Ministry of Food, Agriculture and Fisheries of Denmark

Fifth Danish progress report (2024) on implementation of the Eel Regulation and Eel Management Plan (EMP) in Denmark

To be submitted in line with Article 9 of Council Regulation (EC) No 1100/2007 of 18 September 2007 establishing measures for the recovery of the stock of European eel.

Further to be submitted as appendix to WGELL data call of 2024

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Content

Introduction and summary

This report is an update of the fourth progress report (2021) which follows the questions in the original Commission Guidance Document for the production of reports to be submitted to the Commission in line with Article 9 in the Eel Regulation (1100/2007). The report is a collaboration of the National Institute of Aquatic Resources (DTU Aqua), at the Technical University of Denmark, the Danish Fisheries Agency and the Ministry of Food, Agriculture and Fisheries.

This Danish status report shows that the foreseen gradual reduction in eel fishing effort and eel landings is in line with the Eel Regulation and the Danish Eel Management Plan.

1. Outline of the monitoring, effectiveness and outcome of the Danish Eel Management Plan

The Danish fisheries authorities have implemented a control and landing monitoring system to monitor Danish fisheries, including the regulation implemented according to the Danish Eel Management Plan (EMP). Thus, the developments in fishing effort, effort reduction, and the developments in eel landings and reduction in eel landings have been closely monitored.

Since 2007 the Danish fisheries authorities have applied a risk based strategic control and monitoring of both commercial and recreational fishing activities, to target and optimize the utilization of the authority resources based on a dynamic assessment of the risks in each type of fishery. The risk based control and monitoring strategy has mainly focused on "hot spot" (high priority) areas, periods and species and supported by a biological assessment from the National Institute of Aquatic Resources. The Danish fisheries authorities have furthermore established an electronic reporting system that helps to collect and distribute information about observed irregularities.

Since implementation of the Danish EMP in 2009, this risk-based control and monitoring strategy has targeted control and monitoring of the restrictions implemented in Danish legislation for all types of eel fishing in both marine and freshwater in line with the Danish EMP – i.e. closed seasons, closed periods, number and type of gears allowed, eel passes, and increased minimum legal size for yellow eel.

Glass eel and yellow eel monitoring takes place at five selected river systems. Yellow standing stock is monitored in one river system. As stated in the Danish EMP, silver eel escapement is monitored in 2 out of 887 river systems.

Concerning the stocking measure and expected outcome, Denmark has initiated a program to monitor the effect by stocking tagged eels in selected areas. Furthermore, short time experiments in ponds have been initiated to evaluate fitness of stocked farmed eel compared to wild eels of different size (yellow eel, glass eel).

<u>Outcome: Commercial eel fishing</u>

The reductions in the Danish commercial eel fishing implemented as of 1 July 2009 have by 31 December 2023 resulted in:

- A gradual reduction in commercial eel fishing licenses from 406 to 212 (191 marine and 21 freshwater).

- A substantial reduction in fishing effort for eel relative to the average effort deployed from 2004 to 2006. The reduction in eel fishing licenses has resulted in the following reduction in fishing effort relative to the average effort deployed from 2004-2006 (section 2.B):
  - fyke nets: 55 % reduction
  - small pound nets: 55 % reduction
  - large pound nets: 70 %% reduction
  - hook lines: 92 % reduction.

- A reduction in commercial marine landings by 78 % relative to the average landings in the period 2004-2006.
- A substantial regional reduction in commercial landings targeting eel from the Baltic Sea relative to the landings in the period 2004-2006 (section 2. B and map in Annex 3)
  - 100 % reduction in the Eastern Baltic (ICES area 24-IIId)
  - 75 % reduction in the Belt Sea and Western Baltic Sea (ICES area 22-IIIc)
  - 91 % reduction in the Sound (ICES area 23-IIIb)
  - 60 % in the Kattegat (ICES area IIIas).

Outcome: Recreational eel fishing

- Recreational eel fishery in marine waters is now prohibited according to the Council Regulation for fishing opportunities. Landings from recreational fishers in marine waters have been estimated at approximately 100 ton in 2009. (Table 2.B3).

- Recreational fishery in freshwater is estimated to have been reduced from approximately 16 ton to 4.1 ton in 2023 (*Table 2.B3*) by implementing a closed season i.e. a very limited period for eel fishing from 1 August until 15 October.

The estimates of recreational landings given in this report (for marine landings from 2009 to 2022) are the results of telephone and internet surveys made by the National Institute of Aquatic Resources and Statistics Denmark. A project RECREA has been completed to gain more knowledge of the size of the recreational harvest on eel and other species (trout, salmon, cod).

In the RECREA project eel harvest data and eel fishing effort data were collected on site by personal contact to the fishermen in selected areas. These data were combined with airplane and boat surveys that count eel fyke nets. The expected outcome was a better resolution in the data of recreational eel harvest to show how precise the standard telephone and internet survey describe the recreational eel harvest in Denmark. However, the data obtained in the project was too weak and no firm conclusion was achieved (Olesen et al. 2019)

2. Best available estimates of escapement, level of fishing effort and landings, reduction in effort and landings, level of mortality factors outside the fishery and the amount of eel utilized for restocking

2. A. Silver eel biomass currently escaping

The current best estimate of silver eel production in freshwater is 182.3 ton. Mortalities in freshwater is 16.3 ton and the current escapement 166 ton. The 40 % pristine target level is 444 ton (Danish EMP) and the difference between current escapement and target level is 166 – 444 = - 278 ton (Table 1).

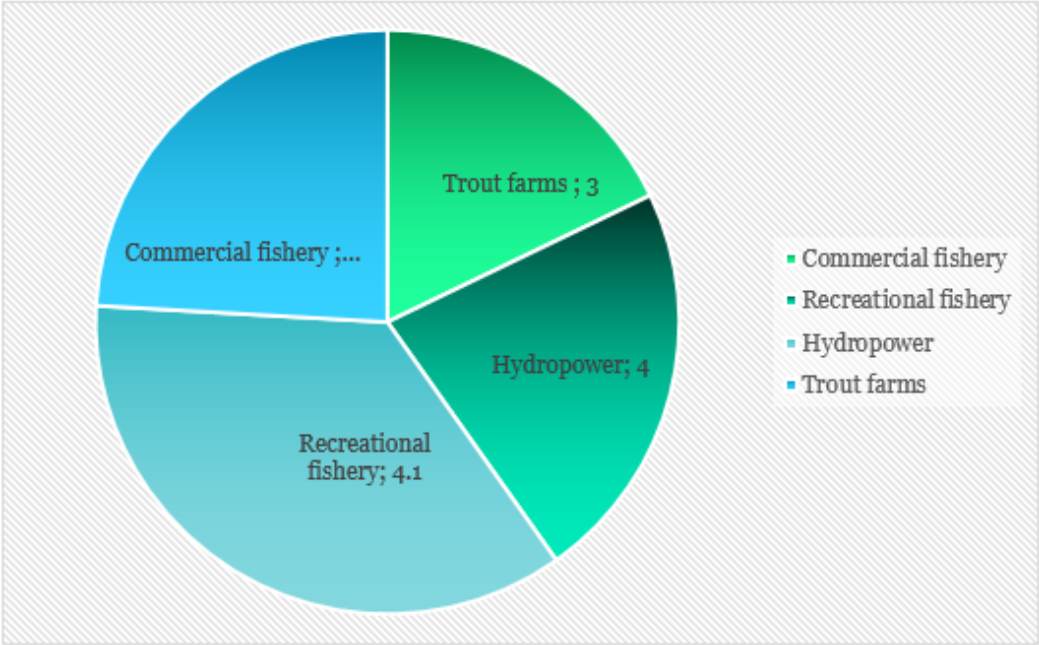

Figure 2.A.1:

Best estimates of mortality (16.3 ton) in freshwater. The number refers to ton in each category.

The landing of commercial registered fisheries in freshwater is 5.2 ton and unregistered recreational fishery is estimated to be 4.1 ton. Total fisheries mortality adds up to 9.3. ton. Some mortality has been documented due to hydropower turbines especially from Tange Hydropower plant but not from Vestbirk Hydropower plant (see chapter 2. C1). The number of hydropower plants are decreasing, and current mortality is estimated to be 4 ton. At flow-through trout farms located at the bank of rivers the mortality is estimated to be 3 ton (see chapter 2. C2). Mortality outside the fishery adds up to 7 ton.

Predation from cormorants and mammals are known to be significant. Cormorants do eat eel from rivers and lakes, but they mainly forage in coastal waters.

Table 2.A.1. Current escapement (2023) from freshwater, mortality factors and target level.

Freshwater	Area (ha)	Silver eel production (kg/ha)	Total production (ton)
Running water	15,000	8.10	**121.5**
Lakes	45,000	1.35	**60.8**
Total	60,000		**182.3**
Mortality (fisheries, hydropower)			**16.3**
Current escapement			**166.0**
Target level – 40 % pristine			**444**

2. A.1. Current production of silver eels

Due to the large number of Danish River systems (887) it was suggested in the Danish EMP to select 3 index river systems and count the number of silver eels escaping these systems. Data from these index systems have been used to calculate the total silver eel escapement from the Danish freshwater territory. The count should be repeated every three years. The National Institute of Aquatic Resources has succeeded in estimating and counting escaping silver eels on an annual basis in River Ribe and Lake Vester Vandet and in the upper part of River Gudenå until 2020.

River Ribe Å

River Ribe Å is a medium size lowland river with a catchment area of 1723 km^2 with one commercial fishery situated in the lower part of the river. To estimate the escapement of silver eels in River Ribe, the fishery efficiency has annually been measured by tag recapture experiments. The fishery efficiency in River Ribe varies but has decreased. It was estimated at 17.7 % in 2010; 28 % in 2014 and 11 % in 2023. The effort in terms of number of gears used has been constant since the EMP was introduced in 2009. The variation in fisheries effort may be explained e.g. by differences in river discharge and floating debris, which can alter the effectiveness of the passive fishing gear. Combined with data for the total commercial catch in 2023, production can be calculated at 8.1 kg of silver eel per hectare of the river system (Figure 2.A.2). This figure was used in the calculation of eel production for rivers for 2023 (Table **2.A.1**).

River Gudenå

At Vestbirk Hydropower station, the biomass of silver eels produced upstream the hydropower station has been monitored in an eel trap from August to December every year from 2001 – 2020. The upstream productive river area (66.6 ha) and lake area (121.3 ha) total 187.9 ha. The silver eel production in the area was calculated at 0.2 kg/ha in 2020. Monitoring is no longer possible at this site because the power plant is closing down.

Lake Vester Vandet

In Lake Vester Vandet in northern Jutland (479 ha) silver eels leaving the lake are caught in an eel trap during the months September to December. There is no commercial fishery in the lake but a few recreational fishers exploiting the yellow eel stock. The fishery in the lake and also escapement of spring migrants are not included in the figure for production. Silver eel production in 2023 was 0.21 kg/ha. The figure is considered too low to represent eel production in Danish freshwater lakes.

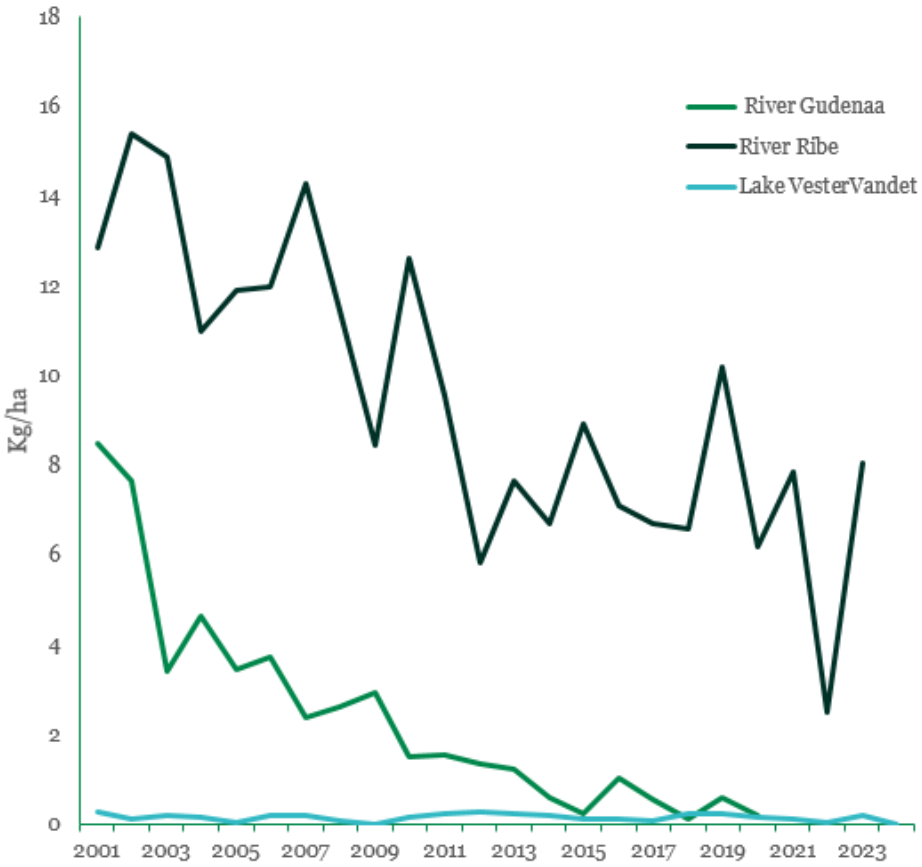

Figure 2.A.2: The production of silver eel (kg/ha) from three index systems from 2001-2023. The River Gudenaa until 2020.

Production of silver eel in Danish Lakes

In a number of freshwater lakes, where commercial fishery takes place, the yellow and silver eel landings during 2020 – 2023 was between 1.0-0.6 kg/ha. In 2023 the average landings from freshwater lakes were 0.67 kg/ha. It is assumed that landings make up half the silver eel production, and the total production is calculated 0.67 *2= 1.35 kg/ha. This figure has been used in the calculation of eel production in freshwater lakes for 2023 (Table 2.A.1).

The best estimate of escapement (Bcurrent) has changed since the reference period, from 261 ton in 2004-2006 to 166 ton in 2023 (decrease of 36 %). In the same period the anthropogenic mortality has decreased from 42.7 to 16.3 ton (62 %). The reduced escapement is likely to be caused by the reduced recruitment of young eel (glass eel) arriving to the Danish freshwater from the spawning areas in the Sargasso Sea. This is in line with the models of the National Institute of Aquatic Resources (Pedersen and Rasmussen 2013) estimating that escapement of silver eels will decrease until approximately 2030, from where it will start increasing again.

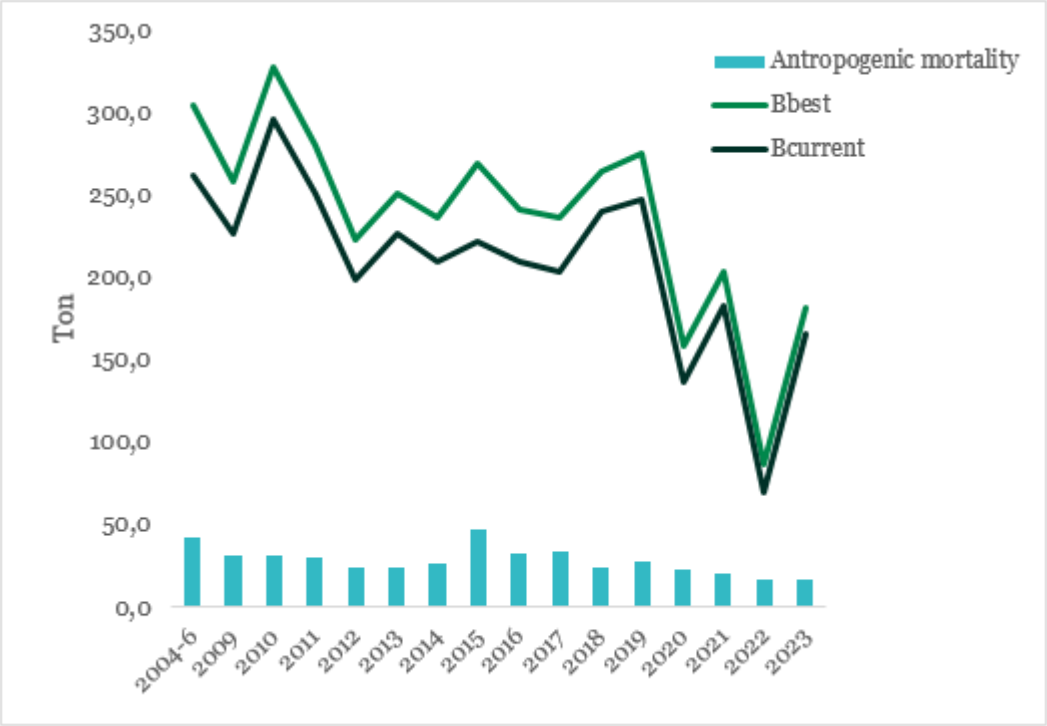

Figure 2.A.3. Stock indicators from 2004-2006 to 2023.

2. B. The level of fishing effort that catches eel each year, the level of landings, and the reduction in effort and landings effected since the entry into force of the Regulation

In accordance with Article 8 of the Council Regulation, Denmark has implemented a series of measures aimed at gradually reducing fishing effort and thereby landings in Community waters by at least 50 % relative to the average effort and average landings deployed from 2004 to 2006.

In conjunction with the plan, Danish fisheries authorities implemented a license system as of 1 July 2009, which limits each commercial fisher and entity to a limited number of gears, and thus a limited fishing effort. The system includes a variety of elements, routine compulsory registration and reporting and tangible measures for strengthened control efficiency, providing managers and researchers with comprehensive and reliable data for monitoring, analysis and adequate management.

The developments in fishing effort reduction and the corresponding developments in eel landings have been closely monitored and analysed by the Danish fisheries authorities. The registered reductions in effort have resulted in subsequent and substantial reductions in registered eel landings.

Of the 783 commercial fishers and entities with registered landings and registered pound nets in the reference period 2004-2006, a total of 525 applied for licences in 2009. A total of 406 commercial licenses were allocated in 2009. Since then, a total of 194 licenses have been cancelled, reducing the number of active commercial fishing licenses to 212.

Commercial eel fishing effort and the reduction in fishing effort

Table 2.B.1*. The level of commercial fishing effort by type of gear from 2004-2006 to 2023. From 2009, the number and types of gear represent the total allocated number and types of gear in all the individual fishing licenses (Danish Fisheries Agency)*

	Fyke nets		**Small pound nets**		**Large pound nets**		**Hook lines**	
	Number	**Reduction**	**Number**	**Reduction**	**Number**	**Reduction**	**Number**	**Reduction**
Average 2004-2006	43.500		1.588		1.572		6.366	
2007	41.114	5.50%	1.578	0.60%	1.582	-0.60%	5.875	7.70%
2009	38.336	11.90%	1.292	18.60%	1.466	6.70%	1.932	69.70%
2010	33.661	22.60%	1.082	31.90%	1.322	15.90%	1.200	81.10%
2011	32.591	25.10%	1000	37.00%	1.273	19.00%	1.200	81.10%
2012	32.191	26.00%	963	39.40%	1.273	19.00%	1.200	81.10%
2013	29.004	33.30%	917	42.30%	1.198	23.80%	1.176	81.50%
2014	27.281	37.30%	915	42.40%	1.157	26.40%	1.136	82.20%
2015	26.922	38.10%	921	42.00%	1.131	28.10%	1.136	82.20%
2016	23.071	47.00%	886	44.20%	642	59.20%	952	85.00%
2017	21.269	51.10%	900	43.30%	604	61.60%	832	86.90%
2018	21.417	50.77%	874	44.96%	572	64.12%	687	89.21%
2019	19.633	54.87%	880	44.58%	544	65.90%	687	89.21%
2020	19.736	54.63%	871	46.35%	507	68.26%	576	90.95%
2021	19.632	54.87%	832	47.61%	495	68.51%	551	91.34%
2022	19.414	55.37%	829	47.80%	474	69.85%	537	91.56%
2023	**19.764**	**54.57%**	**714**	**55.04%**	**464**	**70.48%**	**537**	**91.56%**

As the reduction in marine commercial eel landings have been reduced by 78 %, the actual number of gears used by commercial eel fishers is considerably lower than the registered allowed gears and thus a substantial further reduction in eel fishing effort has been achieved. Several fishers have converted large pound nets for smaller ones or for fyke nets. The catch effect of these smaller types of gear are less effective than that of large pound nets.

Commercial eel landings and the reduction in eel landings

The total reduction in commercial marine landings by 31 December 2023 is 78 % relative to the average landings (536 ton) from 2004-2006. The total reduction in commercial freshwater landings is 65 % since 2004-2006.

Table 2.B.2. The level of registered commercial landings in ton since the reference period 2004-2006 and the level of reduction in landings (Danish Fisheries Agency)

Marine				Fresh water			
Year	**Silver**	**Yellow**	**Total**	**Year**	**Silver**	**Yellow**	**Total**
2004	342	178	520	2004	4	11	15
2005	384	133	517	2005	4	10	14
2006	424	146	570	2006	8	8	16
2007	413	109	523	2007	5	5	10
2008	363	89	452	2008	5	4	9
2009	367	87	454	2009	8	5	13
2010	306	105	411	2010	11	3	14
2011	271	84	355	2011	11	5	16
2012	226	78	304	2012	9	4	13
2013	223	95	318	2013	10	3	13
2014	240	77	317	2014	12	3	15
2015	188	59	247	2015	9	6	15
2016	179	74	253	2016	10	3	13
2017	170	70	240	2017	12	5	16
2018	88	82	170	2018	6.5	5	11.5
2019	95	79	173	2019	5.9	4.0	9.9
2020	101	76	177	2020	3.6	1.6	5.4
2021	130	94	224	2021	7.7	0.9	8.6
2022	71	87	158	2022	3.8	0.6	4.4
2023	24	96	120	2023	4.0	1.2	5.2

Recreational eel landings and the reduction in eel landings

Table 2.B.3*. The level of estimated recreational landings in ton from interview surveys.*

Year	Fresh	Marine	Total	Year	Fresh	Marine	Total
2004-6	16	138	154	**2016**	10.2	154.1	164.3
2009	NA	100	100	**2017**	8.3	109	117,3
2010	NA	117.5	117.5	**2018**	3.5	101.5	105.0
2011	4.3	75.2	79.5	**2019**	8.5	101.5	110.0
2012	0.4	51.9	52.3	**2020**	8.0	90.9	98.9
2013	0.4	49.5	49,9	**2021**	2.7	79.0	81.7
2014	2.0	55.0	57.0	**2022**	4.0	156.0	160.0
2015	23.3	95.0	118.3	**2023**	4.1	0	4.1

Regional Focus: Regional landings and reduction in regional landings with special regard to fisheries targeting eel from the Baltic Sea

The Danish EMP states that due to the geographical location of Denmark, the nature of Danish marine waters and the structure of the Danish eel fishing fleet, the Danish eel management plays an important role in securing silver eel escapement from the Baltic Sea. The Danish fishing authorities have therefore devoted special attention to fishers and entities registering eel landings in the Baltic area.

Table 2.B.4. *The level of regional commercial registered landings in ton and the level of reduction in landings (see map for specific areas in Annex 3). (Danish Fisheries Agency)*

Area	Skagerrack (IIIaN)	Kattegat (IIIaS)	The Sound (23-IIIb)	Belt Sea and Western Baltic (22-IIIc)	Eastern Baltic (24-IIId)	North Sea (IV)	Fresh-water	Total
2004	0.3	20.0	121.7	366.4	1.1	10.5	15.2	535.2
2005	0.1	26.1	130.2	352.9	0.1	7.4	13.7	530.5
2006	0.1	36.1	138.9	386.7	0.1	8.2	16.0	586.0
2007	0.3	26.3	162.3	327.8	0.4	5.9	10.4	533.4
2008	0.0	22.1	153.0	269.7	1.2	6.2	8.5	460.7
2009	0.2	19.4	156.7	266.0	2.1	9.0	13.3	466.7
2010	0.1	21.6	102.2	271.8	0.6	14.8	14.4	425.4
2011	0.0	22.9	111.1	205.7	0.6	15.6	14.8	370.3
2012	0.0	23.3	108.3	158.3	0.8	14.2	13.8	318.7
2013	0.1	31.2	96.6	175.0	0.6	14.3	13.3	331.0
2014	0.1	22.5	98.5	184.3	0.4	11.6	14.8	334.3
2015	0.0	18.2	73.5	148.3	0	9.1	14.4	263.5
2016	1.0	22.3	82.4	136.0	0	13.4	12.9	268.0
2017	0.4	21.0	65.9	140.3	0	12.5	16.4	256.5
2018	0	25.8	41.1	89.3	0	16.0	11.5	183.7
2019	0.1	21.9	38.3	100.7	0	15.4	9.9	186.3
2020	0	14.4	35.6	118.8	0.1	8.8	5.2	182.9
2021	0	15.1	45	158	0	5.9	8.6	232.6
2022	0	16.6	26	109	0	6.3	4.4	162.3
2023	0	10.8	11.6	92.1	0	5.8	5.2	125.5
Reduction (%)	100	60	91	75	100	33	65	77

*) Reduction indicates the geographical reduction since the reference period (2004-2006).

The reduction by 31 December 2023 in registered commercial regional landings, relative to the average landings from 2004-2006 is:

- 100% reduction in the Eastern Baltic (ICES area 24-IIId)
- 75 % reduction in the Belt Sea and Western Baltic Sea (ICES area 22-IIIc)
- 91 % reduction in the Sound (ICES area 23-IIIb)
- 60 % in the Kattegat (ICES area IIIas).

2. C. The level of mortality factors outside the fishery

2. C1. Hydropower

In 2006 there were at least 43 hydroelectric power units in operation in Denmark. Since then, several hydropower units have been closed (e.g. Vilholdt, Karlsgårdeværket, Harte). Danish legislation stipulates that physical screens with a maximum bar distance of 10 mm must be installed in front of hydropower turbines. Bypasses guiding the eel around the power plant are established at some power plants, although at most power plants only fish ladders to guide salmonid are present. The knowledge of the efficiency of the different bypasses for the downstream migrating silver eel is limited and may differ from place to place. It is known that fish impinge on the turbine screens and die there.

Recent research at the biggest hydropower unit in Denmark, Tange Hydropower plant, suggests that up to 77 % of the eels are lost bypassing the hydropower plant. There is no exact knowledge of the proportion of eels that impinge on the screens or are lost for other reason e.g. predation and fisheries, but approximately 10 % of the migrants overwinter upstream the power plant and resume migration in the next year. At Tange Hydropower plant there is a significant bypass problem for eels (Pedersen et al. 2011). At Vestbirk Hydropower station 25 % of the water discharge is passed around the turbines in two bypass facilities. One bypass stream is the old riverbed and the other is at the turbine screens guiding the fish around the turbines. The bypass facility seems appropriate and fish including eels do not impinge on the screens except at very low temperatures < 50C in combination with very high-water discharge. These situations usually occur during winter outside the normal eel migration period. Similar problems likely appear at other hydropower facilities in e.g. Holstebro Hydropower plant. This has not yet been investigated.

2. C2. Aquaculture

Danish trout farms are often located on the banks of rivers depending on water intake from the rivers. To guide the river water into the trout farm, a weir is built in the river. The number of trout farms are decreasing. Some farms are still using “flow through” river water. Recently, many Danish fish farms are being converted into fully recycled facilities, which do not require weirs to divert water through. To prevent fish from entering the trout farms, a screen with a max. 6 mm bar distance is mandatory at the point of the water inflow and a max. 10 mm bar distance at the point of outflow. Small eel can easily enter trout farms and are possibly predated by the trout. However, for the past years there has been an on-going process in collaboration with municipal environmental authorities to improve measures for the unhindered migration of several different fish species. Research in relation to weirs of trout farms have been conducted in connection with three trout farms in River Mattrup Å and River Kongeåen.

River Mattrup Å

At Brejnholt trout farm in River Mattrup Å the National Institute of Aquatic Resources studied the behaviour of silver eels while bypassing the weir at the trout farm. The river water is guided into the farm by a weir and screens prevent the eels to enter the farm. Fish passage is through an overflow

spillway at the weir and the water discharge in the spillway may be significantly reduced depending on the hydrological conditions. The study was conducted during two years. The first year the water discharge was low and only 56 % of the eels bypassed the weir. The second year the river discharge was normal and several more eels succeeded to pass the weir (82%) during the same year as they were released. It was concluded that the weir had a significant effect in delaying migrating silver eels. The delay varied with water discharge in the migration period. It is therefore recommended that a constant amount of water in the fish pass should be available e.g. 25 % of the river discharge to neutralize the effect of the weir (and screens are placed appropriate to guide the fish. (Pedersen and Jepsen 2012).

River Kongeå

In River Kongeå two trout farms are situated on the bank of the river at Vejen and Jedsted. In the autumn 2011 forty fish were radio tagged and their downstream migration was monitored while passing the two trout farms. Both trout farms have 6 mm bar distance at the water intake. At Vejen fish farm several fish entered the fish farm despite the 6mm bar screen which seems not correctly installed or damaged. At Jedsted no fish entered the fish farm and the screen was working well. If the screen at Vejen fish farm is fixed properly, eels would not be able to enter the fish farm. However, it is quite difficult to see by eye if there is any such problem at other comparable fish farms unless the place where the screen is mounted is dried out.

2. C3. Predation

Predation on eel may occur from various species of birds e.g. heron and cormorants and from mammals, e.g. otter and mink. Cormorants are possibly the most important predators due to the large number of nesting birds; predation is expected to be highest in the vicinity of the colonies, but migrating birds may have significant impact during the fall. The number of cormorants nesting in Denmark during the last 10-15 years can be regarded as stable, but with downward trend. In the year 2000, 42.481 nests were counted in colonies throughout Denmark. In 2023, there were 30.767 nests (Figure 2.C.3.1).

In the Danish EMP it was suggested that in the period 2004-06 app. 80 ton of yellow eel was eaten by cormorants. However, recent work from Hirsholmene (57.29'N; 10.37'E) a cormorant colony in Kattegat, analyzing 350 regurgitated pellets showed that eel otoliths occurred with a frequency of 0.3 % (Poul Hald 2007). The frequency of occurrence of eel otoliths found in cormorant pellets in 2005 was only 0.12 % (Sonnesen 2007) suggesting that wild eels are not important as food in Ringkøbing Fjord (55,55'N;08,20'E). However, despite this low occurrence, the estimated number of eels eaten in Ringkøbing Fjord by cormorants in 2004 was 38,000 – more individuals than was caught in the fishery – and recovery of cw-tags from 20,000 tagged stocked eels showed a 40 % predation from cormorants during the first season (Jepsen et al. 2010). Thus, cormorant predation can be a very significant factor in areas with a high cormorant density. The number of cormorants in Ringkøbing Fjord is not higher than most coastal areas in Denmark.

Recent analyses of data from ongoing studies of silver eel migration, using PIT tagging, showed that even relatively large silver eels can be eaten by cormorants as PIT tags were recovered from nearby colonies and roosting sites. The recoveries may provide a basis for quantification of the predation in future studies.

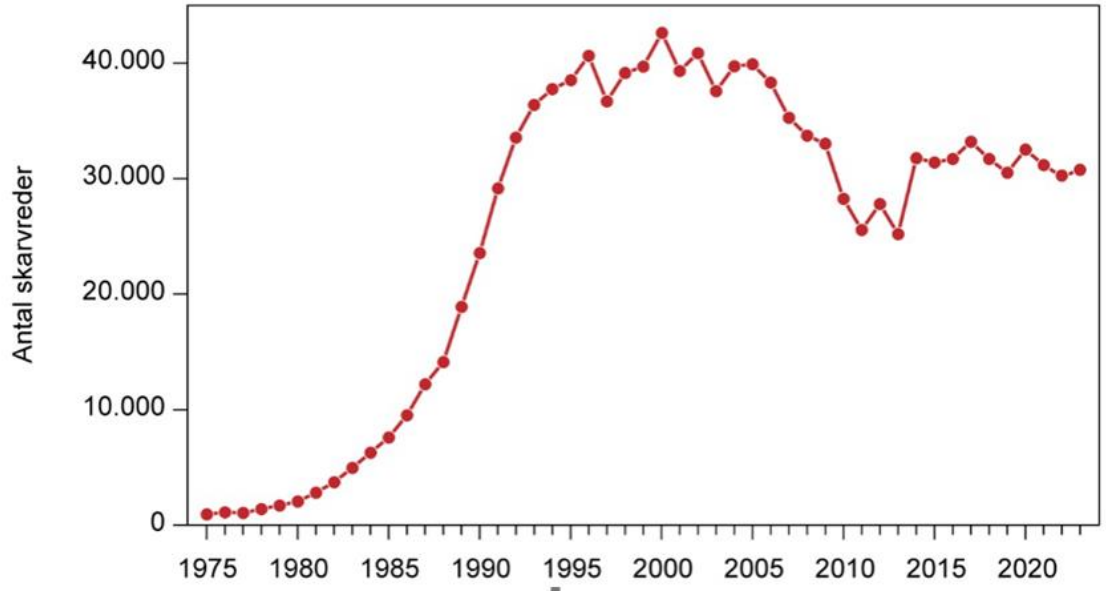

Figure 2.C.3.1: Number of cormorant nests in Denmark 1973 -2023. Data from NERI. University of Århus.

2. D. The amount of eel utilized for restocking
See section 3.8.

3. Have all the foreseen measures been fully implemented as described within the adopted plan pertaining to your national territory?

3.1 Fisheries
All the foreseen measures have been fully implemented as described within the adopted Danish EMP.

3.2 Obstruction to migration
As part of general measures to restore rivers in line with the EU Water Framework Directive a high number of obstacles have been and are currently being removed. This includes major hydropower stations (Vestbirk, Harte and Karlsgårde) and more than 500 smaller obstacles and 145 river sections formerly piped have been restored. These measures have certainly improved both up- and downstream eel passage and reduced silver eel mortality substantially in the restored rivers. Routine control of eel passes and their functionality at remaining obstructions in rivers has continued.

3.3 Hydropower
Some research have been conducted (see section 2.C1). The mortality and delay (silver eels) caused by hydropower facilities are significant and can best be mitigated by complete removal of the facility or by letting a significant proportion of the water run through a bypass channel. This has already been achivedat several Hydropower stations).

3.4 Aquaculture
Some research have been conducted (see section 2.C2.) The mortality and delay (silver eels) caused by traditional fish farms are significant and can best be mitigated by complete removal of the facility or by letting a significant proportion of the water run through a bypass channel. Recently, many Danish fish farms are being converted into fully recycled facilities, which do not require weirs to divert water through. Thus, numerous weirs have been removed and the river connectivity restored.

This process is encouraged by the authorities and is ongoing. A removal of fish farm barriers will clearly benefit migrating eels.

3.5 Predators

According to the National Management Plan for Cormorants, regulations in the form of protective shooting (at fish nets and fish farms) as well as egg oiling (culling) in colonies and limit successful colonization of new sites have continued, resulting in a reduction in the numbers of breeding pairs (see section 2C3). New research has been conducted to evaluate the effect on cormorants on local eel population.

3.6 Parasites and contaminants

Procedures for testing restocked eel for viruses and parasites (*anguillicola*) have continued as a standard protocol and monitoring of the spread of *Anguillicola crassus* is continued. There is no new knowledge available to further limit contamination of *Anguillicola*.

3.7 Eel habitats

A high number of obstacles are currently being removed (see section 3.2). In line with the EU Water Framework Directive Denmark has, during the years 2014-2023, restored 1700 km of river. The Ministry of Environment continues to reduce nutrient flows from soil to river basins. This is being done by re-establishing formerly drained lakes and meadows. Aside from official wetland restoration projects, a private fund (Aage V. Jensens Fund) has reestablished the 915 ha Lake Filsø.

Considerable improvements and measures for restoration of Danish rivers takes currently place through grants of approximately 60 million DKK per year (equal to approximately 8 million Euro per year). These measures will also benefit migrating eels.

3.8 Restocking

Restocking has been fully implemented as described within the Danish EMP. The amount of restocked eel in freshwater has increased from year 2010, where funds from the European Fisheries Fund were granted. In the Danish EMP the amount of eel to be restocked was proposed to be 0.8 million eels. The actual amount of restocked eels has increased to 1.0-1.7 million eels during the years 2010 – 2023 (Table 3.8.1).

Table 3.8.1 *Number of restocked eel size 2-5 gram.*

Year	Lakes	Rivers	Total
2009	203,900	50,000	253,900
2010	574,350	672,000	1,246,350
2011	771,000	590,000	1,361,000
2012	644,000	640,000	1,284,000
2013	665,400	610,000	1,275,400
2014	712,000	630,000	1,342,000
2015	785,300	614,000	1,399,300
2016	690,000	700,000	1,390,000
2017	685,000	705,000	1,390,000
2018	666,000	310,000	976,000
2019	880,000	745,000	1,625,000
2020	638,200	555,000	1,193,200
2021	518,700	380,000	898,700
2022	1,054,000	600,000	1,654,000
2023	1,040,000	510,000	1,550,000
2024	859,500	415,000	1,274,500

Net benefit of eel stocking

The National Institute of Aquatic Resources has recently conducted experiments comparing growth and mortality of wild and farmed eel of weight, 2-5 g, in semi natural drainable ponds. The experimental eels were not fed. The expected outcome was that the wild eels would perform better, concerning growth and mortality, since they were used to natural food items and not fed on artificial pellets as farmed eel. However, the results showed that the farmed eel both survived and grew better than the wild eels and the National Institute of Aquatic Resources concludes that farmed eel is a satisfactory stocking material (Pedersen et al. 2017). The National Institute of Aquatic Resources also analyzed the yield per recruit (YPR) from stocking two different sizes of eel, 2-5 gram eel and larger 8-10 gram eel, in a Marine Fjord where a commercial fishery was operating. The expected outcome was that the larger eel would have a better yield per recruit due to a better survival of the bigger eel. The professional fishery recaptured 12.7 % of the 2-5 g and 9.4% of the 8-10 g eels, originally stocked. Growth rate and mortality rate were different for the two stocked sizes, favoring the small eels. Brut yield per recruit (YPR) was 13 and 9.2 g and net YPR was 9.8 and 0.31 g for 2-5 and 8-10 g eel, respectively. It was concluded that there seems to be no advantage in using a larger eel compared with small 2-5 g eels for stocking. Disregard size at stocking about half of the recaptures were caught as silver eels (Pedersen and Rasmussen 2015).

DTU Aqua released 75,000 juvenile (2-5 g) eels in the years 2011 and 2012 in a marine Karrebæk Fjord and the river Susaa to see how well they grew and survived. The eels were all tagged with a coded wire (CW) tag, for recognition by recapture. The eels were released in the Fjord (83%) and in

the Susaa (17%). Different codes on the CW tags enables distinction between recaptured eels released in the Susaa, versus in the Fjord. Growth and survival of the exposed eels have been monitored in the period from 2013 to 2018. The results showed that the stocked eels

1) to a large degree remained in the Fjord during their growing season; on average, 13% of eels in the landings surveyed were identified with a CW tag,
2) the stocked eel had a high survival rate,
3) they grow rapidly compared to other studies; the average growth was 10.3 cm year-1, and
4) over 99.5% of the fish were identified as females.

The eels stocked in Susaa have probably not migrated into the Fjord as not one single individual of the 12,500 eels, stocked in the river was recaptured. Their fate is not known, but they may still be in the river (Christensen et al. 2019).

A long-term study on the effect of stocking eel in freshwater was recently completed. In 2001 and 2002, a total of 78,633 Coded wire tagged eels were stocked in the upper part of river Gudenaa. In the years from 2007 until 2020, 712 tagged eels were recaptured in a fixed trap at Vestbirk Hydropower station. The catch efficiency of the trap was estimated to be 37% of all eels migrating from the release area and the total migration was thus estimated to be 1,924 silver eels corresponding to a total survival of 2.45% of the 78,633 eels that were released. The total survival and the yield were less than what was documented in similar studies e.g. in Marine Fjord areas, which can be attributed to slower growth and higher age and the presence of predators (cormorants and otters), in the river Gudenaa (Pedersen et al. 2024).

The effect of stocking is estimated at 23.8 kg of silver eel per 1000 stocked ongrown eel 2-5 g. The stocked eel will gradually become silver eel and it will take 5-20 years before the stocked eel has left the growth area. Stocking Danish freshwater started as early as 1987. In the period 1987 to 2024 in average 950.000 ongrown (2-5) gram has been stocked annually. The average biomass of silver eel from stocking is calculated at 22.4 tons annually.

4. Provide a list of the measures foreseen and implemented and a list of the measures foreseen but not implemented. Provide the date as of which each measure was implemented

The measures foreseen in the Danish Eel Management Plan have all been implemented. The regulation and restrictions for commercial eel fishing activities were implemented as of 1 July 2009. The regulation and restrictions for recreational eel fishing activities were implemented as of 1 February 2009.

5. Provide an explanation for each measure included in the adopted plan(s), which has not been implemented, or implemented after the foreseen date. If an alternative measure was implemented, please describe it and compare its effectiveness in relation to the measure it has replaced or will replace

Denmark has nothing to report.

6. Please list the difficulties encountered in the implementation of the plan

Denmark has not encountered major difficulties in the implementation of the Danish EMP. Since the implementation of the Danish EMP, Danish fisheries authorities and the National Institute of Aquatic Resources have had a close cooperation with all segments of eel fishing.

7. Do you have any indication/evidence/data to suggest that an amendment of the Regulation is necessary to achieve the objective set out in Article 2(4) of the Regulation and to ensure the recovery of the species?

Denmark does not have any indication/evidence/data to suggest that an amendment of the Regulation is necessary to achieve the objective set out in Article 2(4) of the Regulation and to ensure the recovery of the species. However, Denmark will continue to follow the situation closely. Denmark will inform the Commission if any new inputs to amendment of the Regulation are found.

8. Attach as an annex the annual report required in line with Article 7(5)

Reporting on prices for eels for restocking. See Annex 2.

9. References

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Annex 1
Produced in accordance with the Commission Guidance document 2014.

Table A1.1 Landings from Danish freshwater lakes and rivers. NA= Not available

Lake	Water surface	2021	2022	2023	2021	2022	2023
	Ha	Landing (kg)	Landing (kg)	Landing (kg)	Landing (kg/ha)	Landing (kg/ha)	Landing (kg/ha)
Arresø	4047	1144	0	0	0.3	0	0
Flade Sø	482	252	230	519	0.5	0.5	1.1
Flyndersø	418	207	177	83	0.5	0.4	0.2
Gudenå	NA	901	639	541	NA	NA	NA
Jylland syd for Limfjorden	NA	276	52	259	NA	NA	NA
Mossø	1689	380	257	496	0.2	0.2	0.3
Rands Fjord	140	0	0	138	0	0	1.0
Ribe Å	287	617	420	426	2.1	1.5	1.5
Saltbæk Vig	1610	3170	1673	1922	2.0	1.0	1.2
Stilling-Solbjerg Sø	371	0	49	54	0	0.1	0.1
Tissø	1290	1400	850	739	1.1	0.7	0.6
Vidå	187	236	0	0	1.3	0	0
(total)/ Avg kg/ha	**(10521)**	**(8583)**	**(4347)**	**(5177)**	**1.0**	**0.6**	**0.7**

Table A1.2. Fishing mortality and the reduction affected in freshwater. Landing (ton) in the reference period 2004-2006 and in 2023. (*) Reported landing data (**) Interview survey

Fishery	2004-2006	2023
Commercial fishery (*)	15	5.2
Recreational landowners (**)	16	4.1
Total	**31**	**9.3**

Table A1.3. Estimates of mortality (ton) outside the fishery. Hydropower units may not all be active.

Units	2004-2006	Mortality 2023 (ton)
Hydropower - less than 40	unknown	4
Fish farms - less than 100	unknown	3
Total		7

Table. A1.4 Approximate number of glass eels used for stocking in fresh waters (calculated by multiplying number of stocked eels by 1.15 equal to 15 % mortality between glass eel and 2-5 gram eel)

Year	Stocked eel, # (2-5 g)	Glass eel used, #
2009	253,900	291,985
2010	1.246,350	1.433,303
2011	1.361,000	1.565,150
2012	1.284,000	1.476,600
2013	1.275,400	1.466,710
2014	1.342,000	1.543,300
2015	1.399,000	1.609,100
2016	1.390,000	1.598,500
2017	1.390,000	1.598,500
2018	1.106,000	1.271,900
2019	1.810,000	2.081,500
2020	1.343,200	1.544,680
2021	898,700	1.033,505
2022	1.654,000	1.902,100
2023	1.550,000	1.782,500
2024	1.274,500	1.465,675

Annex 2

Article 7 (5) in Council Regulation (EC) No 1100/2007 of 18 September 2007 establishing measures for the recovery of the stock of European eel – Reporting on prices for eels for restocking

Please find Danish data for the quantity and prices paid for eel 2-5 gram for restocking in accordance with Council Regulation (EC) 1100/2007 and the Danish Eel Management Plan. In order to fulfil the reporting obligations, set out in Article 7 (5) of the Regulation, the Commission requests that the Member States provide the following information in writing:

Prices paid for glass eel purchased for the purpose of restocking, starting from the date of implementation of the relevant Member State's eel management plan until present.

As described in the Danish Eel Management Plan, Denmark does not stock glass eel. Danish eel farmers purchase glass eel, typically from France. After 2-3 months in aquaculture, eels of 2-5 gram are purchased by the Ministry of Food, Agriculture and Fisheries for restocking.

Tabel A2.1 The table below shows the average prices of each eel for restocking in the period of 2010-2020.

Year	Danish currency (DKr)	Euro (€)
2010	2.35	0.31
2011	2.05	0.27
2012	2.07	0.28
2013	2.14	0.29
2014	2.05	0.27
2015	1.93	0.26
2016	1.93	0.26
2017	1.92	0.26
2018	2.05	0.27
2019	1.63	0.22
2020	1.63	0.22
2021	1.83	0.24
2022	1.79	0.24
2023	1.89	0.25
2024	1.89	0.25

Tabel A2.2 The quantity of glass eel bought for restocking during 2010-2024.

Year	Restocked eels (2-5 g), individuals	Approximately number of additional eels of 2-5 g bought for restocking in marine waters
2010	1.25 millions	300,000
2011	1.36 millions	200,000
2012	1.28 millions	250,000
2013	1.28 millions	250,000
2014	1.34 millions	226,000
2015	1.40 millions	130,000
2016	1.39 millions	130,000
2017	1.39 millions	130,000
2018	1.11 millions	130,000
2019	1.81 millions	185,000
2020	1.34 millions	150,000
2021	0.9 millions	330,000
2022	1.65 millions	139,000
2023	1.55 millions	130,000
2024	1.27 millions	138,000

Annex 3
Map showing the regional areas described in table 2.B.4.