Report on the eel stock, fishery, and other impacts in:

Greece

2023

Note to the reader – this document accompanies a series of spreadsheet tables that provide the bulk of the data in a format most suitable for the working practices of WGEEL. Summaries of these data are provided in this document.

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Changes in the report since 2023

1) Update of the Table 1 (Stock indicators of silver eel escapement, biomass and mortality rates, and assessed habitat area)
2) Update of the data regarding the commercial landings, aquaculture and restocking.
3) Update of the biological data.

1 Summary of national and international stock status indicators

1.1 Escapement biomass and mortality rates

Under the GFCM Project "Research Programme on European eel: Towards coordination of European eel stock management and recovery in the Mediterranean", the data on the "Escapement biomass and mortality rates" are under evaluation and validation. Thus, the data will be available to Joint ICES/EIFACC/GFCM WGEEL by the end of the project.

Table 1. Stock indicators of silver eel escapement, biomass and mortality rates, and assessed habitat area.

Year	EMU_code	Assessed Area (ha)	B_0 (kg)	B_{curr} (kg)	B_{best} (kg)	B_{curr}/B_0 (%)	∑F	∑H	∑A
2016	GR_NorW	18,158.98	136,149.30	21,472.30	52,430.50	15.77	0.389	0.020	0.410
2016	GR_WePe	6,567.84	38,030.00	9879.40	20711.90	25.77	0.453	0.024	0.477
2016	GR_EaMT	18,240.00	72,240.00	3343.50	4175.10	3.25	0.761	0.040	0.801
2016	GR_CeAe	22,472.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2016	GR_total	65,439.62	278937.20	34695.30	77317.60	12.44	0.426	0.022	0.449
2017	GR_NorW	18,158.98	136,149.30	21,749.4	53,275.30	21.69	0.84	0.04	0.88
2017	GR_WePe	6,567.84	38,030.00	22,217.70	22,217.70	419.20	4.77	0.24	5.01
2017	GR_EaMT	18,240.00	72,240.00	1,876.70	2,410.70	2.60	0.176	0.009	0.185
2017	GR_CeAe	22,472.80	0.00	0.00	0.00		0.000	0.000	0.000
2017	GR_total	65,439.62	177,830.00	45,843.70	77,903.60	25.78	0.060	0.003	0.063
2018	GR_NorW	63,284	136,149.30	16,121.90	36,116.00	16.07	0.022	0.424	0.446
2018	GR_WePe	4,655	38,030.00	12,714.90	12,714.90		0.05	0.95	1.00
2018	GR_EaMT	26,850	72,240.00	6,607.10	6,607.10	9.15			
2018	GR_CeAe	12,628							
2018	GR_total	107,417	177,836.70	35,443.90	55,438.90	19.93	0.032	0.6074	0.6393
2019	GR_NorW	63,284	136,149.30	10,894	17,712	7.41	10,894	573,4	11,467
2019	GR_WePe	4,655	38,030.00	6,650	8,900	5.92	6,650	350,0	7,000
2019	GR_EaMT	26,850	72,240.00	1,715	6,027	8.34	1,715	90.3	1,013
2019	GR_CeAe	12,628							
2019	GR_total	107,417	177,836.70	19,491	32,639	7.45	19,259	1.805,3	20,272
2020	GR_NorW	63,284	136,149.30	14,164.61	30,147.71	10.40	0.47	0.02	0.45
2020	GR_WePe	4,655	38,030.00	1,184.45	4,684.45	3.11	0.25	0.01	0.24
2020	GR_EaMT	26,850	72,240.00	4,667.12	4,667.12	6.46	1.00	0.05	0.95
2020	GR_CeAe	12,628							
2020	GR_total	107,417	177,836.70	20,016.17	39,499.27	8.12	0.51	0.03	0.48
2021	GR_total	107,417	246,419.3	14,551.0	28,055.46	5.90	0.519	0.026	0.493
2021	GR_NorW	63,284	136,149.30	11,832.7	23,037.17	8.69	0.514	0.026	0.488
2021	GR_WePe	4,655	38,030.00	778.3	3,078.35	2.05	0.25	0.01	0.024
2021	GR_EaMT	26,850	72,240.00	1,939.9	1,939.95	2.69	1.00	0.05	0.95
2021	GR_CeAe	12,628							

Year	EMU_code	Assessed Area (ha)	B_0 (kg)	B_{curr} (kg)	B_{best} (kg)	B_{curr}/B_0 (%)	∑F	∑H	∑A
2022	GR_total	107,417	278,937.2	24654.50	13579.10	4.87%	0.523	0.028	0.551
2022	GR_NorW	63,284	136,14920	10428.60	18755.80	7.66%	0.528	0.028	0.556
2022	GR_WePe	4,655	38,340.0	2317.44	4858.44	6.04%	0.453	0.024	0.477
2022	GR_EaMT	26,850	102,839.13	1040.26	833.06	0.81%	0.761	0.040	0.801
2022	GR_CeAe	12,628	1,608						
2023	GR_total	107,417	278937.18	15869.335	29427.73464	5.69%	0.512	0.027	0.539
2023	GR_NorW	63,284	136149.329	12196.688	24147.08764	8.96%	0.480	0.025	0.505
2023	GR_WePe	4,655	38340.0272	1161.9114	2435.911443	3.03%	0.453	0.024	0.477
2023	GR_EaMT	26,850	102839.104	1379.055	1722.054974	1.34%	0.761	0.040	0.801
2023	GR_CeAe	12,628	1608.71964	1131.6806	1122.680586	70.35%	1.061	0.053	1.008

Key:
EMU_code = Eel Management Unit code (see Table 2 for list of codes); B_0 = the amount of silver eel biomass that would have existed if no anthropogenic influences had impacted the stock (kg); B_{curr} = the amount of silver eel biomass that currently escapes to the sea to spawn (in the assessment year) (kg); B_{best} = the amount of silver eel biomass that would have existed if no anthropogenic influences had impacted the current stock (kg); ∑F = mortality due to fishing, summed over the age groups in the stock (rate); ∑H = anthropogenic mortality excluding the fishery, summed over the age groups in the stock (rate); ∑A = all anthropogenic mortality summed over the age groups in the stock (rate); Assessed area (ha) = combined area total (ha) of transitional and inland waters.

1.2 Recruitment time series

The WGEEL uses these time series data to calculate the Recruitment Indices, relative to the reference period of 1960-1979, and the results form the basis of the annual Single Stock Advice reported to the EU Commission. These recruitment indices are also used by the EU CITES Scientific Review Group in their annual review of the Non-Detriment Finding position.

2 Overview of the national stock and its management

2.1 Describe the eel stock and its management

The Hellenic Eel Management Plan defines four Eel Management Units (EMU) (Figure 2.1.1.). Their definition is based on the main climatic characteristics, on the spatial distribution of lagoons, lakes and rivers, on the existing Ecoregions (Directive 2000/60/EC), on the distribution of the eel fisheries and on the location of the main authorities involved in water and eel management. The management measures concerning fishing restrictions and environmental aspects are applied to all EMUs. The nature and scale of the proposed specific actions, like stocking or pilot studies, respect the relative importance of the EMUs.

The fishery of eel in Greece is limited to the capture of adults during their migration to the Atlantic for reproduction. In Western Greece there is limited fishery of yellow eels, as part of the local tradition (influences from Italy) of consuming younger eels, a practice that is not found elsewhere in Greece. Concerning the fishery of underage eels or otherwise glass eels, it is not performed despite efforts were made with the purpose to be used in aquaculture units. It should also be mentioned that the fishery of the eels is prohibited and only performed with a special permission from the regional authorities. More-over, there are no scientific data for eel recreational fishing until today.

GR_NorW or EMU-01 (7 Prefectures, 3 Regions) is located on the North Western Greece. It comprises 70% of the total Hellenic lagoons surface and 45% of the lakes surface. Despite the considerable decrease of the EMU-01 landings (180 t in mid-1980, 50 t the recent years), the unit remains the most important eel producer.

GR_WePe or EMU-02 (5 Prefectures, 2 Regions) is located on the Western Peloponnesus. It comprises 5% of the total Hellenic lagoons surface and 3% of the lakes. The eel landings of this EMU increased since the mid-1980's, contrary to the general pattern and now represents about 40% of the Hellenic lagoon landings (about 40 t).

GR_EaMT or EMU-03 (4 Prefectures, 1 Region) is located on the North Eastern part of the country. It comprises 24% of the total Hellenic lagoons surface and 9% of the lakes surface. The landings dropped from 70 t in early 1980's to less than 10 t.

GR_CeAe or EMU-04 covers the rest of the country, mainly central eastern continental Greece, and the islands of the Aegean Sea (35 Prefectures and 8 Regions). The landings of the EMU-04 are almost zero.

The eel fishery usually is performed with traditional traps, which catch alive the eels during their repro-duction migration carried from September to January every year. The fyke nets are also used in certain lagoons, where no permanent installed traps exist or during the year except the period of migration. The fishermen cooperatives usually have the adequate infrastructure to

store live eels up to their sale (the largest quantity of these is exported to other European countries, such as Italy and Germany). The total fishery of the eels and the total fishery of the rest species must declare every month to the regional authorities. The fishermen cooperatives are obliged to release 30% of the annual eel production in the framework of the Hellenic EMP.

Also, some of the catches are made in the lakes and in the estuaries but eel fishing in the rivers is prohibited. In the lakes, fishermen use special eel traps (fyke nets). However, this fishing method, due to the fact that catches have declined significantly during the last decades, has almost disappeared. However, after the implementation of the Ministerial Decision 643/39462/01-04-13 (in the implementation of the European Regulation 1100/07) an eel fishery with fyke nets is also banned.

Since the adaptation of the first Hellenic Eel Management Plan in 2009, a significant number of measures were implemented towards the protection and enhancement of the European eel population.

One of the first measures implemented was the release by the fishermen of the 30% of the total eel production. The target was achieved in 2014, when the total releases were slightly higher than 30%. Apart from these releases, the aquaculture units that import glass eels are obliged to release the 10% of the total imported glass eel biomass. Fishing cooperatives, however, constantly declare fewer and fewer quantities of eels. There is an essence of a tendency to conceal real production data. Besides concealing part of the production, it has been found that in some specific occasions, fishing cooperatives indicate zero catches while available information from traders report significant catches from the same fishing cooperatives. It seems that the obligation to release part of the eel catches pushed the fishing cooperatives to intensify the concealing of the real catches. As fisheries cooperatives are obliged to release 30% of the catches by declaring smaller quantities, necessarily release less. This was more pronounced at the beginning of the season because in most areas was the first implementation of the measure introduced by the EMP. In the process, given that licenses are needed for eel exports, the concealing of real catch-es decreased.

Also, other important measures for the protection of the species is the ban of eel fisheries in rivers and estuaries with any type of gear and the ban of fisheries with fyke nets inside the lagoons. In addition, all the eels that are going to be exported in other EU countries or transported inside the country are al-lowed only after the issue of licence in accordance to the regulations of CITES.

Measures that have not been implemented concerns the further reduction of eel mortality due to the fisheries. This is because the implementation of this measure requires the realization of a study for the modification of the permanent installed traps in the lagoons that will increase the escapement of eels and then the modification of the relative legislation.

With the purpose to describe the population dynamics of eels in Greece, attempts are made to apply the Eel Population Dynamics Model (Aschonitis et al. 2015) in Vistonida lagoon, which is located in the area of EMU-03. In the next phase this model will be calibrated in order to be applied at the whole country.

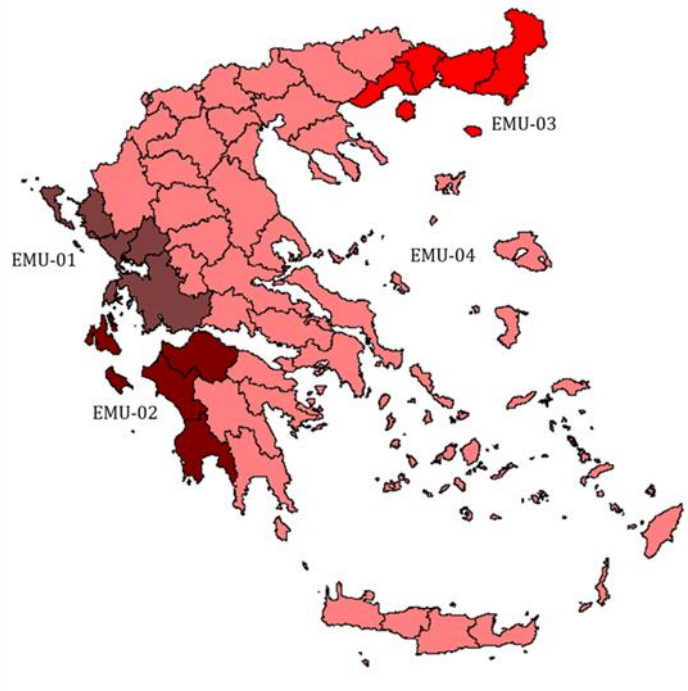


Figure 2.1.1. Map of EMUs in Greece (modified by Hellenic Eel Management Plan, 2009).

2.2 Significant changes since last report

There weren't any significant changes, since the last report.

3 Impacts on the national stock

The impact categories align with the categories proposed for the 2018 EMP Progress reports.

The Data Call has tables for Catches, Restocking and Aquaculture production so there are no tables for these in the CR excel file.

3.1 Fisheries

In Greece, a framework regulating the collection of eel data has been established after the approval of the Hellenic Eel Management plan (HEMP) on 2011, but only landings of silver eels, captured at the permanent installations of the commercially exploited lagoons were recorded. Due to the ban of the fyke nets in all the lagoons, yellow eels are not fished. There are no data for eel landings of any stage from the freshwater fisheries. It must be mentioned that due to the fact the eel fisheries are implemented by using fixed fishing installations in the lagoons, the fishing effort is considered stable during the years, changing only by the number of lagoons, where fishing is applied. Due to the specific fishing methodology, the fishing capacity is equal to fishing effort, since it is a passive fishing device, and the fishing effort is not affected by any other factor such as fuel consumption.

3.1.1 Glass eel fisheries

Glass eel fisheries are prohibited according to the RD/142/1971, however, some data on glass eels can be found in published research papers (Daoulas et al., 2000; Cladas et al 1999; Zompola et al., 2008).

Table 2. Commercial catches (kg) of glass eel from x reported to the y, from 2005 to 2022. NP = not pertinent, in this case because glass eel fisheries is closed since 1970's

Year	EMU 1	EMU 2	EMU 3	EMU 4	EMU	EMU
2005	NP	NP	NP	NP		
2006	NP	NP	NP	NP		
2007	NP	NP	NP	NP		
2008	NP	NP	NP	NP		
2009	NP	NP	NP	NP		
2010	NP	NP	NP	NP		
2011	NP	NP	NP	NP		
2012	NP	NP	NP	NP		
2013	NP	NP	NP	NP		
2014	NP	NP	NP	NP		
2015	NP	NP	NP	NP		
2016	NP	NP	NP	NP		
2017	NP	NP	NP	NP		
2018	NP	NP	NP	NP		
2019	NP	NP	NP	NP		
2020	NP	NP	NP	NP		
2021	NP	NP	NP	NP		
2022	NP	NP	NP	NP		
2023	NP	NP	NP	NP		

Repeat for recreational catches where appropriate.

Table 3. Effort used to take Commercial catches of glass eel from x reported to the y, from 2005 to 2020. NP = not pertinent, in this case because

Year	EMU 1	EMU 2	EMU 3	EMU 4	EMU	EMU
2005	NP	NP	NP	NP		
2006	NP	NP	NP	NP		
2007	NP	NP	NP	NP		
2008	NP	NP	NP	NP		
2009	NP	NP	NP	NP		
2010	NP	NP	NP	NP		
2011	NP	NP	NP	NP		
2012	NP	NP	NP	NP		
2013	NP	NP	NP	NP		
2014	NP	NP	NP	NP		
2015	NP	NP	NP	NP		
2016	NP	NP	NP	NP		
2017	NP	NP	NP	NP		
2018	NP	NP	NP	NP		
2019	NP	NP	NP	NP		
2020	NP	NP	NP	NP		
2021	NP	NP	NP	NP		
2022	NP	NP	NP	NP		
2023	NP	NP	NP	NP		

Repeat for recreational catches where appropriate.

3.1.2 Yellow eel fisheries

RD/142/1971 also indicates that both fishing and commercial exploitation of eels smaller than 30 cm is entirely prohibited. Therefore, there are no yellow eel fisheries in Greece. Concerning yellow eel fisheries effort, after the implementation of HEMP, it is prohibited to use fyke nets in the lagoons, so there are not legal catches of yellow eel and therefore fishing effort cannot be estimated.

Yellow eel fisheries still exist in EMU-1 (GR_NorW), after the issue of a special permit with only obligation, the captured eels to be above 30 cm in total length.

3.1.3 Silver eel fisheries

Most of the eels are caught in the lagoons using fixed barrier fish traps. The lagoons are leased and operated by co-operatives of fishermen. Individual fishermen operating around the lagoons and in lakes also catch eels (fishing in rivers and river Deltas is prohibited). Small catches have also been recorded in coastal areas, mainly through the use of static fishing equipment used in coastal fisheries, but some quantities are also fished by trawls and purse seines. Specialists estimate that 90% of the eel catches come from fishing in the lagoons. Furthermore in 2018, specifically for River Evros (EMU-03), six special licenses are issued for eel fisheries in the river. These licenses are used for two years and concerns professional fisheries with boat.

The number of the fishing traps in the lagoons remained unchanged in the last 2-3 decades. Therefore, the main fishing dynamics and effort can be considered stable.

It is characteristic that fishing dynamics and effort in the Messolonghi-Aitoliko lagoons during 2012 remained stable despite an increase of the mesh size in fishing traps. This took place in an

attempt to de-crease the discards of this type of fishing. Smaller eels are expected to escape these traps, but there are no quantitative data available.

The total landings of **lagoons** in 2022 for the three EMUs (EMU-01, EMU-02 and EMU-03) were 19,412kg In EMU-1 (GR_NorW) the landings recorded were 16,589 kg, in EMU-2 (GR_WePe) the total landings were 1,820kg, and finally in EMU-3 (GR_EaMT) the landings were 30 kg.

Additionally, licenses for eel fisheries were provided to fishermen to perform eel fisheries in lakes, rivers and lagoons (independently from Fishing Cooperatives). The total landings of the licensed fisheries were 483.0 kg in EMU-1 (GR_NorW), 30.0 in EMU-4 (GR_CeAe), 460.0 kg in EMU-3 (GR_EaMT).

3.2 Restocking

According to the Greek EMP, 10% of the imported glass eels for rearing must be used in stocking actions in selected ecosystems. Since 2009 that the HEMP was officially accepted this action is taking place every year. According to the CITES office, in 2023, one permission was issued for the import of 195 kg of glass eel, 19.54kg of which were released in estuaries.

Moreover, the fishing cooperatives that manage the lagoons are obliged by CITES to release the 30% of the annual silver eels catches to get a permission to export silver eels to other EU countries. For 2023, the total biomass of silver eels that were released was 8,288kg, which corresponds to a 42.70% of the total annual silver eels' catches, while the limit that was set by the HEMP was 30%.

3.3 Aquaculture

Regarding the Aquaculture production, eel rearing occurred in two units in the area of EMU-1 (GR_NorW). In total in 2023, 15,2430kg eels were sold live or as smoked product.

3.4 Entrainment

According to the Public Electricity Company (Argyrakis 2008), in Greece there are 16 large scale and 8 small scale hydropower stations. However, since the hydropower stations are installed on the mountainous part of the rivers in high altitude, the mortality caused by the turbines, pumps are very low to zero. The main problem for the eel movement is caused by the obstacles that are found in the lowland part of the rivers, such as irrigation dams and "ford" type bridges that disrupts the river connectivity.

3.5 Habitat Quantity and Quality

NO AVAILABLE DATA

3.6 Other impacts

NO AVAILABLE DATA

4 National stock assessment

4.1 Description of Method

4.1.1 Data collection

Biological and commercial samplings were conducted during the implementation of the National Data Collection Project. In particular, as regards the biological sampling, samples of eels were collected for further processing. The number of samples taken per region under the DCF was determined by SGRN (STECF) (2007) that suggested 200 specimens per 20 t of production. Thus, 200 specimens were randomly collected from each of the three Greek EMU. This number corresponds to the minimum number of specimens required for the examination of the external morphometric characteristics. For internal organs (gonads, liver, digestive system, otoliths) in any case and for small productions a sample of 30 specimens is the minimum required.

For the measuring of the external characteristics, an ichthyometer specially designed for measuring eels and accuracy of 1 mm was used. Finally, for the measurement of the body weight, a digital precision scale (± 0.1 gr) was used. Also, a precision digital scale was used (± 0.01 mm) was used to measure the eye of the fish. This in an important biometric measurement usually associated with other biological and ecological parameters of the species. Finally, for the determination of the age, the method of age determination through otolith reading was used.

4.1.2 Analysis

Age analysis

The age determination of eel, for 2022, carried out according to the modified Crack and Burn protocol, which was used the previous years.

4.1.3 Reporting

The results of the above-mentioned analysis are reported both in the DCF report and also in the country report submitted to the WGEEL.

4.1.4 Data quality issues and how they are being addressed

As part of the Data Collection Framework a "Methodology and Data Quality Assurance Framework for anadromous and catadromous species" was prepared and it can be found online in the address (https://inale.gr/wp-content/uploads/2021/03/GREECE-Eel-Methodology-data-QAF_2020.pdf).

4.2 Trends in Assessment results

5 Other data collection for eel

This section is an overview of methods used to collect other data that are not directly used in the National Stock Assessment(s). Describe how you sample and measure, if possible referring (and summarising) existing protocols. The level of detail in your description is up to you but report at least on the items in these sections. Add further sections where appropriate.

5.1 Yellow eel abundance surveys

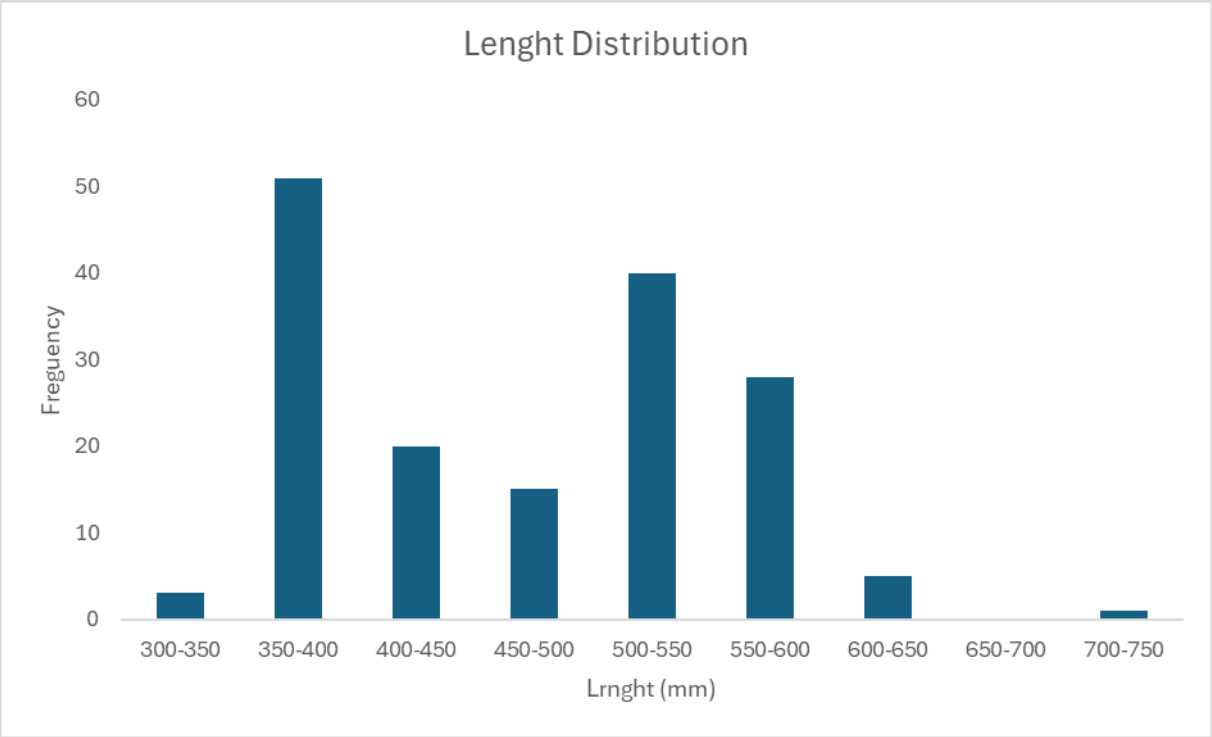
A project to gather data for the calibration of the Eel Population Dynamics Model (EPDM) (Aschonitis et al. 2015) is in progress. Yellow eels are being captured using fyke nets in the estuarine systems of Kotixi Lagoon and Prokopos Lagoon in EMU2. In total, four eels were captures from those lagoons, from which the smallest one was 384 mm in TL, while the biggest one was 543 mm. The age was determined using otoliths from the captured eels; the youngest eels were 2 years old and the oldest one 6 years old.

5.2 Silver eel escapement surveys

NO AVAILABLE DATA

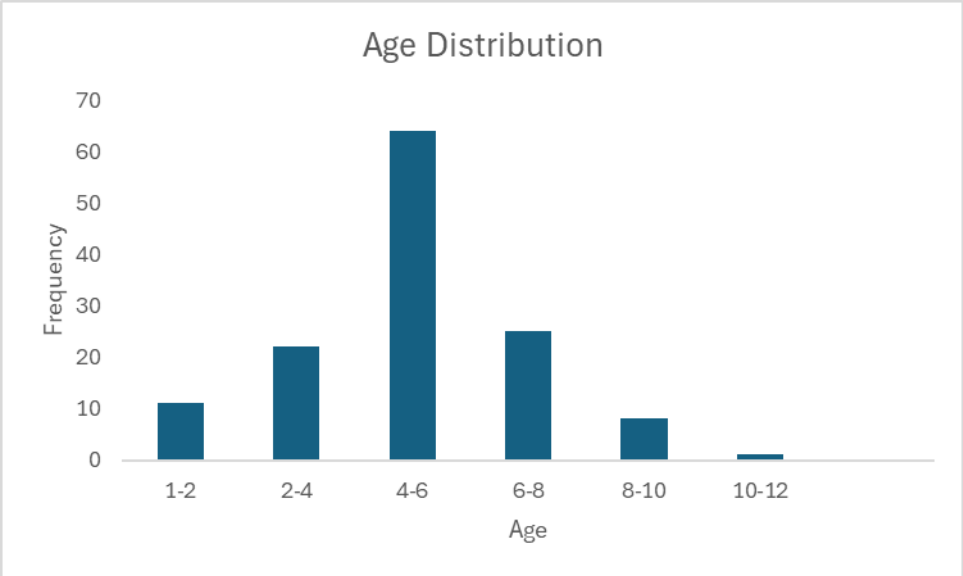
5.3 Life-history parameters

Silver eels are being captured in the fixed barrier traps in the estuarine systems of EMU1. For the estimation of the Length Frequency, 185 eel samples were used. The smallest one was 323mm in TL, while the biggest one was 718 mm. The most frequent size class was the 350-400 mm.



Age Distribution

The age was determined using otoliths from 131 samples collected from EMU 2. The youngest eels were 2 years old and the oldest one 11 years old. However, the most abundant class was the 4-6 years old.



5.4 Diseases, Parasites & Pathogens or Contaminants

Parasites & Pathogens

In 2022, 0.03% of the eel samples collected in EMU-1 that were examined were infected by the *A. crassus.*

6 New Information

During 2022, one projects was under implementation:

- Urgent measures in the Eastern Mediterranean for the long term conservation of endangered European eel – LIFEEL (LIFE19 NAT/IT/000851)", funded by LIFE.

One project was finalized:

- Research Programme on European eel: Towards coordination of European eel stock management and recovery in the Mediterranean (7/2020 – 02/2022)

In 2023 one new project will be initiated and it will be the second phase of the Research project on European eel.

- Roadmap towards informing the future GFCM long-term management plan for European eel in the Mediterranean.

  In order to inform future long-term measures for European eel in the Mediterranean, the 2023-2024 Roadmap, has a number of specific objectives:

  I. Increase the size of the subset of data-rich sites, reviewing, updating and integrating available data towards a larger database of sites for which exhaustive information is available,
  II. Broaden the scope of the measures appraised in the MSE to include habitat-related issues,
  III. Perform a socioeconomic study of European eel fisheries in the Mediterranean and take into account the results within the MSE,
  IV. Perform a multi-objective Management Strategy Evaluation (MSE) evaluating different measures in terms of their estimated conservation benefits (solutions that maximize conservation by ensuring silver eel escapement from single catchments and maximize escapement of silver eels with high spawning potential also to contribute to the global stock recovery) against estimated socio-economic impacts, at minimal possible socioeconomic drawbacks.

Finally, a new student is starting in 2023 a new PhD, with the title "Study of the biology of two populations of the endangered species *Anguilla anguilla* (Linnaeus, 1758), (European eel), in the Regions of Western Greece and Eastern Macedonia and Thrace". The PhD will include, apart from the study of the biology of the species, also the study of the diet using DNA analysis of the stomach content and also the analysis of various tissues for the presence of microplastics.

7 References

Aschonitis V.G., Castaldelli G., Lanzoni M., Merighi M., Gelli F., Giari L., Rossi R., Fano E.A., 2015. A size-age model based on bootstrapping and Bayesian approaches to assess population dynamics of Anguilla anguilla L. in semi-closed lagoon. Ecology of Freshwater Fish 2017: 26: 217–232.

Cladas Y., Koutsikopoulos C., Zompola S. & Ioannou G., 1999. Glass eel (*Anguilla anguilla*, L.) of the western Greek coast: abundance and size composition fluctuations in relation to environmental factors. 8th Int. Congress on the Zoogeography and Ecology of Greece & adjacent regions, Kavala, Greece.

Daoulas C., Economou A.N., Psarras Th., Barbieri-Tseliki R., Papadakis V., Economou A.I., 2000. A study on glass eels (*Anguilla anguilla* L.) and the support of their ascent and dispersal in inland waters. Proceedings of the 9th Hellenic Congress of Ichthyologists, 165-168 (in Greek with English abstract).

Durif C., Guibert A., Elie P. 2009. Morphological discrimination of the silvering stages of the European eel. p. 103–111. In: Casselman, J. M., Cairns, D. K. (Eds) Eels at the Edge: Science, Status, and Conservation Concerns. American Fisheries Society Symposium. Bethesda, MD, U.S.A.

ICES, 2009. Workshop on Age Reading of European and American Eel (WKAREA), 20-24 April 2009, Bordeaux, France. ICES CM 2009\ACOM: 48. 66 pp.

Katselis G., Koutsikopoulos C., Dimitriou E. & Rogdakis Y., 2003. Spatial patterns and temporal trends in the fishery landings of the Messolonghi-Aitoliko lagoon system (western Greek coast).Scientia Marina, 67(4): 501-511.

Koutrakis E.T., Conides A., Parpoura A.C., van Ham E.H., Katselis G. & Koutsikopoulos C., 2007. Lagoon Fisheries' Resources in Hellas. Chapter 6, pp. 223-234. In. Papaconstantinou C., Zenetos A., Vassilopoulou V. & Tserpes G. (eds), State of Hellenic Fisheries. Hellenic Centre for Marine Research, Athens, Greece.

Koutsikopoulos C., Cladas Y., Katselis G., Zompola S., Dimitriou E., Mitropoulos D. & Chatzispyrou A., 2009. Hellenic Eel Management Plan. General Directorate of Fisheries of the Ministry of Rural Development and Food (MRDF, Des.No. 147800), 55pp.

MacNamara R., Koutrakis E.T., Sapounidis A., Lachouvaris D., Arapoglou F., Panora D. & McCarthy T.K., 2013. Reproductive potential of silver European eels (*Anguilla anguilla*) migrating from Vistonis Lake (Northern Aegean Sea, Greece). Mediterranean Marine Science. (In press).

MacNamara R., McCarthy T.K. 2012. Size-related variation in fecundity of European eel (*Anguilla anguilla*). ICES Journal of Marine Science, 69: 1333–1337.

Pankhurst N.W. 1982. Relation of visual changes to the onset of sexual maturation in the European eel Anguilla anguilla (L.). *Journal of Fish Biology*, 21: 127–140.

Scientific, Technical and Economic Committee for Fisheries (STECF) Evaluation of 2014 MS DCF Annual Reports & Data Transmission (STECF-15-13). 2015. Publications Office of the European Union, Luxembourg, EUR 27410 EN, JRC 96975, 287 pp.

Tesch F.W. 2003. The Eel. Fifth edition. Blackwell, Oxford, UK, 408 pp.

Volponi S. 1997. Cormorants wintering in the Po Delta: estimated and possible impact on aquaculture production. Suppl. Ric. Biol.323-332.

Zompola S., Cladas Y., Vavoulis D., Kentrou A., Pagoni S., Koutsikopoulos C., 2001. European eel (*Anguilla anguilla* L.) fisheries production in Greece. Proceedings of the 10th Hellenic Congress of Ichthyologists, 237-240 (in Greek with abstract in English).