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Forsmark site investigation

Testfishing with multimesh gillnets in Kallrigafjärden

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National Board of Fisheries, Institute of Coastal Research

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 authors and do not necessarily coincide with those of the client.

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Abstract

Inventory test-fishings were made with the Nordic net-system in Kallrigafjärden SW Bothnian Sea, about 10 km south of the Forsmark nuclear power plant. Depth intervals of 0–3 m, 3–6 m and 6–10 m were fished. To get a reasonable view over species and length distributions these nets have many different mesh-sizes. Fishings were performed in August–September 2004. The results showed a dominance of warm-water species as perch (*Perca fluviatilis*), roach (*Rutilus rutilus*), rudd (*Scardinius erythrophthalmus*), silver bream (*Abramis bjoerkna*) and bleak (*Alburnus alburnus*). Perch and roach constituted 60–80% of the total catch in numbers. The results were compared with the same kind of net fishing in an area north of the Forsmark power plant. The two areas showed the same dominance of perch and roach. However, ruffe, silver bream, pike-perch (*Sander lucioperca*) and herring (*Clupea harengus*) were more common in the Forsmark area.

Sammanfattning

Inventerande nätprovfisken har genomförts i Kallrigafjärden ca 10 km söder om Forsmarks kärnkraftverk. Ett s k Nordic-system användes för provfisket. Detta innebär att man fiskar inom ett antal djupintervall, i detta fall 0–3 m, 3–6 m och 6–10 m. För att täcka in så många arter och storlekar som möjligt innehåller näten många olika maskstorlekar. Fiskena genomfördes i augusti–september 2004. Resultaten visade på en dominans av s k varmvattenarter som abborre (*Perca fluviatilis*), mört (*Rutilus rutilus*), sarv (*Scardinius erythrophthalmus*), björkna (*Abramis bjoerkna*) och löja (*Alburnus alburnus*). Antalsmässigt utgjorde abborre och mört 60–80 % av totalfångsten. En jämförelse med motsvarande provfisken norr om Forsmarks kärnkraftverk (inom dess kontrollprogram) uppvisade samma dominans för abborre och mört. Gers, björkna, gös (*Sander lucioperca*) och strömming (*Clupea harengus*) var dock vanligare i Forsmark.

Contents

1	Introduction	7
2	Equipment and execution	9
2.1	Equipment	9
2.2	Execution	9
2.3	Nonconformities	10
3	Results and discussion	11
	References	19

1 Introduction

This document reports the results gained by the gill-net test fishing in Kallrigafjärden, which is one of the activities performed within the site investigation at Forsmark. Data from this activity as well as from other fish surveys will be compiled in a separate report. This data will be used in the ecosystem model of the site description at Forsmark. The work was carried out in accordance with activity plan AP PF 400-04-55. In Table 1-1 controlling documents for performing this activity are listed (activity plans are SKB's internal controlling documents). The data have been stored in SKB's database SICADA and is traceable by the activity plan number.

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

Activity plan	Number	Version
Beståndsuppskattning av fisk i havet	AP PF 400-04-55	1.0

2 Equipment and execution

2.1 Equipment

The Nordic multi-mesh net was used in this study. Each net is 1.83 m high and 45 m long. The net is composed of nine 5-m panels of different mesh size. The panels are placed at a random order of 30, 15, 38, 10, 47, 12, 24, 60 and 19 mm. Three different depth strata were fished; 0–3 m, 3–6 m and 6–10 m (see Figure 2-1).

2.2 Execution

The number of stations within each depth stratum was related to the stratum area within the study area (Table 2-1). Thus, the effort at the shallowest depth interval was eleven nets per nights, at the next stratum ten nets per night and at stratum three nine nets per night. The positions of the stations within each stratum were randomly distributed.

The nets were set in the afternoon and lifted the next morning. All fish were registered according to number, length (cm) and in which mesh size they were caught. Surface temperature and water transparency (Secchi depth) were measured in the middle of Kallrigafjärden (Figure 2-1). Bottom temperature was measured at each net station.

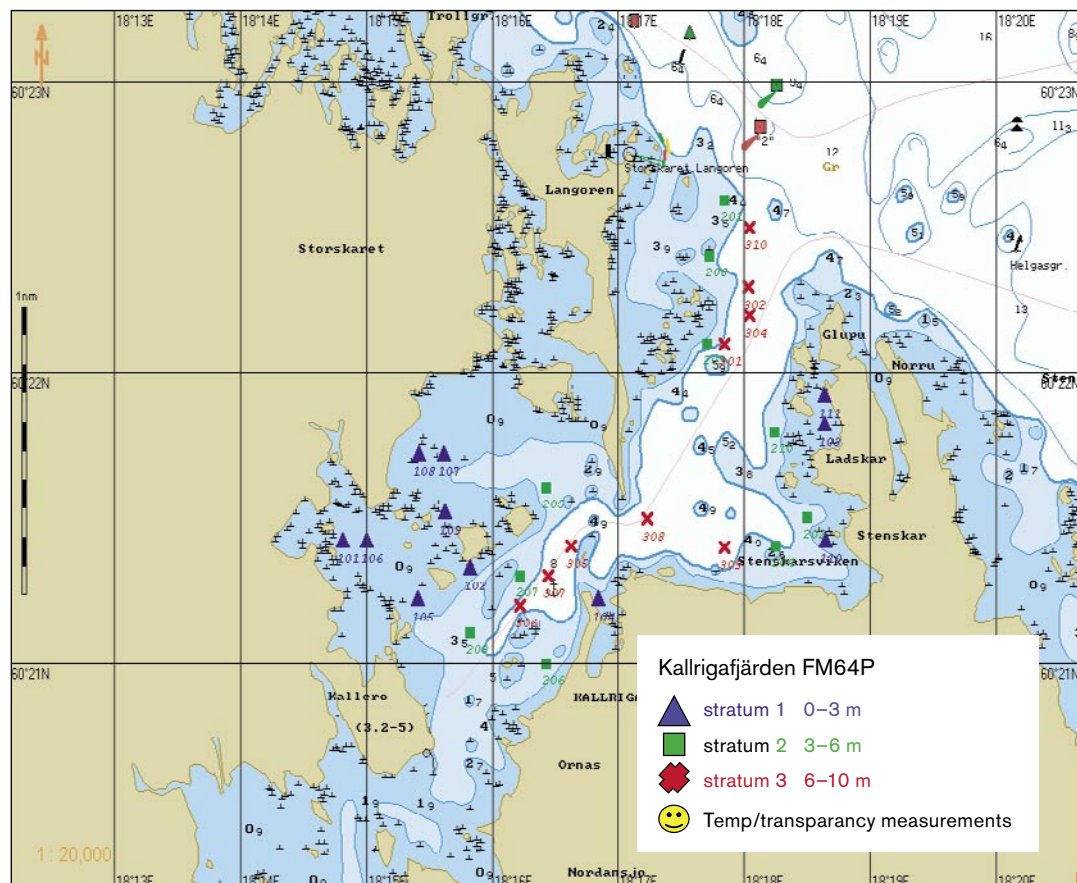


Figure 2-1. Sampling stations within depth strata.

Table 2-1. Area (ha) of the different depth strata.

Test fishing area	Total area (ha)	0–3 m	3–6 m	6–10 m
Kallrigafjärden	680	252	224	204

The plan was to perform the test fishing during two nights. However, after the first day when fifteen stations were fished, severe winds made it impossible to complete the test fishing properly. Therefore, all thirty stations were fished one night two weeks later. The test-fishing method and data treatment are described in /Appelberg, 2000/ and /Thoresson, 1996/.

2.3 Nonconformities

The activity was performed according to the plans (no nonconformities).

3 Results and discussion

Although the first test fishing could not be completed because of the weather conditions, that data, although incomplete, will also be presented here. Temperatures in week 34 (late August) were about the same in all stations and at all depths (Table 3-1 and Figure 3-1). After two weeks of heavy winds the temperatures decreased. Thus, in week 36 (beginning of September) the steady temperature situation had changed and there were large differences between stations and depths. In general, temperatures were lower the deeper the station was situated.

A comparison in numbers per unit effort (CPUE) and distribution in percent of different species between week 34 and 36 (Figure 3-2, 3-3 and 3-4, Table 3-2 and 3-3) was made. Species composition was about the same for the two weeks. However, the catch of roach and silver bream was in general higher in warmer temperatures in week 34, and the catch of perch was higher in the shallow area (0–3 m) in week 36 with lower temperature. In general perch and roach were the dominating species. Together they constituted about 60–80% of the total catch in numbers. Silver bream, pike-perch, ruffe and herring were, however, also common. Except for herring, species with a relatively low temperature preference were only found deeper than 3 m.

The complete test fishing in week 36 was compared to the same kind of test-fishing north of the nuclear power plant at Forsmark, see Table 3-4. Species composition closely resembled each other and CPUE of the two dominating species perch and roach were about the same (Figure 3-6). There were, however, somewhat higher abundances of ruffe, silver-bream, pikeperch and herring in the Forsmark area. Length distribution of perch in both areas was close to each other (Figure 3-7).

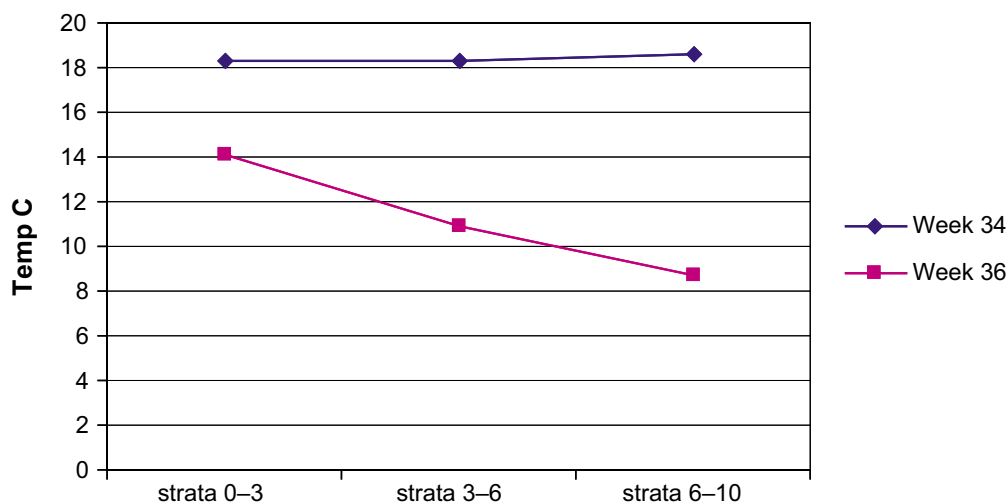


Figure 3-1. Temperatures, mean values for week 34 and 36.

Table 3-1. Bottom temperatures at the different stations.

Section	Station	SKB id code	Week 34	Week 36
0-3 m	101	LFM000840	17.6	17.0
0-3 m	102	LFM000841	18.4	14.2
0-3 m	103	LFM000842		11.4
0-3 m	104	LFM000843	18.7	13.3
0-3 m	105	LFM000844	18.7	13.8
0-3 m	106	LFM000845	17.6	16.6
0-3 m	107	LFM000846	18.4	10.7
0-3 m	108	LFM000847	18.4	15.3
0-3 m	109	LFM000848	18.2	15.1
0-3 m	110	LFM000849		13.4
0-3 m	111	LFM000850		14.6
3-6 m	201	LFM000851		10.2
3-6 m	202	LFM000852		11.9
3-6 m	203	LFM000853	18.9	9.4
3-6 m	204	LFM000854		11.7
3-6 m	205	LFM000855	18.6	9.7
3-6 m	206	LFM000856	18.8	9.8
3-6 m	207	LFM000857	18.9	10.4
3-6 m	208	LFM000858		12.4
3-6 m	209	LFM000859		11.6
3-6 m	210	LFM000860		11.9
6-10 m	301	LFM000861		8.6
6-10 m	302	LFM000862		7.7
6-10 m	304	LFM000863		10.8
6-10 m	305	LFM000864	18.5	7.9
6-10 m	306	LFM000865	18.7	8.2
6-10 m	307	LFM000866	18.6	8.0
6-10 m	308	LFM000867		7.2
6-10 m	309	LFM000868		7.7
6-10 m	310	LFM000869		12.2

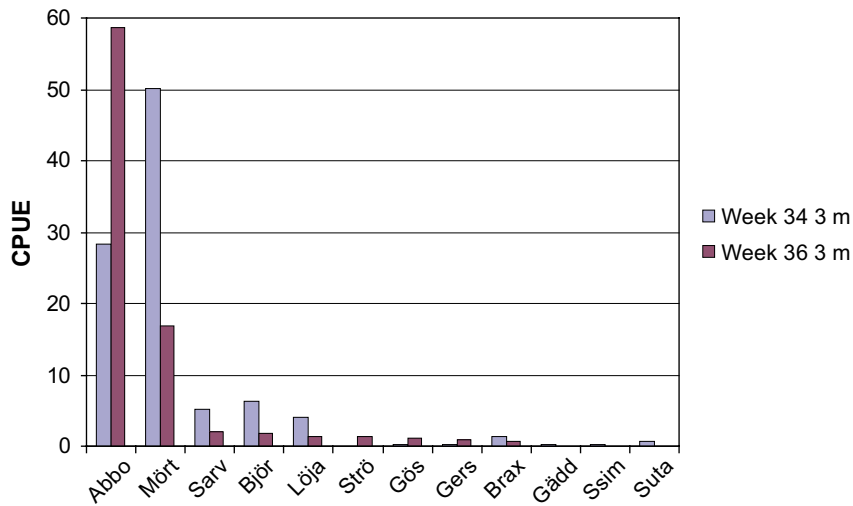


Figure 3-2. Catch per unit effort (CPUE) in stratum 0–3 m. Comparison between the two sampling weeks. The abbreviations used are explained in Table 3-4.

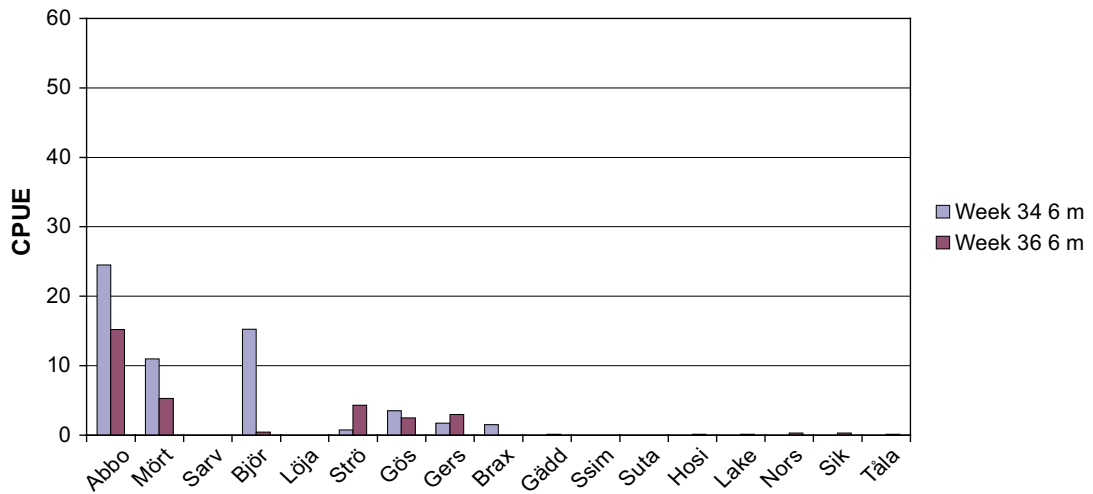


Figure 3-3. Catch per unit effort (CPUE) in stratum 3–6 m. Comparison between the two sampling weeks. The abbreviations used are explained in Table 3-4.

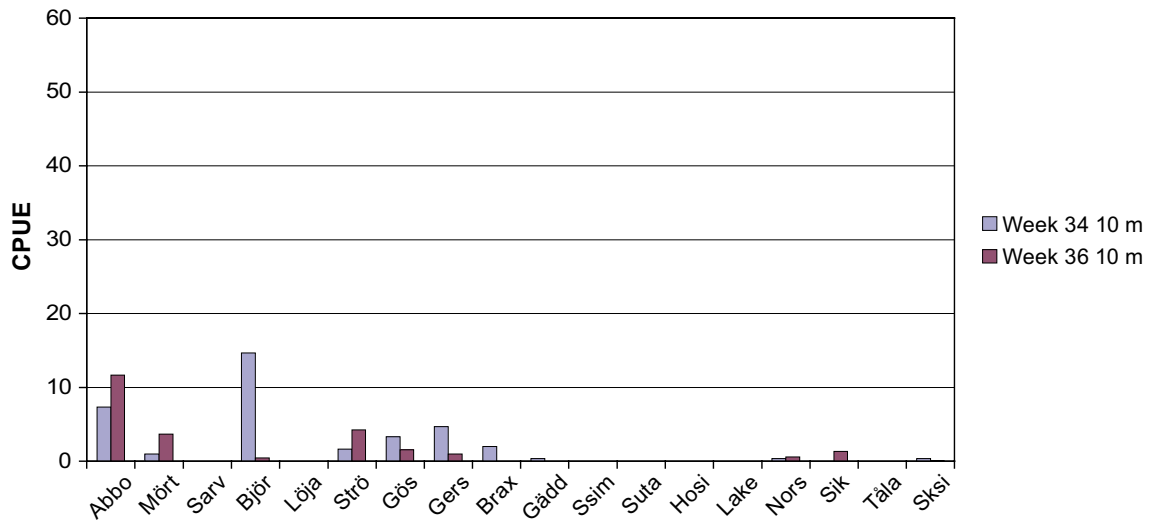


Figure 3-4. Catch per unit effort (CPUE) in stratum 6–10 m. Comparison between the two sampling weeks. The abbreviations used are explained in Table 3-4.

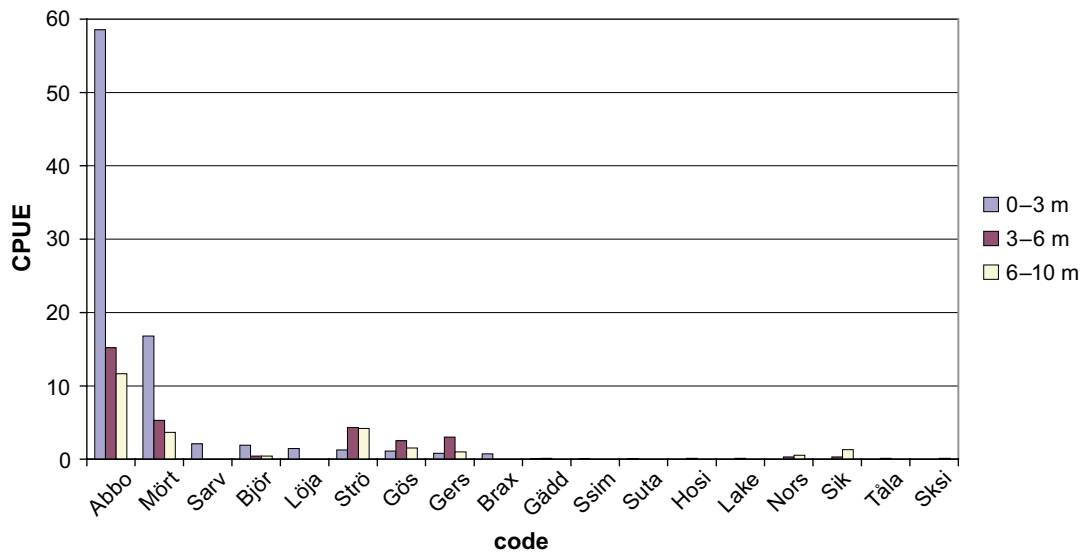


Figure 3-5. Catch per unit effort (CPUE), comparison between strata, week 36.

Table 3-2. Catch per unit effort (CPUE) per stratum, week 36.

Species	0–3 m		3–6 m		6–10 m		Total CPUE	%
	CPUE	%	CPUE	%	CPUE	%		
Perch	58.55	68.9	15.20	47.9	11.67	47.5	85.41	60.5
Roach	16.82	19.8	5.30	16.7	3.67	14.9	25.78	18.3
Rudd	2.09	2.5					2.09	1.5
Silver bream	1.91	2.2	0.40	1.3	0.44	1.8	2.75	1.9
Bleak	1.45	1.7					1.45	1.0
Herring	1.27	1.5	4.30	13.6	4.22	17.2	9.79	6.9
Pikeperch	1.09	1.3	2.50	7.9	1.56	6.3	5.15	3.6
Ruffe	0.82	1.0	3.00	9.5	1.00	4.1	4.82	3.4
Bream	0.73	0.9					0.73	0.5
Pike	0.09	0.1	0.10	0.3			0.19	0.1
Bullhead	0.09	0.1					0.09	0.1
Tench	0.09	0.1					0.09	0.1
Sculpin			0.10	0.3			0.10	0.1
Burbot			0.10	0.3			0.10	0.1
Smelt			0.30	0.9	0.56	2.3	0.86	0.6
Whitefish			0.30	0.9	1.33	5.4	1.63	1.2
Eel-pout			0.10	0.3			0.10	0.1
Sprat					0.11	0.5	0.11	0.1

Table 3-3. Catch per unit effort (CPUE) per strata, week 34.

Species	0–3 m		3–6 m		6–10 m		Total CPUE	%
	CPUE	%	CPUE	%	CPUE	%		
Perch	28.38	29.3	24.50	42.1	7.33	20.6	60.2	31.54
Roach	50.13	51.7	11.00	18.9	1.00	2.8	62.1	32.54
Silver bream	6.25	6.4	15.25	26.2	14.67	41.1	36.2	18.94
Bream	1.38	1.4	1.50	2.6	2.00	5.6	4.9	2.55
Ruffe	0.25	0.3	1.75	3.0	4.67	13.1	6.7	3.49
Pike	0.25	0.3					0.3	0.13
Pikeperch	0.25	0.3	3.50	6.0	3.33	9.3	7.1	3.71
Bleak	4.13	4.3					4.1	2.16
Smelt	0.13	0.1			0.33	0.9	0.5	0.24
Rudd	5.13	5.3					5.1	2.68
Sprat					0.33	0.9	0.3	0.17
Bullhead	0.13	0.1					0.1	0.07
Herring			0.75	1.3	1.67	4.7	2.4	1.27
Tench	0.63	0.6					0.6	0.33
Eel-pout					0.33	0.9	0.3	0.17

Table 3-4. Occurrence of different species at Forsmark and Kallrigafjärden.

Code	English	Swedish	Latin	Limnic warm-water species	Caught in Forsmark Area	Caught in Kallrigafjärden
Abbo	Perch	Abborre	<i>Perca fluviatilis</i>	yes	yes	yes
Björ	Silver bream	Björkna	<i>Abramis bjoerkna</i>	yes	yes	yes
Blål	Silver eel	Blankål	<i>Anguilla anguilla</i>	no	yes	yes
Brax	Bream	Braxen	<i>Abramis brama</i>	yes	yes	yes
Fine	Lamprey	Flodnejonöga	<i>Lampetra fluviatilis</i>	no	yes	yes
Gers	Ruffe	Gers	<i>Gymnocephalus cernuus</i>	yes	yes	yes
Guål	Yellow eel	Gulål	<i>Anguilla anguilla</i>	no	yes	no
Gädd	Pike	Gädda	<i>Esox lucius</i>	yes	yes	yes
Gös	Pike-perch	Gös	<i>Sander lucioperca</i>	yes	yes	yes
Hosi	Fourhorned sculpin	Hornsimpa	<i>Trigloporus quadricornis</i>	no	yes	yes
Hogå	Garfish	Horngädda	<i>Belone belone</i>	no	yes	no
Id	Ide	Id	<i>Leuciscus idus</i>	yes	yes	no
Lake	Burbot	Lake	<i>Lota lota</i>	no	yes	yes
Lax	Salmon	Lax	<i>Salmo salar</i>	no	yes	no
Miha	Straight-nosed pipefish	Mindre Havsnål	<i>Nerophis ophidion</i>	no	yes	no
Löja	Bleak	Löja	<i>Alburnus alburnus</i>	yes	yes	yes
Mört	Roach	Mört	<i>Rutilus rutilus</i>	yes	yes	yes
Nors	Smelt	Nors	<i>Osmerus eperlanus</i>	no	yes	yes
Rebå	Rainbow/Steelhead trout	Regnbåge	<i>Onchorhynchus mykiss</i>	no	yes	no
Ruda	Crusian carp	Ruda	<i>Carassius carassius</i>	yes	yes	no
Sarv	Rudd	Sarv	<i>Scardinius erythrophthalmus</i>	yes	yes	yes
Sik	Whitefish	Sik	<i>Coregonus lavaretus</i>	no	yes	yes
Silö	Vendace	Siklöja	<i>Coregonus albula</i>	no	yes	no
Sksi	Sprat	Skarpsill	<i>Sprattus sprattus</i>	no	yes	yes
Sksk	Flounder	Skrubbskädda	<i>Platichthys flesus</i>	no	yes	yes
Smsp	Nine-spined stickleback	Småspigg	<i>Pungitius pungitius</i>	no	yes	no
Ssim	Bullhead	Stensimpa	<i>Cottus gobio</i>	no	yes	yes
Strö	Baltic herring	Strömming	<i>Clupea harengus</i>	no	yes	yes
Stäm	Dace	Stäm	<i>Leuciscus leuciscus</i>	yes	yes	no
Stsp	Three-spined stickleback	Storspigg	<i>Gasterosteus aculeatus</i>	no	yes	no
Suta	Tench	Sutare	<i>Tinca tinca</i>	yes	yes	yes
Svsm	Black goby	Svart smörbult	<i>Gobius niger</i>	no	yes	no
Tobi	Lesser sandeel	Tobis	<i>Ammodytes tobianus</i>	no	yes	no
Tåla	Eel-pout, Viviparous blenny	Tånglake	<i>Zoarces viviparus</i>	no	yes	no
Vimm	Vimba	Vimma	<i>Abramis vimba</i>	yes	yes	no
Örin	Brown trout	Öring	<i>Salmo trutta</i>	no	yes	no

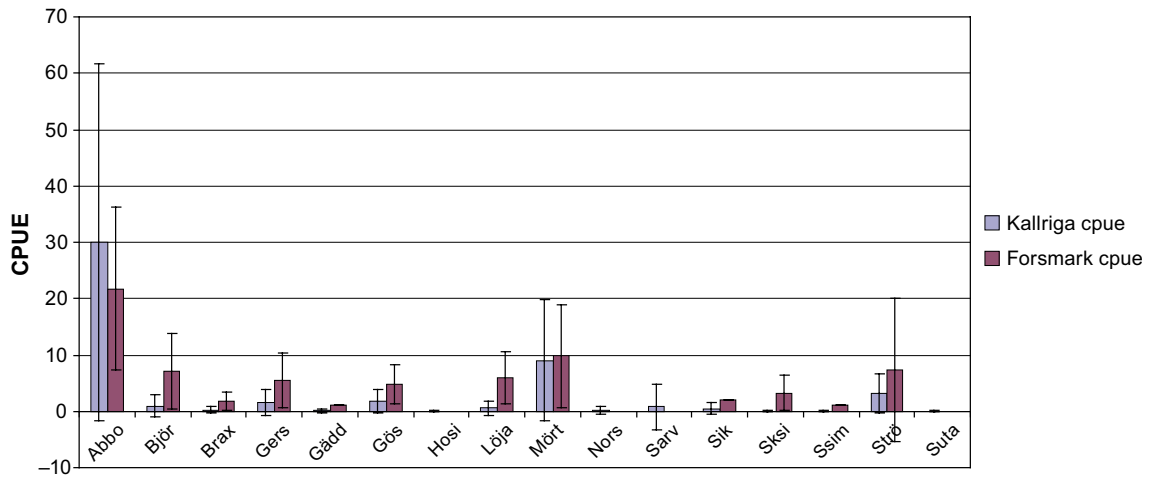


Figure 3-6. Catch per unit effort (CPUE) and standard deviation in Kallrigafjärden compared to the Forsmark area. The abbreviations used are explained in Table 3-4.

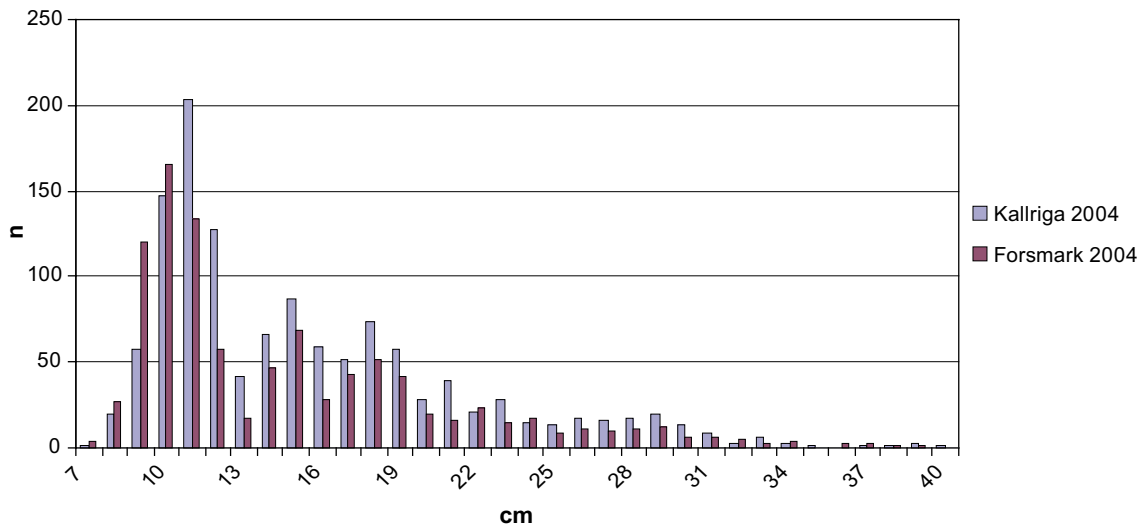


Figure 3-7. Length distribution of perch caught in Forsmark and Kallrigafjärden 2004.

References

Appelberg M, 2000. Swedish standard methods for sampling freshwater fish with multi-mesh gillnets. Fiskeriverket informerar 2000:1.

Thoresson G, 1996. Metoder för övervakning av kustfiskbestånd. Fiskeriverket, Kustlaboratoriet. Kustrapport 1996:3.