Report on the eel stock and fishery in

Sweden

2006

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This report was completed in August 2007; most data are from 2006 and some from 2004 and 2005.

The following persons provided useful input to the report; Joakim Hjelm, Institute of Marine Research, Håkan Westerberg, HQ, Berit Sers and Stefan Sjögren, Institute of Freshwater Research, Sven Gunnar Lunneryd and Johan Modin, Institute of Coastal Research, all within the Swedish Board of Fisheries

SE.B Introduction

Eel fisheries in Sweden occur in most coastal waters from the Norwegian border in Skagerrak to about 61°N in the Baltic Sea. In the beginning of the 20th century eel fishery was practised also along the northern most parts of the Baltic Sea. There is also a considerable eel fishery in a number of freshwater lakes. Both yellow and silver eels are fished, but there is no tradition (it is also against the law) to catch glass eels or elvers. The Government manages and controls the fishery in most marine areas and in the five largest lakes using a few management instruments like minimum legal size, gear restrictions etc. There is also a substantial fishery for eels in privately owned waters both in coastal areas as in freshwater. In most lakes, except the five largest ones, the Government has almost no jurisdiction to regulate the fishery for any species. However, since 1st May, 2007 fishing for eels is prohibited in Sweden. There are some exceptions to this general ban as professional fishermen that could prove they have fished more than 400 kg of eel on average during 2003-2005 or had a corresponding income from processed eel products could apply for a special permit (during 2007). At the same time this rule was imposed the minimum legal size was raised from 600 to 650 mm in freshwater and along the Baltic Coast. On the Swedish West Coast this size was raised from 370 to 400 mm. These minimum legal sizes now include also silver eels that were earlier exempted. The total number of fyke nets allowed is now limited to 500 single or double fykes. To avoid an unwanted by-catch of eels, fyke nets used by non-eel fishermen should be equipped with two escape openings in each cod end. As the mortality in eels passing several hydropower turbines probably is very high, eel fishing at sites (rivers and lakes) above three turbines without safe passages for descending silver eels is still allowed. In most fisheries the eels are fished in combination with other species. Depending on the type of water (fresh or brackish, west or east coast etc.) species as pike-perch, perch, pike, cod, turbot, whitefish and flounders are important by-catch in the eel fisheries, though not worth enough alone for a viable fishery without eel as the main target species. The distribution of the commercial Swedish eel fishery could be simplified as follows:

SE.B.1 The present division in eel fishing areas

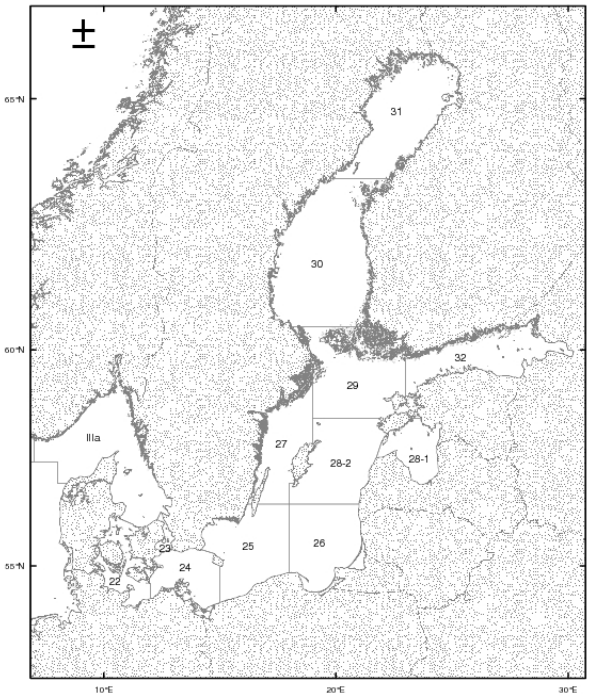


Figure SE.1 ICES Subdivisions in the Baltic area

SE.B.1.1

The Swedish West Coast from the Norwegian border (59°N, 11°E) to Öresund (56°N, 13°E), i.e. 320 km in Skagerrak and Kattegat (ICES Subdivisions 20 and 21).

Along this open coast there is an important fishery for yellow eels. Accordingly the minimum legal size is still as small as 400 mm. Mostly fyke nets (single or double) are used, but also baited pots during certain periods of the year. The landings in this fishery are reported through the EU-logbook system as well as from contract notes delivered from authorised wholesaler to the Board of Fisheries. During the last eight years the annual commercial catch of mostly yellow eels was about 215 tons.

SE.B.1.2

Öresund, i.e. a 110 km long Strait between Sweden and Denmark (ICES Subdivision 23).

In this area both yellow and silver eels are caught using fyke nets and some large pound nets. The northern part of Öresund is the last place where silver eels originating from the Baltic Sea could be caught before they disappear into the open seas. In recent time about 49 tons of yellow and silver eels were caught annually by Swedish fishermen in Öresund. As Öresund is shared with Denmark special rules apply, among other things a very small minimum legal size (350 mm).

SE.B.1.3

The Swedish South Coast from Öresund to about 56°N, 15°E (ICES Subdivisions 24 and 25).

This is a 315 km long coastal stretch of which more than 50 % is an open and exposed coast. Silver eels caught in a traditional fishery using large pound nets dominate the catch. This is the “Swedish Eel Coast” where there are a lot of activities, restaurants and tourism based on the eel and the eel fishery. Some yellow eels are also caught, mainly in the archipelagos to the east. The minimum legal size in this area is now 650 mm. In recent years about 109 tons of yellow and silver eels were caught annually by commercial fisheries in this area.

SE.B.1.4
The Swedish East Coast from about 56°N, 15°E to 59°30'N, 18°50''E.
Along this 450 km long stretch both silver and yellow eels are fished using both fyke nets and large pound nets. Also in this area 650 mm is the new minimum legal size for eels. About 139 tons of yellow and silver eels are caught annually in this area.

SE.B.1.5
Freshwater lakes.
There are sparse stocks of eels in most drainage basins all over Sweden except in the high mountain areas. However, nowadays most eels are fished with pound nets in Lakes Mälaren, Vänern and Hjälmaren. A number (at least 17) of smaller lakes, mainly situated in the southern part of the country, add another 25 % to the catch in the large lakes. In total about 110 tons of eels are caught annually by the commercial eel fishery in lakes. In the five largest lakes where the Government has jurisdiction 650 mm is the new minimum legal size for both yellow and silver eels.

The fishery in freshwater is probably to a large extent based on stocked eels (about 90 % in Lakes Hjälmaren and Mälaren) since the natural immigration to these lakes should be small today. Stocking material is either yellow eels in the size of 0.1 kg that has been caught on the Swedish West Coast or imported newly pigmented eels. In the three large lakes Vänern, Mälaren and Hjälmaren the fishermen must have a permit from their respective County Board to fish with fyke nets as soon they are deeper than 1,5 m. With that they are also obliged to leave catch statistics to the Board of Fisheries on a monthly basis. In the smaller lakes the professional fishermen fish in privately owned waters but as they have a fishing license they have to deliver catch statistics but only on a yearly basis. The fishing is usually carried out from small boats with a length of 5-6 m.

Eel fishing may also occur in additional lakes and some streams where traps have been built. The extent of this fishery is unknown, but it is probably of very little importance today. The recreational fishing of eel in small freshwaters is probably of even smaller importance, even if long line fishing exists in some lakes (cf. the 20 tons mentioned below). Probably most of such eel fisheries have now stopped due to the new restrictions imposed.

Besides what is described above there is a more or less unknown and uncontrolled fishery by non-commercial fishermen, by recreational fishers using professional fishing gears and by true anglers (rod and line). This fishery has been estimated four times since 1990 by using questionnaires and amounts according to the most recent poll in 2005 to 491 tons of which 388 came from the sea and 103 from freshwater (Fiskeriverket 2005). As the estimates for eel are based on very few replies the uncertainties are large.

The commercial catch of eels in Sweden in 2004 was then about 473 tons from the sea and 100 tons from freshwater, i.e. about 573 tons in total. The recreational catch adds another 491 tons making a grand total of about 1 000 tons. A very recent correction of the estimate of the recreational catch is discussed in SE.E.5. In short the new estimate of the recreational catch is 249 tons only. Thus the grand total might be about 800 tons.

Most preliminary results from a similar questionnaire for 2006 give ca 280 tons of eel as total recreational catch of which ca 20 tons were taken by anglers. Most of this fishery is now (since 1st May, 2007) prohibited due to the new legislation.

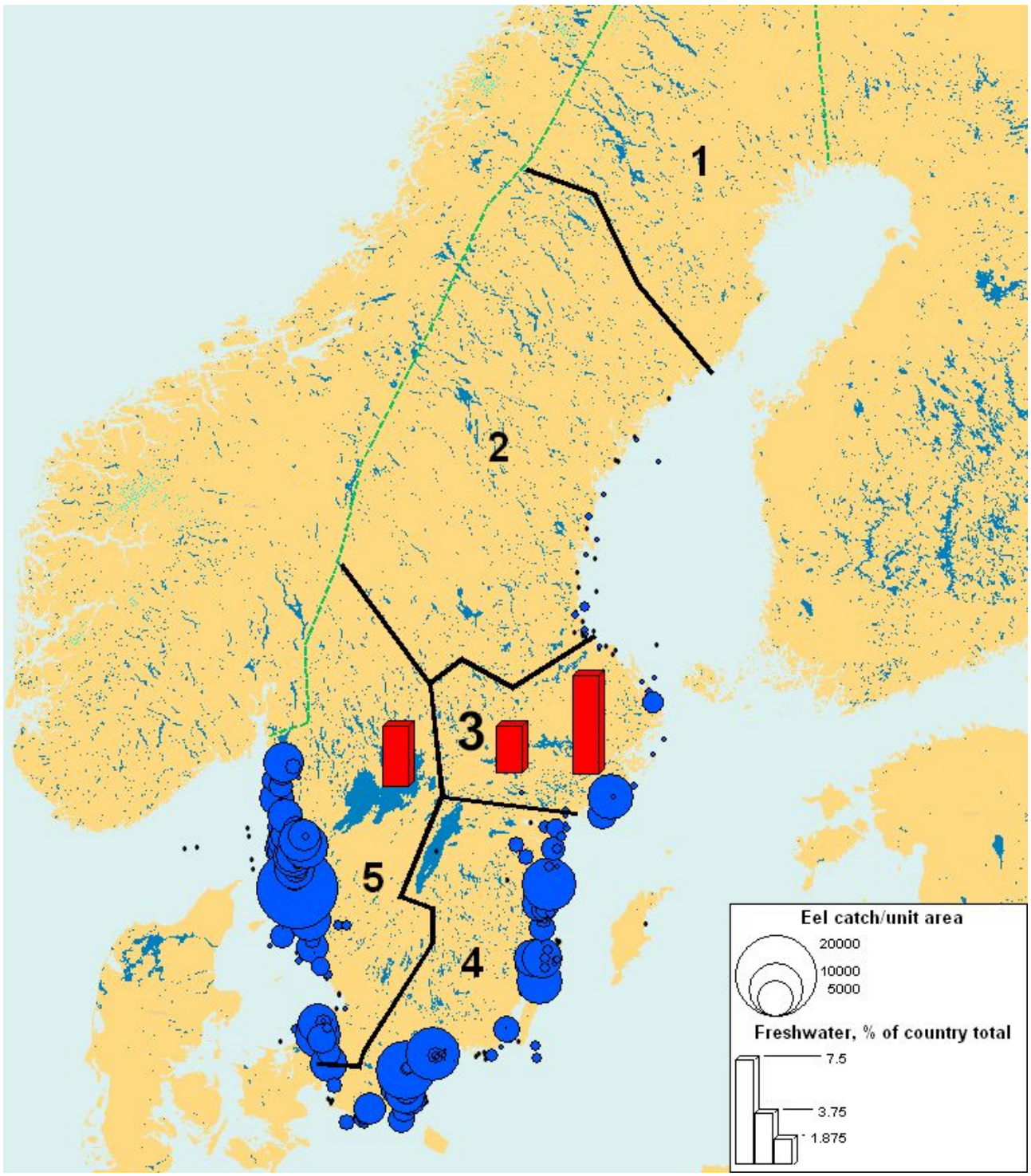


Figure SE.2 The commercial catch in year 2004 expressed per unit area (squares of 1 minute latitude * 1 minute longitude). The catch from the major Swedish lakes is given as their respective percentages of the total Swedish catch. The River Basin Districts are schematically indicated (as 1-5).

SE.B.2 River Basin Districts (RBD)

The Water Framework Directive subdivides Sweden into 5 separate River Basin Districts, of which two extend to some importance beyond our borders (Figure SE.2). These are the RBD nos.:

1. **Bottenvikens vattendistrikt** (or BBAY) shared with Finland (small part to the north). This RBD includes all drains to **the northern part of the Gulf of Bothnia**. Eels do occur in this

RBD, but are nowadays quite rare. A few successful stocking experiments were performed in this RBD during the 1970's and 1980's. Drainage area: 154 702 km^2.

2. **Bottenhavets vattendistrikt** (or BSEA) that drains into **the southern part of the Gulf of Bothnia**. Eels occur also in this area. During the early 20th century there was a substantial eel fishery in the southern parts of this RBD. At the present time the commercial catches are small. Drainage area: 146 667 km^2.

3. **Norra Östersjöns vattendistrikt** (or NBAL) drains **the central parts of Sweden**, including two of the five largest lakes in Sweden. Eels and eel fisheries are quite abundant in this RBD and in addition to a reduced natural recruitment both lakes and coastal areas are frequently stocked with imported elvers. Drainage area: 44 212 km^2.

4. **Södra Östersjöns vattendistrikt** ("**the Southern Baltic Sea**") (or SBAL) drains a large part of southern Sweden and includes a vast number of lakes with eel and also the coastal waters where there was and still is an important and traditional fishery for silver eels. Several lakes are stocked annually also in this RBD. Drainage area: 59 939 km^2.

5. **Västerhavets vattendistrikt** ("**the North Sea**") (or WEST) shared with Norway (to a minor part). This RBD includes the large Lake Vänern and numerous lakes and streams were eels still are quite abundant. Several lakes are stocked annually in this RBD. Drainage area: 73 330 km^2.

The main parts of the eel fisheries in Sweden are concentrated to RBD 3, 4 and 5. However, the catch of silver eels along the coast of RBD 4 is known to come from eels that have lived and grown in almost any part of the Baltic Basin. However, a majority have grown up in brackish water. This knowledge is based on tagging studies and otolith chemistry.

SE.C Fishing Capacity

SE.C.1 Coastal waters

Table SE.a Number fishermen by RBD with eel landings (all gears)

	BBAY	BSEA	NBAL	SBAL	WEST	ALL
1999	0	27	37	162	176	402
2000	3	28	35	135	139	340
2001	0	27	27	134	142	330
2002	1	23	28	118	149	319
2003	1	29	28	134	139	331
2004	1	31	29	127	134	322
2005	0	30	33	143	137	343
mean	1	28	31	136	145	341

Reliable information on fishing capacity can only be presented as the number of individual fishermen reporting catches in the official statistics. The numbers in Table SE.a do not consider the size of the reported catch of the individual fisherman or which life stage is the primary target. The Southern Baltic and the West Coast (North Sea) RBD´s were the dominating districts with equal shares in 1999-2005.

SE.C.2 Freshwater
From the inland eel fishery, statistics exists from all fishermen that have fishing licenses or a permit to use deeper fyke nets and pound nets in Lakes Vänern, Mälaren and Hjälmaren. There are no companies operating in the lakes but the fishing is carried out by single fishermen or in very few cases by two fishermen together. The number of fishermen in the lakes that reported catch of eels is shown below, per lake or group of lakes and per RBD. The total number of eel fishermen has decreased from 104 to 93 in a few years.

Table SE.b

Lake	Vänern	Mälaren	Hjälmaren	Other lakes	Total
Number of fishermen in 2006	22	26	25	20	93

RBD	3	4	5	Total
Number of fishermen in 2006	53	12	28	93

SE.D Fishing Effort

SE.D.1 Coastal waters
The official catch statistics at the present do not give reliable information on the effort in the fishery for eel.

SE.D.2 Freshwater
In the eel fisheries in the three lakes mentioned above, the type of net used varies both between and within lakes. There is no other information than that the nets are deeper than 1, 5 m. The nets have a leader which may be 50-300 m long and the depth of the nets varies between 3 and 20 m.

The temporal resolution of the statistics is on a daily basis in the larger lakes and on a yearly basis in the smaller lakes. The maximum number of all kinds of fyke nets used in 2006 is shown in the table below.

Table SE.c

Lake	Vänern	Mälaren	Hjälmaren	Other lakes	Total
Number of net permits	101	165	167	133	566

During 2006 the following number of pound nets (“bottengarn”) were used on a daily average in four of our lakes.

Table SE.d

Lake	Number of pound nets used (daily average over the year)
Vänern	43
Vättern	4
Mälaren	69
Hjälmaren	77
Total	192

The abundance of fyke nets is largest in the shallow Lake Hjälmaren, which area is about 20% of the area of Lake Vänern and 40% of the area of Lake Mälaren.

SE.E Catches and Landings

SE.E.1 Not valid as there are no glass eel fisheries in Sweden (neither viable nor legally allowed)

SE.E.2 Restocking

Restocking inland and coastal waters with glass eels, elvers, bootlace or medium-sized yellow eels, is practised since many years in Sweden, in order to improve the local eel fishery. Already in the beginning of the 20th century elvers were imported from England (via Hamburg, Germany). Since the beginning of the 1970's a more regular restocking programme has been in operation. From the beginning mostly medium-sized yellow eels from the Swedish West Coast were used but the proportion of imported and quarantined elvers has slowly increased. Most of the costs are covered by the Government using different funds destined for fish stock management (e.g. funds imposed by the water-rights courts), but also the commercial fishermen's association and local societies make a substantial contribution. In 1998 ca. 1,1 million € was spent on restocking while only about 0,5 million € was spent in 2005. A database over the amounts of stocked eels in separate water bodies is under construction. During 2000-2005 the following quantities (preliminary data) of eels were restocked:

Table SE.e Restocked quantities per RBD in 2000-2005.

RBD	2000		2001		2002		2003		2004		2005		Total	
	G (pcs)	M (kg)	G (pcs)	M (kg)	G (pcs)	M (kg)	G (pcs)	M (kg)	G (pcs)	M (kg)	G (pcs)	M (kg)	G (pcs)	M (kg)
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	32 000	0	111 460	0	138 850	0	71 819	0	354 129	0
3	249 955	24 183	183 820	13 550	374 390	5 388	377 210	6 724	114 292	4 200	185 496	3 662	1 485 163	57 707
4	156 560	33 298	136 560	21 031	259 633	15 330	148 860	16 118	231 480	12 493	286 778	1 924	1 219 871	100 194
5	723 839	3 238	317 330	4 344	407 336	2 570	0	1 960	497 608	1 679	189 780	292	2 135 893	14 083
Not defined	205 455	0	209 176	0	311 969	0	3 736	0	69 626	0	0	0	799 962	0
Total	1 335 809	60 719	846 886	38 925	1 385 328	23 288	641 266	24 802	1 051 856	18 372	733 873	5 878	5 995 018	171 984

Today "glass eels" (G) implies quarantined and pre-grown elvers of about one gram each and the medium-sized yellow eels (M) are about 90 gram each.

In 2006 and 2007 about 1215 000 and 944 000 "glass eels", respectively were stocked in total. For the first time in many years no medium-sized yellow eels were stocked in 2006 and 2007.

SE.E.3 Catch of yellow and silver eel

SE.E.3.1 Landings (data from contract notes)

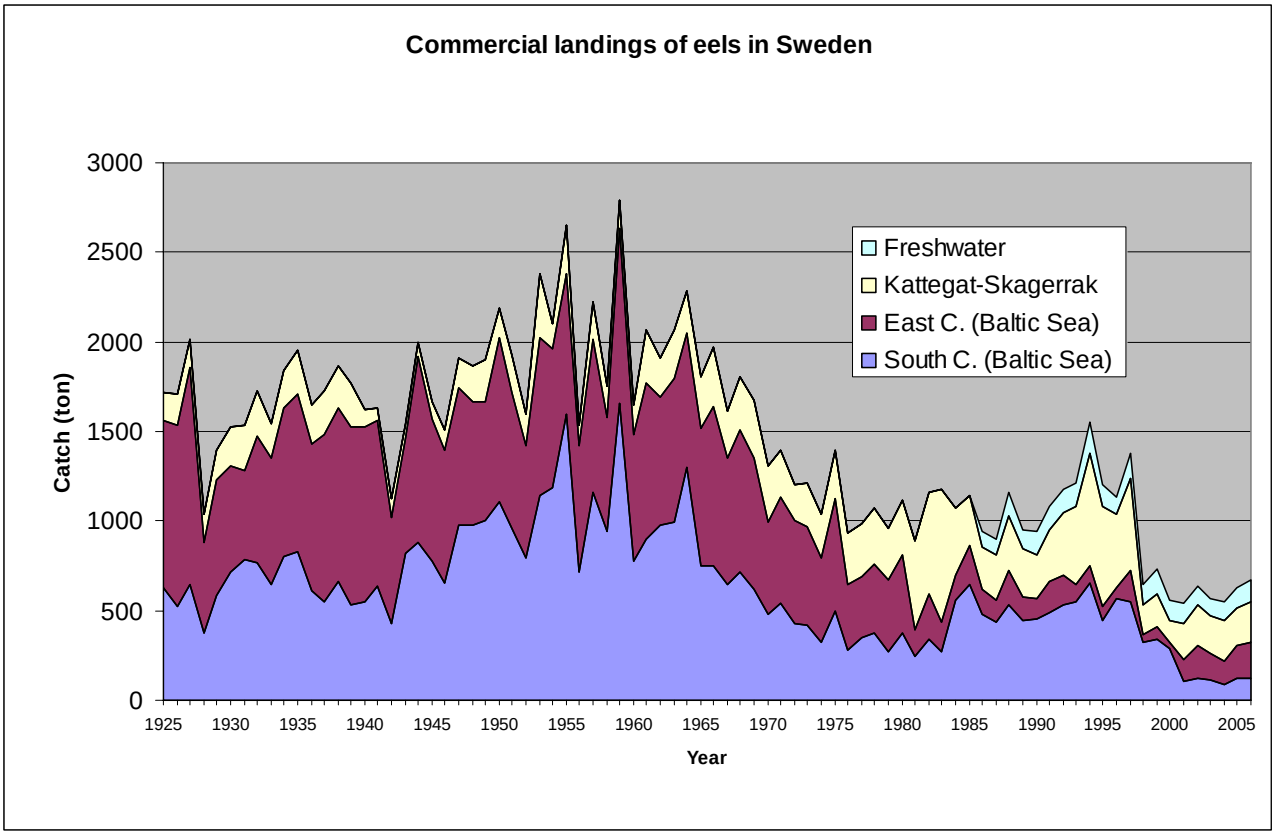


Figure SE.3 Commercial landings of eel in Sweden (data come from the contract notes, Kattegat-Skagerrak corresponds to RBD 5). The data behind this figure is given in the Appendix (Table SE.n).

SE.E.3.1 Freshwater

In inland waters the catch statistics is reported and stored at the Swedish Board of Fisheries. No distinction is made of different life stages of the eels caught. A recent sample from the commercial catch in 6 lakes showed that about 80 % were silver eels and 20 % yellow or half-silver. The average size was 0, 96 kg with a range from 0,25 to 2,5 kg. Eels do silver at different sizes in different lakes. Yearly catches for the period 2000-2006 is shown below.

Table SE.f Commercial catch in freshwater (tons)

Year	Vänern	Mälaren	Hjälmaren	Other lakes	Total
2000	22	38	20	34	114
2001	25	38	23	32	118
2002	22	34	18	29	103

2003	23	31	16	26	96
2004	23	38	18	28	107
2005	21	42	18	29	111
2006	21	45	21	36	124

The catches have varied fairly little during the period.

SE.E.3.2 Freshwater per RBD:

RBD 1. There are no data or catches reported from freshwater in this district. This is in accordance with the low natural recruitment to this remote part of Sweden and to the fact there are no regular restocking activities in operation. There are more than 15 157 lakes with a total area of 9 919 km^2 in this RBD.

RBD 2. Eels do occur in this area, but there is only a small fishery for them. There are no data from freshwater available. There are more than 12 132 lakes with a total area of 10 212 km^2 in this RBD.

RBD 3. From this district there are catch data from four lakes, Mälaren, Hjälmaren, Sottern and Öljaren. The total reported catch was 68,2 tons in 2006. There are more than 2 474 lakes with a total area of 3 375 km^2 in this RBD.

RBD 4. In this district there are catch data from 16 lakes. In total 12,1 tons were caught in 2004. There are more than 3 970 lakes with a total area of 4 899 km^2 in this RBD.

RBD 5. There are commercial eel fisheries in six lakes in this district. The main part comes from the huge Lake Vänern (5650 km^2) with 21,3 tons and the total reported catch was 44,3 tons in 2004. There are more than 4 900 lakes with a total area of 9 734 km^2 in this RBD.

SE.E.3.3 Coastal waters

Total eel catches reported to the log-book system averaged 511 tons in 1999-2006. As the system allows reports of undefined eel catches, the relation between life stages is not exactly known. It is estimated that the shares are equal for yellow- and silver eel. The duty to present logbooks was not mandatory for fishing on private waters until 2005. This implies that catches in the Baltic Sea silver eel fishery were underestimated. The degree of underestimation is not known. However, during the last two years reported catches were considerably higher than the preceding years. That might be an effect by this new legislation.

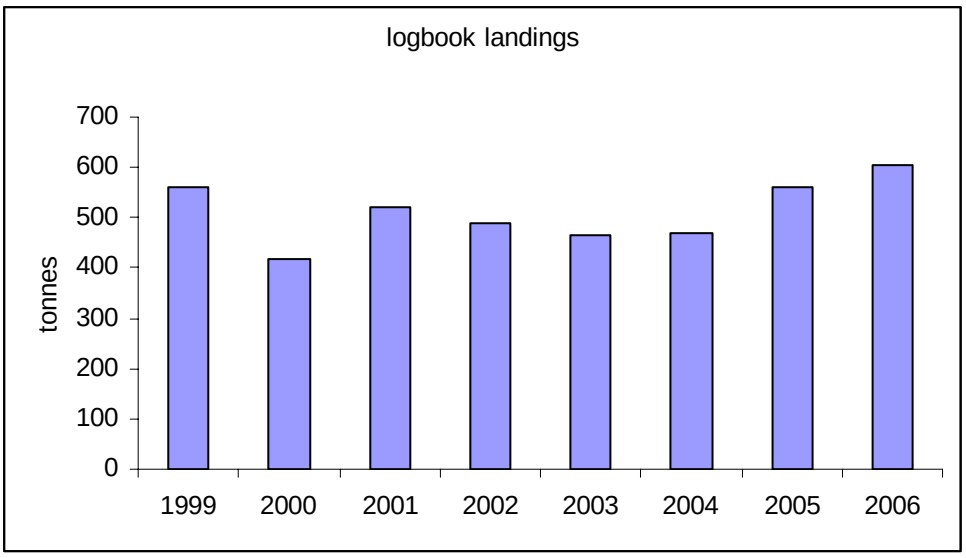


Figure SE 4 Total landings in the Swedish eel fishery as reported in logbooks in 1999-2006

When catches are separated on RBD´s, the dominance for the Southern Baltic and the West Coast districts is evident (see Figure SE. 5). The catches in Southern Baltic RBD is dominated by silver eel from pound nets, while the catches from the West coast RBD concerns mainly fyke net catches of yellow eel.

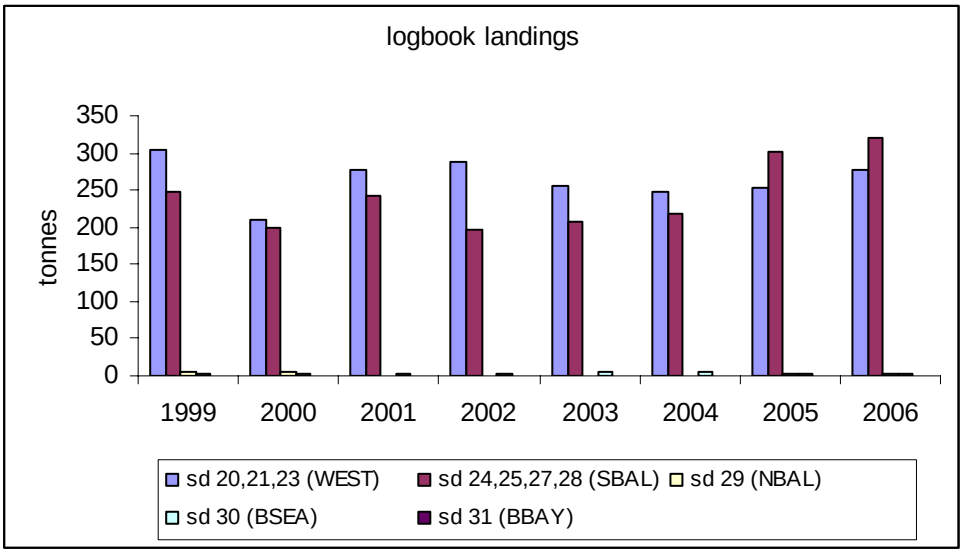


Figure SE 5 Total logbook landings in 1999-2006 approximately separated on RBD´s.

SE.E.4 Aquaculture

Different sources reported slightly diverging results for the Swedish aquaculture industry:

Table SE.g Production of eels in aquaculture from 1983 in Sweden. (SCB 1 and SCB 2 denote one official (SCB 1) and one “unofficial” (SCB 2) version (SCB 2007)

Aquaculture production (tons/year)	Data source		
	*SCB 1	*SCB 2	FAO Fishstat
1983	2	2	2
1984	12	15	12
1985	41	47	41
1986	51	59	51
1987	90	104	90
1988	203	233	203
1989	166	190	166
1990	157	179	157
1991	141	160	141
1992	171	195	171
1993	169	192	169
1994	160	182	160
1995	139	158	139
1996	161	184	161
1997	189	215	189
1998	204	232	204
1999	222	253	222
2000	273	311	273
2001	200	228	200
2002	167	190	167
2003	170	194	170
2004	158	158	
2005	222		
2006	191		

**SCB (Statistics Sweden) is the official source of statistics in Sweden.*

SE.E.5 Recreational Fisheries

In addition to commercial fisheries, the sports/recreational/household fisheries contribute significantly to the total landings of eel. The recreational fisheries have been studied in four surveys, most recently in 2005, by means of questionnaires (Fiske 2005-Report by the Swedish Board of Fisheries and Statistics Sweden). Although biased when it comes to the representativeness in the collected data (those who do fish tend to answer questionnaires whereas those who do not fish do not bother) the amount of eel caught by sport/recreational/household fishery in the whole country is estimated to 491±218 tonnes per year- about the same amount as the commercial fisheries.

The results and conclusions from this study have recently been subject for a provisional recalculation. It seems that due to the problems mentioned above the recreational catch of eels was overestimated with 97 %. The new and corrected results are shown below.

A fifth survey has just been carried out and the preliminary results concerning eel and 2006 give ca 280 tons of which 20 tons were taken by anglers.

Table SE.h

Fishing district	Skagerrak & Kattegat	The Sound	S. Baltic Sea	Middle Baltic Sea	the Gulf of Bothnia	Others	Total
Corresponding RBD	5	4	4	~3	~1-2	na	
Corrected estimated	18 283	19 765	60 549	81 597	3 364	65 840	249 398

catch (kg)							

Adding up these 249 tons of eel from recreational fisheries (Table SE.h) to the commercial catch ends in a total Swedish catch of about 800 tons.

Using the most recent but preliminary data above for the recreational fishery in 2006, the corresponding total Swedish catch was about 950 tons.

SE.F Catch per Unit of Effort

SE.F.1 Freshwater

In inland eel fisheries CPUE data can be calculated on a yearly basis in respective lake, but the dataset is not accessible at the moment. As the type of nets may shift over time it may, however not seem to be very meaningful to do that. In Lake Mälaren and Hjälmaren for example the fishermen tend to replace fine mesh fyke nets, which catches pike, pikeperch and perch in addition to eel, with nets with a coarser mesh size to be able to fish for pikeperch more effectively. The data has never been used for stock assessment as the fishery is based mainly on stocked individuals.

SE.F.2 Marine areas

Selected companies have provided detailed catch statistics from the pound net fishery for silver eel in the Baltic Sea since the late 1950´s. The trend in cpue is negative in the longest time series, corresponding to a 50 % decrease from the highest levels in the early 1960´s to recent years. The series starting in the early 1970´s are diverging, although the changes in time were small. Due to different reasons two of the longer time series were broken in the early 2000´s. In the longest one from northern Småland (figure SE.6) a negative trend in the early 2000´s.

Fishing for eel with fyke nets is of minor importance compared to pound nets on the Swedish coast of the Baltic Proper. Nevertheless it operates in a rather conservative way since several decades and long time series exist from a few companies. Since determination of life stage by the fishermen may be influenced by market demands rather than being based on biology, catch per unit effort is presented for yellow- and silver eel together (Figure SE.7). The cpue was stable in both areas over the years In southern county of Östergötland area yellow eel became less abundant in the mid 1990´s, but this decrease was compensated by a larger proportion of silver eels. The CPUE in 2006 of both life stages together was the highest since 1974. In the northern county of Kalmar, silver eel became more abundant in fyke net catches in the early 1990´s. In this area the silver eel catches in 2005 and 2006 were the biggest ever recorded in fyke nets, and fishers all over the area reported good catches.

From 1990 the minimum legal size for landing of yellow eel was raised in two steps from 53 to 60 cm. This may had an influence on the cpue in fyke nets. From 1 May, 2007 the minimum legal size was raised to 650 mm for both yellow and silver eels. The mean weight for yellow eel landings was close to 600 g in recent years.

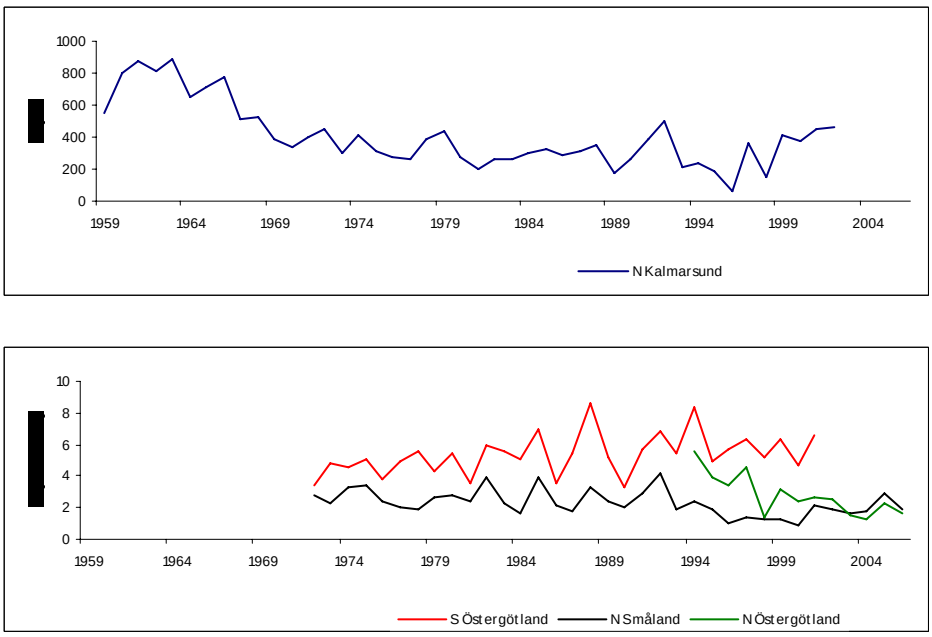


Figure SE.6 Time trends in pound net catches of silver eel in four subareas in Swedish RBD 4 (Southern Baltic). The subareas are all located in ICES subdivision 27 on the Swedish coast of the Baltic Proper.

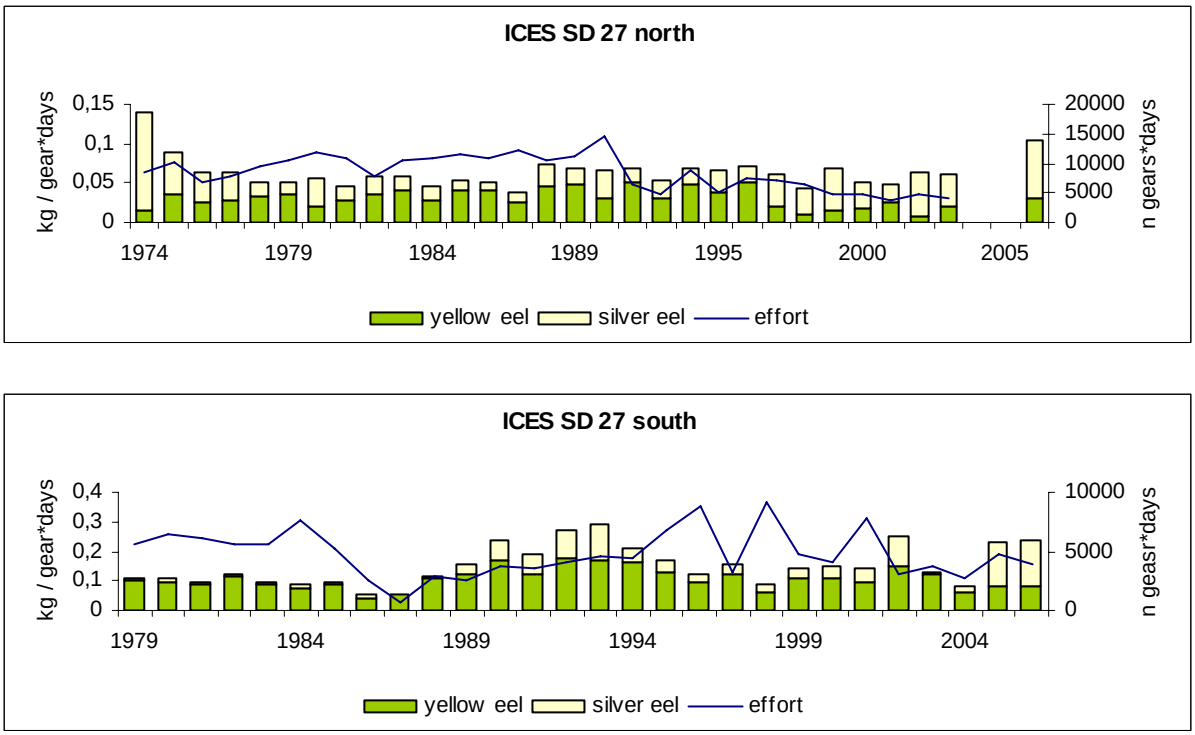


Figure SE.7 Time trends in CPUE and effort for fyke net catches of silver and yellow eel in two subareas in Swedish RBD 4 (Southern Baltic). The subareas are all located in ICES subdivision 27 on the Swedish coast of the Baltic Proper. Southern part of the county of Östergötland (upper) and northern part of the county of Kalmar (lower).

SE.G Scientific surveys of the stock

SE.G.1.1 Recruitment surveys/ascending young eels

Recruitment of young eels (from glass eels and elvers to quite large bootlace eels) in Swedish waters is monitored in eel passes (equipped with collecting boxes) at the most downstream

hydropower dam in a number of rivers along the Swedish coasts. Eels caught are weighed (or counted) before being released in upstream areas. Data from the most reliable eel passes, four in the Baltic Sea and four in Skagerrak-Kattegat, are given in the table below (see Wickström 2002 for a more complete description).

During the last years the recruitment has generally been low or very low compared to historical levels until the 1960'. So far unexplained, there are sudden peaks in the amount of ascending eels during certain years and in different rivers. In e.g. River Kävlingeån there was an unusually high catch in 2004 when all the remaining rivers were still very low. Since 2006 the catch in the River Göta Älv eel pass is negligible and the reason behind is still unclear. Reconstruction work at the most downstream dam might have affected the upstream run of eels in the river.

Additional recruitment series on glass eels come from an experimental trawl fishery (with an IKMWT) in the intake channel for cooling water at the Ringhals Nuclear Power Plant (in Kattegat) and from the ICES-IBTS (formerly YFS) using an MIK-trawl in Skagerrak-Kattegat (c.f. SE.G.1.2).

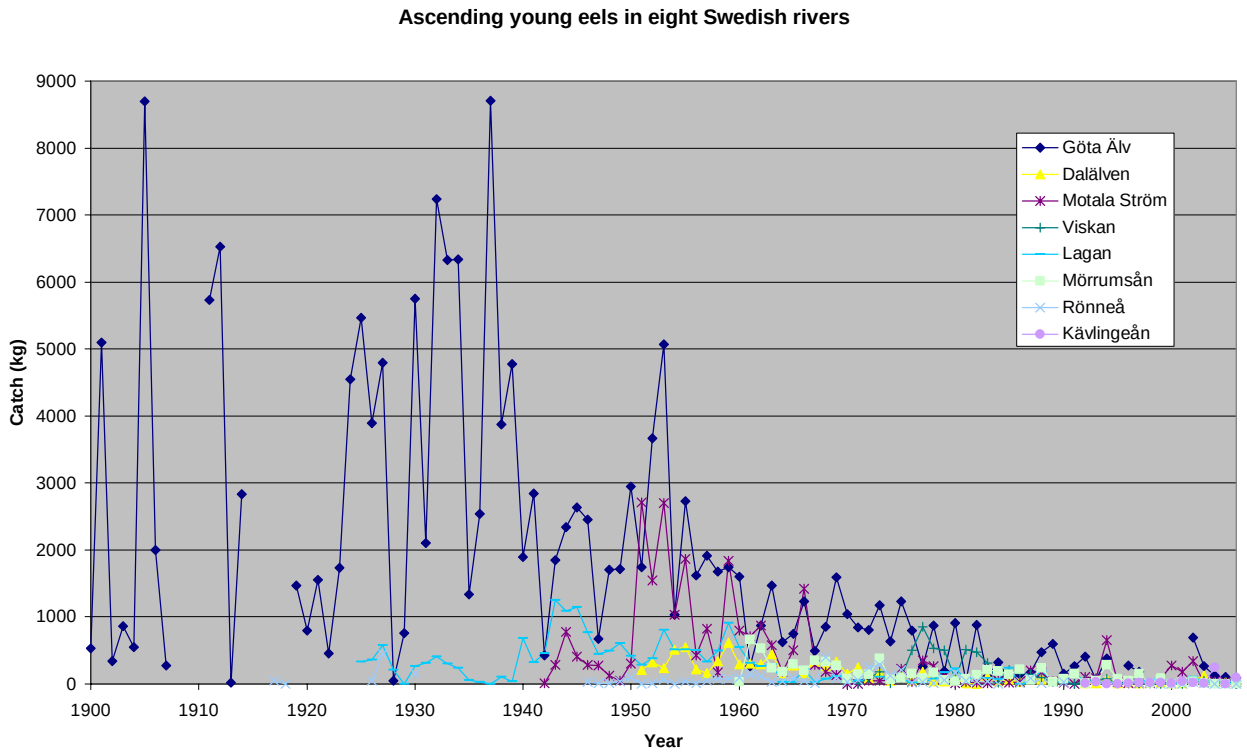
Table SE.i Amounts (kg) of ascending young eels caught in eight rivers along the Swedish coasts.

RIVER	DALÄLVEN	MOTALA STRÖM	MÖRRUMSÅN	KÄVLINGEÅN	RÖNNE Å	LAGAN	VISKAN	GÖTA ÄLV
YEAR/RBD	RBD 2	RBD 4	RBD 4	RBD 4	RBD 5	RBD 5	RBD 5	RBD 5
1900								530,0
1901								5100,0
1902								340,0
1903								858,0
1904								552,0
1905								8700,0
1906								2000,0
1907								275,0
1908								-9,0
1909								-9,0
1910								-9,0
1911								5728,0
1912								6529,0
1913								20,0
1914								2828,0
1915								-9,0
1916								-9,0
1917					45,0			-9,0
1918					4,5			-9,0
1919					-9,0			1465,0
1920					-9,0			800,0
1921					-9,0			1555,0
1922					-9,0			455,0
1923					-9,0			1732,0
1924					-9,0			4551,0
1925					-9,0	331,3		5463,0
1926					49,0	357,8		3893,0
1927					445,0	581,1		4796,0
1928					0,0	211,9		47,0
1929					0,0	4,5		756,0
1930					147,0	268,0		5753,0
1931					-9,0	316,0		2103,0
1932					-9,0	408,0		7238,0
1933					-9,0	303,5		6333,0

1934					-9,0	236,0		6338,0
1935					-9,0	53,5		1336,0
1936					-9,0	24,5		2537,0
1937					-9,0	0,5		8711,0
1938					-9,0	106,5		3879,0
1939					-9,0	36,0		4775,0
1940					-9,0	684,0		1894,0
1941					-9,0	321,0		2846,0
1942		14,0			-9,0	454,0		427,0
1943		283,0			-9,0	1248,0		1848,0
1944		773,0			-9,0	1090,0		2342,0
1945		406,0			-9,0	1143,0		2636,0
1946		280,0			29,7	766,5		2452,0
1947		272,5			5,8	440,8		675,0
1948		120,0			6,0	494,7		1702,0
1949		43,0			39,4	603,6		1711,0
1950		304,5			93,5	419,9		2947,0
1951	210,0	2713,0			1,0	281,8		1744,0
1952	324,0	1543,5			9,1	379,1		3662,0
1953	241,5	2698,0			70,0	802,4		5071,0
1954	508,5	1030,0			2,7	511,3		1031,0
1955	550,0	1871,0			42,6	506,9		2732,0
1956	215,0	429,0			14,1	501,6		1622,0
1957	161,5	826,0			46,8	336,1		1915,0
1958	336,7	172,0			73,2	497,2		1675,0
1959	612,6	1837,0			80,0	910,5		1745,0
1960	289,0	799,0	29,0		93,0	552,4		1605,0
1961	303,0	706,0	665,5		143,7	314,8		269,0
1962	289,0	870,0	534,8		113,0	261,9		873,0
1963	445,4	581,0	241,2		32,5	298,1		1469,0
1964	158,0	181,6	177,8		34,7	27,5		622,0
1965	276,4	500,0	292,3		87,1	28,0		746,0
1966	157,5	1423,0	196,3		48,5	216,5		1232,0
1967	331,8	283,0	353,6		6,6	24,4		493,0
1968	265,5	184,0	334,8		398,0	74,4		849,0
1969	333,7	135,0	276,8		85,7	117,1		1595,0
1970	149,8	2,0	80,4		29,8	24,7		1046,0
1971	242,0	1,0	141,1		53,3	45,3	12,0	842,0
1972	87,6	51,0	139,9		249,0	106,2	88,0	810,0
1973	159,7	46,0	375,0		282,3	107,1	177,0	1179,0
1974	49,5	58,5	65,4		120,7	33,6	13,0	631,0
1975	148,7	224,0	93,3		206,7	78,4	99,0	1230,0
1976	44,0	24,0	147,2		17,1	20,2	501,0	798,0
1977	176,4	353,0	89,6		32,1	26,4	850,0	256,0
1978	35,1	266,0	168,4		10,8	75,8	532,6	873,0
1979	34,3	112,0	61,4		56,1	165,9	505,2	190,0
1980	71,2	7,0	36,5		165,7	226,0	72,5	906,0
1981	6,8	31,0	72,8		49,2	78,0	513,1	40,0
1982	0,5	22,0	129,0		40,0	90,8	472,0	882,0
1983	112,1	12,0	204,6		37,6	87,8	308,4	113,0
1984	33,9	48,0	189,9		0,5	68,0	20,7	325,0
1985	69,7	15,2	138,1		0,0	234,1	211,5	77,0
1986	28,4	26,0	220,3		8,6	2,5	150,9	143,0
1987	73,5	201,0	54,5		84,8	69,8	140,9	168,0

1988	69,0	169,5	241,0		4,9	191,7	91,9	475,0
1989	-9,0	35,2	30,0		0,0	44,0	32,7	598,0
1990	-9,0	21,0	72,5		32,0	21,6	42,1	149,0
1991	-9,0	2,0	151,0	-9,0	-9,0	161,3	0,4	264,0
1992	9,6	108,0	14,0	12,5	-9,0	42,2	70,3	404,0
1993	6,6	89,0	45,7	25,8	-9,0	8,7	43,4	64,0
1994	71,9	650,0	283,0	4,0	-9,0	30,7	76,1	377,0
1995	7,6	32,0	72,4	2,9	-9,0	11,6	5,5	0,0
1996	17,5	14,0	51,9	13,5	-9,0	2,8	10,0	277,0
1997	7,5	8,1	148,0	19,4	10,4	31,7	7,6	180,0
1998	14,7	5,5	12,9	15,3	24,0	62,6	5,0	0,0
1999	15,5	85,0	84,2	22,2	4,2	49,5	1,8	0,0
2000	12,4	270,1	1,0	5,0	-9,0	13,0	14,1	0,0
2001	8,2	177,5	19,3	34,5	1,8	26,8	1,8	0,0
2002	58,6	338,8	37,4	19,3	27,0	102,0	26,2	693,0
2003	126,1	19,0	11,0	9,7	9,1	31,7	45,1	266,0
2004	26,4	42,0	1,5	248,3	2,0	29,0	5,0	125,0
2005	30,9	24,8	2,5	3,4	0,1	20,5	25,8	105,0
2006	35,1	25,9	2,5	94,4	0,1	38,1	2,7	0,04
2007	*>18,4*	*>30*	*na yet*	*>74,5*	*na yet*	*>70*	*>2,1*	*na yet*

The ascent in River Viskan is totally dominated by elvers arrived as glass eels the same year. Also in River Lagan there is a considerable proportion of "glass eels" but in the remaining rivers there is a mix of year-classes, with eels up to more than 300 mm in TL. The value -9,0 implies no data available. Not available = na. 0 for River Göta Älv in recent years is due to the fact the eel pass was closed in those years. Data for 2007 are only indicated as the season is not over yet.



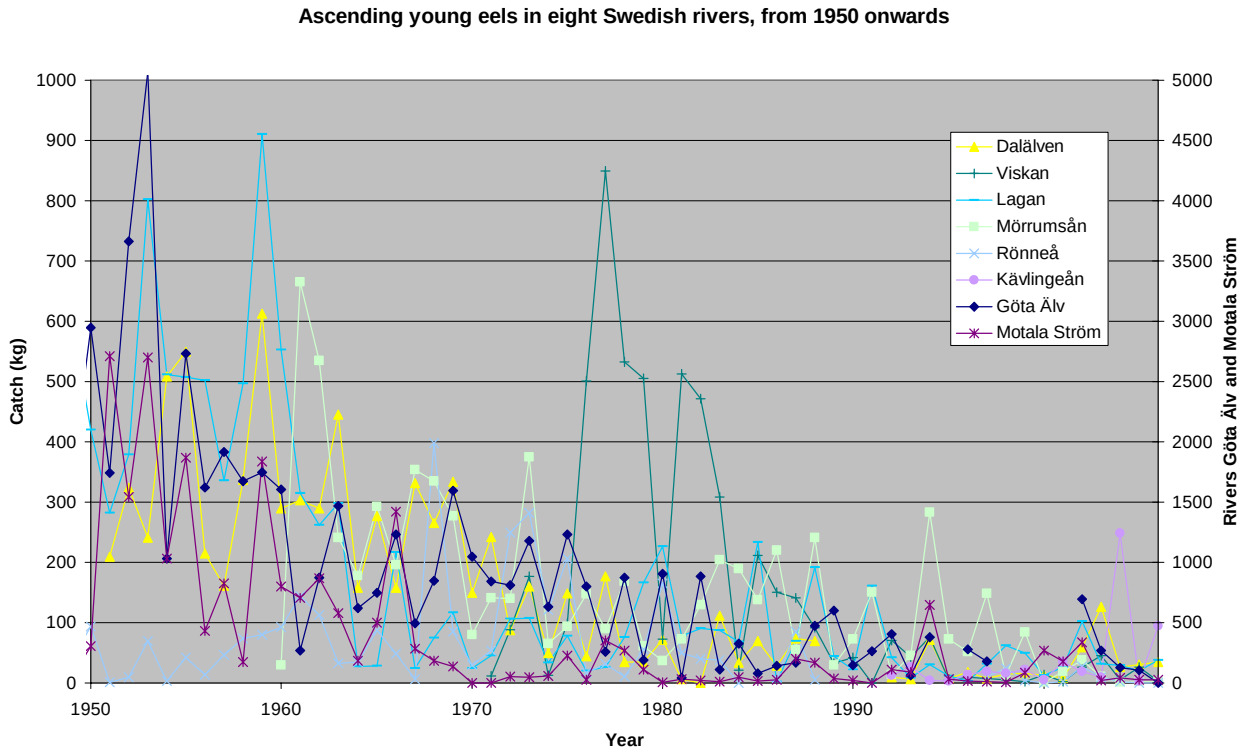


Figure SE.8 a&b Long-term trends in the catches of young eels at various places along the Swedish coast. The lower panel is a magnified version of the upper one from 1950 onwards.

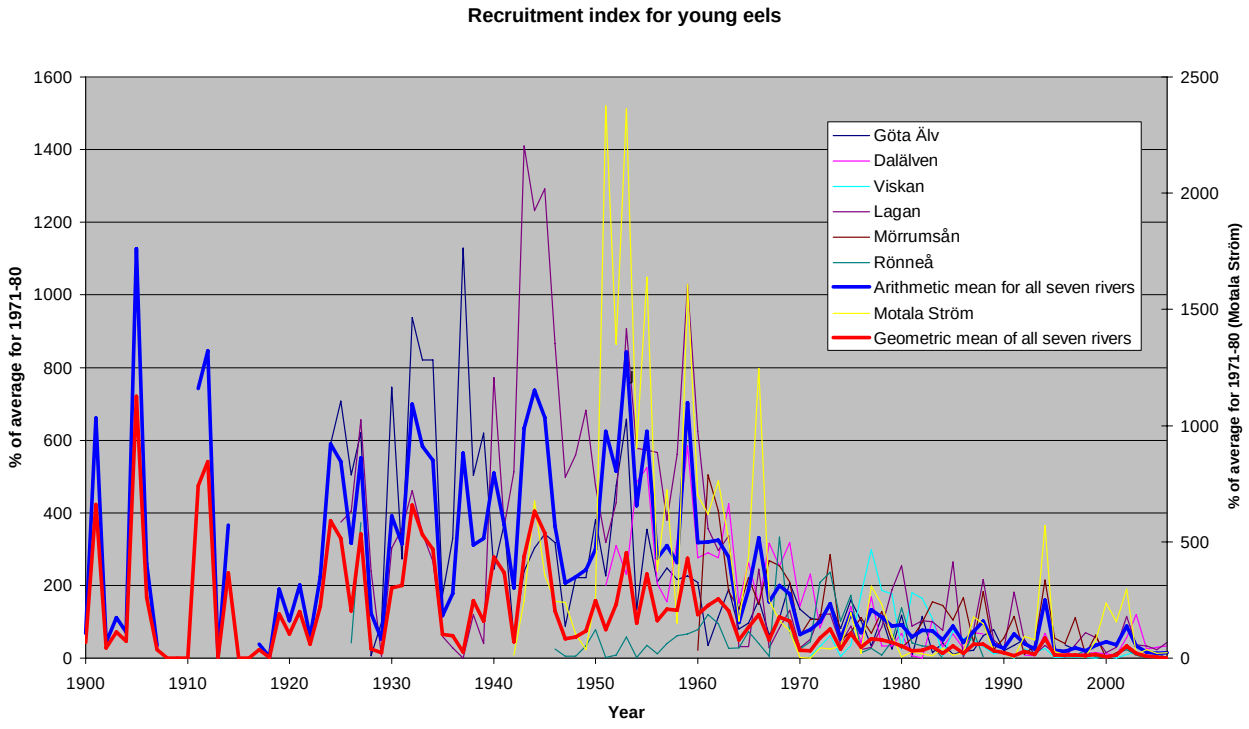


Figure SE.9 Recruitment indices from seven Swedish rivers. Data are presented as percentages of the averages for 1971 to 1980 in the same rivers, respectively.

SE.G.1.2 Recruitment surveys/marine data

The abundance of glass eels in the open sea (Kattegat and Skagerrak) are surveyed by trawling with either an Isaacs-Kidd Midwater trawl (IKMT) or with a modified Methot-Isaacs-Kidd Midwater trawl (MIKT). The former trawl is used in a fixed position in the intake canal for cooling water to the condensers at the Ringhals Nuclear Power Station (e.g. Westerberg 1998 a & b). The latter method is used from R/V Argos during the ICES-International Young Fish Survey (since 1993 called the International Bottom trawl Survey (IBTS Quarter 1) (Hagström & Wickström 1990).

When the glass eels have settled they and larger eels can be monitored on soft and shallow bottoms using a "Drop Trap" technique (Westerberg *et al* 1993). This was successfully done during a number of years but is now a resting series. This approach made it possible to roughly estimate the total recruitment of young eels to the Swedish coast.

From all three methods recruitment series could be compiled:

Recruitment of glass eel to the Swedish west coast is monitored at the intake of cooling water to the nuclear power plant at Ringhals in the Kattegat (**Fig. SE.10** and **Table j**). The time of arrival of the glass eels to the sampling site varies between years, probably due to hydrographical conditions, but the peak in abundance normally occurred in late March to early April. Abundance has decreased by 90 % if recent years are compared to the peak in the early 1980`s.

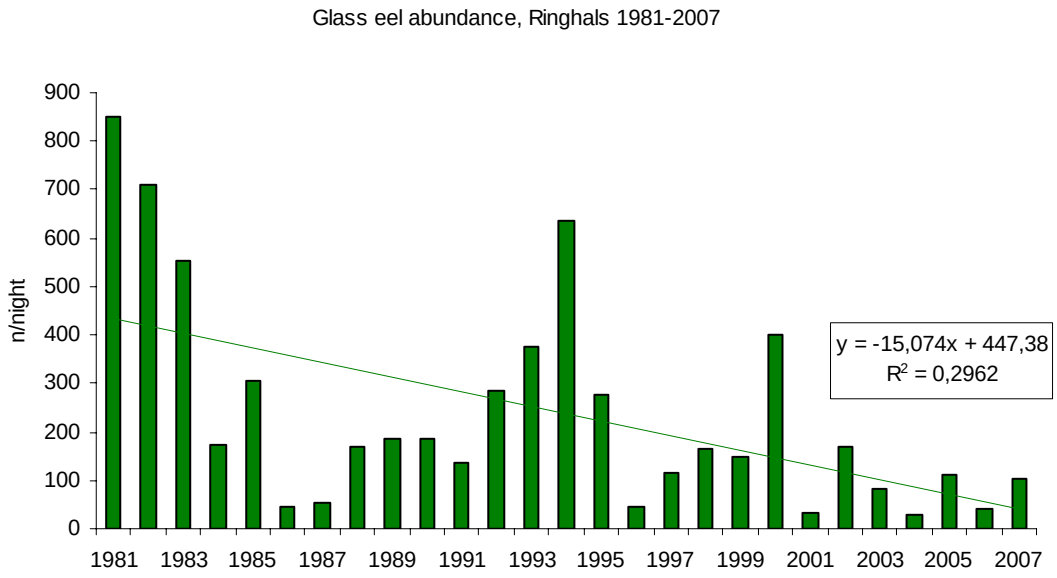


Figure SE.10 Time trend in glass eel recruitment at the Ringhals nuclear power plant on the Kattegat coast in Swedish RBD 5 (Västerhavet).

Table SE.j Annual indices of glass eel recruitment at the intake canal for cooling water to reactors 1 and 2 at the Ringhals nuclear power plant. Mean of weekly means of numbers of glass eels collected with a modified Isaacs-Kidd midwater trawl during March and April (weeks 9-18). Data were corrected for variations in water flow.

week	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
3	3													1										
4	0							17			1			4					0					
5	4							8		15	14	18	30	5	4	0	0	1	0	74	2	27	6	

6								28		27	13	56	45	7	11	0	1	1	0	142	0	86	5	1
7								6		22	9	85	331	7	41	0	22	9	8	267	3	154	2	2
8	1							34		57	3	44	57	8	48	11	3	50	12	115	5	327	5	0
9	187		51			3		36	342	185	3	160	55	3	172	0	68	125	62	344	5	117	5	1
10	199	24				2		80	372	150	15	471	118	7	224	4	200	100	121	377	3	200	10	3
11	250	130	528	176		4		19	129	150	88	290	130	610	333	13	198	8	72	533	22	366	44	3
12	374	806	835	289	14	6	2	16	107	145	42	469	535	400	569	25	60	177	158	214	24	530	53	18
13	1886	1258	265	122	109	1	0	72	291	251	110	562	495	1430	331	60	42	220	2	479	16	59	185	35
14	2093	1335	469	181	0	3	31	149	121	351	138	151	403	1236	625	33	77	448	314	942	22	185	192	65
15	1849		878	112	878		141	603	67	284	414	298	540	1145	91	128	201	237	377	154	45	184	151	55
16			925		476		69	416	42	120	254	142	527	619	64	73	49	96	79	299	25	53	74	90
17	804		477	171	350		6	127		37	193	231	564	278	80	56	44	202	141	257	128	8	84	32
18	0					297	114				124	55					230	31				9	46	8
mean 9-18	849	711	553	175	305	45	52	169	184	186	138	283	374	636	277	44	117	164	147	400	32	171	84	31

The numbers of glass eels caught during the Swedish parts of the International Bottom trawl Survey (IBTS Quarter 1) are given in Figure SE.11.

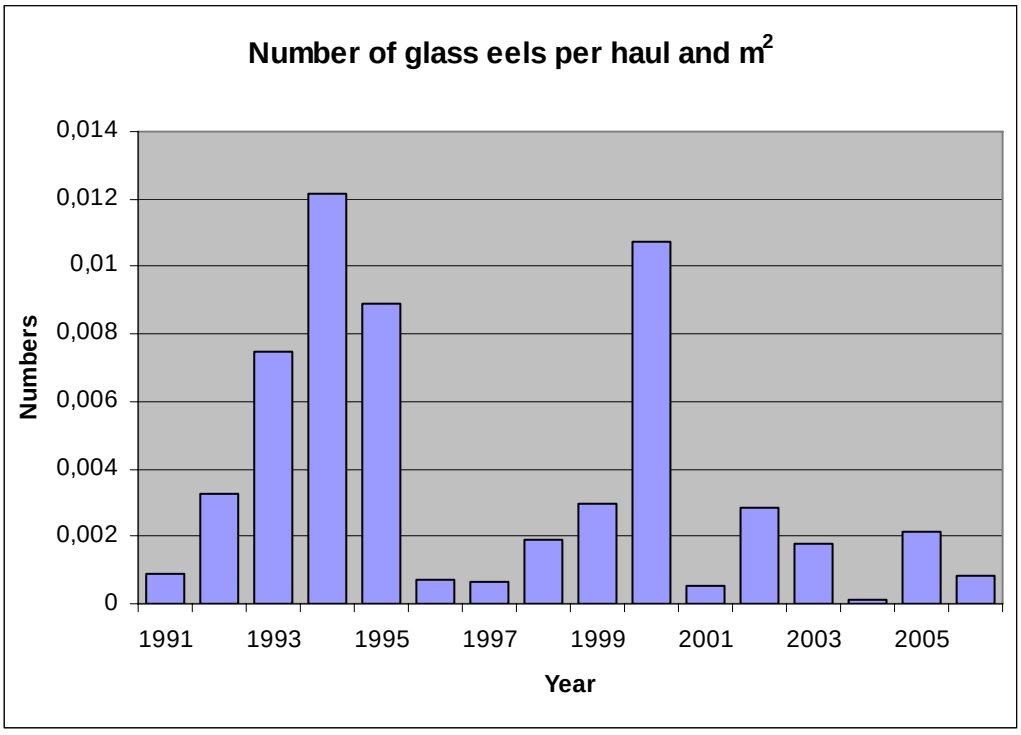


Figure SE.11 Catch of glass eels by a modified Methot-Isaacs-Kidd Midwater trawl (MIKT) in the Skagerrak-Kattegat 1991-2006. Numbers have been corrected for the flow through the net.

SE.G.1.3

Another way of estimating the occurrence of young eels ascending in smaller streams is by electro-fishing (Degerman 1985, Fiskeriverket & Laxforskningsinstitutet 1999, CEN 2002). Normally this is done with salmonids in focus with eels as secondary product or spin-off.

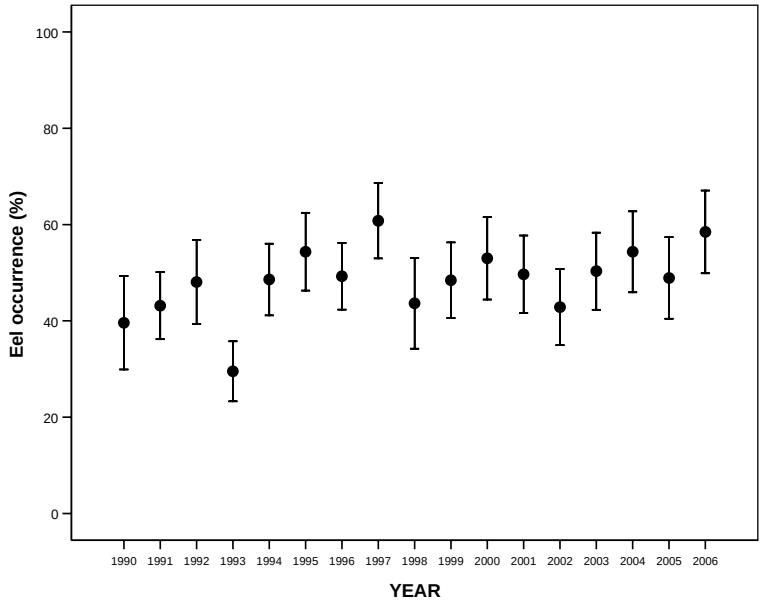


Figure SE.12 Proportion of electro-fished stations (%) with eel occurrence (+/- 95% CI) along the West Coast. The stations in Halland County (Swedish West Coast) that were fished in 1990-2006 are situated from 0 to 100 m asl. Note that local abundance is not given here, only presence/absence. Data from SERS (Swedish Electrofishing Register). *The positive trend is significant (Pearson correlation, n=17, r=0,48, p=0,046).*

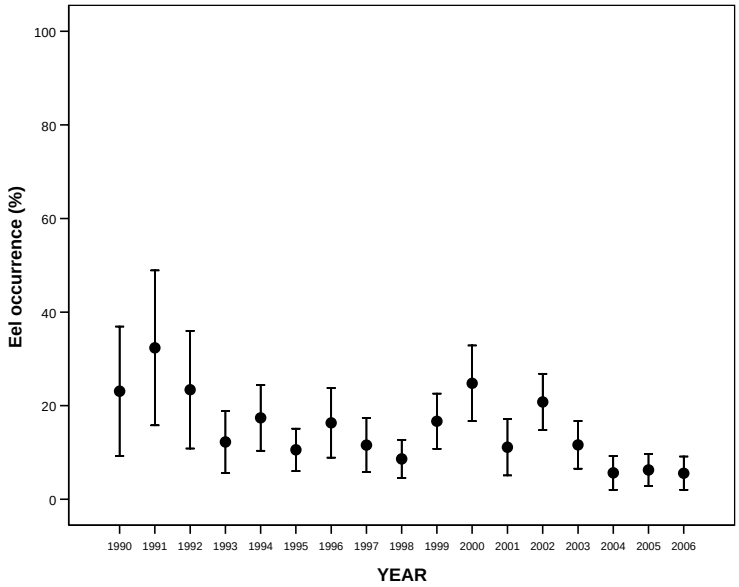


Figure SE.13 Proportion of electro-fished stations (%) with eel occurrence (+/- 95% CI) along the East Coast. Stations that were fished in 1990-2000 in this figure are situated from 0 to 100 m asl in six counties along the Baltic Sea Coast. Note that local abundance is not given here, only presence/absence. Data from SERS (Swedish Electrofishing Register). *The negative trend is significant (Pearson correlation, n=17, r=-0,64, p=0,006).*

SE.G.2 Yellow eel surveys

SE.G.2.1 Yellow eel surveys in coastal waters

The coastal fish communities on the Swedish west coast are monitored by standardized fishing with fyke nets in shallow water (2-5 m). Yellow eel was among the dominating fish species in August

most years. Barsebäck in the SW part of the area belongs to RBD SE Baltic, other areas to RBD Västerhavet. The trend for the longest time series from Vendelsö in N Kattegatt is significantly positive. A negative tendency for the Barsebäck area was broken by increasing catches in 2006 and 2007. In the other areas the period of sampling was too short to be examined for biologically significant trends. The magnitude of cpue though, was similar to that of the longer series. The inter annual variations in cpue were influenced by water temperature at the time of sampling, but no time trends in temperature were observed for the period with available data (1988-2006).

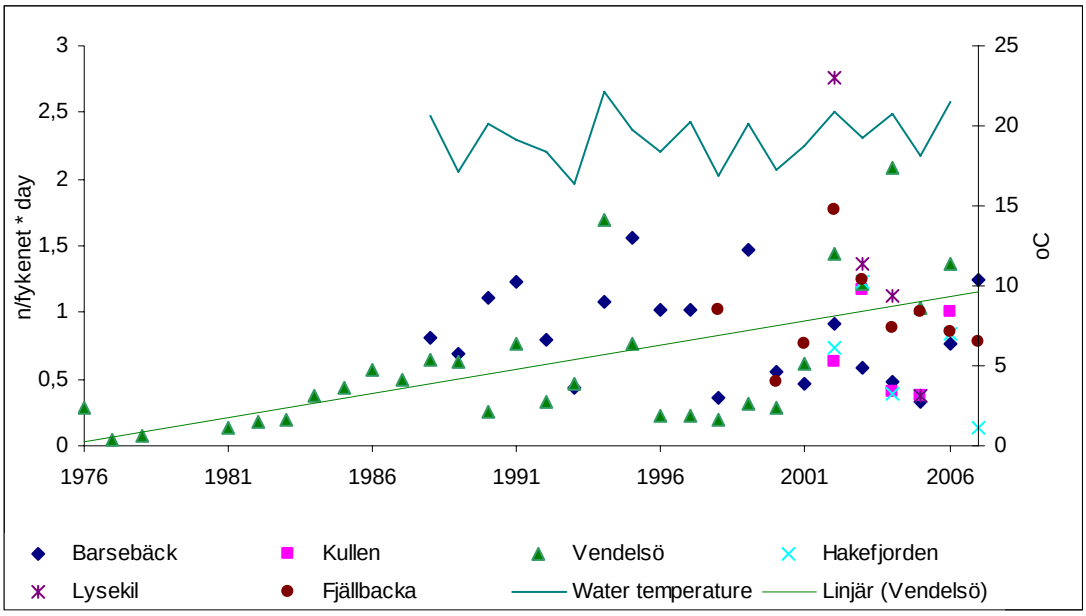


Figure SE.14. Time trend in the yellow eel catches in coastal fish monitoring with fyke nets in August on the Swedish west coast. RBD SE Baltic (Barsebäck) and RBD Västerhavet (others). Annual mean water temperature at the fishing gears is presented for the Vendelsö area in central Kattegat.

SE.G.2.2 Yellow eel surveys in freshwater

There are no routine stock surveys for yellow eels in freshwater. The nearest equivalents are the surveys dedicated to stocked populations of eels. These are mostly performed in smaller lakes but also at one site in the large Lake Mälaren where glass eels were stocked in both 1980 and 1997. The aim is to follow the development of the introduced stock and individual growth of young eels stocked in nature. The eels that were stocked in 1997 were marked with Alizarin Complexone. Such marked eels are now dominating the local eel population. Their proportion of the catch has increased from 4 % in 2000 to 69 % in 2007. In 2007 the stocked eels were 494 mm (+/- 75 SD) which corresponds to a growth rate of 39,8 mm/year (+/- 7,5 SD) after stocking.

SE.G.3 Silver eel surveys

There are no regular silver eel surveys in Sweden. However, in 2003 the Institute of Freshwater Research collected large samples from the commercial fisheries in eight lakes and at two sites where most silver eels try to leave the Baltic Sea, i.e. in the Sound (Öresund). In 2005 and 2006 silver eels from additional sites along the Baltic Coast were collected for a tagging study. All these eels (except tagged but not recaptured individuals) have now been analysed with respect to e.g. their fat content and to their chemical background (by otolith microchemistry). This extensive study might together with a now realized tag-recapture study be the baseline for recurrent sampling of silver eels.

The Coastal Institute is sampling the commercial catch with the purpose to collect length and age data. This is done within the DCR (Data Collection Regulation Programme). See also SE.H below.

SE.H Catch composition by age and length

SE.H.1 Catch composition by age and length in coastal areas.

In 2002-2006 over 7000 yellow eel vere sampled for individual length, total and somatic weight, sex and prevalence of *Anguillicola crassus*. All but fifty were female and the males were mainly recorded on the Skagerrak coast in SD 20. Age readings exist for 2700 individuals in August 2007 (Table SE.k(b)).The sampling programme started as an initiative from the Swedish Board of Fisheries and is now part of the Swedish contribution to the DCR. Sampling of silver eel in pound net catches started in 2005. So far length and weight recordings and otoliths were collected from 1700 silver eels and 1200 age readings were performed.

Table SE.k Swedish sampling of yellow eel in commercial catches with fyke nets.

a. total number sampled for size and age

	Year of catch					
ICES SD	**2002**	**2003**	**2004**	**2005**	**2006**	**Total**
20	202	201	200	729	670	2002
21	205	198	200	202	100	905
23	202	201	200	200	197	1000
25	409	405	414		1	1229
27	392	426	469	465	478	2230
Total	**1410**	**1431**	**1483**	**1596**	**1446**	**7366**

b. total number of age records

	Year of catch					
ICES SD	**2002**	**2003**	**2004**	**2005**	**2006**	
20	97	96	98	433		724
21	98	99	98	201	100	596
23	96	96	198	199		589
25		97	99		1	197
27			390	188		578
Total	**291**	**388**	**883**	**1021**	**101**	**2684**

Sampling for length in commercial fyke net catches show a similar size composition of yellow eel in four out of five areas. Sizes in the interval 40-50 cm were most abundant. Sampling in subdivision 27 in the central Baltic Proper demonstrates a population with considerably higher mean length and with single individuals reaching almost 90 cm in length (Figure SE.x).

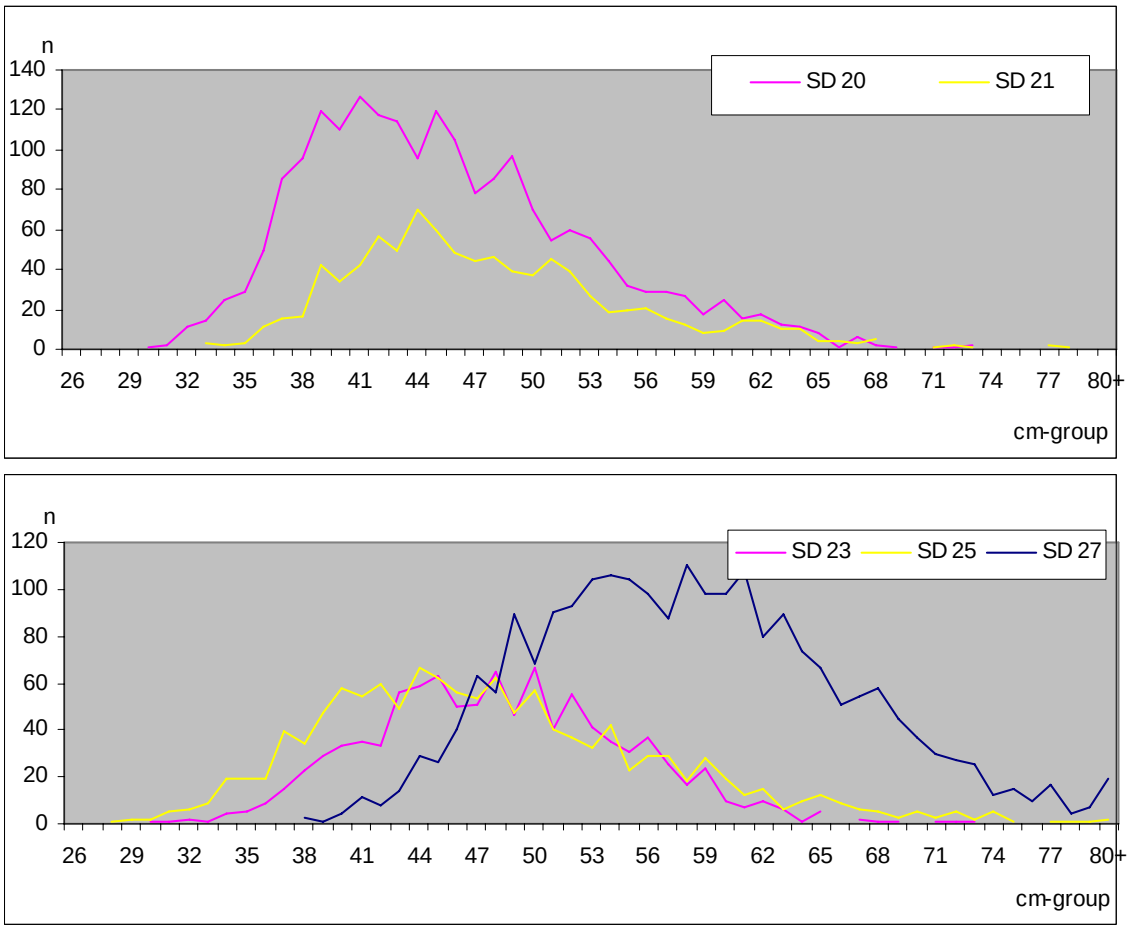


Figure SE.15 Length composition of yellow eel from commercial fyke net catches in samples collected in 2002-2006 in RBD SE Västerhavet (ICES SD 20-21) and RBD SE Baltic (ICES SD 23,25 and 27). Samples from subdivisions 25 and 27 are based on an unsorted mixture of landings and discard.

There is a gradient in mean length of silver eel from 77 cm SD 27 in central Baltic to 65 cm in SD 23, Öresund. Since May 2007 the minimum legal landing size is 65 cm in the Baltic. The length distribution in SD 24 in southern Baltic indicates a potential for a considerable reduction of the fishing mortality in the pound net fishery in this area with the new regulations.

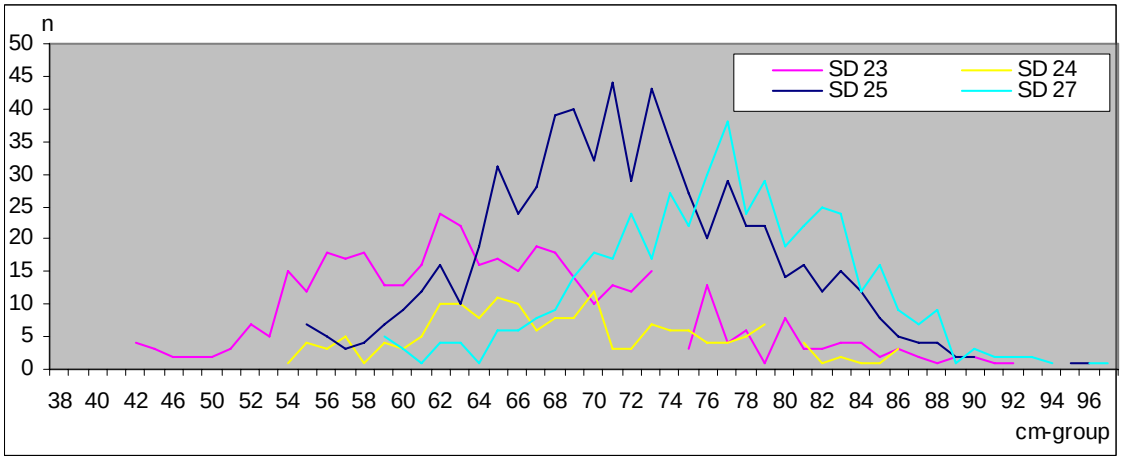


Figure SE.16 Length composition of silver eel from commercial pound net catches for samples collected in 2005-2006 in RBD SE Baltic (ICES SD 23, 24, 25 and 27).

In the three western subdivisions, Öresund, Kattegat and Skagerrak, the average age of the yellow eel landings varied between 8 and 10 years. The samples from SD 25 represent the first proper habitat for yellow eel recruits on their path of migration from the west coast into the Baltic Sea. The relatively low mean age in unsorted fyke net landings in SD 25 indicate that migrants on transit might make up a considerable proportion of the catches. Although the yellow eels from SD 27 in the Central Baltic were considerably larger, they were only 1-2 years older compared to the western sampling sites. Silver eel ages varied from 14 years on average in SD 27 to 10-12 years in SD 23-25.

Table SE.l Mean age of yellow eel in the Swedish coastal fyke net fishery

ICES SD	Year of catch					
	2002	2003	2004	2005	2006	Total
20	9,0	8,9	9,6	8,7		8,9
21	8,7	8,2	8,7	7,9	9,2	8,4
23	8,6	9,6	9,4	8,9		9,1
25		7,2	6,8			7,0
27			9,8	10,9		10,1

In SD 20, 21 and 23 (West Coast) eels were recruited to the fishery at the age of 4 to 5 years and the oldest individuals recorded had reached the age of 18. On the southern Baltic coast the age span in unsorted landings was 3-12 years. The age distribution in SD 27 was similar to those from the west coast, although shifted one year to the right in figure SE.X.

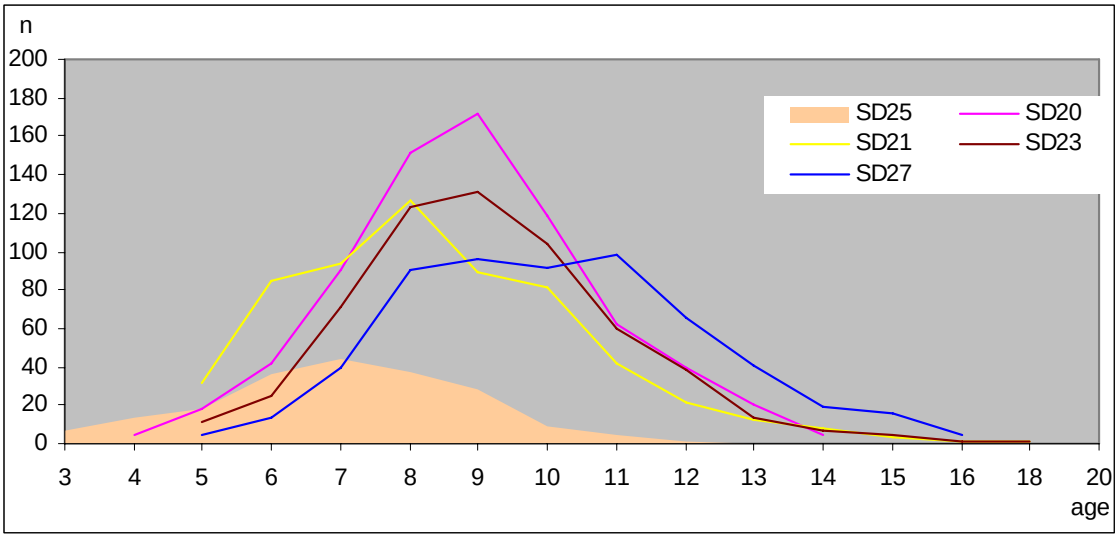


Figure SE.17 Age distribution of yellow eel from commercial fyke net catches for samples collected in 2005-2006 in RBD SE Västerhavet (ICES SD 20-21) and RBD SE Baltic (ICES SD 25 and 27) .

The growth pattern is close to linear for both length and weight in all areas (Figure SE.x). Bias is probably introduced for younger ages du to gear selectivity and in higher ages due to silvering. Yellow eel from SD 27 in central Baltic were considerably longer and heavier than in other areas, a 10 year old female beeing 57 cm and 314 g in the former area compared to 49,5 cm and 192 g on the Skagerrak coast (SD 20). Comparing the most abundant ages, somatic condition is higher in the Baltic samples and increases with increasing age. The possibly transiting eels in SD 25 thus were fatter than eels from the west coast, but had otherwise grown at approximately the same speed. Condition increasing with increasing age is seen in all areas but SD 20.

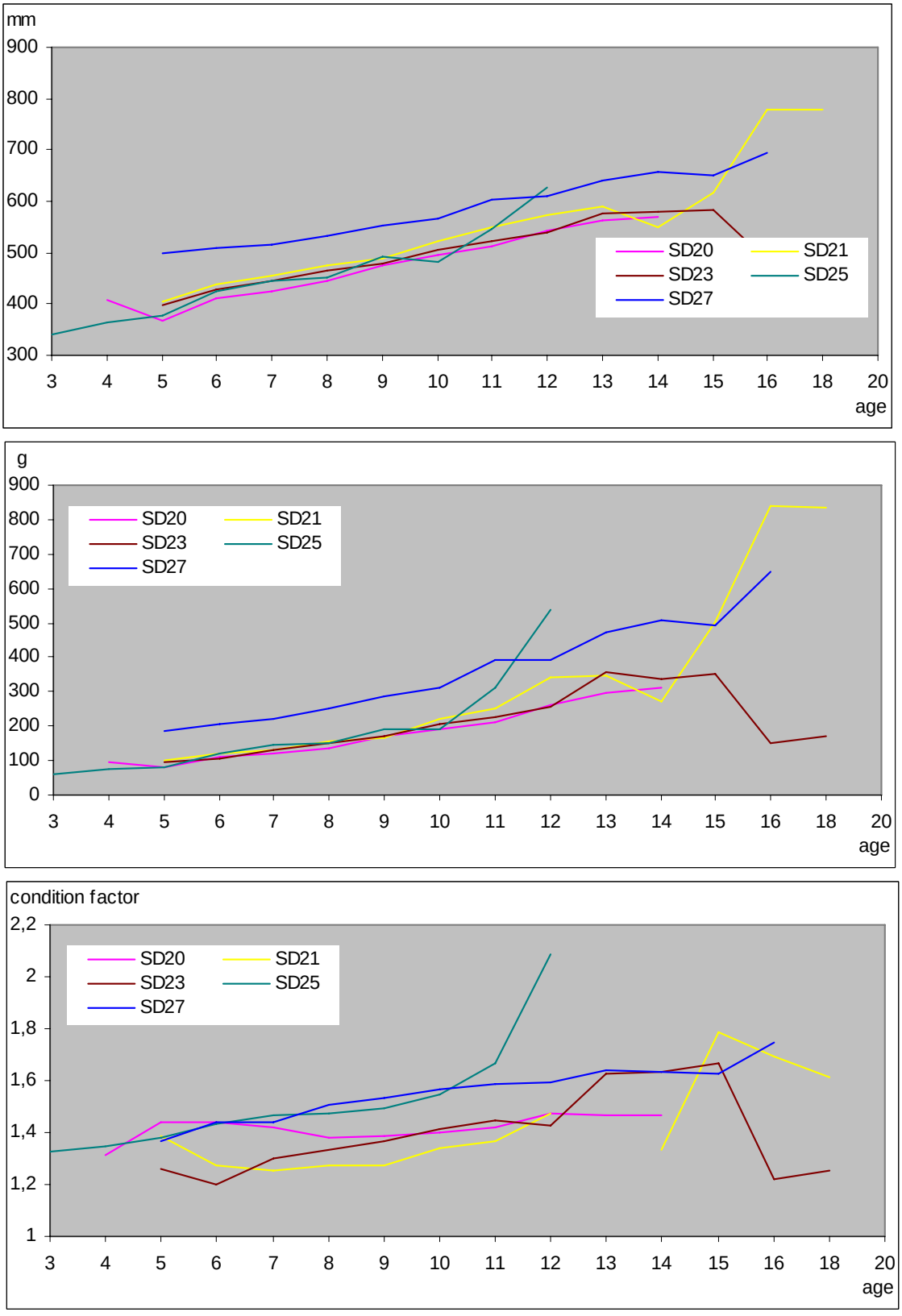


Figure SE.18. Length, weight and condition factor at age of yellow eel from commercial fyke net catches for samples collected in 2005-2006 in RBD SE Västerhavet (ICES SD 20-21) and RBD SE Baltic (ICES SD 25 and 27) .

SE.H.2 Freshwater

In addition to the programme mentioned under SE G.3 no data on catch composition is collected in freshwaters.

SE.I Other biological sampling

SE.I.3 Parasites

The swim bladder parasite (*Anguillicola*) does occur in eels from most sites. All eels dissected at the Swedish Board of Fisheries are analysed macroscopically for the prevalence (at both Institutes involved) and intensity (at the Institute of Freshwater Research only) of *Anguillicola* in their swim bladders. The prevalence in coastal waters in 2002-2005 was close to 10% in the marine habitats of RBD 5 and about 60% in the central parts of RBD 4. The straight between Sweden and Denmark (Öresund, SD 23) took an intermediate position.

Prevalence of *Anguillicola crassus* is a mandatory variable in all coastal sampling of eel in Sweden, including the DCR sampling. The rate of infestation in the pooled data from 2002-2006 was less than 15% in the most marine areas, 47% in Öresund and close to 60 in the Baltic sites.

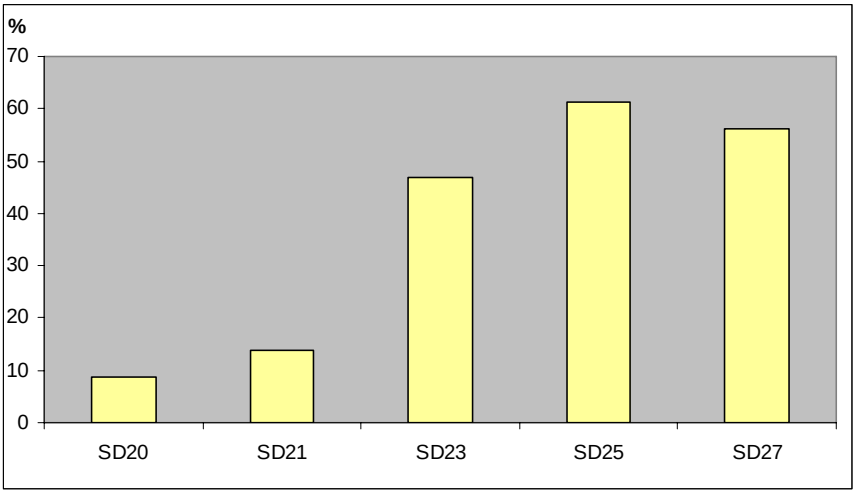


Figure SE.19. Prevalence of the swimbladder parasite (*Anguillicola crassus*) in yellow eel from commercial fyke net catches for samples collected in 2005-2006 in RBD SE Västerhavet (ICES SD 20-21) and RBD SE Baltic (ICES SD 25 and 27)

Table SE.m Prevalence of *Anguillicola crassus* in yellow eel from Swedish coastal waters in 2002-2005. ICES subdivisions 20-21 represent RBD 5, other subdivisions represent RBD 4.

	ICES Subdivision				
	20	**21**	**23**	**25**	**27**
Not infested	723	611	442	475	493
Infested	80	93	361	753	794
Grand Total	803	704	803	1228	1287
Prevalence	**0.10**	**0.13**	**0.45**	**0.61**	**0.62**

Between 2000 and 2007 the Institute of Freshwater Research analysed 3 545 eels from 41 different freshwater sites. Infested eels were found in all sites and the prevalence varied from 37 % to 90 %.

SE.I.4 Contaminants

The National Food Administration in Sweden has analysed both yellow and silver eels sampled in 2000 and 2001 from nine different sites in Sweden with respect to 17 dioxins and furans and 10 dioxin-like PCB congeners (www.slv.se). Pooled samples showed that eels had less than 1 pg TEQ/g fresh weight of sum TCDD/F in muscle (TEQ = Toxic Equivalents, TCDD = C12H4O2Cl4). To this came about 3,8 pg PCB-TEQ/g fresh weight. Silver eels had higher levels than yellow ones. Compared to the other fish species analysed, eels have a higher ratio of PCB to

dioxins. Due to the high costs for this type of analyses only few eels will be sampled regularly in future.

Recently yellow eels from the Sound (between Sweden and Denmark) outside a heavily loaded industrial area in Helsingborg were analysed for dioxins and dioxin-like PCB:s. Pooled samples from 2005 contained 5,7 WHO-PCDD/F-TEQ pg/g and 11 WHO-PCB-TEQ pg/g, both based on fresh weights. In 2006 another five pooled samples from the same area were analysed. The dioxins varied between 0,9 and 4,7 with an average of 2,2 WHO-PCDD/F-TEQ pg/g. The PCB:s varied between 3,9 and 12,7 with an average of 6,6 WHO-PCDD/F-PCB-TEQ (Source: SLV (The National Food Administration)). At some sites the level of dioxins in eel muscle exceeded by that the 4 p/g level of dioxins or the 12 pg/g level of summed up dioxins and dioxin-like PCBs, set as maximum allowed levels in eel by the Commission of the European Communities.

Recent analyses of mercury (Hg) in eels from a number of lakes did show very low levels.

SE.I.5 Predators

Cormorants

Cormorants are believed to predate substantially on eels. As about 2 900 young eels stocked in Lake Ymsen 1998-2000 were equipped with PIT-tags in the spring 2004 we took the opportunity to scan the ground below the only cormorant colony in that lake for tags. In total 30 PIT-tags were found corresponding to a minimum loss by cormorant predation of 1 %.

An extensive study of the stomach content of cormorants at three sites along the Kattegat-Skagerrak coast revealed that eels were taken by about 5 % of the cormorants. That was equivalent to about 1 % of their diet. Although the low percentage, it corresponds to a total annual predation of 310 000 yellow eels, i.e. one fourth of the commercial catch on this coast (Lunneryd & Alexandersson 2005).

Seals

Along the Swedish West Coast there is substantial damage on eel fyke-nets done by harbour seal (*Phoca vitulina*) Königson *et al*. 2006. The cost of the damage estimates to several percent (up to 18 %) of the catch (Königson *et al* 2003). There are circumstances that indicate that the raiding seals are a minor part of the population. It is shown that those seals have strong preference for eel compared with cod or flatfish in the fyke nets (Königson *et al* 2006). Old diet studies indicate that a “normal” seal seldom eat eel (Härkönen & Heide-Jørgensen 1991) but obvious is that the specialised seals that damage the fyke nets cause an additional mortality on the eel population of several percent of the catches.

There is only one minor diet study of grey seals (*Halichoerus grypus*) in the Baltic proper. The material consists of fish remains from 54 stomachs and intestines which reflect maximum one day’s food. Remains were found from two eels (Lundström *et al.* in press). It is from those figures impossible to calculate an accurate figure of how important eels are fore the grey seals.

SE.J Other sampling

SE.J.2 Obstacles to eel migration

During 2005 and 2006 an inventory of obstacles for eels migrating both up- and downstream was performed. Not only are the obstacles as such studied but also the occurrence of fish passes, by-passes, deflecting screens, etc. and their suitability for eels. The purpose is to achieve a database to

be used as background when installing new or improving existing eel passes and deflecting devices. Water Courts decisions might be reconsidered with this database as argument.

SE.K Stock assessment

So far the collected data has not by routine been used for stock assessment.

Published mortality estimates from subdivision 20 and 21 (Svedäng 1999) (approximating RBD 5, Västerhavets vattendistrikt ("the North Sea")) have been used in a simple length based mortality rate model to assess the effect of present yellow eel exploitation on spawner escapement in relation to present and estimated past unexploited levels of spawner escapement (Åström & Wickström 2004). The relation between the present and past population levels has been estimated using the longer data series on ascending elvers and young eels, indicating that the present population probably is less than 10 % of the one in the mid-1900s.

An attempt has also been made to use the length sampling from the yellow eel fishery in fives areas in ICES subdivision 25 and 27 (part of RBD 4, Södra Östersjöns vattendistrikt ("the Southern Baltic Sea" or SBAL)) in a catch-at-length analysis to estimate natural and yellow eel fishery induced instantaneous mortality rates, in terms of mortality rate per unit length increment. The result from analyses of a large number of mark recapture studies on silver eels has been used as a rough estimate of the silver eel fishery mortality rate. Data on average length of female silver eels in the subdivisions were also needed for the analyses. Males have been disregarded because of their very low prevalence in Swedish waters. The simple length based mortality rate model has then been used to assess the effect of present yellow and silver eel exploitation on spawner escapement in subdivision 25 and 27 in relation to present and estimated past unexploited levels of spawner escapement (Åström 2004).

The above analyses indicate that the yellow eel exploitation allows at most 15 % of the present possible escapement to the silver eel stage. This applies both to subsections 20 and 21 (~ RBD 5) as well as to subsections 25 and 27 (part of RBD 4), and indicates a severe overexploitation. The silver eel fishery in the latter two subsections then further reduces the spawner escapement by about half, so that only about 7 % of the present possible spawner escapement remains from these subsections. In perspective of past possible spawner escapement this would only amount to less than 0.7 % of the spawner escapement possible in the mid-1900s.

Using additional data on the amounts of yellow and silver eels caught in the different subdivisions have allowed for analyses of the possible effects of fishing restrictions and re-stocking of elvers on spawner escapement using the same conceptual model (Åström 2005).

SE.O. Overview

To some extent Sweden has a good data situation, particularly regarding coastal yellow eels. At the same time much remains to be filled in order to be able to establish a sustainable management in accordance with the EU regulation regarding eel management. The Department of Research and Development of the Swedish Board of Fisheries is currently changing it system for planning and prioritizing hopefully allowing for coherent planning, collection of data and analyses.

SE.P Literature references

CEN 2002 Water analysis-Sampling fish with electricity. CEN/TC 230/WG 2/TG 4 N. Final draft for formal vote.

Degerman, E., Fogelgren, J.E., Tengelin, B. & E. Thörnelöf 1985 Förekomst och täthet av havsöring, lax och ål i försurade mindre vattendrag på svenska västkusten [Occurrence of brown trout, Atlantic salmon and eel in small acidified watercourses on the West Coast of Sweden]. Information från Sötvattenslaboratoriet, Drottningholm. 65 p.

Fiskeriverket 2005 Fiske 2005, en undersökning om svenskarnas fritidsfiske, Fiskeriverket i samarbete med SCB. 89 p. [Fishing 2005, a survey of the Swede's recreational fishing].

Fiskeriverket & Laxforskningsinstitutet 1999 RASKA - Resursövervakning av sötvattensfisk. [English summary: The status of fish populations in inland waters and coastal rivers in Sweden]. Inform.Inst.Freshw.Res., Drottningholm (8). 37 p.

Hagström O. & H. Wickström 1990 Immigration of Young Eels to the Skagerrak-Kattegat Area 1900 to 1989. Int. Revue. Ges. Hydrobiol. 75 86): 707-716.

Härkönen, T., and Heide-Jørgensen, M. P. 1991. The harbour seal *Phoca vitulina* as a predator in the Skagerrak. Ophelia, 34: 191–207.

Königson, S., Lunneryd, S.G., and Lundström, K. (2003) Sälskador i ålfisket på svenska västkusten. En studie av konflikten och dess eventuella lösningar. (The seal-fisheries conflict on the west coast of Sweden. An investigation of the problem and its possible solutions. (In Swedish with an English summary)). *Finfo. Fiskeriverket informerar.* **9**, 1-24. *http://www.fiskeriverket.se/service/publikationer/fiskeriverketinformerar/finfo2003/finfo20039.4.63071b7e10f4d1e2bd380006462.html*

Königson, S., Lundström, K., Hemmingsson, M., Lunneryd, S.G., and Westerberg, H. 2006. Feeding Preferences of Harbour Seals (*Phoca vitulina*) Specialised in Raiding Fishing Gear. Aquatic Mammals, *32*(2), 152-156.

Lunneryd, S.-G. & Alexandersson, K. 2005. Födoanalyser av storskarv, Phalacrocorax carbo i Kattegatt–Skagerrak. Finfo 2005:11. 22p.

SCB (Statistics Sweden) 2005. Vattenbruk 2004 [Aquaculture in Sweden 2004]. Sveriges Officiella Statistik, Statistiska Meddelanden JO60SM0501, 17p.

Svedäng H. 1999 Vital population statistics of the exploited eel stock on the Swedish west coast. Fisheries Research 40: 251-265.

Westerberg, H. 1998a. Oceanographic aspects of the recruitment of eels to the Baltic Sea. Bull. Fr. Pêche Piscic. 349: 177-185.

Westerberg, H. 1998b. The migration of glass-eel and elvers in the Skagerrak and the Kattegatt. ICES CM 1998/N:11, 14 p.

Westerberg H., J. Haamer and I. Lagenfelt 1993 A new method for sampling elvers in the coastal zone. ICES C.M. 1993/M:5, 10p.

Wickström, H. 2002. Monitoring of eel recruitment in Sweden. Volume 2A: Country reports, Northern part: 69-86. In: Monitoring of glass eel recruitment. Dekker, W. (Ed). Netherlands Institute of Fisheries Research, Ijmuiden, The Netherlands, Report C007/02-WD, 256 pp.

www.slv.se 2004 Delrapport 3 - dioxinanalyser av fet fisk från Sverige 2001 – 2002 [Report 3 – analyses of dioxins in fat fish from Sweden 2001 – 2002]
http://www.slv.se/templates/SLV_Page.aspx?id=9624

Åström, M. 2004. "Analyser rörande ålen och ålfisket i svenska kustvatten". Intern rapport inom Fiskeriverket. [Analyses concerning the eel and the eel fishery in coastal waters of Sweden. Internal report of the Swedish Board of Fisheries]

Åström, M. 2005. Spawner escapement from yellow and silver eel fishery. Appendix 3.3. in ICES CM 2005/I:01, Report on the ICES/EIFAC Working Group on Eels, Galway (WGEEL), 22-26 November 2004, Galway, Ireland.

Åström, M. & Wickström, H. 2004. Some management options for the yellow eel fishery on the Swedish west coast. Internal report of the Swedish Board of Fisheries.

Appendix

Table SE.n Commercial landings of eel in Sweden (Kattegat-Skagerrak corresponds to RBD 5 and the data come from the contract notes).

Year	South C. (Baltic Sea)	East C. (Baltic Sea)	Kattegat-Skagerrak	Freshwater	Total Sweden
1925	624	936	155		1715
1926	520	1011	176		1707
1927	642	1216	152		2010
1928	373	509	157		1039
1929	582	644	167		1393
1930	716	596	216		1528
1931	782	497	252		1531
1932	769	701	253		1723
1933	645	704	196		1545
1934	798	830	215		1843
1935	829	880	240		1949
1936	608	818	226		1652
1937	548	931	244		1723
1938	666	969	235		1870
1939	535	988	248		1771
1940	553	974	98		1625
1941	633	926	69		1628
1942	426	592	110		1128
1943	820	648	77		1545
1944	879	1042	79		2000
1945	778	790	96		1664
1946	658	738	116		1512
1947	980	761	169		1910
1948	979	689	194		1862
1949	999	671	229		1899
1950	1109	911	168		2188
1951	962	755	212		1929
1952	791	627	180		1598
1953	1146	879	353		2378
1954	1186	780	140		2106
1955	1599	780	272		2651
1956	714	707	112		1533
1957	1158	856	211		2225
1958	938	642	171		1751
1959	1658	977	154		2789
1960	778	703	165		1646
1961	896	870	300		2066
1962	980	713	215		1908
1963	997	802	272		2071
1964	1303	749	236		2288
1965	749	768	285		1802
1966	748	893	328		1969
1967	646	703	268		1617
1968	713	794	301		1808
1969	622	733	320		1675
1970	476	515	318		1309
1971	545	587	259		1391
1972	425	582	197		1204
1973	419	553	240		1212

1974	322	470	242		1034
1975	494	629	276		1399
1976	283	363	289		935
1977	346	340	303		989
1978	376	385	315		1076
1979	267	404	285		956
1980	371	438	303		1112
1981	243	153	491		887
1982	342	250	569		1161
1983	267	171	735		1173
1984	559	136	378		1073
1985	647	213	280		1140
1986	479	138	234	92	943
1987	439	119	250	89	897
1988	532	190	304	136	1162
1989	447	132	264	109	952
1990	452	119	242	129	942
1991	486	181	285	132	1084
1992	534	162	352	132	1180
1993	550	93	438	129	1210
1994	654	98	630	171	1553
1995	444	79	555	127	1205
1996	564	67	406	97	1134
1997	546	181	513	142	1382
1998	318	50	165	112	645
1999	339	69	186	140	734
2000	286	39	123	113	561
2001	107	123	195	118	543
2002	126	183	222	102	633
2003	115	145	209	96	565
2004	84	134	227	106	551
2005	119	187	211	111	628
2006	125	195	227	123	670

Table SE.o Mean length at age with standard deviation in Swedish samples of yellow eel from commercial fyke net catches in 2002-2005.

Mean length in mm

	SD 20				SD 21				SD 23			SD 25		SD 27	
	Stenungsund				Kullen				Öresund			Valjeviken		Simpevarp	Kvädöfjärden
	2002	2003	2004	2005	2002	2003	2004	2005	2003	2004	2005	2003	2004	2004	2004
3												336	341		
4		403		407								357	385		
5	396	342		376	403	374	423	428		399	409	369	381	499	
6	378	375	375	396	429	427	449	447	464	444	412	413	435	526	413
7	419	396	441	436	446	447	463	465	432	418	471	414	466	535	485
8	416	418	471	466	451	462	484	499	460	448	491	444	461	549	525
9	459	428	478	513	454	500	501	508	485	457	504	496	484	564	545
10	436	496	484	572	492	525	511	576	508	497	524	477	492	591	553
11	493	502	497	565	541	549	546	590	534	512	527	529		654	559
12	484		543	668	523	524	655	654	521	566	524	628		639	599
13	523	561	573	711		576	561	635	579	562	614			675	609
14	475		547		496	604	565	614	582	568	589			682	645
15					726	512			585	606	568			693	624
16				617										678	
17															
18						778									
20															778

Standard Devation

	SD 20				SD 21				SD 23			SD 25		SD 27	
	Stenungsund				Kullen				Öresund			Valjeviken		Simpevarp	Kvädöfjärden
Age	2002	2003	2004	2005	2002	2003	2004	2005	2003	2004	2005	2003	2004	2004	2004
3												72	37		
4		-		19								37	42		
5	-	20		30	91	18	14	17		61	80	28	33	62	
6	45	45	49	30	61	64	18	35	49	68	22	55	37	45	41
7	38	53	44	53	65	51	51	34	44	40	61	34	55	64	56
8	49	66	44	60	59	56	44	60	33	50	41	33	54	72	50
9	70	54	46	56	39	78	43	69	48	50	53	48	37	62	59
10	56	67	49	51	74	70	71	68	64	56	50	49	43	62	67
11	62	48	32	55	59	70	49	57	41	63	64	111		87	61
12	26		34	67	72	63	102	49	38	77	92	-		100	60
13	95	80	41	-		70	-	-	15	98	64			58	58
14	-		2		56	-	101	-	15	6	16			68	82
15					-	-			-	-	-			112	38
16				-										-	
17															
18						-									
20															-

SE.F

Table SE.p Time trends in pound net catches of silver eel in four subareas in Swedish RBD Southern Baltic.
The subareas are all located in ICES subdivision 27 on the Swedish coast of the Baltic Proper.
(antal per redskap och dygn)

	N Kalmarsund	S Östergötland	N Småland	N Östergötland
1959	553			
1960	797			
1961	871			
1962	812			
1963	886			
1964	646			
1965	712			
1966	774			
1967	509			
1968	526			
1969	392			
1970	335			
1971	401			
1972	444		3,4	2,8
1973	301		4,8	2,3
1974	416		4,6	3,2
1975	313		5,1	3,4
1976	278		3,9	2,4
1977	257		4,9	2,1
1978	392		5,5	2,0
1979	434		4,3	2,6
1980	279		5,4	2,8
1981	199		3,6	2,4
1982	263		6,0	3,9
1983	268		5,6	2,2
1984	305		5,1	1,7
1985	321		7,0	3,9
1986	282		3,5	2,2
1987	315		5,4	1,8
1988	350		8,7	3,3

1989	175	5,2	2,4		
1990	258	3,3	2,0		
1991	391	5,7	2,9		
1992	500	6,8	4,1		
1993	218	5,4	1,9		
1994	241	8,4	2,4	5,5	
1995	185	4,9	2,0	3,9	
1996	57	5,7	1,0	3,4	
1997	364	6,4	1,4	4,5	
1998	149	5,3	1,2	1,4	
1999	411	6,4	1,3	3,1	
2000	374	4,7	0,9	2,4	
2001	455	6,6	2,2	2,7	
2002	460		2,0	2,6	
2003			1,6	1,5	
2004			1,7	1,3	
2005			2,9	2,3	
2006			1,8	1,7	

Figure SE.x Time trends in cpue and effort for fyke net catches of silver and yellow eel in two subareas in Swedish RBD Southern Baltic. The subareas are all located in ICES subdivision 27 on the Swedish coast of the Baltic Proper. Northern part of the county of Kalmar and southern part of the county of Östergötland. (effort = unit gear*days)

N Kalmar	CPUE				
	silver eel (n)	silver eel (kg)	yellow eel (n)	yellow eel (kg)	effort
1979	0,01	0,00	0,19	0,11	5569
1980	0,01	0,01	0,18	0,10	6511
1981	0,01	0,01	0,15	0,09	6106
1982	0,01	0,00	0,21	0,12	5655
1983	0,01	0,01	0,17	0,09	5629
1984	0,01	0,01	0,15	0,08	7709
1985	0,00	0,00	0,15	0,09	5240
1986	0,01	0,01	0,08	0,04	2475
1987	0,00	0,00	0,10	0,05	684
1988	0,01	0,01	0,19	0,11	2901

1989	0,03	0,03	0,24	0,12	2488
1990	0,08	0,06	0,32	0,17	3767
1991	0,08	0,07	0,21	0,12	3581
1992	0,11	0,09	0,32	0,18	4138
1993	0,14	0,12	0,34	0,17	4641
1994	0,05	0,05	0,28	0,17	4474
1995	0,04	0,04	0,25	0,13	6755
1996	0,03	0,02	0,17	0,10	8820
1997	0,03	0,03	0,23	0,12	3173
1998	0,03	0,02	0,12	0,06	9104
1999	0,04	0,03	0,19	0,11	4745
2000	0,04	0,03	0,19	0,11	4094
2001	0,05	0,05	0,16	0,09	7808
2002	0,11	0,10	0,25	0,15	2987
2003	0,01	0,01	0,22	0,12	3655
2004	0,03	0,02	0,10	0,06	2766
2005	0,17	0,15	0,13	0,08	4830
2006	0,17	0,15	0,14	0,08	3908

S Östergötland	CPUE				
	silver eel (n)	silver eel (kg)	yellow eel (n)	yellow eel (kg)	effort
1974	0,17	0,12	0,04	0,01	8419
1975	0,06	0,05	0,10	0,04	10088
1976	0,05	0,04	0,06	0,03	6774
1977	0,05	0,04	0,07	0,03	7667
1978	0,03	0,02	0,07	0,03	9355
1979	0,03	0,02	0,08	0,04	10360
1980	0,05	0,04	0,05	0,02	11967
1981	0,03	0,02	0,06	0,03	10713
1982	0,03	0,02	0,08	0,04	7826
1983	0,02	0,02	0,09	0,04	10404
1984	0,03	0,02	0,06	0,03	10860
1985	0,02	0,01	0,08	0,04	11396
1986	0,01	0,01	0,09	0,04	10831
1987	0,01	0,01	0,06	0,03	12131

1988	0,04	0,03	0,10	0,05	10396
1989	0,03	0,02	0,10	0,05	11116
1990	0,05	0,04	0,06	0,03	14508
1991	0,03	0,02	0,10	0,05	6565
1993	0,03	0,02	0,06	0,03	4867
1994	0,03	0,02	0,09	0,05	8667
1995	0,03	0,03	0,06	0,04	5045
1996	0,02	0,02	0,09	0,05	7607
1997	0,04	0,04	0,03	0,02	6961
1998	0,04	0,03	0,02	0,01	6334
1999	0,05	0,05	0,03	0,02	4830
2000	0,04	0,03	0,03	0,02	4858
2001	0,02	0,02	0,04	0,03	3815
2002	0,06	0,05	0,02	0,01	4641
2003	0,05	0,04	0,02	0,02	4123
2004					
2005					
2006	0,09	0,08	0,06	0,03	3157

SE.G

Figure SE.x. Time trend in the yellow eel catches in coastal fish monitoring with fyke nets in August on the Swedish west coast. RBD SE Baltic (Barsebäck) and RBD Västerhavet (others). Annual mean water temperature at the fishing gears is presented for the Vendelsö area in central Kattegat.

	numbers/fyke net*day						
	Barsebäck	Kullen	Vendelsö	Hakefjorden	Lysekil	Fjällbacka	Temperature
1976			0,29				
1977			0,05				
1978			0,08				
1981			0,13				
1982			0,18				
1983			0,19				
1984			0,38				
1985			0,44				

1986			0,57			
1987			0,49			
1988	0,80		0,64			20,6
1989	0,69		0,63			17,1
1990	1,10		0,26			20,1
1991	1,24		0,77			19,2
1992	0,80		0,33			18,4
1993	0,43		0,47			16,4
1994	1,08		1,69			22,1
1995	1,56		0,77			19,7
1996	1,02		0,23			18,4
1997	1,02		0,23			20,3
1998	0,35		0,19		1,02	16,8
1999	1,46		0,32			20,2
2000	0,55		0,29		0,48	17,3
2001	0,47		0,61		0,77	18,7
2002	0,92	0,63	1,44	0,73	2,76	1,77	20,9
2003	0,59	1,17	1,22	1,23	1,36	1,24	19,3
2004	0,47	0,41	2,09	0,39	1,13	0,88	20,7
2005	0,34	0,37	1,03	0,37	0,38	1,01	18,1
2006	0,77	1,01	1,37	0,84		0,86	21,4
2007	1,24			0,14		0,78	

Table X. Annual indices of glass eel recruitment at the intake canal for cooling water to reactors 1 and 2 at the Ringhals nuclear power plant. Mean of weekly means of numbers of glass eels collected with a modified Isaaks-Kidd midwater trawl during March and April (weeks 9-18). Data were corrected for variations in water flow.

week	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2
3	3													1												
4	0							17			1			4					0							
5	4							8		15	14	18	30	5	4	0	0	1	0	74	2	27	6		20	
6								28		27	13	56	45	7	11	0	1	1	0	142	0	86	5	1	12	
7								6		22	9	85	331	7	41	0	22	9	8	267	3	154	2	2	62	
8	1							34		57	3	44	57	8	48	11	3	50	12	115	5	327	5	0	22	
9	187		51			3		36	342	185	3	160	55	3	172	0	68	125	62	344	5	117	5	1	15	

10	199	24				2		80	372	150	15	471	118	7	224	4	200	100	121	377	3	200	10	3	10
11	250	130	528	176		4		19	129	150	88	290	130	610	333	13	198	8	72	533	22	366	44	3	39
12	374	806	835	289	14	6	2	16	107	145	42	469	535	400	569	25	60	177	158	214	24	530	53	18	162
13	1886	1258	265	122	109	1	0	72	291	251	110	562	495	1430	331	60	42	220	2	479	16	59	185	35	153
14	2093	1335	469	181	0	3	31	149	121	351	138	151	403	1236	625	33	77	448	314	942	22	185	192	65	162
15	1849		878	112	878		141	603	67	284	414	298	540	1145	91	128	201	237	377	154	45	184	151	55	202
16			925		476		69	416	42	120	254	142	527	619	64	73	49	96	79	299	25	53	74	90	286
17	804		477	171	350		6	127		37	193	231	564	278	80	56	44	202	141	257	128	8	84	32	66
18	0					297	114				124	55					230	31				9	46	8	10
mean 9-18	849	711	553	175	305	45	52	169	184	186	138	283	374	636	277	44	117	164	147	400	32	171	84	31	110

SE.H.silver

Table SE.x Length composition of silver eel from commercial pound net catches in samples collected in 2005-2006 in RBD

RBD SE Baltic (ICES SD 23, 24, 25 and 27).

	ICES Subdivision			
cm-class	SD 23	SD 24	SD 25	SD 27
38	3			
39				
40				1
41				
42	4			
43	3			
46	2			
48	2			
50	2	1		
51	3			
52	7	2	2	
53	5			
54	15	1		
55	12	4	7	1
56	18	3	5	

57	17	5	3	
58	18	1	4	
59	13	4	7	5
60	13	3	9	3
61	16	5	12	1
62	24	10	16	4
63	22	10	10	4
64	16	8	19	1
65	17	11	31	6
66	15	10	24	6
67	19	6	28	8
68	18	8	39	9
69	14	8	40	14
70	10	12	32	18
71	13	3	44	17
72	12	3	29	24
73	15	7	43	17
74		6	35	27
75	3	6	27	22
76	13	4	20	30
77	4	4	29	38
78	6	5	22	24
79	1	7	22	29
80	8		14	19
81	3	4	16	22
82	3	1	12	25
83	4	2	15	24
84	4	1	12	12
85	2	1	8	16
86	3	3	5	9
87	2		4	7
88	1		4	9
89	2	1	2	1
90	2		2	3
91	1			2
92	1			2
93			3	2

94				1
95			1	
96	1	1	1	1
102				1
Total	412	171	658	465

Table SE X. Swedish sampling of silver eel in commercial catches with pound nets.
Number of samles

	Year of catch	
	2005	2006
SD 23	206	206
SD 24	72	99
SD 25	299	353
SD 27	312	149
Totalt	894	810

	Year of catch	
Number of ages	2005	2006
SD 23	200	200
SD 24	71	
SD 25	292	198
SD 27	236	
Total	799	398

Table SE.x Average age of silver eel from commercial pound net catches in samples collected in 2005-2006 in RBD
SE Baltic (ICES SD 23, 24, 25 and 27).

	Year of catch		
	2005	2006	Totalt
SD 23	11,6	10,4	11,0
SD 24	12,3		12,3
SD 25	12,0	12,1	12,0
SD 27	13,8		13,8

Totalt	12,4	11,3	12,0

Table SE.x Length at age of silver eel from commercial pound net catches in samples collected in 2005-2006 in RBD SE Baltic (ICES SD 23, 24, 25 and 27). s = standard deviation.

	Age																	
	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
SD 23	536	640	614	612	616	636	648	681	691	711	696	679	657	685	828			
s	*104*	*118*	*107*	*88*	*88*	*92*	*83*	*98*	*97*	*103*	*78*	*72*	*51*	*81*				
SD 24				629	632	646	721	703	694	752	662	701	732	829	857	730		
s				*47*	*36*	*64*	*109*	*76*	*78*	*56*	*148*	*49*	*120*	*45*				
SD 25	654	593	645	702	677	683	688	708	709	743	735	727	755	793	753	780		
s	*37*		*33*	*63*	*61*	*59*	*61*	*65*	*64*	*63*	*53*	*58*	*54*	*94*		*33*		
SD 27				839	704	740	759	740	758	775	772	783	805	825	758	790	828	833
s					*87*	*88*	*62*	*66*	*71*	*50*	*68*	*45*	*51*	*62*	*55*	*75*	*70*	
Total	587	636	622	634	640	665	686	706	717	748	734	744	755	773	776	779	828	833
s	*100*	*113*	*92*	*94*	*81*	*83*	*79*	*79*	*81*	*71*	*77*	*67*	*72*	*94*	*58*	*49*	*70*	

Table SE.x Weight at age of silver eel from commercial pound net catches in samples collected in 2005-2006 in RBD SE Baltic (ICES SD 23, 24, 25 and 27). s = standard deviation.

	Age																	
	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
SD 23	333	567	520	470	479	527	542	659	713	743	667	615	562	608	987			
s	*194*	*267*	*309*	*225*	*214*	*282*	*225*	*340*	*312*	*347*	*238*	*223*	*102*	*174*				
SD 24				481	542	577	878	721	703	914	720	685	792	1051	1308	662		
s				*163*	*84*	*256*	*509*	*246*	*230*	*265*	*507*	*145*	*361*	*50*				
SD 25		407	522	694	658	660	676	724	719	817	762	758	871	1007	756	853		
s	*104*		*103*	*142*	*182*	*201*	*201*	*214*	*219*	*241*	*163*	*230*	*269*	*342*		*96*		
SD 27				1143	685	865	886	836	908	941	978	1008	1056	1091	846	877	1112	1177
s					*318*	*280*	*272*	*247*	*267*	*203*	*282*	*197*	*280*	*236*	*218*	*312*	*298*	
Total	447	554	521	527	548	612	671	726	770	852	810	847	881	912	903	845	1112	1177
s	*207*	*258*	*263*	*244*	*214*	*263*	*270*	*268*	*274*	*262*	*274*	*259*	*293*	*310*	*237*	*187*	*298*	

Table SE.x Somatic condition at age of silver eel from commercial pound net catches in samples collected in 2005-2006 in RBD

SE Baltic (ICES SD 23, 24, 25 and 27). s = standard deviation.

	Age																	
	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
SD 23	1,87	1,89	1,94	1,84	1,85	1,82	1,83	1,86	1,96	1,88	1,84	1,80	1,92	1,81	1,68			
s	*0,21*	*0,26*	*0,38*	*0,18*	*0,20*	*0,20*	*0,18*	*0,21*	*0,30*	*0,22*	*0,25*	*0,25*	*0,32*	*0,17*				
SD 24				1,80	2,03	1,90	2,01	1,88	1,93	1,93	2,04	1,85	1,87	1,78	1,98	1,63		
s				*0,24*	*0,17*	*0,35*	*0,28*	*0,20*	*0,26*	*0,33*	*0,34*	*0,14*	*0,03*	*0,18*				
SD 25	2,04	1,88	1,86	1,89	1,98	1,93	1,93	1,90	1,87	1,86	1,81	1,84	1,90	1,88	1,70	1,72		
s	*0,15*		*0,12*	*0,10*	*0,19*	*0,21*	*0,18*	*0,19*	*0,19*	*0,17*	*0,15*	*0,17*	*0,23*	*0,22*		*0,16*		
SD 27				1,84	1,77	1,97	1,88	1,91	1,93	1,91	1,98	1,97	1,91	1,84	1,83	1,65	1,86	1,94
s					*0,21*	*0,13*	*0,20*	*0,17*	*0,17*	*0,18*	*0,22*	*0,19*	*0,26*	*0,22*	*0,21*	*0,14*	*0,01*	
Total	1,95	1,89	1,92	1,85	1,90	1,88	1,90	1,89	1,92	1,88	1,89	1,90	1,90	1,83	1,81	1,69	1,86	1,94
s	*0,20*	*0,24*	*0,32*	*0,17*	*0,20*	*0,21*	*0,20*	*0,19*	*0,22*	*0,19*	*0,22*	*0,20*	*0,23*	*0,19*	*0,19*	*0,14*	*0,01*	

SE.H.yellow

Table SE.x Length composition of yellow eel from commercial fyke net catches in samples collected in 2002-2006 in RBD SE Västerhavet (ICES SD 20-21) and RBD SE Baltic (ICES SD 23,25 and 27). Samples from subdivisions 25 and 27 are based on an unsorted mixture of landings and discard.

	ICES Subdivision				
cm-class	SD 20	SD 21	SD 23	SD 25	SD 27
26				1	
27					
28	1			1	
29				2	
30	1		1	2	
31	2		1	5	
32	11		2	6	
33	14	3	1	9	
34	25	2	4	19	
35	29	3	5	19	
36	49	11	9	19	
37	85	15	15	39	

38	96	16	23	34	3
39	119	42	29	47	1
40	110	34	33	58	4
41	127	42	35	54	11
42	117	57	33	60	8
43	114	49	56	49	14
44	96	70	59	67	29
45	119	60	63	62	26
46	105	48	50	56	40
47	78	44	51	53	63
48	85	46	65	62	56
49	97	39	46	47	89
50	70	37	67	57	68
51	55	45	40	40	90
52	60	39	55	37	93
53	56	27	41	32	104
54	44	19	35	42	106
55	32	20	31	23	104
56	29	21	37	29	98
57	29	15	25	29	88
58	27	12	17	18	110
59	17	8	24	28	98
60	25	9	10	19	98
61	15	14	7	12	108
62	17	14	10	15	80
63	12	10	6	6	89
64	11	10	1	10	74
65	8	4	5	12	67
66	1	4		9	51
67	6	3	2	6	54
68	2	5	1	5	58
69	1		1	3	45
70				5	37
71	1	1	1	3	30
72	1	2	1	5	27
73	2	1	1	2	25
74				5	12

75				1	15
76			1		10
77	1	2		1	17
78		1		1	4
79				1	7
80+	0	1	0	2	19
Total	2002	905	1000	1229	2230

Table SE.x Annual mean age of yellow eel from commercial fyke net catches in samples collected in 2002-2006 in RBD SE Västerhavet (ICES SD 20-21) and RBD SE Baltic (ICES SD 23,25 and 27). Samples from subdivisions 25 and 27 are based on an unsorted mixture of landings and discard. s = standard deviation. Year of catch

	Year of catch					
	2002	2003	2004	2005	2006	Total
SD20	9,0	8,9	9,6	8,7		8,9
s	*1,69*	*1,65*	*1,80*	*1,91*		*1,86*
SD21	8,7	8,2	8,7	7,9	9,2	8,4
s	*2,03*	*2,28*	*1,99*	*2,04*	*1,96*	*2,11*
SD23	8,6	9,6	9,4	8,9		9,1
s	*2,15*	*1,95*	*1,73*	*1,85*		*1,91*
SD25		7,2	6,8			7,0
s		*1,99*	*1,60*			*1,83*
SD27			9,8	10,9		10,1
s			*2,17*	*2,08*		*2,20*

Table SE.x Age distribution of yellow eel from commercial fyke net catches for samples collected in 2005-2006 in RBD Västerhavet (ICES SD 20-21) and RBD SE Baltic (ICES SD 23,25 and 27). Samples from subdivisions 25 and 27 are based on an unsorted mixture of landings and discard. Year of catch guål

	Age															
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	18	20
SD20		4	18	42	90	151	172	119	62	40	20	5		1		
SD21			32	85	94	127	89	81	42	21	12	8	3	1	1	
SD23			11	25	71	123	131	104	60	38	13	7	4	1	1	
SD25	7	13	18	36	44	37	28	9	4	1						
SD27			4	14	39	90	96	91	98	65	41	19	16	4		1
Total	7	17	83	202	338	528	516	404	266	165	86	39	23	7	2	1

Table SE.x Length at age of yellow eel from commercial fyke net catches for samples collected in 2005-2006 in RBD Västerhavet (ICES SD 20-21) and RBD SE Baltic (ICES SD 23,25 and 27). Samples from subdivisions 25 and 27 are based on an unsorted mixture of landings and discard. s = standard deviation.

	Age															
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	18	20
SD20		407	369	412	426	444	476	495	513	543	563	570		617		
		11,6	*37,2*	*40,9*		*56,9*	*65,1*	*65,6*	*56,6*	*68,0*	*73,8*	*71,3*				
s		*3*	*6*	*6*	*42*	*1*	*6*	*4*	*4*	*8*	*6*	*4*				
SD21			405,4	439,4	455,1	475,1	490,1	522,4	548,5	572	590,7	550	616,7	777	778	
			32,5	*50,4*	*50,0*	*59,0*	*61,3*	*78,7*	*57,1*	*107,*	*62,8*	*78,6*	*107,*			
s			*7*	*1*	*8*	*1*	*3*	*5*	*8*	*9*	*9*	*9*	*1*			
SD23			397,3	427,3	445,7	464,3	480,2	505,9	522,5	538,7	577,9	580,7	582,5	487	506	
			68,2	*43,6*	*54,3*	*47,3*		*56,2*	*60,7*	*66,7*	*77,1*	*14,6*	*17,3*			
s			*5*	*4*	*1*	*8*	*53,3*	*6*	*6*	*1*	*6*	*7*	*3*			
SD25	339,1	366	376	425	445	453	491	482	547	628						
		39,3	*30,7*		*53,9*	*45,9*		*45,2*								
s	*49,07*	*4*	*8*	*46,7*	*7*	*1*	*43,5*	*8*	*97,7*							
SD27			499,	509,	516	533,	552,	567,	601,	608,	641,	657,	649,	695,		778

			3	6		6	6	2	8	6	6	5	9	5		
s			*50,63*	*59,27*	*65,59*	*59,77*	*63,21*	*61,97*	*80,28*	*66,28*	*61,81*	*69,21*	*60,65*	*78,8*		
Total	339,1	375,4	394,6	434,5	451,1	472,1	494,5	519,3	554	572,1	606,7	610,5	633,8	666,1	642	778
s	*49,07*	*38,9*	*48,48*	*52,64*	*57,44*	*62,74*	*66,41*	*70,5*	*77,47*	*79,06*	*74,78*	*78,95*	*65,55*	*107,1*	*192,3*	

Table SE.x. Weight at age of yellow eel from commercial fyke net catches for samples collected in 2005-2006 in RBD Västerhavet (ICES SD 20-21) and RBD SE Baltic (ICES SD 23,25 and 27). Samples from subdivisions 25 and 27 are based on an unsorted mixture of landings and discard. s = standard deviation.

	Age															
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	18	20
SD20		94,58	81,51	112,1	119,3	135,6	169,9	191,8	213,2	263,9	295,9	310,6		392		
s		*17,87*	*34*	*41*	*41*	*58*	*83*	*89*	*85*	*120*	*126*	*135*				
SD21			99,75	121,1	129,8	154,7	167,8	220,9	248,9	341	348,1	270,2	501	839	833,7	
s			*32*	*71*	*50*	*84*	*80*	*134*	*99*	*263*	*137*	*128*	*386*			
SD23			96	105	130	148	169	206	229	257	358	338	350	149	169,3	
s			*74*	*47*	*65*	*66*	*66*	*82*	*93*	*134*	*165*	*52*	*75*			
SD25	57,86	73,46	79	121	145	150	193	189	310	537						
s	*23,41*	*26,16*	*19*	*44*	*64*	*51*	*61*	*63*	*163*							
SD27			186	208	223	254	286	314	390	392	473	509	493	649		665
s			*62,47*	*67,99*	*95,35*	*106,9*	*114,5*	*113,3*	*188,2*	*140*	*166*	*183,8*	*192,4*	*252,9*		
Total	57,86	78,43	95	123,2	139,8	164,3	192,1	228,8	288,9	324,1	397	407,5	469,4	567,9	501,5	665
s	*23,41*	*25,65*	*44,98*	*62,54*	*67,2*	*86,42*	*95,67*	*113,1*	*156,8*	*166,2*	*168,9*	*180,4*	*206,6*	*288,1*	*469,8*	

Table SE.x Condition factor at age of yellow eel from commercial fyke net catches for samples collected in 2005-2006 in

RBD Västerhavet (ICES SD 20-21) and RBD SE Baltic (ICES SD 23,25 and 27). Samples from subdivisions 25 and 27 are based on an unsorted mixture of landings and discard. s = standard deviation.

	Age															
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	18	20
SD20		1,31	1,44	1,44	1,42	1,38	1,39	1,40	1,42	1,47	1,47	1,47		1,59		
s		*0,19*	*0,25*	*0,20*	*0,21*	*0,18*	*0,20*	*0,19*	*0,18*	*0,22*	*0,18*	*0,29*				
SD21			1,38	1,27	1,25	1,27	1,27	1,34	1,36	1,47		1,33	1,78	1,69	1,61	
s			*0,25*	*0,23*	*0,18*	*0,22*	*0,19*	*0,22*	*0,21*	*0,32*	*0,32*	*0,14*	*0,51*			
SD23			1,26	1,20	1,30	1,33	1,37	1,41	1,44	1,43	1,63	1,63	1,66	1,22	1,25	
s			*0,15*	*0,19*	*0,18*	*0,20*	*0,19*	*0,19*	*0,18*	*0,23*	*0,22*	*0,21*	*0,22*			
SD25	1,33	1,35	1,38	1,43	1,47	1,47	1,49	1,55	1,67	2,08						
s	*0,05*	*0,11*	*0,13*	*0,13*	*0,20*	*0,16*	*0,14*	*0,19*	*0,06*							
SD27			1,37	1,44	1,44	1,51	1,54	1,57	1,58	1,59	1,64	1,63	1,63	1,75		1,34
s			*0,11*	*0,16*	*0,16*	*0,16*	*0,16*	*0,20*	*0,17*	*0,18*	*0,19*	*0,19*	*0,21*	*0,23*		
Totalt	1,327	1,339	1,379	1,338	1,357	1,371	1,395	1,433	1,481	1,513	1,582	1,554	1,654	1,641	1,433	1,338
s	*0,05*	*0,12*	*0,21*	*0,22*	*0,21*	*0,21*	*0,20*	*0,21*	*0,20*	*0,24*	*0,22*	*0,23*	*0,25*	*0,25*	*0,25*	

SE.I

Table SE.x Prevalence of *Anguillicola crassus* in yellow eel from commercial fyke net catches for samples collected in 2005-2006 in RBD Västerhavet (ICES SD 20-21) and RBD SE Baltic (ICES SD 23,25 and 27). Samples from subdivisions 25 and 27 are based on an unsorted mixture of landings and discard.

	Not infested	Infested	Total	Prevalence
	n	n	n	%
SD20	1829	173	2002	9
SD21	782	124	906	14
SD23	530	470	1000	47
SD25	476	753	1229	61
SD27	975	1255	2230	56
Total	4592	2775	7367	38

SE.11

	Number of glass eels per m2	
1991	0,000887	
1992	0,003287	
1993	0,007485	
1994	0,012144	
1995	0,008874	
1996	0,000702	
1997	0,000653	
1998	0,0019	
1999	0,00297	
2000	0,010742	
2001	0,000516	
2002	0,002831	
2003	0,001771	
2004	9,94E-05	
2005	0,002121	
2006	0,000815	
2007	0,000173	provisional value

SE.13

Underlag vid körning av ålförekomst ostkusten ICES-rapport 2005 (körning i januari 2006)

Case Processing Summary

		Cases					
		Valid		Missing		Total	
	YEAR	N	Percent	N	Percent	N	Percent
ÅLKLASS	1990	39	100,0%	0	,0%	39	100,0%
	1991	34	100,0%	0	,0%	34	100,0%
	1992	47	100,0%	0	,0%	47	100,0%
	1993	98	100,0%	0	,0%	98	100,0%
	1994	115	100,0%	0	,0%	115	100,0%
	1995	180	100,0%	0	,0%	180	100,0%

1996	98	100,0%	0	,0%	98	100,0%
1997	121	100,0%	0	,0%	121	100,0%
1998	186	100,0%	0	,0%	186	100,0%
1999	156	100,0%	0	,0%	156	100,0%
2000	113	100,0%	0	,0%	113	100,0%
2001	108	100,0%	0	,0%	108	100,0%
2002	177	100,0%	0	,0%	177	100,0%
2003	155	100,0%	0	,0%	155	100,0%
2004	126	100,0%	0	,0%	126	100,0%
2005	111	100,0%	0	,0%	111	100,0%

Underlag för körning av ålförekomst ICES-rapport 2006 (körning i juli 2007)

Case Processing Summary

		Cases					
		Valid		Missing		Total	
	YEAR	N	Percent	N	Percent	N	Percent
Eel occurrence (%)	1990	39	100,0%	0	,0%	39	100,0%
	1991	34	100,0%	0	,0%	34	100,0%
	1992	47	100,0%	0	,0%	47	100,0%
	1993	98	100,0%	0	,0%	98	100,0%
	1994	115	100,0%	0	,0%	115	100,0%
	1995	180	100,0%	0	,0%	180	100,0%
	1996	98	100,0%	0	,0%	98	100,0%
	1997	121	100,0%	0	,0%	121	100,0%
	1998	186	100,0%	0	,0%	186	100,0%
	1999	156	100,0%	0	,0%	156	100,0%
	2000	113	100,0%	0	,0%	113	100,0%
	2001	108	100,0%	0	,0%	108	100,0%
	2002	178	100,0%	0	,0%	178	100,0%
	2003	155	100,0%	0	,0%	155	100,0%
	2004	160	100,0%	0	,0%	160	100,0%
	2005	192	100,0%	0	,0%	192	100,0%
	2006	162	100,0%	0	,0%	162	100,0%