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Oskarshamn site investigation

Vegetation in lake Frisksjön

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June 2005

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

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Abstract

An inventory of the vegetation in lake Frisksjön was performed during the “Field week in august 2004,” as a part of the investigations of the surface ecosystems in the site investigation area of Oskarshamn.

The activity comprised qualitative estimations of submerged vegetation, emergent and floating-leaved vegetation i e a description of species abundance and distribution in lake Frisksjön. Furthermore, a quantitative estimation of the degree of surface cover and the biomass of the identified plants in the lake was made.

Sammanfattning

Under ”Fältveckan” 2004 inventerades Frisksjön med avseende på vegetation av makrofyter. Undersökningen genomfördes inom ramen för SKB:s platsundersökning i Oskarshamn.

Inventeringen omfattade kvalitativa och kvantitativa uppskattningar av de växtarter som förekommer i sjön.

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1 Introduction

This document reports the data gained by the inventory of vegetation in lake Frisksjön, which is one of the activities performed within the site investigation at Oskarshamn. The work was carried out in accordance with activity plan AP PS 400-04-085. In Table 1-1 controlling documents for performing this activity are listed. Both activity plan and method descriptions are SKB's internal controlling documents.

The activity was performed during august 2004, during the "Field week" for investigations of the surface ecosystems in the site investigation area of Oskarshamn.

The activity comprised qualitative estimations of submerged vegetation, emergent and floating-leaved vegetation i.e a description of species abundance and distribution in lake Frisksjön. Furthermore, a quantitative estimation of the degree of surface cover and the biomass of the identified plants in the lake was made.

Lake Frisksjön is situated in the Oskarshamn site investigation area, see Figure 1-1.

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

Activity plan	Number	Version
Vegetation in Frisksjön.	AP PS 400 04-085	1.0
Method descriptions	Number	Version
Metodmanual för sjöar och vattendrag.	SKB PIR-04-06	1,0

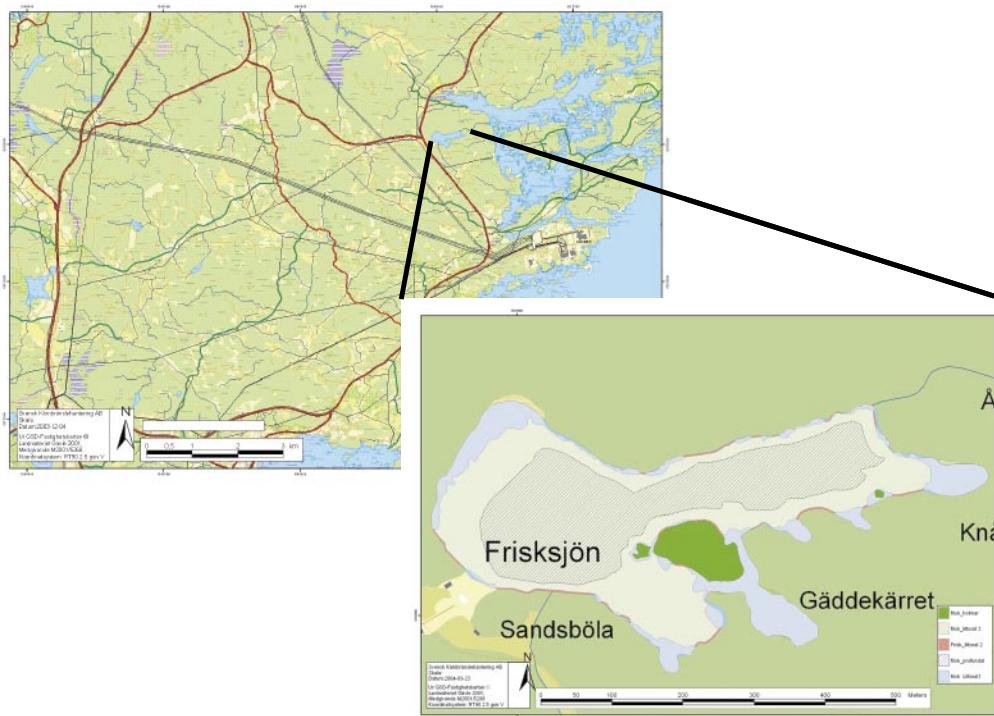


Figure 1-1. Lake Frisksjön in the regional model area for the Oskarshamn site investigations.

2 Objective and scope

The main objective of this activity was to map the distribution of fresh water plants and generate site specific estimates of the species, their abundance and biomass/m² and the total fresh water plant biomass in the lake Frisksjön.

3 Equipment

The qualitative inventory of fresh water plant in lake Frisksjön was done with visual inspection from a canoe.

The quantitative investigations were made along transects, when possible from a boat with water glasses or else, with diving equipment or with snorkel (see Figure 3-1).

Wooden or steel frames (see Figure 3-2) with 0.5 m or 0.25 m side were used.

Measuring devices for water depth and sight was used as well as GPS for determination of transect coordinates.



Figure 3-1. One of the marked transects from the shore in lake Frisksjön.



Figure 3-2. One of the steel frames for estimations of plant cover.

4 Execution

4.1 General

The activity was performed in the beginning of august, when the biomass production has reached its maximum for the season. The methods used in the investigation are from /Huononen R, 2004; NV, 2004/.

4.1.1 Qualitative

The qualitative inventory of the fresh water plants in the lake was performed directly in the field. On a field map the identified species was noted and the cover was estimated on a scale from sparse to very dense. The relevant plant habitat was noted according to three categories;

I = Habitat with emergent and floating-leaved vegetation.

II = Habitiat with hard substrate.

III = Habitat with submerged vegetation (single or few emergent and floating-leaved plants).

The size of the lake area inhabited by the identified freshwater plants was also noted in the field protocol.

4.1.2 Quantitative

A quantitative investigation of vegetation includes estimation of degree of coverage and estimation of biomass. In lake Frisksjön 7 transects were placed on the field map see Figure 4-2. Along these transects the wooden/steel frames were placed once in each 0.5 m depth interval, until the water depth and sight limited plants from growing. The water depths were measured for each frame. In the frames all plant individuals were identified and counted. Samples from each identified plant species were dried and weighed.

From the number of individuals for each plant species and dry weight/plant species the total dry weight in each square were calculated. The calculations were often based on only one weight of each plant species and are therefore to be considered as rough estimates of the total plant weight in each square.

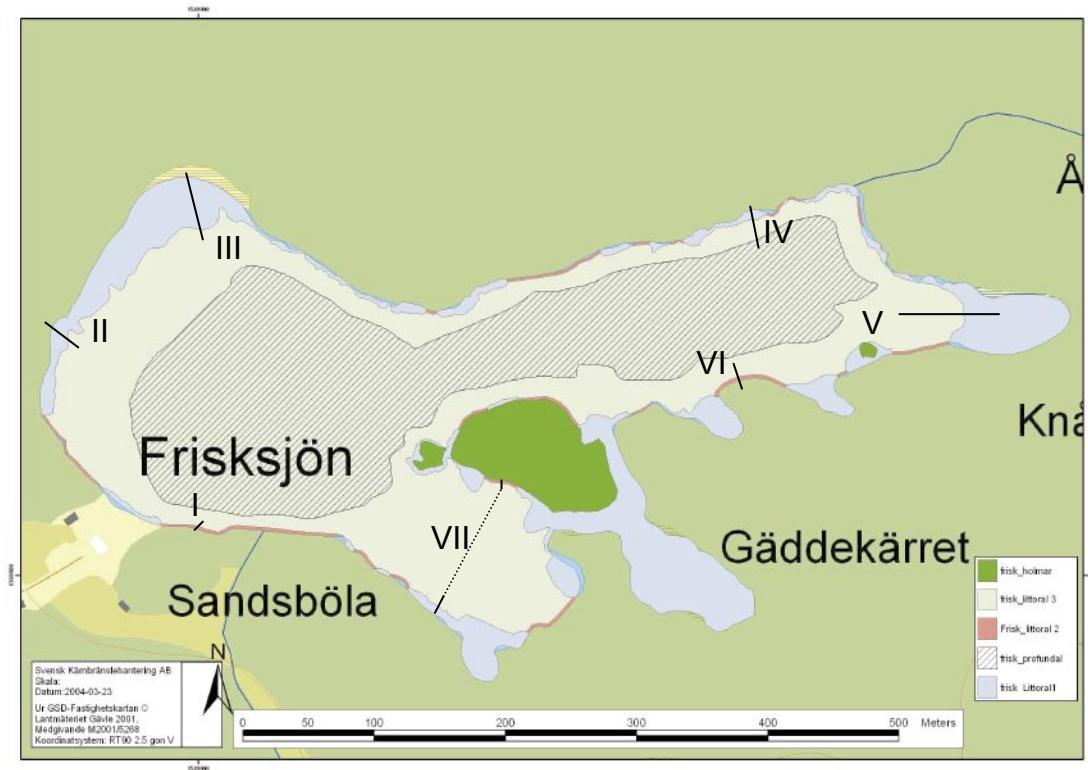


Figure 4-1. Lake Frisksjön, with the examined transects. The transect are illustrations and not in the correct scale. The legend is explained in Figure 5-1.

4.2 Data handling/post processing

Field data were noted in field protocols. The field protocols for inventory of vegetation are included in Appendix 1.

Data were reported to the SICADA database.

4.3 Nonconformities

According to the activity plan four lakes in the site investigation area should have been investigated, but only lake Frisksjön was investigated.

5 Results

5.1 Qualitative

The inventory resulted in a map where identified plants and their location and coverage is noted, see Figure 5-1, in Appendix 1 legend to the map with comments is presented.

In Table 5-1 identified emergent and floating-leaved plants in lake Frisksjön are listed.

Table 5-1. Emergent and floating-leaved fresh water plants found in the inventory in lake Frisksjön.

Latin name	Swedis name
<i>Equisetum fluviatile</i>	Sjöfräken
<i>Alisma plantago-aquatica</i>	Svalting
<i>Potamogeton natans</i>	Gäddnate
<i>Iris pseudacorus</i>	Gul svärdslilja
<i>Juncus conglomeratus alt. J. effusus</i>	Knapptåg alt. Veketåg
<i>Phragmites australis</i>	Bladvass
<i>Sparganium emersum</i>	Vanlig igelknopp
<i>Sparganium angustifolium Michx.</i>	Plattbladig igelknopp
<i>Typha latifolia</i>	Bredkaveldun
<i>Schoenoplectus lacustris</i>	Säv (kolvass)
<i>Carex vesicaria</i>	Blåsstarr
<i>Carex rostrata</i>	Flaskstarr
<i>Carex nigra</i>	Hundstarr
<i>Nymphaea alba</i>	Vit näckros
<i>Nuphar lutea</i>	Gul näckros
<i>Oenanthe aquatica</i>	Vattenståkra
<i>Lysimachia vulgaris</i>	Videört (strandlysing)
<i>Lysimachia thyrsiflora</i>	Topplösa
<i>Menyanthes trifoliata</i>	Vattenklöver
<i>Potentilla lacustris</i>	kråkklöver
<i>Lythrum salicaria</i>	Fackelblomster

The identified fresh water flora indicates a nutrient rich environment.

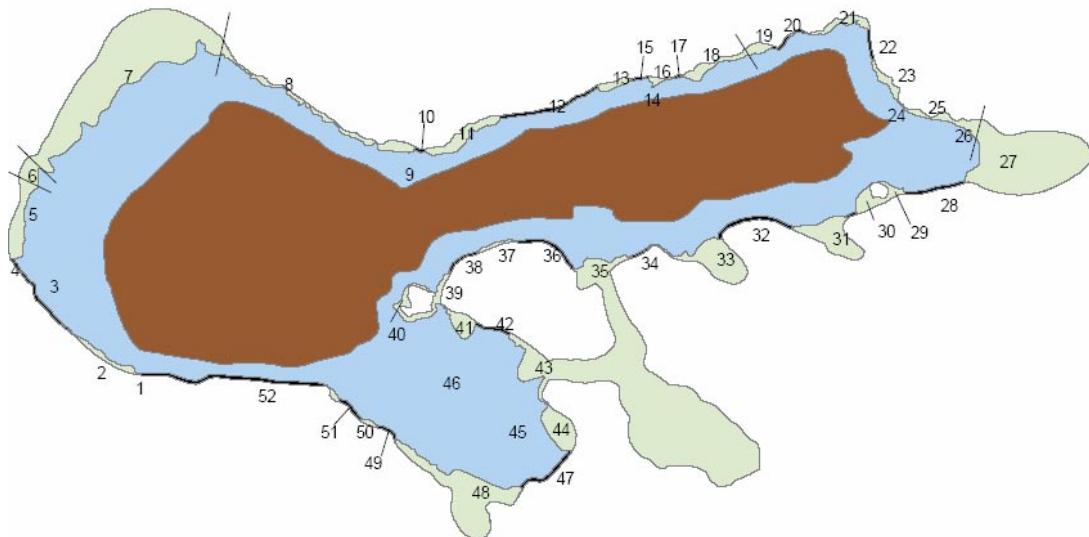


Figure 5-1. Lake Frisksjön with field notes from the qualitative investigation. Red = profundal, blue = littoral type III, black = littoral type II and green = littoral type I.

5.2 Quantitative

The quantitative investigation resulted in estimates of the biomass in the four defined habitats in lake Frisksjön /Brunberg et al, 2004/;

- Littoral type I: wind-sheltered, shallow areas with soft substrate inhabited by emergent and floating –leaved vegetation,
- Littoral type II: wind exposed areas with hard-bottom substrate,
- Littoral type III: in deeper areas of the lake were light is enough to sustain photosynthetic primary production and finally the
- Profundal habitat: were light penetration is less than needed to sustain permanent growth of primary producers, see Table 5-2.

The percentage of different plants species considering number of individual species and weight/species, in the different lake habitats are shown in Table 5-3 and 5-4.

Table 5-2. Biomass in the different investigated habitats in lake Frisksjön.

Habitats	Area (m ²)/Brunberg et al, 2004/	Mean biomass (DW, g/m ²)
Littoral type I	24,200	26.3
Littoral type II	1,430	5.5
Littoral type III	49,130	6.6
Profundal	52,250	7.4

Table 5-3. Percentual distribution of individuals of different species in the various habitats in lake Frisksjön.

Species	Littoral type I	Littoral type II	Littoral type III	Profundal
Typha latifolia	1	0	5	0
Lythrum salicaria	0	7	0	0
Poaceae	2	0	0	0
Nuphar lutea,	0	0	8	33
Potamogeton natans	0	0	5	0
Potentilla lacustris	1	0	5	0
Epilobium palustre	1	0	0	0
Polypodiace spp.	3	0	0	0
Equisetum fluviatile	1	0	13	0
Carex spp,	42	21	5	0
Schoenoplectus lacustris	1	14	5	0
Phragmites australis	27	25	18	0
Menyanthes trifoliata r	19	25	16	33
Lysimachia vulgaris	1	7	16	33
Sphagnum spp	0	0	0	0

Table 5-4. Percentual distribution of weight of different species in the various habitats in lake Frisksjön.

Species	Littoral type I	Littoral type II	Littoral type III	Profundal
Typha latifolia	41	0	54	0
Lythrum salicaria	0	1	0	0
Poaceae	0	0	0	0
Nuphar lutea,	0	0	30	95
Potamogeton natans	0	0	1	0
Potentilla lacustris	0	0	0	0
Epilobium palustre	0	0	0	0
Polypodiace spp.	0	0	0	0
Equisetum fluviatile	1	0	1	0
Carex spp,	5	5	0	0
Schoenoplectus lacustris	2	16	1	0
Phragmites australis	41	56	9	0
Menyanthes trifoliata r	10	21	3	5
Lysimachia vulgaris	0	1	0	1
Sphagnum spp	0	0	0	0

References

NV, 2004. Naturvårdsverket, 2004, Metodhandbok för miljöövervakning, www.environ.se

Huononen R, 2004. Metodik för provtagning av ekologiska parametrar i sjöar och vattendrag SKB PIR-04-06.

Appendix 1

Field protocols – Qualitative investigations

Legend to map in Figure 5-1.

Vegetationsbeskrivning, Frisksjön. Inventering 2004-08-17.

Anna Brunberg och Björn Söderbäck. Inventering från kanot längs stränderna.

Ev gränser mellan vattenväxter (tex vass/säv) och våtmarksvegetation (tex sälgs/al mm) inåt land karterades inte, endast det som var synligt från sjösidan. Detta gäller främst områdena nr 27 och 35/43. I område 7 når våtmarksområdet ända fram till sjön.

Nr	Littoral typ*	Växter	Täthet	Områdets storlek**	Kommentar
1	II	Vattenklöver	tät	4 x 1 m	
2	I	Tät vass längst in, lite säv och gul näckros ut mot sjön	tät	se kartan	
3	III	gul näckros		5 x 5 m	
4	I-II	vass, fräken, vattenklöver, gul näckros, gäddnate	gles		
5	I	vass, vattenklöver	tät		
6	I	vass	tät	10 m längs stranden	innerst
		säv			
		tät			
7	I	vass	tät	vass blandat med blaa al	
8	I	vass	tät vass, men ej hög	smal bård	smal bård, blandad med stora stenar
9	III	kräkklöver, gäddnate		5 st å 1m ²	5 plantor ute i littoral typ III
10	II	vit näckros	-	häll	
11	I	-	-		
		vass	tät vass, men ej hög	smal bård	smal bård, blandad med stora stenar
12	II	kräkklöver, gäddnate	-	brant hög häll	
13	I	-	-		
		vass	tät vass, men ej hög	smal bård	smal bård

Nr	Littoral typ*	Växter	Typ*	Täthet	Områdets storlek**	Kommentar
14		kräkklöver, gul näckros	vit näckros	3 st å 1m ²	3 plantor ute i littoral typ III	
15						sten
16	-	starr, kräkklöver				
17						längst in
18	-	starr, kräkklöver, iris, igelknopp, gul näckros				
19	-	starr, iris, videört, kräkklöver, gul näckros				
20						sten
21	-	starr, iris, videört, kräkklöver				
22	-					
23	-	vass				
24			gles			
25	-	kräkklöver	vit näckros	tät	1 m ²	en planta
26				tät		innerst mot stranden
27	-	gäddnate	al, vass, starr,	tät		
	-		fräken, säv			kraftig starr längs vattenlinjen i vissa partier
	-					ytterst i övervattensvegetationen
	-		gäddnate, gul näckros, vit näckros			utanför säven
28						lite, mellan stenar längs stranden
29	-	starr	starr, videört	tät		
30	-	svalting	kräkklöver, litet gul näckros			
31	-		fräken, gul näckros			
32		svalting, fackelblomster				i strandkanten
33	-	gäddnate		tät		
34						sten/häll
35	-	gäddnate, gul näckros				ytterst
	-		al, vass			längre in i "viken"
36						sten/fastmarksiktant
37	-	kräkklöver				tät

Nr	Littoral typ*	Växter	Täthet	Områdets storlek**	Kommentar
38		vass, säv	tät		sten/fastmarksiktant
39	-	vass	tät		
40	-	vass, bredkavelduun, starr	tät		
41	-	gäddnate, lite gul näckros	tät - gles		
42		vass, bredkavelduun, starr			sten/fastmarksiktant
43	-	al, vass	tät		kräftig starr
44	-	vass, starr	tät		längre in i "viken"
45		gul näckros			kräftig starr
46		svalting, fräken	gles		vid stränderna
		gäddnate, gul näckros	mkt gles		mestadels öppen vattenytta i denna vik
47		vass, starr, säv, vattenklöver	tät		häll
48	-	gul näckros	gles		
49					sten/fastmarksiktant
50	-	svalting, flaskstarr	tät		sten/fastmarksiktant
51					sten/fastmarksiktant
52					

* I = The habitat with emergent and floating-leaved vegetation.

|| = The habitat with hard substrate.

||| = The habitat with submerged vegetation (single or few emergent and floating-leaved plants reported if present in this zone).

** Där ingen storlek anges fyllde vegetationen den del som markerats med habitatgränser på kartan.

Appendix 2

Field protocols – Quantitative investigation

Fieldprotocols from inventory along transects in lake Frisksjön.

Vattenvegetationskartering i Frisksjön, 2004-08-16-2004-08-18.

Transekt nr	X-koordinat	Y-koordinat	Datum	Provtagare	Kommentarer
I	1548986	6368031	20040818	Kaq, JJ, SK	
Ruta	1	2	3	4	
djup, cm	3,2	70	104	175	
avstånd från 0-pkt, m	0	2	3,5	4,5	
Växtart					
vattenklöver	6	5	1	1	
videört		3	1	1	

Transekt nr	X-koordinat	Y-koordinat	Datum	Provtagare	Kommentarer
II	1548914	6368241	20040818	Kaq, JJ, SK	6 m osäk, 290 grader
Ruta	1	2	3	4	5
djup, cm	15	60	130	175	145
avstånd från 0-pkt, m	0	3,5	11	27	20?
Växtart					
kaveldun	1		1	1	
vass	11		1	1	5*
kräkklöver	1		1	1	
fläskstarr	30	9	1	1	
videört	1		1	1	

* 1-1,5 m långa strän

Transekt nr	X-koordinat	Y-koordinat	Datum	Provtagare	Kommentarer
II	1548988	6368281	20040818	Kaq, JJ, SK	7 m osäk, 29 m lång transek
Ruta	1**	2	3	4	6 ** vassrugge m vitmossa
djup, cm	0	0,8	1,2	1,95	2,1 2,45
avstånd från 0-pkt, m	0	2	3	11,5	25,5 50
Växtart					
kräkklöver					0,25m-rutan
vitmossa					0,25m-rutan, täcker hela rutan
vass		32*			* ca 2 m långa strän
ormbunkar					
okänd					
kärrdunört?					
gräs					
okänd 2 (ev vattenmynta)					
gul näckros					
			1	1	
Transekt nr	x-koordinat	y-koordinat	Datum	Provtagare	Kommentarer
IV	1549404	6368279	20040818	Kaq, JJ, SK	7 m osäk, uppskattad transektlängd 10 m (bojkoordinater: 1549410, 6368263), 340 grader, siktdujp 1m
Ruta	1	2	3	4	5 6
djup, cm	0				
avstånd från 0-pkt, m	30				
Växtart					
vattenköver					
Carex av ngt slag					
			15	1	

Transekt nr	X-koordinat	Y-koordinat	Datum	Provtagare	Kommentarer
V	1549597	6368194	20040818	Bso	5 m osäk, 50 m lång transekt ("ytterkoordinater": 1549551, 6368201), 120 grader
Ruta	1	2	3	4	5
djup, cm	48	93	125	175	6
avstånd från 0-pkt, m	4,5	12*	15*	20	* uppskattadde värden
Växtart					
vattenklöver	27				
bredkaveldun	1				
sjöfräken	2	3			
säv	2	2	9*		* 3,3 m långt strå
Carex sp	1				
gul näckros		1		1	
gäddnate		2			
mossa?	1				

Transekt nr	X-koordinat	Y-koordinat	Datum	Provtagare	Kommentarer
VI	1549421	6368147	20040818	Kaq, JJ, SK	10 m osäk
Ruta	1	2	3	4	5
djup, cm	0,25	0,75	1,3		6
avstånd från 0-pkt, m	0	2	2,75		
Växtart					
Carex rostrata (flask starr)	5				
Vattenklöver	1				
Vidörört	2				
Stain	Ruta	Datum	DW (g)	Notering	
T6	1	2004-08-18	3,445		
T6	1	2004-08-18	2,445		

Transsekt nr	X-koordinat	Y-koordinat	datum	provtagare	kommentarer
VII	1549158	6367973	20040818	Kaq, JJ, SK	14 m osäk, 220 grader mot strandkanten
Ruta	1	2	3	4	
djup, cm	0,3	0,75	1,4	2	
avstånd från 0-pkt, m	0	1,32	4,5	2,25	
Växtart					
Carex	12				
Sjöfräken		2			
Fackellblomster				2	
Vass					1
Säv					6
Starr					3
					1
					1

Calculated weights

Calculated weights, in g and in percent, of the different squares, transects and habitats.

Ruta	Transektsnr	Djup (m)	Zon	DW g/m ² (total/truta)	Bred- kaveludn	Fackel- blomster	Gräs	Gul Näckros	Gädd- nate	Kräk- klöver	Kärr- dunört	Orn- bunkar	Sjö- fräken	Starr spp	Såv	Vatten- klöver	Vid- ört	Vit- mossa	totalt
3	IV		Littoral III	0,0															
4	IV		Littoral III	0,0															
5	IV		Littoral III	0,0															
6	IV		Littoral III	0,0															
2	V	0,93	Littoral III	2,8															
3	V	1,25	Littoral III	13,5															
4	V	1,75	Littoral III	12,8															
2	VI	0,75	Littoral III	0,0															
3	VI	1,3	Littoral III	0,0															
4	VI	>1,3	Littoral III	0,0															
2	VII	0,75	Littoral III	0,4															
3	VII	1,4	Littoral III	0,0															
4	VII	2	Littoral III	0,0															
5	VII		Littoral III	0,0															
6	VII		Littoral III	0,0															
7	VII		Littoral III	0,0															
8	VII	1,25	Littoral III	0,0															
			Summa (g)	277,3	0,0	0,0	153,4	2,7	0,6	0,0	0,0	4,0	1,0	6,3	45,4	14,7	2,3	2,4	510,2
			% vikt	54,4	0,0	0,0	30,1	0,5	0,1	0,0	0,0	0,8	0,2	1,2	8,9	2,9	0,5	0,0	
4	I	1,75	Profundal	0,7															
5	III	2,1	Profundal	51,1															
6	III	2,45	Profundal	0,0															
5	V	2,05	Profundal	0,0															
6	V	>2,05	Profundal	0,0															
5	VI	>2	Profundal	0,0															
6	VI	>2	Profundal	0,0															
			Summa (g)	0,0	0,0	0,0	51,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	2,4	0,4	0,0	54,0
			% vikt	0,0	0,0	0,0	94,7	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	4,5	0,7	0,0	