

**Report to the European Commission required in line with Article 9  
of Regulation 1100/2007/EC**

# **Report on the Implementation of Eel Management Plan (EMP) for Latvia**

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## 1. Monitoring, effectiveness, and outcome of the implemented eel management plan.

### 1.1. Introduction

The Council Regulation (EC) No 1100/2007 of 18 September 2007 establishing measures for the recovery of the stock of European eel (the Eel Regulation) imposes on Member States an obligation to prepare and implement eel management plans (EMPs) and regularly report to the Commission on the progress thus achieved. Each Member State shall report to the Commission, initially every third year, with the first report to be presented by 30 June 2012. The frequency of reporting shall decrease to once every sixth year, after the first three tri-annual reports have been submitted.

The Latvian EMP was created for the time period of 2008-2013 and 2015-2016. After that the measures introduced by the EMP were implemented in the National Restocking Plan for the time periods of 2017-2020 and 2021-2024. Under these National Restocking Plans, Latvia, followed the Eel Regulation, continued to monitor the eel stock, evaluated current silver eel escapement and post-evaluated implemented management actions aimed at reducing eel mortality and increasing silver eel escapement. Eel management measures will be continued within the new National Restocking Plan for 2025-2028 which will be developed by the end of the year 2024. The measures for this plan will take into account the improvements detailed in the Progress Report.

### 1.2. Status of the Latvian stocks

The total amount of waters in Latvia, where eel have been found historically in pristine or nearly pristine conditions, is unknown. For many watercourses there is no reliable historical information about whether eels have historically been found in these watercourses before the construction of the mill dams. The main factors that determine the distribution of eel in Latvia today are related to anthropogenic activity. In last century glass eels and on-grown eels were introduced in about 55 lakes, where there is no information on eel presence before. According to 1950s survey data, the eels were found in 150 lakes, but frequently found – only in 12 of them.

Eel stock in Latvia consists of 3 parts: eel in coastal waters; eel in inland waters where upstream and downstream migration is possible and restocking was done; eel in eel-growing lakes where free eel migration is not possible because of obstructions and where eel is being restocked infrequently.

Nowadays about 60% of Latvia's territory are inaccessible for eel natural recruitment. Here only artificially distributed eels are found. At present only 24 000 ha of Latvia's freshwaters are available for free eel upstream and downstream migration (Table 1).

Table 1. Accessible inland and costal water habitats for eel

River basin district	Rivers		Lakes	
	number	area (ha)	number	area (ha)
Daugava	5	3461	4	3038
Gauja	6	1637	5	4700
Lielupe	4	1255	1	2555
Venta	12	2365	5	5214
Total in inland waters	<b>27</b>	<b>8718</b>	<b>15</b>	<b>15 507</b>
Coastal and transitional waters				<b>89 776</b>
<b>Total of habitats accessible for eel</b>				<b>114 001</b>

### 1.3. Monitoring progress

Monitoring of glass eel restocking effectiveness was performed in 7 lakes and about 30 rivers on average. Yellow eel and silver eel abundance in EMU water bodies restocked by glass eel in 2011 – 2019 is recorded as part of the fish monitoring programme. Major rivers are surveyed annually.

Yellow eel abundance in the rivers and lakes is surveyed by electrofishing. Surveying carried out mostly in the rivers where restocking was done in the previous years. All young yellow eels caught in rivers and lakes are sampled - length, weight, sex, eye diameter, pectoral fin length, stomach contents, and *Anguillicola crassus* presence/absence in swimming bladder is registered. Otoliths were collected for age reading.

Electrofishing results indicate that yellow eel density and occurrence in the rivers of Latvia increases, which is explained by intensified restocking (Figure 2).

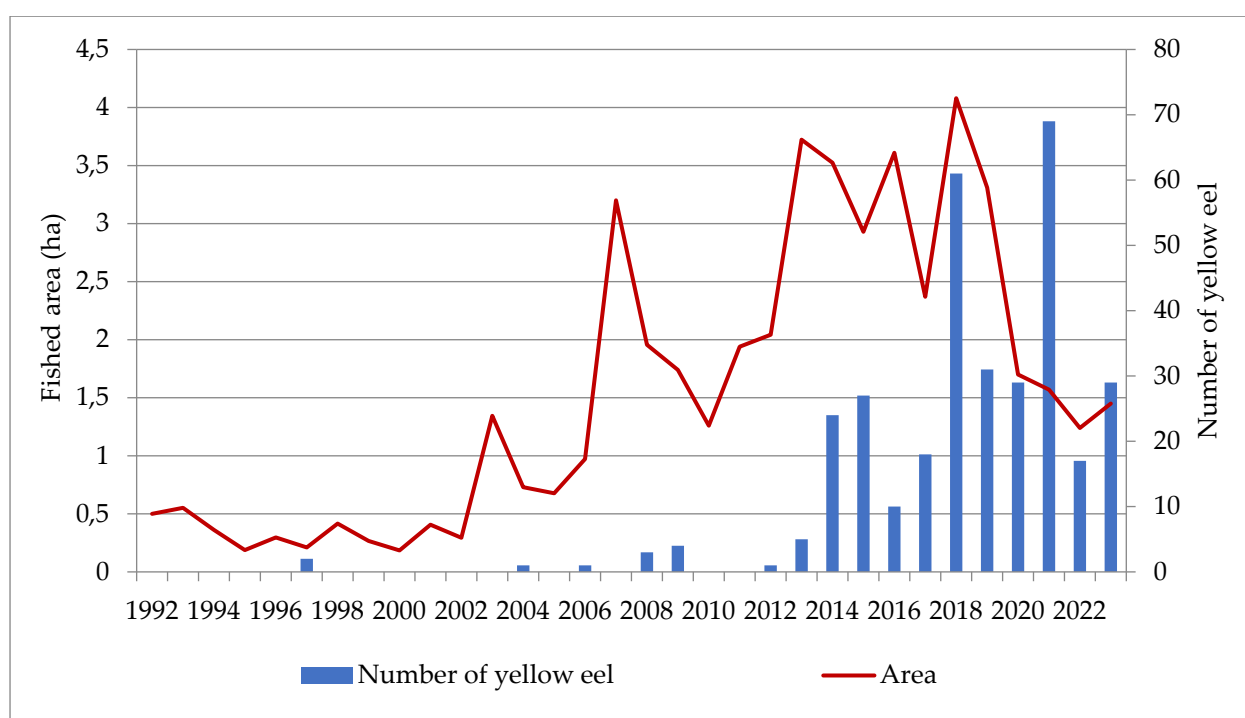


Figure 2. Number of yellow eel in the rivers of Latvia (data from electrofishing)

In the time span from May to November a set of 4 small mesh size (8 - 10 mm from knot to knot) fyke-nets were used in the lower part of the river Daugava to catch yellow and silver eel. All caught eels (Table 3.) were held alive in net – cage until sampling procedure. All caught eel were analysed and their total length, weight, sex, eye diameter, pectoral fin length was registered. Life stage of eel recognized by Silvering Index calculated according to (Durif et al., 2009). All eels were tagged with Carlin tags or T-bar anchortags and released. The aim of tagging is to estimate silver eel escapement and mortality rates in the fisheries.

From April to November a fyke-net with side arms closing the lake Lilaste outlet (mesh sizes 14 - 20 mm) was used to catch yellow and silver eel migrating from the lake to the Gulf of Riga. Number of days in operation and number of eel caught were registered in the logbook. All caught eels (Table 4.) were held alive in net – cage until sampling procedure. All caught eel were analysed at the harbour, tagged with Carlin tags or T-bar anchortags and released.

In 2019, two eel tagged in 2017 were caught in bycatch of local fishery and one specimen three month after tagging was caught on the Estonian coast at Virtsu.

Table 3. Data on the river Daugava yellow/silver eel test fishing.

	2019	2020	2021	2022	2023
Total eel	77	79	156	103	126
Yellow eel	49	75	139	92	93
Silver eel	28	4	17	11	33
Yellow eel %	64	95	89	89	64
Silver eel %	36	5	11	11	36

Table 4. Data on the river Lilaste yellow/silver eel test fishing.

	2019	2020	2021	2022	2023
Total eel	9	73	120	38	26
Yellow eel	5	35	42	10	1
Silver eel	4	38	78	28	25
Yellow eel %	56	48	35	26	4
Silver eel %	44	52	65	74	96

The silver to yellow eel procentage has increased in the last years in both monitored river escapments. This can be explained with the increased restocking from 2011-2019. Lilastes last two year low catch is because of storms which filled the connection of the Lilaste river with the sea with sand.

The eel stock in Latvian rivers and lakes is stable for now, but only thanks to the restocking of glass eels. According to the data collected in Daugava and Lilaste, the number of younger yellow eels whose gender is not yet determined has proportionally decreased, while the number of older eels, including silver eels, has increased. The decline of the youngest age groups shows that the natural replenishment of the stock is at a low level.

Because the eel catch volumes are so small, the collection of biological data of eel from fisheries has been complicated. In the fisheries, eels are not sorted in silver and yellow eel and it is not mandated by Latvian legislation as well. The proportions of silver and yellow eel in these fisheries can only be assessed using the results of biological analyses. The collection of biological data on eel from commercial fishing in Latvia has a rather short history, it was started in 2006, and only data from 2008 onwards can be used to estimate proportion of silver and yellow eel in catches. Data from biological analyses in Lake Ķīšezers and the Gulf of Riga until 2011 indicate that all analysed eel were silver eel females at various silvering stages according to (Durif et al., 2009).

#### 1.4. Diseases, parasites & pathogens or contaminants

A complex study on eel parasites in freshwater habitats in Latvia was made in 2015. A total of 75 European eels from 6 freshwater sampling sites in Latvia were investigated in respect of their parasites communities. Overall 19 different parasite species were identified: 4 protists (*Trypanosoma granulosum*, *Myxidium giardi*, *Myxobolus portucalensis*, *Trichodina sp.*), 12 helmiths

(*Pseudodactylogyrus anguillae*, *P. bini*, *Diplostomum* sp., *Sphaerostomum bramae*, *Bothriocephalus claviceps*, *Proteocephalus macrocephalus*, *Anguillicola crassus*, *Camallanus lacustris*, *Raphidascaris acus*, *Spinitectus inermis*, *Pseudocapilaria tomentosa*, *Acanthocephalus lucii*) and a copepod (*Ergasilus sieboldi*), a leech (*Piscicola geometra*) and a glochidia (*Anodonta* sp.). The overall prevalence of infection reached 93.3% (95%CI 85.5-97.5) with mean intensity  $13.4 \pm 35.2$  parasites per fish. Three different parasite communities with different species richness, diversity, evenness and dominant species were defined. This was a first report about *M. portucalensis* and *S. inermis* in eels from lakes in Latvia and this is a new geographic record for those species (Deksne et al., 2015a; Deksne et al., 2015b).

One of the most common parasites in eel is *Anguillicola crassus*, whose distribution in Latvia is generally unknown. It has been found both in the Latvian EMP waters and in lakes inaccessible for migrating eels. This parasite was first detected by the Food and Veterinary Service in the 1980s in two Venta UBA lakes – Puze and Usma. Within the framework of Latvian National Fisheries data collection programs from 2009-2023 more than 1000 eel swim bladders were analyzed (Table 9). *Anguillicola crassus* was found in yellow and silver eels found in inland fresh waters and coastal waters. The eel bladder nematode was also detected in the young yellow eels caught in the lakes and rivers of the Daugava UBA in 2013, two years after the introduction of glass eels in connection with the glass eel restocking initiative from 2011-2019. *Anguillicola crassus* has also been found in eel breeding lakes, which have not been available to eels naturally for more than 50 years.

Table 9. *Anguillicola crassus* in yellow and silver eels

Year	Analyzed yellow eel	Infected yellow eel	Percentage of infected yellow eel (%)	Asnalyzed silver eel	Infected silver eel	Percentage of infected silver eel (%)
2009	52	2	3,8	51	0	0
2011	50	7	14,0	11	4	36,4
2012	31	4	12,9	23	5	21,7
2013	19	3	15,8	21	2	9,5
2014	28	5	17,9	25	0	0
2015	68	17	25,0	6	0	0
2016	39	5	12,8	10	2	20,0
2017	76	12	15,8	4	1	25,0
2018	117	23	19,7	3	0	0
2019	4	3	75,0	20	10	50,0
2020	31	13	41,9	2	2	100,0
2021	133	37	27,8	8	2	25,0
2022	88	30	34,1	17	7	41,2
2023	79	17	21,5	11	1	9,1

Monitoring of eel pathogens is not carried out in Latvia. Separate bacteriological studies of eels have been carried out in Latvian lakes with a focus on evaluating the safety of eels for consumption (Strazdina et al. 2015; Terentjeva et al. 2015). In 2023, a mass death of eels was detected in Lake Rāzna due to weakened immunity of the eel caused by viruses, which was additionally affected by environmental factors such as high water temperature and low oxygen levels. Eel Herpes Virus-1 (AngHV-1) was detected in the analyzed eels. This was the first time this virus was detected in eels in Latvian waters.

According to the 2021 surface water quality monitoring results, ~11% of Latvian water bodies correspond to high or good quality, 5% correspond to bad ecological quality and 2% to very bad. The concentration of all analyzed pesticides was below the quantification limit of the methods. Exceeding of mercury environmental quality standard (0.02 mg/kg wet weight) were detected in all LVĢMC monitoring stations. It should be noted that the Commission Regulation (EC) No. 1881/2006, the maximum permissible concentration of mercury in fish intended for human consumption is 0.50 mg/kg of wet weight. The results of the conducted studies show that the concentration of chemical compounds of PHB, PBB and other NOP groups in the muscle tissue of eels in the fresh waters of Latvia is lower than the concentrations specified in Regulation EC 1259/2011. Concentrations of heavy metals determined in muscles fluctuated within the following limits: Pb 0.019–0.047; Cd, 0.0051–0.011; Hg, 0.01–0.48; Cu, 0.76–0.92; Zn, 9.27–42; and As, 0.02–0.48 mg kg<sup>-1</sup> wet weight (Rodovica, et.al., 2015; Zacs et al., 2016; Bajinskis et.al. 2020; Bajinskis et.al. 2022). The low concentrations found do not threaten the survival of eels and the ability to accumulate sufficient energy reserves for spawning migration.

### 1.5. Silver eel biomass currently escaping

The target level of silver eel escapement is 40% of the EMU biomass. This target level is determined by applying Council Regulation (EC) No. 1100/2007 Article 2(5) methods - by making a habitat-based assessment of the potential eel production in the absence of anthropogenic mortality, as well as referring to the ecology and hydrography of similar river systems.

The total amount of waters in Latvia, where eel have been found historically in pristine or nearly pristine conditions, is unknown. According to rough estimates it could be 114,001 thousand ha and historic silver eel biomass ( $B_0$ ) accordingly about 259600 kg (Table 5.).

Studies aimed at assessing the potential density of silver eels per habitat area unit have not been conducted in Latvia. Only fishing data is available that would allow for a rough estimate of silver eel production. An average landing of eel in 10 lakes included in the Latvian EMU has been 0.7 kg/ha, while in 1980s - just 0.05 kg/ha. The highest landings in one lake were 2.0 kg/ha. In the rivers the corresponding landings were 0.29, 0.05 and 1.7 kg/ha. An average silver eel landing in the lakes restocked by eel outside of EMU (lakes inaccessible for natural recruitment) was 0.35 kg/ha, with maximal catches of 5.6 kg/ha. An average landing of eel in Latvia's coastal waters were 0.12 kg/ha before year 1980 and only 0.01 at present. The highest landing (0.7 kg/ha) was observed in 1938. Based on historical fisheries data, potential silver eel escapement could be estimated as 3 kg/ha for the rivers, 3.5 kg/ha for lakes and 2 kg/ha for coastal waters.

According to the available data, approximately 3% of the silver eel biomass that would exist if the stock was not affected by anthropogenic factors reaches the sea from Latvian waters. The number of eels caught in the monitoring of silver eels migrating to the sea can be attributed to the water area freely available for migration in the Daugava and Līlāste lake basins. The number of down-migrating silver eels obtained from the area unit can be further extrapolated to the total area of internal waters of Latvia available for free down-migration, where eel stock replenishment has been carried out. Mortality in fishing has also been taken into account, unfortunately the mortality of silver eels in migration to the sea caused by other anthropogenic factors has not been quantified.



Table 5. Best available estimates of silver eel biomass

EMU	Area (ha)	B <sub>0</sub> (kg)	Year	Bcurr (kg)	Bbest (kg)	Bcurr/B <sub>0</sub> (%)	ΣF	ΣH	ΣA
LV_Latv	114001	259600	2016	3420	4542	1,3	0,79	NA	NA
			2017	5130	6813	2,0	0,54	NA	NA
			2018	2052	2725	0,8	0,34	NA	NA
			2019	3070	3501	1,2	0,48	NA	NA
			2020	5989	7296	2,3	0,83	NA	NA
			2021	11421	12721	4,4	0,60	NA	NA
			2022	4692	5562	1,8	15,6	NA	NA
			2023	7717	8749	3,0	11,8	NA	NA

## 2. Implementation of EMP measures

### 2.1. Reduction of fisheries

There is no direct eel fishery in coastal waters of Latvia. All eel caught in coastal waters are bycatch in other fisheries. Presently Latvia has its lowest eel catches in coastal waters with less than 0.2 t per year (Table 6.).

There are only 2 lakes (Liepājas and Ķīšezers) accessible for eel migration in Latvian EMP waters where eel occur in commercial catches. Starting from 2019 eel fishing was banned in Lake Liepājas (previously - overall eel catch ~50 kg per year). More substantial eel fishing is going on in inland lakes inaccessible for eel free migration, restocked by glass eel in 1980. – 1990. Restocking in some of these lakes is continued with private funding.

Eel fishing effort (Table 7.) in Latvia is regulated by the Rules of the Cabinet of Ministers, limiting the number of fishing gears in each of the water bodies where it is carried out. These restrictions apply both to public and private waters. In accordance with Latvian legislation, amendments to fishing effort for commercial and self-consumption fishery can be made if necessary – annually, changing the number of fishing gears or the type of fishing gear authorized. This change requires a scientific advice.

Table 6. Commercial eel catch(kg) in coastal and inland waters.

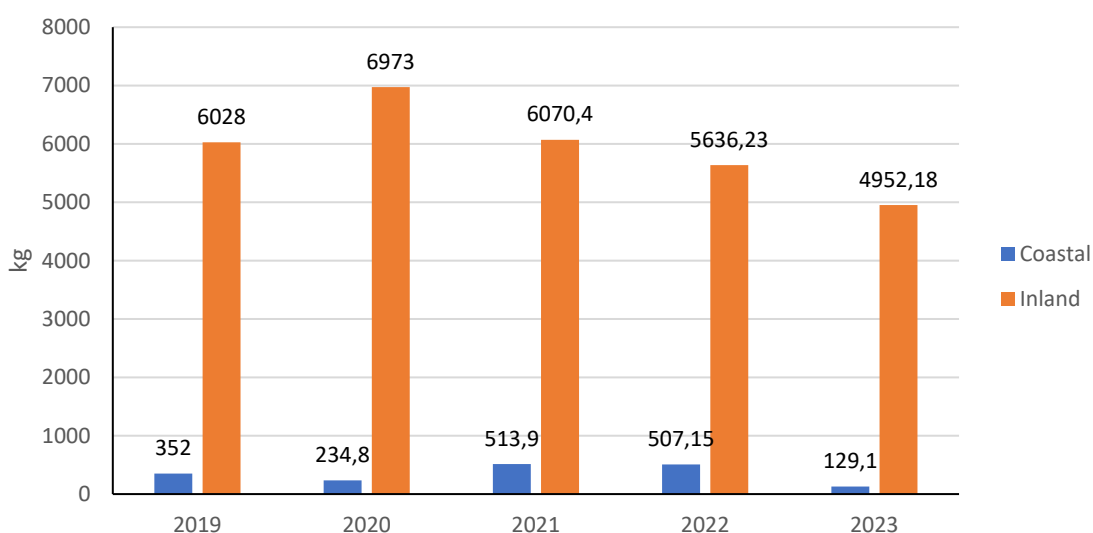


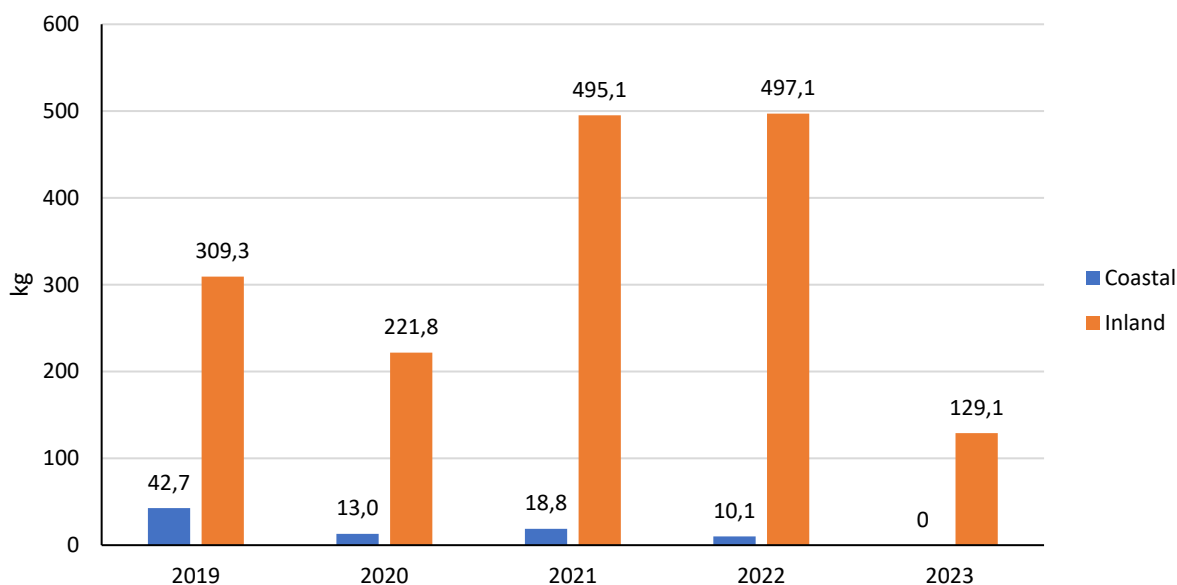
Table 7. Number of gears allowed and fishing effort in eel fishery in EMU LV \_Latv.

2022			
Commercial fisheries	FYK	Number of gears in operation	96
		Day in operation	355
		Landing (kg)	313.7
		kg of eel/day	0.0092
	FFN	Number of gears in operation	8
		Day in operation	126
		Landing (kg)	94.5
		kg of eel/day	0.09375
	HOK	Day in operation	5
		Landing (kg)	32
		Eel kg/100 hooks*day	0.354
Self-consumption fisheries	FYK	Number of gears in operation	1
		Day in operation	1
		Landing (kg)	1.1
		kg of eel/day	1.1
	HOK	Day in operation	5
		Landing (kg)	9
		Eel kg/100 hooks*day	0.449

Following ICES advise that when the precautionary approach is applied, there should be zero catches in all habitats in 2024. This applies to both recreational and commercial catches and includes catches of glass eels for restocking and aquaculture. Latvia has implemented total ban on recreational fishing in coastal waters in the year 2023 and 2024 and a commercial fishing ban from 15<sup>th</sup> September 2024 to 15<sup>th</sup> March of 2025. In May of 2024, changes in the fishing regulations were made to allow one person to keep 1 eel in all EMU waters and 3 eels in 16 inland lakes where eel migration is not possible.

Information about the effect of eel angling on the eel stock in EMU waters is very limited. Rivers and lakes included in EMU are public waters, where it is impossible to regulate the number of anglers, unless licensed angling is introduced. The information available (Table 8.) show that catch is below 0.2t, but realistically it could be several tonnes.

Table 8. Recreational eel catch in coastal and inland waters



## 2.2. Control of the predators

Identification of problems scale has been done in Latvia. Taking into account insignificant effect, no measures have been taken regarding the control of predators. Further studies of Northern pike impact on eel stock will be continued in EMP waters. The numbers of breeding cormorant and grey heron pairs are counted each year. Recent studies have shown that the effect of cormorant on eel is not relevant at present. Further studies together with ornithologists are planned.

## 2.3. Restocking

Latvia ended its glass eel restocking programme in 2019. Restocking was done in lakes and rivers where the water quality was moderate, no eel weirs or any fisheries who target eel specifically and there were no Hydro Power Stations or milldams which could impact eel downstream migration. These glass eel were bought from UK Glass Eel.

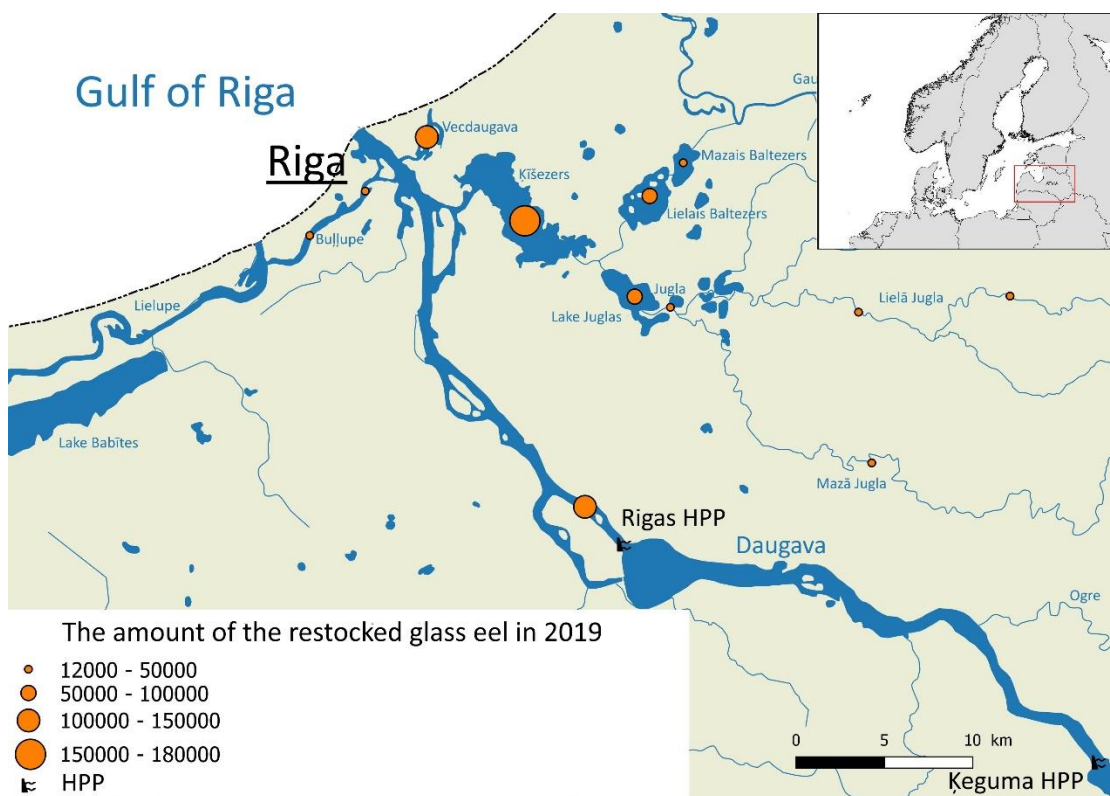


Figure 1. Restocking of glass eel in 2019

Table 2. Number of restocked glass eel (average weight 0.26 g).

YEAR	LAKES	RIVERS	TOTAL
2009	0	0	0
2010	0	0	0
2011	303 800	0	303 800
2012	740 300	289 700	1 030 000
2013	0	0	0
2014	805 000	581 200	1 386 200
2015	0	0	0
2016	0	0	0
2017	740 300	289 700	1 030 000
2018	521 400	196 800	718 200
2019	303 800	386 200	690 000
Total	3 414 600	1 743 600	5 158 200

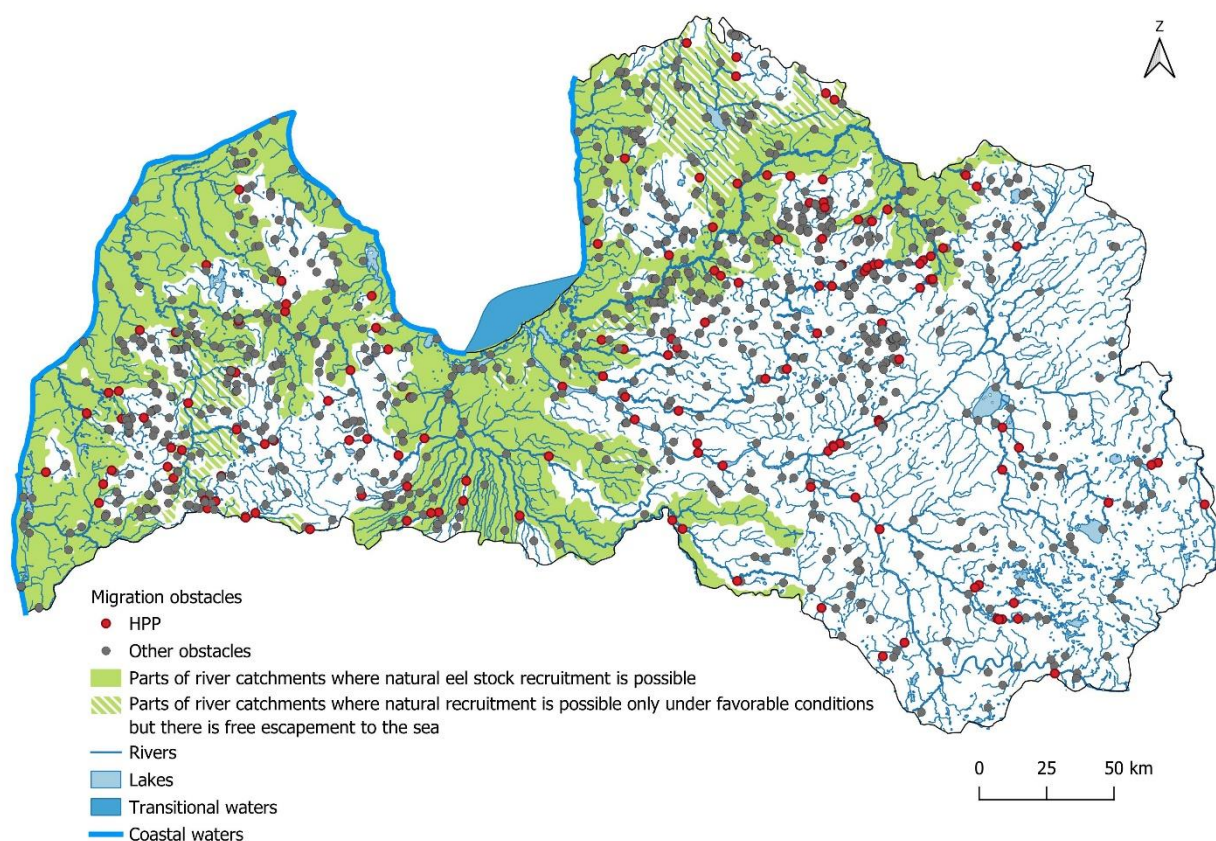
After this restocking programme no restocking has been done within the EMP in the inland waters where migration obstacles exist in the way to the sea that can lead to excess mortality in downstream migration. As per the National Restocking Plan task 4.1., the institute will prepare a recommendation by the end of 2024 as to whether restocking should be continued.

## 2.4. Migration obstacles

In the inland waters of Latvia, up until the 19<sup>th</sup> century, there were few natural or manmade obstacles, which prohibited eels from reaching large parts of rivers and lakes in the modern territory of Latvia. The possibilities of fish migration were reduced by the construction of HPP dams. Until the 1970's there was only one HPP with a fishway in the river Daugava (Ķeguma HPP), allowing eels to reach the territory of modern Russia and Belarus. Daugava, historically the largest eel river, was heavily transformed by the construction of two additional HPP dams (Pļaviņas HPP and Rīgas HPP), which made the greater part of this river basin inaccessible to migrating fish, including eel. Pļaviņas HPP is equipped with the Francis-type turbines while Ķeguma and Rīgas HPP are equipped with Kaplan-type turbines. Two of these HPP (Pļaviņu and Rīgas) does not have fish paths built, and it is not currently planned to build them.

In the small rivers, starting from the 1990s, 164 small HPP were installed in existing watermill dams by private owners. Therefore, the contribution of restocked eels from eel growing lakes to downstream sites in Latvia is constrained (Lin et al., 2011). Further construction of the HPPs in Latvia is restricted by the Cabinet of Ministers regulations which establishes the list of the rivers, where it is forbidden to build HPPs.

For migrating eels 24,225 ha of inland waters are considered accessible for the species in Latvia - 8,718 ha in rivers and 15,507 ha in lakes (Figure 3.), but not all waters are suitable for the species. Today, the ecological quality of certain water bodies is not satisfactory, regular suffocation of fish is observed (Lake Engures).



3. Figure 3. Accessibility of inland waters and obstacles

In 2023 BIOR created a detailed database of all inland water obstacles. Of the 1123 obstacles registered in the database, 70 were outlined as being especially disruptive to migrating fish. For these 70 obstacles a detailed list was made of their theoretical impact on specific migrating fish species, cost to fully remove the obstacle or possibilities to build a fish way for it. This database is public and intended as an aid to anyone who would want to improve fish migration - owners and users of migration barriers, municipalities, state and local government institutions, non-governmental organizations and anyone else.

### **3. List of the measures foreseen and implemented and a list of the measures foreseen but not implemented**

#### **3.1. Implemented measures**

Planned actions for reduction of commercial and recreational fisheries, actions related to restocking and monitoring of its effectiveness have been fully implemented. Predator impact monitoring is continued. A public register of 1123 anthropogenic obstacles has been created.

#### **3.2. Not fully implemented measures**

Structural improvements in water bodies have been foreseen but not all of them have been implemented. Assessment and reduction of HPP impact have not been accomplished. For this reason, no restocking is done or planned above HPP dams.

### **4. Explanation for each measure included in the adopted plan(s), which has not been implemented, or implemented after the fore seen date**

Planned habitat restoration actions in the Salaca River by demolishing the remnants of the Staiceles dam have not been taken. The dam could still be demolished or more gravel and pebbles added to rise the ground level below the obstacle.

Assessment and reduction of HPP impact have not been accomplished due to the inability to get enough silver eel necessary for telemetry studies. Acoustic telemetry is planned to use in the next years to assess the HPP impact on downstream migrating eel.

### **5. Difficulties encountered in the implementation of the plan**

Main difficulties encountered making stock assessment which are related to lack of historical studies on eel population in Latvia. No reliable stock assessment of silver eel escapement or mortality rates have been made before.

### **6. Indication/evidence/data to suggest that an amendment of the Regulation [and consequently the eel plans] is necessary to achieve the objective set out in Article 2(4) of the Regulation and to ensure the recovery of the species?**

Due to the small stock size and limited data at this moment, Latvia cannot suggest any amendments of the Regulation to achieve the objective set out in Article 2(4) of the Regulation and to ensure the recovery of the species.

## 7. References

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## Annex

*In addition, together with your report, in line with Article 11 of the Eel regulation, please provide to the Commission:*

*- a list of all fishing vessels flying your flag authorised to fish for eel in EU waters notwithstanding the overall length of the vessel;*

There are no eel specific fisheries in coastal or marine waters of Latvia targeting one of eel life stage.

*- a list of all fishing vessels, commercial entities or fishermen, authorised to fish for eels in eel river basins which constitute natural eel habitats according to Article 2(1) of the Eel regulation;*

A list of all commercial entities authorised to fish for eels in eel river basins which constitute natural eel habitats:

Lake Kīšezers

LLC "Baltezers"

Fishermen farm "Krūmiņa Saulkrastu"

*- a list of all auction centres or other bodies or persons authorised by your Member State to undertake the first marketing of eel;*

There are no auction centres or other bodies or persons authorised by Latvia to undertake the first marketing of eel.

*- an estimate of the number of recreational fishermen and their catches of eels.*

Currently there are about 100 000 recreational fishermen in Latvia. According to collected data, the amount of eel caught in angling is under a tonne, but realistically it could be about 4t.