



EUROOPA ÜHENDUSTE KOMISJON

PEASEKRETARIAAT

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Euroopa Liidu juures

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Kristina Jancheva

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Peasekretäri nimel

Karl VON KEMPIS

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EUROOPA ÜHENDUSTE KOMISJON

Brüssel 30.11.2009
K(2009)9358 lõplik

KOMISJONI OTSUS,

30.11.2009,

**millega kiidetakse heaks angerjavarude majandamiskava, mille Eesti esitas komisjonile
vastavalt nõukogu määrusele (EÜ) nr 1100/2007, millega kehtestatakse meetmed
euroopa angerja varude taastamiseks**

(Ainult eestikeelne tekst on autentne)

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(Ainult eestikeelne tekst on autentne)

EUROOPA ÜHENDUSTE KOMISJON,

võttes arvesse Euroopa Ühenduse asutamislepingut,

võttes arvesse nõukogu 18. septembri 2007. aasta määrust (EÜ) nr 1100/2007, millega kehtestatakse meetmed euroopa angerja varude taastamiseks,¹ eriti selle artikli 5 lõiget 1,

olles konsulteerinud Rahvusvahelise Mereuurimise Nõukoguga

ning arvestades järgmist:

- (1) Eesti esitas 31. detsembril 2008 komisjonile määruse (EÜ) nr 1100/2007 artikli 4 lõike 1 kohaselt Narva ja Lääne-Eesti jõgikondade angerjavarude majandamiskava.
- (2) Komisjon on saanud määruse (EÜ) nr 1100/2007 artikli 5 lõike 1 kohaselt kõnealuse kava tehnilise ja teadusliku hinnangu, mille teostas asjaomane teadusorganisatsioon, Rahvusvaheline Mereuurimise Nõukogu. Kõnealune hinnang näitas, et kavandatav angerjavarude majandamiskava vastab määruses (EÜ) nr 1100/2007 sätestatud nõuetele.
- (3) Seepärast tuleks Eesti esitatud kava heaks kiita.
- (4) Käesoleva otsusega ettenähtud meetmed on kooskõlas kalanduse ja vesiviljeluse korralduskomitee arvamusega,

ON VASTU VÕTNUD KÄESOLEVA OTSUSE:

Artikkel 1

Kiidetakse heaks käesoleva määruse lisas esitatud angerjavarude majandamiskava, mille Eesti esitas 31. detsembril 2008.

¹ ELT L 248, 22.9.2007, lk 17.

Artikkel 2

Käesolev otsus on adresseeritud Eesti Vabariigile.

Brüssel, 30.11.2009

*Komisjoni nimel
komisjoni liige
Joe BORG*



LISA

Eesti esitatud ANGERJAVARUDE MAJANDAMISKAVA.



EEL MANAGEMENT PLAN

ESTONIA

2008

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INTRODUCTION

The stock of the European Eel *Anguilla anguilla* is in decline and the fisheries are not sustainable. Since the 1980s, a 90% decline in recruitment of eel has occurred across most of Europe (Dekker, 2003). The European Community has decided on a protection and restoration plan (Eel Regulation) in June 2007, aiming at the protection of 40% of the silver eels escapement, relative to a situation without human intervention and full oceanic recruitment.

Historically eel was one of the most important fish species in coastal waters of Estonia. Before the Second World War (1938) the total annual catch of eel in Estonia exceeded 500 tons (Kint, 1940). Shallow coastal waters close to western inlands (ICES subdivision 28-2; 28-5) and Väinameri (29-4) were most productive areas at that time. In 1950s total catch decreased to one hundred ton and continues to decline up to 20 t in the end of 1970s.

Natural eel stocks have never been very dense in Estonian large lakes. In the beginning of 20th century (1903-1910) there was caught 2-17 thousands of eels annually in the Narva River, the outflow from Lake Peipsi to Gulf of Finland (Vasilyev, 1974). The annual catch of eel in 1935-1939 was only 1.8 tons from L. Võrtsjärv and 6 tons from L. Peipsi (Kint, 1940). The construction of the Narva hydroelectric power station in the early 1950s blocked totally the natural upstream migration of young eel from the Baltic Sea to the basins of lakes Peipsi and Võrtsjärv (Kangur, 1998). As a result, eel almost disappeared from the fish fauna of Estonian large lakes. Today, due to the introduction of glass eels or farmed eels into L. Võrtsjärv, it has become one of the most important commercial fish in this lake again. Since the 1980s annual catch of eel in Lake Võrtsjärv (20-60 t, in 1988 100 t) and in coastal waters (6-27 t). Annual catch from small lakes and rivers mostly in L. Peipsi basin is 2-4 t. Eel catches by amateur fishermen constitute about 0,5 t from brackish water and about 1 t from inland water bodies. According to the fishery statistics during the last decade the total annual catch of eel from Estonian waters was nearly 50 tons (in 2007 35 tons).

Nowadays the eel fishery in Estonia occurs in L. Võrtsjärv, coastal waters and in some small lakes in L. Peipsi basin. In comparison to many other European countries catches are small, 0,5% from total. Only 30 % of catch based on natural stocks of eel. Natural recruitment of eel in Estonian waters takes place in stage of young yellow eel.

1. Description of eel management units

According to ordinance of government (RT I 2004, 48, 339) and WFD the territory of Estonia is divided into 3 basins (Figure 1) and 9 sub-basins (Figure 2). Basins and sub-basins are not connected directly with one river, as in European scale Estonian rivers are very small except Narva River and its watershed area.

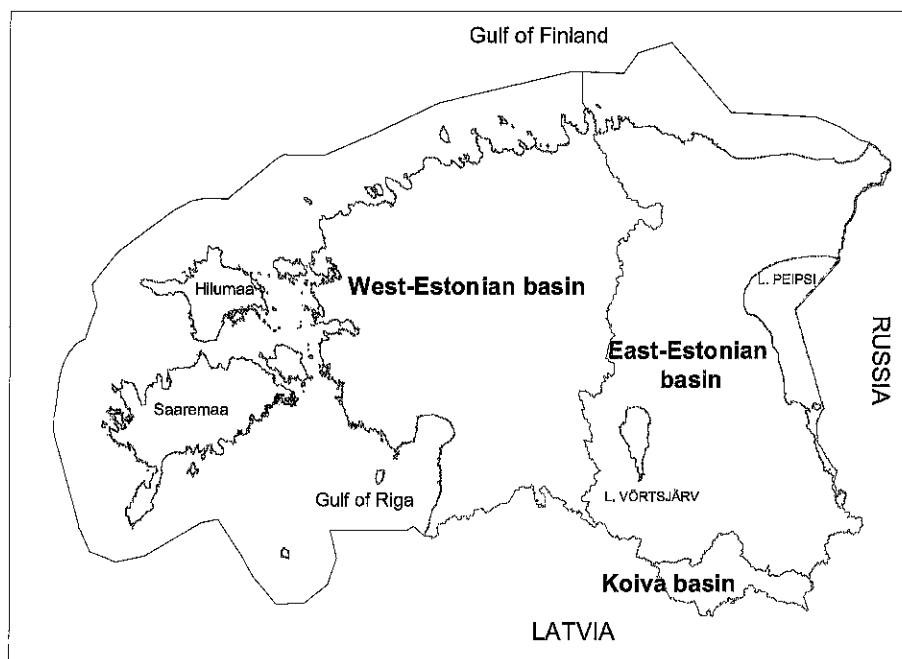


Figure 1. Map of basins

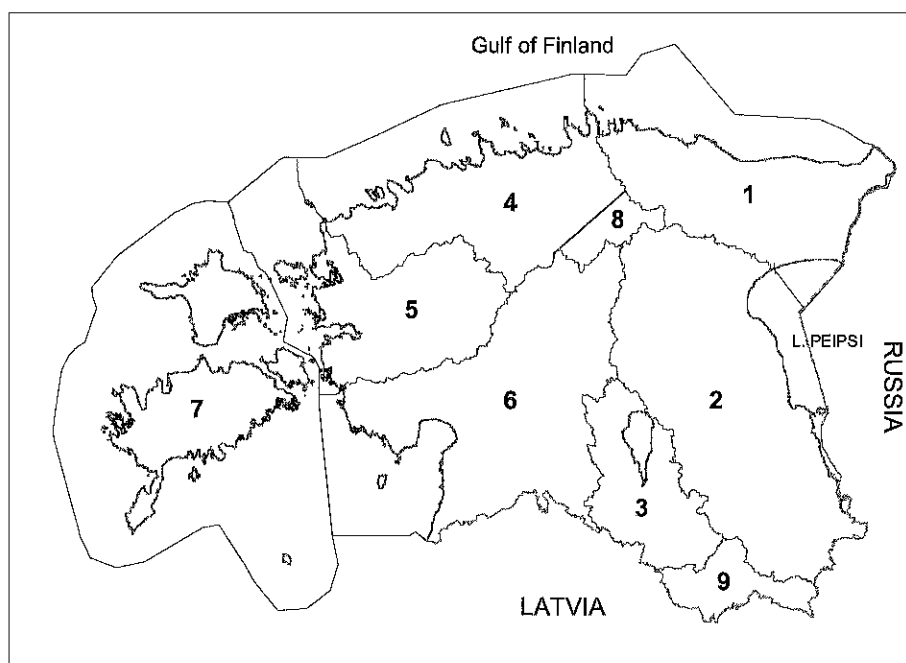


Figure 2. Map of sub-basins: 1 - Viru; 2 – Peipsi; 3 – Võrtsjärve; 4 – Harju; 5 – Matsalu; 6 – Pärnu; 7 – Läänesaarte; 8 – Pandivere groundwater; 9 – Mustajõe

In connection with Eel Management Plan (EMP) Estonian water bodies were divided into two management units on the basis of formation of eel stock.

- 1) Narva River Basin District – population of eel based entirely on stocking
- 2) West-Estonian Basin District (coastal waters and West-Estonian inland water bodies) – natural population of eel

Authorities responsible for the implementation of Estonian EMP are Ministry of the Environment (Fisheries Resources Department) and Ministry of Agriculture (Fishery Economics Department).

2. Narva River Basin District – (East-Estonian basin)

2.1. Description of district and maps

Narva River basin District is shared with Russian Federation (Figure 3), with a third country and the escapement of silver eel depends not only from measures put into practice in Estonia. Therefore present eel management plan covers Estonian part of the basin and measures assure 40% of silver eel escapement applying only in territory under the jurisdiction of Estonia.

The Narva River District includes the fourth biggest lake in Europe, Lake Peipsi (Peipus) (3555 km²), Lake Võrtsjärv (270 km²) and hundreds of small lakes and rivers. Most of the lakes in Narva River Basin are relatively shallow and eutrophic, suitable habitats for eel. Feeding conditions are good and growth rate is rather rapid.

Lake Peipsi is located on the border of the Republic of Estonia and the Russian Federation and consists of three parts: the largest and deepest northern part L. Peipsi s.s. (area 2611 km², mean and maximum depth 8,3 and 12,9 m resp.), the middle part L. Lämmijärv (236 km², 2,5 and 15,3 m) and the southern part L. Pihkva (708 km², 3,8 and 5,3 m). Altogether 1570 km² belongs to Estonia. The catchments area 47,800 km² including the lake, covers territorial parts of Estonia (1/3) and Russia (2/3) (Pihu & Haberman, 2001). There are about 240 inlets into L. Peipsi. The largest rivers are the Velikaya (in Russia) and the Emajõgi connecting L. Peipsi with L. Võrtsjärv. The only outflow, the Narva River runs its waters (12 km³ per year) into Gulf of Finland.

Pikeperch *Sander lucioperca*, perch *Perca fluviatilis* northern pike *Esox lucius* bream *Abramis brama* and lake smelt *Osmerus eperlanus* are the main commercial fishes in the lake. Considering fish catches which have been 5000-10000 t (Estonia and Russia) or 20-30 kg ha⁻¹ yr⁻¹ in 1980-2007, depending mostly on the abundance of smelt, L. Peipsi surpasses all other lakes in North-Europe. Professional fishing gears are Danish seines, large fyke nets and gill nets. Eel catch is very low, 100-500 kg per year in a mixed species fishery.

The second large lake in this basin is **Võrtsjärv**, very shallow and turbid lake with a surface area of about 270 km² and mean and maximum depths of 2.8 m and 6.0 m, respectively. Its drainage basin (Figure 3) (3104 km², incl. 103 km² in Latvia) is situated in the Central Estonia. Eel, pikeperch, northern pike and bream are the main commercial fishes in the lake. Professional fishing gears are fyke nets (table 1). Recreational fishermen use long lines. Every fisherman has its own individual fishing licences.

Small lakes where eel fishery take place in the basin, are L. Saadjärv (707 ha), L. Kuremaa (497 ha) and L. Kaiavere (250 ha) in Vooremaa district and L. Vagula (519 ha) in South Estonia (Figure 4). The eel has migrated after stocking from L. Võrtsjärv via Emajõgi River to these lakes or was stocked consistently during last years.

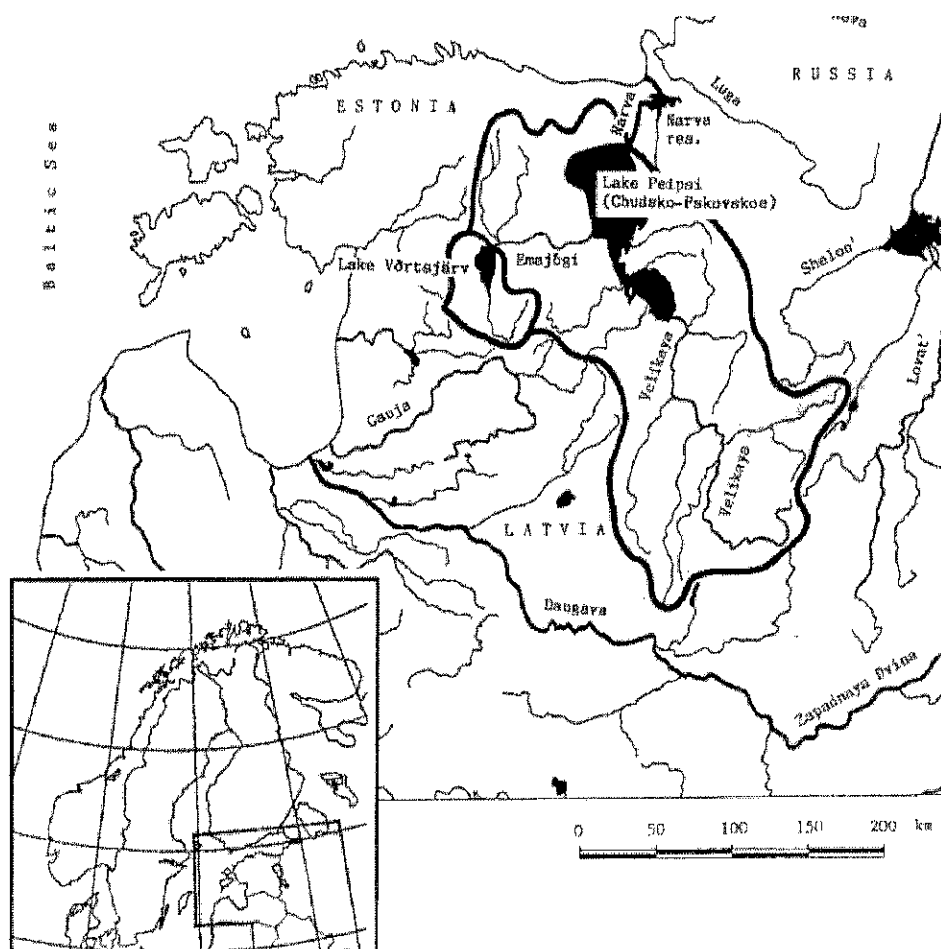


Figure 3. Location of watershed areas of L. Peipsi and L. Võrtsjärv

Fyke nets dominate potential eel fishing gear. In L. Peipsi and Narva reservoir eel type of fishing gear are not used specially for the catch of eel (table 1).

Table 1. Maximum number of gear licences (professional) per year allocated for water bodies in Narva River Basin in 2008

Type of gear	L. Peipsi	L. Võrtsjärv	Narva R. and res.	Small lakes and rivers	Total
Fyke net	901	324	40	144	1409
Longline (100 hooks)	10			26	36

In recreational fishing there are only limited number of gillnets, longlines and harpoons allowed to use beside the rod fishery in Estonia.

The proportion of recreational fishery (longlines and harpoon) from total eel catch in inland waters in 2005-2007 was 3,9 %.

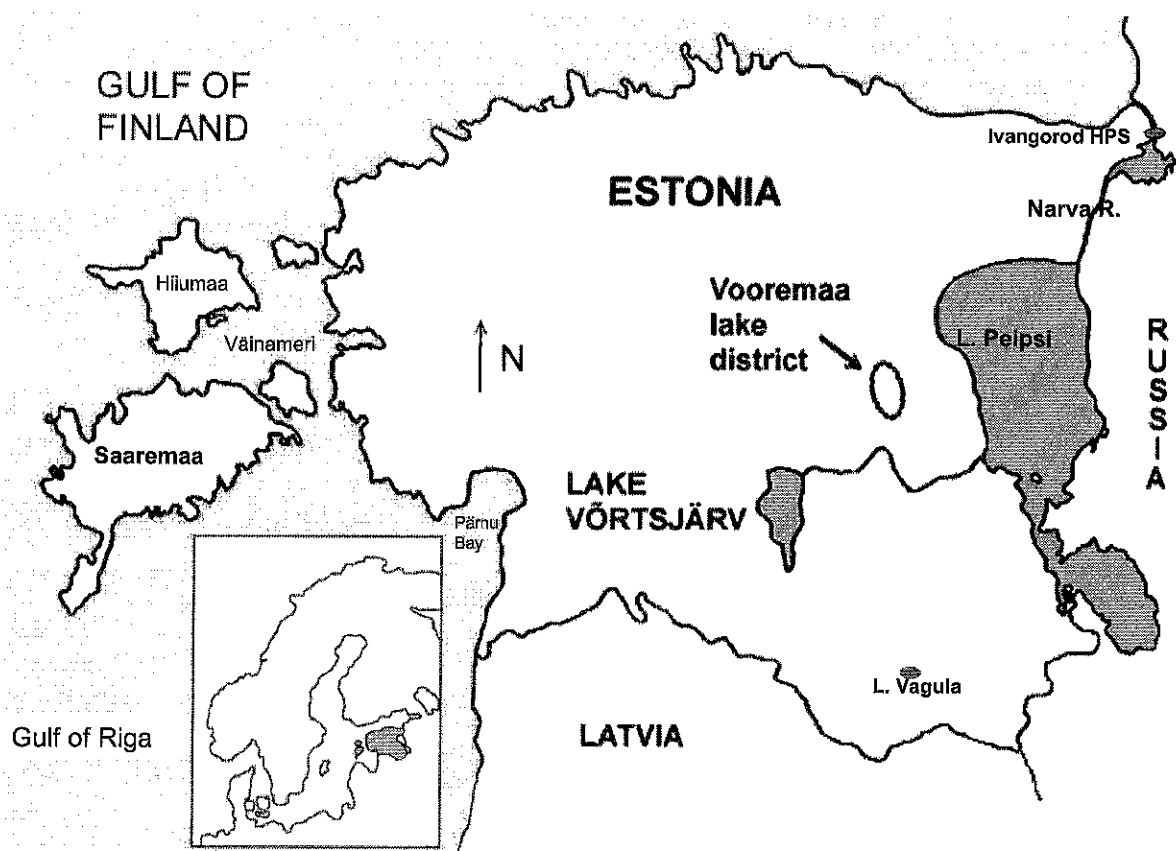


Figure 4. Location of Estonia, Lake Võrtsjärv, Lake Vagula, the Vooremaa Lake District and hydropower station in Ivangorod (Russia).

2.2. Present situation of the eel population in Narva River Basin

2.2.1. Fishing capacity, effort, catches and landings

50-80 % of total eel catch in Estonia based on stocking (Table 2). 80% from registered catch of eel from small lakes and rivers originated from the three lakes (Kaiavere, Kuremaa and Saaadjärv) situated in Vooremaa district (Figure 5).

According to the official statistics in 1988, the maximum annual catch of eel from L. Võrtsjärv exceeded 100 t. In the 1990s, the reported annual catch of eel was 22-49 tons. In 2000-2004 the mean annual catch of eel per fyke net in L. Võrtsjärv was 80 kg, in 2005-2007 60 kg.

Nearly half of the income of fishermen comes from eel, despite their annual investments (>100000 € annually) for stocking.

During 1970-1998, the number of professional fishermen in L. Võrtsjärv varied between 20-25, followed by an increase to 32 in 2003 and over 40 in 2004-2008. During the last years total number of people involved seasonally into the fishery from Estonian side of L. Peipsi was estimated to be 500.

The number of fyke nets in L. Võrtsjärv in 1970s and 1980s was 200-250, in 1990s 300 and from 1998 up to 2004 350. In 2005-2008 the total number of fyke nets was

reduced to 324 (1.2 fyke nets per km²) (table 1). Longlines are used only for recreational fishing in L. Võrtsjärv. In 2003-2007 fishing effort was 500 fishing nights of 100 hooks per year and mean annual catch was 400 kg. In Vooremaa lakes licensed fishermen have 36 fyke nets (2.6 fyke nets per km²) and 3 eel boxes on the outflow. 20 licensed longlines (professional fishery) are not continuously in use. In 2007 there was used 40 licences of longlines (100 hooks) in two Vooremaa lakes, L. Saadjärv and L. Kuremaa. Both lakes are clearwater lakes and therefore rather popular among underwater hunters. 150 recreational licences for harpoon fishery was given out in 2007 and the total catch was 110 kg.

Table 2. Catch of eel (in tons per year) in different water bodies of Estonia in 1993-2007 and proportion (%) of stocked eels.

Year	Baltic Sea	L. Võrtsjärv	L. Peipsi	Others	Total	Proportion (%) of stocked eels
1993	10	49	0,2		59,2	83
1994	10	36,9			46,9	79
1995	6	38,8		0,6	45,4	87
1996	20	34,1	0,1	1,2	55,4	64
1997	18,3	40,3	0,5		58,8	69
1998	22,2	21,8	0,2		44,2	50
1999	28,3	36,3	0,2		64,8	56
2000	26,7	38,9	0,2		67	60
2001	27,1	37,6	0,3	1,2	65,2	58
2002	27,3	20,4	0,2	2	50,3	46
2003	18,8	26,4	0,2	3,2	48,6	61
2004	15,6	20,1	0,3	3,2	38,9	60
2005	15,7	17,6		3	36,3	57
2006	9,6	19,9	0,1	3,1	32,7	71
2007	6,5	21,5	0,1	2,8	30,9	79

Table 3. Annual landings (in tons) from Lake Võrtsjärv

Year	1933-39	1960	1970	1980	1990	2000
0	1,8	0	6,5	17,8	56,1	38,8
1	Mean	0	6,5	16,5	48,5	37,6
2		0	16,4	10,8	31	20,4
3		0	21,3	24,5	49	26,3
4		3	18,7	66,7	36,9	20,1
5		0,3	36,9	71,9	38,8	17,6
6		1,9	49,6	55,6	34,1	19,9
7		2,7	50	61,2	40,3	20,5
8		2,9	44,5	103,8	21,8	19,9
9		5	45	47,6	35,2	

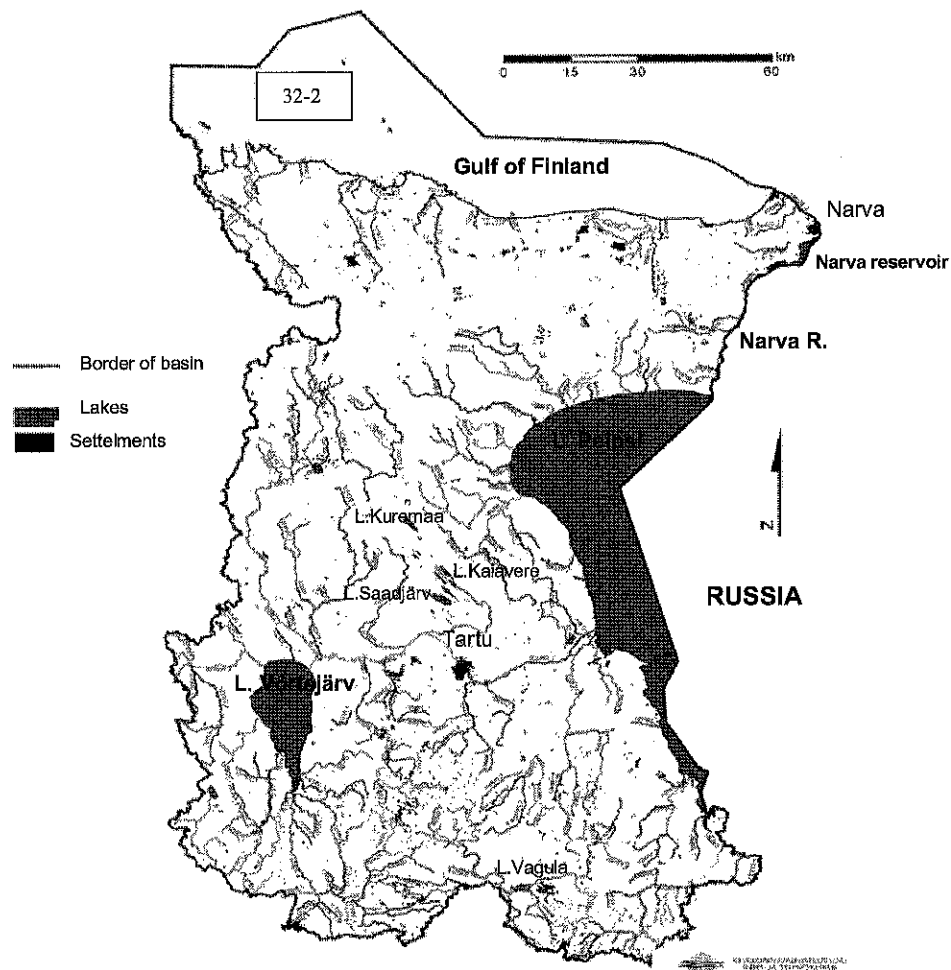


Figure 5. Map of Estonian part of Narva River Basin.

According to the long line data (CPUE) the density of natural eel population in Estonian lakes outside of Peipsi watershed area was 2-3 times lower (Table 4).

The eel catches have two peaks in inland waters: May and September. Eel has a legal (minimum) size: 55 cm in L. Võrtsjärvi and L. Peipsi, 50 cm in other Estonian inland water bodies and 35 cm in coastal waters.

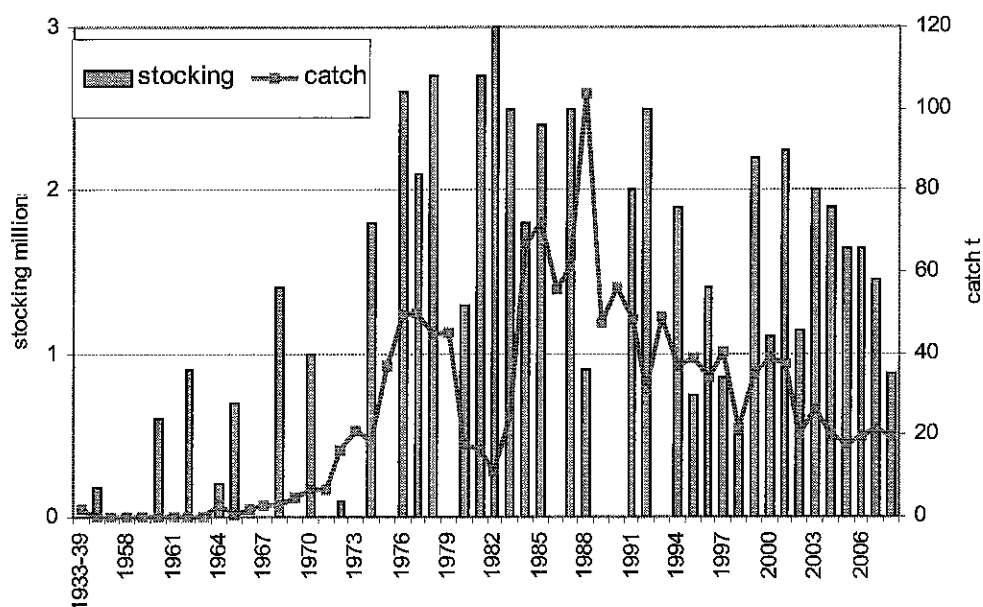


Figure 6. Stocking and catch of eel in L. Võrtsjärv. (young yellow eel = 5 glass eels)

Table 4. CPUE (catch in grams per 100 hooks per night) of loglines in inland water bodies of different river basins (data from 2001-2008)

River basin	CPUE g	Number of Long lines	Catch kg	Sub-basin (Figure 2)	Origin
Amme R.	1758	541,5	952	Peipsi	Stocked
Emajõgi R.	1071	135	145	Peipsi	Stocked
Võhandu R.	368	223	82	Peipsi	Stocked
Väike Emajõgi R.	1218	352	429	Võrtsjärve	Stocked
L. Võrtsjärv	1096	1330	1457	Võrtsjärve	Stocked
Õhne R.	836	44	36,8	Võrtsjärve	Stocked
L. Ermistu	800	4	3,2	Pärnu	Natural
Pärnu R.	421	67,5	29	Pärnu	Natural
Koiva (Gauja) R.	544	9	5	Mustajõe	Natural
Daugava R.	390	122	48	Mustajõe	Stocked
Salaca R.	0	6	0	Mustajõe	Natural

Table 5. CPUE (catch in grams per 100 hooks per night) of long lines in lakes and rivers (data from 2001-2008)

River basin	Waterbody	CPUE g	Number of long lines	Catch kg
Võhandu R.	Lake Kahrila	243	7	1,7
	Lake Kaussjärv	1000	3	3
	Lake Kavadi	273	3	0,818
	Lake Rõuge Suurjärv	1000	1	1
	Lake Rõuge Valgjärv	500	1	0,5
	Lake Tamula	218	85	18,5
	Lake Tsolgo Mustjärv	80	5	0,4
	Lake Tsolgo Pikkjärv	0	1	0
	Lake Tõugjärv	0	6	0
	Lake Vagula	507	110,5	56,04
Mean	Total	368	222,5	81,96
Koiva R.	Lake Hanija	1200	1	1,2
	Lake Ähijärv	463	8	3,7
Mean	Total	544	9	4,9
Daugava R.	Lake Hino	288	69	19,9
	Lake Hino Mustjärv	0	1	0
	Lake Misso Saarijärv	0	3	0
	Lake Pullijärv	565	49	27,7
Mean	Total	390	122	47,6
Väike Emajõgi R.	Lake Karula Pikkjärv	400	1	0,4
	Lake Inni	400	5	2
	Lake Porijärv	800	1	0,8
	Lake Lõõdla	1066	87	92,75
	Lake Uhtjärv	1016	19	19,3
	Väike Emajõgi R.	1312	239	313,6
Mean	Total	1218	352	428,85
endorheic lake	Lake Paidra	0	5	0
Salaca R.	Lake Ruhijärv	0	1	0
	Lake Tündre	0	5	0
Mean	Total	0	6	0
Amme R.	Lake Kaiavere	1577	83	130,9
	Lake Saadjärv	1467	372,5	546,5
	Lake Kuremaa	3192	86	274,5
Mean	Total	1758	541,5	951,9

River basin	Waterbody	CPUE g	Number of longlines	Catch kg
Pärnu R.	Lake Sinialliku	0	1	0
	Lake Kariste	520	5	2,6
	Karksi-Nuia reservoir	540	10,75	5,8
	Lake Mäeküla	257	35	9
	Navesti R.	0	3	0
	Lake Viljandi	659	29,5	19,45
Mean	Total	421	67,5	28,45
Õhne R.	Lake Koorküla-Valgjärv	1421	14	19,9
	Lake Pikre	570	20	11,4
	Õhne R.	611	9	5,5
	Lake Veisjärv	0	1	0
Mean	Total	836	44	36,8
Lake Võrtsjärv	Lake Võrtsjärv	1096	1329,9	1457,4
Emajõgi R.	Emajõgi R.	1071	135	144,55

2.2.2. Catch composition by age and length

There is a sampling programme including measuring of length, weight and age determination of eel in L. Võrtsjärv and small lakes. Due to the legal size of eel 55 cm and minimum legal mesh size in the cod end of fyke net (18 mm knot to knot) 50-60 % of eels in commercial catch in L. Võrtsjärv is silver eel. In Vooremaa lakes this proportion reach up to 90% (Table 6, Figures 7, 8). Eels caught from Estonian lakes are larger (usually over 60 cm) than those caught from other water bodies in Europe.

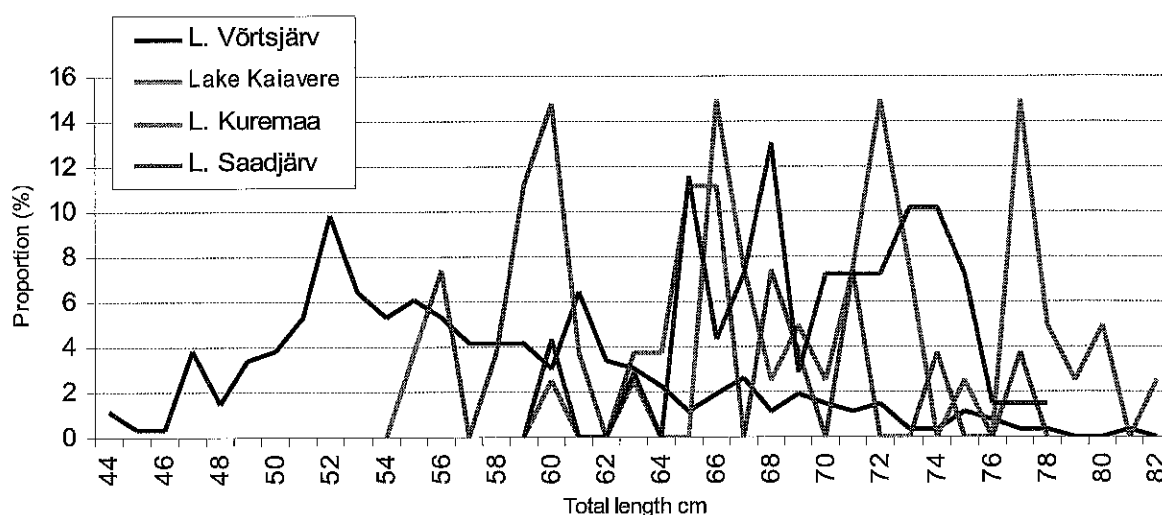


Figure 7. Length distribution of eel in fyke net catches in L. Võrtsjärv and in the lakes of Vooremaa district in September 2008

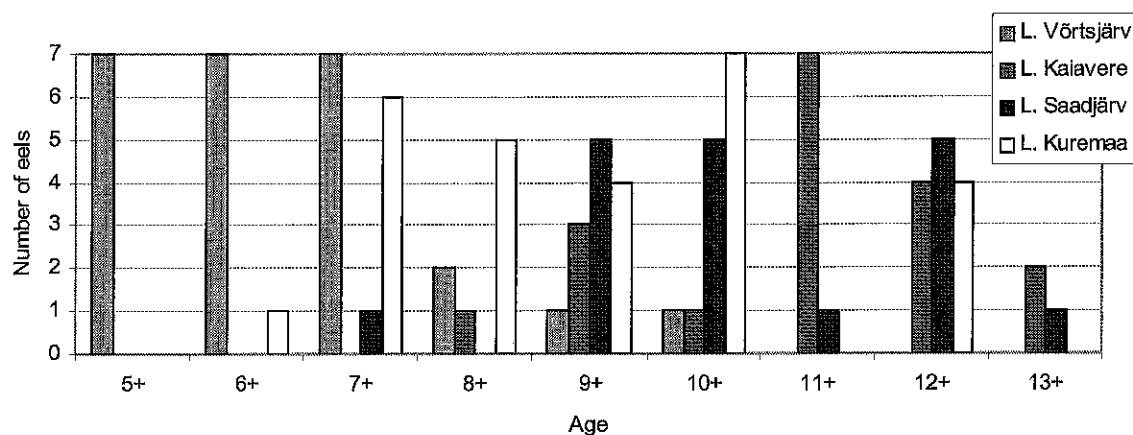


Figure 8. Age composition of eel in fyke net catches in L. Võrtsjärv and in the lakes of Vooremaa district in 2008

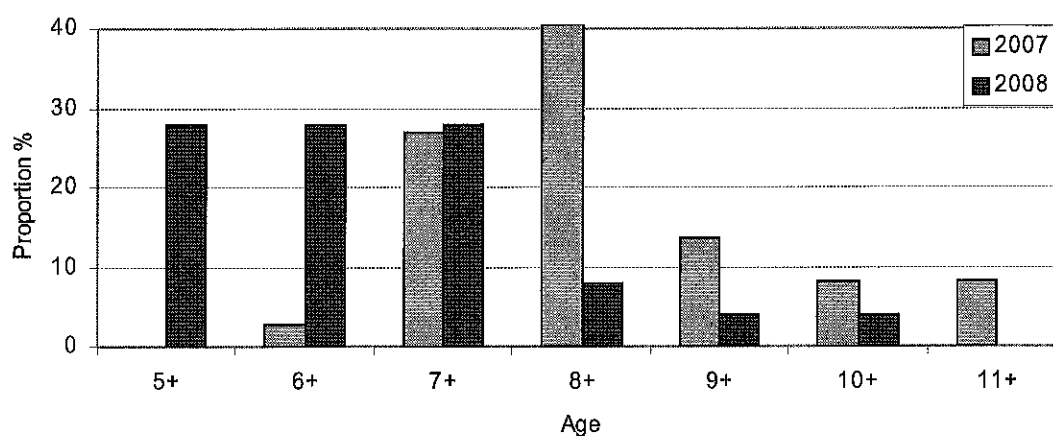


Figure 8. Age composition of eel in fyke net catches in L. Võrtsjärv in 2007-2008

Table 6. Mean length (TL cm), weight (TW g) and proportion (%) of silver eel in fyke net catches in “eel lakes” of Narva River Basin in Autumn 2008

Lake	TL cm	TW g	Proportion (%) of silver eel	Number of measured eels
L. Võrtsjärv	58	412	41	199
L. Kuremaa	64	480	80	27
L. Saadjärv	70	608	94	69
L. Kaiavere	72	672	97	40

2.2.3. Stocking

Estonia has state stocking programme of fish, including eel, for years 2002-2010.

In soviet time government used state money for stocking. Since the beginning of 1990s 75-100% was financed by fishermen. During the last years stocking of eel has been financed fully by local fishermen (>100000 € per annum). Finances for stocking were collected through the licence fees (fyke nets, long lines) for water bodies where eel was stocked. Stocking quantities are listed in tables 7 and 8. Estonia imported glass eel up to 1987 from France, afterwards from England. Young yellow eel (5-20 g) was imported from Germany in 1988 and 1995, from local fish farm in 2002-2008. Young eels were reared previously in a fish farm before stocking into lakes.

In 1956 stocking of glass eels into L. Võrtsjärv was started. However, stocking has been irregular (Figure 6). The stocking rate with glass eels in L. Võrtsjärv has been relatively low: annual average in 1956-2001 was about 35 ind.ha⁻¹yr⁻¹ with a maximum of 84 ind.ha⁻¹yr⁻¹ in 1980-1984. The peak of stoking with glass eels occurred in the early 1980s. As a result, during the following five-eight years the catches of eel were the highest, constituting 2.5 kg ha⁻¹ yr⁻¹. The maximum catch of this fish in L. Võrtsjärv was recorded in 1988 (104 t or 3.7 kg ha⁻¹). From the end of 1980s the annual catch decreased (Figure 6). Since 2005 the eel was stocked only into those lakes in Estonia which are named in table 7.

Table 7. Stocking number of young yellow eel (10³) into the lakes of Narva River Basin and stocking density in 2002-2008

Lake	Area (ha)									Stocking density	
		2002	2003	2004	2005	2006	2007	2008	Total	sp/ha	sp/ha/year
Võrtsjärv	27000	285	408	483	330	330	290	175	2 301	85	21
Saadjärv	707	50	36	29,4	15	15	10	8,3	163,7	231	58
Kaiavere	250	20	25	22	10	10	10	4,5	101,5	406	102
Kuremaa	397	0	30	11,2	10	10	10	3	74,2	187	47
Vagula	519	6	20	19,6	10	10	8,1	2,6	76,3	147	37

Table 8. Stocking of glass eel and young yellow eel in the Estonia (in millions)

Year	1950		1960		1970		1980		1990		2000	
	glass eel	young yellow eel	glass eel	young yellow eel	glass eel	young yellow eel	glass eel	young yellow eel	glass eel	young yellow eel	glass eel	young yellow eel
0			0,6		1,0		1,3				1,1	
1							2,7		2,0			0,44
2			0,9		0,1		3,0		2,5			0,36
3							2,5					0,54
4			0,2		1,8		1,8		1,9			0,44
5			0,7				2,4			0,15		0,37
6	0,2				2,6				1,4			0,38
7					2,1		2,5		0,9			0,33
8			1,4		2,7			0,18	0,5			0,19
9									2,3			

2.2.4. Potential downstream escapement

The construction of the hydropower station on the Narva River in the early 1950s blocked the natural upstream migration of eel to the water bodies of L. Peipsi basin (Figure 9). As a result, eel almost disappeared from the fish fauna of Estonian large lakes. The hydroelectric power station belongs to Russian Federation and lies in town Ivangorod. Since 1960s the population of eel of Narva River Basin District based entirely on stocking. During the half hundred years (1956-2008) about 50 million eels were stocked into the lakes of Narva River Basin (46 millions into L. Võrtsjärv). Due to the stocking, eel is one of the most important commercial fish in Lake Võrtsjärv and in some small lakes in Narva River Basin. One of the most crucial tasks for Narva River Basin was to determine potential silver eel escapement and survival in turbines to allow improved eel migration. According to latest investigation (INTERREG III A priority North project NIV-86 "Influence of dam and turbines of Narva hydropower station on the migration of European eel from Lake Peipsi basin" EELMIG) the downstream migration of eel through the turbines of hydropower station is possible.

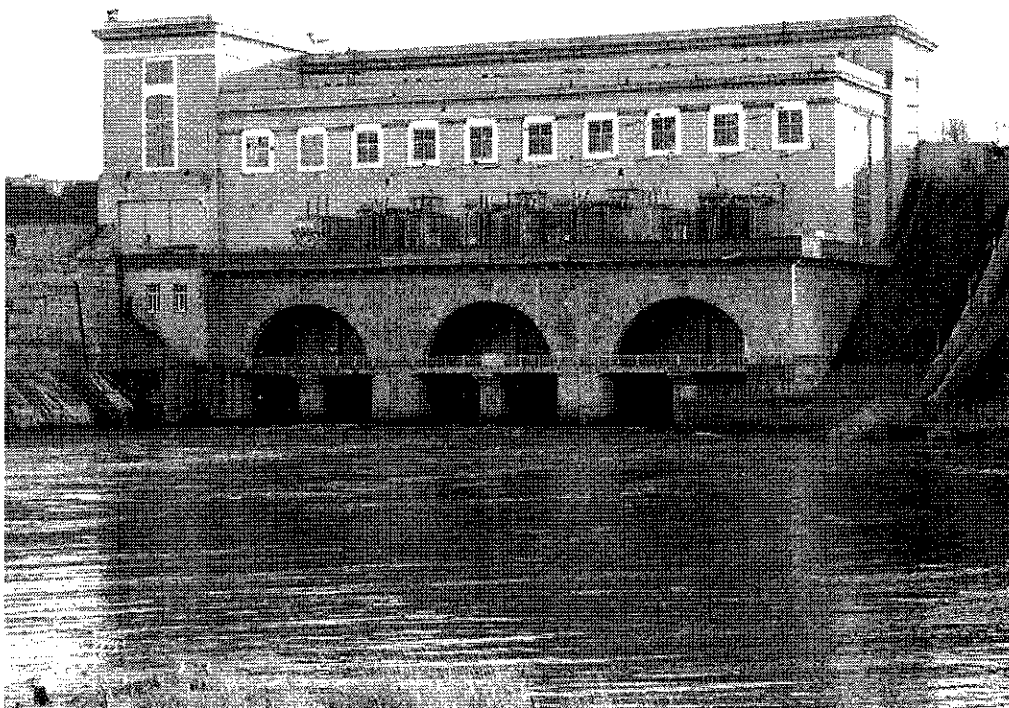


Figure 9. The hydropower station on Narva River has three turbines

To investigate the downstream migration of silver eel from L. Võrtsjärv and L. Peipsi and their possibility to go through the turbines there was tagged 147 eels. All specimens were tagged with Carlin-type of tags, among them 7 specimens with radio telemetric tags. Eels for tagging were caught from Lake Võrtsjärv or Lake Ülemiste. Stocking of label-tagged eels into Narva water reservoir took place in November 2006 and in June 2007. Recapture results in 2007 were rather successful. Despite of low intensity of eel-type fishing gear in Narva River, there were recaptured 4 label-tagged eels downstream of the power station. One eel was recaptured on the South coast of

Gulf of Finland near the Purtse river mouth. Two large eels with Carlin tag have been caught in Koge Bay, close to Copenhagen, Denmark. One specimen covered the distance more than 1200 km with 4 month the second was recaptured in the same bay a year later in September 2008 (Figure 10).

In November 2007 there also survival and behaviour of 7 eels equipped with transmitters was observed after coming through the turbines using manual registration of migration. Minimum 50% of radio-tagged eels came through the turbines alive and without any damage. Two of them were caught back in Narva R. after two month in winter and one next Summer close to island Saaremaa (Figure 10). The fixed evidence of successful downstream migration of silver eel is very important to emphasize sustainable and reproductive management of European eel in Narva River Basin during the last 50 years.

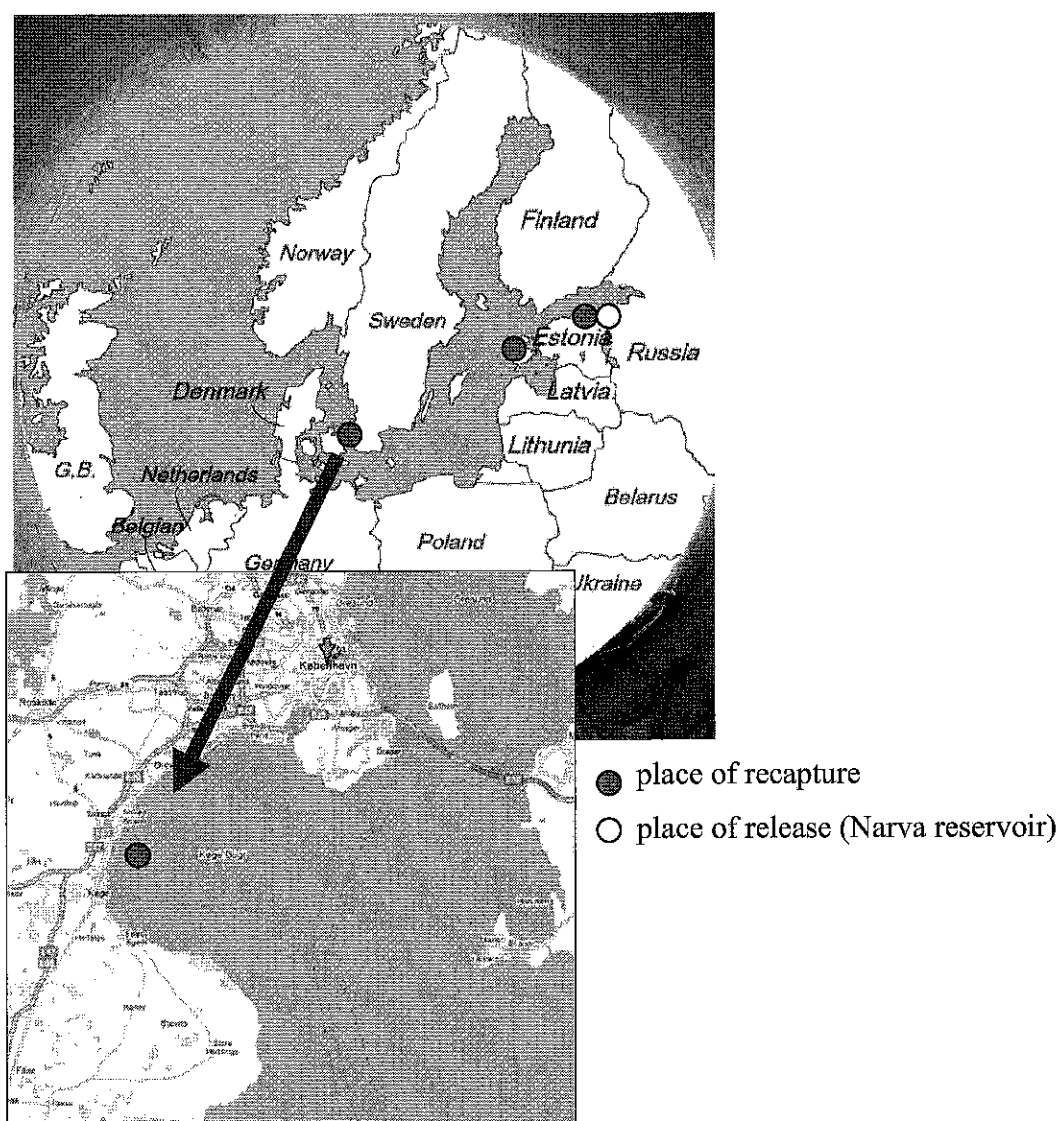


Figure 10. Places of release and recapture of tagged eels.

2.2.5. Estimation of escapement

According to A. Kangur (1998) the annual fishing return in L. Võrtsjärv has considerably changed. The specially high values (8,4-8,7 %) were noticed in the end of 1970s and in 1980s (5-6,6 %). Since the beginning of 1990s until the end of glass eel stocking fishing return decreased (1,4-4 %). During long-term glass eel stocking period (1965-2001) the effectiveness of stocking (the number of glass eels required to produce 1 kg of eel catch) was 32 (Kangur, 2002). As in this period the legal size of eel was 60 cm and mean weight in fyke net catches was 0,5 kg, there was recaptured one silver eel per 16 stocked glass eels or mean recapture percentage was 6,3.

In Spring 2007 was stocked 81 Carlin-tagged eels over legal size (>55 cm) into L. Võrtsjärv (Table 9). During the same year was recaptured 12 eels (14,8 %) and annual catch of eel was 21,5 tons. In 2007 mean weight of eel in the fyke net was 430 g and total catch in numbers was 50 thousand. According to the recapture percentage there was over 330 000 eels over mean length at first capture 50 cm. On the basis of mark-recapture results approximately 85% of silver eel emigrating L. Võrtsjärv via Emajõgi R. to L. Peipsi and therefore via Narva R. to Gulf of Finland. As there is not allowed to put fishing gear closer than 200 m from both side of outflow of Lake Võrtsjärv, entrance into river for migrating fish is free. There are 60 fyke nets licences in Emajõgi R. (100 km), but 2/3 of riverbed should be let open. According to fisheries statistics the total catch of eel in Emajõgi R. was 50-150 kg yr⁻¹ in 1996-2007, in L. Peipsi 100-500 kg yr⁻¹ (Table 2).

Table 9. The number of tagged and recaptured eels, annual catch in kilos and numbers, total number of eel over mean length at first capture (50 cm) and proportion of silver eel in fyke net catches in L. Võrtsjärv in 2007-2008

Year	Tagged eels in the lake	Number of recapture	Percentage of recapture	Annual catch kg	Mean weight of eel g	Yield in number of eels (>50cm)	Total number of eels (>50cm)	Proportion % of silver eel
2007	81	12	14,8	21 500	430	50 000	337 838	84
2008	96	12	13,2	19 900	425	46 824	354 727	41

CPUE of long lines (1071 g) shows the same density of eel in the Emajõgi R. during summer months (Table 4). The most intensive emigration time is in September and October. In 1975 -1976 in the river was used special light barrier, leading migrating eels into fyke net. The biggest catch (570 eels per night) was caught in the end of September 1975. Experimental catch using electric barrier and fyke net took place in 1999 in the same place on the Emajõgi R. During one week was caught about 50 eels, mean length and weight 67,5 cm and 670 g accordingly.

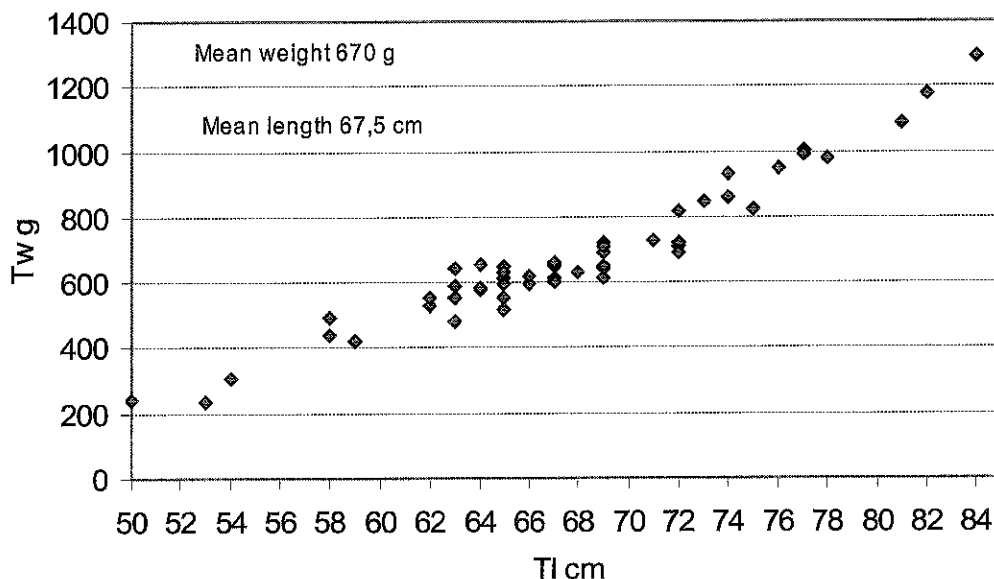


Figure 11. The length and weight of downstream migrating silver eel in fyke net in Emajõgi R. in October 1999

2.2.6. Condition of eel

Since 1992 till 2001 the intensity of *Anguillicola* infection in the eel population of L. Võrtsjärv have studied (Kangur, 2002). The prevalence of the infected eels varied between 51% and 86% over the years, with no apparent trend. In 2008 the intensity of infection was 50% in L. Võrtsjärv. In spite of the belonging to one river basin in the lakes of Vooremaa district the intensity of infection varied very much. In L. Saadjärv all investigated eels (18) where infected, in L. Kaiavere 89% (18) and in L. Kuremaa (27) only one small parasite was found in swim bladder in 2008.

2.2.7. Description of measures

The natural status of eel stock in Narva River Basin before the construction of hydropower station near Ivangorod was not very abundant (annual catch 1,8 tons L. Võrtsjärv and 3-6 tons L. Peipsi), therefore the contribution into recruitment(escaped silver eels) was tenth of times lower than at present. Due to permanent stocking and rather fetterless downstream migration, the 40% escapement objective of silver eel in Narva River Basin is achieved. On the basis of financing of local fishermen the present escapement capacity exceed the historically natural escapement several times and there is no need of reduction in fishing effort. The main proposal is to increase annual stocking amount of eel in the water bodies of Narva River Basin and to enhance the stocking with additional financing. The hydroelectric power station lying on Russian side totally hindered the natural pass of eel into Narva River Basin. Therefore without stocking huge area of suitable habitat for eel will be cut off for recruitment.

According to tagging and recapture results more than 1,4% of silver eel escaped from Narva River Basin were caught in Danish Straits.

3. West-Estonian Basin District – (costal waters and West-Estonian inland water bodies)

3.1. Description of district and maps

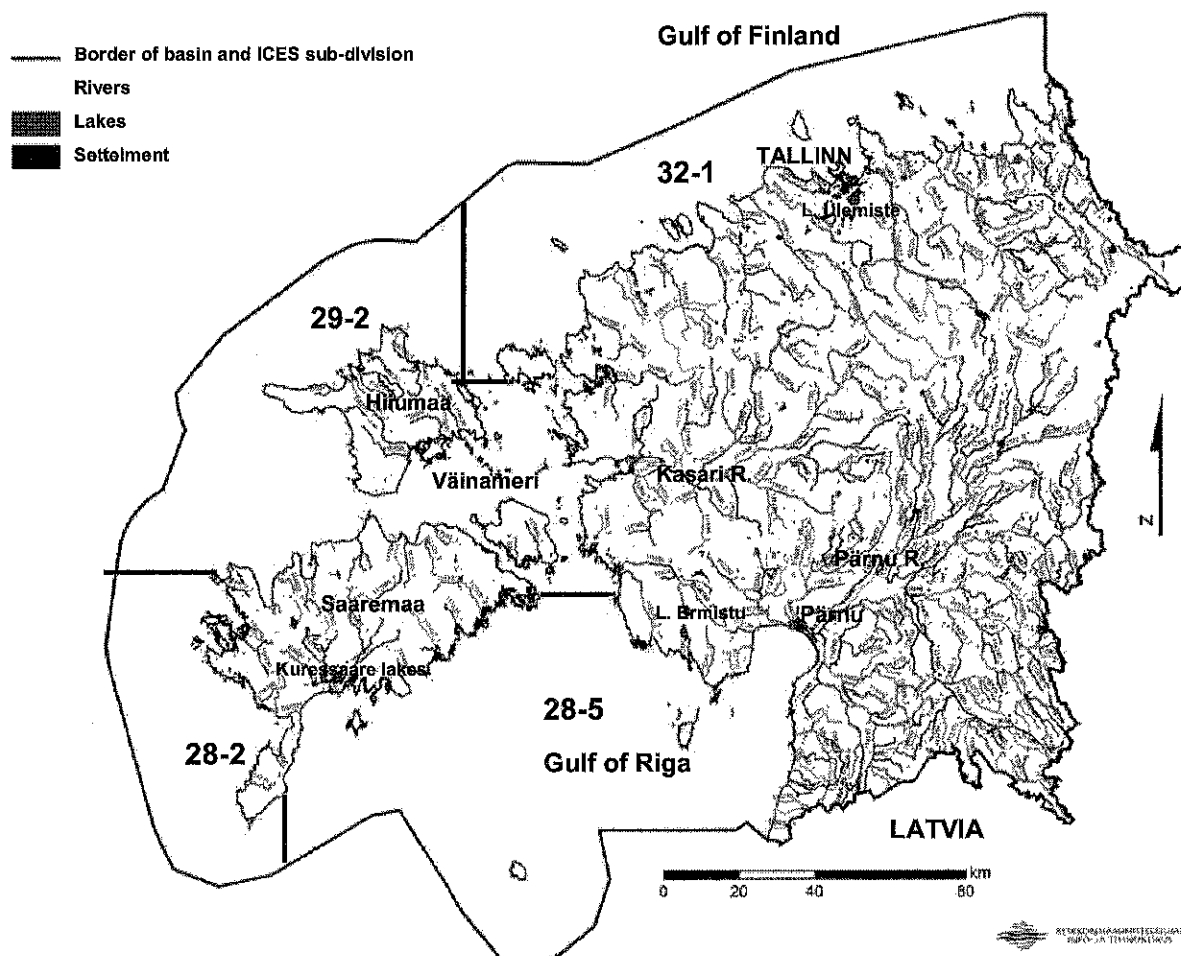


Figure 12. Map of West-Estonian Basin District

Most important in West-Estonian Basin District for natural eel population in Estonia are coastal brackish waters, especially Väinameri area, coastal waters of islands and Riga Bay (Figure 12). In the basin there are two main river systems, Pärnu River and Kasari River. All other rivers are considerably small. In Kasari River basin there are only one larger lake over 100 ha, L. Kaisma (135,5 ha). Pärnu R. watershed area is 6920 km²; there is added area of coastal rivers 1493 km². Pärnu R. sub-basin is not rich in lakes. Most of the lakes are small, the biggest lake is L. Ermistu (480 ha), where population of eel is mostly natural and it has free connection with Gulf of Riga. In 2003–2004 there was stocked 8000 young-yellow eels into L. Ermistu.

On the Pärnu River there are several old dams, but according to investigations they are not impassable obstacles for eel, because eel has caught by amateur fishermen in upstream lakes up to the present day, but in very small quantities. All over Estonia

there are hundreds of non-functional old dams but due to small height and bad conditions they usually are not serious obstacles for up- and downstream migrating eel.

As the abundance of eel population in Koiva basin (Gauja in Latvian) shared with Latvia is low, there is no need to take it into account.

3.2. Present situation of the eel population in West-Estonian Basin

3.2.1. Fishing capacity, effort, catches and landings

Potential eel fishing gear are dominated by fyke nets in costal waters and in some lakes of the basin. According to fishery law fyke nets in costal waters are divided into four groups: large fykes in deeper open waters, the height of mouth of fyke net is over 3 m; fyke nets 1-3 m; fyke nets with the height of mouth up to 1 m and small fykes in line. Only small fykes in line are focused on eel specially. Therefore diminishing of this type of fyke net is necessary. In table 9 is given the number of fishing gear potentially catching eel and the percentage of each type. In fishery statistics the catch of two types (up to 1 m and 1-3 m) was given together (table 10). All fyke nets, except small fykes in line, are focused on catch of other fish species and eel is bycatch in small amount.

Table 9. Number of gear licences (professional) allocated for costal waters in West-Estonian Basin in 2008

Area (county)	Ida-	Lääne-	Harju-	Hiiu-	Lääne-	Pärnu-	Saare-		Type
Type of gear	Virumaa	Virumaa	maa	maa	maa	maa	maa	Total	%
Large fyke nets	30	30	80	250	30	487	130	1037	11
Fyke nets (1-3 m)*	20	75	61	65	85	131	265	702	7
Fyke nets up to 1 m*	12	29	101	1000	70	315	197	1724	18
Small fyke nets in line	5	5	80	1026	1890	550	1300	4856	50
Longlines (100 hooks)	2	25	76	200	130	835	208	1476	15
	69	164	398	2541	2205	2318	2100	9795	

* Height of the mouth of fyke net

Table 10. Commercial catch (in kg) of eel in costal waters and the proportion (%) of different types of fishing gear in coastal waters of West-Estonia in 2005-2007

Type of gear	2005	2006	2007	Total	%
Large fyke net (open water)	2166	1282	898	4346	37
Fyke net (1-3 m; <1m)	2115	1521	931	4567	39
Small fyke net in line	1062	1026	377	2465	21
Longline (100 hooks)	46	186	181	413	4
	5389	4015	2387	11791	

Historically eel was one of the most important fish species in costal waters of Estonia. Before the Second World War (1938) the total annual catch of eel in Estonia exceeded 500 tons (Kint, 1940). In 1950s total catch decreased to one hundred ton and continues to decline up to 20 t in the end of 1970s. In 1980s the eel catch increased again up to 30 tons (Figure 13). Shallow costal waters close to western inlands and Väinameri (Figure 12) were most productive areas at that time and there are biggest catches of eel at the present also.

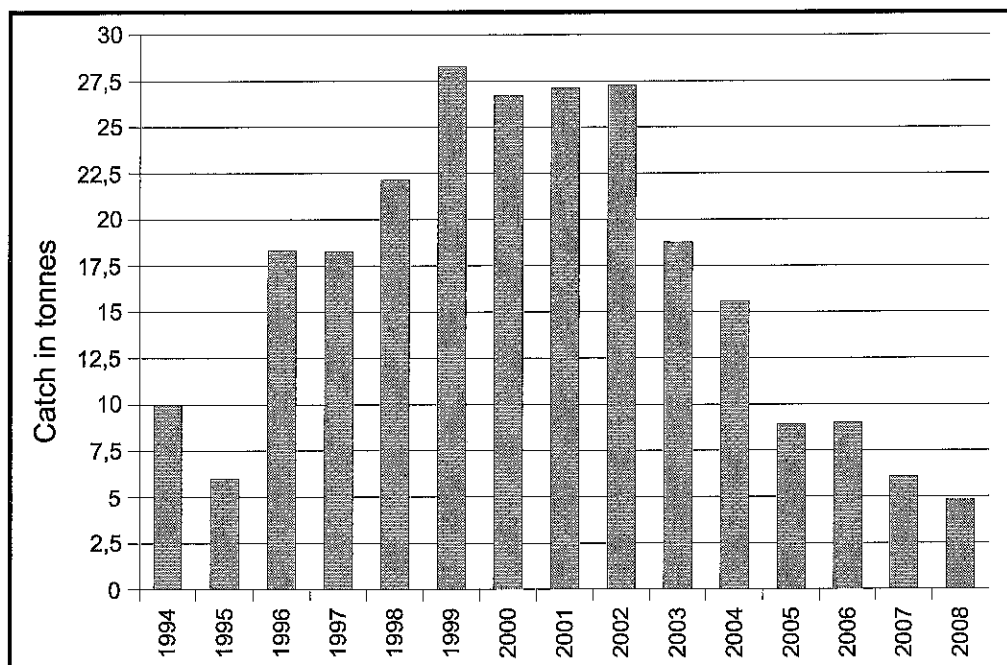


Figure 13. Annual landings of eel (in tons) from coastal waters of Estonia in 1993-2008

Recreational fishermen using mostly longlines. At the present the CPUE of longlines is in decline (Table 11). The proportion of amateur fishery from total eel catch in coastal waters in 2005-2007 was 3,7 %.

Table 11. Non-commercial longline catches (kg) of eel in ICES subdivisions of Estonian coastal waters in 2005-2007

Year	28-2	28-5	29-2	29-4	32-1	32-2	Total
2005	46	231	88	57	49	9	480
2006	35	120	17	33	24	0	229
2007	37	84	32	18	30	1	202
Total	118	435	137	108	103	10	911
%	13,0	47,7	15,0	11,9	11,3	1,1	

Table 12. CPUE (catch in grams per 100 hooks per night) of longlines in coastal waters of Estonia (data from 2001-2008)

Area	CPUE g	Number of long lines	Catch kg
Väinameri	635	262	167
Saaremaa	612	489	299
Riga Bay	629	397	250
Mean/Total	623	1148	715

Table 13. CPUE (catch in grams per 100 hooks per night) of long lines in different areas of costal waters (data from 2001-2008)

District	ICES subdivision	Area	CPUE g	Number of long lines	Catch kg
Väinameri	29-4	Väinameri	443	31,6	14
Väinameri	168	Dirhami	743	2,69	2
Väinameri	169	Noarootsi	345	11,6	4
Väinameri	170	Haapsalu Bay	667	81	54
Väinameri	172	Virtsu	676	22,2	15
Väinameri	230	Muhu	1250	12	15
Väinameri	231	Arju Bay	681	47	32
Väinameri	245	Muhu	565	54	30,5
			635	262,09	166,5
Saaremaa	246	Saastna Bay	1286	7	9
Saaremaa	260	Randküla	750	4	3
Saaremaa	261	Turja	558	19,7	11
Saaremaa	272	Soela Strait	386	124,3	48
Saaremaa	292	Varese	4000	1	4
Saaremaa	293	Nasva	705	80,8	57
Saaremaa	303	Küdema Bay	1000	3	3
Saaremaa	304	Sõrve Teesu Bay	1000	1	1
Saaremaa	314	Ariste Bay	1077	39	42
Saaremaa	315	Sõrve, Mõntu	830	26,5	22
Saaremaa	325	Undva	603	29	17,5
Saaremaa	326	Vilsandi	333	60	20
Saaremaa	328	Sõrve Jämaja	800	5	4
Saaremaa	329	Sõrve tipp	1000	7	7
Saaremaa	283	Vätta	435	11,5	5
Saaremaa	313	Tagalaht	655	69,9	45,8
			612	488,7	299,3
Riga Bay	174	Varbla	1167	12	14
Riga Bay	176	Matsi	444	18	8
Riga Bay	177	Tõstamaa	1407	20,25	28,5
Riga Bay	178	Munalaiu	420	130,25	54,7
Riga Bay	179	Liu	200	24	4,8
Riga Bay	180	Pärnu Bay	645	34,4	22,2
Riga Bay	181	Häädemeeste	920	87	80
Riga Bay	182		821	28	23
Riga Bay	183	Kabli	433	3	1,3
Riga Bay	188	Kihnu	138	29	4
Riga Bay	195	Kihnu	818	11	9
			629	396,9	249,5

In inland waters of the basin the total catch of eel reminds under the 200 kg. On the basis of state finances in 2003 and 2004 there was stocked 80 000 young yellow eels into the small lakes of West-Estonian Basin. From all these lakes eel has free way out into the sea.



Figure 14. Age composition of eel in small fyke nets in line catches in coastal waters of island Saaremaa in 2006

Table 14. Growth rate of eel in coastal waters of inland Saaremaa

Age	3+	4+	5+	6+	7+	8+	9+	10+
Mean TL mm	407	431	506	540	563	623	660	750
Mean TW g	95	117	166	200	305	461	589	600

3.2.2. Description of measures

As in most of fyke nets used in coastal waters eel is as bycatch and it consists under the 1% of total, there is no need to diminish the number of licences of those gear, except small fykes in line what are focused on catch of eel. In 2009 the number of licences of small fykes in line where diminished approximately 15% already. For 2013 this number will diminish up to 50% of present number (Table 15). Catch of eel in West-Estonia, mostly in coastal waters, should to be less than 6 tons per year, set in relation to the average catches in 2004-2006 (12 tons). Actually, the requirement of 50% reduction in eel catch in maritime areas is followed up to now already as the yield of eel in coastal waters was 4.8 tons, in 2008 (Figure 13). In spite of this there will be diminished licences of small fykes 50%. In case of the increase of eel catches in coastal waters of Estonia the further reduction of fishing effort is possible.

In rivers flow into sea, the catch with fyke nets and longlines are not allowed to use at all except Nasva R. in Saaremaa Island (6) and in small lakes of the basin there are only 11 fyke nets licences allowed. Total annual catch of eel in inland waters of the basin is below 200 kg. Due to above mentioned, 40% escapement of silver eel from inland waters of the West Estonian Basin District is guaranteed.

Table 15. The initial proposal for diminishing of licences of small fyke nets in line in different areas of costal waters of Estonia in 2008-2013

Area (county) Year	Ida- Virumaa	Lääne- Virumaa	Harju- maa	Hiiu- maa	Lääne- maa	Pärnu- maa	Saare- maa	Total	%
2008	5	5	80	1026	1890	550	1300	4856	100
2009	4	4	68	850	1611	544	1105	4186	86
2010	3	3	58	723	1369	462	939	3557	73
2011	3	3	49	614	1164	393	798	3025	62
2012	3	3	42	522	989	334	679	2571	53
2013	3	3	35	444	841	284	577	2185	45

4. Aquaculture

At present there is only one fish farm in Estonia, which started with farming of eel at 2002. Next year the production was 10 tons, in 2004 15 tons and in following years 40-50 tons. In 2002-2008 the stocking material of eel (young yellow eel 2-20 g) for Estonian lakes was brought from this eel farm.

5. Monitoring of the stock

The fish stock assessment programme of Fishery Department of Ministry of Environment financed by Environmental Investments Centre, includes special project of eel stock investigations (length and age structure, recapture calculations, prognoses, limits) in L. Võrtsjärv and in other inland waters of Estonia. The results are reported to the Fishery Department. Joint project with Russia for investigation of silver eel downstream migration in Narva River was financed by ERDF.

Until the end of 1990s Estonian investigations, based on commercial catches, were focused on stocking and fishing return of eel in L. Võrtsjärv. Since 2001 the catches of yellow and silver eel were investigated in many lakes and rivers all over Estonia. Main source of the information were official catch and special long-line and fyke net catches and electro fishing in lakes and rivers (multispecies survey in more than 300 stations every year, relative abundance). Special survey of eel in costal waters was not done in Estonia, except detailed data collection in 2008. During last five years Ministry of Environment and Environmental Investments Centre financed investigations of eel.

Management of eel stock in Estonia is under the control of government. There are fishery departments in Ministry of Environment, takes care of stocking and fishing licences. Fishery department in Ministry of Agriculture organize commercial fishery. There are gear and size restrictions.

Estonia has the state programme of reproduction and re-stocking of fish (2002-2010) including European eel. In connection with this programme there was done special investigations and monitoring projects focused on eel. Since 1992 the intensity of *Anguillicola* infection in the eel population of L. Võrtsjärv have studied. During 1999-2003 there was estimated food composition of cormorants in the costal waters including the proportion of eel. In 2008 was passed the management plan for limitation of the abundance of cormorants in Estonian territory, especially in

Väinämeri area. In winters 2002-2006 feeding of pike and the proportion of eel in pike food was studied.

Registration of fishing efforts, investigation of catch composition etc. is well organised in inland waters, but in coastal waters it should be monitored better.

Positive effect of restocking is clear and it is therefore recommended to continue the existing restocking according restocking programme. Monitoring of stocking results and silver eel migration is necessary to continue. There is need for a pilot study for quantifying angling catch and effort.

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