	37500	1700009	1790009
P1 #10 3800m	0	0	0	0	0	15000	2500	20000	1030005	1067505
P1 #11 3800m	0	0	0	0	0	2500	5000	0	630003	637503
P1 #12 3800m	0	0	0	0	0	3409	3409	13636	981823	1002278
P2 #1 3800m	14063	14063	0	0	28125	65625	145313	396096	7125036	7732070
P2 #2 3800m	0	4688	9375	0	14063	119532	98438	117198	6075031	6410189
P2 #3 3800m	0	0	0	0	0	65625	157032	166407	4575023	4964088
P2 #4 3800m	0	4688	4688	0	9375	79688	239064	201554	15937580	16457895
P2 #5 3800m	9375	0	9375	0	18750	175782	166407	168751	15435078	15946018
P2 #6 3800m	4688	4688	14063	0	23438	234376	203907	199220	6150031	6787534
P2 #7 3800m	0	0	9375	0	9375	147657	89063	77344	8062541	8376605
P2 #8 3800m	4688	9375	9375	0	23438	171095	46875	185157	15150076	15553203
P2 #9 3800m	18750	9375	56250	0	84375	175782	82032	180470	19950100	20368384
P2 #10 3800m	0	9375	18750	0	28125	135938	53907	126563	11100056	11416464
P2 #11 3800m	0	0	0	0	0	117188	100782	182813	5737529	6133312
P2 #12 3800m	0	0	0	0	0	77344	60938	201564	4575023	4914869

* Treated as 125-1000um (250-1000 & 125-250um were not separated).

Table 4. (cont.)

Taxon	Denticulopsis seminae (2 va.)				TOTAL	Denticulopsis seminae (# in chains)**				TOTAL	TOTAL		
Size fraction	250-1000	125-250	63-125	(63)	FLUX	250-1000	125-250	63-125	(63)	FLUX	CENTRICS	DIATOMS	
(μm)											FLUX	FLUX	
P2 #1 1000m*		60938	56250	9000045	9117233			0	9375	750004	759379	1389334	21926359
P2 #2 1000m*		46875	300002	12525063	12871940			0	37500	3000015	3037515	1010955	22436266
P2 #3 1000m	42188	257814	154688	11475058	11929748	9375	93750	37500	1950010	2090636	1082746	21283008	
P2 #4 1000m	84375	89063	98438	22800115	23071991	9375	37500	9375	3000015	3056265	3410661	45746616	
P2 #5 1000m	32813	28125	89063	7575038	7725039	0	0	0	1650008	1650008	819634	17763174	
P2 #6 1000m	28125	32813	23438	7275037	7359412	0	0	9375	1350007	1359382	843409	15349560	
P2 #7 1000m	98438	70313	206251	11100056	11475058	0	0	0	600003	600003	3032874	27715042	
P2 #8 1000m	46875	79688	150001	18600094	18876657	0	0	9375	1800009	1809384	4036880	42175774	
P2 #9 1000m	70313	28125	168751	6750034	7017223	0	0	9375	150001	159376	910418	15939474	
P2 #10 1000m	4688	51563	14063	3375017	3445330	0	0	0	450002	450002	333517	7086744	
P2 #11 1000m	18750	42188	70313	4200021	4331272	0	9375	9375	0	18750	555008	11786555	
P2 #12 1000m	46875	75000	117188	4200021	4439085	9375	0	9375	300002	318752	593492	10191437	
P1 #1 3800m	2857	25714	114286	3885734	4028592	0	5714	22857	731432	760004	3524393	12303009	
P1 #2 3800m	116001	28000	48000	15616078	15808079	24000	0	32000	1536008	1592008	12054928	48679511	
P1 #3 3800m	90000	75000	180001	5680029	6015030	10000	10000	40000	480002	540003	4393501	17746543	
P1 #4 3800m	0	10000	20000	5040025	5070025	0	0	40000	480002	520003	4090954	16489041	
P1 #5 3800m	30000	40000	180001	5600028	5850029	20000	10000	80000	800004	910005	3195054	16470284	
P1 #6 3800m	5000	0	40000	7200036	7245036	0	0	40000	2720014	2760014	2700068	15785834	
P1 #7 3800m	0	5000	80000	3840019	3925020	0	0	0	800004	800004	1715454	11146464	
P1 #8 3800m	8571	2857	2857	3748590	3762876	5714	0	0	548574	554289	1493250	9866821	
P1 #9 3800m	15000	5000	5000	980005	1005005	0	0	0	160001	160001	422538	3218296	
P1 #10 3800m	20000	0	15000	800004	835004	10000	0	10000	80000	100001	244656	2147515	
P1 #11 3800m	10000	0	0	380002	390002	10000	0	0	120001	130001	166323	1194179	
P1 #12 3800m	0	0	0	381820	381820	0	0	0	109091	109091	203877	1588065	
P2 #1 3800m	42188	135938	389064	5325027	5892217	9375	9375	75000	1200006	1293757	1835096	15459630	
P2 #2 3800m	89063	75000	79688	6000030	6243781	9375	0	0	600003	609378	908705	13562921	
P2 #3 3800m	107813	215626	210939	5850029	6384407	18750	37500	18750	1050005	1125006	627111	11977944	
P2 #4 3800m	89063	241407	196876	18937595	19464942	0	46875	18750	1500008	1565633	1167785	37093493	
P2 #5 3800m	126563	103126	117188	15592579	15939455	9375	9375	0	3780019	3798769	1078046	32969647	
P2 #6 3800m	164063	215626	150001	8100041	8629731	9375	103126	46875	2250011	2409387	529963	15954611	
P2 #7 3800m	98438	42188	51563	7275037	7467225	18750	0	0	1350007	1368757	632249	16479155	
P2 #8 3800m	112501	42188	168751	12900065	13223504	18750	0	18750	1800009	1837509	5027235	33825435	
P2 #9 3800m	65625	84375	126563	15600078	15876642	9375	28125	9375	2400012	2446887	3359684	39656047	
P2 #10 3800m	32813	46875	60938	12000060	12140686	9375	9375	9375	3000015	3028140	2071268	25637031	
P2 #11 3800m	65625	70313	107813	4575023	4818774	9375	0	0	750004	759379	917919	11880625	
P2 #12 3800m	23438	65625	154688	3900020	4143771	0	9375	18750	900005	928130	507073	9570757	

* Treated as 125-1000 μm (250-1000 & 125-250 μm were not separated).

** The values in this category are included in D. seminae (2 valves).

Table 5. Number of mean counted specimens (valves) per sample. The means were computed every 6-month time-series period. Each value represents a mean of the sum of microscopic counts performed on four microslides each representing size fractions: 250-1000 μ m, 125-250 μ m, 63-125 μ m, and <63 μ m.

Taxon	Deployment/Depth			
	I 3800m	II 1000m	II 3800m	All samples
<u>Coscinodiscus marginatus</u>	430	109	186	241
<u>Coscinodiscus oculus-iridis</u>	10	1	2	4
<u>Thalassiosira trifurcata</u> group	424	630	541	531
<u>Actinocyclus curvatulus</u>	63	94	109	88
Unidentified small-sized (<25 μ m) Coscinodiscids	69	150	105	108
<u>Asteromphalus robustus</u>	19	51	30	33
<u>Asteromphalus heptactis</u>	9	18	9	12
<u>Pseudopodosira elegans</u>	1	1	2	1
<u>Corethron criophilum</u>	2	348	122	157
<u>Rhizosolenia styliiformis</u>	162	136	144	148
<u>R. styliiformis</u> (auxospore base)	1	1	1	1
<u>R. styliiformis</u> (auxospore process)	3	3	4	3
<u>Rhizosolenia alata curvirostris</u>	2	1	2	1
<u>Rhizosolenia alata gracillima</u>	109	4	1	38
<u>Chactoceros atlanticus</u>	56	83	84	74
<u>Chactoceros concavicornis</u>	70	14	15	33
<u>Denticulopsis seminae</u>	332	580	631	514
<u>Nitzschia</u> spp. group	3	15	12	10
All Taxa	1820	2239	2012	2023

Fig. 2.

a *Coscinodiscus marginatus* (1 valve)

b *Coscinodiscus marginatus* (1 valve)

Fig. 3.

a *Coscinodiscus marginatus* (2 valves)

PAPA II 1000m

b *Coscinodiscus marginatus* (2 valves)

PAPA I & II 3800m

Fig. 4.

Fig. 5.

Coscinodiscus sp. A

PAPA I & II 3800m

Fig. 6.

a *Thalassiosira trifulta* group

PAPA II 1000m

b

Thalassiosira trifulta group

PAPA I & II 3800m

Fig. 7.

Fig. 8.

a Unidentified Coscinodiscids (<25 μ m)

b Unidentified Coscinodiscids (<25 μ m)

Fig. 9.

a

Asteromphalus robustus

PAPA II 1000m

b

Asteromphalus robustus

PAPA I & II 3800m

Fig. 10.

a

Asteromphalus heptactis

PAPA II 1000m

b

Asteromphalus heptactis

PAPA I & II 3800m

Fig. 11.

a

Pseudopodosira elegans

PAPA II 1000m

b

Pseudopodosira elegans

PAPA I & II 3800m

Fig. 12.

a

Corethron criophilum

PAPA II 1000m

b

Corethron criophilum

PAPA I & II 3800m

Fig. 13.

a *Rhizosolenia styliformis*

PAPA II 1000m

b

Rhizosolenia styliformis

PAPA I & II 3800m

Fig. 14.

a *Rhizosolenia styliiformis* (aux. process)

b *Rhizosolenia styliiformis* (aux. process)

Fig. 15.

a *Rhizosolenia styliiformis* (aux. base)

PAPA II 1000m

▨ <63 μm ▩ 63-125 ⊠ 125-250 ⊞ 250-1000

b *Rhizosolenia styliiformis* (aux. base)

PAPA I & II 3800m

▨ <63 μm ▩ 63-125 ⊠ 125-250 ⊞ 250-1000

Fig. 16.

a *Rhizosolenia hebetata* forma hiemalis

b *Rhizosolenia hebetata* forma hiemalis

Fig. 17.

a

Rhizosolenia alata gracillima

PAPA II 1000m

b

Rhizosolenia alata gracillima

PAPA I & II 3800m

Fig. 18.

a

Rhizosolenia alata curvirostris

PAPA II 1000m

b

Rhizosolenia alata curvirostris

PAPA I & II 3800m

Fig. 19.

a

Chaetoceros atlanticus

PAPA II 1000m

b

Chaetoceros atlanticus

PAPA I & II 3800m

Fig. 20.

a Chaetoceros atlanticus (1 valve)

b Chaetoceros atlanticus (1 valve)

Fig. 21.

a *Chaetoceros atlanticus* (2 valves)

PAPA II 1000m

b

Chaetoceros atlanticus (2 valves)

PAPA I & II 3800m

Fig. 22.

(Copy 11 from the same specimen)

Fig. 23

Fig. 23.

a *Chaetoceros concavicornis* (1 valve)

b *Chaetoceros concavicornis* (1 valve)

Fig. 24.

a *Chaetoceros concavicornis* (2 valves)

PAPA II 1000m

b *Chaetoceros concavicornis* (2 valves)

PAPA I & II 3800m

Fig. 25.

a

Denticulopsis seminae

PAPA II 1000m

b

Denticulopsis seminae

PAPA I & II 3800m

Fig. 26.

a

Denticulopsis seminae (1 valve)

PAPA II 1000m

b

Denticulopsis seminae (1 valve)

PAPA I & II 3800m

Fig. 27.

a *Denticulopsis seminae* (2 valves)

PAPA II 1000m

or more

<63µm

63-125

125-250

250-1000

b

Denticulopsis seminae (2 valves)

PAPA I & II 3800m

or more

<63µm

63-125

125-250

250-1000

Fig. 28.

a *Denticulopsis seminae* (chains)

PAPA II 1000m

b *Denticulopsis seminae* (chains)

PAPA I & II 3800m

Fig. 29

a

Nitzschia spp. group

PAPA II 1000m

b

Nitzschia spp. group

PAPA I & II 3800m

Fig. 30.

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