

P-05-72

Forsmark site investigation

Sampling of phyto- and zooplankton in sea water

Abundances and carbon biomasses

Roger Huononen, Micke Borgiel
Sveriges Vattenekologer AB

February 2005

Svensk Kärnbränslehantering AB

Swedish Nuclear Fuel
and Waste Management Co
Box 5864

SE-102 40 Stockholm Sweden

Tel 08-459 84 00

+46 8 459 84 00

Fax 08-661 57 19

+46 8 661 57 19



Forsmark site investigation

Sampling of phyto- and zooplankton in sea water

Abundances and carbon biomasses

Roger Huononen, Micke Borgiel
Sveriges Vattenekologer AB

February 2005

Keywords: Phytoplankton, Zooplankton, Forsmark, Plankton sampling, Sea water, Chlorophyll, Plankton abundance, Carbon biomass, AP PF 400-03-13.

This report concerns a study which was conducted for SKB. The conclusions and viewpoints presented in the report are those of the authors and do not necessarily coincide with those of the client.

A pdf version of this document can be downloaded from www.skb.se

Abstract

This document reports the data gained by sampling of phyto- and zooplankton in sea water within the site investigation program at Forsmark in Sweden.

The aim of this work was to obtain data about the plankton community during periods of water bloom. These data can be used to transform chlorophyll data into abundance of plankton, expressed in gram carbon per volume unit. The amount of carbon can then be used in the ecosystem model that is set up for the investigation area.

Phyto- and zooplankton were collected in a small bay as an integrated sample ranging from the surface to 3.5 m depth. The sampling was performed between June 2003 and June 2004. Samples from September 2003, October 2003, December 2003, April 2004 and May 2004 were then selected for analysis.

The phytoplankton analysis was performed by Susanna Hajdu, Department of Systems Ecology, Stockholm University.

The zooplankton analysis was performed by Christina Ekström, Ekströms Hydrobiology, Stockholm.

Sammanfattning

I denna rapport redovisas resultaten av de växt- och djurplanktonundersökningar som under perioden juni 2003 till juni 2004 utförts i Forsmarks platsundersökningsområde.

Syftet med undersökningen var att vid tillfällen då höga klorofyllhalter förekom erhålla data om planktonsamhällets sammansättning. Dessa data kan användas för att omvandla klorofylldata till mängden plankton uttryckt i gram kol per volymenhet. Mängden kol kan sen användas i den ekosystemsmodell som skapas för Forsmarks platsundersökningsområde.

Plankton insamlades från en grund havsvik som ett integrerat prov från ytan till 3,5 meters djup. Prover från september 2003, oktober 2003, december 2003, april 2004 och maj 2004 utvaldes för analys.

Växtplanktonanalyserna utfördes av Susanna Hajdu, avdelningen för Systemekologi, Stockholms universitet.

Djurplanktonanalyserna utfördes av Christina Ekström, Ekströms Hydrobiologi, Stockholm.

Contents

1	Introduction	7
2	Objective and scope	9
3	Equipment	11
3.1	Sampling, storage and analysis	11
4	Execution	13
4.1	Sampling	13
4.2	Analyses and interpretations	15
4.3	Nonconformities	16
5	Results	17
5.1	Phytoplankton	17
5.2	Zooplankton	18
	References	21
	Appendix 1 Primary phytoplankton data	23
	Appendix 2 Primary zooplankton data	28

1 Introduction

This document reports the data gained by sampling phyto- and zooplankton in sea water within the site investigation at Forsmark.

The activity, which is part of the surface ecosystem program in Forsmark, was performed according to Activity Plan AP PF 400-03-13 (phytoplankton) and an addition to the plan (zooplankton). These documents are listed in Table 1-1. The activity plan is SKB's internal controlling document.

Table 1-1. Controlling documents for the performance of the activity.

Activity plan	Number	Version
Planktoninventering 2003	AP PF 400-03-13	1.0
Addition	Date	
Tillägg till aktivitetsplan 400-03-13	2003-06-18	

Plankton was sampled in a small bay of the Baltic with a water depth of 4 m at a point called PFM000062 (Figure 1-1) between June 2003 and June 2004. Six samples, from September 2003, October 2003, December 2003, April 2004 and May 2004 were selected for analysis.

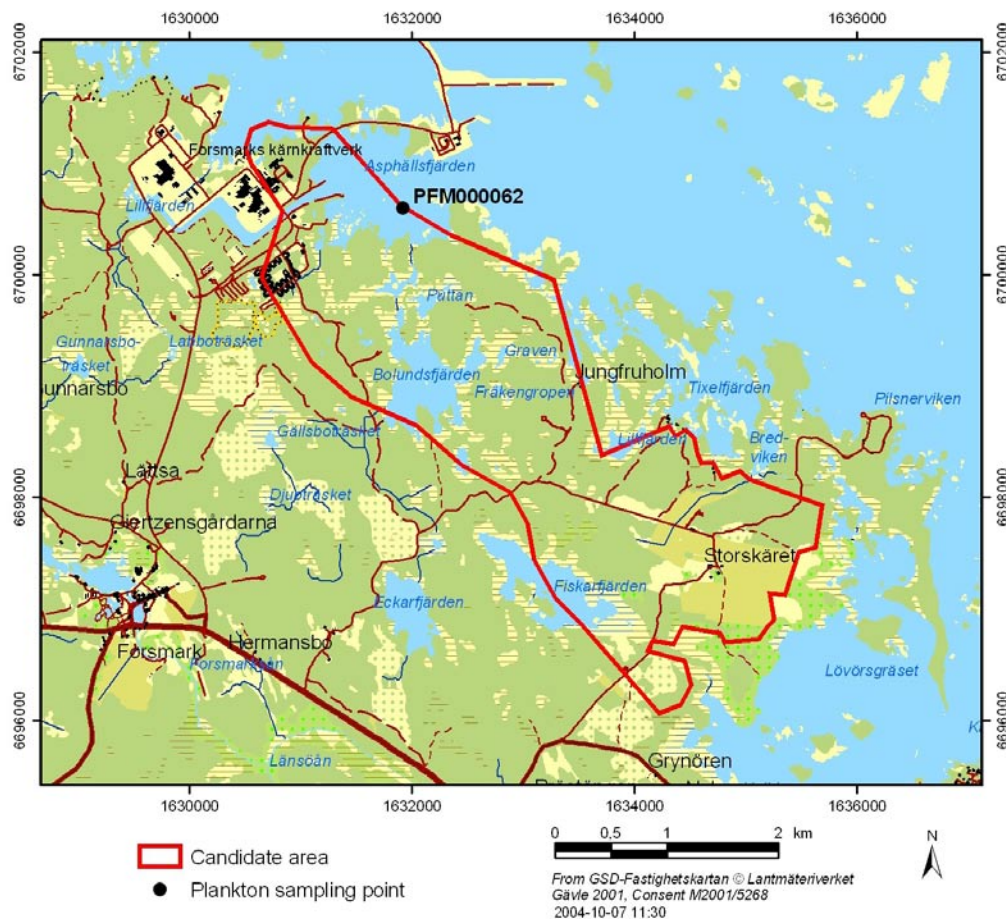


Figure 1-1. Sampling point for plankton.

2 Objective and scope

The aim of this work was to obtain data about the plankton community during periods of water bloom. These data can be used to transform chlorophyll data (from the surface water sampling program in the area, AP PF 400-03-36, June 2003–February 2004 and AP PF 400-04-21, March 2004–June 2004) into abundance of plankton, expressed in gram carbon per volume unit. The amount of carbon can then be used in the ecosystem model that is set up for the investigation area. This report only describes the result of the phyto- and zooplankton analysis, though.

3 Equipment

3.1 Sampling, storage and analysis

Phytoplankton was collected with a tube sampler ("Ramberg rör"; a plastic tube 2.0 m×0.025 m) (Figure 3-1). The samples were emptied into a bucket and mixed, thus representing an integrated sample. Subsample that were drawn from the bucket were collected in 100 ml glass bottles.

Zooplankton was collected in a bucket (25 l) with the aid of a submersible pump (75–100 l/min with a blade for pumping) and a plastic hose (10×0.025 m) (Figure 3-2). The sampled water was gently rinsed through a mesh (75 µm) and transferred into a 100 ml glass bottle.



Figure 3-1. Sampling of sea water phytoplankton with a Ramberg rör at sampling point PFM000062.



Figure 3-2. Sampling of sea water zooplankton with a submersible pump at sampling point PFM000062.

4 Execution

The methods for sampling and analysis are partially described in an internal SKB report, (SKB PIR-04-09, Metodik för provtagning av ekologiska parametrar i hav). The methods are known from the Swedish Environmental Protection Agency. The sampling procedure is also described below. The activity was performed according to Activity plan SKB AP PF 400-03-13 and an addition to the plan (SKB's internal document).

4.1 Sampling

The samples were taken from a boat at a sampling point called PFM000062 which has a water depth of 4.0 m.

Phytoplankton was collected with a "Ramberg rör" as a 0–3.5 m integrated sample by pooling equal amounts of water from the depths 0–1.5 m, and 1.5–3.5 m and mixing them thoroughly in a large bucket. A subsample of approximately 90 ml was drawn from the bucket into a glass bottle for quantitative phytoplankton analysis and preserved immediately with Lugol's solution.

Zooplankton was collected in a bucket with the aid of a submersible pump and a plastic hose (Figure 4-1). It was collected as an integrated sample by pumping water from 0–3.5 m.



Figure 4-1. Submersible pump and a plastic hose.

In the sampling procedure, the pump was submerged below the surface and then turned on. It was lowered slowly at a regular speed through the water, the speed adjusted so that the bucket was full when the pump was 0.5 m above the bottom.

The sampled water was then gently rinsed through a mesh. The integrated filtrate sample (the net with the plankton) was rinsed with filtrated water and the sample was transferred to a 100 ml glass bottle. This procedure was repeated twice per bottle, every bottle thus representing 50 litres of water. The samples for quantitative zooplankton counts were preserved immediately with Lugol's solution.

Sampling point and sampling occasions

The sampling point PFM000062 is located in a small bay of the Baltic, with a maximum water depth of 4 m (Table 4-1). Phyto- and zooplankton samples from six sampling occasions were selected and sent for analysis (Table 4-2). The samples were selected at occasions when the chlorophyll levels were high (Figure 4-2).

Table 4-1. Sampling point, coordinates, trivial name and comment.

Sampling point	Coordinates (RT 90)	Name	Comment
PFM000062	16 31 921, 67 00 605	SV Forslingens grund	Water depth 4.0 m

Table 4-2. Sampling date and occasions for plankton analysis.

Sampling date at PFM 000062	Phytoplankton sampling	Zooplankton sampling	Comments
2003-04-22	X		
2003-05-07	X		
2003-05-19	X	X	Test of zooplankton sampling method
2003-06-02	X	X	Test of zooplankton sampling method
2003-06-16	X	X	
2003-07-07	X	X	
2003-08-04	X	X	
2003-09-01	X	X	Selected occasion for analysis
2003-09-15	X	X	
2003-09-28	X	X	
2003-10-27	X	X	Selected occasion for analysis
2003-11-12	X	X	
2003-11-25	X	X	
2003-12-15	X	X	Selected occasion for analysis
2004-01-13	X	X	
2004-04-06	X	X	Selected occasion for analysis
2004-04-19	X	X	
2004-05-03	X	X	Selected occasion for analysis
2004-05-17	X	X	Selected occasion for analysis
2004-06-01	X	X	
2004-06-14	X	X	
2004-07-05	X	X	

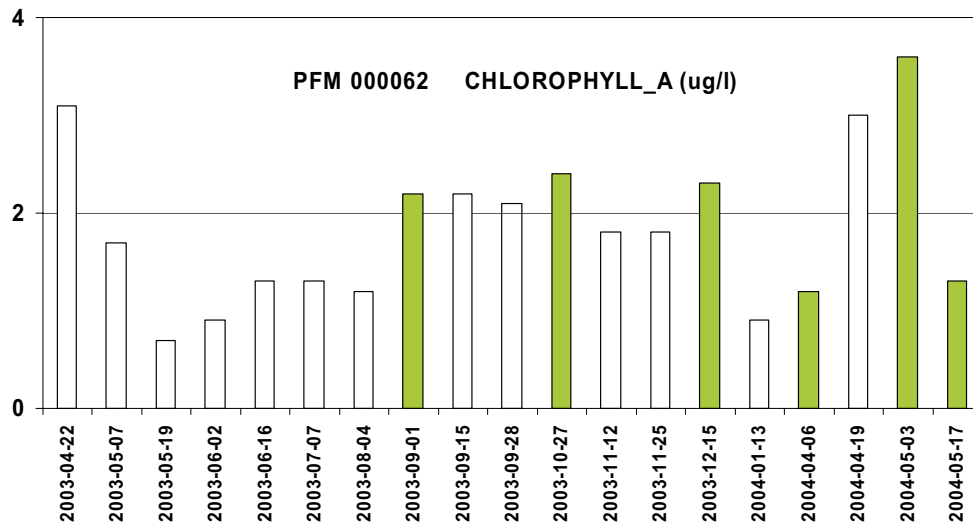


Figure 4-2. Chlorophyll concentration at PFM000062. Data from the surface water sampling program (AP PF 400-02-07 and AP PF 400-04-21). The green bars show selected occasions for phyto- and zooplankton analysis.

4.2 Analyses and interpretations

The phytoplankton analysis was performed by Susanna Hajdu, Department of Systems Ecology, Stockholm University, according to the guidelines for the Baltic Monitoring Program for the third stage /1/.

The zooplankton analysis was performed by Christina Ekström, Ekströms Hydrobiology, Stockholm, according to the guidelines for the Baltic Monitoring Program for the third stage /2/ and the guidelines for the recommendations on methods for marine biological studies in the Baltic Sea /3/.

Phytoplankton

The phytoplankton biovolume is calculated with different geometrical formulas for different taxonomic groups /1/. The carbon biomass is calculated from the biovolume with a factor (dinoflagellates 0.13 and other 0.11) /1/.

Zooplankton

The zooplankton biovolume is also calculated with different geometrical formulas for different taxonomic groups /2/. Biovolume is assumed to be directly convertible to biomass (1 mm³ biovolume = 1 g wet weight). The carbon content is presumed to amount to 5% of zooplankton wet weight /4/.

4.3 Nonconformities

In SKB's internal controlling document (in the addition to the plan SKB AP PF 400-03-13) the filtrate procedures of zooplankton describe a 90 µm mesh size. Normally, the recommendation is 100 µm /1/. When the investigation started, a 90 µm mesh was not available. The closest (smaller) available mesh was 75 µm, so this was the mesh used. The advantage of the 75 µm mesh is that you also catch the smaller species.

According to SKB's internal controlling document (in the plan and the addition to the plan SKB AP PF 400-03-13), the sampling should have been performed between April 2003 and October 2003. However, due to technical problems, the actual sampling period for zooplankton was between June 2003 and July 2004 (Table 4-2). The schedule for this project was in this manner delayed.

5 Results

5.1 Phytoplankton

All phytoplankton data are supplied in Appendix 1. Selected data are presented in the figure and table below. The total phytoplankton biomass and dominant groups are presented in Figure 5-1. The total phytoplankton carbon biomass and dominant groups are presented in Table 5-1.

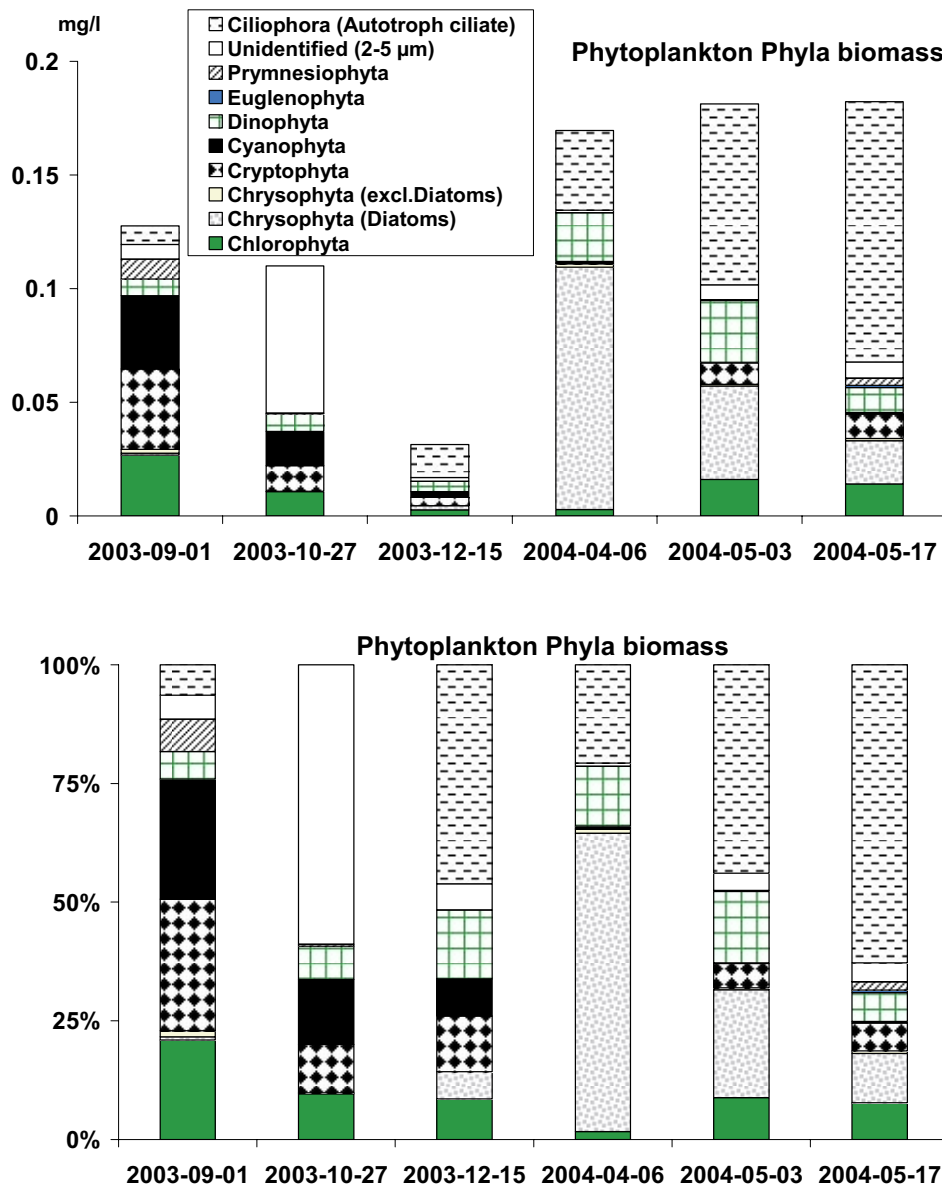


Figure 5-1. Phytoplankton biovolume/biomass ($\text{mm}^3/\text{l} = \text{mg/l}$) and percentage composition.

Table 5-1. Phytoplankton phyla and carbon biomass (mg C/m³).

Phylum (mg C/m ³)	2003-09-01	2003-10-27	2003-12-15	2004-04-06	2004-05-03	2004-05-17
Chlorophyta	2.94	1.19	0.30	0.31	1.76	1.58
Chrysophyta (Diatoms)	0.05	0.01	0.10	5.92	2.89	1.04
Chrysophyta (excl.Diatoms)	0.18			0.15	0.08	0.12
Cryptophyta	3.89	1.23	0.40	0.05	1.03	1.17
Cyanophyta	3.57	1.68	0.27	0.08	0.03	0.08
Dinophyta	0.95	0.98	0.58	2.57	3.54	1.35
Euglenophyta						0.12
Prymnesiophyta	0.96				0.04	0.34
Unidentified (2-5 µm)	0.73	0.04	0.20	0.12	0.73	0.81
Ciliophora (Autotroph ciliate)	0.90	7.12	1.59	3.86	8.75	12.59
Total	14.18	12.26	3.45	13.06	18.84	19.19

5.2 Zooplankton

All zooplankton data are supplied in Appendix 2. Selected data are presented in the figure and table below.

The total zooplankton biomass and dominant groups are presented in Figure 5-2. The total zooplankton carbon biomass and dominant groups are presented in Table 5-2.

Table 5-2. Zooplankton Class/order and carbon biomasses (mg C/m³).

Class/order mg C/m ³	2003-09-01	2003-10-27	2003-12-15	2004-04-06	2004-05-03	2004-05-17
Rotifera	0.11	0.16	0.001	0.000	0.16	0.03
Cladocera	0.46	0.01	0.000	0.000	0.02	0.21
Copepoda	5.14	9.20	3.09	0.47	1.06	0.55
Cirripedia	0.04	0.000	0.000	0.000	0.000	0.00
Polychaeta	0.000	0.000	0.000	0.15	0.000	0.46
Total	5.74	9.37	3.09	0.63	1.25	1.25

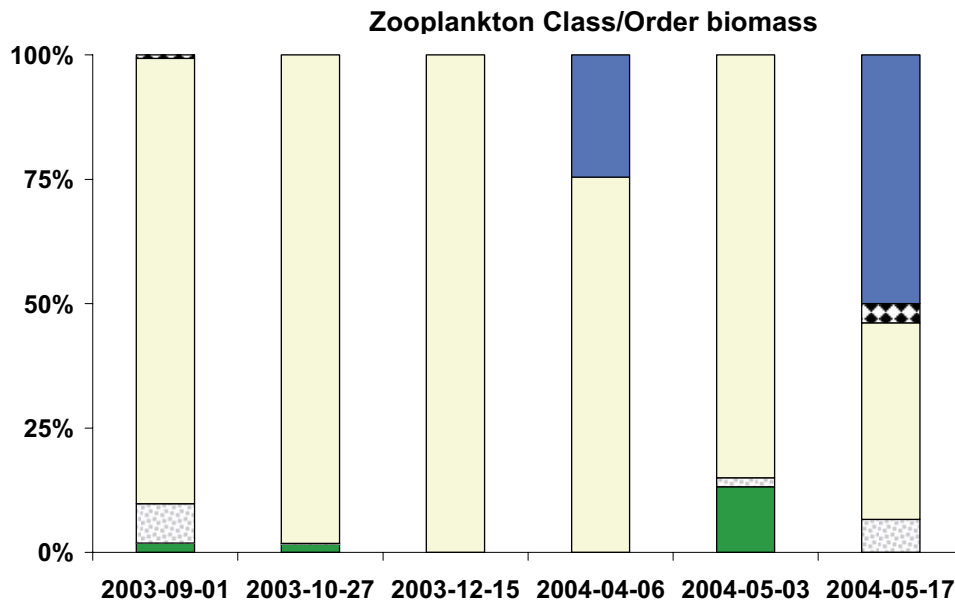
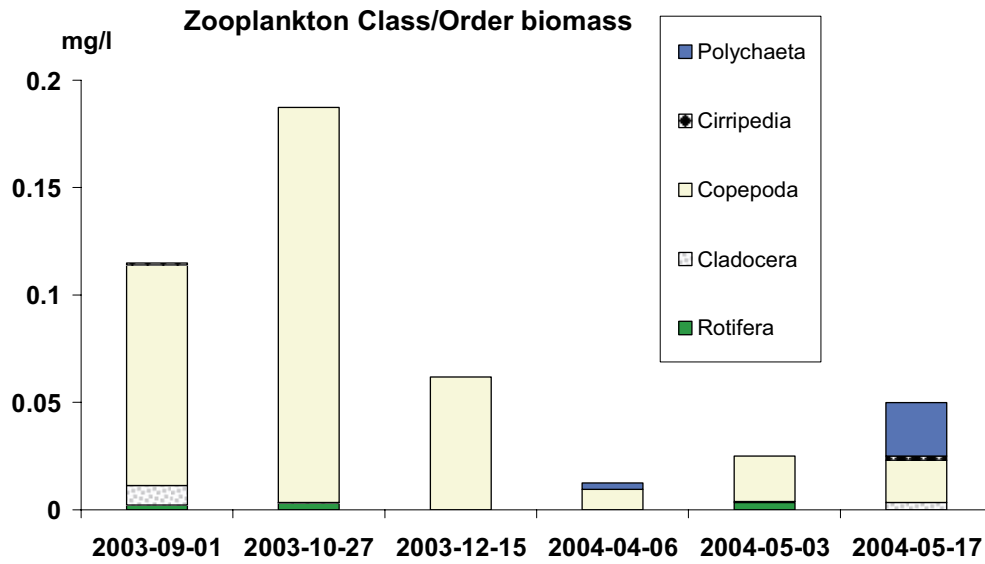


Figure 5-2. Zooplankton biovolume/biomass ($\text{mm}^3/\text{l} = \text{mg}/\text{l}$) and percentage composition.

References

- /1/ **HELCOM, 1988.** Guidelines for the Baltic Monitoring Programme for the third stage. Part D. Biological determinands. Balt. Sea Environ. Proc. 27 D: 1–161.
- /2/ **HELCOM, 1997.** Guidelines for the Baltic Monitoring Programme for the third stage. Biological Determinands BSEP No 27C: 88–90.
- /3/ **Hernroth L, 1985.** Guidelines for the Recommendations on methods for marine biological studies in the Baltic Sea. Mesozooplankton biomass assessment. BMP Publ. No 10.
- /4/ **Mullin M M, 1969.** Production of zooplankton in the ocean: the present status and problems. Oceanogr. mar. Biol. Rev. 7:293–310.

Primary phytoplankton data

Phytoplankton Species Page 1(2)

23

Idcode	Water type	Depth m	Date - time	Phylum	Taxa (species/genus name)	Abundance*	Accuracy** of	Biovolyme	Biovolyme	Carbon-biomass
						Cells/Liters	abundance (±) 95 % confidence interval	mm3/Liter	µm3/Liter	mgC/m3
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Chlorophyta	Pyramimonas spp.	184 900		0.02034	20 339 000	2.2188
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Chlorophyta	Pyramimonas virginica	399 900		0.00640	6 398 400	0.7198
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Chrysophyta (diatoms)	Chaetoceros subtilis	6 420		0.00083	834 600	0.0533
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Chrysophyta (diatoms)	Cylindrotheca closterium	160		0.00001	11 520	0.0012
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Chrysophyta (excl. Diatoms)	Pseudopedinella pyriforme	6 420		0.00116	1 155 600	0.1284
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Chrysophyta (excl. Diatoms)	Pseudopedinella tricostata	14 980		0.00049	494 340	0.0554
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Ciliophora (autotrof)	Mesodinium rubrum	1 280		0.00817	8 169 600	0.8973
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Cryptophyta	Hemiselmis virescens	258 000		0.00258	2 580 000	0.2838
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Cryptophyta	Plagioselmis prolonga	666 500		0.02666	26 660 000	2.9326
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Cryptophyta	Teleaulax spp.	38 520		0.00616	6 163 200	0.678
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Cyanophyta	Anabaena sp.	290		0.00037	365 400	0.0415
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Cyanophyta	Aphanizomenon sp.	12 910		0.01678	16 783 000	1.8719
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Cyanophyta	Cyanodictyon spp.	64 000		0.00006	56 576	0.0063
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Cyanophyta	Nodularia spumigena	410		0.00390	3 895 000	0.4284
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Cyanophyta	Pseudanabaena limnetica	139 120		0.01113	11 129 600	1.2243
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Dinophyta	Dinophysis acuminata	160		0.00208	2 080 000	0.2704
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Dinophyta	Glenodinium sp.	8 560		0.00445	4 451 200	0.5821
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Dinophyta	Gymnodinium sp.	240		0.00091	912 000	0.1003
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Prymnesiophyta	Chrysochromulina spp.	188 320		0.00866	8 658 440	0.9596
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Unidentified	Flagellate 2-5 µm(unidentified)	675 100		0.00540	5 400 800	0.6076
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Unidentified	Unicell 2-5 µm(unidentified)	132 680		0.00106	1 061 440	0.1194
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Total	Total	2 798 870	< 6 %	0.12760	127 599 716	14.1804
PFM000062	Sea Water	0.0-3.5	2003-10-27 12:06	Chlorophyta	Monoraphidium contortum	40 660		0.01017	10 165 000	1.1385
PFM000062	Sea Water	0.0-3.5	2003-10-27 12:06	Chlorophyta	Pyramimonas spp.	4 280		0.00047	470 800	0.0514
PFM000062	Sea Water	0.0-3.5	2003-10-27 12:06	Chrysophyta (diatoms)	Chaetoceros danicus	80		0.00016	164 000	0.0079
PFM000062	Sea Water	0.0-3.5	2003-10-27 12:06	Ciliophora (autotrof)	Mesodinium rubrum	1 840		0.06481	64 809 600	7.1242
PFM000062	Sea Water	0.0-3.5	2003-10-27 12:06	Cryptophyta	Plagioselmis prolonga	2 140		0.00009	85 600	0.0094
PFM000062	Sea Water	0.0-3.5	2003-10-27 12:06	Cryptophyta	Teleaulax spp.	42 800		0.01113	11 128 000	1.2241
PFM000062	Sea Water	0.0-3.5	2003-10-27 12:06	Cyanophyta	Aphanizomenon sp.	11 560		0.01503	15 028 000	1.6762
PFM000062	Sea Water	0.0-3.5	2003-10-27 12:06	Cyanophyta	Pseudanabaena limnetica	580		0.00005	46 400	0.0051
PFM000062	Sea Water	0.0-3.5	2003-10-27 12:06	Dinophyta	Dinophysis acuminata	480		0.00624	6 240 000	0.8112
PFM000062	Sea Water	0.0-3.5	2003-10-27 12:06	Dinophyta	Heterocapsa rotundata	14 980		0.00150	1 498 000	0.1648
PFM000062	Sea Water	0.0-3.5	2003-10-27 12:06	Unidentified	Flagellate 2-5 µm(unidentified)	47 080		0.00038	376 640	0.0424
PFM000062	Sea Water	0.0-3.5	2003-10-27 12:06	Total	Total	166 480	< 14 %	0.11001	110 012 040	12.2552
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Chlorophyta	Monoraphidium contortum	10 700		0.00268	2 675 000	0.2996
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Chrysophyta (diatoms)	Actinocyclus octonarius	80		0.00066	664 000	0.0238
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Chrysophyta (diatoms)	Chaetoceros danicus	160		0.00033	328 000	0.0158
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Chrysophyta (diatoms)	Chaetoceros wighamii	4 600		0.00080	803 040	0.0628
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Ciliophora (autotrof)	Mesodinium rubrum	1 120		0.01445	14 452 800	1.5872
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Cryptophyta	Plagioselmis prolonga	49 220		0.00197	1 968 800	0.2166
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Cryptophyta	Teleaulax spp.	10 700		0.00171	1 712 000	0.1883
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Cyanophyta	Aphanizomenon sp.	1 870		0.00243	2 431 000	0.2712
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Cyanophyta	Pseudanabaena limnetica	410		0.00003	32 800	0.0036
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Dinophyta	Dinophysis acuminata	320		0.00416	4 160 000	0.5408
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Dinophyta	Heterocapsa rotundata	2 140		0.00021	214 000	0.0235
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Dinophyta	Scrippsiella hangoei	80		0.00016	160 000	0.0176
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Unidentified	Flagellate 2-5 µm(unidentified)	219 300		0.00175	1 754 400	0.1974
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Total	Total	300 700	< 20 %	0.03136	31 355 840	3.4482

* Filamentous cyanobacteria 100µm/L.

** The accuracy value in this 95 % confidence interval is estimated from HELCOM 1988. Guidelines for the Baltic Monitoring Programme for the third stage.Part D.Biological determ.Balt.Sea.Environ.Proc.27D:1-161.

Idcode	Water type	Depth m	Date - time	Phylum	Taxa (species/genus name)	Abundance* Cells/Liters	Accuracy** of	Biovolyme mm3/Liter	Biovolyme µm3/Liter	Carbon-biomass mgC/m3
							abundance (±) 95 % confidence interval			
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Chlorophyta	Pyramimonas spp.	25 680		0.00282	2 824 800	0.3082
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Chrysophyta (diatoms)	Achnanthes taeniata	65 143		0.05993	59 931 369	3.0096
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Chrysophyta (diatoms)	Actinocyclus octonarius	640		0.01216	12 160 000	0.3584
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Chrysophyta (diatoms)	Chaetoceros wighamii	158 100		0.01955	19 547 400	1.6162
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Chrysophyta (diatoms)	Skeletonema costatum	9 290		0.00128	1 282 075	0.0948
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Chrysophyta (diatoms)	Thalassiosira baltica	160		0.00219	2 185 600	0.072
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Chrysophyta (diatoms)	Thalassiosira levanderi	14 980		0.01153	11 534 600	0.764
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Chrysophyta (excl. Diatoms)	Dinobryon fauliferum	14 980		0.00075	749 000	0.0824
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Chrysophyta (excl. Diatoms)	Pseudopedinella tricostata	17 120		0.00056	564 960	0.0633
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Ciliophora (autotrof)	Mesodinium rubrum	6 880		0.03513	35 128 000	3.8603
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Cryptophyta	Plagioselmis prolonga	10 700		0.00043	428 000	0.0471
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Cyanophyta	Aphanizomenon sp.	580		0.00075	754 000	0.0841
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Dinophyta	Glennodinium sp.	1 440		0.00576	5 760 000	0.7488
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Dinophyta	Heterocapsa triquetra	6 420		0.00526	5 264 400	0.6805
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Dinophyta	Scrippsiella hangoei	3 920		0.01038	10 384 000	1.1422
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Unidentified	Flagellate 2-5 µm(unidentified)	136 960		0.00110	1 095 680	0.1233
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Total	Total	472 993	< 6 %	0.16959	169 593 884	13.0552
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Chlorophyta	Pyramimonas spp.	143 380		0.01577	15771800	1.7349
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Chlorophyta	Monoraphidium contortum	10 700		0.00022	224700	0.0247
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Chrysophyta (diatoms)	Achnanthes taeniata	7 509		0.00691	6908280	0.4626
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Chrysophyta (diatoms)	Chaetoceros wighamii	123 120		0.02832	28317600	2.1669
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Chrysophyta (diatoms)	Actinocyclus octonarius	240		0.00456	4560000	0.1344
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Chrysophyta (diatoms)	Fragilaria sp.	1 440		0.00144	1440000	0.1224
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Chrysophyta (excl. Diatoms)	Pseudopedinella tricostata	21 400		0.00071	706200	0.0777
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Ciliophora (autotrof)	Mesodinium rubrum	20 480		0.07957	79568800	8.7526
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Cryptophyta	Plagioselmis prolonga	36 380		0.00146	1455200	0.1601
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Cryptophyta	Teleaulax spp.	49 220		0.00788	7875200	0.8663
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Cyanophyta	Aphanizomenon sp.	175		0.00023	227500	0.0250
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Cyanophyta	Pseudanabaena limnetica	117		0.00001	9360	0.0010
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Dinophyta	Scrippsiella hangoei	1 040		0.00163	1632000	0.2122
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Dinophyta	Peridiniella catenata	4 000		0.02560	25600000	3.3280
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Prymnesiophyta	Chrysochromulina spp.	27 820		0.00039	389480	0.0428
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Unidentified	Flagellate 2-5 µm(unidentified)	829 900		0.00664	6639200	0.7303
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Total	Total	1 276 921	< 7 %	0.18133	181325320	18.8418
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Chlorophyta	Monoraphidium contortum	53 500		0.01338	13 375 000	1.498
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Chlorophyta	Pyramimonas spp.	6 420		0.00071	706 200	0.077
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Chrysophyta (diatoms)	Chaetoceros wighamii	15 280		0.00408	4 082 160	0.2943
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Chrysophyta (diatoms)	Fragilaria sp.	1 200		0.00467	4 668 000	0.3636
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Chrysophyta (diatoms)	Tabellaria sp.	480		0.00031	309 120	0.0331
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Chrysophyta (diatoms)	Thalassiosira baltica	80		0.00571	5 712 800	0.1392
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Chrysophyta (diatoms)	Thalassiosira levanderi	10 700		0.00417	4 173 000	0.214
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Chrysophyta (excl. Diatoms)	Pseudopedinella tricostata	32 100		0.00106	1 059 300	0.1188
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Ciliophora (autotrof)	Mesodinium rubrum	16 480		0.11449	114 488 000	12.5874
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Cryptophyta	Hemiselmis virescens	17 120		0.00017	171 200	0.0188
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Cryptophyta	Plagioselmis prolonga	12 840		0.00051	513 600	0.0565
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Cryptophyta	Teleaulax spp.	62 060		0.00993	9 929 600	1.0923
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Cyanophyta	Aphanizomenon sp.	410		0.00053	533 000	0.0595
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Cyanophyta	Cyanodictyon spp.	112 800		0.00011	106 596	0.0116
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Cyanophyta	Pseudanabaena limnetica	880		0.00007	70 400	0.0077
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Dinophyta	Dinophysis acuminata	80		0.00104	1 040 000	0.1352
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Dinophyta	Peridiniella catenata	960		0.00614	6 144 000	0.7968
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Dinophyta	Scrippsiella hangoei	1 440		0.00379	3 792 000	0.4172
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Euglenophyta	Eutreptiella gymnastica	2 140		0.00107	1 070 000	0.1177
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Prymnesiophyta	Chrysochromulina spp.	23 540		0.00313	3 130 820	0.3437
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Unidentified	Flagellate 2-5 µm(unidentified)	241 820		0.00193	1 934 560	0.2176
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Unidentified	Unicell 2-5 µm(unidentified)	657 900		0.00526	5 263 200	0.5921
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Total	Total	1 270 230	< 6 %	0.18227	182 272 556	19.1921

* Filamentous cyanobacteria 100µm/L.

** The accuracy value in this 95 % confidence interval is estimated from HELCOM 1988. Guidelines for the Baltic Monitoring Programme for the third stage.Part D.Biological determ.Balt.Sea.Environ.Proc.27D:1-161.

Idcode	Water type	Depth m	Date - time	Phylum	Taxa (species/genus name)	Abundance* Cells/Liters	Accuracy** of	Biovolyme mm3/Liter	Biovolyme µm3/Liter	Carbon- biomass mgC/m3
							abundance (±) 95 % confidence interval			
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Cryptophyta	Plagioselmis prolonga	666 500		0.02666	26660000	2.9326
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Chlorophyta	Pyramimonas spp.	184 900		0.02034	20339000	2.2188
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Cyanophyta	Aphanizomenon sp.	12 910		0.01678	16783000	1.8719
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Cyanophyta	Pseudanabaena limnetica	139 120		0.01113	11129600	1.2243
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Prymnesiophyta	Chrysochromulina spp.	188 320		0.00866	8658440	0.9596
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Ciliophora (autotrof)	Mesodinium rubrum	1 280		0.00817	8169600	0.8973
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Chlorophyta	Pyramimonas virginica	399 900		0.00640	6398400	0.7198
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Cryptophyta	Teleaulax spp.	38 520		0.00616	6163200	0.678
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Unidentified	Flagellate 2-5 µm(unidentified)	675 100		0.00540	5400800	0.6076
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Dinophyta	Glenodinium sp.	8 560		0.00445	4451200	0.5821
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Cyanophyta	Nodularia spumigena	410		0.00390	3895000	0.4284
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Cryptophyta	Hemiselmis virescens	258 000		0.00258	2580000	0.2838
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Dinophyta	Dinophysis acuminata	160		0.00208	2080000	0.2704
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Chrysoophyta (excl. Diatoms)	Pseudopedinella pyriforme	6 420		0.00116	1156500	0.1284
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Unidentified	Unicell 2-5 µm(unidentified)	132 680		0.00106	1061440	0.1194
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Dinophyta	Gymnodinium sp.	240		0.00091	912000	0.1003
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Chrysoophyta (diatoms)	Chaetoceros subtilis	6 420		0.00083	834600	0.0533
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Chrysoophyta (excl. Diatoms)	Pseudopedinella tricostata	14 980		0.00049	494340	0.0554
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Cyanophyta	Anabaena sp.	290		0.00037	365400	0.0415
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Cyanophyta	Cyanodictyon spp.	64 000		0.00006	56576	0.0063
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Chrysoophyta (diatoms)	Cylindrotheca closterium	160		0.00001	11520	0.0012
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Total	Total	2 798 870	< 6 %	0.12760	127599716	14.1804
PFM000062	Sea Water	0.0-3.5	2003-10-27 12:06	Ciliophora (autotrof)	Mesodinium rubrum	1 840		0.06481	64809600	7.1242
PFM000062	Sea Water	0.0-3.5	2003-10-27 12:06	Cyanophyta	Aphanizomenon sp.	11 560		0.01503	15028000	1.6762
PFM000062	Sea Water	0.0-3.5	2003-10-27 12:06	Cryptophyta	Teleaulax spp.	42 800		0.01113	11128000	1.2241
PFM000062	Sea Water	0.0-3.5	2003-10-27 12:06	Chlorophyta	Monoraphidium contortum	40 660		0.01017	10165000	1.1385
PFM000062	Sea Water	0.0-3.5	2003-10-27 12:06	Dinophyta	Dinophysis acuminata	480		0.00624	6240000	0.8112
PFM000062	Sea Water	0.0-3.5	2003-10-27 12:06	Dinophyta	Heterocapsa rotundata	14 980		0.00150	1498000	0.1648
PFM000062	Sea Water	0.0-3.5	2003-10-27 12:06	Chlorophyta	Pyramimonas spp.	4 280		0.00047	470800	0.0514
PFM000062	Sea Water	0.0-3.5	2003-10-27 12:06	Unidentified	Flagellate 2-5 µm(unidentified)	47 080		0.00038	376640	0.0424
PFM000062	Sea Water	0.0-3.5	2003-10-27 12:06	Chrysoophyta (diatoms)	Chaetoceros danicus	80		0.00016	164000	0.0079
PFM000062	Sea Water	0.0-3.5	2003-10-27 12:06	Cryptophyta	Plagioselmis prolonga	2 140		0.00009	85600	0.0094
PFM000062	Sea Water	0.0-3.5	2003-10-27 12:06	Cyanophyta	Pseudanabaena limnetica	580		0.00005	46400	0.0051
PFM000062	Sea Water	0.0-3.5	2003-10-27 12:06	Total	Total	166 480	< 14 %	0.11001	110012040	12.2552
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Ciliophora (autotrof)	Mesodinium rubrum	1 120		0.01445	14452800	1.5872
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Dinophyta	Dinophysis acuminata	320		0.00416	4160000	0.5408
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Chlorophyta	Monoraphidium contortum	10 700		0.00268	2675000	0.2996
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Cyanophyta	Aphanizomenon sp.	1 870		0.00243	2431000	0.2712
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Cryptophyta	Plagioselmis prolonga	49 220		0.00197	1968800	0.2166
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Unidentified	Flagellate 2-5 µm(unidentified)	219 300		0.00175	1754400	0.1974
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Cryptophyta	Teleaulax spp.	10 700		0.00171	1712000	0.1883
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Chrysoophyta (diatoms)	Chaetoceros wighamii	4 600		0.00080	803040	0.0628
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Chrysoophyta (diatoms)	Actinocyclus octonarius	80		0.00066	664000	0.0238
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Chrysoophyta (diatoms)	Chaetoceros danicus	160		0.00033	328000	0.0158
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Dinophyta	Heterocapsa rotundata	2 140		0.00021	214000	0.0235
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Dinophyta	Scrippsiella hangoei	80		0.00016	160000	0.0176
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Cyanophyta	Pseudanabaena limnetica	410		0.00003	32800	0.0036
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Total	Total	300 700	< 20 %	0.03136	31355840	3.4482

*Filamentous cyanobacteria 100µm/L.

**The accuracy value in this 95% confidence interval is estimated from HELCOM 1988. Guidelines for the Baltic Monitoring Programme for the third stage.Part D.Biological Determ.Balt.Sea Environ.Proc.27D1-161.

Idcode	Water type	Depth m	Date - time	Phylum	Taxa (species/genus name)	Abundance* Cells/Liters	Accuracy** of	Biovolume mm3/Liter	Biovolume µm3/Liter	Carbon- biomass mgC/m3
							abundance (±) 95 % confidence interval			
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Chrysophyta (diatoms)	Achnanthes taeniata	65 143		0.05993	59931368.64	3.0096
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Ciliophora (autotrof)	Mesodinium rubrum	6 880		0.03513	35128000	3.8603
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Chrysophyta (diatoms)	Chaetoceros wighamii	158 100		0.01955	19547400	1.6162
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Chrysophyta (diatoms)	Actinocyclus octonarius	640		0.01216	12160000	0.3584
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Chrysophyta (diatoms)	Thalassiosira levanderi	14 980		0.01153	11534600	0.764
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Dinophyta	Scrippsiella hangoei	3 920		0.01038	10384000	1.1422
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Dinophyta	Glenodinium sp.	1 440		0.00576	5760000	0.7488
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Dinophyta	Heterocapsa triquetra	6 420		0.00526	5264400	0.6805
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Chlorophyta	Pyramimonas spp.	25 680		0.00282	2824800	0.3082
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Chrysophyta (diatoms)	Thalassiosira baltica	160		0.00219	2185600	0.072
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Chrysophyta (diatoms)	Skeletonema costatum	9 290		0.00128	1282075.2	0.0948
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Unidentified	Flagellate 2-5 µm(unidentified)	136 960		0.00110	1095680	0.1233
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Cyanophyta	Aphanizomenon sp.	580		0.00075	754000	0.0841
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Chrysophyta (excl. Diatoms)	Dinobryon faculiferum	14 980		0.00075	749000	0.0824
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Chrysophyta (excl. Diatoms)	Pseudopedinella tricostata	17 120		0.00056	564960	0.0633
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Cryptophyta	Plagioselmis prolonga	10 700		0.00043	428000	0.0471
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Total	Total	472 993	< 6 %	0.16959	169593883.8	13.0552
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Ciliophora (autotrof)	Mesodinium rubrum	20 480		0.07957	79568800	8.752568
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Chrysophyta (diatoms)	Chaetoceros wighamii	123 120		0.02832	28317600	2.1669
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Dinophyta	Peridiniella catenata	4 000		0.02560	25600000	3.328
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Chlorophyta	Pyramimonas spp.	143 380		0.01577	15771800	1.7349
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Cryptophyta	Teleaulax spp.	49 220		0.00788	7875200	0.8663
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Chrysophyta (diatoms)	Achnanthes taeniata	7 509		0.00691	6908280	0.4626
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Unidentified	Flagellate 2-5 µm(unidentified)	829 900		0.00664	6639200	0.7303
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Chrysophyta (diatoms)	Actinocyclus octonarius	240		0.00456	4560000	0.1344
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Dinophyta	Scrippsiella hangoei	1 040		0.00163	1632000	0.2122
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Cryptophyta	Plagioselmis prolonga	36 380		0.00146	1455200	0.1601
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Chrysophyta (diatoms)	Fragilaria sp.	1 440		0.00144	1440000	0.1224
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Chrysophyta (excl. Diatoms)	Pseudopedinella tricostata	21 400		0.00071	706200	0.0777
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Prymnesiophyta	Chrysochromulina spp.	27 820		0.00039	389480	0.0428
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Cyanophyta	Aphanizomenon sp.	175		0.00023	227500	0.0250
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Chlorophyta	Monoraphidium contortum	10 700		0.00022	224700	0.0247
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Cyanophyta	Pseudanabaena limnetica	117		0.00001	9360	0.0010
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Total	Total	1 276 921	< 7 %	0.18133	181325320	18.84184475
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Ciliophora (autotrof)	Mesodinium rubrum	16480		0.11449	114488000	12.5874
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Chlorophyta	Monoraphidium contortum	53500		0.01338	13375000	1.498
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Cryptophyta	Teleaulax spp.	62060		0.00993	9929600	1.0923
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Dinophyta	Peridiniella catenata	960		0.00614	6144000	0.7968
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Chrysophyta (diatoms)	Thalassiosira baltica	80		0.00571	5712800	0.1392
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Unidentified	Unicell 2-5 µm(unidentified)	657900		0.00526	5263200	0.5921
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Chrysophyta (diatoms)	Fragilaria sp.	1200		0.00467	4668000	0.3636
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Chrysophyta (diatoms)	Thalassiosira levanderi	10700		0.00417	4173000	0.214
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Chrysophyta (diatoms)	Chaetoceros wighamii	15280		0.00408	4082160	0.2943
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Dinophyta	Scrippsiella hangoei	1440		0.00379	3792000	0.4172
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Prymnesiophyta	Chrysochromulina spp.	23540		0.00313	3130820	0.3437
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Unidentified	Flagellate 2-5 µm(unidentified)	241820		0.00193	1934560	0.2176
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Euglenophyta	Eutreptiella gymnastica	2140		0.00107	1070000	0.1177
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Chrysophyta (excl. Diatoms)	Pseudopedinella tricostata	32100		0.00106	1059300	0.1188
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Dinophyta	Dinophysis acuminata	80		0.00104	1040000	0.1352
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Chlorophyta	Pyramimonas spp.	6420		0.00071	706200	0.077
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Cyanophyta	Aphanizomenon sp.	410		0.00053	533000	0.0595
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Cryptophyta	Plagioselmis prolonga	12840		0.00051	513600	0.0565
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Chrysophyta (diatoms)	Tabellaria sp.	480		0.00031	309120	0.0331
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Cryptophyta	Hemiselmis virescens	17120		0.00017	171200	0.0188
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Cyanophyta	Cyanodictyon spp.	112800		0.00011	106596	0.0116
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Cyanophyta	Pseudanabaena limnetica	880		0.00007	70400	0.0077
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Total	Total	1270230	< 6 %	0.18227	182272556	19.1921

*Filamentous cyanobacteria 100µm/L.

**The accuracy value in this 95% confidence interval is estimated from HELCOM 1988. Guidelines for the Baltic Monitoring Programme for the third stage.Part D.Biological Determ.Balt.Sea Environ.Proc.27D1-161.

Idcode	Water type	Depth m	Date - time	Phylum	Abundance*	Accuracy** of abundance (±) 95 % confidence interval	Biovolume	Biovolume	Carbon- biomass
					Cells/Liters		mm3/Liter	µm3/Liter	mgC/m3
PFM000062	Sea Water	0-3.5	2003-09-01 10:15	Chlorophyta	584 800		0.02674	26 737 400	2.9386
PFM000062	Sea Water	0-3.5	2003-09-01 10:15	Chrysophyta (Diatoms)	6 580		0.00085	846 120	0.0545
PFM000062	Sea Water	0-3.5	2003-09-01 10:15	Chrysophyta (excl.Diatoms)	21 400		0.00165	1 649 940	0.1838
PFM000062	Sea Water	0-3.5	2003-09-01 10:15	Cryptophyta	963 020		0.03540	35 403 200	3.8944
PFM000062	Sea Water	0-3.5	2003-09-01 10:15	Cyanophyta	216 730		0.03223	32 229 576	3.5724
PFM000062	Sea Water	0-3.5	2003-09-01 10:15	Dinophyta	8 960		0.00744	7 443 200	0.9528
PFM000062	Sea Water	0-3.5	2003-09-01 10:15	Prymnesiophyta	188 320		0.00866	8 658 440	0.9596
PFM000062	Sea Water	0-3.5	2003-09-01 10:15	Unidentified (2-5 µm)	807 780		0.00646	6 462 240	0.727
PFM000062	Sea Water	0-3.5	2003-09-01 10:15	Ciliophora (Autotroph ciliate)	1 280		0.00817	8 169 600	0.8973
PFM000062	Sea Water	0-3.5	2003-09-01 10:15	Total	2 798 870	< 6 %	0.12760	127 599 716	14.1804
PFM000062	Sea Water	0-3.5	2003-10-27 12:06	Chlorophyta	44 940		0.01064	10 635 800	1.1899
PFM000062	Sea Water	0-3.5	2003-10-27 12:06	Chrysophyta (Diatoms)	80		0.00016	164 000	0.0079
PFM000062	Sea Water	0-3.5	2003-10-27 12:06	Cryptophyta	44 940		0.01121	11 213 600	1.2335
PFM000062	Sea Water	0-3.5	2003-10-27 12:06	Cyanophyta	12 140		0.01507	15 074 400	1.6813
PFM000062	Sea Water	0-3.5	2003-10-27 12:06	Dinophyta	15 460		0.00774	7 738 000	0.976
PFM000062	Sea Water	0-3.5	2003-10-27 12:06	Unidentified (2-5 µm)	47 080		0.00038	376 640	0.0424
PFM000062	Sea Water	0-3.5	2003-10-27 12:06	Ciliophora (Autotroph ciliate)	1 840		0.06481	64 809 600	7.1242
PFM000062	Sea Water	0-3.5	2003-10-27 12:06	Total	166 480	< 14 %	0.11001	110 012 040	12.2552
PFM000062	Sea Water	0-3.5	2003-12-15 15:06	Chlorophyta	10 700		0.00268	2 675 000	0.2996
PFM000062	Sea Water	0-3.5	2003-12-15 15:06	Chrysophyta (Diatoms)	4 840		0.00180	1 795 040	0.1024
PFM000062	Sea Water	0-3.5	2003-12-15 15:06	Cryptophyta	59 920		0.00368	3 680 800	0.4049
PFM000062	Sea Water	0-3.5	2003-12-15 15:06	Cyanophyta	2 280		0.00246	2 463 800	0.2748
PFM000062	Sea Water	0-3.5	2003-12-15 15:06	Dinophyta	2 540		0.00453	4 534 000	0.5819
PFM000062	Sea Water	0-3.5	2003-12-15 15:06	Unidentified (2-5 µm)	219 300		0.00175	1 754 400	0.1974
PFM000062	Sea Water	0-3.5	2003-12-15 15:06	Ciliophora (Autotroph ciliate)	1 120		0.01445	14 452 800	1.5872
PFM000062	Sea Water	0-3.5	2003-12-15 15:06	Total	300 700	< 20 %	0.03136	31 355 840	3.4482
PFM000062	Sea Water	0-3.5	2004-04-06 09:38	Chlorophyta	25 680		0.00282	2 824 800	0.3082
PFM000062	Sea Water	0-3.5	2004-04-06 09:38	Chrysophyta (Diatoms)	248 313		0.10664	106 641 044	5.915
PFM000062	Sea Water	0-3.5	2004-04-06 09:38	Chrysophyta (excl.Diatoms)	32 100		0.00131	1 313 960	0.1457
PFM000062	Sea Water	0-3.5	2004-04-06 09:38	Cryptophyta	10 700		0.00043	428 000	0.0471
PFM000062	Sea Water	0-3.5	2004-04-06 09:38	Cyanophyta	580		0.00075	754 000	0.0841
PFM000062	Sea Water	0-3.5	2004-04-06 09:38	Dinophyta	11 780		0.02141	21 408 400	2.5715
PFM000062	Sea Water	0-3.5	2004-04-06 09:38	Unidentified (2-5 µm)	136 960		0.00110	1 095 680	0.1233
PFM000062	Sea Water	0-3.5	2004-04-06 09:38	Ciliophora (Autotroph ciliate)	6 880		0.03513	35 128 000	3.8603
PFM000062	Sea Water	0-3.5	2004-04-06 09:38	Total	472 993	< 6 %	0.16959	169 593 884	13.0552
PFM000062	Sea Water	0-3.5	2004-05-03 10:53	Chlorophyta	154 080		0.01600	15996500	1.759615
PFM000062	Sea Water	0-3.5	2004-05-03 10:53	Chrysophyta (diatoms)	132 309		0.04123	41225880	2.886266
PFM000062	Sea Water	0-3.5	2004-05-03 10:53	Chrysophyta (excl. Diatoms)	21 400		0.00071	706200	0.077682
PFM000062	Sea Water	0-3.5	2004-05-03 10:53	Ciliophora (autotrof)	20 480		0.07957	79568800	8.752568
PFM000062	Sea Water	0-3.5	2004-05-03 10:53	Cryptophyta	85 600		0.00933	9330400	1.026344
PFM000062	Sea Water	0-3.5	2004-05-03 10:53	Cyanophyta	292		0.00024	236860	0.026055
PFM000062	Sea Water	0-3.5	2004-05-03 10:53	Dinophyta	5 040		0.02723	27232000	3.540160
PFM000062	Sea Water	0-3.5	2004-05-03 10:53	Prymnesiophyta	27 820		0.00039	389480	0.042843
PFM000062	Sea Water	0-3.5	2004-05-03 10:53	Unidentified	829 900		0.00664	6639200	0.730312
PFM000062	Sea Water	0-3.5	2004-05-03 10:53	Total	1 276 921	< 7 %	0.18133	181 325 320	18.84184475
PFM000062	Sea Water	0-3.5	2004-05-17 10:42	Chlorophyta	59 920		0.01408	14 081 200	1.575
PFM000062	Sea Water	0-3.5	2004-05-17 10:42	Chrysophyta (Diatoms)	27 740		0.01895	18 945 080	1.0442
PFM000062	Sea Water	0-3.5	2004-05-17 10:42	Chrysophyta (excl.Diatoms)	32 100		0.00106	1 059 300	0.1188
PFM000062	Sea Water	0-3.5	2004-05-17 10:42	Cryptophyta	92 020		0.01061	10 614 400	1.1676
PFM000062	Sea Water	0-3.5	2004-05-17 10:42	Cyanophyta	114 090		0.00071	709 996	0.0788
PFM000062	Sea Water	0-3.5	2004-05-17 10:42	Dinophyta	2 480		0.01098	10 976 000	1.3492
PFM000062	Sea Water	0-3.5	2004-05-17 10:42	Euglenophyta	2 140		0.00107	1 070 000	0.1177
PFM000062	Sea Water	0-3.5	2004-05-17 10:42	Prymnesiophyta	23 540		0.00313	3 130 820	0.3437
PFM000062	Sea Water	0-3.5	2004-05-17 10:42	Unidentified (2-5 µm)	899 720		0.00720	7 197 760	0.8097
PFM000062	Sea Water	0-3.5	2004-05-17 10:42	Ciliophora (Autotroph ciliate)	16 480		0.11449	114 488 000	12.5874
PFM000062	Sea Water	0-3.5	2004-05-17 10:42	Total	1 270 230	< 6 %	0.18227	182 272 556	19.1921

*Filamentous cyanobacteria 100µm/L.

** The accuracy value in this confidence interval is estimated from HELCOM 1988. Guidelines for the Baltic Monitoring Programme for the third stage.Part D.Biological determ.Balt. Sea Environ.Proc.27D1-161.

Appendix 2

Primary zooplankton data

Zooplankton Page 1(1)

Idcode	Water type	Depth m	Date - time	Species	Number/m3	µg/ m3	µg/ m2	mg C/m3
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Keratella cochlearis	12860	1286	4501	0.0643
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Keratella quadrata	3960	792	2772	0.0396
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Keratella cruciformis	560	56	196	0.0028
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Bosmina	420	2940	10290	0.147
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Bythotrephes	40	6000	21000	0.3
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Evadne	20	160	560	0.008
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Acartia bifilosa	1440	32400	113400	1.62
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Acartia copepodites	2400	31200	109200	1.56
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Eurytemora	680	15300	53550	0.765
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Eurytemora copepodites	120	1680	5880	0.084
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Nauplies	11100	22200	77700	1.11
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Balanoidnauplies	200	800	2800	0.04
PFM000062	Sea Water	0.0-3.5	2003-09-01 10:15	Total	33800	114814	401849	5.7407
PFM000062	Sea Water	0.0-3.5	2003-10-27 12:06	Keratella cochlearis	40	4	14	0.0002
PFM000062	Sea Water	0.0-3.5	2003-10-27 12:06	Keratella quadrata	120	24	84	0.0012
PFM000062	Sea Water	0.0-3.5	2003-10-27 12:06	Keratella cruciformis	140	14	49	0.0007
PFM000062	Sea Water	0.0-3.5	2003-10-27 12:06	Synchaeta	2140	3210	11235	0.1605
PFM000062	Sea Water	0.0-3.5	2003-10-27 12:06	Bosmina	20	140	490	0.007
PFM000062	Sea Water	0.0-3.5	2003-10-27 12:06	Acartia bifilosa	540	12150	42525	0.6075
PFM000062	Sea Water	0.0-3.5	2003-10-27 12:06	Acartia copepodites	1340	16080	56280	0.804
PFM000062	Sea Water	0.0-3.5	2003-10-27 12:06	Eurytemora	1680	37800	132300	1.89
PFM000062	Sea Water	0.0-3.5	2003-10-27 12:06	Eurytemora copepodites	5940	77220	270270	3.861
PFM000062	Sea Water	0.0-3.5	2003-10-27 12:06	Nauplies	20360	40720	142520	2.036
PFM000062	Sea Water	0.0-3.5	2003-10-27 12:06	Total	32320	187362	655767	9.3681
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Keratella cochlearis	60	12	42	0.0006
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Acartia bifilosa	520	11700	40950	0.585
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Acartia copepodites	1360	16320	57120	0.816
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Eurytemora	680	15300	53550	0.765
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Eurytemora copepodites	600	7800	27300	0.39
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Limnocalanus	60	4200	14700	0.21
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Nauplies	3280	6560	22960	0.328
PFM000062	Sea Water	0.0-3.5	2003-12-15 15:06	Total	6560	61892	216622	3.0946
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Acartia bifilosa	20	400	1400	0.02
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Eurytemora	20	900	3150	0.045
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Eurytemora copepodites	120	1680	5880	0.084
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Limnocalanus nauplies	1660	4980	17430	0.249
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Nauplies remaining	740	1480	5180	0.074
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Polychaeta larvae	140	3080	10780	0.154
PFM000062	Sea Water	0.0-3.5	2004-04-06 09:38	Total	2700	12520	43820	0.626
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Keratella cochlearis	60	12	42	0.0006
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Polyarthra	1840	368	1288	0.0184
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Synchaeta	1940	2910	10185	0.1455
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Bosmina	20	140	490	0.007
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Podon	20	300	1050	0.015
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Acartia copepoditer	860	9460	33110	0.473
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Eurytemora copepoditer	180	2520	8820	0.126
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Limnocalanus copepoditer	20	560	1960	0.028
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Limnocalanus nauplier	2240	6720	23520	0.336
PFM000062	Sea Water	0.0-3.5	2004-05-03 10:53	Nauplier øvriga	960	1920	6720	0.096
PFM000063	Sea Water	0.0-3.5	2004-05-03 10:53	Totalt	8140	24910	87185	1.2455
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Synchaeta	340	510	1785	0.0255
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Evadne	40	800	2800	0.04
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Podon	220	3300	11550	0.165
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Acartia bifilosa	40	1000	3500	0.05
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Cyclops sp	40	800	2800	0.04
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Eurytemora	45	5320	18620	0.266
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Limnocalanus copepodites	60	1680	5880	0.084
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Limnocalanus nauplies	280	840	2940	0.042
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Nauplies remaining	700	1400	4900	0.07
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Balanoidnauplier	20	80	280	0.004
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Polychaeta larvae	420	9240	32340	0.462
PFM000062	Sea Water	0.0-3.5	2004-05-17 10:42	Total	2205	24970	87395	1.2485