ESTONIAN FISHERY 2011

FISHERIES INFORMATION CENTRE

Original title:
Armulik, T., Sirp, S. (koost.). 2012.
Eesti kalamajandus 2011. Pärnu:
Kalanduse teabekeskus, 99 lk.
ISSN 2228-1495

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Cover photo by: Aimar Rakko

Translation: Päevakera Ltd.

Issued by:
Fisheries Information Centre 2012
www.kalateave.ee

ISSN 2228–1495

EUROOPA
KALANDUSFOND
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Toetab Euroopa Liit

Estonian Fishery
2011

Fisheries Information Centre
Pärnu 2012

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Foreword

Dear reader,

This book contains data that characterise the state of Estonian fisheries in 2011 with a focus on comparing them with the situation in 2010. There is also an emphasis on comparison with data from earlier, albeit to a lesser extent, as the book "Estonian Fishery 2010" published last year provided an overview of, among others, the periods that had not been covered in previous years. We have still sought to present previous years' data in the tables and graphs, as the previous publication may no longer be available to all interested parties.

As in previous years, conditions were not favourable for our fishermen in 2011. In the context of the overall decline in fish stocks, the quotas of the main trawling targets – sprat and herring – were reduced to the lowest level in recent years. The sprat quota was just 36,734 tonnes, which is almost a quarter less than the year before, and the herring quota, including coastal fishing, amounted to 27,978 tonnes. To some extent the decline in catches was offset by a rise in first sales prices. On the other hand, fuel, energy and labour costs increased. Against this background, credit must be given to Estonian fishermen who continue to pursue this traditional activity in spite of the difficulties and, if our own fish stocks are not sufficient, buy some of their quota from our northern neighbours.

Also, in coastal fishery, where the main income is still derived from three fish species – perch, herring and pikeperch – the number of fishermen who are able to earn their living by fishing is diminishing. There is an ever-growing need to look for ways to add value to catches and to find other activities besides traditional fishing.

Despite the difficult times, Estonian fish processing companies were able to increase their total revenue, and most industries closed the financial year with a profit. Optimism has also been boosted by the fact that after a lull of several years the number of fish processing companies grew in 2011.

While the hot summer of 2010 was disastrous for many fish farms in Estonia, 2011 was a time to start over. This pushes the accomplishment of the strategic goal of a quantitative leap in production volume into an even more distant future. At the same time, companies engaged in aquaculture are continuously being modernised and fish farms based on flow-through and re-use of water are being established with the help of the European Fisheries Fund and local investments. Thus, the production volume should start increasing.

I hope that this publication will help provide an overview of the state of fishery as one of Estonia's most important and traditional fields of activity in 2011 and deepen respect for the people who make a living in this sector in such a harsh environment.

Toomas Armulik
Head of Fisheries Information Centre

Abbreviations

B_{lim}	the limit on biomass, reaching which should be prevented by fisheries management, as below this level the risk of stock collapse increases significantly
CPUE	catch per unit effort
EFF	European Fisheries Fund
EIER	Estonian Institute of Economic Research
EULS	Estonian University of Life Sciences
EU	European Union
F	fishing mortality rate
F_{med}	the fishing mortality rate that secures a balanced ratio of spawning stock and recruitment
F_{MGT}	international management plan-based fishing mortality rate target level
F_{MSY}	maximum fishing mortality for sustainable yield
F_{PA}	sustainable mortality rate, i.e. maximum sustainable exploitation intensity (fishing mortality precautionary approach)
F_{sq}	fishing mortality status quo
GT	gross tonnage
ICES	International Council for the Exploration of the Sea
EIC	Environmental Investment Centre
MoE	Ministry of the Environment
M	natural mortality
NAFO	Northwest Atlantic Fisheries Organization
NEAFC	North-East Atlantic Fisheries Commission
NIPAG	Joint NAFO/ICES Pandalus Assessment Working Group
MoA	Ministry of Agriculture
ARIB	Agricultural Registers and Information Board
RFMO	Regional Fisheries Management Organisation
SE	Statistics Estonia
SL	standard length; the length of a fish measured from the tip of the snout to the end of scale cover
SSB	spawning stock biomass
STECF	European Commission's Scientific, Technical and Economic Committee for Fisheries
TAC	total allowable catch
TL	total length; the length of a fish measured from the tip of the snout to the end of the caudal fin
TW	total weight of a fish
UT EMI	Estonian Marine Institute of University of Tartu
Z	total mortality

Distant-water fishery

Distant-water fishery means fishing outside of the Baltic Sea. Distant-water fishing vessels flying the Estonian flag have fishing rights on three fishing grounds: Svalbard, North-West Atlantic (NAFO) and North-East Atlantic (NEAFC). After acceding to the European Union, Estonia retained fishing rights as a member of these international organisations on the basis of the principle of relative stability and as a share of the fishing quota of the European Union (Aps et al, 2005).

Fleet

The distant-water fishing fleet still consists solely of trawlers on board that fish or shrimp undergo primary or final processing. In general, demersal trawls are used. However, pelagic trawls are occasionally used as well. A crew typically consists of around 20 people.

According to the data of the Estonian Fishing Vessel Register, the number and main characteristics of fishing vessels did not change in 2011. The average length of the vessels is 63 metres; the average age is 32 years; the combined power of the vessels' main engines is 12,670 kW; and the combined gross tonnage is 8281 tonnes (Table 1). The number of vessels actually engaged in distant-water fishery remained the same – in 2011 there were five such vessels, owned by two companies.

State of fish stocks and fishing opportunities

The state of fish stocks in the NAFO area is assessed by the Scientific Council of NAFO on the basis of exploratory trips and/or commercial fishing data. NAFO observers on board vessels help collect information on Estonia's commercial fishing. To determine the total allowable catch (TAC), the precautionary approach is applied in the NAFO area, which should ensure the preservation of stocks and the ecosystem. Environmental conditions and interaction of species is increasingly taken into account when assessing stocks, i.e. the ecosystem approach is used. In this context, areas with a higher abundance of corals and sponges have been closed for fishing.

Fishing quotas are agreed between member states at the annual meetings of NAFO and NEAFC. From 2005–2010, vessels flying the Estonian flag could make use of fishing opportunities primarily on NAFO fishing grounds, but also in the NEAFC and Svalbard areas.

Table 1. Main characteristics of Estonian distant-water fishing fleet, 2005–2011

Year	Number of vessels	Combined power of main engines (kW)	Combined gross tonnage (GT)
2005	10	18 605	11 520
2006	11	21 413	12 923
2007	10	19 923	12 215
2008	8	15 634	10 331
2009	6	12 670	8 281
2010	6	12 670	8 281
2011	6	12 670	8 281

Source: MoA

As the stocks of many species are in a poor state, stock recovery plans have been established. For example, a 15-year recovery plan for Greenland halibut was implemented in 2003, and a plan for recovery of cod stocks in NAFO division 3NO was implemented in 2007 (NAFO, 2011). No remarkable progress has been observed in 3NO cod yet, but because it is a long-term plan, recovery can be expected in future. By contrast, the Greenland halibut recovery plan has been successful and fishing quotas increased by 7% in 2011 for this species. The moratorium on fishing also seems to have had a beneficial effect on 3M cod and 3LN redfish stocks, which were prohibited for fishing from 1999–2009 (NAFO, 2011). The state of the stocks of these species continued to improve in 2011, and fishing quotas increased by 82% and 72%, respectively (Table 2).

Species are interrelated through dietary relationships. Improvement of the state of cod and redfish stocks has reduced the shrimp stock, but this is apparently not the only reason for the poor condition of shrimp. Thus, in 2011 a moratorium on fishing for 3M shrimp was implemented in accordance with a recommendation of the Scientific Council, as the stock biomass had decreased below the permissible limit (B_{lim}). This affected our distant-water fishery to a large extent, because Estonia has traditionally caught large quantities of shrimp in division 3M, which accounted for as much as 80% of the shrimp catch of the European Union (Vetemaa, 2008). Therefore, Estonian ships were also fishing in NAFO subareas 0 and 1, where the stock and biomass of shrimp were in good shape in 2011. However, as the biomass has been declining since 2004 and recruitment is low, it has been recommended to reduce catches (NIPAG, 2011). From 2008–2011 the state of shrimp stock also deteriorated in division 3L. In 2010 it was recommended to limit catches and in 2011 fishing quotas were reduced by 36% (Table 2).

Commercial fishing of the following species was prohibited in the NAFO area in 2011: Atlantic cod (*Gadus morhua*) in divisions 3L and 3NO; American plaice (*Hippoglossoides platessoides*) in divisions 3LNO and 3M; witch flounder (*Glyptocephalus cynoglossus*) in divisions 3L and 3NO; capelin (*Mallotus villosus*) in division 3NO; and shrimp (*Pandalus borealis*) in divisions 3NO and 3M (NAFO, 2011a).

The state of fish stocks in NEAFC fishing grounds is assessed by the ICES. Shrimp, redfish and mackerel are the most important species for Estonia in the

Table 2. Estonia's distant-water fishing quotas for 2005–2011, before charter arrangements and quota transfers, in tonnes and fishing days, by fishing ground, and change (%) compared to 2010

Species	Unit	Fishing ground	2005	2006	2007	2008	2009	2010	2011	Change (%) from 2010 to 2011
Shrimp or northern prawn, *Pandalus borealis*, PRA	fishing day	NAFO 3M	1667	1667	1667	1667	1667	834	0	–100
	tonne	NAFO 3L	144	245	245	278	334	334	214	–36
Atlantic redfishes nei, *Sebastes* spp, RED	tonne	NAFO 3M	1571	1571	1571	1571	1571	1571[1]	1571	0
	tonne	NAFO 3LN	0	0	0	0	0	173	297	72
Northern shortfin squid, *Illex illecebrosus*, SQI	tonne	NAFO 3 and 4	128	128	128	128	128	128	128	0
Greenland halibut, *Reinhardtius hippoglossoides*, GHL	tonne	NAFO 3LMNO	380	371	321	321	321	321	345	7
Raja rays nei, *Raja* spp, SKA	tonne	NAFO 3LNO	546	546	546	546	546	485	485	0
Atlantic cod, *Gadus morhua*, COD	tonne	NAFO 3M	0	0	0	0	0	61	111	82
Mackerel, *Scomber scombrus*, MAC	tonne	NEAFC	115	119	135	124	165	107	172	61
Roundnose grenadier, *Coryphaenoides rupestris*, RNG	tonne	NEAFC	77	77	67	67	57	49	43	–12
Black scabbardfish, *Aphanopus carbo*, BSF	tonne	NEAFC	17	17	17	17	15	14	13	–7
Dogfish sharks nei, *Squalidae*, DGX	tonne	NEAFC	10	10	4	2	1[2]	0[3]	0[4]	0
Blue ling, *Molva dypterygia*, BLI	tonne	NEAFC	5	5	4	3	3	3	5	67
Atlantic redfishes nei, *Sebastes spp*, RED	tonne	NEAFC	344	284	210	210	210	210	177	–16
Greenland halibut, *Reinhardtius hippoglossoides*, GHL	tonne	NEAFC	10	8	6	6	4	3	2	–33
Raja rays nei, *Raja* spp, SKA[5]	tonne	NEAFC					8	7	6	–14
Shrimp or northern prawn, *Pandalus borealis*, PRA	fishing day	Svalbard	377	377	377	377	377	377	377	0
Total	tonne		3347	3381	3254	3273	3740	3843	3946	3
	fishing day		2044	2044	2044	2044	2044	1211	377	–69
Change in tonne quotas since 2010	%		–13	–12	–15	–15	–3	0	3	

Sources: MoE and EU Council Regulations (EC) No 1359/2008, 43/2009 and (EU) No 53/2010, 1225/2010, 57/2011

1 Estonia's revised quota was 841 tonnes, as the catches of 2009 exceeded the permitted quantity and the overfished quantity was counted against the quota for 2010.
2 Exclusively for by-catches. No directed fishing for deep-sea sharks is permitted.
3 By-catches are permitted up to 10% of the quotas for 2009.
4 By-catches are permitted up to 3% of the quotas for 2009.
5 Catches of cuckoo ray (*Leucoraja naevus*), thornback ray (*Raja clavata*), blonde ray (*Raja brachyura*), spotted ray (*Raja montagui*), small-eyed ray (*Raja microocellata*), sandy ray (*Leucoraja circularis*) and shagreen ray (*Leucoraja fullonica*) are reported separately. Does not apply to undulate ray (*Raja undulata*), common skate (*Dipturus batis*), Norwegian skate (*Raja* (*Dipturus*) *nidarosiensis*) and white skate (*Rostroraja alba*), which may not be retained on board and must promptly be released unharmed to the extent practicable. Fishermen are encouraged to develop and use techniques and equipment to facilitate the rapid and safe release of these species.

North East Atlantic, as Estonia has higher quotas for these species. In 2011, shrimp was the most important target species; shrimp stocks continued to be in good shape in the NEAFC fishing grounds. Stock indicators had not changed significantly – the fishing mortality rate was low and stable, the biomass index was also stable and close to the mean value of historical biomass levels, while the recruitment index had declined from 2004–2008, but increased again from 2009–2011 (ICES, 2011a).

Stocks of beaked redfish (Sebastes mentella) and golden redfish (Sebastes marinus) are managed separately in the NEAFC area. The stock of both redfish species remained in poor shape in 2011. It has been recommended to avoid directed trawling for this species until an increase in spawning stock biomass and in the abundance of juveniles is observed (ICES, 2011a).

For mackerel (*Scomber scombrus*) a management plan was adopted in 2008, but the plan has not been applied, as there are no effective agreements between the countries involved in the fishery. Mackerel stock was in good condition in 2011, but it has still been recommended to maintain the closed areas and seasons in order to support a continued increase in stocks (ICES, 2011b).

Directed fishing for many deep-water species and skates and rays is prohibited in the NEAFC area.

Assessment and scientific advice concerning stocks in the NAFO area are available on the website of NAFO (www.nafo.int). Materials on NEAFC fishing grounds can be found on the websites of NEAFC (www.neafc.org) and ICES (www.ices.dk, ICES Advice Book).

Estonian vessels can fish for unregulated species in international waters outside of the closed areas. Thus, after a three-year break (2007–2009), one vessel fished for several species of bony fish and squids in the South-West Atlantic in 2010 and 2011. There is no regional fisheries management organisation (RFMO) in the area, and no quotas have been allocated to Estonia there. In addition, Estonian vessels fished for shrimp in the international waters of the Barents Sea in 2011.

Catches and revenue

From 2005–2011, distant-water fishing vessels flying the flag of Estonia only fished in the Atlantic Ocean. Shrimp was the target species for most of these vessels (3), but different fish species and occasionally squid species were also targeted. Besides their own fishing opportunities, Estonian vessels also used the shrimp quotas of the USA, Canada and Greenland in 2011. As in 2010, catches were landed in ports in Canada, Spain, Greenland, Iceland, Uruguay and Norway. In 2011, shrimp (both northern prawn and Aesop shrimp) produced the biggest catches, followed by Argentine hake and redfish (Table 3). As catches increased in the South-West Atlantic, cod failed to make the top four in terms of both catch and revenue, with the species caught in the South-West Atlantic providing higher revenue. Argentine hake from the South-West Atlantic outperforms traditional revenue-generating species like redfish and Greenland halibut (Figure 1).

Table 3. Estonia's distant-water fishery catches (t) by species, 2005–2011

Species	2005	2006	2007	2008	2009	2010	2011
Blue antimora, *Antimora rostrata*			3				
Aesop shrimp, *Pandalus montagui*							858
Argentine shortfin squid, *Illex argentinus*	581	499				42	329
Argentine hake, *Merluccius hubbsi*		700				1125	1395
Patagonian grenadier, *Macruronus magellanicus*		73				135	92
Greenland shark, *Somniosus microcephalus*	9						
Baird's slickhead, *Alepocephalus bairdii*	64	158	9				
Rabbit fish, *Chimaera monstrosa*	4	2					
Atlantic halibut, *Hippoglossus hippoglossus*				3		3	3
American plaice, *Hippoglossoides platessoides*	47	34	33	77	29	9	36
Splendid alfonsino, *Beryx splendens*		4					
Atlantic wolffish, *Anarhichas lupus*				12	5		
Northern prawn, *Pandalus borealis*	12 381	9242	12 076	12 742	8587	9037	9919
Roundnose grenadier, *Coryphaenoides rupestris*	154	104	140				
Mediterranean slimehead, *Hoplostethus mediterraneus*		1					
Haddock, *Melanogrammus aeglefinus*	<1						
Cusk-eels nei, *Genypterus* spp	17	1					
Golden redfish, *Sebastes marinus*		104					
Alfonsinos nei, *Beryx* spp			1				
Pink cusk-eel, *Genypterus blacodes*		22					127
Southern blue whiting, *Micromesistius australis*							<1
Northern shortfin squid, *Illex illecebrosus*		24			5	1	
Atlantic redfishes nei, *Sebastes* spp	1111	1156	1040	1003	1748	1340	1075
Wolffishes nei, *Anarhichas* spp	74	63	10	2			
Hakes nei, *Merluccius* spp	700	6					
Black cardinal fish, *Epigonus telescopus*		<1					
Black dogfish, *Centroscyllium fabricii*		4	6				
Beaked redfish, *Sebastes mentella*		396	684				
Antarctic rockcods, noties nei, *Nototheniidae*	56	127				58	76
Dogfish sharks nei, *Squalidae*	6		3	3		<1	
Patagonian squid, *Loligo gahi*						44	69
Patagonian toothfish, *Dissostichus eleginoides*		<1					
Tadpole codling, *Salilota australis*		32				1	2
Longnose velvet dogfish, *Centroscymnus crepidater*			3				
Witch flounder, *Glyptocephalus cynoglossus*	31	28	24	38	8	11	14
Portuguese dogfish, *Centroscymnus coelolpis*	7	7					
Red hake, *Urophycis chuss*	47	26	2			19	
Roughhead grenadier, *Macrourus berglax*	103	95	69	132	41	93	116
Raja rays nei, *Raja* spp	62	258	366	123	29	228	82
Rays, stingrays, mantas nei, *Rajiformes*	479						
Yellowtail flounder, *Limanda ferruginea*	20	6	25	33		4	13
Blue ling, *Molva dypterygia*	5	3	7				
Black scabbardfish, *Aphanopus carbo*	11	6	7				
Greenland halibut, *Reinhardtius hippoglossoides*	534	373	365	299	300	441	279
Threebearded rockling, *Gaidropsarus ensis*					1	3	
Cod, *Gadus morhua*	33	52	25	73	128	93	105
Spotted wolffish, *Anarhichas minor*						12	
White hake, *Urophycis tenuis*	1		32	19			
Sharks, rays, skates, etc., nei, *Elasmobranchii*		11					
Total	**16 539**	**13 617**	**14 930**	**14 559**	**10 881**	**12 699**	**14 590**

Source: MoA and MoE

Table 4. First sales prices of distant-water fishery species (€ kg^{-1}) in 2011

Species	2011	Species	2011
Argentine hake	2.11	Raja rays nei	2.00
Northern prawn and Aesop shrimp	2.29	Antarctic rockcods, noties nei	1.15
Atlantic redfishes nei	1.52	Argentine shortfin squid	2.18
Greenland halibut	4.95	American plaice	2.02
Pink cusk-eel	4.43	Roughhead grenadier	0.35
Cod	3.63	Yellowtail flounder	2.51
Patagonian squid	2.45	Witch flounder	1.13
Patagonian grenadier	1.58	Tadpole codling	0.89

Source: UT EMI

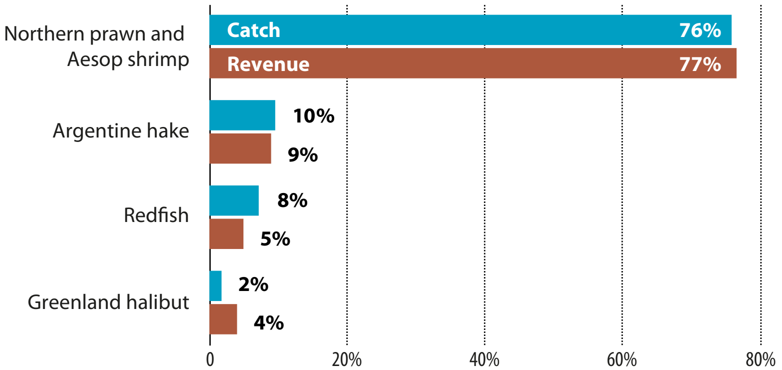
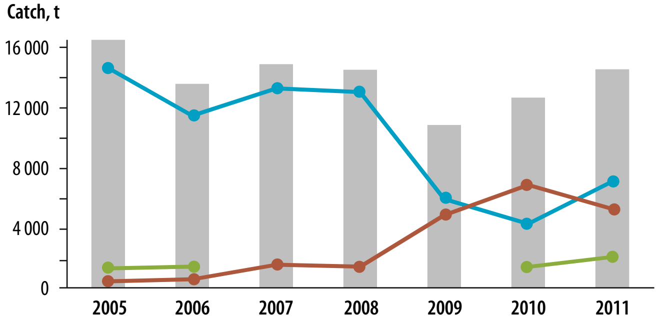


Figure 1. Proportion (%) of catch and revenue by main species in distant-water fishery sector in 2011. Source: MoA, UT EMI



	2005	2006	2007	2008	2009	2010	2011
Total	16 539	13 617	14 930	14 559	10 881	12 699	14 590
North West-Atlantic	14 690	11 515	13 332	13 086	5 979	4 329	7 146
North East Atlantic	494	633	1 598	1 473	4 903	6 906	5 318
South West Atlantic	1 355	1 469				1 464	2 126

Figure 2. Estonia's total distant-water fishery catches (t) by fishing ground, 2005-2011. Source: MoA

The average first sales prices were calculated on the basis of catches and sales revenue and not on the annual average (Table 4). The Estonian long-distance fishery sector's revenue from sales of catches amounted to 32.3 million euros in 2011, which is higher than in the period 2005–2009. The average number of people working on board vessels was 105 in 2011.

The distant-water fishing vessels flying the flag of Estonia did not use fishing opportunities in the NEAFC area in 2011, except for shrimp fishery in the international waters of the Barents Sea. The quantities caught in the North-West Atlantic increased in 2011, as Estonian vessels also fished for shrimp in NAFO subareas 0 and 1. The quantities caught in the North-West and North-East Atlantic were more or less equal from 2009–2011. The total catch for 2011 was at the level of 2008 (Figure 2).

Outlook

Globally, there currently seems to be a period of shrimp stocks dwindling, while the stocks of some fish species are improving. Fortunately, Estonia is able to continue shrimp fishery in the Barents Sea, where the stock is still in good condition, and in NAFO subareas 0 and 1 by entering into agreements with Canada and Greenland. The improving state of traditionally more expensive stocks – Greenland halibut and cod – in the NAFO area is also creating better conditions.

Baltic Sea fisheries

COASTAL FISHERY IN THE BALTIC SEA

In 2010 the number of coastal fishermen listed on Baltic Sea fishing permits amounted to 1808. This figure decreased to 1744 in 2011 (Figure 3). The decline was most remarkable in Lääne County where the number of coastal fishermen with fishing permits decreased from 229 to 123 in 2011. In other counties the number of coastal fishermen did not change significantly. The number of fishermen is highest in Pärnu and Saare Counties, followed by Harju and Hiiu Counties. By county, coastal fishermen numbers were as follows in 2011:

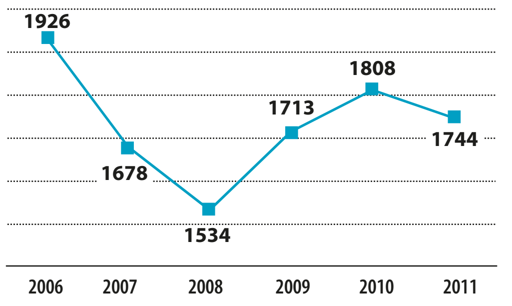
Pärnu County	401
Saare County	401
Hiiu County	282
Lääne County	123
Harju County	301
Lääne-Viru County	132
Ida-Viru County (excl. Lake Peipsi)	133

Since one coastal fisherman can have fishing permits in several counties, the number calculated on the basis of counties exceeds the actual number of coastal fishermen. As in previous years, fishing is the main source of income for around 10% of coastal fishermen. According to the data of the Fishing Vessel Register, Estonian coastal fishermen used 1305 fishing vessels in the Baltic Sea in 2011.

The most important species in terms of catch volume was herring, followed by perch, flounder, smelt, garfish and pikeperch. The flounder catch remained more or less the same as in 2010, while the smelt catch declined significantly (Table 5). Based on average first sales prices, coastal fishermen earned most from perch fishing in 2011, as in the preceding year. In terms of profitability, perch was followed by herring, pikeperch, flounder, smelt and garfish. Whereas in 2010 whitefish held sixth place in terms of profitability, in 2011 it was preceded by garfish, pike, sea trout and roach. The reason was not so much the smaller catch, but rather the decline in the average first sales price (26%, Figure 4).

Looking at the most important fish species, the first sales price as published in the official publication *Ametlikud Teadaanded* rose most significantly for smelt (152%), but its total catch decreased by 71% compared to 2010. The first sales price of perch and flounder increased by 18% and that of herring rose by 23% (Figure 5, Table 6). The total catch of coastal fishermen amounted to 11,243 tonnes in 2010 and 10,350 tonnes in 2011, which translated to 3.35 and 3.87 million euros, respectively, in sales revenue.

Figure 3.
Number of coastal fishermen fishing in Baltic Sea, 2006–2011
Source: MoE, MoA



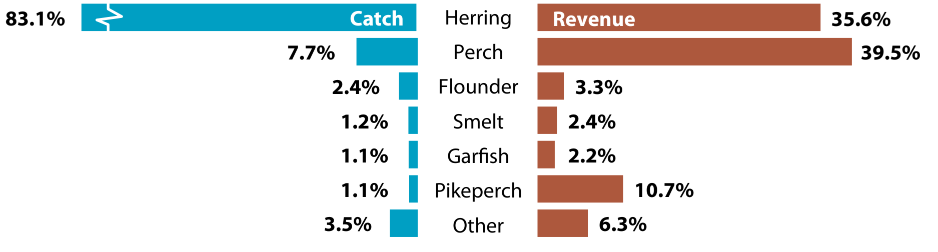


Figure 4. **Proportion (%) of catch and revenue in coastal fishing by species in 2011**
Source: MoA

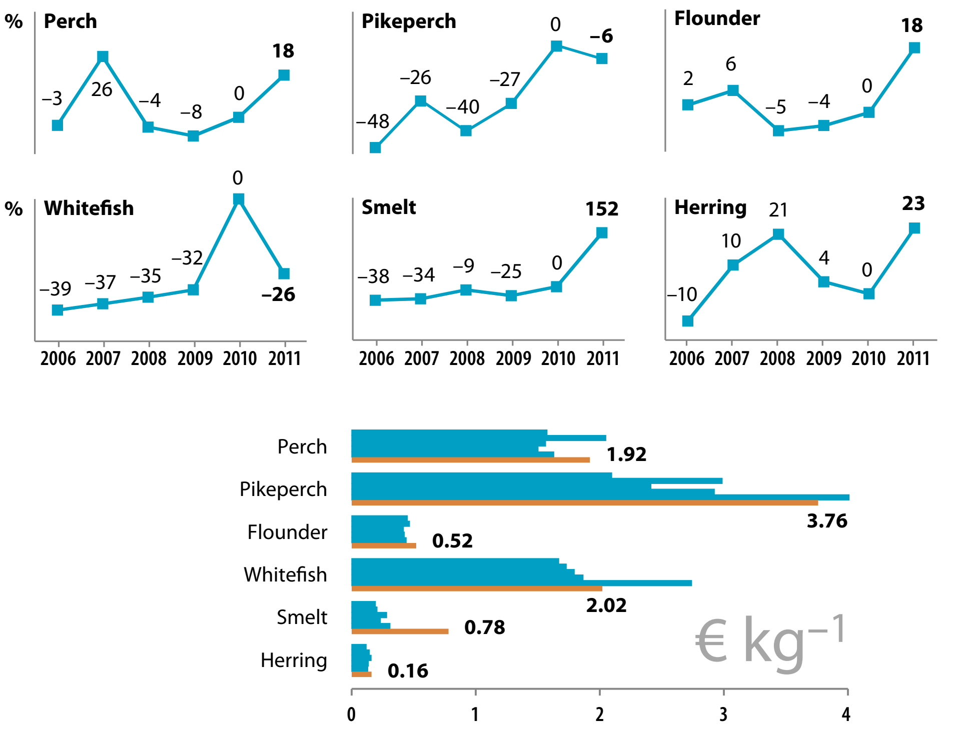


Figure 5. **Change (%) of average first sales prices of fish species most important to coastal fishery compared to prices in 2010, 2006–2011.** Source: MoA

Table 5. **Coastal fishing catches (t) and proportion (%) of total catch from Baltic Sea in 2010 and 2011 by species**

Species	2010		2011	
	Catch (t)	Proportion (%)	Catch (t)	Proportion (%)
Perch	878.76	7.8	795.84	7.7
Eel	3.45	<0.1	2.21	<0.1
Eelpout	0.81	<0.1	0.09	<0.1
Turbot	0.18	<0.1	0.10	<0.1
Atlantic mackerel	<0.01	<0.1	0.00	0.0
Pike	22.77	0.2	32.07	0.3
Gibel carp	51.32	0.5	47.64	0.5
Lamprey	0.57	<0.1	0.89	<0.1
Carp	0.14	<0.1	0.08	<0.1
Ruff	32.36	0.3	60.80	0.6
Sprat	0.15	<0.1	0.64	<0.1
Pikeperch	73.36	0.7	110.52	1.1
Bream	3.58	<0.1	7.55	0.1
Flounder	269.77	2.4	244.99	2.4
Tench	2.26	<0.1	2.96	<0.1
Burbot	1.30	<0.1	1.62	<0.1
Salmon	3.80	<0.1	4.42	<0.1
Baltic prawn	0.03	<0.1	0.00	0.0
Sea trout	12.21	0.1	13.40	0.1
Four-horned sculpin	0.03	<0.1	0.02	<0.1
Whitefish	15.54	0.1	14.62	0.1
Sea lamprey	0.03	<0.1	0.00	0.0
Smelt	417.31	3.7	120.36	1.2
Lumpfish	<0.01	<0.1	0.00	0.0
Sabre carp	<0.01	<0.1	0.00	0.0
Silver bream	21.60	0.2	22.53	0.2
Stickleback	0.02	<0.1	0.04	<0.1
Rudd	1.19	<0.1	4.86	<0.1
Herring	9236.65	82.2	8597.27	83.1
Ide	6.30	0.1	6.13	0.1
Roach	66.48	0.6	83.24	0.8
Dace	<0.01	<0.1	0.02	<0.1
Cod	3.69	<0.1	3.50	<0.1
Garfish	86.05	0.8	117.74	1.1
Bleak	0.11	<0.1	0.06	<0.1
Rainbow trout	0.09	<0.1	0.14	<0.1
Vimba bream	29.82	0.3	50.08	0.5
Twaite shad	0.03	<0.1	0.00	0.0
Round goby	1.12	<0.1	4.05	<0.1
Total	**11 242.89**	**100.0**	**10 350.50**	**100.0**

Source: MoA

Table 6. Average first sales prices of fish (€ kg^{-1}), 2006–2011

Species	Year					
	2006	2007	2008	2009	2010	2011
Perch	1.58	2.05	1.56	1.50	1.63	1.92
Eel	5.92	5.68	5.58	5.14	5.72	6.56
Eelpout	0.06		0.13		0.36	0.14
Pike	0.84	0.92	0.98	1.05	1.05	1.33
Gibel carp	0.14	0.12	0.14	0.12	0.11	0.11
Lamprey	1.95	1.96	1.88	1.76	1.68	2.96
Carp	0.40	0.31	0.27	0.74	0.94	1.11
Ruff	0.06	0.10	0.08	0.09	0.13	0.16
Sprat	0.12	0.15	0.17	0.15	0.13	0.17
Crucian carp	0.11	0.04		0.32	0.30	0.25
Pikeperch	2.10	2.99	2.41	2.92	4.01	3.76
Bream	0.35	0.38	0.40	0.49	0.45	0.56
Flounder	0.45	0.47	0.42	0.42	0.44	0.52
Tench	0.73	0.76	0.95	0.80	0.86	1.09
Burbot	0.55	0.52	0.56	0.61	0.63	0.76
Salmon	2.79	1.35	3.29	1.64	2.63	3.95
Baltic prawn				2.36		
Sea trout	1.87	2.55	2.05	1.47	1.68	3.00
Whitefish	1.67	1.73	1.79	1.87	2.74	2.02
Smelt	0.19	0.20	0.28	0.23	0.31	0.78
Silver bream	0.07	0.07	0.07	0.07	0.09	0.12
Lake Peipsi whitefish	1.31	0.81	0.99	1.04	0.94	1.00
Lake Peipsi smelt	0.41					
Rudd	0.11	0.03	0.13	0.07	0.04	0.06
Herring	0.12	0.14	0.16	0.14	0.13	0.16
Vendace		1.04	1.01	1.43	2.88	
Ide	0.28	0.40	0.39	0.42	0.46	0.64
Roach	0.16	0.28	0.39	0.39	0.44	0.48
European chub				0.19		
Cod	1.43	0.80	0.55	1.10	0.92	1.03
Garfish	0.28	0.37	0.38	0.43	0.47	0.71
Bleak			0.13	0.03	0.13	
Rainbow trout				1.92		
Vimba bream	0.20	0.28	0.23	0.23	0.38	0.43
Round goby		0.20	0.25	0.34	0.32	0.39

Source: official publication *Ametlikud Teadaanded*

Dynamics of coastal fishing catches in different parts of the Baltic Sea

Gulf of Finland

Gill nets and trap nets are the main fishing gear in coastal fishing. The biggest catches taken from the Gulf of Finland in 2011 using coastal fishing gear were those of herring, but also of flounder, perch, garfish, sea trout and whitefish. The catches of all major species declined compared to 2010 (Table 7). Again in 2011 it was herring that produced the biggest sales revenue (around 128,000 euros); this was followed by perch (around 71,000 euros) and flounder (around 43,000 euros).

Herring is caught in the Gulf of Finland mainly using trap nets. Herring catches were more abundant from 2009–2011 than in 2007 and 2008. Herring catches have decreased over the last two years. Flounder is mostly caught using gill nets and its fishing grounds are mostly in the western part of the gulf. Flounder catches were relatively stable from 2007–2011, but the decline in the last two years indicates that flounder stock is decreasing. Perch is mostly caught using gill nets, with the proportion of trap net catches varying from year to year. Perch stock is expected to increase slightly in the near future. Whitefish is caught in the Gulf of Finland mainly using gill nets. The whitefish catch declined from 2007–2011 and was the smallest of the period in 2011. Smelt is generally also caught using gill nets and its catches decreased sharply in 2010 and 2011. Sea trout and salmon are mainly caught using gill nets as well. No significant changes were observed in the catches of these valuable fish species from 2008–2011. Catches of round goby, an alien species, have increased steadily. Whereas in 2010 a catch of 1.1 tonnes was recorded, in 2011 around 4 tonnes of round goby was caught. In future, this species may start competing for food with other fish species, particularly demersal fish such as flounder and eelpout, and there is no solution to this problem.

In summary, the total catch of coastal fishermen decreased in the Gulf of Finland from 1309 tonnes in 2010 to 984 tonnes in 2011.

High seas

Fishing gear used in coastal regions towards the Baltic Proper near Saaremaa and Hiiumaa includes gill nets, trap nets, longlines and seine nets. The species caught are dominated by flounder, followed by perch, roach, herring, garfish and ide (Table 8). As in 2010, flounder and perch produced the biggest sales revenue in 2011 (around 71,000 euros and 21,000 euros, respectively), with the sales revenue produced by perch growing by more than three times compared to the preceding year. Sales revenue generated by other species was much lower.
In flounder fishing over the last five years the main fishing gear included gill nets (60% of the catch), seine nets (32%) and trap nets (7%). During the last two years, open-sea flounder catches have been lower than previously, falling short of the average for the period. Flounder stock is decreasing due to the deteriorating situation in the spawning grounds of deep flounder. Garfish, which is caught using trap nets and has held second place in terms of catch volume in previous

years, dropped to fifth place in 2011. Perch was the most important freshwater fish in 2011: its catch almost tripled compared to the preceding year, placing perch second after flounder. The roach catch also increased in 2011. For herring, the situation reversed: its catch increased in 2008 and 2009, reaching a record level, but has shrunk over the last two years, with the catch for 2011 being the lowest during the period observed. Trap nets are the main fishing gear in herring fishery, but the share of gill nets is also higher in high seas than in other parts of the sea.

In summary, the total catch taken from coastal regions towards the Baltic Proper near Saaremaa and Hiiumaa did not change significantly from 2007–2011. In 2011 the total figure remained at the same level as in the previous year.

Väinameri Sea

Fishing gear used in the Väinameri Sea includes gill nets, trap nets and longlines. Ranked on the basis of catch volume, herring, garfish, Gibel carp, pike, roach and perch were most commonly caught in 2011. Whereas in 2010 the perch catch exceeded the catches of Gibel carp, pike and roach, in 2011 it was lower (Table 9). Perch, herring and pike produced the biggest sales revenue (around 33,000 euros, 29,000 euros and 25,500 euros, respectively); the corresponding figures were around 39,000, 30,000 and 13,000 euros in 2010.

Herring is mostly caught using trap nets in the Väinameri Sea. The herring catch increased significantly from 2007–2010, but remained lower in 2011 than in the two preceding years. The record catch of garfish, which is caught using trap nets, was taken from the Väinameri Sea in 2007. Catches declined in subsequent years, but rose above the data series average again in 2011. Perch is fished mainly using gill nets, but considerable quantities are caught with trap nets as well. Catches fluctuated strongly from 2007–2011, as fishing for perch relied on just a few year classes. The perch catch for 2011 decreased compared to the preceding year, but ultimately came close to the average of the period. On account of the catch for 2011, Gibel carp, caught mostly using gill nets, became the third most important fish species over the observed period (2007–2011). However, the rapid increase in the population of Gibel carp has probably ended in the area. The proportion of gill nets and trap nets is more or less equal in roach fishing. Over the past five years, the highest catch was taken in 2011, while the catches for the four preceding years were almost the same. Pike is mainly caught using gill nets, with the proportion of trap nets in the catch being half as much. Current pike catches are not comparable to past catches taken from the Väinameri Sea, but have increased remarkably in the last two years, with the catch for 2011 being the biggest for the last five years. Ide, eel, burbot and smelt catches continued to contract.

In summary, catches were significantly lower in the Väinameri Sea in 2007 and 2008 than from 2009–2011. This was mainly due to better herring catches from 2009–2011. However, even if herring is not taken into account, the overall catch was biggest in 2011.

Gulf of Riga

The most common fishing gear used in the Gulf of Riga (except Pärnu Bay) is gill nets and trap nets, with seines and longlines being used to a lesser extent. In 2011, the biggest catches taken in the Gulf of Riga were these of herring, followed by perch, roach, garfish and flounder (Table 10). Perch, herring, garfish and roach produced the biggest sales revenue in 2011 (around 320,000 euros, 212,000 euros, 15,000 euros and 12,500 euros, respectively). Unlike in 2010, the sales revenues generated by garfish exceeded that of roach in 2011.

Herring is caught in the Gulf of Riga mostly using trap nets and less so using gill nets. The herring catch in 2011 was smaller than the average for 2007–2011 and also fell short of the catch in 2010. Gill nets are preferred in perch fishing, but considerable quantities are also caught using trap nets. Catches were relatively stable from 2007–2010, with the catch in 2011 being the poorest of the period. Garfish is caught primarily using trap nets. The record catch of the period under review was taken from the Gulf of Riga in 2008, while the catch in 2011 was the smallest. Trap nets are the main fishing gear in roach fishing. From 2009–2011 catches were higher than in the previous two years, but the catch in 2011 fell short of that for 2010. Flounder is mostly caught using trap nets in the Gulf of Riga, but in 2010 and 2011 considerable quantities were also taken with seine nets. The flounder catch decreased in 2011. According to official statistics, ruff is mainly caught using gill nets, and on a much smaller scale with trap nets. Being small in size, ruff do not become entangled in large-mesh gill nets, which can be used for fishing larger freshwater fish, in the quantity set out in Table 11. Consequently, a considerable quantity of ruff was caught as a by-catch in fine-mesh gill nets intended for the fishing of herring. The period during which ruff is active and is caught with nets coincides with that of other Perciformes. This raises the question of the rate of the by-catch of undersized pikeperch and perch in gill net herring fishery. Since this fishing method does not enable undersized fish to be released back into the water alive, the rate of by-catch of undersized fish and its impact on the stocks of more expensive commercial fish should be further examined and assessed.

There have apparently been errors in catch statistics as regards the distinguishing and recording of Gibel carp and Crucian carp: the fish caught is predominantly Gibel carp. Most carp catches are taken with gill nets. The rapid increase in the abundance (yield) of Gibel carp is likely to have ended in the Gulf of Riga. The proportion of trap nets has grown in pike fishing over the last five years, and pike catches increased markedly in 2010 and 2011. By contrast, eel catches have steadily declined, as in other areas.

In summary, catches taken in the Gulf of Riga were smaller in 2011 than in the previous three years, and the total catch of all major species decreased compared to 2010. If herring is not taken into account, the record amount of fish was caught in the Gulf of Riga in 2009.

Pärnu Bay

Fishing gear used in Pärnu Bay includes gill nets, trap nets, seines and longlines. In 2011 the biggest catches were produced by herring, followed by perch, smelt, pikeperch, ruff and garfish (Table 11). Compared to last year, the ranking of the most commonly caught fish has changed: for example, perch placed second instead of smelt. Perch also generated the biggest sales revenue in 2011 (around 1,083,000 EUR), followed by herring (around 1,005,000 euros), pikeperch (around 381,000 euros) and smelt (around 91,000 euros), compared to 1,000,000, 823,000, 284,000 and 126,000 euros, respectively, in 2010. Of the major species, only the revenue generated from sales of smelt decreased. As the first sales price of perch increased, the revenue generated by sales of perch grew, while its catch diminished by around 10%. In terms of catch volumes and sales revenue, Pärnu Bay is the most important coastal fishing area in Estonia.

Herring is caught in Pärnu Bay mainly using trap nets. Herring catches fluctuated greatly from 2007–2011. The herring catch in 2011 was below the average of the period and remained almost unchanged compared to 2010. Perch catches are stable and the state of stocks is average, but the significant proportion of undersized fish in catches and the intensive exploitation of stocks are of concern. The catch in 2011 was above average, but decreased compared to the previous year. Smelt catches increased from 2007–2009, but the increase in 2011 was 3.5 times more modest than the year before. In addition to the state of stocks, commercial fishing catches of smelt during the spawning period also depend on the hydro-meteorological conditions (including ice conditions) prevailing at the time of fishing to a great extent. The decline in stocks is obvious, however. Pikeperch is caught mostly using nets and traps, and the pikeperch catch of 2011 was the richest of the period observed. Garfish is mostly caught using trap nets. The garfish catch has increased over the last three years, the largest catch for the period 2007–2011 being taken from Pärnu Bay in 2011.

In summary, catches taken from Pärnu Bay from 2008–2011 fluctuated to a great extent, and the catch in 2011 was the lowest of the period. The total catch was most influenced by mass species – herring and smelt. If these species are not taken into account, the total catch of all other fish species in 2011 was the highest of the past five years.

Table 7. **Species composition and catches (kg) of commercial fishing in Gulf of Finland (ICES subdivision 32) by coastal fishing gear, 2007–2011**

Year	2007				2008				2009	
Species / fishing gear	Trap nets	Gill nets	Long-lines	Total	Trap nets	Gill nets	Long-lines	Total	Trap nets	Gill nets
Perch	11 119	24 876	6	36 000	20 821	56 185		77 005	34 724	37 763
Eel	2 417	13	15	2 445	2 102	4	7	2 113	1 714	21
Eelpout	43	5		48	1			1	15	2
Atlantic mackerel				0						
Grayling				0						1
Pike	120	1 545		1 664	111	1 453		1 564	161	1 176
Gibel carp	208	5 053		5 261	334	5 593		5 926	470	4 128
Lamprey		46		46						
Turbot		12		12		32		32	11	42
Carp				0		1		1		8
Ruff	45	52		97	5	152		157	2	180
Sprat				0	35	178		213	80	1
Crucian carp				0					5	85
Pikeperch	159	2 262		2 420	211	11 011		11 222	555	418
Bream	1 397	1 573		2 970	1 015	2 017		3 032	948	884
Flounder	4 961	99 243	91	104 295	5 113	80 972	55	86 139	5 120	96 368
Tench	1	5		5	2	3		4	4	75
Burbot	39	53		92	5	43		48	5	18
Salmon	731	3 091		3 822	666	3 443		4 108	638	3 002
Sea trout	1 560	11 629		13 189	430	7 841		8 271	459	8 603
Four-horned sculpin				0		9		9		
Longspined bullhead				0						
Whitefish	1 263	20 495		21 758	917	22 195		23 112	825	14 177
Smelt	417	15 110		15 527	492	21 285		21 777	530	20 309
Lumpfish				0						
Sabre carp				0						
Silver bream	160	695		855	326	460		786	539	461
Rudd	13	12		24		68		68	14	10
Herring	610 926	2 075		613 001	553 087	2 905		555 992	1 132 459	7 511
Ide	14	199		213	61	342		403	60	250
Roach	526	2 136		2 662	499	2 318		2 817	1 246	3 525
Dace				0		1		1		
Cod	20	66		86	22	832		854	8	1 872
Garfish	9 377	189	1	9 567	1 318	31		1 349	6 535	194
Bleak	41	3		44	51	11		62	27	
Rainbow trout	6	104		110	22	203		224	8	173
Vimba bream	377	3 624		4 000	234	2 758		2 991	1 118	700
Twaite shad				0						
Round goby		89		89	4	360		364	22	464
Total	**645 937**	**194 252**	**112**	**840 301**	**587 880**	**222 702**	**62**	**810 644**	**1 188 298**	**202 422**

Source: MoA

2009		2010				2011				2007–2011
Long-lines	Total	Trap nets	Gill nets	Long-lines	Total	Trap nets	Gill nets	Long-lines	Total	Average
29	72 516	16 598	33 467		50 066	16 598	20 169		36 767	54 471
4	1 739	1 317	54	2	1 373	760	10	1	771	1 688
	18	7	2		9	3	8		11	17
			1		1	1			1	0.4
	1								0	0.2
	1 337	225	1 540		1 766	280	1 781		2 061	1 678
	4 598	947	3 575		4 522	294	4 315	4	4 613	4 984
							14		14	12
	53	22	50		73	1	10		11	36
	8	8	8		16		11		11	7
	182	24	17		41	68	61		129	121
	81	2			2	599			599	179
	90	219	873		1 092		41		41	244
	973	579	446		1 025	260	4 362		4 622	4 052
	1 831	600	317		918	445	409		854	1 921
69	101 557	7 535	88 171	20	95 725	4 950	78 489	2	83 441	94 231
	79	115	29		144	78	34		112	69
	22		10		10	5	7		12	37
	3 640	614	1 879		2 493	371	2 330		2 701	3 353
	9 062	1 143	8 040		9 182	1 558	8 288		9 846	9 910
			31		31		11		11	10
							2		2	0.4
	15 003	727	10 064		10 791	530	8 310		8 840	15 901
	20 838	427	9 404		9 831	128	3 509		3 637	14 322
			1		1				0	0.1
			1		1				0	0.2
	1 000	332	150		482	58	448		506	726
	24	235	4		239	415	92		507	172
	1 139 971	1 095 410	3 031		1 098 441	799 189	1 912		801 101	841 701
	310	50	158		208	88	39		127	252
	4 771	1 785	1 043		2 828	1 096	2 906		4 002	3 416
									0	0.2
2	1 882	67	2 057		2 124	11	2 054		2 065	1 402
	6 729	13 092	68		13 160	11 067	126		11 193	8 400
	27	29	2		31	27			27	38
	181	2	74		76	3	82		85	135
	1 818	915	699		1 613	420	927		1 347	2 354
			13		13				0	3
6	492	235	878	8	1 121	3 557	485	9	4 051	1 223
110	**1 390 830**	**1 143 260**	**166 156**	**30**	**1 309 445**	**842 860**	**141 242**	**16**	**984 118**	**1 067 067**

Table 8. **Species composition and catches (kg) of commercial fishing in Baltic Proper (ICES subdivisions 28.2 and 29.2) by coastal fishing gear, 2007–2011**

Year	2007					2008					2009	
Species / fishing gear	Trap nets	Gill nets	Seine nets	Long-lines	Total	Trap nets	Gill nets	Seine nets	Long-lines	Total	Trap nets	Gill nets
Perch	1 018	2 507			3 525	494	1 472		8	1 974	1 300	3 747
Eel	733	7		19	759	454			2	456	520	6
Eelpout	19				19	6				6	22	2
Pike	528	923	2		1 453	496	974			1 470	548	653
Gibel carp	581	1 316	6		1 903	219	787		2	1 008	464	1 189
Turbot												1
Carp		13			13							
Ruff	34	7			41	19	6			25	39	4
Sprat											15	
Pikeperch	1				1		2			2		
Bream	7				7	1				1	1	3
Flounder	12 419	98 734	70 031	2	181 186	12 083	97 313	51 187	38	160 621	9 636	100 758
Tench	53	53			106	2	1			3	8	2
Burbot	596	589			1 185	270	267			536	460	200
Salmon	10	890			900	15	766			781	14	957
Sea trout	40	3 153			3 193	54	2 777			2 831	93	3 798
Four-horned sculpin		7			7		4			4		5
Whitefish	32	2 535			2 567	45	2 158			2 203	24	1 375
Smelt		2			2		30			30		3
Lumpfish		1			1		2			2		
Sabre carp												
Silver bream		20			20						0	84
Thicklip grey mullet		3			3							
Rudd	68	1			69	29				29	20	1
Herring	5 910	868			6 778	5 499	1 853			7 351	10 875	3 763
Gudgeon												
Ide	325	1 528	20	4	1 877	468	3 146			3 614	566	1 987
Roach	3 332	2 023	10		5 365	2 351	2 729		5	5 085	2 700	1 780
Dace		0.03			0.03							
Cod	45	534			579	213	811		4	1 028	207	1 472
Garfish	15 764	604		11	16 379	8 485	830		10	9 325	6 270	310
Bleak	17				17	25	5			30	12	2
Rainbow trout	2	75			77	5	80			85	13	48
Vimba bream	1	4			4		4			4		4
Twaite shad	1				1							
Total	**41 534**	**116 397**	**70 069**	**36**	**228 036**	**31 232**	**116 016**	**51 187**	**69**	**198 504**	**33 805**	**122 153**

Source: MoA

	2009			2010					2011					2007–2011
	Seine nets	Long-lines	Total	Trap nets	Gill nets	Seine nets	Long-lines	Total	Trap nets	Gill nets	Seine nets	Long-lines	Total	Average
	80	2	5 129	1 058	2 664	115	30	3 867	2 124	8 936		3	11 063	5 112
		34	560	381	2		9	391	254			5	259	485
			24	19				19	1				1	14
			1 201	1 008	1 214		20	2 242	1 185	1 472		5	2 662	1 805
			1 652	815	751		14	1 580	968	2 010			2 978	1 824
			1	25	84			109		91			91	40
										15			15	6
			43	11	12			23	87	55			142	55
			15						8	15			23	8
										1			1	1
			4	2				2	3	124			127	28
	50 888	9	161 291	8 618	83 237	51 916	71	143 842	14 139	92 281	29 850	2	136 272	156 642
			10	11	13		7	31	16	204			220	74
			660	392	271		10	674	613	399			1 012	813
			971	12	369			381	8	359			367	680
			3 891	117	1 863			1 979	141	2 231			2 372	2 853
			5							1			1	3
			1 399	25	1 180			1 205	22	2 013			2 035	1 882
			3		7			7		14			14	11
										1			1	1
					1			1						0.2
			84							5			5	22
														1
			21	30	9			39	87	94			181	68
			14 638	5 728	1 895		22	7 645	3 418	1 846			5 264	8 336
									1				1	0.2
		11	2 564	741	1 849	8	32	2 629	827	2 820			3 647	2 866
	720		5 199	3 965	1 751		13	5 729	3 335	3 584			6 919	5 659
														0.006
			1 679	199	909			1 108	258	819		13	1 090	1 097
		12	6 592	7 827	253		10	8 090	4 559	427			4 986	9 074
			13	38	7			45	2	5			7	22
			61	3	14			18	8	27			35	55
			4	5	7			12	21	34			55	16
				11	1			12						3
	51 688	68	207 714	31 040	98 363	52 039	238	181 679	32 085	119 883	29 850	28	181 846	199 554

Table 9. **Species composition and catches (kg) of commercial fishing in Väinameri Sea (ICES subdivision 29.4) by coastal fishing gear, 2007–2011**

Year	2007				2008				2009	
Species / fishing gear	Trap nets	Gill nets	Long-lines	Total	Trap nets	Gill nets	Long-lines	Total	Trap nets	Gill nets
Perch	1 825	18 802	46	20 673	2 031	9 551	25	11 608	2 519	12 038
Eel	631	18	13	662	637	12	13	662	432	9
Eelpout	9	1		10	14			14		
Pike	2 712	5 068	7	7 787	3 074	5 374	1	8 449	2 791	5 017
Gibel carp	4 371	12 732	13	17 116	7 175	17 744	3	24 922	3 965	15 362
Carp	11	8		19	7	31		38	16	24
Ruff	4 404	92	1	4 497	4 408	25		4 433	1 081	148
Sprat		25		25		21		21		7
Pikeperch	12	120		132	44	84		128	12	127
Bream	212	206		418	168	76		244	84	109
Flounder	1 775	6 892		8 667	1 953	6 405		8 358	2 321	7 892
Tench	1 779	40		1 819	1 678	4		1 682	1 143	608
Burbot	533	720		1 253	279	224		503	178	318
Salmon	16	84		100	21	86		106	8	124
Sea trout		313		313	36	176		212	37	258
Whitefish	61	3 166		3 227	59	1 939		1 998	49	1 870
Smelt	1 042	15		1 057	468	29		497	279	26
Silver bream	2 333	7 116		9 449	2 786	6 102		8 888	1 493	6 616
Stickleback	213			213	8			8		
Rudd	1 744	244		1 988	1 275	90		1 365	484	507
Herring	40 465	2 431		42 896	33 579	4 612		38 191	216 230	3 322
Ide	2 733	3 976	38	6 747	3 178	3 509	9	6 696	2 358	3 080
Roach	7 480	7 155	5	14 639	6 826	6 953	2	13 781	6 215	7 492
Dace						3		3		
European chub						15		15		20
Cod	1	5		6		7		7	3	39
Garfish	38 141	339	90	38 570	20 668	615	71	21 353	19 297	1 152
Bleak	50	66		116	35	20		55	31	
Rainbow trout	2	8		10					4	2
Vimba bream	279	977		1 255	289	538		827	713	1 225
Twaite shad										
Total	**112 833**	**70 615**	**213**	**183 661**	**90 693**	**64 244**	**124**	**155 061**	**261 741**	**67 391**

Source: MoA

2009		2010				2011				2007–2011
Long-lines	Total	Trap nets	Gill nets	Long-lines	Total	Trap nets	Gill nets	Long-lines	Total	Average
14	14 571	3 737	19 847	72	23 655	2 234	14 969	9	17 212	17 544
6	447	380		5	384	264	26	3	293	490
		19			19					9
	7 808	4 463	7 770	18	12 251	5 069	14 125		19 194	11 098
	19 328	4 571	17 419	1	21 990	3 983	19 856	5	23 844	21 440
	40	22	2		24		1		1	24
	1 228	712	88	11	811	1 269	200		1 469	2 488
	7	50	18		68		11		11	26
	139	127	262		388	99	378		477	253
	193	110	206		316	409	385		794	393
1	10 215	2 412	8 827	21	11 260	1 352	7 453		8 805	9 461
	1 751	1 075	207		1 282	1 272	198		1 470	1 601
	496	94	331		424	153	194		347	605
	132	31	90		121		56		56	103
	295	2	244		246	17	419		436	300
10	1 930	70	1 339		1 408	30	1 981		2 011	2 115
	305	129	38		167	27	9		36	412
	8 109	1 550	6 254		7 804	1 043	9 078		10 121	8 874
										44
	991	498	416		914	1 006	737		1 743	1 400
	219 552	228 994	2 430	8	231 432	178 818	2 885		181 703	142 755
3	5 440	1 702	1 520	18	3 241	1 007	1 261		2 268	4 878
2	13 709	5 915	7 774	10	13 699	7 692	11 342		19 034	14 972
										1
	20									7
	42	5	51		56	12	47		59	34
36	20 485	19 292	246	63	19 601	30 303	691	10	31 004	26 202
	31	33			33	27			27	52
	6						8		8	5
	1 938	778	2 285		3 063	754	3 024		3 778	2 172
							1		1	0.2
72	**329 204**	**276 767**	**77 663**	**226**	**354 656**	**236 840**	**89 335**	**27**	**326 202**	**269 756**

Table 10. **Species composition and catches (kg) of commercial fishing in Gulf of Riga (ICES subdivision 28.1, except Pärnu Bay) by coastal fishing gear, 2007–2011**

Year	2007					2008					2009	
Species / fishing gear	Trap nets	Gill nets	Seine nets	Long-lines	Total	Trap nets	Gill nets	Seine nets	Long-lines	Total	Trap nets	Gill nets
Perch	10 004	195 535		4 835	210 374	10 326	171 554		1 595	183 475	7 117	205 629
Eel	2 027	1		15	2 043	1 690	4		8	1 703	1 440	15
Eelpout	8		65		73	27		65		92	29	
Pike	873	1 393			2 266	1 369	1 505			2 874	1 585	957
Gibel carp	1 538	7 572		4	9 114	1 898	7 289			9 187	2 023	2 845
Lamprey												2
Carp		141		3	144	9	21			30	7	10
Ruff	196	4 082			4 278	1 088	5 623		10	6 721	267	10 870
Sprat		42			42							8
Crucian carp											409	5 703
Pikeperch	32	1 908		22	1 962	35	1 543		7	1 585	207	465
Bream	4	18			22	19	186			205	13	62
Flounder	14 642	5 583	128	12	20 365	13 957	6 255		10	20 222	8 974	4 076
Tench	47	41			88	246	46			292	304	191
Burbot	454	57			511	157	7			164	155	4
Salmon	63	547			609	85	368			453	70	541
Sea trout	41	358			399	130	475			605	144	544
Four-horned sculpin							1			1		1
Whitefish	19	2 092			2 111	20	2 122			2 142	13	3 602
Sea lamprey	1				1							
Smelt	567	206			773	1 000	413			1 413	5 308	116
Lumpfish							1			1		
Silver bream	38	385		6	429	273	99		8	380	153	43
Stickleback						9				9	40	
Rudd	46	52			98	21				21		
Herring	1 161 643	12 706			1 174 349	1 623 106	13 225			1 636 331	1 357 088	3 681
Ide	59	228		2	289	126	166			292	129	288
Roach	12 745	8 521		28	21 294	11 722	6 642		8	18 372	10 868	6 273
Dace		12			12							
Cod	116	47			163	345	157			502	210	115
Garfish	26 405	304			26 709	37 305	2 401		15	39 721	22 338	164
Bleak	12				12	6				6	28	10
Rainbow trout	1	11			12	3	11			14	3	3
Vimba bream	164	4 062		42	4 268	151	2 962			3 113	188	2 833
Twaite shad	1				1							
Round goby												0.2
Total	**1 231 745**	**245 901**	**193**	**4 969**	**1 482 808**	**1 705 121**	**223 075**	**65**	**1 661**	**1 929 922**	**1 419 106**	**249 049**

Source: MoA

	2009			2010					2011					2007–2011
	Seine nets	Long-lines	Total	Trap nets	Gill nets	Seine nets	Long-lines	Total	Trap nets	Gill nets	Seine nets	Long-lines	Total	Average
		1 193	213 939	7 175	180 483		136	187 794	25 668	140 799		18	166 485	192 413
		4	1 459	1 219	1		10	1 230	795	2			797	1 447
			29	2				2	29	1			30	45
			2 542	3 027	1 784			4 811	3 695	2 740			6 435	3 786
			4 868	2 605	2 287			4 891	2 561	5 512			8 073	7 226
			2	4				4						1
			17		6			6	1	8			9	41
			11 137	242	10 093			10 335	199	7 277			7 476	7 989
			8	50	30			80		10			10	28
			6 112	399	3 315			3 714	64	752			816	2 128
		2	673	61	950			1 011	190	4 027			4 217	1 889
			75	25	24			49	128	86			214	113
		26	13 076	7 861	5 280	4 050	5	17 195	8 931	4 575	1 773		15 279	17 227
			494	501	260			761	1 042	61			1 103	548
			159	143	29			171	217	13			230	247
			611	63	678			741	53	467			520	587
			688	63	721			784	98	645			743	644
			1							12			12	3
			3 615	5	1 281			1 286	53	900			953	2 021
														0.1
			5 424	1 011	87			1 098	529	25			554	1 852
														0.2
		22	218	227	205		7	439	235	233		15	483	390
			40						42				42	18
														24
			1 360 769	1 555 136	15 626			1 570 761	1 307 801	18 640			1 326 441	1 413 730
			417	110	109			219	45	44			89	261
	6 700	16	23 857	15 219	4 926	11 400	7	31 552	15 661	10 258		15	25 934	24 201
				2				2		1			1	3
			324	220	171			391	118	154			272	330
		25	22 527	23 763	122		122	24 007	21 102	106			21 208	26 834
			38											11
			6							11			11	9
			3 021	148	3 040			3 188	131	2 845			2 976	3 313
														0.2
			0.2											0.04
	6 700	**1 288**	**1 676 143**	**1 619 278**	**231 506**	**15 450**	**287**	**1 866 521**	**1 389 388**	**200 204**	**1 773**	**48**	**1 591 413**	**1 709 360**

Table 11. Species composition and catches (kg) of commercial fishing in Pärnu Bay (fishing squares 178-180) by coastal fishing gear, 2007–2011

Year	2007				2008					2009		
Species / fishing gear	Trap nets	Gill nets	Long-lines	Total	Trap nets	Gill nets	Seine nets	Long-lines	Total	Trap nets	Gill nets	Seine nets
Perch	232 627	269 814	3 743	506 184	243 774	184 705		712	429 190	228 052	277 703	2
Eel	184	2	12	198	144			4	148	115		
Eelpout	4			4	60				60	44	3	
Pike	260	270		531	486	950			1 436	338	129	
Gibel carp	17 334	5 870	14	23 218	11 239	7 337			18 576		8	
Lamprey	505			505	17				17	148		
Carp	12	45	3	60	27	245			272	10	124	
Ruff	6 125	1 842		7 967	7 143	1 567		5	8 715	8 719	3 706	
Crucian carp										5 404	7 818	
Pikeperch	38 185	56 446	35	94 666	41 849	9 089		146	51 084	40 415	24 511	
Bream	4 966	643		5 609	3 336	404			3 740	2 102	309	
Flounder	640	685	2	1 327	691	494	1	1	1 186	1 202	581	
Tench					3	10			13	1	13	
Burbot	16	7		23	6	2			8	13		
Salmon	14	4		18	32	109			141	44	32	
Sea trout	5	3		8	2	6			8	20		
Four-horned sculpin						1			1			
Whitefish	97	993		1 090	63	328			391	96	631	
Sea lamprey												
Smelt	457 234	6 351		463 585	624 103	1 558			625 661	717 895	25 675	
Silver bream	25 593	2 422		28 015	20 207	2 855	12	7	23 081	11 265	2 302	4
Stickleback												
Rudd	3			3						7		
Herring	4 627 326	229		4 627 555	8 338 808	277			8 339 085	9 030 925	43	
Ide	42	6		48	2	6			8		5	
Roach	16 559	2 339	2	18 900	9 621	1 387		9	11 017	9 018	1 682	
Dace												
Cod	1			1	9				9		3	
Garfish	18 188	120		18 308	10 090	100			10 190	14 689	115	
Bleak					10				10			
Vimba bream	20 190	5 612		25 801	20 644	4 570			25 214	11 182	5 223	
Lesser sand eel							80		80			
Total	**5 466 109**	**353 702**	**3 811**	**5 823 622**	**9 332 365**	**215 998**	**93**	**884**	**9 549 339**	**10 081 700**	**350 615**	**6**

Source: MoA

2009		2010					2011					2007–2011
Long-lines	Total	Trap nets	Gill nets	Seine nets	Long-lines	Total	Trap nets	Gill nets	Seine nets	Long-lines	Total	Average
159	505 916	301 034	312 067	19	228	613 348	391 777	172 031	31	479	564 318	523 791
	115	72			2	74	84	2			86	124
	47	762	3			765	50				50	185
	466	1 035	667			1 702	1 185	537			1 722	1 171
	8						2 163	5 969			8 132	9 987
	148	567				567	868	3			871	421
	134	11	82			93	11	35			46	121
	12 425	12 218	8 933			21 151	41 184	10 398			51 582	20 368
5	13 227	4 724	8 810			13 534	3 781	865			4 646	6 281
4	64 931	34 119	36 739		82	70 941	48 233	52 699	135	133	101 200	76 564
	2 411	2 031	260			2 291	5 240	324			5 564	3 923
	1 783	898	689			1 587	887	304			1 191	1 415
	14	2	36			38	45	12			57	24
	13	19	2			21	19				19	17
	76	29	30			59	102	32			134	85
	20	13				13	3				3	10
												0,2
	727	36	817			853	53	731			784	769
		31				31						6
	743 569	404 780	1 428			406 208	115 864	257			116 121	471 029
	13 570	10 397	2 474	3		12 874	9 795	1 615			11 410	17 790
		11		5		16						3
	7											2
	9 030 968	6 328 126	246			6 328 372	6 282 647	110			6 282 757	6 921 747
	5	6	2			8						14
	10 700	10 544	2 131			12 675	23 662	3 695			27 357	16 129
							20	1			21	4
	3	12	3			15	3	7			10	8
	14 804	21 168	20			21 188	49 137	212			49 349	22 768
												2
	16 405	16 606	5 338			21 944	32 022	9 905			41 927	26 258
									52		52	26
168	**10 432 489**	**7 149 251**	**380 777**	**27**	**311**	**7 530 366**	**7 008 835**	**259 744**	**218**	**612**	**7 269 409**	**8 121 043**

TRAWL FISHERY IN THE BALTIC SEA

Stocks and catches of herring, sprat and cod and future outlooks

Herring, sprat and cod are internationally regulated fish species with regard to which the International Council for the Exploration of the Sea (ICES) issues annual stock assessments and management recommendations for different fishing grounds and stock units.

Herring

Herring (*Clupea harengus membras*) is a subspecies of Atlantic herring that inhabits the entire Baltic Sea, forming local populations. Based on the time of spawning, a distinction is made between spring-spawning herring, which spawns from March to June, and autumn-spawning herring, which spawns in August and September and whose proportion has been less than 5% since 1970 in all areas. In recent years, however, the share of autumn-spawning herring has increased, e.g. on the southern coast of the island of Saaremaa. It needs to be clarified, however, whether this is actually autumn-spawning herring or rather spring-spawning herring whose spawning has been postponed until autumn for some reason.

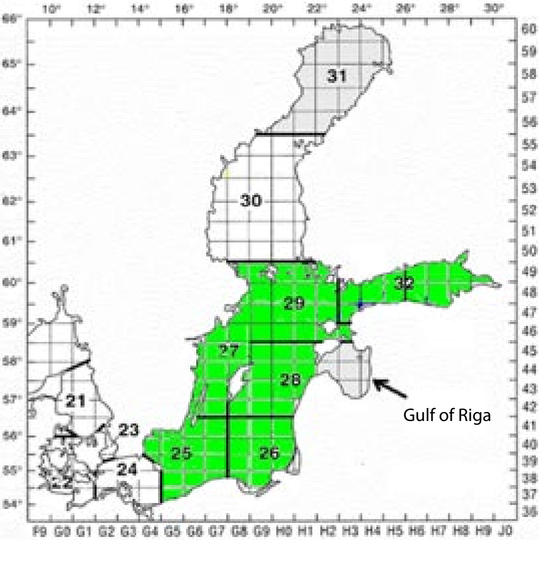
Since 2009, herring and sprat stocks have been assessed in accordance with the methodology of the ICES, while biological material is collected under EU Council Regulation (EC) No 199/2008, Commission Regulation (EC) No 949/2008 and Commission Decision 949/2008/EC.

In the case of herring the state of stocks is assessed and advice for exploitation is given separately for four stock units (Figure 6):

- Baltic Proper herring (subdivisions 25–29 and 32);
- Gulf of Riga herring (subdivision 28.1);

Figure 6.
Agreed stock and management units for herring in Baltic Sea:
- Baltic Proper herring (ICES subdivisions 25–29 and 32; green in figure),
- Gulf of Riga herring (subdivision 28.1),
- Bothnian Sea herring (subdivision 30),
- Bothnian Bay herring (subdivision 31).

Source: ICES, 2012



- Bothnian Sea herring (subdivision 30); and
- Bothnian Bay herring (subdivision 31).

The Gulf of Riga and the Bothnian Sea (and possibly also Bothnian Bay) are inhabited by local natural herring populations. Herring in subdivisions 25–29 and 32 of the Baltic Proper comprise different populations (e.g. Gulf of Finland herring and Swedish coast herring).

Herring in subdivisions 25–29 and 32 (Baltic Proper herring)

In recent years, herring catches from the Baltic Proper have increased from the recession of 2005 (92,000 tonnes) to 137,000 tonnes in 2010. As the total allowable catch (TAC) for 2011 was reduced, the official herring catch amounted to 117,000 tonnes. The average catch of herring taken in this area currently represents just 45% of the average herring catch of the 1980s. As in previous years, Sweden (31%), Poland (24%) and Finland (16%) landed the largest catches in 2011. Estonia's catch was 15,000 tonnes, which accounted for 13% of the total catch (Table 12). In terms of weight, the most herring was caught in subdivisions 25–26, 28.2 and 29, while subdivisions 29 and 32 dominated in terms of numbers. This can be explained by geographical differences in the mean body weight of herring (Figure 7).

The average age composition of herring catches has remained relatively unchanged over time: catches are dominated by age groups 1–3, which represent nearly 60% of catches. This can be explained by the domination of pelagic cohorts mainly composed of younger herring in trawl catches (Figure 8). Unlike sprat, greater stability of age composition has been observed in herring catches which is due to smaller variation in the strength of herring year classes.

The mean body weight of herring has decreased considerably in the past 20–25 years throughout the Baltic Sea, accounting for just 40–50% of the weight level of the 1970s and 1980s in the age groups that are more abundant today. The mean body weight of age groups has stabilised at a low level since the period 2006–2008 (Figure 9).

According to the latest estimate, at the start of 2012 the spawning stock biomass (SSB) of herring in the Baltic Proper amounted to 628,000 tonnes or

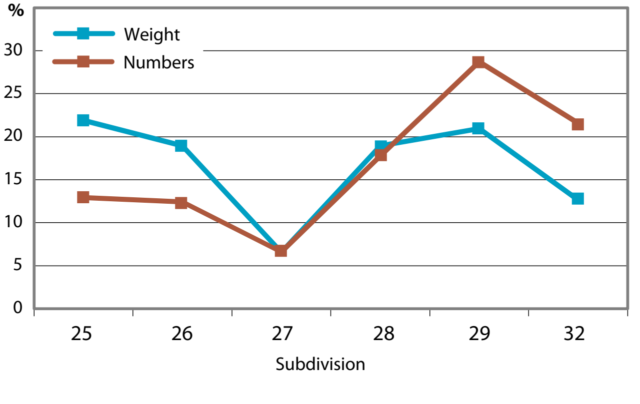


Figure 7. Herring in subdivisions 25–29 and 32: proportion of catch in weight and numbers by subdivision in 2011
Source: ICES, 2012

71% of the 1974–2011 average (Figure 10). This relatively low SSB is explained by low mean body weight, as well as by lower abundance of recent year classes compared to previously. Namely, there have been no abundant herring year classes since 1985. From 1986 up to today, just six year classes were observed whose abundance exceeded the long-term average, with the most recent such year class being that of 2007 (Figure 11). Therefore, in recent years the stocks have increased mainly as a result of the decline in fishing mortality. The outlook for the coming years depends on the actual abundance of the cohorts of 2008–2011, which will account for most of the catch in the period 2012–2014 when they will be 2–6 years of age.

Table 12. Herring in subdivisions 25–29 and 32: catches by country (10^3 t), 1977–2011

Year	Denmark	Estonia	Finland	Germany	Latvia	Lithuania	Poland	Russia	Sweden	Total
1977	11.9		33.7	0.0			57.2	112.8	48.7	**264.3**
1978	13.9		38.3	0.1			61.3	113.9	55.4	**282.9**
1979	19.4		40.4	0.0			70.4	101.0	71.3	**302.5**
1980	10.6		44.0	0.0			58.3	103.0	72.5	**288.4**
1981	14.1		42.5	1.0			51.2	93.4	72.9	**275.1**
1982	15.3		47.5	1.3			63.0	86.4	83.8	**297.3**
1983	10.5		59.1	1.0			67.1	69.1	78.6	**285.4**
1984	6.5		54.1	0.0			65.8	89.8	56.9	**273.1**
1985	7.6		54.2	0.0			72.8	95.2	42.5	**272.3**
1986	3.9		49.4	0.0			67.8	98.8	29.7	**249.6**
1987	4.2		50.4	0.0			55.5	100.9	25.4	**236.4**
1988	10.8		58.1	0.0			57.2	106.0	33.4	**265.5**
1989	7.3		50.0	0.0			51.8	105.0	55.4	**269.5**
1990	4.6		26.9	0.0			52.3	101.3	44.2	**229.3**
1991	6.8	27.0	18.1	0.0	20.7	6.5	47.1	31.9	36.5	**194.6**
1992	8.1	22.3	30.0	0.0	12.5	4.6	39.2	29.5	43.0	**189.2**
1993	8.9	25.4	32.3	0.0	9.6	3.0	41.1	21.6	66.4	**208.3**
1994	11.3	26.3	38.2	3.7	9.8	4.9	46.1	16.7	61.6	**218.6**
1995	11.4	30.7	31.4	0.0	9.3	3.6	38.7	17.0	47.2	**189.3**
1996	12.1	35.9	31.5	0.0	11.6	4.2	30.7	14.6	25.9	**166.7**
1997	9.4	42.6	23.7	0.0	10.1	3.3	26.2	12.5	44.1	**172.0**
1998	13.9	34.0	24.8	0.0	10.0	2.4	19.3	10.5	71.0	**185.9**
1999	6.2	35.4	17.9	0.0	8.3	1.3	18.1	12.7	48.9	**148.7**
2000	15.8	30.1	23.3	0.0	6.7	1.1	23.1	14.8	60.2	**175.1**
2001	15.8	27.4	26.1	0.0	5.2	1.6	28.4	15.8	29.8	**150.2**
2002	4.6	21.0	25.7	0.3	3.9	1.5	28.5	14.2	29.4	**129.1**
2003	5.3	13.3	14.7	3.9	3.1	2.1	26.3	13.4	31.8	**113.8**
2004	0.2	10.9	14.5	4.3	2.7	1.8	22.8	6.5	29.3	**93.0**
2005	3.1	10.8	6.4	3.7	2.0	0.7	18.5	7.0	39.4	**91.6**
2006	0.1	13.4	9.6	3.2	3.0	1.2	16.8	7.6	55.3	**110.4**
2007	1.4	14.0	13.9	1.7	3.2	3.5	19.8	8.8	49.9	**116.0**
2008	1.2	21.6	19.1	3.4	3.5	1.7	13.3	8.6	53.7	**126.2**
2009	1.5	19.9	23.3	1.3	4.1	3.6	18.4	12	50.2	**134.1**
2010	5.4	17.9	21.6	2.2	3.9	1.5	25.0	9.1	50.0	**136.7**
2011	1.8	14.9	19.2	2.7	3.4	2.0	28.0	8.5	36.2	**116.8**

Source: ICES, 2012

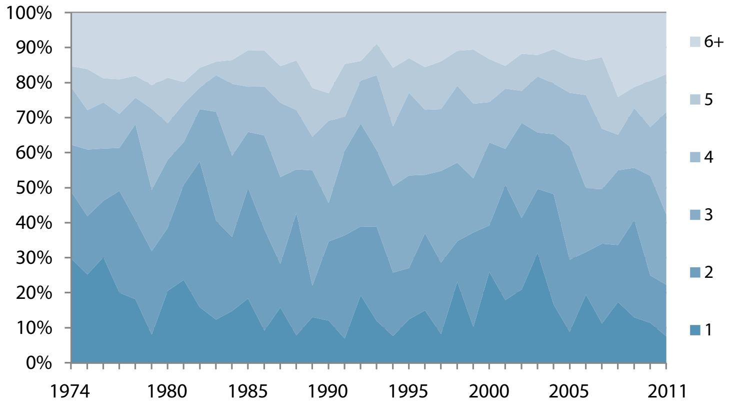


Figure 8. **Herring in subdivisions 25–29 and 32: average age composition of catches, 1974–2011. 1:** age 1, **2:** age 2, etc., **6+:** age 6 and older. Source: ICES, 2012.

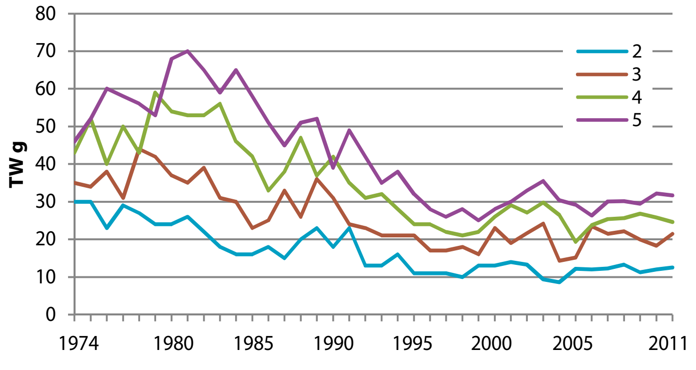


Figure 9. **Herring in subdivisions 25–29 and 32: dynamics of mean body weight of herring at ages 2–5, 1974–2011.** Source: ICES, 2012

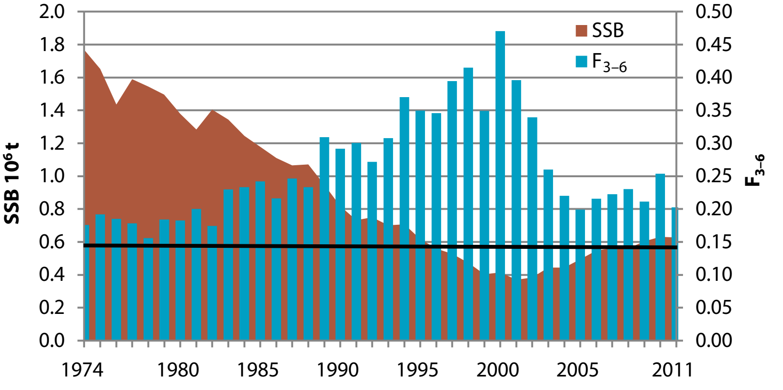


Figure 10. **Herring in subdivisions 25–29 and 32: spawning stock biomass (SSB) and fishing mortality in age groups 3–6 ($F_{3–6}$), 1974–2011.** The horizontal line in the graph represents the maximum sustainable exploitation intensity F_{PA} = 0.19. Source: ICES, 2012

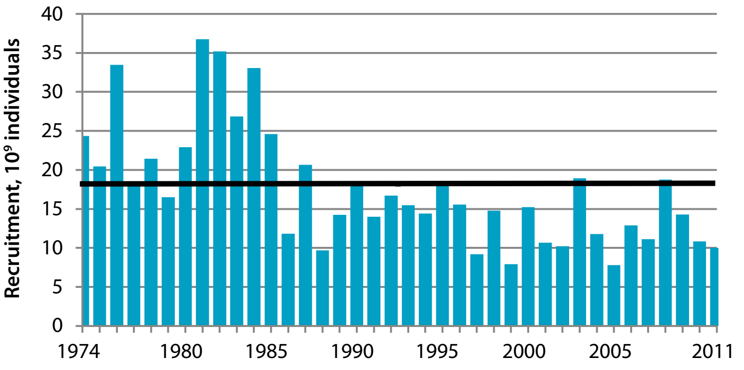


Figure 11. Herring in subdivisions 25–29 and 32: dynamics of abundance of recruitment (at age 1), 1974–2011. The horizontal line marks the long-term average. Source: ICES, 2012

Central Baltic herring stock status is assessed against two reference levels of fishing mortality:

1) precautionary fishing mortality rate $F_{PA} = 0.19$: the maximum fishing mortality rate that can be implemented without directly endangering stock reproduction potential but which should be avoided in accordance with responsible fishing principles; and

2) maximum fishing mortality for sustainable yield $F_{MSY} = 0.16$: enables maximum catches to be taken in the long run without endangering stocks.

Unfortunately, actual fishing mortality has exceeded both levels since 1983. The situation was particularly bad from 1994–2002, when actual mortality was more than double the recommended level (Figure 10). As in 2010, exploitation of the Central Baltic herring stock was not sustainable because of the high fishing mortality rate. This means that recommended fishing quotas are not expected to increase until fishing mortality has fallen to the levels mentioned above.

The fishing mortality rate F_{PA} has been used as the reference level in assessing the herring stock of the Baltic Proper for many years. F_{PA} is deemed to be equal to F_{med} (the fishing mortality rate which secures a balanced ratio of spawning stock and recruitment) determined in 2000. According to the ICES advice, which is based on the maximum sustainable yield approach, the fishing mortality rate F_{PA} of the Baltic Proper herring should not exceed 0.19 in 2013. Such a mortality rate will ensure up to 117,000 tonnes of catches. For 2012 the ICES has advised that catches should not exceed 92,000 tonnes; the EU TAC2012 was 78,000 tonnes.

The European Commission's Scientific, Technical and Economic Committee for Fisheries (STECF) states in its report that the advice of the ICES pertains to stocks from which the catches traditionally taken in the Gulf of Riga should be excluded and in which the gulf herring caught in the Baltic Proper should be included. Based on this, the STECF suggests that for maximum sustainable yield the TAC for herring in subdivisions 25–29 and 32 in 2013 should be no more than 112,560 tonnes, which is 4% less than actually caught in 2011 (Casey et al, 2012). Therefore, a situation may occur in 2013 where the TAC limits catches, as happened in the previous two years.

Gulf of Riga herring

Gulf of Riga herring are only caught by Estonian and Latvian fishermen. The proportion of Latvia's catches has been 60–70% in the last couple of decades, but Estonia has vigorously increased its share since 2008: in 2011 its proportion exceeded that of Latvia's for the first time. According to Latvian researchers, a significant part of Latvian herring catches was not reflected in official statistics until 2010. In recent years it has been estimated to be up to 10% of the official catch, and previously even up to 20% (Table 13).

In addition to local gulf herring, catches also include Baltic Proper herring that prefer to spawn in the Gulf of Riga. Both varieties come under a single catch quota. The proportion of Baltic Proper herring in the total herring catch taken from the Gulf of Riga was less than 5% in 2011, as in previous years.

The long-term age structure of herring catches from the Gulf of Riga is generally similar to that of Central Baltic herring catches. The only difference is the greater variation in the strength of the Gulf of Riga year classes, especially in the 1990s and 2000s (Figure 12).

Similar to Central Baltic herring, the mean body weight of different age groups of herring caught in the Gulf of Riga has decreased significantly compared to the 1980s (Figure 13).

The spawning stock biomass of the Gulf of Riga herring is around twice the level of the 1970s (Figure 14). The good state of the stock in the 1990s and 2000s is mostly due to the abundance of year classes which has been high, unlike in the Baltic Proper. Only the cohorts that appeared after the cold winters of 1996,

Table 13. Gulf of Riga herring: Estonian, Latvian and unreported landings, 1991–2011

Year	Estonia	Latvia	Unreported (Latvia)	Total
1991	7 420	13 481	–	**20 901**
1992	9 742	14 204	–	**23 946**
1993	9 537	13 554	3 446	**26 537**
1994	9 636	14 050	3 512	**27 198**
1995	16 008	17 016	3 401	**36 425**
1996	11 788	17 362	3 473	**32 623**
1997	15 819	21 116	4 223	**41 158**
1998	11 313	16 125	3 225	**30 663**
1999	10 245	20 511	3 077	**33 833**
2000	12 514	21 624	3 244	**37 382**
2001	14 311	22 775	3 416	**40 502**
2002	16 962	22 441	3 366	**42 769**
2003	19 647	21 780	3 267	**44 694**
2004	18 218	20 903	3 136	**42 257**
2005	11 213	19 741	2 961	**33 915**
2006	11 924	19 186	2 878	**33 988**
2007	12 764	19 425	2 914	**35 103**
2008	15 877	19 290	1 929	**37 096**
2009	17 167	19 069	1 907	**38 143**
2010	15 422	17 751	1 775	**34 948**
2011	20 303	14 721	–	**35 024**

Source: ICES, 2012

2003 and 2006 were moderate or weaker than the long-term average in the Gulf of Riga (Figure 15). The year-class strength of herring seems to be influenced by the severity of the winter and the abundance of zooplankton in spring, which determines the feeding conditions of juveniles in spring and thus their survival.

The spawning stock biomass of herring in the Gulf of Riga decreased slightly from 2004–2006. However, the SSB stabilised thanks to the rich year classes of 2005 and 2007, exceeding the long-term average by 25% at the start of 2012 (SSB2011 was 95,900 tonnes). The dynamics of herring catches have been similar to that of spawning stock biomass: the catches have ranged from 30,000–40,000 tonnes since the second half of the 1990s, which is two times higher than in the 1970s and 1980s (ICES, 2012). It should be remembered that catches of Gulf of Riga herring are limited by the TAC.

High fishing mortality has been a concern in the management of Gulf of Riga herring, as in the case of Central Baltic herring. This phenomenon can probably be explained by body weight dynamics and the fact that some landings are not reported (it is estimated that 10–20% of Latvia's landings remained unreported in previous years, Table 13).

The status of the Gulf of Riga herring stock is assessed against the two reference levels of fishing mortality mentioned above. In the case of Gulf of Riga herring the sustainable fishing mortality F_{PA} is 0.4 and the maximum sustainable yield fishing mortality F_{MSY} is 0.35.

Figure 12.
Gulf of Riga herring: average age composition of catches, 1974–2011
1: age 1
2: age 2, etc.
6+: age 6 and older
Source: ICES, 2012

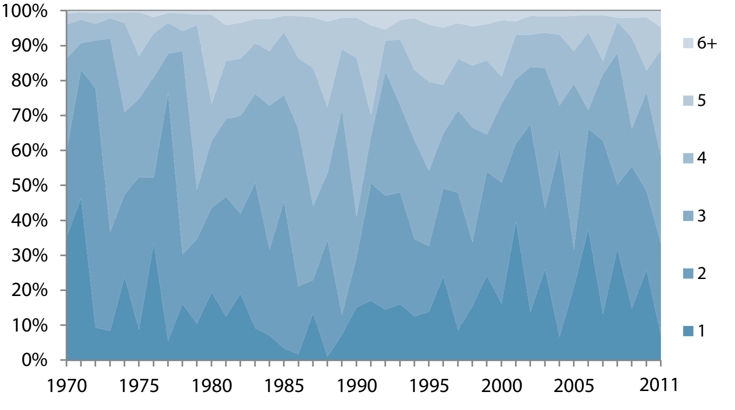
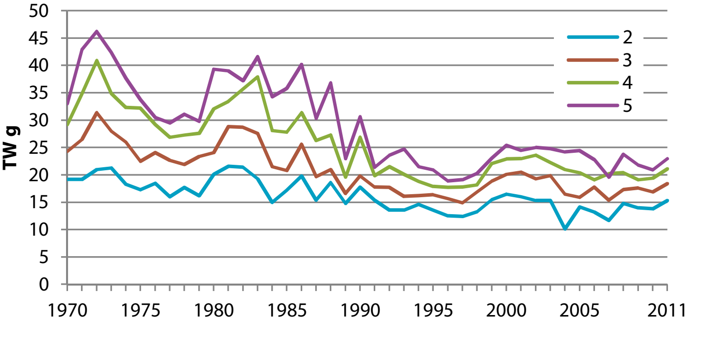


Figure 13.
Gulf of Riga herring: dynamics of mean body weight of 2–5-year-old herring, 1970–2011
Source: ICES, 2012



According to the ICES advice, which is based on the maximum sustainable yield approach, the fishing mortality rate of Gulf of Riga herring for 2013 (F2013) should not exceed 0.352, which is very close to $F_{MSY} = 0.35$. This implies that the total catch of Estonia and Latvia should not exceed 23,300 tonnes (for 2011 the ICES advised a catch of up to 25,500 tonnes). The advice of the ICES only concerns gulf herring. The STECF suggests that the catches of open sea herring likely to be caught in the Gulf of Riga should be included and the catches of gulf herring taken outside of the Gulf of Riga should be excluded; thus the TAC of herring taken from the Gulf of Riga in 2013 should be 27,640 tonnes (TAC2012 = 30,600 tonnes).

The long-term trend in fishing mortality rates indicates that despite the high biomass of Gulf of Riga herring, fishing mortality has exceeded the F_{PA} level since 1997 (Figure 14). Thus, in the next few years the recommended fishing quantities are not expected to increase for Gulf of Riga herring either.

The state of both Central Baltic herring and Gulf of Riga herring stocks may improve if sprat stocks decrease. This would reduce food competition between sprat and herring and lead to an increase in the mean body weight of herring. As a result, the fishing mortality of both stock units would be reduced much faster, which in turn would create preconditions for increased fishing opportunities.

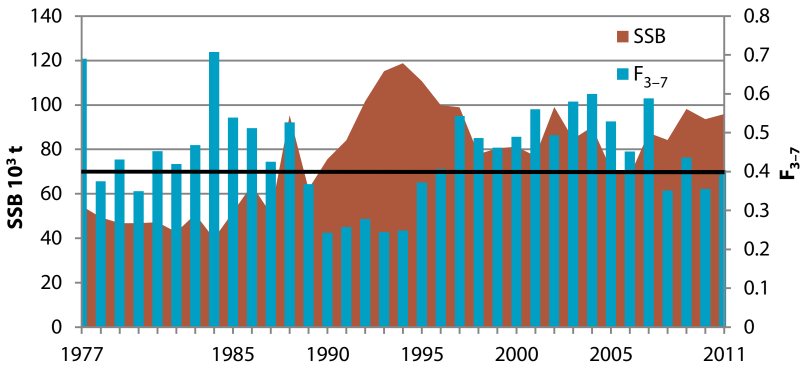


Figure 14. Gulf of Riga herring: spawning stock biomass (SSB) and fishing mortality in age groups 3–7 ($F_{3–7}$), 1977–2011. The horizontal line in the graph represents the maximum sustainable exploitation intensity $F_{PA} = 0.4$
Source: ICES, 2012

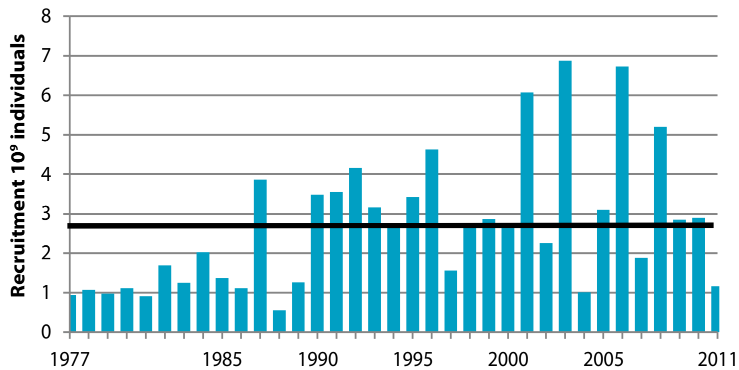


Figure 15. Gulf of Riga herring: dynamics of abundance of recruitment (age 1), 1977–2011. The horizontal line marks the long-term average.
Source: ICES, 2012

Sprat

Unlike herring, sprat (*Sprattus sprattus balticus*) is treated as a single stock unit (population) across the Baltic Sea. Sprat is a pelagic fish, like herring. The main biological difference lies in the high fecundity and pelagic spawning of sprat (sprat roe develops while floating in water, whereas herring mostly spawns on benthic vegetation). These factors cause a remarkable variation in the reproduction of sprat, which depends on the environmental conditions prevailing in different years.

The main spawning grounds of sprat in the Baltic Sea are located on the slopes of the Bornholm and Gotland Deeps, which are characterised by optimal

Table 14. Sprat catches in Baltic Sea by country (10^3 t), 1977–2011

Year	Denmark	Estonia	Finland	GDR	FRG	Latvia	Lithuania	Poland	Sweden	Russia*	Total
1977	7.2		6.7	17.2	0.8			38.8	0.4	109.7	**180.8**
1978	10.8		6.1	13.7	0.8			24.7	0.8	75.5	**132.4**
1979	5.5		7.1	4.0	0.7			12.4	2.2	45.1	**77.0**
1980	4.7		6.2	0.1	0.5			12.7	2.8	31.4	**58.4**
1981	8.4		6.0	0.1	0.6			8.9	1.6	23.9	**49.5**
1982	6.7		4.5	1.0	0.6			14.2	2.8	18.9	**48.7**
1983	6.2		3.4	2.7	0.6			7.1	3.6	13.7	**37.3**
1984	3.2		2.4	2.8	0.7			9.3	8.4	25.9	**52.7**
1985	4.1		3.0	2.0	0.9			18.5	7.1	34.0	**69.6**
1986	6.0		3.2	2.5	0.5			23.7	3.5	36.5	**75.9**
1987	2.6		2.8	1.3	1.1			32.0	3.5	44.9	**88.2**
1988	2.0		3.0	1.2	0.3			22.2	7.3	44.2	**80.2**
1989	5.2		2.8	1.2	0.6			18.6	3.5	54.0	**85.9**
1990	0.8		2.7	0.5	0.8			13.3	7.5	60.0	**85.6**
1991	10.0		1.6		0.7			22.5	8.7	59.7	**103.2**
1992	24.3	4.1	1.8		0.6	17.4	3.3	28.3	54.2	8.1	**142.1**
1993	18.4	5.8	1.7		0.6	12.6	3.3	31.8	92.7	11.2	**178.1**
1994	60.6	9.6	1.9		0.3	20.1	2.3	41.2	135.2	17.6	**288.8**
1995	64.1	13.1	5.2		0.2	24.4	2.9	44.2	143.7	14.8	**312.6**
1996	109.1	21.1	17.4		0.2	34.2	10.2	72.4	158.2	18.2	**441.0**
1997	137.4	38.9	24.4		0.4	49.3	4.8	99.9	151.9	22.4	**529.4**
1998	91.8	32.3	25.7		4.6	44.9	4.5	55.1	191.1	20.9	**470.9**
1999	90.2	33.2	18.9		0.2	42.8	2.3	66.3	137.3	31.5	**422.7**
2000	51.5	39.4	20.2		0.0	46.2	1.7	79.2	120.6	30.4	**389.2**
2001	39.7	37.5	15.4		0.8	42.8	3.0	85.8	85.4	32.0	**342.4**
2002	42.0	41.3	17.2		1.0	47.5	2.8	81.2	77.3	32.9	**343.2**
2003	32.0	29.2	9.0		18.0	41.7	2.2	84.1	63.4	28.7	**308.3**
2004	44.3	30.2	16.6		28.5	52.4	1.6	96.7	78.3	25.1	**373.7**
2005	46.5	49.8	17.9		29.0	64.7	8.6	71.4	87.8	29.7	**405.2**
2006	42.1	46.8	19.0		30.8	54.6	7.5	54.3	68.7	28.2	**352.1**
2007	37.6	51.0	24.6		30.8	60.5	20.3	58.7	80.7	24.8	**388.9**
2008	45.9	48.6	24.3		30.4	57.2	18.7	53.3	81.1	21.0	**380.5**
2009	59.7	47.3	23.1		26.3	49.5	18.8	81.9	75.3	25.2	**407.1**
2010	43.6	47.9	24.4		17.8	45.9	9.2	56.7	70.4	25.6	**341.5**
2011	31.4	3.05	15.8		7.7	33.1	9.9	55.3	56.2	19.5	**263.8**

* Until 1991, the Soviet Union.

Source: ICES. 2012

environmental conditions for sprat. In periods when sprat abundance is high, sprat move out of these reproduction centres and spread throughout the Baltic Sea, except in freshwater areas in the northern part of Bothnian Bay and the eastern part of the Gulf of Finland. Sprat are also present in the Gulf of Riga in relatively low numbers. The state of sprat stocks is influenced by the abundance of its main natural enemy: the cod. During periods when cod abundance is high, there are few sprat in the Baltic Sea and vice versa. Some researchers believe, however, that sprat may also act as a 'predatory fish' for cod, feeding on its pelagic roe. Of course, this situation occurs only on the spawning grounds of cod.

The large variability in the abundance and biomass of sprat is also reflected in the total catch of sprat, which has varied over the last 34 years from just 37,000 tonnes in 1983 to 589,000 tonnes in 1997 (Table 14). From 2007–2011 the catches of Baltic sprat ranged from 264,000 to 407,000 tonnes. The catch in 2011 was 264,000 tonnes, i.e. 23% less than in 2010. Sweden (21%), Poland (21%), Estonia (13%) and Denmark (12%) land the largest catches of sprat.

The stock and age composition of sprat is characterised by the dominance of younger age groups: age groups 1–2 account for up to 80% of catches, depending on the abundance of cohorts (Figure 16).

Changes in the body weight of sprat have generally followed the corresponding trend of herring in recent decades, but the body weight of sprat has still declined faster. The mean body weight of sprats of the same age currently

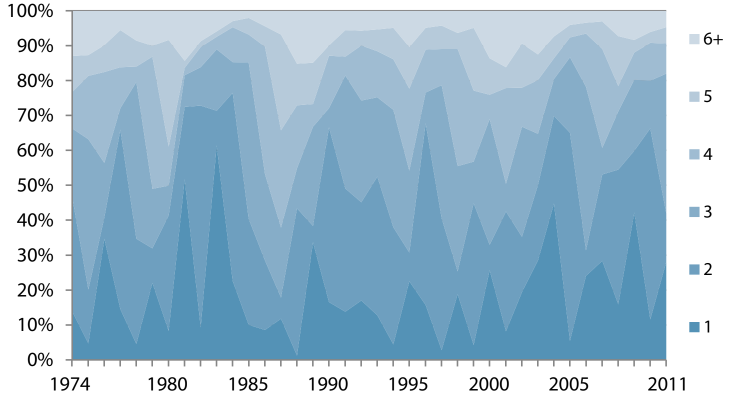


Figure 16. Average age composition of sprat catches, 1974–2011
1: age 1
2: age 2, etc.
6+: age 6 and older
Source: ICES, 2012

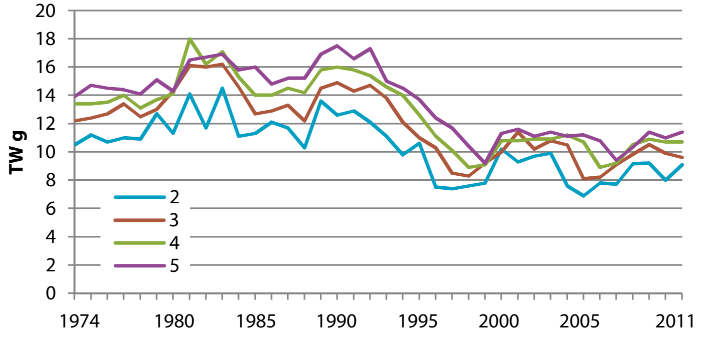


Figure 17. Dynamics of mean body weight of 2–5-year-old sprats, 1974–2011
Source: ICES, 2012

amounts to approximately 70% of the figures from the first half of the 1980s. However, the data for 2011 allow for a more favourable projection of the body weight of sprat: the body weight of 2-year-old sprat has overcome the recession of 2010 and now reaches the level of 2008 and 2009 (Figure 17).

Sprat in the Baltic Sea is treated as a single stock unit and therefore a single total allowable catch (TAC) is specified that covers the entire Baltic Sea.

Since the second half of the 1980s, in parallel with a decline in the abundance of cod, the abundance and biomass of sprat began to increase rapidly, reaching 3 million tonnes in 1995 (with spawning stock biomass amounting to 1.4 million tonnes). On account of the strong year classes of 1994 and 1995, the spawning stock biomass of sprat reached a record level of 1.7 million tonnes in 1997 and 1998, after which it declined again until 2003. Since 2004 the SSB has ranged from 0.8 to 1.2 million tonnes. In 2011 the SSB was estimated to amount to 809,000 tonnes, which is 7% less than the long-term average (Figure 18).

The depletion of spawning stock biomass has been caused by the weak year classes of 2004, 2007 and 2009, as well as high fishing mortality from 2003–2005 and in 2009 (Figures 18 and 19). Recent acoustic surveys of pelagic fish stocks in the Baltic Sea show that stocks have declined mainly in the southern part of the Baltic Sea and that stocks have mostly relocated to the northern part of the sea. Thus, the current status of the sprat stock in the economic zone of Estonia can still be regarded as relatively satisfactory. This is also reflected in the decreased sprat catch of countries around the western part of the sea (Table 14). However,

Figure 18. Sprat spawning stock biomass (SSB) and fishing mortality in age groups 3–5 ($F_{3–5}$), 1974–2011. The horizontal line in the graph represents the maximum sustainable exploitation intensity $F_{PA} = 0.4$
Source: ICES, 2012

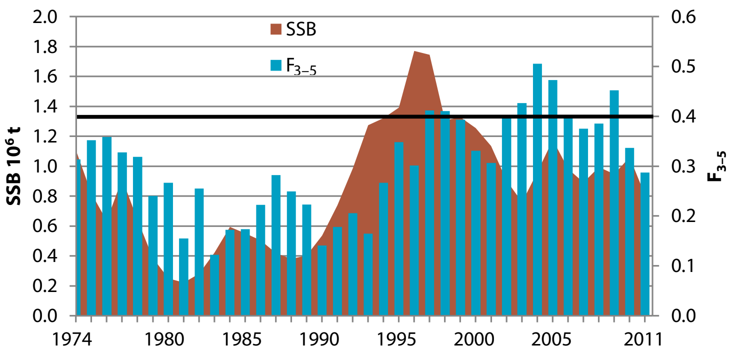
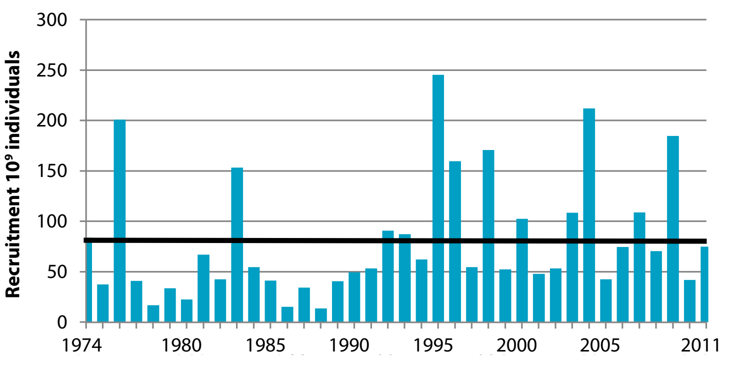


Figure 19. Dynamics of sprat recruitment (age 1), 1974–2011. The horizontal line marks the long-term average.
Source: ICES, 2012



it should be noted that fishing prospects still depend on the overall status of the stock in the Baltic Sea, i.e. the better situation in our waters does not automatically mean better fishing opportunities for our fishermen.

Unlike the assessment given in 2011, in its advice for 2012 the ICES classified the current level of exploitation of the Baltic sprat stock as sustainable, given that the fishing mortality rate has now fallen below the level of sustainable mortality (F_{PA}) as well as the level of mortality at maximum sustainable yield (F_{MSY}), being 0.4 and 0.35, respectively (Figure 18).

Considering that the year classes 2007 and 2009 were weak, the stock and catches of sprat are currently largely dependent on the cohort of 2008, which according to the assessment made in 2012 is around twice as abundant as the long-term average and accounted for 39% of catches in 2011 (ICES, 2012). Unfortunately, the cohort of 2010 is small, and stock and fishing that are based on just one abundant year class are not sustainable in the long term. As sprat stocks are highly dependent on recruitment, any assessment of the prospects of stocks is plagued by considerable uncertainty. For example, the cohorts of 2011 and 2012, whose abundance can only be estimated at present, will account for as much as 55% of spawning stock biomass in 2013. The actual abundance of these cohorts will not be clear until 2012 and 2013.

As sprat is an important food for cod, the main predatory fish in the Baltic Sea, the prospects of sprat stocks are undoubtedly influenced by the abundance of cod.

Figure 20 compares the average natural mortality of sprat in the age groups 1–6, and the spawning stock biomass of cod in the eastern part of the Baltic Sea from 1974–2011. The clear interdependence depicted allows us to claim that the increase in the spawning stock biomass of cod by 100,000 tonnes over the period has, theoretically, increased the natural mortality of sprat by around 25% on average.

Since 1994 the total mortality of sprat has mostly been influenced by fishing mortality. Natural mortality prevailed from 1978–1986, when the spawning stock biomass of cod ranged from 250,000 to 300,000 tonnes (currently less than 250,000 tonnes, Figure 21). This shows that with current cod stock levels the key

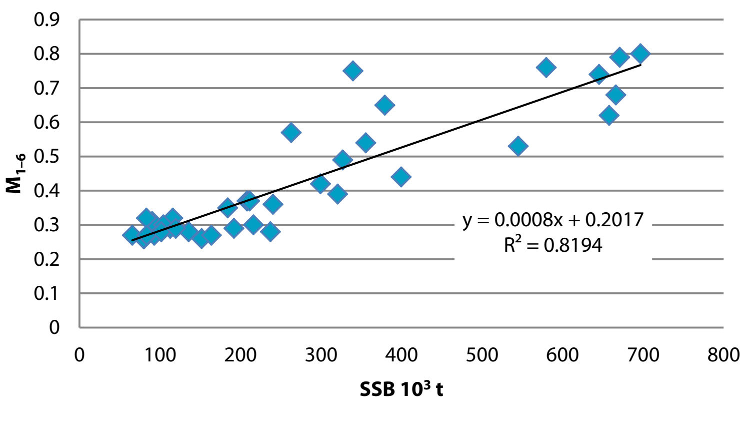
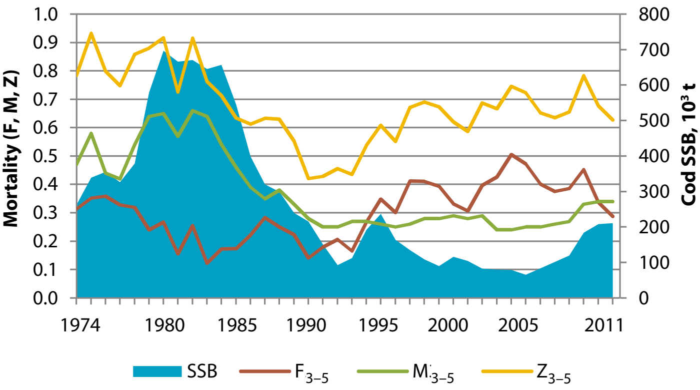


Figure 20. Estimate of natural mortality of sprat in age groups 1–6 at different levels of Eastern Baltic cod spawning stock biomass, 1974–2011
Source: ICES, 2012

Figure 21.
Fishing mortality ($F_{3–5}$), natural mortality ($M_{3–5}$) and total mortality ($Z_{3–5}$) of sprat and spawning stock biomass (SSB) of Eastern Baltic cod, 1974–2011
Source: ICES, 2012



to the management of sprat stock still lies in influencing the fishing mortality of sprat; all the more so as the spatial overlap between cod and sprat stocks has greatly decreased in recent years.

According to the ICES advice, which is based on the maximum sustainable yield approach, the fishing mortality rate of sprat should be less than F_{MSY} (0.35) in 2013. This corresponds to the total allowable catch of up to 278,000 tonnes (for 2012, the ICES advised a catch of up to 242,500 tonnes; not counting the catch of Russia, the TAC2012 of EU Member States is 225,000 tonnes). Thus, the ICES recommends increasing the catch of sprat by around 9% in 2013.

Cod in subdivisions 25–32 (Eastern Baltic cod)

Being a marine fish species, the distribution and abundance of cod (Gadus morhua callarias) in the Baltic Sea depend on suitable reproduction conditions. The main spawning grounds of cod are located on the slopes of the Bornholm, Gdansk and Gotland Deeps. The low salinity of the Baltic Sea is generally not conducive to wide distribution of cod. Then again, subject to the availability of favourable salinity, oxygen and temperature conditions, the high fecundity of cod (similar to that of sprat) may rapidly increase in abundance. This happened last at the end of the 1970s when the spawning stock biomass of cod tripled in less than a decade (Figure 22) before decreasing at the same pace.

Cod stocks have remained at low levels in the eastern part of the Baltic Sea since the 1990s. The ICES estimates that the long-term recession has been caused by low reproduction (due to unfavourable environmental conditions, in particular in the Gotland Deep), and excessive, often uncontrolled, fishing, especially in the 1990s and the first half of the 2000s. The catches of 2010 and 2011 amounted to 50,000 and 49,000 tonnes, respectively, exceeding the catches taken in the two preceding years (Table 15).

Thanks to the strong year classes of 2008 and 2009 (which nevertheless still fall significantly short of the long-term average, Figure 23), the abundance and spawning stock biomass of Eastern Baltic cod have increased slightly in recent years. This amounted to 211,000 tonnes at the beginning of 2012, representing around 81% of the long-term average (261,000 tonnes).

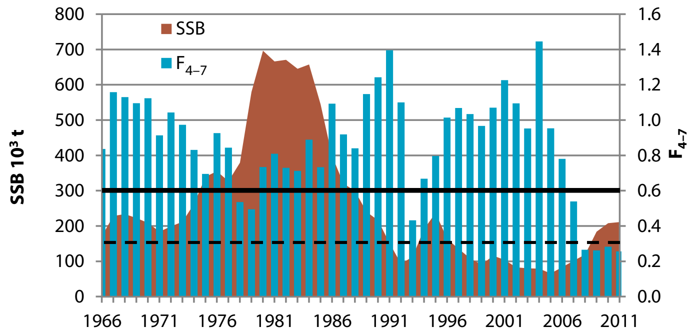


Figure 22. Eastern Baltic cod: spawning stock biomass (SSB) and fishing mortality in age groups 4–7 ($F_{4–7}$), 1966–2011. The horizontal solid line in the graph represents the maximum sustainable exploitation intensity F_{PA}=0.6 and the dotted line marks the target level F_{MGT} = F_{MSY} = 0.3 set in the Management Plan.
Source: ICES, 2012

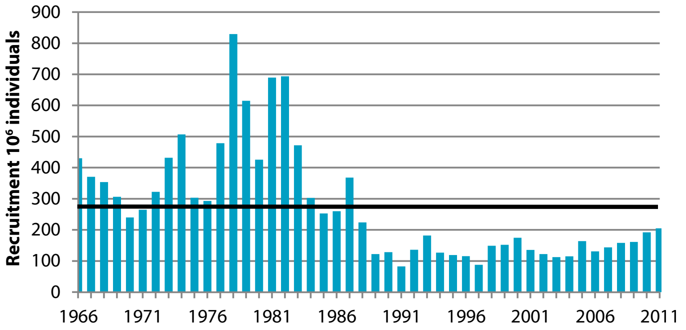


Figure 23. Eastern Baltic cod: dynamics of abundance of recruitment (age 2), 1966–2011. The horizontal line marks the long-term average.
Source: ICES, 2012

Table 15. Catches of Eastern Baltic cod by country (t), 1992–2011

Year	Denmark	Estonia	Finland	Germany	Latvia	Lithuania	Poland	Russia	Sweden	Unreported	Total
1992	18 025	1 368	485	2 793	1 250	1 266	13 314	1 793	13 995	0	**54 882**
1993	8 000	70	225	1 042	1 333	605	8 909	892	10 099	18 978	**50 711**
1994	9 901	952	594	3 056	2 831	1 887	14 335	1 257	21 264	44 000	**100 856**
1995	16 895	1 049	1 729	5 496	6 638	4 513	25 000	1 612	24 723	18 993	**107 718**
1996	17 549	1 338	3 089	7 340	8 709	5 524	34 855	3 306	30 669	10 815	**124 189**
1997	9 776	1 414	1 536	5 215	6 187	4 601	31 396	2 803	25 072	0	**88 600**
1998	7 818	1 188	1 026	1 270	7 765	4 176	25 155	4 599	14 431	0	**67 428**
1999	12 170	1 052	1 456	2 215	6 889	4 371	25 920	5 202	13 720	0	**72 995**
2000	9 715	604	1 648	1 508	6 196	5 165	21 194	4 231	15 910	23 118	**89 289**
2001	9 580	765	1 526	2 159	6 252	3 137	21 346	5 032	17 854	23 677	**91 328**
2002	7 831	37	1 526	1 445	4 796	3 137	15 106	3 793	12 507	17 562	**67 740**
2003	7 655	591	1 092	1 354	3 493	2 767	15 374	3 707	11 297	22 147	**69 476**
2004	7 394	1 192	859	2 659	4 835	2 041	14 582	3 410	12 043	19 563	**68 578**
2005	7 270	833	278	2 339	3 513	2 988	11 669	3 411	7 740	14 991	**55 032**
2006	9 766	616	427	2 025	3 980	3 200	14 290	3 719	9 672	17 836	**65 532**
2007	7 280	877	615	1 529	3 996	2 486	8 599	3 383	9 660	12 418	**50 843**
2008	7 374	841	670	2 341	3 990	2 835	8 721	3 888	8 901	2 673	**42 235**
2009	8 295	623		3 665	4 588	2 789	10 625	4 482	10 182	3 189	**48 439**
2010	10 739	796	826	3 908	5 001	3 140	11 433	4 264	10 169	0	**50 277**
2011	10 842	1 180	958	3 054	4 916	3017	11 348	5 022	10 031	0	**50 368**

Source: ICES, 2012

Despite the relatively low biomass, the fishing mortality of cod stocks has been below the level of the fishing mortality rate $F_{MSY} = 0.3$ in recent years (Figure 22). On this basis, the ICES regards the exploitation of Eastern Baltic cod as sustainable.

In 2008 the EU implemented a Multiannual Management Plan for the cod stocks in the Baltic Sea that aims to rebuild safe biological limits for the Eastern population and ensure stock levels at which the full reproductive capacity of the population is maintained and the highest long-term yields can be achieved (1098/2007/EC). This has probably helped to restore the Eastern Baltic cod stock to some extent.

There is still no commercial cod resource in Estonian waters, and directed fishing for this species is not economically feasible. However, Estonian vessels fish for cod in the Southern Baltic in small quantities. In 2011 the TAC of Eastern Baltic cod (EU + Russia) was 64,500 tonnes. Estonian fishermen caught 1180 tonnes, increasing their catch by 48% compared to 2010. In 2012 the total allowable catch of Eastern Baltic cod is 74,200 tonnes.

The advice of the ICES regarding the TAC of Eastern Baltic cod is based on the Multiannual Management Plan for cod stocks in the Baltic Sea that states that this stock unit's advisable fishing mortality rate $F_{MSY} = 0.3$ ($F_{sq} = 0.26$). This means that the total allowable catch of the EU and Russia will be 74,200 tonnes in 2012 and 65,900 tonnes in 2013, allowing for an increase in the SSB to 313,000 tonnes in 2014.

ESTONIA'S TRAWL FLEET IN THE BALTIC SEA

General overview of sector

In 2011, catches were reported for a total of 42 trawlers with a combined main engine power of 11,234 kW and a combined gross tonnage of 4362 tonnes. The average age of the vessels was 26 years, and a total of 215 people were employed on them. Compared to 2010, the number of trawlers engaged in fishing decreased by six i.e. 12.5% in 2011 (Figure 24). Because of reduced fishing quotas and a lack of raw material in the Estonian fish processing industry, some Estonian fishing companies have bought Finnish trawling companies in order to acquire fresh fish. Thus, some of the Finnish quota is landed in Estonia.

In 2011 the Estonian trawl fleet's final sprat and herring quotas (after quota transfers) were 36,734 and 19,315 tonnes, respectively (Figure 25). The sprat catch quota decreased by as much as 24% and the herring catch quota decreased by 5% compared to the preceding year. Despite this decrease, however, the fleet was not able to use the quotas in their entirety – quota uptake was just 92% in the case of sprat and herring. Representatives of fishing companies have explained that this was due to the prevailing weather conditions at the end of 2011, which were unfavourable for fishing.

In 2011 the historical fishing rights to catch sprat and herring in the Baltic Sea on the basis of fishing vessels' fishing permits were distributed among 27 companies. The rights to catch cod were distributed among 10 companies. The total catch of Estonian trawlers in the Baltic Sea amounted to 53,000 tonnes in 2011. Based on average first sales prices, the value of the catch was 10.1 million euros. In terms of species, sprat and herring prevailed in catches, but small amounts of cod, smelt, flounder and eelpout were also caught (Figure 26). The proportion of Estonian trawlers in the total catch from the Baltic Sea amounted to 84% in 2011.

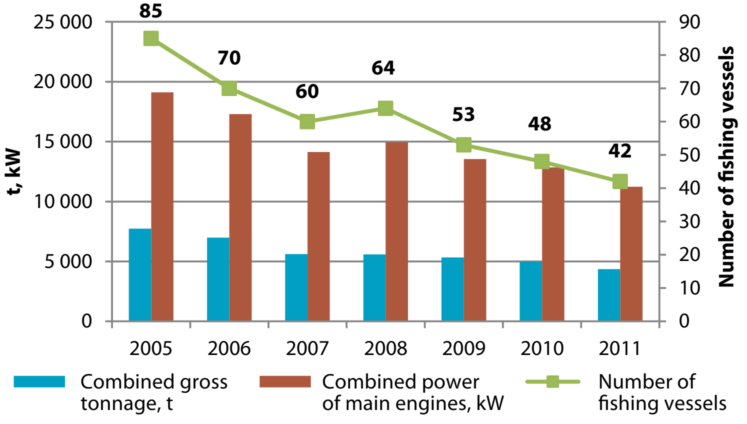


Figure 24. Number (units), combined gross tonnage (t) and combined power of main engines (kW) of fishing vessels engaged in fishing, 2005–2011 Source: MoA

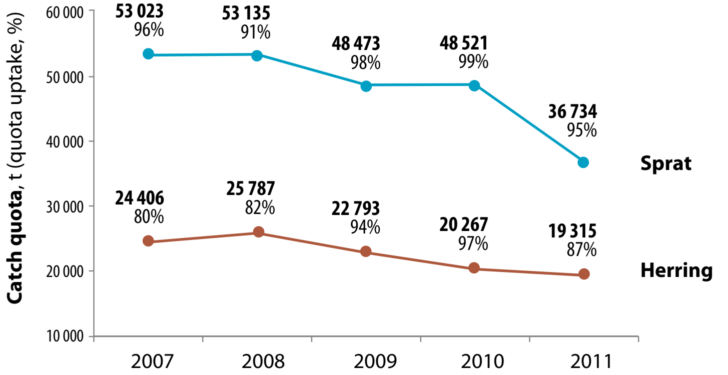


Figure 25. Estonian trawl fleet's final sprat and herring quotas (after quota transfers), 2007–2011. The quota uptake rate (%) for the given year is indicated in brackets. Source: MoA

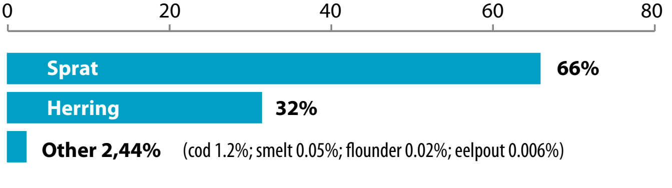


Figure 26. Proportion of different fish species caught from Baltic Sea in catches of Estonia's Baltic trawl fleet in 2011. Source: MoA

Sprat and herring were mainly landed at Estonian ports, where the catch was sold to fish freezing or processing companies, unless the fishing company itself was engaged in the processing and marketing of fish. Compared to 2010, the quantities of landed fish decreased in Latvia (1773 tonnes in 2010, 660 tonnes in 2011), but increased significantly in Denmark (Table 16). Estonian trawlers landed fish at 18 Estonian ports (Table 17). The largest quantities were landed at Dirhami, Veere and Miiduranna, where more than half (54%) of the fish caught by Estonian trawlers was brought ashore. Striking changes were

Table 16. Landings (t) in different countries of fish caught from Baltic Sea by Estonian trawlers in 2010 and 2011

Species	Year	Estonia	Latvia	Poland	Sweden	Denmark	Lithuania
Sprat	2010	47 698	163		<1		
	2011	34 254	189		315	218	
Herring	2010	18 007	1 610		9		
	2011	16 184	408		83	53	
Cod	2010			479	195	3	
	2011		50	674	120	139	23
Smelt	2010	35	<1				
	2011	76	4				
Flounder	2010			15			
	2011		9	25			1
Eelpout	2010						
	2011	3					
Total	**2010**	**65 740**	**1 773**	**494**	**204**	**3**	
	2011	**50 517**	**660**	**699**	**518**	**410**	**24**

Source: MoA

Table 17. Landings (t) in Estonian ports of fish caught from Baltic Sea by Estonian trawlers in 2011

County	Place of landing	Landings, t	Proportion (%) of total landings of trawlers
Lääne	Dirhami	12 831	25.4
Saare	Veere	7 871	15.6
Harju	Miiduranna	6 609	13.1
Lääne	Virtsu	4 181	8.3
Harju	Paldiski Lõunasadam	3 851	7.6
Lääne	Westmeri	3 556	7.0
Harju	Meeruse	2 513	5.0
Saare	Saaremaa	2 465	4.9
Hiiu	Lehtma	1 892	3.7
Saare	Roomassaare	1 656	3.3
Saare	Mõntu	1 345	2.7
Harju	Leppneeme	943	1.9
Pärnu	Pärnu	353	0.7
Ida-Viru	Toila	207	0.4
Harju	Bekkeri	172	0.3
Harju	Tapurla	52	0.1
Pärnu	Munalaiu	20	0.0
Pärnu	Kihnu	1	0.0

Source: MoA

observed in the quantities of fish compared to 2010. While the quantity landed at Dirhami Harbour increased by 74%, the quantities brought to Veere Harbour and Paldiski South Harbour decreased by 41% and 68%, respectively, compared to the preceding year. Most of the sprat and herring caught by the Estonian trawl fleet in 2011 were sold on the eastern market (Russia, Ukraine, etc.) in frozen form. Cod, on the other hand, was landed and sold at foreign ports (mostly Poland, Denmark and Sweden).

2011 was difficult for a number of fishing companies. Of the 24 engaged in trawling, one terminated its activities during the year because it was no longer profitable to continue. The year was characterised by a significant reduction in fishing quotas (in particular with regard to sprat), severe weather conditions and a continued rise in fuel prices. Then again, the decline in sales was offset by a rise in first sales prices of fish compared to the preceding year.

Fisheries subsidies paid in 2011 to fishing companies for permanent cessation of fishing activities by scrapping or permanent reassignment of fishing vessels amounted to nearly one million euros. In addition, 400,000 euros were paid for investments in fishing vessels. In 2010 the corresponding figures were 1.4 million and 617,000 euros, respectively.

According to Commission Decision 2008/949/EC, by which the European Union's multiannual programme for the fisheries sector was adopted, Estonia's Baltic trawlers can be divided into two length classes: 12–18 m and 24–40 m[1]. In 2011, large trawlers dominated. Preference for large trawlers in fishing can be explained by their efficiency. Greater efficiency enables e.g. higher wages to be paid to crews.

Basic and economic indicators of 12–18 m length class trawlers

In 2011, catches were reported by ten small vessels owned by six companies. These trawlers caught a total of 1230 tonnes of fish, representing just 2.3% of the total trawl catch. Based on first sales prices, the value of the catch was 204,000 euros. The trawlers mainly caught sprat and herring, with the remaining species accounting for 0.02% of the catch. The share of sprat increased noticeably: while it was nearly 25% in 2008 and 2009 and increased to 44% in 2010, in 2011 small trawlers caught even more sprat than herring – the proportion of sprat in the catch amounting to 59% (Figure 27).

Compared to 2010, the number of small trawlers engaged in fishing decreased by two in 2011, from 12 to 10 (Table 18). 17 fishermen were employed on small trawlers in 2011[2]. The volume of fish catch decreased by 44%, and the number of trawling hours per vessel also declined. The average annual labour cost per employee was 2303 euros in 2011, which was lower than a year previously. The gross value added provided by small trawlers amounted to 118,000 euros.

Operating expenses related to the fishing operations of trawlers of the 12–18 m length class were 198,000 euros in 2011. Labour (38%) and fuel (30%) made up the largest proportion of expenses (Figure 28).

[1] Except the Ann-Mari I fishing vessel, which is 19.99 metres long, but which belongs to the group of large trawlers due to its engine power (220 kW) and tonnage (99 t)

[2] Average number of employees during the year

Basic and economic indicators of 24–40 m length class trawlers

In 2011, catches were reported for 32 large vessels owned by 19 companies. These trawlers caught 51,800 tonnes of fish, whose estimated total value amounted to 9.9 million euros based on average first sales prices. Similarly to small trawlers, catches were dominated by sprat. Sprat and herring accounted for 66% and 31%, respectively, of the total catch for 2011, which means that the proportion of sprat decreased significantly compared to the preceding year (Figure 29).

The number of large trawlers decreased by 11%, dropping from 36 in 2010 to 32 in 2011 (Table 19). As a result, the number of employees changed: whereas

Figure 27. Sprat and herring catches (t) of 12–18 m length class trawlers, 2008–2011
Source: MoA

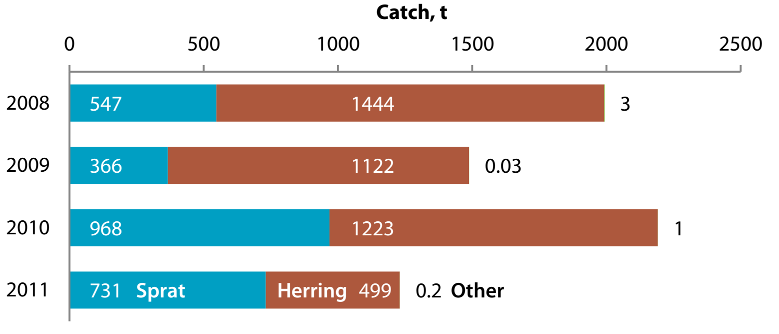


Figure 28. Distribution of operating expenses related to fishing operations of fishing vessels of 12–18 m length class in 2011
Source: UT EMI

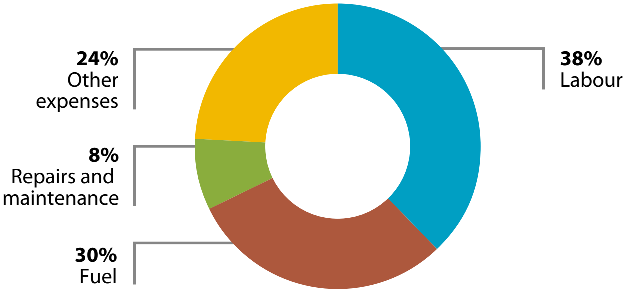


Table 18. Basic and economic indicators related to fishing operations of 12–18 m length class trawlers, 2008–2011

	2008	2009	2010	2011
Number of fishing vessels	23	14	12	10
Catch, 10^3 t	2	1.5	2.2	1.2
Value of catch based on first sale prices, 10^3 €	322	207	285	204
Average number of employees	37	22	20	17
Average annual labour cost per employee, €	2485	2566	2750	2303
Average number of trawling hours per vessel	154	163	178	118
Average fuel price, € l^{-1}	0.553	0.550	0.704	0.853
Gross value added, 10^3 €	136	60	161	118

Sources: MoA, UT EMI

in 2010 the average number of fishermen employed on large trawlers was 207, by 2011 this figure had decreased by 12% and amounted to 199. Despite the decrease in the volume of total fish catch the number of trawling hours per vessel increased. The increase in the number of trawling hours per vessel may have resulted from the lower number of fishing vessels and the growth in the cod quota. The average annual labour cost per employee was 12,368 euros, slightly lower than in 2010. The gross value added of the segment of large trawlers amounted to around 5.2 million euros.

Fishing-related operating expenses of trawlers of the 24–40 m length class amounted to 7.9 million euros in 2011. Labour (42%) and fuel (29%) made up the largest proportion of expenses (Figure 30).

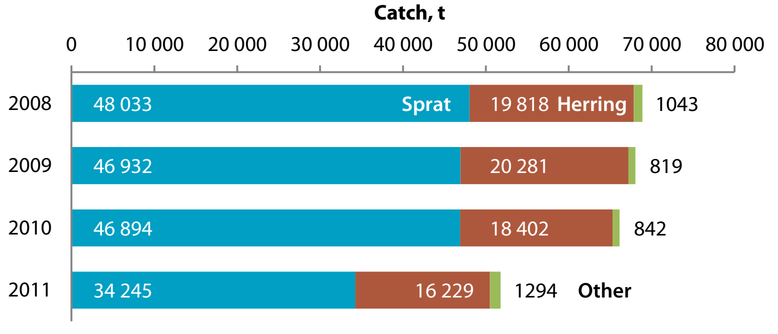


Figure 29. Catches of sprat, herring and other species (t) of 24–40 m length class trawlers, 2008–2011
Source: MoA

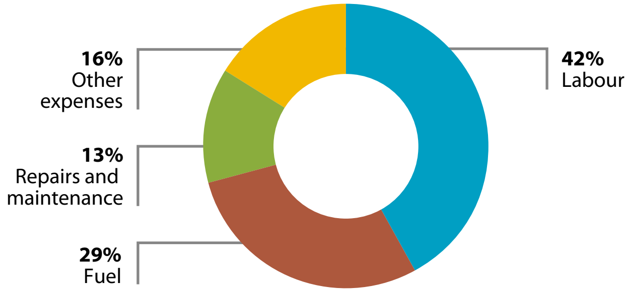


Figure 30. Distribution of operating expenses related to fishing operations of fishing vessels of 24–40 m length class in 2011
Source: UT EMI

Table 19. Basic and economic indicators related to fishing operations of 24–40 m length class trawlers, 2008–2011

	2008	2009	2010	2011
Number of fishing vessels	40	39	36	32
Catch, 10^3 t	68.9	68	66,1	51,8
Value of catch based on first sales prices, 10^3 €	11.9	10.7	9.2	9.9
Average number of employees	236	227	207	199
Average annual labour cost per employee, €	12 057	12 129	12 510	12 368
Average number of trawling hours per vessel	1 152	1 025	812	1 080
Average fuel price, € l^{-1}	0.503	0.377	0.486	0.709
Gross value added, 10^3 €	7.3	6.7	5.2	5.2

Source: MoA, UT EMI

Inland fisheries

LAKE VÕRTSJÄRV FISHERY

In 2011 a total of 181.6 tonnes of fish was caught in Lake Võrtsjärv, which was significantly less compared to previous years (Table 21). 75% of the total catch was taken with trap nets, with bream accounting for half of this (Figure 31). It should be noted that during the last two years the 'small bream', which is considered a second-rate fish, has also been included in the catches of bream. The remaining quarter of the total catch was taken with gill nets, with pikeperch accounting for 60%. Reported recreational fishing with gill nets and longlines made up 3% of the total catch, amounting to 5.5 tonnes.

The total catch was reduced, in particular, by a decline in the share of the by-catch of second-rate low-value fish in trap nets. As there is no market for second-rate fish, it is usually discarded when moving away from the trap net line, and thus the actual quantity is not reflected in catch statistics.

The amount of fishing gear and the fishing effort have remained unchanged on Lake Võrtsjärv in recent years. In 2011, permits were issued for fishing with

Figure 31. Proportion (%) of fish species in trap net catches from Lake Võrtsjärv in 2011
Source: EULS

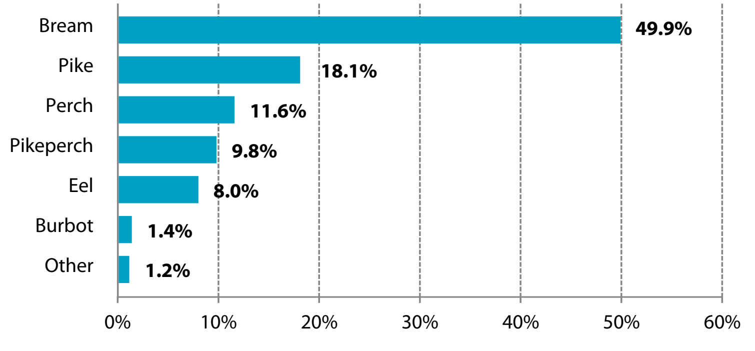
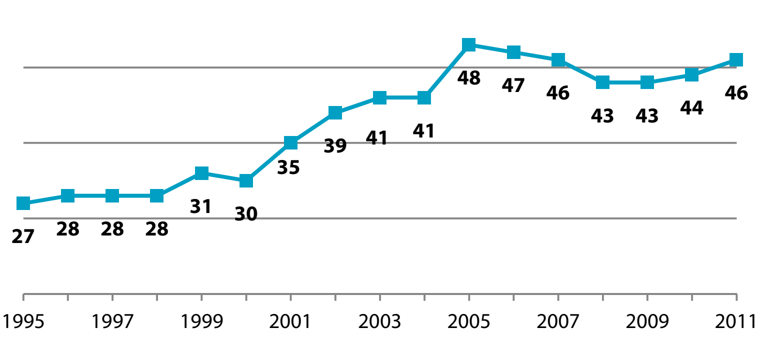


Figure 32. Number of commercial fishing permits issued for Lake Võrtsjärv, 1995–2011
Source: EULS



324 trap nets and 360 gill nets, including 40 recreational gill net permits. Thus there is one 170-metre trap net per 83 hectares and one 70-metre gill net per 75 hectares of the lake. In 2011 a total of 46 commercial fishing permits were issued for Lake Võrtsjärv. The number of holders of permits has increased by two as a result of partial transfer of permits (Figure 32).

Unfortunately, there are obvious distortions in the catch statistics for 2011 with regard to certain species. For example, the catch of perch increased significantly compared to the previous year under strange circumstances. When com-

Table 21. Catches (t) from Lake Võrtsjärv, 1971–2011

Year	Eel	Pike-perch	Pike	Bream	Burbot	Perch	Other*	Second-rate fish	Total
1971	6.5	28.1	12.9	20.1	2.7	4.5	0.5	75.3	**150.6**
1972	16.4	32.3	14.0	21.4	2.4	3.3	0.8	80.7	**161.4**
1973	21.3	43.0	11.5	16.0	1.2	3.8	0.4	92.3	**184.6**
1974	18.7	50.7	17.6	25.9	2.7	0.9	0.2	42.6	**161.9**
1975	36.9	51.8	12.3	23.8	1.3	1.6	0.3	41.3	**151.1**
1976	41.6	46.3	9.0	27.1	1.6	1.0	0.1	33.1	**155.1**
1977	50.0	45.3	12.8	33.2	1.7	0.6	0.3	20.8	**156.3**
1978	45.0	62.0	17.8	31.7	2.6	2.7	0.3	42.1	**209.2**
1979	19.0	73.0	19.0	26.1	3.0	3.0	0.8	40.3	**210.2**
1980	17.8	50.9	24.8	42.0	11.2	9.1	0.6	53.1	**210.7**
1981	16.4	42.4	29.3	63.0	17.9	7.9	0.4	68.4	**247.1**
1982	10.8	55.2	34.5	45.8	8.8	9.2	0.3	72.0	**242.2**
1983	24.6	50.5	51.4	60.0	7.4	8.8	0.6	85.3	**274.8**
1984	66.7	36.9	50.4	59.9	8.9	7.2	0.3	104.0	**292.2**
1985	71.9	59.0	39.0	100.1	7.4	5.4	0.3	168.4	**446.3**
1986	55.6	68.2	61.4	74.7	6.9	9.4	0.6	205.4	**498.5**
1987	61.2	45.5	35.0	76.9	6.6	7.0	1.2	163.3	**391.1**
1988	103.7	53.4	48.7	127.0	6.6	6.3	1.2	330.4	**634.8**
1989	47.6	44.5	56.4	196.7	5.9	7.4	1.4	303.6	**719.6**
1990	56.1	18.8	45.8	194.4	2.5	4.4	1.0	147.8	**414.7**
1991	48.5	26.7	30.5	139.4	4.8	3.7	1.4	212.5	**419.0**
1992	31.0	14.0	25.0	100.0	3.3	6.2	0.3	97.7	**246.5**
1993	49.0	36.0	32.0	81.0	7.0	8.0	0.8	107.0	**271.8**
1994	36.9	25.5	23.4	87.8	4.2	5.4	1.4	79.1	**226.8**
1995	38.8	28.3	19.4	68.7	1.4	5.2	0.1	112.8	**235.9**
1996	34.1	22.3	28.1	69.1	3.0	2.1	0	88.2	**212.8**
1997	40.3	20.7	19.3	92.3	3.4	2.4	0.1	98.0	**236.2**
1998	21.8	43.7	16.1	70.5	3.8	2.9	0.1	81.9	**219.0**
1999	37.4	34.5	24.9	47.8	2.6	12.1		116.7	**275.9**
2000	38.8	29.5	40.7	54.4	3.8	18.3	2.0	150.1	**337.6**
2001	37.6	32.8	50.8	56.8	4.0	12.6	0.2	191.7	**376.5**
2002	20.4	25.2	44.8	30.5	3.5	9.7	0.1	184.3	**318.8**
2003	26.4	19.2	49.8	42.3	6.0	14.2	0.1	157.9	**315.9**
2004	20.1	27.3	55.5	59.1	4.1	10.1	0.1	176.9	**353.2**
2005	17.6	46.7	52.6	57.3	2.5	15.4		192.5	**379.1**
2006	19.9	42.3	79.5	65.5	2.8	44.1	0.1	127.9	**381.7**
2007	21.5	29.7	57.0	105.2	3.6	17.1	0.1	174.6	**407.3**
2008	20.5	48.3	31.6	158.2	7.8	10.8	1.7	229.0	**507.9**
2009	13.6	74.1	33.0	81.5	2.9	9.0	1.6	131.9	**347.6**
2010	10.3	29.1	34.3	56.9	2.3	13.7	0.8	119.2	**266.6**
2011	11.2	40.7	32.2	77.9	2.3	16.9	1.2		**182.4**

* 'Other' includes tench, Crucian carp, Gibel carp and ide.
Note: The figures for 2000–2010 also include catches from restricted and recreational fishing in addition to commercial fishing.
Source: EULS

paring catches per unit effort (CPUE) on the basis of individual fishing permits, it appeared that certain permit holders who catch, buy and sell fish (and not just on Lake Võrtsjärv) managed to catch perch per trap net nearly ten times more than others. It is also inconceivable that certain permit holders who use ten trap nets were unable to catch any eels during the season. In addition, it is unlikely that just seven kilograms of bream (and nothing else) was caught throughout the season with two trap nets, which were definitely used for fishing, as confirmed by other fishermen. Obviously, fish caught elsewhere is legalised with the help of this scheme.

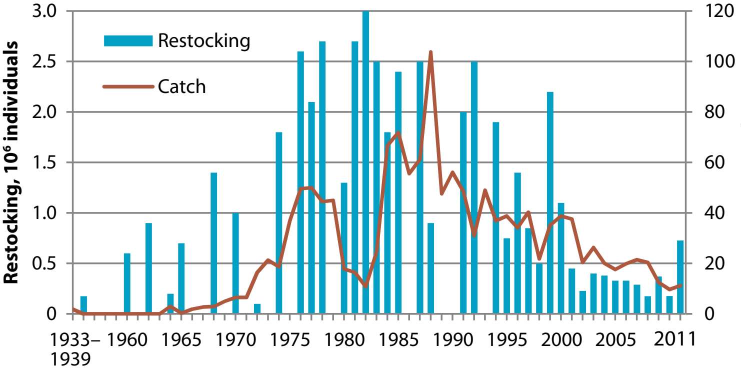
Eel. The eel catch amounted to 11.2 tonnes in 2011, up by one tonne compared to the recession of the previous year. Nevertheless, the catch accounted for just a third of the long-term average (33.7 tonnes). The main reason for the reduction in catches is the sharp decline in the number of eels introduced into the lake since the beginning of the 2000s when the price of restocking material rose dramatically on the world market. Considering the average restocking volume of the last ten years (330,000 farmed eels), catches of 20–25 tonnes should be reflected in catch statistics. However, as the number of pre-grown eels introduced into the lake was 290,000 in 2007, 175,000 in 2008 and 178,000 in 2010, catches are bound to decline in the near future (Figure 33). For better catches, the restocking volume should be increased considerably.

On the other hand, rising water levels have also reduced eel catches, limiting in particular the quantity of eels caught in trap nets. Although recreational fishing with longlines and marking results indicate that the stock remains at the same level, the catch of 2011 was nearly half the size of the quantity projected. The average catch of eels accounts for up to 15% of fishing-sized eels in the lake. In 2010 and 2011 this figure was even smaller: just 9%.

The prevalence of pre-grown cohorts could be observed with certainty in the catch of 2011. The representatives of 10-year-old and older cohorts, i.e. eels released into the lake as elvers, accounted for just 8.3%. The largest proportion of the catch was made up of pre-grown eels introduced into the lake in 2004 when the volume of restocking was highest (483,000).

For the first time in the history of Lake Võrtsjärv, both pre-grown eels (157,000) and elvers were introduced into the lake in 2011.

Figure 33. Eel restocking and catches in Lake Võrtsjärv, 1993–2011
Source: EULS



Fishermen are increasingly adding value to their catches locally, selling smoked or pickled eels in tins or jars. Thus the price of raw fish almost doubles in home yard sales. Also, the first sales price of eel has increased considerably in the last couple of years, offsetting the decline in revenue due to decreasing catches.

Pikeperch. Pikeperch stock and catches have remained in good condition in Lake Võrtsjärv for many years. The catch of 40.7 tonnes taken in 2011 represents the average catch of the past 40 years. Due to deteriorating oxygen conditions, the under-ice catch in late winter was modest, but this was offset by the large catch taken in autumn with gill nets. In December the catch was again smaller than usual, with the lack of ice cover, windy weather and risk of the lake freezing limiting fishing with nets. The reproduction of pikeperch was above average in 2011. The strong cohorts of the last three years will ensure 40–45-tonne catches in the coming years.

The fact that pikeperch year classes remain in commercial fishing catches for up to ten years reflects balanced fishing intensity. Unlike in other lakes, the minimum size (TL) of pikeperch in Lake Võrtsjärv is 51 cm, which enables pikeperch to reproduce for at least a couple of years before being caught. As the natural mortality rate of this predatory fish at the top of the food chain is low, each pikeperch puts on 300–500 g in weight each year. This ultimately means higher catches of each year class.

Pike. The pike catch amounted to 32.2 tonnes in 2011, which is close to the average of many years, but still below the high levels of a few years ago.
The prospects of catches from Lake Võrtsjärv for the next few years are good or even very good for most important species (Table 22).

To reduce the tax burden of fishermen fishing in eel lakes, it was proposed in 2011 that fishing charges be cut, given that a considerable proportion of eels are able to emigrate from the basin. The legislative amendment adopted provides that two-thirds of the cost of the restocking of eels, which so far has been borne by fishermen, be covered through various environmental funds starting from 2012. This will help local fishermen cope better.

Table 22. General assessment of state of stocks and fishing mortality in Lake Võrtsjärv in 2011 and the near future broken down by important species

Species	State of stocks*			Fishing mortality**
	2011	until 2012	until 2015	
Eel	3	3	2	A
Pikeperch	2	2	1	B
Pike	2	2	3	B
Bream	3	3	2	C
Perch	3	3	2	B
Burbot	3	3	2	A
Lake Peipsi smelt	4	4	3	D

* State of stocks – 1: good; 2: moderate; 3: poor; 4: depleted
** Fishing mortality – A: low; B: moderate; C: high; D: insufficient data available
Source: EULS

LAKE PEIPSI FISHERIES

State of fish stocks

The stocks of warm- and moderate-water commercial fish from Lake Peipsi (pikeperch, perch, pike, bream and roach) are in good or satisfactory condition, but the state of the species that prefer cold water (smelt, vendace, whitefish and burbot) remains problematic. This has been caused by the overall state of the lake, combined with the impact of weather conditions and fishing. The total allowable catch for 2011 was almost as big as in the last couple of years (Table 23). The catch quota of the main commercial species of the lake (perch) declined, while the catch quotas of pikeperch, pike and bream increased. Remarkably, vendace was counted among commercial fish for the first time in many years, with a quota of 10 tonnes in 2011.

Pikeperch. Pikeperch stock is in a satisfactory condition, but the situation of the most valuable target fish of Lake Peipsi is becoming increasingly worrying. By the end of 2011 the pikeperch cohort of 2005 lost its commercial relevance and was replaced by the cohort of 2008 and in autumn by the cohort of 2009. The latter are not as strong as the cohort of 2005, but due to catch limits their CPUE (expressed in individuals and kilograms per trawling hour) is at the same level as that of the year class that in 2008 was three summers old (Table 24). Thus the preconditions for exploiting the available pikeperch stock in much the same way as the cohort of 2005 have at least been preserved. In this case, pikeperch catches of around 600 tonnes can be projected for the next three years.

As the abundance of smelt is still low in the lake, young pikeperch (especially at ages 0+ and 1+) grow slowly (Table 25) and are therefore characterised by high natural mortality. No new strong pikeperch cohorts appeared in 2010

Table 23. Estonian national fishing quotas (t) on Lakes Peipsi and Lämmijärv, 2006–2011 (quota transfers and deductions on account of overfishing taken into account)

Species	Year					
	2006	2007	2008	2009	2010	2011
Pikeperch	1000	1029	1000	600	546	672
Perch	396	1000	820	850	1200	900
Pike	85	110	95	85	70	110
Bream	700	625	700	570	460	600
Roach	600	500	475	330	330	305
Burbot	50	50	50	50	50	50
Ruff	750	500	300	300	300	300
Smelt	1000	100	5	5	5	5
Whitefish	10	10	7	5	7	5
Vendace	0	1	1	1	1	10
Other	50	50	50	50	50	50
Total	**4641**	**3975**	**3503**	**2846**	**3019**	**3007**

Source: UT EMI

or 2011. The total mortality of juvenile fish (which are subject to catch limits) remains high: nearly five million fish died in 2011 (Z = 0.37). While official fishing (fishing mortality) can explain the loss of up to a million individuals (F = 0.07), it is difficult to find reasons for the loss of the remaining four million. Apart from natural mortality, fish abundance is most probably being reduced by hidden fishing mortality (poaching and trap net fishing).

Table 24. **Pikeperch CPUE (number of individuals and kg per trawling hour) based on test trawling in Lake Peipsi, 2006–2011 (the numbers in bold indicate strong year classes of 2005 and 2009)**

Individuals			Age group			
Catch year	1+	2+	3+	4+	>4+	Total
2006	**902**	16	0	4	**1**	923
2007	0	**209**	2	0	1	359
2008	9	0	**102**	1	0	664
2009	33	4	0	**35**	2	182
2010	**347**	32	3	0	**10**	392
2011	0	**180**	8	1	1	189
kg			Age group			
Catch year	1+	2+	3+	4+	>4+	Total
2006	**119**	12	0	6	**2**	139
2007	0	**55**	3	0	1	59
2008	1	0	**49**	3	0	54
2009	3	1	0	**37**	5	47
2010	**30**	20	4	0	**22**	75
2011	0	**43**	12	2	3	60

Source: UT EMI

Table 25. **Total length (TL, cm) and total weight (TW, g) of pikeperch from year classes of 2005–2011 in Lake Peipsi**

TL (cm)				Year class			
Age	2005	2006	2007	2008	2009	2010	2011
0+	14	11	9	8	9	–	9
1+	26	–	22	23	22	–	
2+	32	–	33	40	30		
3+	38	–	48	53			
4+	47	–	61				
5+	58	–					
6+	64						
TW (g)				Year class			
Age	2005	2006	2007	2008	2009	2010	2011
0+	23	8	5	3	6	–	4
1+	132	–	83	97	86	–	
2+	261	–	339	616	240		
3+	478	–	1144	1546			
4+	1049	–	2445				
5+	2156	–					
6+	2998						

Source: UT EMI

Table 26. Perch CPUE (number of individuals by age group and total weight per trawling hour) based on test trawling in Lake Peipsi, 2006–2011 (the numbers in bold indicate strong year classes of 2005 and 2009)

Abundance	Age group						Weight (kg)
Catch year	1+	2+	3+	4+	>4+	Total	
2006	**4 738**	61	0	1	4	**4 806**	94
2007	11	**1 965**	53	0	5	**2 034**	82
2008	2	0	**1 267**	12	3	**1 284**	81
2009	7	7	0	**812**	14	**840**	79
2010	**4 422**	46	4	4	**546**	**5 022**	178
2011	1	**1 715**	32	0	253	**2 001**	104

Source: UT EMI

Perch. Thanks to the addition of the strong year class of 2009, perch stock in Lake Peipsi continues to be in good shape, but the year classes of 2010 and 2011 are weak, as is the case with pikeperch (Table 26). The catch quota is likely to be around 1000 tonnes in the coming years. Because of the slow growth of the cohort of 2009, the fish were too small in 2011 to be processed and were therefore of no interest to fishermen. Thus, perch fishing again relied on the cohort of 2005.

Bream. Bream stock, which remains in good condition, mainly comprises cohorts born in the mid-2000s. In test-trawling the CPUE appeared to be equal to many years' average, but the stock composition was uneven (no older fish and annual recruitment was small).

Pike. Pike stock is in good condition with a prevalence of 2007 and 2009 year classes. In test-trawling carried out in 2011 the CPUE was the highest of the last five years.

Vendace. The state of vendace stock has improved since the mid-2000s, but is still quite poor compared to earlier years. However, the biological characteristics of vendace (late spawning and early hatching) probably give it an advantage over whitefish and smelt, and therefore its stock is in a better state. In 2011, very limited commercial fishing (a quota of 10 tonnes) was permitted (in addition to previous years' test fishing), but unfortunately the catch of Estonian fishermen is not reflected in the statistics, as it was not reported. Vendace have grown much more rapidly than in previous years. By autumn the length (TL) of two-summer-old fish that are spawning for the first time is nearly 20 cm and their weight 60 g. This fact prompted the replacement of the current minimum size of vendace (10/12 cm SL/TL) with a new one (17/20 cm SL/TL).

Catches

In 2011, 70 companies and 405 fishermen with fishing opportunities were operating on Lakes Peipsi and Lämmijärv on the Estonian side (Table 27). Permitted fishing capacity was the same as in previous years.

Table 27. Number of companies and fishermen connected with Lake Peipsi, 2006–2011

Year	2006	2007	2008	2009	2010	2011
Companies	96	94	87	68	69	70
Total number of fishermen	530	490	300	336	365	405

Source: MoA

Table 28. Catches from Lakes Peipsi and Lämmijärv (t), 2006–2011

Species	2006	2007	2008	2009	2010	2011
Pikeperch	1083	900	622	654	508	672
Perch	492	345	746	808	1205	757
Pike	100	113	55	66	46	100
Bream	332	395	370	537	435	578
Roach	220	202	204	189	198	225
Smelt	83	0	0	0	0	0
Whitefish	1	2	1	3	1	0
Vendace	0	1	1	1	0	1
Burbot	18	34	25	27	26	30
Burbot	16	17	65	76	41	9
Total	**2 346**	**2 009**	**2 089**	**2 360**	**2 461**	**2 371**

Source: MoA

Estonian fishermen's total catch from Lakes Peipsi and Lämmijärv amounted to 2371 tonnes in 2011, or approximately the same amount as in 2009 and 2010. Compared to 2010 the perch catch decreased significantly, but the catches of almost all other target species increased (Table 28). The total catch of perch, pikeperch and pike, which are mainly exported, was around 1500 tonnes in 2011, which is around 300 tonnes less than in 2010, but equal to the catches taken in 2008 and 2009.

In all of those years these species accounted for around two-thirds of Estonia's total catch from Lakes Peipsi and Lämmijärv. According to the ecosystem approach, this is the part of the catch that comprises predatory fish, while the small catch of burbot (which was the same as in the two previous years) does little to improve this figure.

2011 saw an increase in the catches of non-predatory fish (bream and roach) which are sold mainly on the local market. This may be due to improved registration of catches as a result of entry into force of the requirement of prior notification also for nets and traps (the requirement for Danish seines having been established earlier). The proportion of bream and roach accounted for approximately 30% of the total catch.

Fishing in Lakes Peipsi and Lämmijärv is characterised by high seasonality due to the fishing regime, the composition of stocks, fishing interest and the specific natural conditions. The largest catches are usually taken in spring and autumn, as was the case in 2011 (Figure 34). Catches mostly comprised perch and bream. Pikeperch is fished in winter and autumn; roach, burbot and ruff in spring; and pike in autumn.

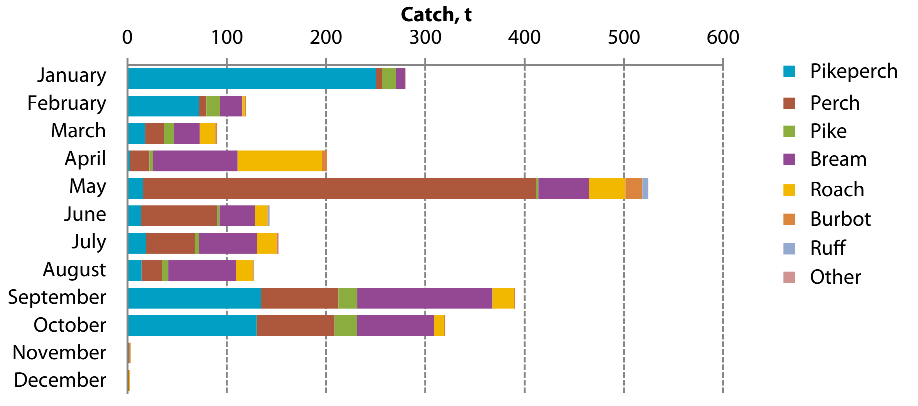


Figure 34. Seasonal dynamics of catches (t) from Lakes Peipsi and Lämmijärv by species in 2011. Source: UT EMI

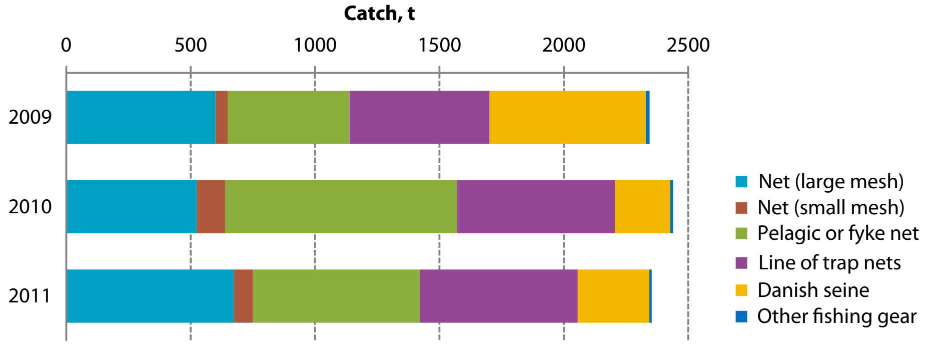


Figure 35. Catch from Lakes Peipsi and Lämmijärv by fishing gear, 2009–2011 Source: UT EMI

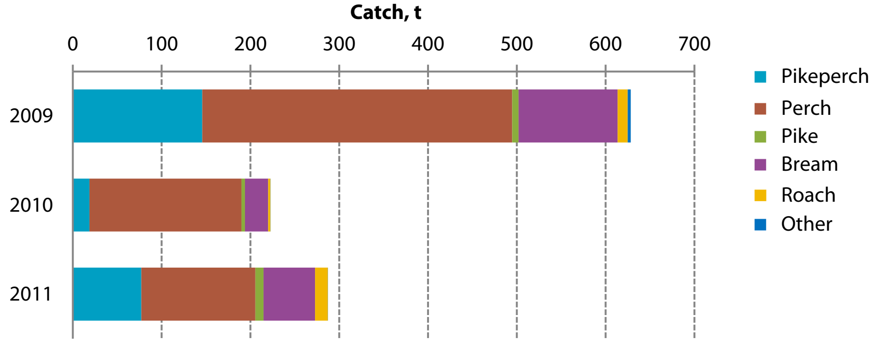


Figure 36. Catch composition taken with Danish seines from Lakes Peipsi and Lämmijärv, 2009–2011. Source: UT EMI

Table 29. Estonian catches (t), quotas (t), uptake (%) and balances (t) of quotas for Lakes Peipsi and Lämmijärv

Species	Catch	Quota	Uptake	Balance
Pikeperch	672	672	100	0
Perch*	757	900	84	143
Pike	100	110	91	10
Bream	578	600	96	22
Roach	225	305	74	80
Burbot	30	50	60	20
Ruff	8	300	3	292
Smelt	0	5	0	5
Whitefish	0	5	4	5
Vendace	1	10	6	9
Other	1	50	1	49
Total	**2371**	**3007**	**79**	**636**

* The quota was initially larger but was reduced at the end of the year because of the slower than anticipated growth of fish.

As more than 90% of the quotas of the primary target species had been used up (Table 29), fishing with nets and Danish seines was suspended on the Estonian side as early as mid-October. (Notably, fishing had also started later, on 15 September instead of the agreed 1 September.) After this, trap net fishing alone continued on the lakes, which was not very productive. Because of a substantial winter catch of pikeperch (Figure 34), catches of the species were limited for the first time in the first half of the year in 2011 (fishing with nets being banned in mid-March).

As in previous years, trap nets provided the most catches in 2011 (Figure 35). Pelagic and fyke nets and lines of trap nets caught a total of 1306 tonnes of fish (55% of the total catch); large-mesh net catches amounted to 673 tonnes (29%); and Danish seine catches amounted to 287 tonnes (12%). The proportion of fish caught with other fishing gear was negligible. Danish seine catches have been unusually low in the last two years because of the restrictions on perch or pikeperch fishing (which also entail the termination of fishing with seines) (Figure 36). In 2011 the quantity of perch caught with Danish seines was also small for reasons attributable to the composition of the stock (the amount of large perch being low and small perch not being big enough for commercial fishing). Kallaste continued to be the major fish port in the region in 2011; more than 400 tonnes of fish were landed there during the year. Approximately 100 or more tonnes of fish were landed at another ten ports on Lake Peipsi.

Catch value

The value of catches taken from the lake, calculated on the basis of average first sales prices in Estonia, rose to 4.5 million euros in 2011 (4.34 million euros in 2010). Traditionally, pikeperch and perch are more valuable species. Large-mesh gill nets (for pikeperch) and pelagic and fyke nets (for perch) are the most profitable fishing gear (Figure 37). In general, Lake Peipsi fishery relies on these two fish species, which is probably more justified and useful socio-economically than pikeperch-based fishing alone.

Again, Estonia's significant fishing effort (which probably even exceeded the permitted levels) made it impossible to fully implement the fishing regime agreed for the second half of 2011. As in earlier periods, this was attributable to intensive and effective fishing with nets and traps in the first half of the year. Therefore, fishing with nets and demersal seines had to be greatly restricted in the second half of the year.

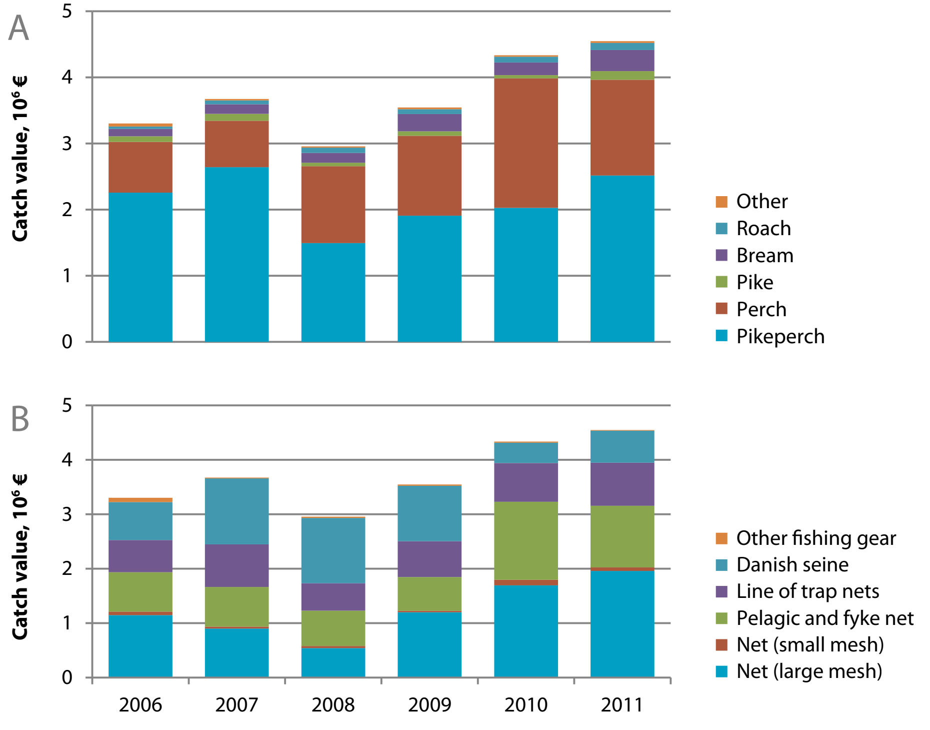


Figure 37. Value of catches from Lakes Peipsi and Lämmijärv based on average first sales prices, 2006–2011. A: by species, **B:** by fishing gear.
Source: MoA, UT EMI

Recreational fishing

In Estonia, people are turning more and more attention to how they spend their leisure time. The Statistical Office even collects data on this, classifying fishing and hunting (as well as berry and mushroom picking) as productive leisure activities.

Because of such a general definition, there are no precise data on recreational fishing – how many recreational fishermen there are, how many times a year they go fishing, what their favourite fishing spots are, etc. Therefore, information on recreational fishing in Estonia has to date mostly been based on estimates.

Surveys conducted from 2004–2011 enable a more precise assessment of recreational fishing. The conclusions of most of these surveys were included in the book 'Estonian Fishery 2010'. The following overview is based on a quantitative survey of recreational fishing in Estonia that was conducted in 2011 by Emor AS (Männaste, 2011). The survey covered 2010, but unconfirmed data indicate that there have been no major changes in recreational fishing in 2011. The primary objective of the survey was to provide an overview of the main characteristics of recreational fishing in Estonia in 2010. The survey focused on the number, age and gender distribution of recreational fishermen, the use of different fishing gear and fishing grounds, the species fished and their quantities, the use of catches and the time and money spent on recreational fishing.

The survey was conducted from 23 May–7 June 2011 in the form of personal interviews in six regions: Tallinn, Northern Estonia, Western Estonia, the Tartu region, Southern Estonia and the Viru region. The target group was composed of Estonian residents aged 15 and older who engaged in recreational fishing in 2010. All forms of recreational fishing were included – fishing with spinning rods, hand lines, crayfish catching gear, longlines, gill nets, underwater fishing gear etc. Assisting to drive boats or handle fishing gear was also included.

Young people (below the age of 15) were not covered by the survey. According to the data on recreational fishing on the Emajõgi River, they account for just under 10% of the total number of recreational fishermen.

Proportion, gender and age distribution and other socio-demographic breakdown of recreational fishermen

One in four inhabitants (25%) of Estonia aged 15 years and older engaged in recreational fishing in 2010. 60% of those who did not fish in 2010 had engaged in fishing in previous years, and 8% had gone fishing regularly in previous years. 30% of the population of Estonia has never engaged in fishing; the remaining 45% have engaged in it in previous years.

Younger people (15–34) prevail among recreational fishermen in Estonia. In terms of gender distribution, men dominate. The proportion of recreational fishermen is slightly above average in Southern Estonia and the Viru region (33% and 30%, respectively). This figure is slightly lower in Tallinn (21%).

Recreational fishermen's participation in fishing process and intensity of fishing

Around a third of those who engaged in fishing can be considered occasional fishermen: they went fishing once or twice a year. Slightly more than a quarter went fishing more than ten times in 2010. The population aged 50 and older, men and non-Estonians prevailed among more active fishermen. One fifth of recreational fishermen considered fishing an important or the most important hobby they had.

Four out of five recreational fishermen usually fished themselves, while one participated by helping others. A gender difference could be noted in the fishing process: nearly half of women compared to just a tenth of men took a passive role. In 2010 the number of fishing days per fisher was 20 on average.

Use of fishing gear

Spinning-rods (used by almost every other fisherman in 2010) and hand lines and simple hand lines (used by more than a third of fishermen) represented the main recreational fishing gear employed. Gill nets, playing hooks and bottom lines were used equally (by around one in ten fishers), while other gear was used in relatively few cases – among 2% of fishermen or fewer. Gill net use differed from region to region and was more prevalent in Western Estonia. The Viru region differed from Tallinn and Harju County in its more modest use of spinning-rods.

Gill nets hold third place after spinning-rods and hand lines. In 2010 the proportion of those using gill nets was higher than the combined numbers of fishermen using trimmers, trolling lines, fly hooks, hoopnets, dragnets, harpoon guns and crayfish catching gear. However, just 17% of recreational fishermen are in favour of using gill nets as fishing gear (MoE, 2009).

Slightly more women than men used simple hand lines, while men make more use of spinning-rods in particular, as well as bottom lines and playing hooks.

In terms of nationality, Estonians were distinguished by stronger support for the use of gill nets, while no major differences were observed in terms of their use of other fishing gear.

Intensity of using fishing grounds

Almost half of all recreational fishermen in Estonia fish in small lakes and rivers. A quarter had fished in Lake Peipsi and 15% had fished in the Emajõgi River. 18% had fished at sea, with the Gulf of Finland being the most popular fishing ground, preferred by 8% of recreational fishermen. While the inhabitants of the

Viru region used Lake Peipsi most, people living in Southern Estonia tended to fish in small lakes. In Western Estonia, the sea was the main fishing ground alongside rivers; the Gulf of Riga, the Väinameri Sea and coastal regions towards the Baltic Proper near the islands stood out for an above-average proportion of fishermen.

When dividing Estonia into fishing grounds – the Gulf of Finland, the Gulf of Riga, the Väinameri Sea, the coastal regions towards the Baltic Proper near the islands, Lake Peipsi, Lake Võrtsjärv, the Emajõgi River and other lakes and rivers – it appears that, on average, recreational fishermen fished in almost two (1.8) fishing grounds in 2010.

Catches of recreational fishermen

In 2010, 80% of those who went fishing at least once landed a catch. Perch was the most common – almost every other recreational fisherman catching it in 2010. Slightly more than a third caught pike and roach, and around a sixth of fishermen caught bream. 5% of fishermen or fewer managed to catch other species.

In total, recreational fishermen in Estonia caught an estimated 5000 tonnes of fish in 2010 (3900–7100 tonnes, taking into consideration confidence limits). The quantity of fish actually caught was probably higher because, for example, gill net catches were not taken into account in the survey.

As previously stated, the bulk of the catch comprised perch and pike, with around 1500 tonnes of each being taken by fishermen. Estimated catches of roach and bream amounted to 1000 and 500 tonnes, respectively.

As the percentage of those who caught other species was low, the estimated quantities of these catches are imprecise (due primarily to fishermen's own vague estimates and the high rate of statistical measurement error), but the catches of these species were most likely less than 100 tonnes. (The quantity of pikeperch and Crucian carp may have been slightly higher.)

In terms of fishing gear, the largest proportion of catches was taken using spinning-rods (around 2000 tonnes), followed by hand lines (around 1500 tonnes) and simple hand lines (around 1000 tonnes). Gill net catches were not taken into account. Catches taken with playing hooks and bottom lines were also considerable; the proportion of other fishing gear was much lower.

Looking at fishing grounds, substantial catches were estimated to have been taken from Lake Peipsi (around 1800 tonnes), other lakes (1000 tonnes) and rivers (1300 tonnes). Catches taken from the Emajõgi River and sea areas were around 600 tonnes each. This estimate differs significantly from the results of the study on recreational fishing on the Emajõgi River conducted by Jalak and Rakko (2012), according to which the quantity of fish caught amounted to 83 tonnes. The fact that the estimates of the total catch given as a result of two studies conducted on the basis of different methodologies at almost the same time indicates that it is very difficult to estimate the catches of recreational fishermen. Fishing in the Emajõgi River is characterised by the use of tonkas or bottom lines, which are used much less frequently elsewhere.

Use of recreational catches

Recreational fishermen used 95% of their catches for human consumption and 2% for animal consumption; 1% was thrown away and 2% was used in other ways – mostly being given to other people (this portion again most likely being used for human consumption), used as fish feed or for introduction in home ponds.

Fishing-related expenses of recreational fishermen

Fishing-related expenses include money spent on fishing gear and permits as well as accommodation, transport, etc. associated with fishing trips. In 2010, 73% of all those who had engaged in fishing bore costs in relation to recreational fishing: 31% of respondents spent between 6.50 and 65 euros; 21% spent between 65 and 650 euros; 18% spent less than 6.5 euros; and 3% spent over 650 euros. The estimated total amount spent on fishing was 32 million euros in 2010, with average expenditure per recreational fisherman of 109 euros. In Western and Southern Estonia, however, the average expenditure was somewhat higher than in the Viru region and Northern Estonia.

The fee payable to the state for recreational fishing rights can be divided into two types, depending on the type of right acquired. The first is the standard charge for the right to recreationally fish using hooks and the second is the charge payable for a fishing card. An overview of receipts of fees is available from 2004 onwards (Table 30). This indicates that the amount of fees paid for recreational fishing increased until 2009 before decreasing somewhat in 2010 and increasing again in 2011. Higher receipts of fees are expected in the coming years.

Conclusion. In total, there were around 292,000 recreational fishermen in 2010; nearly 129,000 went fishing five times or more during the year, and around 796,000 respondents had engaged in the hobby at least once in their lives.

Table 30. Proceeds from commercial and recreational fishing charges (10^6 €), 2001–2011

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Commercial fishing											
Trawling	0.561	0.194	0.238	0.198	0.134	0.173	0.205	0.183	0.238	0.290	0.197
Coastal fishery	0.458	0.384	0.419	0.409	0.300	0.332	0.224	0.314	0.353	0.318	0.373
Distant-water fishery	0.415	0.283	0.497	0.383	0.358	0.268	0.288	0.463	0.408	0.231	0.170
Total commercial fisheries	1.434	0.861	1.154	0.991	0.793	0.773	0.716	0.960	0.998	0.839	0.740
Recreational fishing											
Fishing card*				0.115	0.109	0.096	0.134	0.229	0.166	0.152	0.214
Fee for fishing right**	0.176	0.187	0.217	0.198	0.224	0.281	0.288	0.288	0.377	0.364	0.360
Total recreational fishing	0.176	0.187	0.217	0.313	0.332	0.377	0.422	0.516	0.543	0.516	0.574
Total	**1.610**	**1.048**	**1.371**	**1.304**	**1.125**	**1.150**	**1.138**	**1.476**	**1.541**	**1.356**	**1.314**

* The data for 2004 still concern restricted fishing. There are no data on the receipt of fees before 2004.
** Fishing card until 31 December 2004.
Source: MoE

The average number of fishing days per fisherman per calendar year was 20. When multiplying this figure by the number of fishermen, the total number of fishing days per year was around 5.8 million. It is difficult to assess the number of instances of fishing on this basis, because a fishing day was considered to be a day of fishing with one type of fishing gear (fishing with two types of fishing gear on the same calendar day was regarded as two fishing days). In addition, gill net fishing was not taken into account, while 12% of those who fished in 2010 had engaged in this type of fishing. Also, those younger than 15 were excluded. In any case it is clear that a significant number of people have engaged in recreational fishing in Estonia. For the sake of comparison, the number of museum visits amounted to 2.2 million in the country in 2010.

One must agree with the goal set out in the Recreational Fishing Development Plan 2010–2013 to popularise, simplify and diversify recreational fishing as a healthy leisure activity (MoE, 2009). On the other hand, records on recreational fishing should be improved. For example, the Statistical Office could separately collect and publish recreational fishing data.

Aquaculture

Background and history of Estonia's aquaculture sector

Aquaculture is defined as the cultivation of aquatic organisms in specific conditions created by man where production exceeds the natural production of bodies of water. Globally, aquaculture has undergone rapid technological development. Fish farming, and in Estonia also freshwater crayfish farming, is part of aquaculture. Most aquaculture production is provided by fish farms that use intensive technology.

Estonian aquaculture is characterised by high fragmentation into many small-scale enterprises, different products and different production methods. Some farms are simultaneously engaged in several areas, such as commercial fish farming, angling tourism and farming of fish for restocking purposes. Commercial fish farming comprises the most important part economically and is dominated by large red-flesh rainbow trout production. There are numerous owners of small ponds who farm fish or crayfish for fun or to obtain additional income and develop angling tourism. Also, juvenile fish are farmed for the purpose of restocking natural bodies of water. Crayfish farming forms a domain of its own.

In 2011 there were 25 companies in Estonia for which the cultivation of aquatic organisms was the principally important activity. 18 rainbow trout farms (by location), four carp farms, three eel farms, one sturgeon farm, one whitefish farm, one very small African catfish farm, two state-financed farms for the cultivation of salmonids for restocking and three to five crayfish farms operated in Estonia in 2012. Aquatic organisms were produced in ponds, raceways and recirculation systems. Net pens were used only in fresh water, in a power plant effluent water channel.

In addition to operating fish farms, new farms have been created with support from the European Fisheries Fund that have not yet reached the stage of selling their production. There are over 60 fishing tourism enterprises in Estonia that buy fish from fish farms and offer angling services in their ponds. These enterprises fall into two categories: those that focus on quick servicing of passing tourists; and those that offer fishing opportunities alongside other farm tourism services. Estonia has plenty of small-scale fish farmers (over 200) whose production capacity is just a couple of hundred kilos or a few tonnes, but some of them have been registered as fish farming businesses. The number of fish farms changes rapidly, even within a single year, as some farms go out of business, while others begin construction activities but have yet to sell their production.

Commercial fish farming

Commercial fish farmers sell a variety of products: live fish as restocking material or for 'put-and-take' ponds, as well as gutted and processed fish.

The official statistics of fish farming production from 2000–2011 are presented in Table 31 and Figure 38. However, the data of the Estonian Fish and Crayfish Farmers Association show that the official statistics are often different from actual production. Figures become distorted because of the fact that production sold by different companies to one another may be accounted for several times. Large fluctuations in production data, such as the discrepancy between the quantities of fish farmed and sold, can also be caused by the fact that production and sales periods do not coincide with calendar years. Official statistics take into account the negligible quantities (a few hundred kilos) of additional fish (such as pike, perch and crucian carp) obtained when fish ponds are discharged, but aggregate the species that provide substantial production and are unique in Estonia in the row marked 'Other'. 'Other' includes, first of all, two species of the Acipenser family (the Siberian sturgeon and Russian sturgeon) whose production amounts to around 40 tonnes, as well as experimentally produced Arctic char, tilapia, striped bass, African catfish and whitefish.

A clear trend towards increasing red-flesh rainbow trout production was evident until 2010. However, the heat wave in 2010 caused a loss in production,

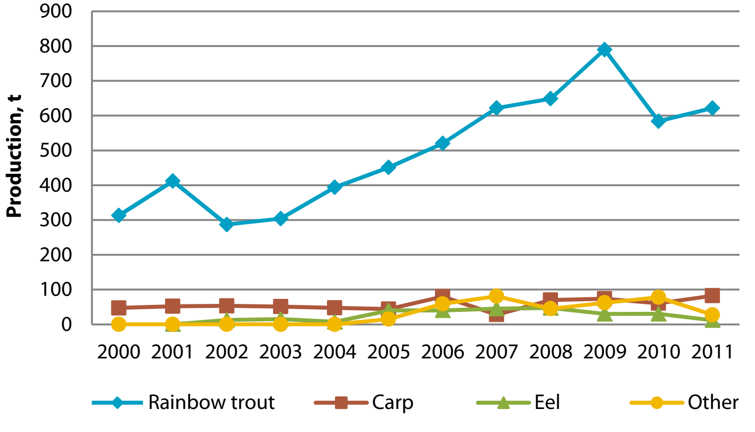


Figure 38. **Estonian fish farming production by main species (t), 2000–2011**
Source: Statistics Estonia

Table 31. **Estonian fish farming production (t), 2000–2011**

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Rainbow trout	313	412	287	304	394	451	520	622	649	790	584	622
Carp	47	52	53	51	47	44	80	28	70	74	61	82
Eel		0	13	15	7	40	40	45	47	30	30	12
Other	0	0	0	0	0	15	59	81	45	62	78	27
Total	**360**	**464**	**353**	**370**	**448**	**550**	**699**	**776**	**810**	**955**	**753**	**743**

Source: Statistics Estonia

and rainbow trout production volumes have not since recovered. The red-flesh rainbow trout is marketed in Estonia. The potential production capacity of currently operating carp farms is less than 100 tonnes. Sales of carp on foreign markets are limited by transportation problems, because carp is mostly marketed in the form of gutted raw fish. Carp farms focus on meeting domestic demand and selling restocking material to small-scale fish farmers. Eel production has decreased and most is exported. The production of sturgeons (the Siberian sturgeon and Russian sturgeon) exceeds 40 tonnes in some years. A new species, African catfish, has been cultivated on a fish farm in a small amount. The small production of Arctic char continues. Exports of farmed freshwater crayfish have been modest due to losses resulting from crayfish plague, with production not exceeding one tonne. Since there is no organisation uniting all aquaculture producers, and many major producers are not members of the Estonian Fish and Crayfish Farmers Association, we cannot provide a complete overview of the sales and product prices of fish farms. Prices vary from season to season, region to region and year to year. Sales in the sector are estimated to amount to around five million euros. According to the data of Statistics Estonia, fewer than 100 full-time employees have been annually engaged in Estonia's commercial fish farms for many years.

Fish farming for restocking purposes

Only native species may be released in natural bodies of water in Estonia. Fish farmers who produce fish for restocking are required to maintain biodiversity and to not mix genetically different populations.

The restocking of farmed juvenile fish into natural bodies of water is regulated by the Programme for Protection and Restocking of Endangered Species Requiring State Protection 2002–2010, which will be updated in 2013. Restocking through fish farming has been financed mainly from the state budget through the Environmental Investment Centre.

To enhance fish resources, juveniles of eight fish species (salmon, sea trout, brown trout, whitefish, pike, eel, tench and pikeperch) and freshwater crayfish were farmed to restock bodies of water from 2002–2010. In 2007, efforts commenced to produce restocking material of asp, a protected species, and the fingerlings were released into the Emajõgi River. In 2011, 40,000 one-summer-old fingerlings and 10,000 freshwater crayfish older than a year were introduced. However, it can be said that by 2011 fish farming for the purpose of restocking mainly comprised the cultivation of salmon, trout and eel. In 2011 there were two fish farms in Estonia exclusively engaged in the production of salmonid stocking material: Põlula Fish Farming Centre (a state enterprise) and OÜ Õngu Noorkalakasvandus. Also, Härjanurme Fish Farm, Riina Kalda's fish farm Carpio in Haaslava, OÜ Ilmatsalu Kala and Triton PR AS have been engaged in the production of restocking material during the last decade.

In 2011, around 83,000 one-year-old and 26,000 two-year-old salmon, and 57,000 two-year-old, 56,000 one-year-old and 30,000 one-summer-old sea trout were released into Estonian waters. Salmon introductions have been successful. Stocked salmons have returned to the Selja, Loobu, Pirita, Purtse and Valgejõgi Rivers and spawned there, which indicates that the salmon populations of these rivers can be restored. In coastal fishing in the Gulf of Finland, stocked salmon have accounted for over 70% of the total catch in some regions. Trout introduced by the Õngu Fish Farm in the coastal waters of Hiiumaa accounted for more than 75% of the catch in Õngu Creek from 1995–2007. Juveniles of eel produced in the warm-water recirculation farm of AS Triton are released into Lake Võrtsjärv and small lakes in Estonia on an on-going basis.

Crayfish farming

Estonia is one of the few countries in Europe that, until recently, had only one indigenous species, the noble crayfish (*Astacus astacus* L.) and where it is prohibited to introduce and cultivate any other species. Local crayfish farming is based on production of noble crayfish. As in the Nordic countries its price is higher than that of other species, because it tastes better. Thus, the prospects for its marketing are good. However, crayfish farming is endangered by crayfish plague; outbreaks of this disease have wiped out the species on a number of Estonian crayfish farms. Since 2008, signal crayfish, a North American species, has been found in three areas in Estonia. This crayfish is less susceptible to the plague and may spread the disease. Current official statistics on crayfish farming include fundamental errors. For example, unit-based data submitted by crayfish farmers have sometimes been recorded as kilo-based data. Therefore, data on crayfish farming have been removed from Table 31 on aquaculture production. Exports of farmed freshwater crayfish have been limited due to losses resulting from diseases and do not exceed one to two tonnes. There are three crayfish farms in Estonia providing production.

Development prospects and problems of aquaculture in Estonia

Unlike in fishery, natural resources do not limit development of fish farming in Estonia. Compared to other EU Member States of a similar size (such as The Netherlands and Denmark), there is enough water and unused land in Estonia. Different forms of technology can be used (flow-through raceways or re-use of water or net cages in the sea or fresh water. Attempts have been made to cultivate native species (eel and whitefish), alien species (sturgeon and Arctic char) and warm-water exotic fish (African catfish, striped bass, tilapia, barramundi and decorative carp i.e. koi). So far, only eel farming has been successful, but work with char and African catfish continues. Many fish farms have been established or modernised with support granted under the Operational Programme of the European Fisheries Fund 2007–2013. 11.92 million euros was allocated from EFF Measure 2.1 (investment support for aquaculture) for the establishment and modernisation of fish farms until 2012.

All of the rainbow trout stocking material and the feed is currently imported from Denmark and other European countries. Carp farming follows the same course, as cheap carp stocking material and feed can be bought from Latvia, Lithuania, Poland and Hungary. Fish species that are new in Estonia are predominantly imported as stocking material and are not reproduced here. Opportunities to export production have been sought. In the case of some species (eel and crayfish), export has become the dominating marketing method.

Lack of investment capital and know-how are the main factors restricting the development of fish farming in Estonia. Fish farms are currently mainly of the family farm type where the owner is both the managing director and the fish farmer, whose knowledge and financial capacity determine the success of the business. Where the capital belongs to a major company, there must be a manager who is a fish farming specialist on site. Small production volumes cannot secure year-round supply for large supermarket chains or attract the interest of exporters. The relatively high production cost of red-flesh trout makes it difficult to compete with similar products imported from Norway.

Lack of cooperation between producers limits the possibilities of organising marketing and training. The Estonian Fish and Crayfish Farmers Association as a non-profit organisation does not unite fish farming businesses, but rather people interested in fish farming. In 2012, the Estonian Aquaculture Association was founded. In addition, the producers' association Ecofarm mainly unites fish farmers from Saaremaa.

Two major and fundamental problems concerning the development of fish farming arose in 2011 and continued to cause trouble in 2012.

1) Although the Environmental Charges Act entered force in 2006, it was not applied to fish farming until 2011. Aquaculture production competes on both the domestic and foreign markets with products from other countries where no pollution charges are applied. The additional tax burden resulting from environmental charges renders our aquaculture sector essentially uncompetitive. In addition, the current methodology does not enable the pollution load of aquaculture to be estimated. In 2012 the Ministry of the Environment commissioned a study on fish farming pollution charges entitled 'Methodology for calculation of emissions released into the environment as a result of fish farming'. The study was carried out by OÜ Aqua Consult Baltic in 2012. Further action in this area will determine the development of our aquaculture in the coming years.

2) Recent strategic choices and the resulting decisions are creating doubt and uncertainty in the Estonian aquaculture sector. The current strategic objective of producing 2500 tonnes is unlikely to be achieved in 2013. How can the unused portion of the funds allocated under the EFF aquaculture investment support measure be efficiently spent? In 2012, four million euros was allocated to the Rural Development Foundation under the measure. This money can be used later as a loan, thereby addressing the shortage of fish farmers' working capital. 2013 will see the start of development of an aquaculture strategy, which should specify the future goals of the aquaculture sector.

Education

Fish farmers have been taught at the Estonian University of Life Sciences since 2002; so far, 17 students have graduated with a Master's degree. In 2011 the Fish Farming Department of the Estonian University of Life Sciences obtained support from the European Fisheries Fund for creating a small fish-rearing facility and supplying it with equipment and tools for aquaculture studies. In 2012

Jacob Bregnballe's 'Guide to Recirculation Aquaculture' was translated in the department. This is the first text book on fish farming in a recirculation system in Estonian that can be used as training material for different level students and as a daily source of reference for fish farming enthusiasts.

In 2011 the Estonian Qualifications Authority prepared the Level 4 Fish Farmer occupational qualification standard. The National Examination and Qualification Centre developed the corresponding curriculum for fish farmers. Fish farming will be taught at Järva County Vocational Training Centre in Särevere from 2013. To ensure a good level of teaching and practice, a training and experiment base will be established, with 839,000 euros support from the European Fisheries Fund. The facility is scheduled to be completed in Särevere by September 2013.

Estonian fish processing industry

General overview of sector

According to the data entered in the Commercial Register, there were 55 companies in Estonia in 2011 (52 in 2010) whose main business comprised the processing and canning of fish, crustaceans and molluscs. Based on the Commission Recommendation (2003/361/EC)[3], 84% of these were small enterprises, as their average number of employees was up to 49. The number of microenterprises increased from 20 in 2010 to 26 in 2011. A more detailed overview of the groups of companies is presented in Figure 39.

The average number of employees[4] in fish processing companies was 1813, most of whom (65%) were women. Looking at the age structure of the companies, 36 (65%) of the 55 companies operating in 2011 were more than ten years old. In 2011, the total sales revenue of the companies amounted to 129 million euros, with processing and canning of fish, crustaceans and molluscs accounting for 85% of revenue, i.e. 109 million euros.

Processing and canning of fish, crustaceans and molluscs was an auxiliary activity for 12 companies. Their sales revenue from this segment amounted to two million euros.

According to the contact details entered in the Commercial Register, most of the companies engaged in the processing of fish in 2011 operated in Harju and Pärnu Counties, accounting for 33% and 25% of the total number of companies, respectively (Table 32). There were no significant changes in the county distribution of fish processing companies compared to 2010.

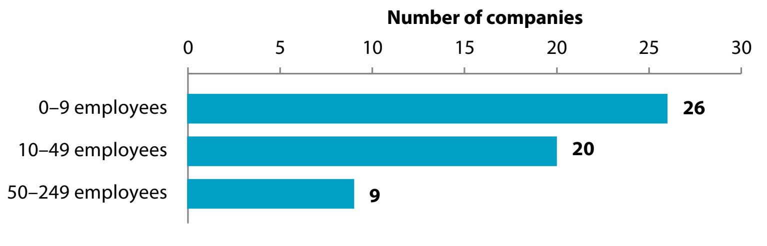


Figure 39. Number of companies whose main business comprised processing and canning of fish, crustaceans and molluscs based on average number of employees in 2011. Source: Commercial Register

[3] Commission Recommendation (2003/361/EC) divides companies into four groups based on the number of employees: microenterprises – 0 to 9 employees, small enterprises – 10–49 employees, medium-sized enterprises – 50–249 employees, large enterprises – 250 or more employees

[4] Average number of full-time employees (full-time equivalent)

Basic and economic indicators and trends of companies whose main business is fish processing

2011 saw recovery in economic activities, as the number of fish processing companies grew somewhat, and total sales revenue increased by 16% (Table 33). On the other hand, the number of people employed in the fish processing industry decreased by 47 (2.5%): from 1860 in 2010 to 1813 in 2011. This decline was mainly caused by business restructuring in one of the country's major fish processing companies. The average annual labour cost per employee was 7029 euros in 2011, which was 10% more than in 2010.

Of the 55 fish processing companies, 14 (25%) closed the financial year 2011 with a loss. The total net profit was nearly three million euros and the total value added amounted to 18.3 million euros. The combined assets of fish processing companies amounted to 84.8 million euros in 2011, with fixed assets accounting for 60% (50.6 million euros). 9.7 million euros was invested in fixed assets during the year. The debt ratio, which shows the share of debt (liabilities) in the funding of the assets of companies, remained at 50%.

The operating expenses of fish processing companies totalled 128 million euros in 2011. Raw materials and supplies accounted for the largest proportion (64%) of expenses; this increased in comparison with 2010 due to price rises in raw and auxiliary materials. The proportions of labour and energy costs in operating expenses were 13% and 3%, respectively (Figure 40).

If we compare the basic and economic indicators in the different size classes of fish processing companies (Table 34), it appears that almost 65% of the total sales revenue of the fish processing industry in 2011 came from nine medium-sized companies, which accounted for just 16% of the total number of

Table 32. Number of companies engaged in processing of fish in 2011 by county

County	Number of companies
Harju	22
Pärnu	17
Saare	7
Tartu	7
Ida-Viru	6
Jõgeva	3
Hiiu	2
Lääne-Viru	2
Lääne	1
Total	**67**

Source: Commercial Register

Table 33. Basic and economic indicators of companies whose main business is fish processing, 2006–2011

	2006	2007	2008	2009	2010	2011
Number of companies	55	57	59	56	53	55
Total sales revenue, 10^6 €	110	99	124	110	111	130
Average number of employees	2360	2097	2101	1822	1860	1813
Average annual labour cost per employee, €	4880	6221	6909	6447	6393	7029
Gross value added, 10^6 €	19.7	17.7	25.2	22.9	20.9	18.3
Investments in fixed assets, 10^6 €	3.5	6.3	7.7	5.4	10.6	9.7
Debt ratio,%	57	55	54	53	49	50

Sources: Statistics Estonia, Commercial Register companies. This size class also employs the highest number of people (63% of the total number of employees) and has the highest wage costs per employee. The amount invested in fixed assets in 2011 was more or less of the same order of magnitude (2.9–3.7 million euros) in all three size classes. 54% of gross value added was produced by medium-sized enterprises. Based on the debt ratio, microenterprises were characterised by the highest risk level.

The total operating expenses of fish processing companies (128 million euros) were divided as follows in 2011: microenterprises – 9.1 million euros;

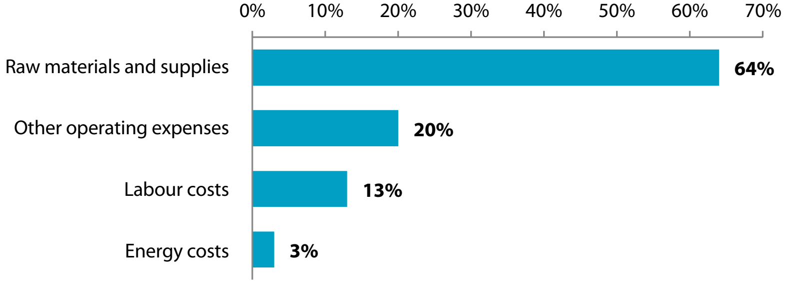


Figure 40. Proportion (%) of operating expenses of companies whose main business is fish processing, 2011. Source: Commercial Register

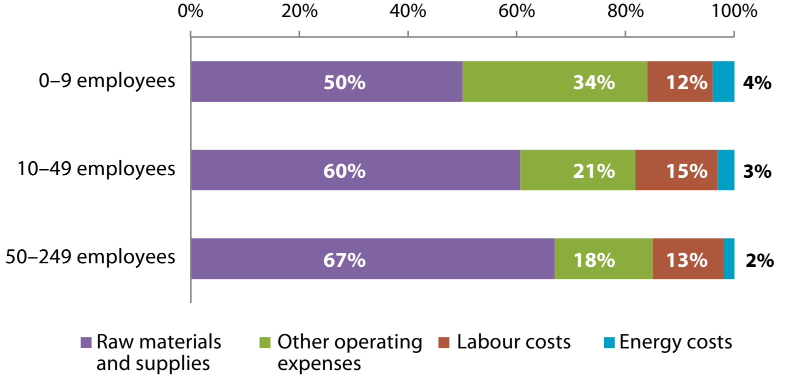


Figure 41. Proportion (%) of operating expenses in different size classes of fish processing companies in 2011. Source: Commercial Register

Table 34. Basic and economic indicators in different size classes of fish processing companies in 2011

Size class	Number of companies	Sales revenue, 10^6 €	Average number of employees	Average annual labour cost per employee, €	Fixed assets, 10^6 €	Investments in fixed assets, 10^6 €	Gross value added, 10^6 €	Debt ratio,%
0-9 employees	26	9.2	123	6894	9.4	3.7	1.2	60
10-49 employees	20	36.5	551	6877	17.9	3.1	8	40
50-249 employees	9	83.6	1139	7118	23.4	2.9	9.5	54

Source: Commercial Register

small enterprises – 33.7 million euros; medium-sized enterprises – 84.9 million euros. The distribution of operating expenses was similar in the different size classes (Figure 41), but the higher proportion of costs of raw materials and supplies in medium-sized enterprises stands out.

Production and sales

The production of the Estonian fish processing industry amounted to nearly 60,000 tonnes in 2011. Frozen fish; salted, spiced and dried fish; deep-frozen fish; and breaded fish accounted for the bulk of production (Table 35).

Compared to 2010, the production of the fish processing industry decreased by 11% in 2011. Such a steep decline can be attributed to the significant reduction in the catch quota of sprat and herring as local raw materials. By contrast, sales revenue amounted to 111 million euros in 2011, which was 16% higher than in the preceding year. Although production has generally been declining since 2002, the value of production sold has remained at more or less the same level or slightly higher, which can be explained by the increase in the price of production (Figure 42).

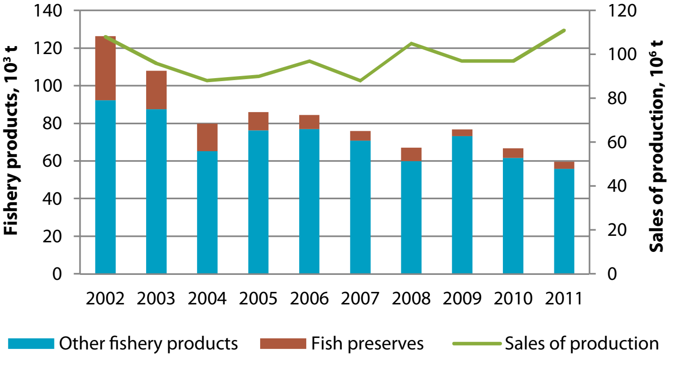


Figure 42. Dynamics of production and sales revenue of fish processing industry, 2002–2011. Source: Statistics Estonia

Table 35. Production (10^3 t) of Estonian fish processing industry by product type, 2006–2011

Fishery products	2006	2007	2008	2009	2010	2011
Fresh and chilled fish meat, fish fillets and minced fish meat	5.4	3.5	3.3	4.1	3.7	2.5
Frozen fish	40.3	36.5	30.3	34.6	35.5	33.5
Smoked fish	3.1	3.6	3.8	3.2	1.4	1.9
Salted, spiced and dried fish, deep-frozen fish and breaded fish	27	24.4	20.8	25.1	19.8	16.8
Culinary fishery products in oil, marinade or sauce	1.3	2.9	1.5	1.7	1.5	1.2
Fish preserves	7.4	5.1	7.1	3.6	5.1	3.8
Total	**84.5**	**76**	**66.8**	**72.3**	**67**	**59.7**

Source: Statistics Estonia

The proportion of exports in sales amounted to 74.7% in 2011 (Table 36), which indicates the high dependence of the Estonian fish processing industry on exports. In 2011, fish processing companies exported their products to 36 countries to a value of 83 million euros. Table 37 sets out the top ten countries in exports and imports of fish and fishery products. The table shows that exports of fishery products to Russia decreased in 2011 (41,840 tonnes in 2010), while exports to Ukraine increased significantly (36,430 tonnes in 2010). Table 38 contains data on exports by type of production and source of raw material. All four types of production were also represented on the local market. Occasional

Table 36. Domestic sales and exports of fish processing company production, 2005–2011

	2006	2007	2008	2009	2010	2011
Total sales, 10^6 €	97	88	105	97	96	111
Domestic market, 10^6 €	24	24	27	25	24	28
Exports, 10^6 €	73	64	78	72	72	83
Proportion of exports, %	75.4	72.8	74.1	74.2	75.2	74.7

Sources: Statistics Estonia, Commercial Register

Table 37. Top ten countries in exports and imports of fish and fishery products in 2011. In addition to local production, the table includes fish and fishery products that passed through Estonia.

Export country	Quantity, t	Export country	Quantity, t
Russia	36 790	Latvia	11 540
Ukraine	27 940	Finland	5 980
Latvia	7 110	Lithuania	4 680
Belarus	4 960	Denmark	3 920
Kazakhstan	4 490	Sweden	3 180
Denmark	4 360	Canada	1 910
Iceland	4 130	Germany	1 500
Spain	4 010	Spain	1 310
Finland	3 000	Norway	1 240
Germany	2 420	Uruguay	1 030

Source: Statistics Estonia

Table 38. Estonian fish processing companies by type of production, source of raw material and main foreign market

Type of production	Source of raw material	Main foreign market
Frozen fish	Baltic sprat and herring	Eastern market (Russia, Ukraine, Belarus, etc.)
Fillets and culinary products	Imported and local fish	Western market (Switzerland, Germany, Denmark, Finland, Sweden, etc.)
Fast-food	Imported raw material	Eastern and western markets (Lithuania, Serbia, Finland, the Czech Republic, etc.)
Canned products	Fish from the Baltic Sea and oceans	Eastern market (Russia, Ukraine, Kazakhstan, the Czech Republic, etc.)

Source: Commercial Register

problems occurring in sales of production on the eastern market have made many companies oriented towards that market more cautious. Therefore, efforts are being made to find additional markets so as to diversify risks.

Aid granted to fish processing industry

In 2011, fish processing companies and producer organisations received fisheries aid to a total value of 7.3 million euros. This amount did not change significantly compared to the 7.2 million euros a year previously, but major differences in the distribution of the aid between measures can be observed (Table 39). Investment support was used for the acquisition or improvement of refrigerating systems, production lines and equipment and for making waste management more efficient.

Table 39. Fisheries aid granted to fish processing companies, 2010–2011

Aid	Purpose	Amount paid, €	
		2010	2011
Investments in processing and marketing of fish (measure 2.3)	To develop and modernise the processing of fishery products or aquatic plants	1 976 605	4 447 864
Collective investments by producer organisations (measure 3.1.1)	To improve the quality of fishery products and increase year-round stability of supplies through the development of producer organisations	4 720 747	2 403 369
Development of new markets and promotional campaigns (measure 3.4)	To promote the consumption of fishery products and new products and find new market outlets for fishery and aquaculture products	437 688	444 073
Practical training support for producers or processors of fishery products	To partially compensate producers or processors of fishery products for the cost of practical training of students in fisheries-related disciplines, which is arranged in the enterprises of the producers or processors	32 170	30 452
Training support for producers or processors of fishery products	To compensate producers or processors of fishery products for the cost of training of producers or processors or their employees	4 990	9 354

Source: ARIB

Grants

14 measures are being implemented under the Estonian Operational Programme of the European Fisheries Fund (EFF):

Measure 1.1 – Public aid for permanent cessation of fishing activities
Measure 1.3 – Investments on board fishing vessels and selectivity
Measure 1.4 – Small-scale coastal fishing
Measure 1.5 – Socio-economic measures
Measure 2.1 – Investment support for aquaculture
Measure 2.2 – Support for inland fisheries
Measure 2.3 – Investments in processing and marketing
Measure 3.1.1 – Collective actions, 'Collective investments' action
Measure 3.1.2 – Collective actions, 'Other collective actions' action
Measure 3.2 – Protection and development of aquatic flora and fauna
Measure 3.4 – Development of new markets and promotional campaigns
Measure 3.5 – Pilot projects
Measure 4.1.1 – Sustainable development of fisheries areas
Measure 5.1 – Technical assistance

Table 40. Aid granted and disbursed under EFF measures, thousands of euros, 2008–2011

	2008		2009		2010		2011*	
Measure	Granted	Disbursed	Granted	Disbursed	Granted	Disbursed	Granted	Disbursed
1.1			7 853	5 740			386	188
1.3			1 505	861	478	429	688	236
1.4			298	177	439	323	229	131
1.5			340	330	180	180	90	80
2.1			6 800	2 646			5 113	
2.2					127	81	252	108
2.3			9 384	6 248	5 498	3 294	230	
3.1.1			2 715	2 715	5 913	4 788	1 390	
3.1.2					4 005	291		
3.2					485	23	256	64
3.4	352	346	543	529	605	554	580	148
3.5					213			
4.1	1 874	1 395						
4.1.1					2 538	1 709	7 312	1 769
Total	**2 226**	**1 741**	**29 439**	**19 247**	**20 481**	**11 674**	**16 526**	**2 725**

* as of 1.11.2012.
Source: MoA

Measures 1.3, 1.4, 1.5, 2.1, 2.2, 3.1, 3.2, 3.4, 3.5, 4.1 and 5.1 are being funded under the Minister of Agriculture Regulation No 1 of 5 January 2011, 'Measures and types of action supported in 2011 under the Operational Programme of the European Fisheries Fund 2007–2013'. No calls for proposals were announced in 2011 under measure 1.1, but aid was still granted under this measure in connection with challenges filed (for the decommissioning of four fishing vessels and the reassignment of one fishing vessel).

Aid has been granted under EFF measures in Estonia since 2008, when 13 projects were supported. In 2009 aid was granted to 183 projects; in 2010 to 202 projects; and in 2011 to 253 projects (Table 40). In terms of distribution between counties, the largest share of aid was granted to Pärnu, Saare and Harju Counties in 2011. As of 31 December 2011, the highest payouts had been made in Saare, Hiiu and Lääne Counties (Figure 43).

In 2011, aid was granted through the following measures:

1. Through **measure 1.1**, aid was granted for, e.g. reassignment and decommissioning of fishing vessels.

   Aid in a total amount of 386,131 euros was granted to five projects; 188,368 euros has been paid out.
2. Through **measure 1.3**, aid was granted for, e.g. equipping a fishing vessel with vertical freezers; modernisation of a fishing vessel and creating better working conditions for the crew; removal of the wooden deck of a fishing vessel and acquisition and installation of an air buoy winch; reconstruction of the coupling of the main pump of a fishing vessel's hydraulic system and construction of a spar deck over the main deck; acquisition and installation of equipment on a fishing vessel; carrying out hull work, renewing equipment and replacing navigation equipment on a fishing vessel; acquisition of selective gear; renovation.

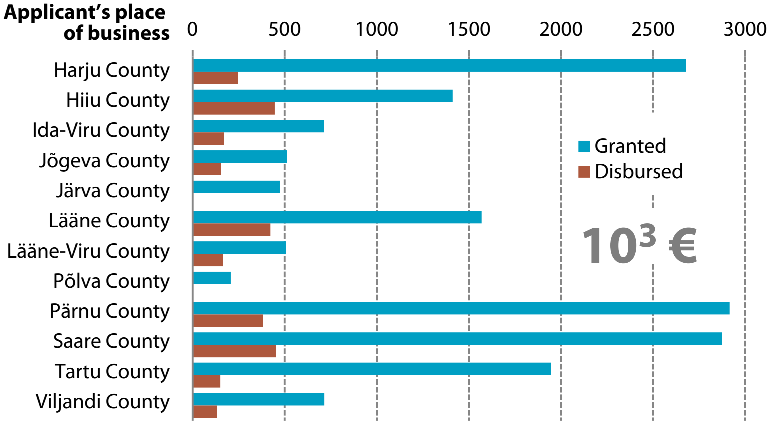


Figure 43. Aid granted and disbursed in 2011 (10^3 €) as of 31.12.2011
Source: MoA

Aid in a total amount of 688,274 euros was granted to 18 projects; 236,225 euros has been paid out.

3. Through **measure 1.4**, aid was granted for, e.g. the reconstruction of a fishing vessel; conversion of a fishing vessel's fishing gear to make it seal-proof and increasing safety on board; partial conversion of a fishing vessel's trap net with a three-metre mouth height; conversion of a fishing vessel's two-bag trap net to make it seal-proof; hull work on a fishing boat and making impregnated boarding for the hold; modernisation of a fishing vessel; acquisition of survival equipment, navigation equipment and a bilge pump for a fishing vessel; hull work on a fishing vessel; acquisition of new pelagic nets; acquisition of a seven-metre selective pound net, navigational aids and survival equipment; making pelagic nets more selective; acquisition of selective fishing gear; acquisition of survival and navigation equipment and an engine; acquisition of Garmin GPSMAP 620; acquisition of two trap nets.

   Aid in a total amount of 228,790 euros was granted to a total of 30 projects; 130,952 euros has been paid out.
4. Through **measure 1.5**, aid was granted for, e.g. paying compensation for loss of employment on (fishing) vessels and for not working on board fishing vessels.

   Aid in a total amount of 90,000 euros was granted to nine projects; 80,000 euros has been paid out.
5. Through **measure 2.1**, aid was granted for, e.g. the expansion of a crayfish farm by setting up new crayfish ponds and a water re-use system; renovation and expansion of an existing farm and alteration of technological systems; establishment of a new aquaculture farm; acquisition of aeration equipment; sturgeon farming in a recirculation system; installation of a video surveillance system at a crayfish farm; arrangement of crayfish ponds; establishment of a salmonid farm; reconstruction of ponds; establishment of a fish farm; establishment of an eel farm complex with a circulating water system; renovation of an existing freshwater crayfish farm.

   Aid in a total amount of 5,112,932 euros was granted to 19 projects; no disbursements have yet been made.
6. Through **measure 2.2**, aid was granted for, e.g. the acquisition of a selective purse seine; acquisition of selective trap nets; acquisition of trap nets; hull work; acquisition of selective fishing gear; acquisition of a hydraulic net machine, an engine-generator and navigation equipment; modernisation of a fishing vessel; acquisition of a pelagic net.

   Aid in a total amount of 252,299 euros was granted to 25 projects; 108,204 euros has been paid out.
7. Through **measure 2.3**, aid was granted for, e.g. the acquisition and installation of handling equipment and acquisition of cleaning equipment and a warehouse truck.

   Aid in a total amount of 229,805 euros was granted to two projects; no disbursements have yet been made.
8. Through **measure 3.1.1**, aid was granted for, e.g. the acquisition of cold trucks and trailers; reconstruction of a warehouse and acquisition of packing equipment, vehicles and containers.

Aid in a total amount of 1,389,633 euros was granted to two projects; no disbursements have yet been made.

9. Through **measure 3.2**, aid was granted for, e.g. additional funding for restocking European eel.

   Aid in a total amount of 255,647 euros was granted to one project; 63,900 euros has been paid out.

10. Through **measure 3.4**, aid was granted for, e.g. the 'World Food Kazakhstan 2012' trade fair and presentation and organisation of the national stand.

    Aid in a total amount of 580,000 euros was granted to five projects; 147,888 euros has been paid out.

11. Through **measure 4.1.1**, aid was granted for, e.g. changing ways of thinking and organising a competition for ideas; acquisition of the schooner Blue Sirius; construction of a fishing port; extension of the service building of a holiday resort; construction of a tourist port; development of activities related to recreational fishing in a recreation area; setting up a resting place and constructing a boat landing pier for recreational fishermen on an artificial lake; a port development project; reconstruction of a port; acquisition of a cold truck and means for direct marketing; setting up a shed-museum; acquisition and installation of equipment at a smoked fish production unit; acquisition and installation of water treatment equipment; acquisition of machinery and equipment for making firewood (firewood splitting machine, chain saw, splitting axe and splitting wedge); training (for fish processors); acquisition of refuelling equipment; acquisition of a warehouse truck; acquisition of a trailer park and a vessel for servicing tourists; renovation of fishing ports and landing sites; construction of a coastal community cooperation centre; construction of a quay and other port facilities; construction of a floating pier and maintenance work, construction of a port service building; construction of a building for first receipt and cooling of fish; acquisition of port dredging equipment; promotion of fishing tourism through environmentally sustainable participation and observation tourism; construction of external infrastructure and landscaping for a coastal community cooperation centre; construction of a bore well; acquisition and installation of necessary first processing equipment at a port; reconstruction of a port; construction of a gable roof building/warehouse; acquisition of a laptop and laser printer/scanner/copier; renovation of a port's net shed, construction of an outdoor kitchen and landscaping/maintenance work; acquisition of a cooler; skipper training and ancient vessel building training; refurbishment of a lake visitor centre and recreation area and marketing activities; development of the main building of a holiday resort; reconstruction of a port's holiday homes; training courses; acquisition of a rowing boat; extension of a fish café; acquisition of a wood chipper; dredging a port basin and access route; acquisition of a flake ice maker; acquisition of a wood dryer; development of fishing tourism; renovation of a farm's apple storage facilities; acquisition of cold storage equipment; construction of a building for fishing gear; renovation of a port's quays; construction work at a fishing port; acquisition of a cold truck; acquisition of a snow plough and high grass mower; diversification of a

fisherman's economic activities; reconstruction of a port; renovation of a service company's building and acquisition and installation of equipment; organising training events for commercial fishermen; acquisition of rowing boats with equipment; extension of a fishing port's quay; organising regional fishery-related events; external training; production of a documentary about a fishery region and promotion of the documentary in newspapers; acquisition of a heat pump; establishment of a parking lot for recreational fishermen; training on navigation equipment; diversification of activities – acquisition of a rotary bush-cutter, firewood splitting machine, chain saw and chain grinder; acquisition of a lumber trailer with crane; reconstruction of the staff building of a beach holiday base; construction of a fish shed; partial conversion of a former production building into a catering establishment; acquisition of fittings for the provision of fish-based food to tourists, upgrading kitchen equipment; setting up a fishery centre; acquisition of boats and trailers; construction of a building for servicing tourists; construction and renovation of cold storage facilities, a warehouse and a wholesale building; construction of a port's power and water supply systems and installation of navigational marking; acquisition of equipment for provision of musical services; reconstruction of a port's quay and installation of a slewing crane; organising a training event for fishermen, local entrepreneurs and domestic consumers at a port; acquisition and installation of first cooling equipment at a first storage building; a port quay with access road; renovation of a port's fish receipt building and installation of a fish pumping system; renovation of a port's warehouse and wooden quay and acquisition and installation of refrigeration equipment; construction of breakwaters at a port; reconstruction of a boat harbour; acquisition of a smoke oven and freezer chest; acquisition of a band saw machine; acquisition of equipment for processing aquaculture products; acquisition of a company's first processing equipment; construction of a structure required for fish processing (smoke oven and grill – outdoor kitchen); acquisition of rowing boats and life jackets for a recreation centre; fittings for the kitchen of a recreation centre; setting up a swing/slide for children visiting a recreation centre; installation of surveillance devices at a recreation centre.

Aid in a total amount of 7,312,469 euros was granted to 137 projects; 1,769,392 euros has been paid out.

In addition to the EFF aid, state subsidies in a total amount of 23,551.67 euros were granted to the fisheries sector on 11 occasions during the year, while support from the fund of common market organisation for fishery and aquaculture products was granted in a total amount of 2,397,956.13 euros on three occasions during the year.

Ichthyologic and fishery-related research projects

The following is an overview of the funded ichthyologic and fishery-related projects carried out in Estonia in 2011. Most of them are multi-annual research projects, but there are also one-year and annual projects (such as 'Implementation of the EU fisheries data collection programme and fisheries data analysis'). The list is not exhaustive: for example, some large-scale projects may contain smaller parts related to fish. Nor does the list include the research topics of graduate students.

Estonian Marine Institute of the University of Tartu

From past to future – development of the populations and ecosystems of the Baltic Sea under dynamic external forces

Funded by: Ministry of Education and Research

This multiannual (2010–2015) target-financed research project aims to: 1) explore the behaviour of the populations and ecosystems of the Baltic Sea over an extensive time scale (from one year to one hundred years) as a response to varying external factors; 2) collect new basic data on the adaptation of the biota in the Baltic Sea for the purpose of interpreting the results of long-term studies; and 3) develop and apply new indicator-based methods in the analysis of the populations and ecosystems of the Baltic Sea in the medium- and long-term, both retrospectively and prognostically.

Supporting natural reproduction of pikeperch by means of artificial spawning grounds: testing various types of spawning ground, selecting the optimal type of artificial spawning ground and mapping spawning areas

Funded by: European Fisheries Fund through ARIB

This project aims to ascertain the most appropriate construction and coating material of artificial spawning grounds so as to support the natural reproduction of pikeperch, i.e. to identify the types of spawning grounds that pikeperch use most frequently and what the success of pikeperch embryo development on these spawning grounds is. By means of artificial spawning grounds, the spawning areas of pikeperch in Pärnu Bay and possibly also Lake Peipsi and Matsalu Bay will be mapped. The project period is 2010–2014.

Improving the selectivity of Danish seine

Funded by: European Fisheries Fund through ARIB

This project aims to identify the most appropriate technical ways of increasing the selectivity of the Danish seine in Estonian fishery. Improving the selectivity of demersal seines provides an opportunity to extend fishing periods, use the resources more evenly and thus keep market prices at a more stable level, as well as to reduce undesirable (or prohibited, e.g. undersized fish) by-catches. The project period is 2010–2013.

Selectivity study of fishery and passive fishing gear

Funded by: European Fisheries Fund through ARIB

This project aims to explore the selectivity and fishing capacity of various commercial fishing methods and types of gear, to assess coastal and inland fishing selectivity as a whole on the basis of the data obtained and to make recommendations to enhance the protection of fish stocks through the implementation of technical measures (such as abandoning current measures that may prove to be unreasonable as a result of the study). The project period is 2010–2013.

Analysis of fishing capacity and recommendations on fishing efforts in the management of the fish stocks of Lakes Peipsi and Lämmijärv

Funded by: European Fisheries Fund through ARIB

This project, which is being implemented from 2010 to 2013, aims to assess the fishing capacity used on the lake and, as a result, make recommendations on the manners and levels of fishing efforts to be used with different states (i.e. size and composition) of fish stocks. The study and resulting recommendations are also necessary for the development of a long-term fishery management plan for the lake.

The state of fish spawning grounds and proposals for their improvement

Funded by: European Fisheries Fund through ARIB

This study is necessary to produce a comprehensive overview of the location, current natural state and use within the territory of Estonia of the spawning grounds of selected commercial fish species. As a result of the study, proposals can be made to improve the spawning grounds and thus commence restoration of the migration routes and spawning grounds essential for fish. The focus is on the state of herring spawning grounds. Other important species for which the state of their spawning grounds is being explored include pikeperch in coastal seas and rivers discharging into the sea, whitefish species spawning in the sea and in rivers and Lake Peipsi whitefish, vendace, Lake Peipsi smelt and pikeperch in Lake Peipsi and the Emajõgi River. The project period is 2010–2013.

Mitigation of the negative impact of seals in Estonian fisheries using acoustic repellent devices and seal-proof netting material

Funded by: European Fisheries Fund through ARIB

The first stage of this project, which was launched in 2010 and which is due to be completed in 2013, includes a detailed analysis of the negative impact of seals in order to determine the total damage they cause, as well as damage by county and type of fishing gear. In the second stage, acoustic repellent devices will be tested to identify their effectiveness in protecting different types of fishing gear.

Implementation of the EU fisheries data collection programme and fisheries data analysis

Funded by: Environmental Investment Centre

This annual study involves the collection of fisheries data in accordance with Council Regulations (EC) No 199/2008 and 812/2004, Commission Regulations (EC) No 665/2008 and 1078/2008 and Commission Decision 949/2008/EC, analysis of the data and making recommendations for the management of fish stocks. Data collected and analyses conducted in the course of the study serve as the basis for catch-related recommendations and forecasts to be presented to the Ministry of the Environment, as well as for international cooperation on fish stocks. Agreements have been reached on the collection of various fisheries data (researchers' monitoring catches, sampling of commercial catches, data on the fishing industry etc.) and analysis of the data collected.

Studies of fish stocks in Lakes Peipsi, Lämmijärv and Pskov

Funded by: Environmental Investment Centre

This long-term follow-up project aims to assess the stocks of commercial fish in Lakes Peipsi, Lämmijärv and Pskov (in cooperation with Russian researchers) and prepare recommendations concerning catches, as well as to collect other necessary fishery data and submit the data to the Estonian-Russian Intergovernmental Fisheries Commission for the development of fishery quotas and regulations.

ESTMAR – Implementation of Natura 2000 in Estonian marine areas – site selection and conservation measures

Funded by: Norwegian Financial Mechanism and the Environmental Investment Centre

This project, completed in 2011 and led by the Estonian Marine Institute at the University of Tartu, aimed to conduct a detailed study of the biota (fish, zoobenthos, benthic flora and birdlife) in the open sea shoals of Estonia's coastal waters. The part dedicated to fish will contain a quantitative overview of fish in 12 areas: lists of species, abundance, year-round dynamics etc.

HEALFISH – Healthy fish stocks: indicators of successful river basin management

Funded by: INTERREG IV A – Central Baltic cross-border cooperation programme

In 2010 work began with the aim of exchanging experience with a Finnish partner regarding egress and spawning grounds of fish and developing optimal solutions to restore the population of sea trout in model rivers. The impact of beaver dams on the migration and reproductive success of sea trout will be examined in more detail, and measures necessary to restore the abundance of sea trout in the Pirita basin will be developed. The Aquaculture Department of the Institute of Veterinary Medicine and Animal Sciences at the Estonian University of Life Sciences is one of the partners in this project (fish genetics). The project will continue until 2013.

Reproductive potential of freshwater fish species in the coastal areas of the eastern Baltic Sea

Funded by: Estonian Research Council

The aim of this project is to elucidate the role of reproductive parameters and spawning migrations in the reproductive success of freshwater fishes in brackish-water environments. The project will clarify: 1) what the variations in main reproductive parameters of coastal fish species are in the eastern Baltic Sea; 2) how abiotic conditions characteristic to the coastal Baltic Sea influence the reproductive success of model species (both cyclostomes and bony fish); and 3) what the extension of the spawning migrations of freshwater species in the coastal sea of horizontal salinity gradient is and whether homing is typical of freshwater fish species. The project period is 2010–2013.

Insufficiently studied commercial fish in Estonian coastal seas: autumn-spawning herring in the Gulf of Riga and Baltic Proper

Funded by: Environmental Investment Centre

The aim of this project, which is being carried out from 2011–2013, is to determine whether and to what extent stocks of autumn-spawning herring have started to recover in recent years, and to explore the reasons that may have led to the recession of autumn-spawning herring stocks in the last few decades.

Assessment of the reproductive potential of sea trout spawning rivers, 2011

Funded by: Environmental Investment Centre

The continuation of a long-term study of sea trout rivers that began in 2007, this study aims to provide an updated and comprehensive overview of the current situation of sea trout in Estonian rivers. The study should promote sustainable management of sea trout rivers and help design measures to improve the condition of sea trout. In 2011 the Estonian Marine Institute at the University of Tartu carried out studies on 14 water courses in Saaremaa. Project partners included the Centre for Limnology of the Institute of Agricultural and Environmental Sciences at the Estonian University of Life Sciences and the NGO Trulling (rivers in North-Western Estonia and on Hiiumaa).

Assessment of the state of fish fauna in the river section downstream from Loobu river reservoir and development of rehabilitation measures

Funded by: Environmental Board

This project, carried out in 2011, assessed the condition of the habitats of salmonids, spined loach and lamprey in the river section downstream from Loobu river reservoir. The effect of sediment release from the reservoir on the spawning grounds of salmonids and brook lamprey was studied. Recommendations were made to improve the status of the fish fauna.

JAKFISH – Judgment and knowledge in fisheries involving stakeholders

Funded by: Seventh framework programme of the European Community for research, technological development and demonstration activities

This project explores the need for and the use of scientific advice in the exploitation of marine stocks (including fish stocks). Methods will be developed that make it possible to take into account the probabilistic nature of knowledge when making decisions on the use and protection of marine stocks. The project involves scientific and research institutions from ten countries. The project period is 2008–2011.

MARMONI – Innovative approaches for marine biodiversity monitoring and assessment of the conservation status of nature values in the Baltic Sea

Funded by: EU LIFE+ Programme, project partners

This project, being carried out from 2010–2015, aims to develop an innovative monitoring and assessment approach based on a common set of marine biodiversity indicators to assess the status of marine species and habitats and the effect of human activities on marine biodiversity in the Baltic Sea. The project is being implemented in conjunction with partners from Estonia, Latvia, Finland and Sweden.

Temporal-spatial dynamics of fish larvae in Pärnu Bay and advice for sustainable management

Funded by: Urmas Margus, sole proprietor

This study, carried out in 2011 and 2012, aimed to reflect long-term changes in fish larvae abundance in Pärnu Bay and River (by taxa); map the spatial distribution of fish larvae in Pärnu Bay in recent decades by month, covering May, June and July; analyse the variability of the temporal-spatial distribution of fish larvae abundance by week, covering May, June and July; and present scientific advice for sustainable management of fish stocks in the bay.

Ecology and dynamics of various life stages of selected marine fish populations in different ecosystem regimes

Funded by: Estonian Research Council

This project aims to identify and analyse, on the basis of long-term datasets, the individual and population-level performance of marine fish in the Gulf of Riga in different ecosystem regimes. This goal will be achieved by exploring the seasonal and long-term abundance dynamics of the dominating ichthyoplankton taxa in the north-eastern part of the Gulf of Riga in relation to large-scale and local abiotic parameters and abundance of prey. The project will ascertain whether the significantly lower feeding activity and smaller food supply of larval spring-spawning herring in the eutrophied environment is caused by a failure to detect suitable food due to the high turbidity of the water. The size and location of the nourishment area of autumn-spawning herring larvae and the density of distribution of autumn-spawning herring larvae at high and low abundance population levels will be studied. Comparative individual and population-level analyses of autumn- and spring-spawning herring performance will be conducted. The project will provide more than half a century's perspective of the dynamics of the ecosystem components in the Gulf of Riga. This will help explain ecosystem regime shifts, define marine management objectives considering the interactions of eutrophication and fish stocks and assess complex reasons behind the depression of the fish population. The project period is 2011–2014.

Fish fauna in the marine environment around Kõpu peninsula

Funded by: Environmental Investment Centre

This study aimed to provide an overview of the fish fauna in the marine environment around Kõpu peninsula and of the importance of the region from a fishery point of view. The project also analysed how anthropogenic and other factors may threaten the fish fauna in the region described. The project period was 2011 and 2012.

Recognised and notified fish processing companies that produce smoked fish in Estonia

Funded by: European Fisheries Fund through ARIB

This study, conducted in 2011 and 2012, aimed to ascertain the share of recognised and notified fish processing companies that produce smoked fish in Estonia, determine the preparedness of fish processing companies to produce smoked fish and identify the training needs of producers.

Consumers' buying habits in relation to the packaging of fish and fishery products in the small-scale retail sector: mapping the training needs of the sector

Funded by: European Fisheries Fund through ARIB

This study, conducted in 2011, aimed to identify the buying habits of consumers in relation to the packaging of fish and fishery products in the small-scale retail sector (fish stalls at markets and in office buildings, fish trucks and small fish shops) and ascertain the training needs of sales workers and filleters.

Mapping the quantities of low-grade fish raw material

Funded by: European Fisheries Fund through ARIB

The Estonian Association of Fishery explained to the Council of the Fisheries Information Centre the need to explore ways of adding value to low-grade fish as raw material and to production residue. This was a preliminary study carried out by the Fisheries Information Centre in 2011 with a view to identifying the quantity of low-grade raw material. Low-grade fish means bruised fish, 'soft fish' (a term used by fishermen), all kinds of residue and by-catch (both undersized fish and low-value species that are difficult to sell).

Study of fish stocks in Lake Võrtsjärv, 2011

Funded by: Environmental Investment Centre

This project aimed to examine the stock status of essential commercial fish – eel, pikeperch, pike, bream and perch. On this basis, recommendations for the management of the stocks in 2011 were made and a recruitment-based forecast for up to five years was issued. Test trawling results enabled the abundance of major non-commercial fish in Lake Võrtsjärv to be assessed as well.

Study on Estonian small lake fisheries 2011

Funded by: Environmental Investment Centre

The aim of the study was to provide an overview of fish communities in the bodies of water examined, assess the state of stocks and factors influencing it, including potential spawning grounds, predict changes in fish stocks in the coming years and provide recommendations for the use of different types of fishing gear in the management of stocks. Attention was focused on the biology of the key target species – perch, pike, bream, pikeperch, tench and roach. On the basis of these data, the value of each body of water in terms of fishery was assessed and recommendations concerning fishing measures were provided.

Assessment of eel stocks and migration; improvement of stock assessment methodology in inland bodies of water

Funded by: European Fisheries Fund through ARIB

This project aims to assess the natural migration of eel to inland bodies of water and the egress of eel from bodies of water into which they have been introduced, as well as to improve the data collection methodology for both lake and migration phases in order to determine the actual number of escaped eels by basin and assess the stocks of the fish. The project also aims to ascertain the stocks of eel-farming lakes using the marking-recapture method; evaluate the migration of eels throughout the fishing period; and test different trap net types for sustainable fishery. The project period is 2010–2013.

BEAST – Impact of anthropogenic hazardous substances on the health of the Baltic Sea ecosystem (Biological Effects of Anthropogenic Stress: Tools for Assessment of Ecosystem Health)

Funded by: BONUS+

Within the scope of this project, carried out from 2009–2011, marine biologists from Baltic Sea countries examined the effects of toxic pollutants on both aquatic invertebrates and fish consumed by humans. The Estonian working group comprised researchers from the Estonian University of Life Sciences and the University of Tartu. In the course of their work the impact of organic pollution (such as petroleum products) on the eelpout and flounder in Estonian coastal waters was studied.

The importance and role of protozoa as the food of larval fish

Funded by: Estonian Research Council

The aims of the project are to: 1) estimate the proportion of protozoan prey in larval fish diet in different bodies of water; 2) determine whether there are any differences in protozoan consumption depending on larval fish species or age; 3) identify the key factors determining the relative importance of protozoan prey in larval fish diets; and 4) determine the effect of larval fish feeding on the microbial loop and classical food web. Work is being carried out in various types of lakes, from oligotrophic to hypereutrophic. To assess the effect of protozoa on planktonic food webs, in-depth seasonal food web studies are being carried out on Lake Võrtsjärv. The project period is 2011–2014.

Assessment of the reproductive potential of sea trout spawning rivers, 2011

Funded by: Environmental Investment Centre

The continuation of a long-term study of sea trout rivers that began in 2007, this study aims to provide an updated and comprehensive overview of the current situation of sea trout in Estonian rivers. The study should promote sustainable management of sea trout rivers and help design measures to improve the condition of sea trout. In 2010 and 2011 the Centre for Limnology of the Institute of Agricultural and Environmental Sciences at the Estonian University of Life Sciences carried out studies on four water courses in North-Western Estonia and 12 water courses on Hiiumaa. Project partners included the Estonian Marine Institute at the University of Tartu (rivers on Saaremaa) and the NGO Trulling (cooperation in studying rivers in North-Western Estonia).

Hydrobiological monitoring of rivers in 2011

Funded by: Ministry of the Environment

Hydrobiological monitoring studies provide an overview of the status of, and long-term changes in, the ecosystems of rivers in Estonia. The studies focus on the elements of river biota that are relevant under the EU Water Framework Directive: benthic diatoms, large vegetation, benthic fauna and fish fauna. In 2011, the bodies of water located on Estonian islands (Saaremaa and Hiiumaa) and in the sub-basin of Lake Peipsi were primarily studied. Some river sections in other regions of Estonia were also examined. Monitoring of fish fauna is based on the recommendations given in the EU standards EN 14962:2006 'Water quality – Guidance on the scope and selection of fish sampling methods' and EN 14011:2003 'Water quality – Sampling of fish with electricity'.

Aquaculture Department of the Institute of Veterinary Medicine and Animal Sciences at the Estonian University of Life Sciences

Genetic diversity and sustainable management of genetic resources of farm animals and fish

Funded by: Ministry of Education and Research

This multiannual target-financed research project aims to identify the genetic characteristics of the species and populations of fish farmed in Estonia and to analyse factors affecting the fish and the variability of these factors. The project period is 2007–2012.

Genetic impact of stocking activities on neutral and adaptive variation in endangered salmonid fish and noble crayfish (*Astacus astacus*) populations

Funded by: Estonian Research Council

This project, carried out from 2008–2011, dealt with the impact of introducing farmed fish into natural bodies of water on the gene pool of endangered species living in the wild.

Linking genotype with phenotype in a variable and changing natural environment – genetic analyses of host-parasite systems in salmonid fish

Funded by: Estonian Research Council

This project studies the genes that cause the spread of proliferative kidney disease (PKD) and resistance to the disease. The project period is 2010–2013.

HEALFISH – Healthy fish stocks – indicators of successful river basin management

Funded by: INTERREG IV A – Central Baltic cross-border cooperation programme

This project, which started in 2010 and which will run until 2013, aims to study the genetic structure of the populations of sea trout in Estonia compared to sea trout in other countries around the Gulf of Finland. The Estonian Marine Institute at the University of Tartu is one of the partners in the project (studying fish migration, migration barriers and reproduction opportunities).

Fish restocking studies

Funded by: Environmental Investment Centre

The report for 2011 forms part of long-term cooperation that was launched in 1995 between the Aquaculture Department of the Institute of Veterinary Medicine and Animal Sciences at the Estonian University of Life Sciences, the Ministry of the Environment and the Põlula Fish Farming Centre. The cooperation aims to analyse the restocking of bodies of water through fish farming in Estonia, incl. monitoring the diversity of fish populations on the basis of the results of salmon and sea trout introductions and farming, especially the impact on the genetic structure of fish populations. The practical output of the work comprises recommendations to the Fisheries Department of the Ministry of the Environment, to the Environmental Board and to the Põlula Fish Farming Centre for organisation of production of fish for restocking.

AQUAFIMA – Integrating Aquaculture and Fisheries Management towards sustainable regional development in the Baltic Sea Region

Funded by: European Union's Baltic Sea Region Programme (INTERREG IVB 2007–2013)

This project, being carried out from 2011–2014, aims to find alternatives to fishing in aquaculture by developing production of fish restocking material. To this end, the fishery strategies and aquaculture technologies of the Baltic Sea countries must be assessed. The project involves 12 partners from Denmark, Norway, Poland, Latvia, Lithuania, Estonia and Germany who are collecting and sharing their practices with a view to improving the management of fish stocks in the Baltic Sea.

Wildlife Estonia

Overview and monitoring of habitats and species and preparation of a draft management plan for six special conservation areas

Funded by: Environmental Board

This project studied the fish stocks of five rivers in Ida-Viru County forming part of the Natura 2000 network – the Narva, Tagajõgi, Pühajõgi, Padajõgi and Avijõgi rivers – with a particular focus on conservation aspects. The project involved extensive studies of the migration of the Narva River lamprey in the lower reaches of the river, using the marking-recapture method and telemetry. The spread of the Amur sleeper (*Perccottus glenii*) in the Narva River system was also examined. The project period was 2009–2011.

Preserving life in the meanders and oxbow lakes of the Emajõgi River in the Alam-Pedja NATURA 2000 area

Funded by: EU LIFE+ Programme, Environmental Investment Centre

This project, called HAPPYFISH, was launched to restore and protect unique water ecosystems (meanders and oxbow lakes of the Emajõgi River) and to restock and protect endangered fish species in the Alam-Pedja Natura 2000 conservation area. The project's objectives were: 1) restoration and protection of valuable spawning grounds and habitats; and 2) restocking and protection of fish species of European importance – the asp (*Aspius aspius*), spined loach (*Cobitis taenia*), weather loach (*Misgurnus fossilis*) and bullhead (*Cottus gobio*). The project period was February 2009–November 2012.

Estonian Trout Foundation

Studies of the effectiveness of restoring trout spawning grounds

Funded by: Environmental Investment Centre

This project aims to examine and compare the performance of natural and artificial spawning grounds of trout (both sea trout and brown trout) in order to determine whether certain types of spawning grounds may be more effective than others and, if so, to identify the differences. Consequently, the project also has a practical goal – to create more effective spawning grounds in subsequent river restoration projects. The cooperation project involves three partners: OÜ Ökokonsult is carrying out fieldwork i.e. collecting data; the University of Turku is conducting genetic analyses; and the Aquaculture Department of the Institute of Veterinary Medicine and Animal Sciences at the Estonian University of Life

Sciences is evaluating and analysing the information obtained and drawing conclusions from it. Staff and students from the Estonian University of Life Sciences are participating in the field work. The project period is 2011–2013.

Emor AS

Consumption of fishery products and possible increase in consumption in Estonia

Funded by: European Fisheries Fund through ARIB

This study, carried out in 2011, aimed to obtain an overview of the attitudes of Estonia's population towards fish and fishery products, of fish consumption and purchasing habits and of attitudes towards potential measures stimulating the consumption of fishery products.

Quantitative study of recreational fishing in Estonia

Funded by: Environmental Investment Centre

The purpose of this study, conducted in 2011, was to identify the main characteristics of recreational fishing in Estonia in 2010. The study focused on the number, age and gender distribution of recreational fishermen, their use of different fishing gear and fishing grounds, the species fished and their quantities, the use of catches and the time and money spent on recreational fishing.

Agency Kämp OÜ

Study of possible ways of increasing the consumption of fish and fishery products in Estonia

Funded by: European Fisheries Fund through ARIB

This study sought to find answers to the following questions: 1) What are the barriers to the consumption of fish and fishery products in Estonia? 2) What are possible ways of eliminating or reducing these consumption barriers? 3) What kinds of optimised activities (by state agencies, production and processing companies, the education, retail and wholesale sectors and the media) could promote an increase in the consumption of fish and fishery products in Estonia? 4) What methods and measures could be used to evaluate the effectiveness of such activities? The project period was 2010–2011.

Estonian Institute of Economic Research

Market of fish and fishery products in Estonia

Funded by: European Fisheries Fund through ARIB

This study, carried out in 2011, aimed to identify the nature of the supply and consumption of fish in Estonia and to determine how consumption has changed over the last decade.

OÜ Eesti Uuringukeskus

Identification of the competencies and skills of the workforce and labour market needs in the fisheries sector

Funded by: European Fisheries Fund through ARIB

The aim of this study was to identify the educational level of the workforce employed in the fisheries sector (in the sub-sectors of fishing, fish farming and processing, manufacturing of fishing gear, fish trade, state agencies and supervisory authorities), the number of people needed in the sector and the required education and qualifications in the short term (2013) and longer term (2020). The project period was 2011–2012.

Eesti Keskkonnauuringute Keskus OÜ

Expert assessment of the exposure of coastal fishermen to dioxins and dioxin-like polychlorinated biphenyls

Funded by: Ministry of Agriculture

This study, carried out in 2011, aimed to assess the levels of polychlorinated dibenzo-p-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs) and dioxin-like polychlorinated biphenyls (DL-PCBs) in the bodies of coastal fishermen due to fish and fishery products. The assessment built on the data of a dietary survey carried out among coastal fishermen in May 2010.

NGO South-Estonian Fishermen's Club

Assessment of recreational fishing capacity on the Emajõgi River

Funded by: Environmental Investment Centre

This study aimed to assess the impact of recreational fishing on the Emajõgi River compared to other fishing methods. The results revealed the proportion of Emajõgi River fishery that recreational fishing accounts for. The project period was 2010–2012.

References

Aps, R., Märtin, K., Saat, T. 2005. Kaugpüük. In T. Saat & R. Aps (editors), Eesti kalandus 2005. University of Tartu Press.

Armulik, T., Sirp, S. (compilers) 2011. Estonian Fishery 2010. Fisheries Information Centre.

Casey, J., Abella, J. A., Andersen, J., Bailey, N., Bertignac, M., Cardinale, M., Curtis, H., Daskalov, G., Delaney, A., Döring, R., Garcia Rodriguez, M., Gascuel, D., Graham, N., Gustavsson, T., Jennings, S., Kenny, A., Kirkegaard, E., Kraak, S., Kuikka, S., Malvarosa, L., Martin, P., Motova, A., Murua, H., Nord, J., Nowakowski, P., Prellezo, R., Sala, A., Scarcella, G., Simmonds, J., Somarakis, S., Stransky, C., Theret, F., Ulrich, C., Vanhee, W. & Van Oostenbrugge, H. 2012. Review of scientific advice for 2013 – part I. Advice on stocks in the Baltic Sea (STECF-OWP-12-04). JRC Scientific and Political Reports. Publications Office of the European Union, Luxembourg.

Commission Recommendation of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises, OJ L 124, 20.5.2003, pp. 36–41 (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:124:0036:0041:EN:PDF).

OECD 2009. Estonian Fisheries and Aquaculture Sector 2009.

ICES 2011a. Report of the ICES Advisory Committee, 2011. ICES Advice, 2011, Book 3.

ICES 2011b. Report of the ICES Advisory Committee, 2011. ICES Advice, 2011, Book 9.

ICES 2012. Report of the Baltic Fisheries Assessment Working Group (WGBFAS). ICES CM 2012/ ACOM: 10.

Jalak, A. and Rakko, A. (compilers) 2012. Emajõe harrastuskalastuse püügivõimsuste hindamine. Report on Project No 54 within the fisheries development sub-programme of the Environmental Investment Centre, 2010.

Ministry of the Environment 2009. Recreational Fishing Development Plan 2010-2013.

Commission Regulation (EC) No 949/2008 of 25 September 2008 fixing the maximum export refund for white sugar in the framework of the standing invitation to tender provided for in Regulation (EC) No 900/2007, OJ L 258, 26.9.2008, p. 62 (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:258:0062:0062:EN:PDF).

Männaste, K. 2011. Eesti harrastuskalapüügi kvantitatiivuuring. CATI consumer survey, May-June 2011. Report by TNS Emor AS.

NAFO 2011. Scientific Council Reports 2010. Northwest Atlantic Fisheries Organization.

NAFO 2011a. Conservation and enforcement measures. NAFO/FC Doc. 10/1. Serial No. N5740.

NIPAG 2010. NAFO/ICES Pandalus Assessment Group Meeting, 20–27 October 2010. NAFO SCS Doc. 10/22 Serial No. N5853.

NIPAG 2011. NAFO/ICES Pandalus Assessment Group Meeting, 19-26 October 2011. NAFO SCS Doc. 11/21 Serial No. N5999.

Council Regulation (EU) No 23/2010 of 14 January 2010 fixing for 2010 the fishing opportunities for certain fish stocks and groups of fish stocks applicable in EU waters and, for EU vessels, in waters where catch limitations are required and amending Regulations (EC) No 1359/2008, (EC) No 754/2009, (EC) No 1226/2009 and (EC) No 1287/2009, OJ L 21, 26.1.2010, pp. 1–120 (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:021:0001:01:EN:HTML).

Council Regulation (EC) No 43/2009 of 16 January 2009 fixing for 2009 the fishing opportunities and associated conditions for certain fish stocks and groups of fish stocks applicable in Community waters and, for Community vessels, in waters where catch limitations are required, OJ L 22, 26.1.2009, pp. 1–205 (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:022:0001:0205:EN:PDF).

Council Regulation (EU) No 57/2011 of 18 January 2011 fixing for 2011 the fishing opportunities for certain fish stocks and groups of fish stocks applicable in EU waters and, for EU vessels, in certain non-EU waters, OJ L 24, 27.1.2011, pp. 1–125 (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:024:0001:0125:EN:PDF).

Council Regulation (EC) No 199/2008 of 25 February 2008 concerning the establishment of a Community framework for the collection, management and use of data in the fisheries sector and support for scientific advice regarding the Common Fisheries Policy, OJ L 60, 5.3.2008, pp. 1–12 (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:060:0001:0012:EN:PDF).

Council Regulation (EC) No 1098/2007 of 18 September 2007 establishing a multiannual plan for the cod stocks in the Baltic Sea and the fisheries exploiting those stocks, amending Regulation (EEC) No 2847/93 and repealing Regulation (EC) No 779/97, OJ L 248, 22.9.2007, pp. 1–10 (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2007:248:0001:0010:EN:PDF).

Council Regulation (EU) No 1225/2010 of 13 December 2010 fixing for 2011 and 2012 the fishing opportunities for EU vessels for fish stocks of certain deep-sea fish species, OJ L 336, 21.12.2010, pp. 1–12 (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:336:0001:0012:EN:PDF).

Council Regulation (EC) No 1359/2008 of 28 November 2008 fixing for 2009 and 2010 the fishing opportunities for Community fishing vessels for certain deep-sea fish stocks, OJ L 352, 31.12.2008, pp. 1–10 (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:352:0001:0010:EN:PDF).

Website of Statistics Estonia, http://www.stat.ee.

Vetemaa, M. 2008. Eesti kalalaevastiku tasuvuse analüüs. Final report under Contract for Services No 116 (entered into in Tallinn on 3 April 2008 between the Ministry of Agriculture and the Estonian Marine Institute at the University of Tartu).

2008/949/EC: Commission Decision of 6 November 2008 adopting a multiannual Community programme pursuant to Council Regulation (EC) No 199/2008 establishing a Community framework for the collection, management and use of data in the fisheries sector and support for scientific advice regarding the common fisheries policy, OJ L 346, 23.12.2008, pp. 37–88 (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:346:0037:0088:EN:PDF).

Measures and types of action supported in 2011 under the Operational Programme of the European Fisheries Fund 2007-2013, RT I, 01.09.2011, 4 (https://www.riigiteataja.ee/akt/101092011004).

Estonian Fishery 2011

ISSN 2228–1495

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