R-05-47

Submerged macrophyte communities in the Forsmark area

Building of a GIS application as a tool for biomass estimations

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December 2005

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Keywords: Submerged vegetation, Macrophyte communities, GIS, Biomass estimation, Epifauna.

Sammanfattning

Ett GIS skikt som illustrerar utbredningen av makrovegetation och associerad fauna på havsbottnen i SKB:s platsundersökningsområde i Forsmark skapades med hjälp av information från tidigare studier i området. Med hjälp av GIS skiktet kan uppskattad biomassa av vegetation och epifauna i olika områden beräknas.

Contents

1 Introduction

Within the site investigation project at Forsmark, and in earlier projects, several surveys regarding the submerged macrophyte communities has been performed /Kautsky et al. 1999, Borgiel 2004, Borgiel 2005/. In order to estimate the fate and circulation of toxins or radioactive matter, the knowledge of biomass distribution in the ecosystems is important. In this study, a GIS application was created. This product is meant to work as a tool for analysing the biomass and species distribution in the macrophyte communities.

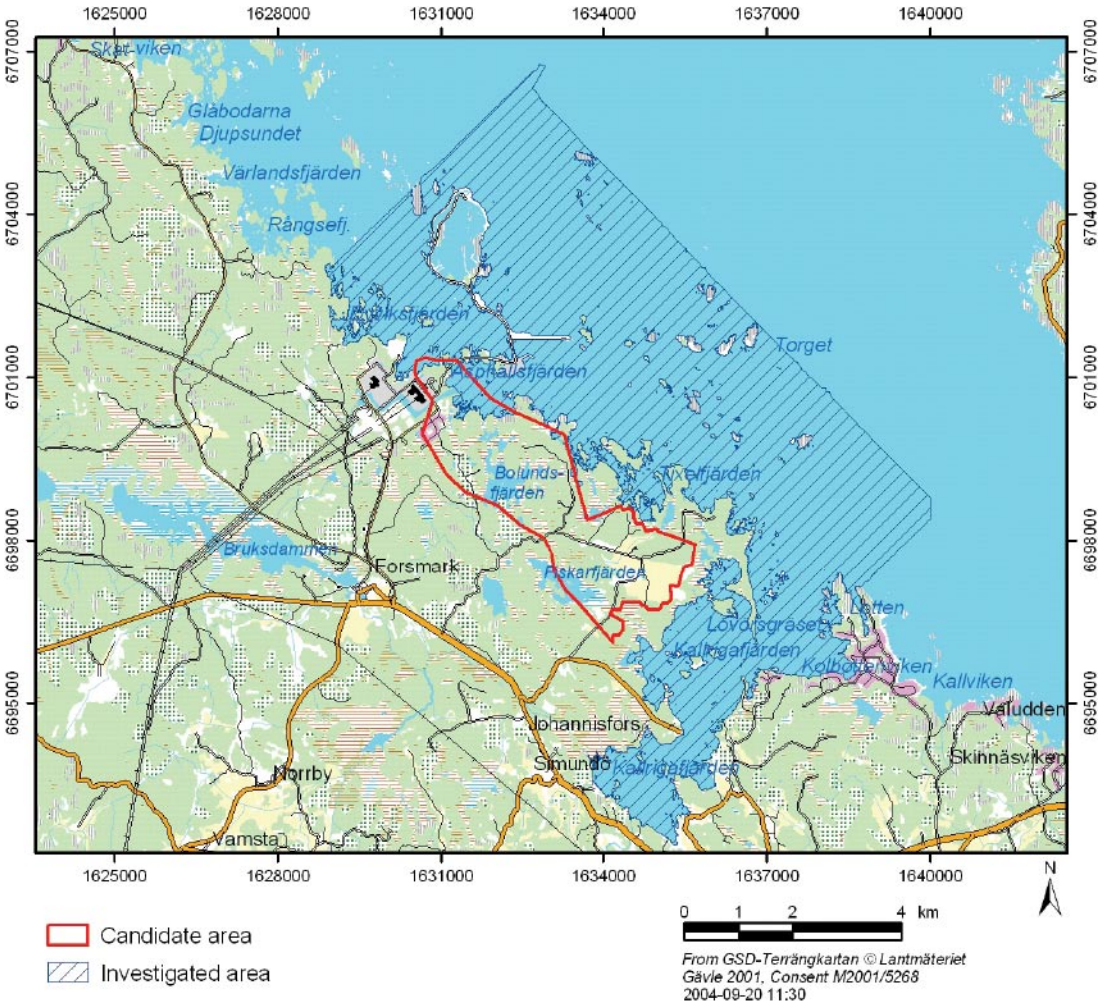

Figure 1-1. *General overview over Forsmark site investigation area and the area limiting this study (Investigated area). The candidate area, where most site investigations are performed, is shown in red.*

2 Material and methods

2.1 Objective

The aim of this study was to compile the information from previous studies to produce a GIS application that both illustrates the distribution of different vegetation communities and also makes it possible to estimate the total biomass of the different vegetation communities and its associated fauna.

2.2 Used software

The GIS application was created by means of the software Arc View 3.3 by Environmental Systems Research Institute, Inc.

2.3 In data

Distribution readings and quantitative data of submerged macrophyte communities and its associated fauna was obtained from studies by /Kautsky et al. 1999, Borgiel 2004, Borgiel, 2005/.

Information about the macrophyte distribution in Långörsviken, located in the northern parts of Kallrigafjärden, was obtained from a report by Upplandsstiftelsen /Wallström et al. 2000/.

Information about water depth and bottom substrate was available as USGS DEM file, produced by Geological Survey of Sweden /Elhammer and Sandkvist 2005/.

Complementary data of the covering degree of submerged vegetation was obtained from a study using an under water video camera /Tobiasson 2003/.

2.4 Data handling/post processing

Quantitative data on macrophyte and faunal biomass were either obtained from the primary SKB data base SICADA or directly from reports. Samples were compiled and analysed according to dominating vegetation.

2.5 Analyses and interpretations

2.5.1 Map

Figure 2-1 shows the location of available information on submerged macrophyte distribution and covering degree. Arrows indicate diving transects, dots indicate survey transects by boat and crosses represent observations from under water filming.

Readings from diving and boat transects were categorised after dominating vegetation (Figure 2-2).

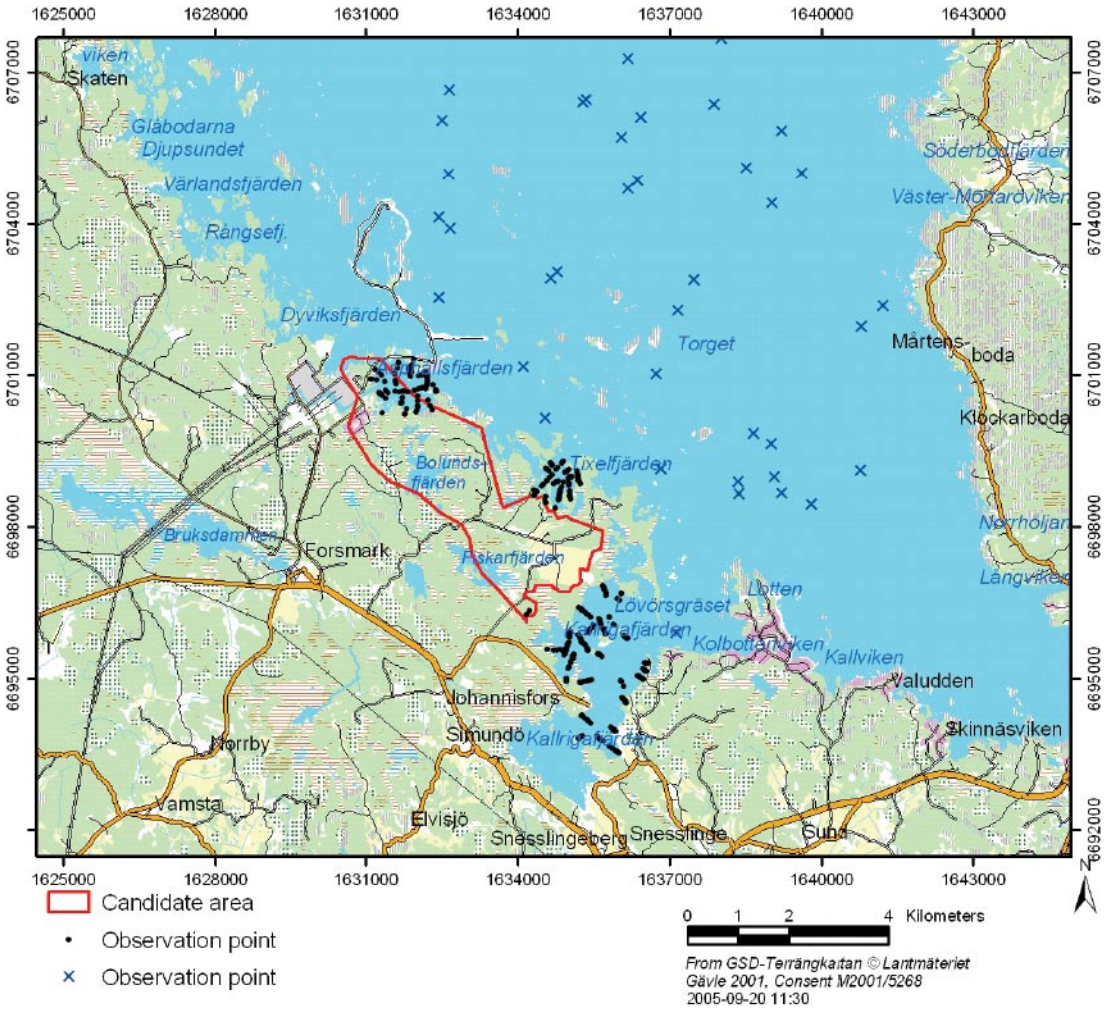

Figure 2-1. *The location of information available. Dots denote boat and diving transects, crosses denote under water video recordings. The candidate area, where most site investigations are performed, is shown in red.*

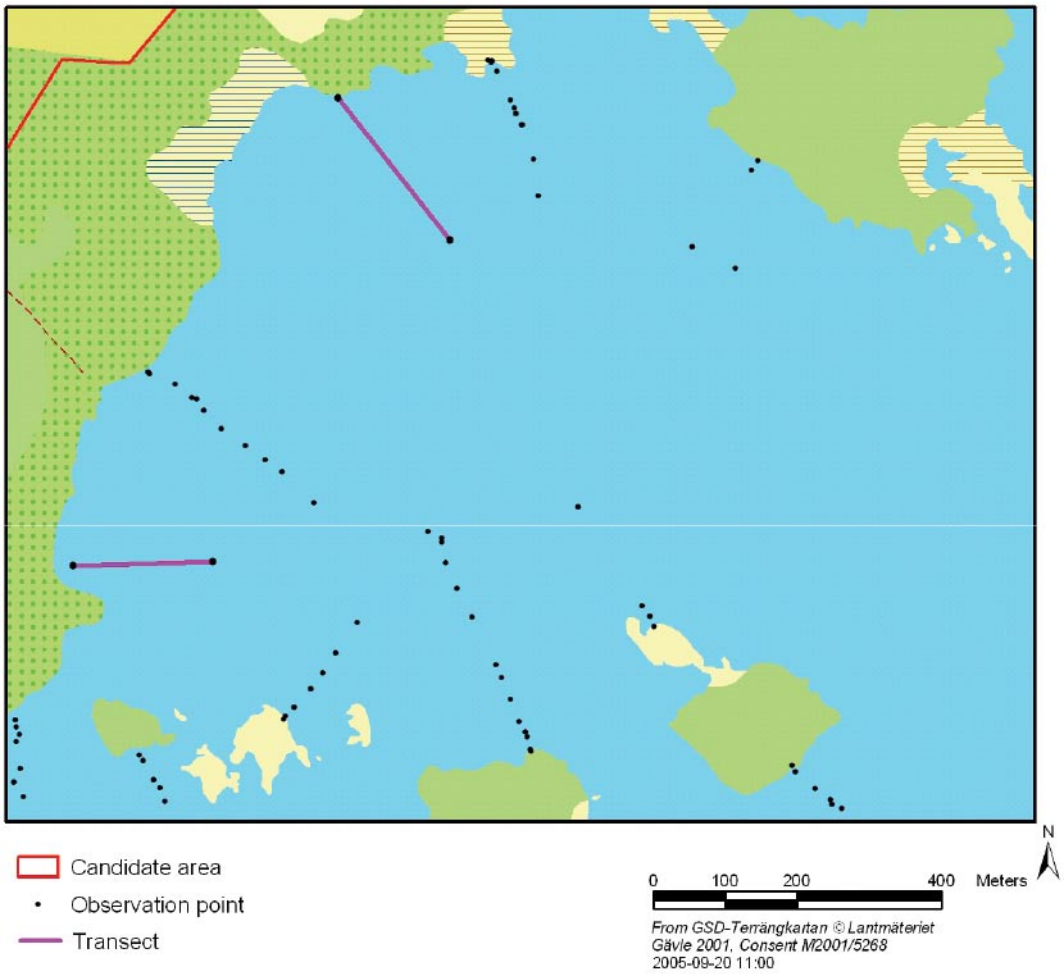

Figure 2-2. *Example of diving transect (line) and boat transects (dots). The south east part of the candidate area, where most site investigations are performed, is shown in red in the upper left corner.*

At each reading from the diving transects it was assumed that the vegetation and covering degree was similar five metres on both sides at right angel from the diving direction. Corresponding figure for boat transects were 20 m. Polygons were then drawn according to these assumptions and classified according to dominating vegetation (Figure 2-3).

By means of these transects and information about water depth and bottom substrate, polygons were created and classified for the remainder of the studied area. Information about bottom substrate was not available for the whole area (Figure 2-4). The classification of the substrates from Geological Survey of Sweden was made from the dominating substrate from the top 50 cm of the substrate (Pers. comm. Ingemar Cato, Geological Survey of Sweden). It is therefore impossible to know if there is a, for example, thin layer of sand or clay on top of an area classified as hard substrate. This could lead to an overestimated amount of hard substrates.

Figure 2-3. *Example of diving transects (10 m wide) and boat transects (40 m wide) after polygons being drawn. Diving transect to the left in the picture. Different colours indicate different macrophyte communities.*

The work was carried out as follows:

- Where information about the bottom substrate was available polygons were created by means of the substrate shape file and depth grid from Geological Survey of Sweden /Elhammer and Sandkvist 2005/
- The vegetation community and the covering degree on a certain depth and substrate combination were determined by compiled information from studies by /Kaustsky et al. 1999, Borgiel 2004/. All observations from a certain bottom substrate were analysed to find the dominating vegetation within different depth ranges (Table 2-1). After determining the dominating vegetation, the covering degrees of different macrophyte classes within each depth range were calculated as a mean of all readings (Appendix 1).
- Areas without information about the bottom substrate, but still adjacent to areas included in the substrate shape file, were defined by means of the depth grid. The vegetation community and covering degree was defined according to adjacent polygons with information about both depth and substrate.
- In areas with diving or boat transects close to one another, polygons were defined by joining similar observations together (Figure 2-5). The covering degree of the vegetation within the new polygon was calculated as a mean of the joined observations.

In areas which hadn't been visited in previous studies, a mean of other readings on a certain depth was used to estimate vegetation community and covering degree.

The type of information used to define the vegetation community and covering degree was noted for all polygons in the GIS application. As a final step the area of the polygons was calculated.

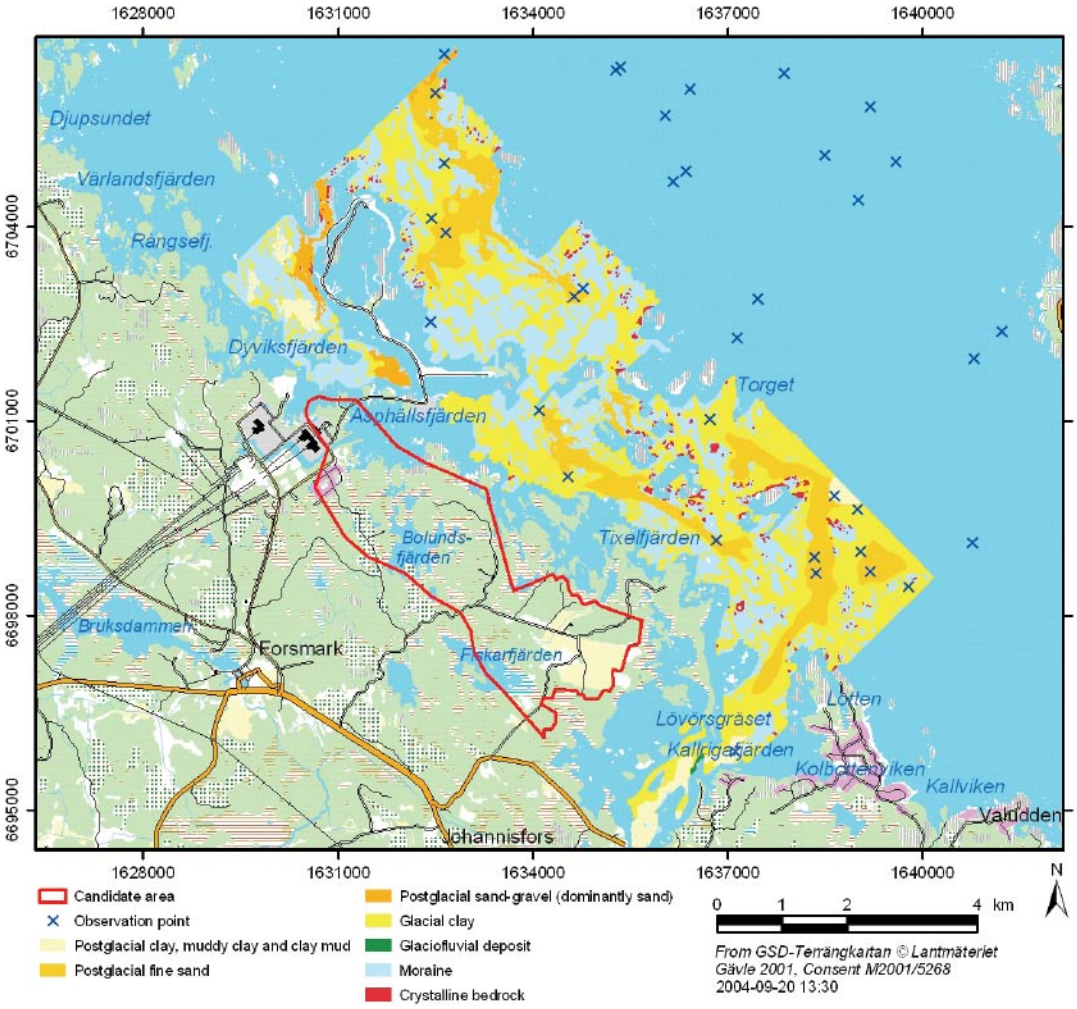

Figure 2-4. *The area where information about bottom substrate was available. Different colours indicate different bottom substrates. Sites of video recordings (x) are also shown.*

Table 2-1. The vegetation communities defined depending on water depth and bottom substrate.

Substrate/Depth(m)	0	1	2	3	4	5	6	7	8	9	10-	Reference
Moraine	Filamentous		Fucus		Red algae						Veg<5%	R-99-69, P-04-82
Bedrock	Filamentous		Fucus		Red algae						Veg<5%	R-99-69, P-04-82
Glacial clay	Veg<5%										Empty	R-99-69, P-04-82
Clay	Veg<5%										Empty	R-99-69, P-04-82
Fine sand	Veg<5%										Empty	R-99-69, P-04-82
Silt	Veg<5%										Empty	R-99-69, P-04-82
Sand and gravel	Phanerogams				Red algae						Veg<5%	R-99-69

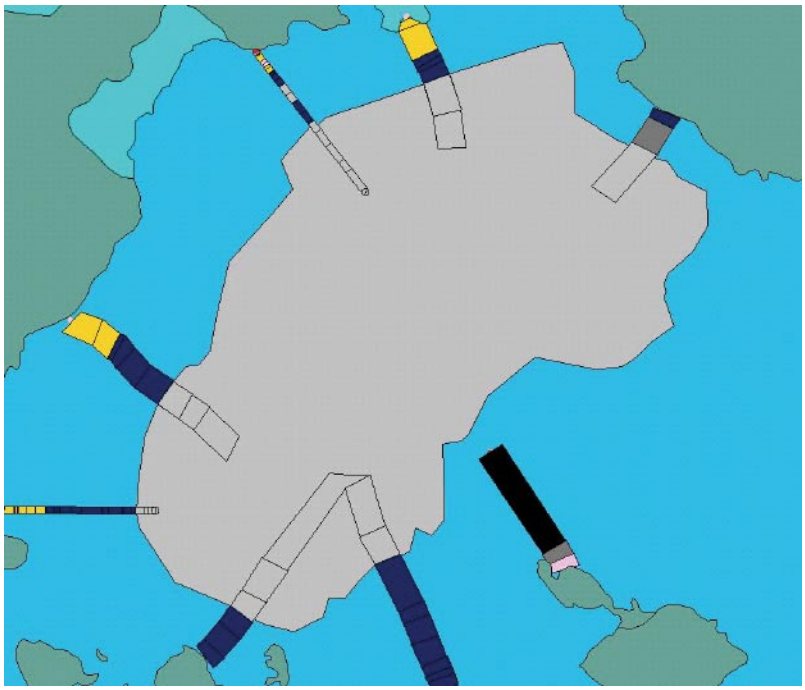

Figure 2-5. *Similar observations were joined together to form polygons. The bay here (in the south part of the area) is approximately 1 km from north to south.*

2.5.2 Quantitative samples

Vegetation and faunal samples were compiled and analysed according to the dominating vegetation. As a final step the biomass per square metre and covering degree was calculated. This value was used to calculate the total biomass within each polygon by multiplying it by the area of the polygon and the defined total covering degree.

3 Results

3.1 Map of macrophyte distribution

Six macrophyte communities were identified in the Forsmark area. The identified communities were *Phanerogams*, *Chara*, *Filamentous* (brown and green) *algae*, *Vaucheria*, *Fucus* and *Red algae*. The distribution of the communities is shown in Figure 3-1.

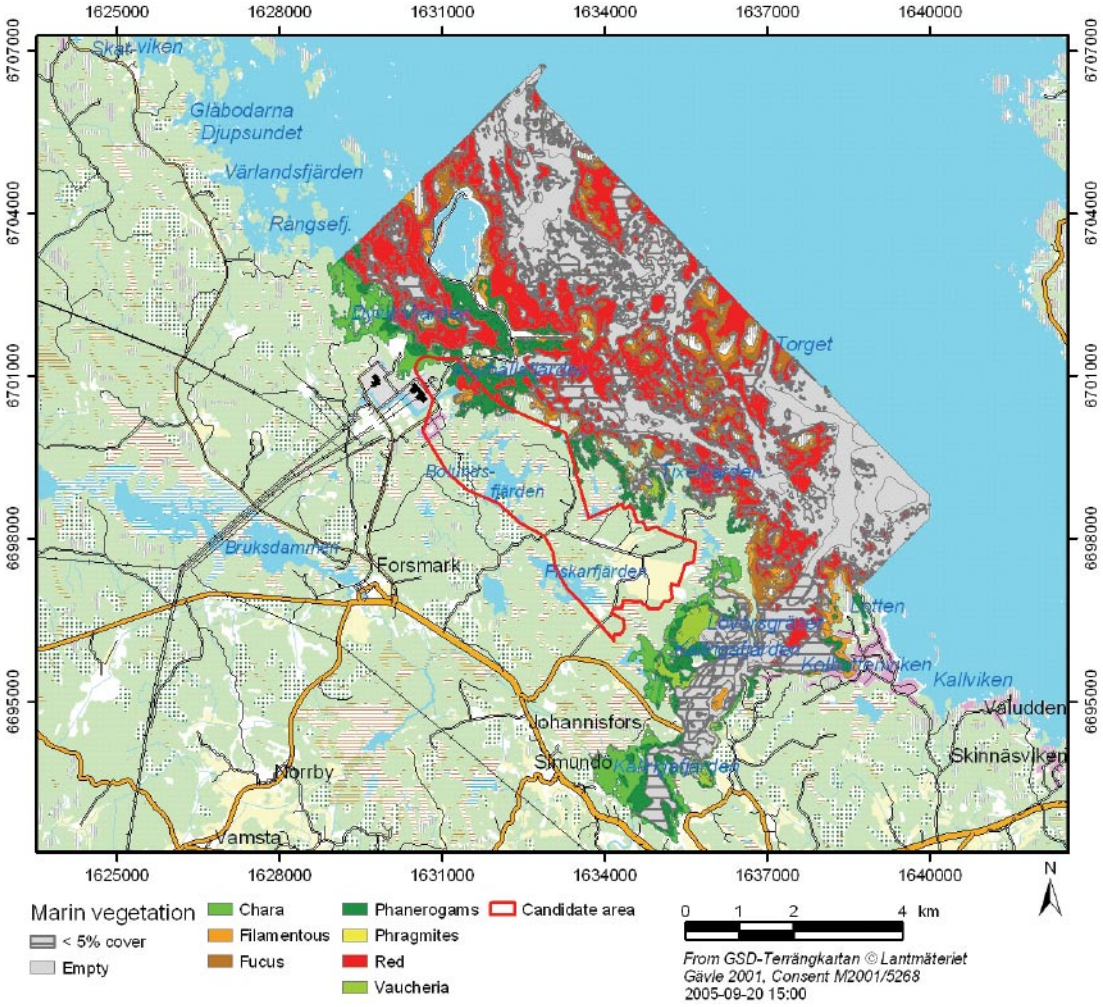

Figure 3-1. *Distribution of submerged macrophyte communities in the Forsmark area. The candidate area is shown in red.*

3.2 Quantitative samples

Table 3-1 presents the calculated values for biomass per square metre and covering degree that were used to calculate the total biomass in the GIS application.

Table 3-1. Vegetation and faunal biomass per square metre and covering degree in the defined vegetation communities.

Vegetation	Vegetation biomass gdw/m²/covering degree M	SE	Epifaunal biomass gdw/m²/covering degree M	SE
Filamentous	0.293	0.0404	0.502	0.2205
Red	0.737	0.2017	0.316	0.0809
Fucus	5.699	0.7331	1.069	0.3590
Vaucheria	3.956	0.1934	0.212	0.0241
Chara	1.647	0.1226	0.440	0.0574
Phanerogams	0.594	0.2262	0.524	0.2703

A source of error is that the calculations in Table 5-1 were based on a different number of samples (Appendix 2 and 3). Also the difference in variation regarding covering degrees could affect the results. For example, all Vaucheria samples were collected from areas with a high covering degree.

Areas with less than 5% vegetation were not included in the biomass estimation.
More detailed results are presented in Appendix 2 and 3.

3.3 Structure of GIS application

The structure of the resulting GIS application shape file is presented in Table 3-2.

Original results are stored in primary data bases, and these data that will be used for further interpretation (modelling). The data is traceable in SDE by the field note Forsmark 508.

Table 3-2. Structure of GIS application shape file. Field name and description.

Field name	Description
Id	Polygon id
VegId	Id for vegetation community
Veg	Name of vegetation community
Cover	Covering degree for taxa giving name to the community
TotCover	Total covering degree, including all taxa
Ph	Covering degree of Phanerogams
Ch	Covering degree of Chara
Va	Covering degree of Vaucheria
Fu	Covering degree of Fucus
Re	Covering degree of Red algae
Gf	Covering degree of Green filamentous algae
Bf	Covering degree of Brown filamentous algae
Bg	Covering degree of Blue green algae
Reed	Covering degree of Reed
Rush	Covering degree of Rush
Font	Covering degree of Fontinalis
Balanus	Covering degree of Balanus
Mytilus	Covering degree of Mytilus
Macoma	Covering degree of Macoma
Cardium	Covering degree of Cardium/Cerastoderma
Other	Covering degree of other taxa
Expl_Other	Naming taxa included under field name ”Other”
LF 0m	Last three digits of SKB LFM number for polygons derived from a boat transect
LFM5m	Last three digits of SKB LFM number for polygons derived from a diving transect
P0482	Station number if polygons are derived from SKB report P-04-82
R9969	Station number if polygons are derived from SKB report R-99-69
US	Polygons created by means of information from report by Upplandsstiftelsen
SGUuv	”Y” if information from under water film has been used
SGUd	”Y” if information from depth grid has been used
SGUs	”Y” if information from substrate shape file has been used
Hand	”Y” if polygon is drawn by hand
Hand_LFM	Last three digits of SKB LFM number from transects determined polygon shape and/or covering degree
Substrat	Describes substrate if information from substrate shape has been used
Reference	SKB report number if vegetation community and covering degrees have been derived from reports
Comment	Comments, if any
Vbbiocov	Vegetation biomass per square metre and covering degree (gdw/m^2/covering degree)
Epbiocov	Epifaunal biomass per square metre and covering degree (gdw/m^2/covering degree)
Area_m^2	Polygon area (square metres)
Vegbio_g	Total macrophyte biomass in grams
Epbio_g	Total epifaunal biomass in grams

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Appendix 1

Covering degrees at different substrate and depth combinations

Table A1-1. Covering degrees (%) at different depth and substrate combinations.

Substrate	Depth (m)	Filamentous	Red algae	Fucus	Phanerogams	Chara	Fontinalis	Mytilus	Balanus	Defined Community
Moraine & Bedrock	<2	67	8	9	1		1			Filamentous
"	2-4	9	27	37	7	2	2			Fucus
"	4-10	4	54	9	1		2		1	Red algae
"	>10	1	1					1		Veg<5%
Sand and gravel	<4	4	17	17	34	8	1			Phanerogams
"	4-10		5		1	1				Red algae
"	>10									Empty
Clay, fine sand, silt	<10	1	1							Veg<5%
"	>10									Empty

Appendix 2

Quantitative vegetation samples

Table A2-1. Biomass (gdw/m²) in samples from the Chara community, per sample and as a total. Also biomass per total covering degree (gdw/m²/%). Coverage = covering degree of the taxa giving name to the community. Total coverage = covering degree of all taxa.

Study		Borgiel, 2005			Total	
Transect		6				
Frame		4	5	6	M	SE
Sampling depth		0.9	0.9	0.9	0.9	0
Coverage		100	100	100	100	0
Total coverage		100	100	100	100	0
Filamentous	Pilayella/Ectocarpus			0.001	0.000	0.0003
	BLUEGREEN	0.053	0.175	0.078	0.102	0.0374
	Cladophora sp.		0.001		0.000	0.0003
	Ulothrix spp.			0.001	0.000	0.0003
	Total filamentous	0.053	0.176	0.080	0.103	0.0375
Chara	Chara aspera	156.298	188.535	148.638	164.490	12.2241
Phanerogams	Zannichellia sp.		0.145	0.235	0.127	0.0685
	∑	156.351	188.856	148.952	164.720	12.2558
	Per covering degree	1.564	1.889	1.490	1.647	0.1226

Table A2-2. Biomass (gdw/m²) in samples from the Vaucheria community, per sample and as a total. Also biomass per total covering degree (gdw/m²/%). Coverage = covering degree of the taxa giving name to the community. Total coverage = covering degree of all taxa.

Study		Borgiel, 2005						Total	
Transect		1			6				
Frame		4	5	6	1	2	3	M	SE
Sampling depth		3.6	3.6	3.6	1.3	1.3	1.3	2.5	0.51
Coverage		100	100	100	100	100	100	100.0	0.00
Total coverage		100	100	100	110	125	110	107.5	4.03
Bryophyta	BRYOPHYTA	0.001	0.593	0.001				0.099	0.099
Filamentous	Leathesia difformis	0.001	0.008	0.001	0.513	0.103	0.600	0.204	0.113
	Pilayella/Ectocarpus					0.001	0.200	0.034	0.033
	BLUEGREEN	0.001			0.030	0.001	0.033	0.011	0.006
	Cladophora aegagrophila	0.475	0.225					0.117	0.081
	green filamentous	0.001						0.000	0.000
	Ulothrix spp.		0.001					0.000	0.000
	Total filamentous	0.478	0.234	0.001	0.543	0.105	0.833	0.365	0.127
Red algae	Hildenbrandia rubra (spp.)	0.001						0.000	0.000
Vaucheria	Vaucheria spp	340.413	358.735	371.820	412.363	568.488	484.050	422.645	35.859
Phanerogams	Callitriche spp			0.110				0.018	0.018
	Zannichellia sp.				24.525	4.030	4.808	5.560	3.896
	Total phanerogams			0.110	24.525	4.030	4.808	5.579	3.891
	∑	340.893	359.561	371.932	437.431	572.623	489.690	428.688	36.616
	Per covering degree	3.409	3.596	3.719	3.977	4.581	4.452	3.956	0.193

Table A2-3. Biomass (gdw/m²) in samples from the Filamentous algae community, per sample and as a total. Also biomass per total covering degree (gdw/m²/%). Coverage = covering degree of the taxa giving name to the community. Total coverage = covering degree of all taxa.

		Study	Borgiel, 2005													P-04-82							R-99-69									Total	
		Transect	1			5										1		2			3		3			4			5				
		Frame	1	2	3	1	10	11	12	3	4	6	7	8	9	1	5	4	5	6	5	6	30	33	34	26	34	35	36	37	38	M	SE
		Sampling depth	0.6	0.6	0.6	6.0	0.5	0.5	0.5	6.0	4.2	4.2	2.1	2 .1	2.1	2.1	2.1	2.7	2.1	2.4	2.5	2.5	10.8	10.5	10.5	8.1	1.8	1.8	0.6	0.6	0.4	3.2	0.00
		Coverage	50	50	50	5	75	25	75	10	25	75	15	25	75	25	25	25	75	75	50	75	25	75	75	50	75	76	51	100	50	51.1	0.00
		Total coverage	51	51	55	5	75	25	75	10	25	75	15	25	75	25	25	25	75	75	50	75	25	75	75	50	75	76	51	100	50	51.3	0.00
Bryophyta	Fontinalis dalecarlica																										0.070			0.049		0.004	0.0029
Diatomea	DIATOMEA															0.001	0.001	0.001		0.001	0.001											0.000	0.0001
Filamentous	Chorda filum							0.335		0.473	0.215	0.001		0.073	1.448														1.225	0.900		0.161	0.0705
	Dictyosiphon foeniculaceus																												14.252	0.049		0.493	0.4914
	Dictyosiphon/Stictyosiphon							0.085										0.148			0.070											0.010	0.0062
	Elachista fucicola															0.001						0.050										0.002	0.0017
	Pilayella littoralis					0.001										0.001																0.000	0.0000
	Pilayella/Ectocarpus		0.795	12.480	0.001	0.594		0.828		1.868	4.323	12.615	1.065	1.048	4.730			0.473	0.613	1.190	1.195	3.165						0.442	24.384		0.015	2.477	0.9887
	Sphacelaria spp.					0.594																										0.020	0.0205
	Sphacelaria arctica									0.001	0.070						0.001		0.001	0.060	0.001	0.088	1.255	2.201	3.947	6.230						0.478	0.2584
	Stictyosiphon tortilis									0.001	0.218	0.375	0.408	3.930		0.043	0.148			0.145		0.033										0.183	0.1354
	BLUEGREEN			4.443								0.030																				0.154	0.1532
	Rivularia sp.																											3.940				0.136	0.1359
	Rivularia atra		2.310		5.165		0.260	0.685	0.143		0.001		0.603	0.318	1.020	0.165	0.053	0.160	0.415	0.023	0.110	0.053										0.396	0.1915
	Cladophora sp.					0.001						0.001				0.001											10.340	8.180	5.667	35.240	14.137	2.537	1.3414
	Cladophora glomerata		13.865	3.675	12.415		19.788	8.363	9.508	1.465	0.848		3.595	0.483	0.001		0.573				0.001											2.572	0.9523
	Enteromorpha sp.					0.001				0.578	4.643						0.263	0.068									0.500	0.320	0.515	2.925	0.093	0.341	0.1849
	Enteromorpha compressa								0.260																							0.009	0.0090
	Enteromorpha intestinalis		4.680	3.450	1.818		0.001					3.583			14.203	0.173		0.323	0.100	0.255	0.645	0.205										1.015	0.5234
	Enteromorpha prolifera		0.170		1.155			0.665					1.535	2.000																		0.191	0.0936
	Spongomorpha aeruginosa (S.pallida)															0.528	0.180															0.024	0.0190
	Ulothrix spp.		0.001	0.001		0.001		0.001		0.001	0.001	0.001	0.001		0.001																	0.000	0.0001
	Total filamentous		21.821	24.049	20.554	1.191	20.050	10.961	9.910	4.386	10.317	16.606	7.206	7.850	21.402	0.911	1.216	1.170	1.129	1.673	2.022	3.593	1.255	2.201	3.947	6.230	10.840	12.883	46.043	39.114	14.245	11.199	2.1220
Red algae	Aglaothamnion roseum														0.001																	0.000	0.0000
	Ceramium nodulosum																	0.270														0.009	0.0093
	Ceramium tenuicorne		0.238	1.735	3.420	0.001	0.268	0.045	0.001	0.001	0.318	0.548	0.203	3.055	2.833	0.088	0.663	0.268	0.050	0.043	0.883	1.685	0.244	0.734	0.011	1.638	0.001	0.175		0.162	0.001	0.666	0.1832
	Furcellaria lumbricalis																				0.001											0.000	0.0000
	Hildenbrandia rubra (spp.)			0.001				0.001		0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001															0.000	0.0001
	Phyllophora sp.																									0.001						0.000	0.0000
	Polysiphonia sp		1.570																													0.054	0.0541
	Polysiphonia fibrillosa							0.700	0.075	0.283		0.158	0.560																			0.061	0.0315
	Polysiphonia fucoides			0.445	0.073	0.001					0.078	0.185	0.548	0.115	5.325		0.283	0.001		0.130	0.708	0.415	0.978	0.734	0.465	1.565	0.127			0.460		0.436	0.1876
	Total red algae		1.808	2.181	3.493	0.002	0.268	0.746	0.076	0.285	0.396	0.891	1.311	3.171	8.160	0.089	0.946	0.539	0.050	0.173	1.591	2.100	1.222	1.467	0.476	3.204	0.128	0.175		0.623	0.001	1.226	0.3126
Fucus	Fucus vesiculosus															1.558					15.195	7.970								0.373		0.865	0.5822
Chara	Chara sp.																	0.001			0.093	0.298										0.013	0.0106
Phanerogams	PHANEROGAMS									0.001																						0.000	0.0000
	Callitriche spp		2.243		0.123																											0.082	0.0773
	Myriophyllum spicatum													0.248																		0.009	0.0085
	Potamogeton perfoliatus				10.743																											0.370	0.3704
	Zannichellia palustris			1.050																												0.036	0.0362
	Total phanerogams		2.243	1.050	10.865					0.001				0.248																		0.497	0.3797
	∑		25.871	27.280	34.911	1.193	20.317	11.707	9.986	4.671	10.713	17.497	8.517	11.269	29.562	2.558	2.163	1.711	1.179	1.846	18.902	13.960	2.477	3.668	4.423	9.434	11.039	13.058	46.043	40.158	14.246	13.805	2.2741
	Per covering degree		0.507	0.535	0.635	0.239	0.271	0.468	0.133	0.467	0.429	0.233	0.568	0.451	0.394	0.102	0.087	0.068	0.016	0.025	0.378	0.186	0.099	0.049	0.059	0.189	0.147	0.172	0.903	0.402	0.285	0.293	0.0404

Table A2-4. Biomass (gdw/m²) in samples from the Phanerogam community, per sample and as a total. Also biomass per total covering degree (gdw/m²/%). Coverage = covering degree of the taxa giving name to the community. Total coverage = covering degree of all taxa.

	Study	Borgiel, 2005						R-99-69	Total	
	Transect	1			6			1		
	Frame	21	23	24	21	22	23	33	M	SE
	Sampling depth	3.13.13.	11.21.21.	24.22.40.46						
	Coverage	100	100	100	100	100	100	50	92.9	7.14
	Total coverage	100	100	100	100	100	100	50	92.9	7.14
Filamentous	Leathesia difformis	0.053	0.053		0.128	0.250	0.133		0.088	0.034
	Pilayella/Ectocarpus				1.313	0.001	0.001	1.535	0.407	0.264
	BLUEGREEN			0.001	1.625	0.688	0.808		0.446	0.238
	Rivularia atra	0.001							0.000	0.000
	Cladophora sp.							0.827	0.118	0.118
	Cladophora aegagrophila	8.830	10.058	5.773					3.523	1.729
	Ulothrix spp.				0.001				0.000	0.000
	Total filamentous	8.884	10.110	5.774	3.066	0.939	0.941	2.362	4.582	1.416
Red algae	RED	0.001							0.000	0.000
	Ceramium tenuicorne							0.062	0.009	0.009
	Furcellaria lumbricalis							1.253	0.179	0.179
	Hildenbrandia rubra (spp.)	0.001	0.001	0.001					0.000	0.000
	Phyllophora sp.							0.041	0.006	0.006
	Polysiphonia fucoides							17.417	2.488	2.488
	Total red algae	0.002	0.001	0.001	0.000	0.000	0.000	18.772	2.682	2.682
Fucus	Fucus vesiculosus							0.920	0.131	0.131
Vaucheria	Vaucheria spp	4.900	4.593	14.375			0.001		3.410	2.014
Chara	Chara sp.				0.001				0.000	0.000
	Tolypella nidifica							2.878	0.411	0.411
	Total chara	0.000	0.000	0.000	0.001	0.000	0.000	2.878	0.411	0.411
Phanerogams	Callitriche spp		4.550	6.888					1.634	1.085
	C.hermafroditica	2.983							0.426	0.426
	Myriophyllum spicatum				0.888				0.127	0.127
	Potamogeton filiformis							70.730	10.104	10.104
	Zannichellia sp.		1.983	4.815	48.023	51.900	46.728		21.921	9.570
	Zannichellia palustris	2.150							0.307	0.307
	Total phanerogams	5.133	6.533	11.703	48.910	51.900	46.728	70.730	34.519	13.047
	∑	18.918	21.236	31.852	51.977	52.839	47.670	95.663	45.736	9.878
	Per covering degree	0.189	0.212	0.319	0.520	0.528	0.477	1.913	0.594	0.226

Table A2-5. Biomass (gdw/m²) in samples from the Fucus community, per sample and as a total. Also biomass per total covering degree (gdw/m²/%). Coverage = covering degree of the taxa giving name to the community. Total coverage = covering degree of all taxa.

	Study	P-04-82					R-99-69						Total	
	Transect	1	3				1	5						
	Frame	4	1	2	3	4	37	30	31	32	33	35	M	SE
	Sampling depth	2.1	4.2	4.2	4.2	2.5	3.3	3	3	3	3.9	3.9	3.4	0.22
	Coverage	25	75	75	37.5	25	75	25	10	75	75	100	54.3	9.07
	Total coverage	25	75	75	37.5	25	76	26	20	76	75	100	55.5	8.67
Bryophyta	Fontinalis dalecarlica						0.360		0.165			0.001	0.048	0.0346
Diatomea	DIATOMEA			0.001									0.000	0.0001
Filamentous	Elachista fucicola	0.001	0.010	0.001	0.001	0.115							0.012	0.0104
	Pilayella littoralis	0.118				4.193							0.392	0.3802
	Pilayella/Ectocarpus		0.020	0.030	0.085			0.345	0.001	0.343			0.075	0.0408
	Sphacelaria arctica		0.158	0.393	0.663	0.180	0.185		0.001				0.144	0.0645
	Stictyosiphon tortilis		0.115			0.070							0.017	0.0117
	BLUEGREEN	0.001		0.001									0.000	0.0001
	Rivularia sp.							0.001					0.000	0.0001
	Rivularia atra	0.001			0.001	0.168							0.015	0.0152
	Chaetomorpha spp.(linum)		0.168										0.015	0.0152
	Cladophora sp.	0.001	0.345	0.001							0.151		0.045	0.0329
	Cladophora glomerata				0.065								0.006	0.0059
	Enteromorpha sp.	0.001							0.001	0.370			0.034	0.0336
	Enteromorpha intestinalis					1.475							0.134	0.1341
	Total filamentous	0.123	0.815	0.426	0.815	6.200	0.185	0.346	0.003	0.713	0.151	0.000	0.889	0.5390
Red algae	Ceramium tenuicorne	0.156	0.703	0.465	0.495	0.685	0.190	2.175	1.385	3.434	0.352	0.070	0.919	0.3128
	Coccotylus truncatus				0.178	0.005							0.017	0.0161
	Furcellaria lumbricalis		2.455	0.050	6.858	0.040	4.867	0.170	0.001	0.001		0.209	1.332	0.7218
	Hildenbrandia rubra (spp.)	0.001	0.001										0.000	0.0001
	Polysiphonia fibrillosa		0.028	0.273	0.100			4.350		0.174	0.001		0.448	0.3912
	Polysiphonia fucoides	0.001	1.540	9.535	2.403	1.205	23.875	17.067	63.260	16.848	1.190	0.419	12.486	5.6683
	Total red algae	0.158	4.726	10.323	10.033	1.935	28.932	23.762	64.646	20.456	1.543	0.697	15.201	5.7947
Fucus	Fucus vesiculosus	215.255	180.120	237.443	146.123	223.570	352.147	105.518	79.180	194.678	404.490	624.102	251.148	47.2028
Vaucheria	Vaucheria dicotoma							0.150					0.014	0.0136
Chara	Chara sp.							8.188	0.248	0.052			0.772	0.7419
	Tolypella nidifica						1.487						0.135	0.1352
	Total chara	0.000	0.000	0.000	0.000	0.000	1.487	8.188	0.248	0.052	0.000	0.000	0.907	0.7402
Phanerogams	Myriophyllum spicatum						31.900						2.900	2.9000
	Potamogeton filiformis						16.087	7.242		2.273			2.327	1.5280
	Ruppia cirrhosa								34.537				3.140	3.1398
	Ruppia maritima	2.440	0.208										0.241	0.2207
	Total phanerogams	2.440	0.208	0.000	0.000	0.000	47.987	7.242	34.537	2.273	0.000	0.000	8.608	4.9947
	∑	217.9752	185.8685	248.192	156.97	231.705	431.1	145.2059	178.779	218.171	406.1836	624.801	276.814	44.8184
	Per covering degree	8.719	2.478	3.309	4.186	9.268	5.672	5.585	8.939	2.871	5.416	6.248	5.699	0.7331

Table A2-6. Biomass (gdw/m²) in samples from the Red algae community, per sample and as a total. Also biomass per total covering degree (gdw/m²/%). Coverage = covering degree of the taxa giving name to the community. Total coverage = covering degree of all taxa.

		Study	Borgiel. 2005		P-04-82						R-99-69																										Total	
		Transect	5		1			2			1							2									4					5				M	SE
		Frame	2	5	2	3	6	1	2	3	30	31	32	34	35	36	38	20	22	24	25	26	27	31	32	33	20	22	24	25	27	27	28	29	34		
		Sampling depth	6	4.2	4.5	4.5	4.5	4.2	4.2	4.2	4.5	4.5	4.5	4.2	4.2	3.3	3.3	9	9	9	6	6	6	3	3	3	5.1	5.1	5.1	8.1	8.1	6.6	6.6	6.6	3.9	5.3	0.31
		Coverage	5	10	50	25	50	37.5	10	5	75	75	75	50	75	50	75	25	25	10	75	100	110	100	87.5	100	100	100	100	25	10	50	50	25	25	54.1	5.96
		Total coverage	5	10	50	25	60	37.5	10	5	75	76	75	55	85	85	100	25	25	10	80	105	120	100	87.5	100	100	100	105	25	10	51	50	25	35 5	7.8	6.32
Bryophyta		Fontinalis dalecarlica									0.093	0.505		0.527	3.290	0.098	1.340				0.365	0.087	7.107						0.400			3.740	0.086		0.138	0.539	0.255
Diatomea		DIATOMEA				0.001	0.001	0.001	0.001	0.001																										0.000	0.000
Filamentous		Chorda filum												0.097																						0.003	0.003
		Dictyosiphon foeniculaceus									0.072		0.495																					0.097	0.147	0.025	0.016
		Dictyosiphon/Stictyosiphon			0.090			0.001	0.001								0.120																			0.006	0.004
		Ectocarpus siliculosus											4.635																							0.140	0.140
		Pilayella littoralis				0.393	0.623			0.170																										0.036	0.022
		Pilayella/Ectocarpus	0.385	1.168	0.318			2.240	0.080		0.645			6.725	10.712	6.315	6.490	0.001		0.537							0.160		0.105				0.105	0.001	2.275	1.159	0.446
		Sphacelaria arctica	0.175	0.001	0.175	0.485	0.450	0.345	0.150	0.005			1.663			25.262	0.425	5.190	2.590	4.835							0.157		0.097	4.863	7.153		0.070	0.001	0.001	1.639	0.805
		Stictyosiphon tortilis				0.943	1.180			0.001																										0.064	0.045
		BLUEGREEN		0.001	0.001	0.228	0.173	0.001	0.001	0.001																										0.012	0.009
		Rivularia atra			0.001	0.001	0.001	0.001	0.001																											0.000	0.000
		Rivularia sp.									0.019		0.063		0.080		0.001																			0.005	0.003
		Cladophora glomerata			0.125	0.001																														0.004	0.004
		Cladophora rupestris																0.001																		0.000	0.000
		Cladophora sp.		0.001			0.058				0.800	0.052		0.195	13.208		0.870																	0.001	0.001	0.460	0.400
		Enteromorpha intestinalis	0.035			0.053	0.035	0.068	0.030																											0.007	0.003
		Enteromorpha prolifera		0.380																																0.012	0.012
		Enteromorpha sp.								0.001	0.074																							0.001	0.001	0.002	0.002
		GREEN								0.001																										0.000	0.000
		green filamentous																							0.840	0.480										0.040	0.029
		Spongomorpha aeruginosa (S.pallida)			0.048																															0.001	0.001
		Ulothrix spp.	0.001	0.001	0.001	0.001		0.001																												0.000	0.000
		Total filamentous	0.596	1.552	0.758	2.103	2.519	2.657	0.263	0.179	1.610	0.052	6.855	7.017	24.000	31.577	7.906	5.192	2.590	5.372					0.840	0.480	0.317		0.097	4.968	7.153		0.175	0.101	2.426	3.617	1.180
Red algae		Aglaothamnion roseum	0.001																																	0.000	0.000
		Ceramium nodulosum																																0.001		0.000	0.000
		Ceramium tenuicorne	0.001	0.130	0.288	2.975	3.118	0.001	0.070	0.001	0.287	2.293	0.512	0.155		6.315	0.001	0.023	0.171	0.262	2.802		3.124	0.515	2.379	2.562	0.120	12.697	4.676	4.501	0.270	1.299	0.338	0.001	5.287	1.733	0.465
		Coccotylus truncatus														0.098																				0.003	0.003
		Furcellaria lumbricalis			0.075	0.708	0.080				3.910	6.295	1.515	0.105		1.796	9.467	0.209		7.140	2.217	2.408	11.085									2.033	4.680	0.188	27.095	2.455	0.921
		Hildenbrandia rubra (spp.)			0.001	0.001	0.001																													0.000	0.000
		Phyllophora pseudoceranoides									0.001																									0.000	0.000
		Phyllophora sp.												0.045																						0.001	0.001
		Polysiphonia fibrillosa																																0.001	0.558	0.017	0.017
		Polysiphonia fucoides		0.400	6.888	4.943	4.660	0.190	0.378	0.001	47.955	43.574	38.487		23.603	25.262		0.717	3.254	1.380	25.382		23.432	65.717	44.420	48.668	53.820	29.626	37.807	7.716	1.567	24.676	21.565	19.392	18.150	18.898	3.384
		Polysiphonia sp												31.927			53.822					27.138														3.421	2.010
		Total red algae	0.002	0.530	7.251	8.626	7.859	0.191	0.448	0.002	52.154	52.163	40.515	32.232	23.603	33.471	63.291	0.950	3.425	8.782	30.402	29.545	37.641	66.232	46.798	51.230	53.940	42.323	42.483	12.217	1.838	28.008	26.583	19.583	51.090	26.527	3.695
Fucus		Fucus vesiculosus				0.253	11.275				10.495	0.104	0.198	3.215		52.432	0.485					0.403					0.203		0.338				1.367	0.203	185.840	8.085	5.788
Vaucheria		Vaucheria dicotoma																											0.023							0.001	0.001
Chara		Tolypella nidifica															0.298																0.057			0.011	0.009
Phanerogams		Potamogeton filiformis										0.362																								0.011	0.011
		Potamogeton pectinatus															21.385																			0.648	0.648
		Ruppia maritima														36.678																				1.111	1.111
		Ruppia spp.					0.393																													0.012	0.012
		Zannichellia sp.												2.618																						0.079	0.079
		Total phanerogams					0.393					0.362		2.618		36.678	21.385																			1.862	1.267
		Σ	0.598	2.082	8.009	10.983	22.046	2.849	0.712	0.182	64.351	53.185	47.567	45.610	50.893	154.256	94.704	6.142	6.015	14.155	30.767	30.035	44.748	66.232	47.638	51.710	54.460	42.323	43.340	17.185	8.990	31.748	28.268	19.887	239.493	40.641	8.307
		Per covering degree	0.120	0.208	0.160	0.439	0.367	0.076	0.071	0.036	0.858	0.700	0.634	0.829	0.599	1.815	0.947	0.246	0.241	1.415	0.385	0.286	0.373	0.6 62	0.544	0.517	0.545	0.423	0.413	0.687	0.899	0.623	0.565	0.795	6.843	0.737	0.202

Appendix 3

Quantitative epifaunal samples

Table A3-1. Biomass (gdw/m²) in samples from the Chara community, per sample and as a total. Also biomass per total covering degree of vegetation (gdw/m²/%). Coverage = covering degree of the taxa giving name to the community. Total coverage = covering degree of all taxa.

		Study	Borgiel, 2005			Total	
		Transect	6				
		Frame	4	5	6	M	SE
		Sampling depth	0.9	0.9	0.9	0.9	0.00
		Coverage	100	100	100	100.0	0.00
		Total coverage	100	100	100	100.0	0.00
Carnivores	PISCES			0.773		0.258	0.258
	Piscicola geometra		0.001			0.000	0.000
	Total carnivores		0.001	0.773		0.258	0.257
Detritus feeders	Hydrobia spp.		28.255	24.418	18.493	23.722	2.840
	Macoma baltica		12.073	10.665	10.248	10.995	0.552
	Total detritus feeders		40.328	35.083	28.740	34.717	3.350
Filter feeders	Cerastoderma/Cardium		3.125	1.848	1.670	2.214	0.458
	Total filter feeders		3.125	1.848	1.670	2.214	0.458
Herbivores	Bithynia tentaculata		6.785			2.262	2.262
	Lymnaea peregra		1.815		1.363	1.059	0.545
	Lymnaea spp.			7.405		2.468	2.468
	Theodoxus fluviatilis			1.360	0.970	0.777	0.404
	Trichoptera			0.308	0.103	0.137	0.090
	Total herbivores		8.600	9.073	2.435	6.703	2.138
Omnivores	Chironomidae			0.113	0.038	0.050	0.033
	Total omnivores			0.113	0.038	0.050	0.033
Unknown	Planorbis sp.		0.068			0.023	0.023
	Total unknown		0.068			0.023	0.023
		∑	52.121	46.888	32.883	43.964	5.743
	Per covering degree		0.521	0.469	0.329	0.440	0.057

Table A3-2. Biomass (gdw/m²) in samples from theVaucheria community, per sample and as a total. Also biomass per total covering degree of vegetation (gdw/m² %). Coverage = covering degree of the taxa giving name to the community. Total coverage = covering degree of all taxa.

		Study	Borgiel, 2005						Total	
		Transect	1			6				
		Frame	4	5	6	1	2	3	M	SE
		Sampling depth	3.6	3.6	3.6	1.3	1.3	1.3	2.5	0.51
		Coverage	100	100	100	100	100	100	100.0	0.00
		Total coverage	100	100	100	110	125	110	107.5	4.03
Carnivores	Calliopius rathkei				0.033				0.005	0.005
	Nereis diversicolor				0.001		0.001		0.000	0.000
	other Diptera				0.001				0.000	0.000
	Total carnivores				0.035		0.001		0.006	0.006
Detritus feeders	Hydrobia spp.					14.940	10.365	8.650	5.659	2.666
	Macoma baltica					8.695	10.255	10.563	4.919	2.215
	Oligochaetae					0.001			0.000	0.000
	Potamopyrgus antipodarium		14.480	5.438	6.273				4.365	2.340
	Total detritus feeders		14.480	5.438	6.273	23.636	20.620	19.213	14.943	3.119
Filter feeders	Cerastoderma/Cardium					0.733	0.318	0.308	0.226	0.119
	Mya arenaria		6.410	10.363	25.360				7.022	4.065
	Total filter feeders		6.410	10.363	25.360	0.733	0.318	0.308	7.248	3.988
Herbivores	Limapontia capitata		2.195			0.001			0.366	0.366
	Lymnaea peregra					0.153	0.145		0.050	0.031
	Trichoptera					0.001			0.000	0.000
	Total herbivores		2.195			0.155	0.145		0.416	0.357
Unknown	Elysia viridis				0.001				0.000	0.000
	Total unknown				0.001				0.000	0.000
		∑	23.085	15.800	31.668	24.523	21.084	19.520	22.613	2.192
	Per covering degree		0.231	0.158	0.317	0.223	0.169	0.177	0.212	0.024

Table A3-3. Biomass (gdw/m²) in samples from the Filametous algea community, per sample and as a total. Also biomass per total covering degree of vegetation (gdw/m²/%). Coverage = covering degree of the taxa giving name to the community. Total coverage = covering degree of all taxa.

		Study	Borgiel. 2005													P-04-82							R-99-69									Total	
		Transect	1			5										1		2			3		3			4			5			M	SE
		Frame	1	2	3	1	10	11	12	3	4	6	7	8	9	1	5	4	5	6	5	6	30	33	34	26	34	35	36	37	38		
		Sampling depth	0.6	0.6	0.6	6	0.5	0.5	0.5	6	4.2	4.2	2.1	2.1	2.1	2.1	2.1	2.7	2.1	2.4	2.5	2.5	10.8	10.5	10.5	8.1	1.8	1.8	0.6	0.6	0.4	3.2	0.59
		Coverage	50	50	50	5	75	25	75	10	25	75	15	25	75	25	25	25	75	75	50	75	25	75	75	50	75	76	51	100	50	51.1	4.79
		Total coverage	51	51	55	5	75	25	75	10	25	75	15	25	75	25	25	25	75	75	50	75	25	75	75	50	75	76	51	100	50	51.3	4.79
Carnivores	ACARINA														0.001																	0.000	0.000
	Diptera																											0.125	0.019			0.005	0.004
	Gobidae																													0.150		0.005	0.005
	Mesidothea entomon																							0.140								0.005	0.005
	Mysidae																							0.012		0.067				0.038		0.004	0.003
	Nereis diversicolor	0.001	0.001						0.040																							0.001	0.001
	PISCES		0.330																													0.011	0.011
	Piscicola geometra										0.001																					0.000	0.000
	Planaria torva																												0.010			0.000	0.000
	Prostoma obscurum		0.001	0.001	0.001						0.001				0.001											0.001			0.004		0.000	0.000
	Total carnivores	0.001	0.332	0.001	0.001				0.040		0.002				0.002									0.152		0.068		0.125	0.029	0.191		0.033	0.014
Detritus feeders	Corophium volutator	0.233	0.060																				0.047	0.162	0.082	0.095						0.023	0.010
	Hydrobia spp.	2.178	5.458	0.850	2.235				6.870	7.175	9.085	0.640	0.001	0.001				0.435			0.275	0.085	0.105	0.265	0.470				4.305	4.128		1.537	0.483
	Macoma baltica	5.378	59.975		0.001				47.305	13.578	82.065	0.085		0.223		0.218	0.060												0.266			7.212	3.726
	Nematoda		0.001																													0.000	0.000
	Oligochaetae	0.001	0.001																													0.000	0.000
	Total detritus feeders	7.789	65.495	0.850	2.236				54.175	20.753	91.150	0.725	0.001	0.224		0.218	0.495				0.275	0.085	0.151	0.427	0.552	0.095			4.571	4.128		8.772	4.128
Filter feeders	Balanus improvisus																				0.395	0.488										0.030	0.021
	Cardium sp.																2.853	0.125	0.200													0.110	0.098
	Cerastoderma/Cardium	9.108	12.123	1.390						10.090	36.390	0.220	5.150	2.433	0.268	6.610					0.001	0.228										2.897	1.355
	Laomedea sp.																								0.016							0.001	0.001
	Pygospio elegans	0.001		0.001	0.001			0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001																	0.000	0.000
	Total filter feeders	9.109	12.123	1.391	0.001			0.001	0.001	10.091	36.391	0.221	5.151	2.434	0.269	6.610	2.853	0.125	0.200	0.396	0.715				0.016							3.038	1.348
Herbivores	Bithynia tentaculata	1.478	9.485	7.968					6.185	0.001	4.755	3.463			5.615		1.538	0.043														1.398	0.503
	Idotea baltica																												0.049		0.030	0.003	0.002
	Idotea sp.									0.020											0.001	0.001							0.029			0.002	0.001
	Idotea viridis												0.035																			0.001	0.001
	Jaera albifronsspp.	0.001												0.063																		0.002	0.002
	Jaera sp.																							0.001	0.036			0.001				0.001	0.001
	Limapontia capitata	0.001	0.033	0.001					0.001	0.001						0.040							0.001									0.003	0.002
	Lymnaea peregra	0.185	1.825	0.003		2.078	0.060	0.810					0.890	2.173							0.123								0.799			0.308	0.120
	Lymnaea stagnalis							0.095																								0.003	0.003
	Theodoxus fluviatilis	0.455	3.428	1.050		8.700	2.335	4.028	0.440	4.660	7.165	0.505	2.893	6.053	0.890	0.598	0.373	0.260	2.365	1.033	1.163					0.001		1.597	0.868	0.257	1.763	0.432
	Trichoptera	0.001	0.001	0.148			0.090		0.001	0.001		0.020		0.028														0.575				0.030	0.020
	Total herbivores	2.121	14.771	9.169		10.778	2.485	4.933	6.627	4.683	11.920	3.988	3.818	8.315	6.505	0.638	1.910	0.303	2.365	1.156	1.164	0.001	0.001	0.0 36		0.050	0.576	2.425	0.898	0.257	3.513	0.757
Omnivores	Chironomidae	0.295	0.403	0.175	0.018	0.338	0.115	0.230		0.001	0.001	0.070	0.030	0.075	0.008		0.018	0.001		0.008	0.001			0.001		0.036	0.058			0.004		0.065	0.021
	Gammarus spp	0.078	0.090	0.008		0.073	0.001	0.473		0.015		0.001	0.030	0.128	0.073					0.173	0.001	0.006	0.081	0.105	0.065	0.073	0.235	0.885	0.647	0.330	0.123	0.039
	Total omnivores	0.373	0.493	0.183	0.018	0.410	0.116	0.703		0.016	0.001	0.071	0.060	0.203	0.080		0.018	0.001		0.180	0.002	0.006	0.082	0. 105	0.101	0.131	0. 235	0.885	0.651	0.330	0.188	0.044
Unknown	Planorbis sp.		0.118																													0.004	0.004
	Total unknown		0.118																													0.004	0.004
	∑	19.391	93.330	11.593	2.256	11.188	2.601	5.636	60.843	35.543	139.464	5.005	9.030	11.177	6.854	7.465	5.275	0.429	2.565	2.007	1.966	0.159	0.662	0.709	0.263	0.181	0.936	7.910	5.868	0.588	15.548	5.795
	Per covering degree	0.380	1.830	0.211	0.451	0.149	0.104	0.075	6.084	1.422	1.860	0.334	0.361	0.149	0.274	0.299	0.211	0.006	0.034	0.040	0.026	0.006	0.009	0.009	0.005	0.002	0.012	0.155	0.059	0.012	0.502	0.220

Table A3-4. Biomass (gdw/m²) in samples from the Phanerogam community, per sample and as a total. Also biomass per total covering degree of vegetation (gdw/m²/%). Coverage = covering degree of the taxa giving name to the community. Total coverage = covering degree of all taxa.

		Study	Borgiel. 2005						R-99-69	Total	
		Transect	1			6			1		
		Frame	21	23	24	21	22	23	33	M	SE
		Sampling depth	3.1	3.1	3.1	1.2	1.2	1.2	4.2	2.4	0.46
		Coverage	100	100	100	100	100	100	50	92.9	7.14
		Total coverage	100	100	100	100	100	100	50	92.9	7.14
Carnivores	Coleoptera							0.001		0.000	0.000
	Mesidothea entomon								1.607	0.230	0.230
	Nereis diversicolor	0.033							0.297	0.047	0.042
	Piscicola geometra				0.023					0.003	0.003
	Prostoma obscurum				0.001				0.033	0.005	0.005
	Total carnivores	0.033			0.024			0.001	1.937	0.285	0.275
Detritus feeders	Hydrobia spp.	19.993	11.120	10.815	26.350	11.223	12.320		18.505	15.761	2.268
	Macoma baltica	6.093	26.490	11.850	6.743	3.015	2.705		47.290	14.884	6.224
	Potamopyrgus antipodarium	0.001								0.000	0.000
	Total detritus feeders	26.086	37.610	22.665	33.093	14.238	15.025		65.795	30.644	6.704
Filter feeders	Cardium sp.								16.183	2.312	2.312
	Cerastoderma/Cardium				0.988	0.375	0.393			0.251	0.141
	Total filter feeders				0.988	0.375	0.393		16.183	2.563	2.274
Herbivores	Bithynia tentaculata								0.363	0.052	0.052
	Idotea sp.								0.278	0.040	0.040
	Jaera sp.								0.027	0.004	0.004
	Limapontia capitata	0.001	0.001	0.028		0.001	0.001			0.005	0.004
	Lymnaea peregra				2.135	0.120	0.001			0.322	0.303
	Theodoxus fluviatilis								20.403	2.915	2.915
	Trichoptera								1.085	0.155	0.155
	Total herbivores	0.001	0.001	0.028	2.135	0.121	0.002		22.155	3.492	3.125
Omnivores	Chironomidae	0.475		0.015		0.001			0.003	0.071	0.067
	Gammarus spp				0.123				0.575	0.100	0.081
	Total omnivores	0.475		0.015	0.123	0.001			0.578	0.170	0.094
Unknown	MOLLUSCA		0.001							0.000	0.000
	Total unknown		0.001							0.000	0.000
	∑	26.595	37.612	22.708	36.361	14.735	15.421		106.648	37.154	12.077
	Per covering degree	0.266	0.376	0.227	0.364	0.147	0.154		2.133	0.524	0.270

Table A3-5. Biomass (gdw/m²) in samples from the Fucus community, per sample and as a total. Also biomass per total covering degree of vegetation (gdw/m²/%). Coverage = covering degree of the taxa giving name to the community. Total coverage = covering degree of all taxa.

		Study	P-04-82					R-99-69						Total	
		Transect	1	3				1	5						
		Frame	4	1	2	3	4	37	30	31	32	33	35	M	SE
		Sampling depth	2.1	4.2	4.2	4.2	2.5	3.3	3	3	3	3.9	3.9	3.4	0.22
		Coverage	25	75	75	37.5	25	75	25	10	75	75	100	54.3	9.07
		Total coverage	25	75	75	37.5	25	76	26	20	76	75	100	55.5	8.67
Carnivores	Mesidothea entomon			3.900										0.355	0.355
	Mysidae			0.001				0.043			0.110			0.014	0.010
	Nereis diversicolor				0.140									0.013	0.013
	PISCES				0.038									0.003	0.003
	Piscicola geometra									0.001				0.000	0.000
	Praunus flexuosus					0.023								0.002	0.002
	Prostoma obscurum				0.001		0.001							0.000	0.000
	Total carnivores			3.901	0.179	0.023	0.001	0.043		0.001	0.110			0.387	0.352
Detritus feeders	Corophium volutator			0.001										0.000	0.000
	Hydrobia spp.		0.253	4.420	0.628	0.623	0.155	2.930	4.350	17.955	14.285	0.663	1.030	4.299	1.840
	Macoma baltica		21.110	33.455		8.663		9.535	3.380	0.440	6.165			7.522	3.245
	Oligochaetae				0.001									0.000	0.000
	Total detritus feeders		21.363	37.876	0.629	9.285	0.155	12.465	7.730	18.395	20.450	0.663	1.030	11.822	3.585
Filter feeders	Balanus improvisus						0.305							0.028	0.028
	Cardium sp.							48.310	19.282	51.650	47.465			15.155	6.809
	Cerastoderma/Cardium		4.785	22.243		0.285	0.193							2.500	2.020
	Cordylophora			0.001	0.001									0.000	0.000
	Electra crustulenta			0.001		0.001	0.001							0.000	0.000
	Mytilus edulis									0.660	0.280			0.085	0.063
	Total filter feeders		4.785	22.245	0.001	0.286	0.499	48.310	19.282	52.310	47.745			17.769	6.583
Herbivores	Bithynia tentaculata		9.463					0.613						0.916	0.856
	Idotea baltica								0.050		0.049			0.009	0.006
	Idotea sp.		0.001				0.060	0.162		0.138		0.131		0.045	0.020
	Idotea viridis										0.015			0.001	0.001
	Jaera albifronsspp.		0.001	0.001										0.000	0.000
	Jaera sp.							0.001			0.001	0.087	0.001	0.008	0.008
	Limapontia capitata						0.001							0.000	0.000
	Lymnaea peregra			0.520	0.333	0.398	0.908		2.793	2.828	3.813	0.001	2.003	1.236	0.415
	Theodoxus fluviatilis		4.858	13.298	6.023	6.358	7.698	21.910	6.063	9.597	9.972	6.800	6.355	8.994	1.482
	Trichoptera				0.001		0.238	1.485						0.157	0.135
	Total herbivores		14.322	13.819	6.356	6.755	8.904	24.171	8.905	12.562	13.849	7.019	8.359	11.365	1.575
Omnivores	Chironomidae			0.001		0.001	0.005					0.001		0.001	0.000
	Gammarus spp		1.478	0.295		0.085	0.340	1.300	1.308	1.430	0.600	0.835	0.452	0.738	0.168
	Total omnivores		1.478	0.296		0.086	0.345	1.300	1.308	1.430	0.600	0.836	0.452	0.739	0.168
Unknown	Pallacea quadrispinata			0.118		0.001	0.125							0.022	0.015
	Total unknown			0.118		0.001	0.125							0.022	0.015
		∑	41.947	78.254	7.164	16.436	10.028	86.289	37.225	84.699	82.754	8.517	9.841	42.105	10.369
		Per covering degree	1.678	1.043	0.096	0.438	0.401	1.135	1.432	4.235	1.089	0.114	0.098	1.069	0.359

Table A3-6. Biomass (gdw/m²) in samples from the Red algae community, per sample and as a total. Also biomass per total covering degree of vegetation (gdw/m²/%). Coverage = covering degree of the taxa giving name to the community. Total coverage = covering degree of all taxa.

		Study	Borgiel, 2005		P-04-82						R-99-69																							Total	
		Transect	5		1			2			1							2										4					5				
		Frame	2	5	2	3	6	1	2	3	30	31	32	34	35	36	38	20	22	24	25	26	27	31	32	33	20	22	24	25	27	27	28	29	34	M	SE
		Sampling depth	6	4.2	4.5	4.5	4.5	4.2	4.2	4.2	4.5	4.5	4.5	4.2	4.2	3.3	3.3	9	9	9	6	6	6	3	3	3	5.1	5.1	5.1	8.1	8.1	6.6	6.6	6.6	3.9	5.3	0.31
		Coverage	5	10	50	25	50	37.5	10	5	75	75	75	50	75	50	75	25	25	10	75	100	110	100	87.5	100	100	100	100	25	10	50	50	25	25	54.1	5.96
		Total coverage	5	10	50	25	60	37.5	10	5	75	76	75	55	85	85	100	25	25	10	80	105	120	100	87.5	100	100	100	105	25	10	51	50	25	35	57.8	6.32
Carnivores	Dendrocoelum lacteum																									0.125									0.004	0.004
	Mesidothea entomon									0.070								0.104		0.203	0.328											0.215	4.420		0.162	0.134
	Mysidae									0.063	0.008	0.045																						0.001	0.004	0.002
	Neomysis integer		0.015																																0.000	0.000
	Nereis diversicolor													0.685																			0.001		0.021	0.021
	PISCES																														0.135				0.004	0.004
	Piscicola geometra				0.001						0.001						0.001																		0.000	0.000
	Prostoma obscurum	0.001											0.045		0.095		0.001			0.203	0.328			0.213		0.500	0.001				0.001				0.026	0.016
	Total carnivores	0.001	0.015		0.001						0.134	0.008	0.090	0.685	0.095		0.002	0.104		0.203	0.328			0.213		0.625	0.001				0.001	0.135	0.216	4.421	0.002	0.221	0.135
Detritus feeders	Corophium volutator				0.115														0.023	0.085											0.041	0.020		0.038	0.135		0.014	0.006
	Hydrobia spp.	0.928	1.448	0.170	0.001	0.001		0.308	0.960	0.664	0.935	1.247	4.943	1.923	1.567	2.398	0.146	2.392	1.457	1.106	1.867	3.467	2.313	4.188	0.738	0.957	1.942	0.512	0.203	0.010	3.540	8.200	7.870	1.709	1.821	0.353
	Macoma baltica	0.001			2.335					8.028	1.197		38.518	0.001	5.747	49.580		5.375		1.106								0.058	0.001				8.398	17.868		4.188	1.919
	Total detritus feeders	0.929	1.448	0.170	2.451	0.001		0.308	0.960	8.692	2.132	1.247	43.460	1.924	7.315	51.978	0.146	7.790	1.542	2.212	1.867	3.467	2.313	4.188	0.738	0.957	1.942	0.570	0.245	0.030	3.540	16.635	25.873	1.709	6.024	2.091
Filter feeders	Balanus improvisus		0.001		0.001		6.735				1.600	2.672											3.188			0.647			0.788		0.417				0.486	0.236
	Cardium sp.					0.053	0.320	0.918		10.075		3.225	1.457		25.850	52.445												0.695				4.457	25.425		3.785	1.879
	Cerastoderma/Cardium		0.053	0.013																															0.002	0.002
	Electra crustulenta				0.001	0.001																													0.000	0.000
	Mytilus edulis									0.303													0.822		14.950			0.525	0.038					0.301	0.513	0.452
	Pygospio elegans		0.001	0.001					0.001																										0.000	0.000
	Total filter feeders		0.055	0.014	0.002	0.054	7.055	0.918	0.001	10.377	1.600	5.897	1.457		25.850	52.445						4.010		14.950		0.647	0.525	0.732	0.788		0.417	4.457	25.425	0.301	4.787	1.889
Herbivores	Bithynia tentaculata									0.166		0.595	0.360	1.072		2.507																			0.142	0.083
	Idotea baltica																											0.080							0.002	0.002
	Idotea sp.									0.142	0.012	0.085	0.175	0.110	0.347	0.275				0.017			0.020	0.023	0.038	0.157					0.233	0.038	0.001	0.001	0.051	0.016
	Idotea viridis																										0.093	0.001	0.028						0.004	0.003
	Jaera albifronsspp.				0.001																														0.000	0.000
	Jaera sp.											0.017	0.001		0.001	0.035				0.051			0.001						0.009	0.010				0.001	0.004	0.002
	Limapontia capitata																								0.001	0.001									0.000	0.000
	Lymnaea peregra				0.098	0.013									3.293						0.108						1.212						0.387		0.155	0.105
	Lymnaea stagnalis		0.343																																0.010	0.010
	Theodoxus fluviatilis	0.001	2.353	2.183	2.370	1.178	0.658	1.178	2.413	5.193	1.315	7.355	12.275	3.348	10.727	11.427	0.001			0.324	1.055	2.872	5.610	2.675	6.043	0.793	2.072	0.395	0.190	0.060	3.338	1.727	2.410	4.080	2.958	0.578
	Trichoptera							0.930			0.387		1.710		0.553	1.440		0.712						1.737	0.162		0.205	0.075	0.515							0.255	0.087
	Total herbivores	0.001	2.695	2.183	2.469	1.190	0.658	2.108	2.413	5.501	1.714	8.052	14.521	4.530	14.921	15.685	0.001	0.712	0.051	0.450	1.055	2.873	7.368	2.862	6.081	0.950	3.662	0.471	0.742	0.070	3.570	1.765	2.799	4.082	3.582	0.735
Omnivores	Chironomidae	0.001	0.028									0.006				0.010	0.001									0.001									0.001	0.001
	Gammarus spp			0.118						0.447	0.290	0.783	0.415	0.228	1.492	1.825	0.167	0.127	0.204	2.753	6.570	5.247	1.395	0.612	1.670	1.487	1.080	0.412	0.279	0.065	0.570	0.725	0.452	0.563	0.908	0.254
	Gammarus zaddachi					0.001																													0.000	0.000
	Total omnivores	0.001	0.028	0.118		0.001				0.447	0.290	0.788	0.415	0.228	1.492	1.835	0.168	0.127	0.204	2.753	6.570	5.247	1.395	0.612	1.670	1.488	1.080	0.412	0.279	0.065	0.570	0.725	0.452	0.563	0.910	0.254
Unknown	ANNELIDAE								0.001																										0.000	0.000
	Total unknown								0.001																										0.000	0.000
	Σ	0.932	4.240	2.484	4.923	1.246	7.713	3.333	3.375	25.151	5.745	16.075	60.539	6.776	49.579	121.945	0.419	8.630	2.000	5.743	9.493	15.598	11.288	22.611	9.113	4.044	7.210	2.186	2.054	0.166	8.233	23.798	58.969	6.657	15.523	4.302
	Per covering degree	0.186	0.424	0.050	0.197	0.021	0.206	0.333	0.675	0.335	0.076	0.214	1.101	0.080	0.583	1.219	0.017	0.345	0.200	0.072	0.090	0.130	0.113	0.258	0.091	0.040	0.072	0.021	0.082	0.017	0.161	0.476	2.359	0.190	0.316	0.081