

Addressing the critical state of European eel stocks

SUMMARY

The European eel population has suffered a dramatic decline since the 1980s. Several factors, both fisheries- and non-fisheries-related, are considered responsible for the high mortality rate among the fish species. The eel has a very complex life cycle covering several metamorphoses as well as long-distance migration, and many details of the species' life are still unknown. The shrinking eel population has gone hand in hand with decline in traditional eel fisheries.

In 2007, the EU adopted Council Regulation (EC) No 1100/2007 (the 'Eel Regulation') to aid the recovery of the European eel stock. The regulation's main target is the escapement to the sea of at least 40 % of the adult silver eel population. EU Member States are obliged to have an eel management plan in place.

Since 2010, all trade in eel with countries outside the EU has been banned, following the listing of the species under the Convention on International Trade in Endangered Species (CITES) in 2009. In 2018, the Council adopted the first in a series of temporary eel fishing closures, banning eel fishing for several months.

However, the European Commission concludes in a 2020 report that the status of the European eel remains critical and that the regulation's main target has not been reached. The report also questions the efficiency of some of the measures implemented at Member State level. Other reports raise similar concerns.

In its resolution of 21 November 2023 on the implementation of the Eel Regulation, the European Parliament highlighted that more work needed to be done on the non-fisheries factors having an impact on eel mortality. It called on Member States to continue the practice of restocking as a necessary temporary measure. Parliament also suggested establishing an eel-specific expert group representing all relevant stakeholders.



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State of the European eel stock

The European eel (*Anguilla anguilla*) has suffered a [90 % to 95 %](#) decline in its population since the 1980s. Within 50 years, the European eel has turned from one of the most abundant freshwater fish to an endangered species. The International Union for Conservation of Nature and Natural Resources (IUCN) has listed the European eel as [critically endangered](#) since 2008. This negative trend goes along with a decrease in the number of fishers targeting eel and is reflected in the reported commercial landings showing a continuing [decline](#), from a level of around 10 000 tonnes in the 1960s to 2 028 tonnes in 2022 for all eel life stages. Despite several preservation measures taken in EU Member States, there is no clear sign of an upturn.

Background

The European eel has one of the largest geographical ranges of any fish stock in Europe. It can be found in oceans and high seas, sheltered coasts, large lakes and small ponds, wetlands, as well as small streams and big rivers draining to the Mediterranean, the North and Baltic Seas, and to the Atlantic.

Details of the species' complex life cycle have been brought to light only gradually (see text box and Figure 1). Given the remaining knowledge gaps regarding eels' life cycle, the reasons for the decline in stock are [not entirely understood](#). There is, however, broad consensus among scientists that no single cause, but rather a combination of several factors, is responsible for the species' sharp decrease in numbers. Alongside fisheries, several non-fishery factors are thought to contribute directly and indirectly to the decline in the eel population: physical damage, habitat fragmentation or loss, water and sediment pollution, as well as climate change, diseases and predators can play a major detrimental role.

The main factors causing **physical damage** to eels include pumping stations and hydropower installations, where eels suffer even higher mortality rates than other fish species, for instance when passing through a hydropower turbine.¹

Habitat loss and fragmentation are deemed essential aspects of eel population decline. Artificial obstacles and barriers such as dams and weirs, sluices, pumping stations and hydropower turbines can restrict river continuity, resulting in a disconnection of living areas and preventing eels from their vital migration upstream or downstream.² Moreover, any alteration of water bodies, river regulation or water abstraction can have a detrimental effect on migrating species.

Water pollution, resulting in particular from the occurrence of **harmful substances** such as persistent organic pollutants and heavy metals, can have an adverse health effect in all life stages of eels. Contamination might impair reproduction or compromise migration. Given the species'

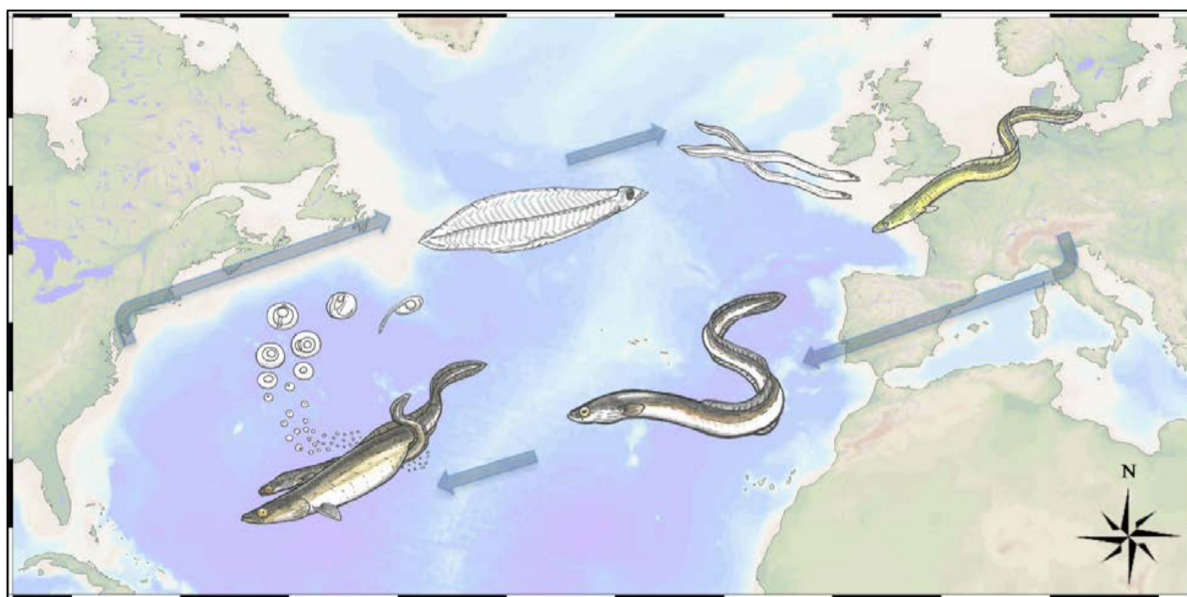
Eel life cycle

The European eel's [life cycle](#) is characterised by migration between oceanic, coastal and freshwater habitats. The different habitats are related to several metamorphoses and distinct life stages: eels start life in the Sargasso Sea as **transparent larvae**. After their oceanic journey, the larvae reach the continental shelf areas and metamorphose to **glass eels**, which aggregate in river estuaries before colonising freshwater and coastal habitats for their **yellow eel** life stage. Yellow eels spend from four to more than 20 years in fresh and coastal waters before changing again into **silver eels**. Adult silver eels cover a distance of between 5 000 and 10 000 km across the Atlantic Ocean back to their presumed birth place, the Sargasso Sea. At their destination, they spawn once and then die.

Eel migration and reproduction remain largely unexplained. Some 100 years ago, the location of the eel breeding place in the Sargasso Sea was deduced from the high number of eel larvae in that area. It was not until 2022 that researchers provided the [first direct evidence](#) of adult European eels migrating to their breeding place in the Sargasso Sea. Other questions, relating for instance to navigation mechanisms, routes taken, timings of arrival or swimming speed, remain unsolved.

longevity, their high fat content and their position as a predator at the end of the food chain, eels are particularly prone to the accumulation of pollutants in their bodies.

Figure 1 – European eel life cycle in clockwise rotation, from spawning silver eels (left), to eggs and larvae (top), glass eels (top right), yellow eel (right), and silver eels (bottom)



Source: [Research for PECH Committee – Environmental, social and economic sustainability of European eel management](#), Policy Department for Structural and Cohesion Policies, European Parliament, 2019, p. 16.

While the effect of **climate change** on ecosystems is [not yet entirely understood](#), the surface water warming, changes in oceanic currents, ocean acidification, droughts, and frequent flooding are considered possible causes of further eel stock decline.

Infestation with **parasites and viral infections** contribute further to the decline. The most notable health risks for the European eel include the parasitic [swim bladder nematode](#) and [eel-specific herpes viruses](#). These have first been documented in the 1980s and 1990s respectively and are now widespread in both fish farms and natural waters.

Predatory species are also a concern, in particular the high abundance of [cormorants](#). The predatory bird species, which is protected under the EU [Birds Directive](#), has considerably grown in population since the 1980s, with possible negative impacts on aquatic biodiversity in general and eels in particular.

While the impact of **fisheries** on the entire eel stock is difficult to quantify,³ any eel individual removed from the stock further increases pressure on the species' population, since the European eel spawns only once and then dies (see text box above). Furthermore, illegal, unreported and unregulated (IUU) fishing, as well as illegal export of glass eels in particular, is deemed a major threat for the European eel. [Europol](#) suspects that around 100 tonnes annually of glass eel are exported illegally from EU Member States, with prices reaching several thousand euros per kilo.

European eel management

EU legislative framework

Fisheries activities in the EU are subject to the EU's common fisheries policy (CFP), the basic rules of which are laid down in the [CFP Regulation](#). The CFP aims to ensure that fishing and aquaculture activities contribute to long-term environmental, economic and social sustainability. To reconcile fishing activities with the protection of the marine environment, EU fisheries are governed by the [precautionary principle](#). The conservation of marine biological resources is one of the few exclusive

EU competences. Rules on fishing in marine waters therefore form the core of the CFP, while inland fishing, aquaculture, and the processing of fishery products fall under shared competence between the EU and its Member States.

To aid the recovery of the European eel stock, in 2007 the EU adopted [Council Regulation \(EC\) No 1100/2007](#) (the 'Eel Regulation') establishing measures for the recovery of the stock of European eel. It follows the scientific advice by the International Council for the Exploration of the Sea (ICES), which had recommended a recovery plan as a matter of urgency.

The regulation's central feature is the obligation for Member States to define their natural habitats for the European eel and to have an eel management plan (EMP) in place for these habitats.⁴

The EMPs pursue in particular the long-term aim of permitting the escapement to the sea of at least 40 % of the adult silver eel as compared with pristine conditions, i.e. the number of silver eels that would have made it to the sea if there were no human influence. Member States are free to determine which measures they will use to attain, monitor and verify the objective of 40 % silver eel escapement.

Possible measures are proposed in Article 2 of the regulation and include the following: reducing fishing activities; restocking (i.e. adding wild-caught glass eels to a waterbody from another source, to supplement existing populations); improving river habitats and removing migration barriers; transporting adult silver eels from inland waters to waters closer to their spawning area; combating predators; temporarily switching off hydro-electric power turbines; and aquaculture-related measures (for the latter, see text box).

Eels in aquaculture

Since eels cannot be reproduced in captivity, [eel farming](#) in aquaculture is based on catches of wild glass eels in nature and their use for further on-growing until they reach market size. Intensive production through recirculation technology, keeping water temperatures stable at around 24 °C, has become the overall production method. In 2021, European eel farming in the EU was [mainly](#) concentrated in the Netherlands, Germany and Denmark.

Moreover, the Council, in its annual regulations setting the fishing opportunities, adopts flanking measures such as temporal or spatial closures. In 2018, the Council adopted the first of a series of temporary eel fishing closures following a [joint declaration](#) on eel recovery. While the European Commission had initially [proposed](#) to prohibit any fishery of adult eels throughout the year, the Council agreed on a three-month closure for adult eels during the species' main migration period, to be determined by each Member State. The initial focus on adult eels has been extended in the following years to include fishing of migrating eels of all life stages.

In January 2023, the [closures](#) were extended to six months for commercial fisheries in EU waters. The relevant period was to be determined by Member States according to the main migration periods in their waters. Recreational eel fishing in EU waters has also been banned.

For [2024](#), the Council decided to continue the six-month closure for commercial eel-fishing activities during the main migration periods, and to maintain the ban of recreational fisheries.⁵ Certain exemptions enable Member States to allow eel fishing for 30 days during the peak migration period and the fishing of glass eels for restocking purposes for an additional 50 days during the migration period.

Since 2010, all trade in eel with countries outside the EU is banned, following the listing of the species under the Convention on International Trade in Endangered Species (CITES) in 2009 and the related [Council Regulation \(EC\) No 338/97](#).

Other pieces of EU legislation, as part of environment policy, cover measures relating to the protection of the different eel habitats. The Water Framework Directive and the Marine Strategy Framework Directive, in particular, require Member States to take action to ensure water quality and good environmental status in freshwater and marine ecosystems.

Member States' implementation measures

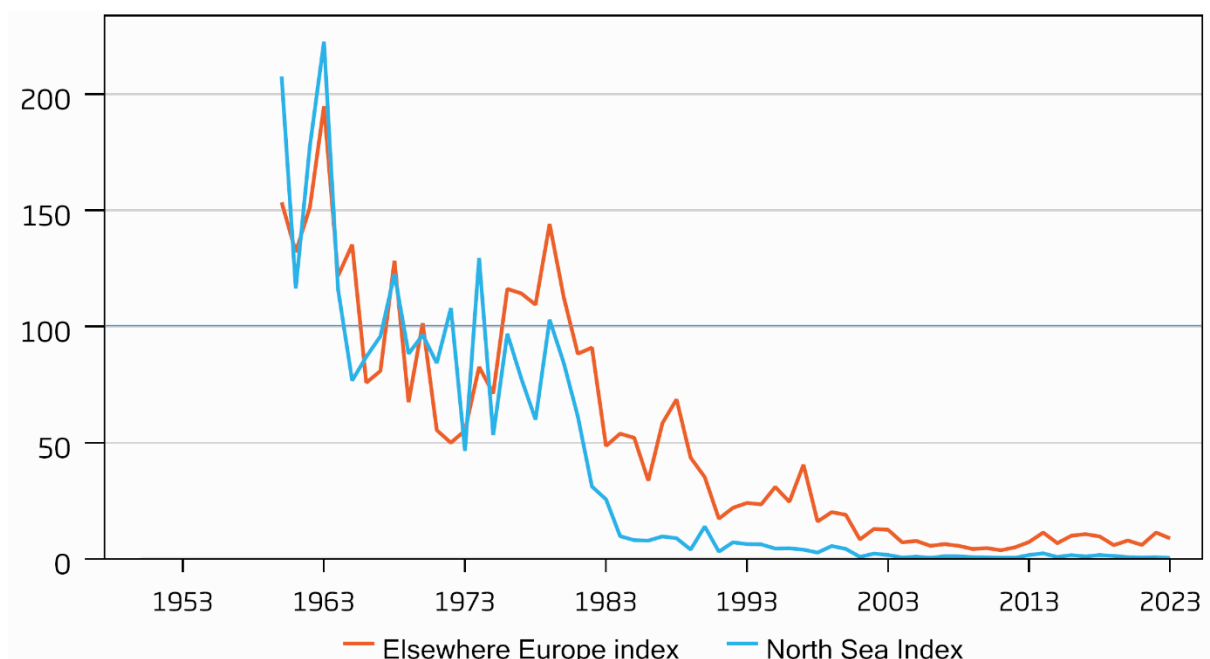
In its 2020 [evaluation](#) of the Eel Regulation, the European Commission concludes that the status of the European eel remains critical. According to the report, the regulation's main target – the escapement to the sea of at least 40 % of the adult silver eel – is far from being reached, and 'there is no evidence to suggest that the measures implemented by Member States have enabled significant progress towards this target'. While fishing activities in general have been restricted, the report highlights that catches of yellow and silver eels have declined, glass eel catches however are further increasing. Significant restocking efforts could not prevent further decline of the stock.

The report stresses in particular the very low level of the annual recruitment of glass eel to European waters, i.e. the number of individuals entering European waters, which in 2018 was 2.1 % of the 1960 to 1979 level in the North Sea area.⁶ According to the report, recruitment is at an all-time low, and exploitation of the stock currently unsustainable (see Figure 2).

The report also points to insufficient control of commercial and recreational fisheries and trade within the EU. Moreover, a considerable un-observed and un-estimated eel mortality through IUU fishing in EU waters can be assumed.

Regarding the implementation of the Eel Regulation at **Member State level**, the report points to significant delays and large discrepancies in terms of progress and approach, as well as a lack of data. The Commission states that Member States' focus broadly seems to have moved further towards fishing restrictions and away from non-fisheries measures.⁷ Improved passage at hydropower installations and other obstacles, as well as habitat improvement in general, have been planned to a lesser extent under the Member States' EMPs. The Commission also points out that restocking is a measure that features in many EMPs, while only six Member States have achieved their stocking target. It also underlines that the long-term use of restocking as a key conservation measure is questioned because of its uncertain contribution to spawner escapement and subsequent recruitment, as well as owing to the risks involved, for instance by introduced diseases.

Figure 2 – Level of glass eel recruitment (i.e. additions of individuals to the population) from 1960 to 2023, compared with a baseline with value 100 representing the 1960 to 1979 average



Source: ICES 2023 advice on European eel, [stock assessment graphs](#), 2023.

Overall, the Commission report stresses that the regulation's effectiveness in ensuring the recovery of the European eel is still far from certain. The report acknowledges, however, that a tangible recovery will take many decades, given the species' long life span.

In its [2022 evaluation](#) of the EU Member States' progress reports regarding the escapement target defined in the Eel Regulation, ICES concludes that no overall progress has been made. The organisation states that most interventions Member States have implemented are not expected to have a direct or quantifiable impact on increasing biomass and escapement, and/or reducing mortality.

Furthermore, a 2021 [report](#) by environmental organisation The Fisheries Secretariat (FishSec) on the implementation of the annual eel fishing closures concludes that the closures implemented in Member States are not in line with the intent of the law and thus do not protect the spawning migration. Only a few countries fulfil the measure's intent, i.e. to protect the mature silver eels on their way to the Sargasso Sea to reproduce. While the measure's effectiveness depends on the closures matching the eel migration periods, the report notes that in general terms, there is little or no correlation. Many fisheries still specifically target the migration of silver eels and/or the arrival of glass eels.

Economic impact

A 2019 [study](#) for Parliament's Committee on Fisheries (PECH) roughly estimates the loss of revenue for a total closure of fisheries in Europe (yellow, silver and glass eels) at approximately €50 million per year. A closure of the glass eel fishery would have a particular severe impact on aquaculture farms specialised in eel, which would have to be closed. A loss of aquaculture production would also affect fish processing companies, as these rely on fish from aquaculture.

For France, the economic impact on revenue of a seasonal shutdown of affected hydropower facilities has been estimated at between €127 million and €634 million. The possible cost of installing upstream and downstream eel migration equipment on hydropower facilities in France are estimated to range between €1 051.6 million to €3 110.4 million. The installation of migration equipment would be more cost effective after a five-year period.

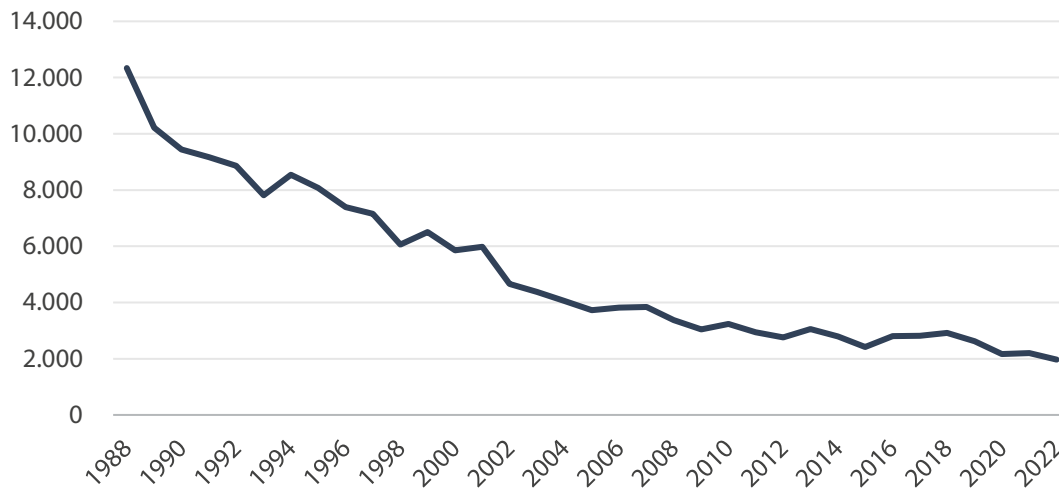
Eel landings

While the overall trend for commercial eel landings is decreasing, the total landings of yellow and silver eel in 2022 were still at around 2 000 tonnes (see Figure 3 below).

According to the EU's Market Observatory for Fisheries and Aquaculture Products ([EUMOFA](#)), [commercial landings](#) of eel in 2021 exceeded 100 tonnes for three EU countries: Denmark (230 tonnes), France (200 tonnes) and Poland (150 tonnes), and had increased considerably for Poland and Denmark compared with 2020. Glass eel landings are dominated by France, which is responsible for around 50 tonnes per year, or 90 % of the EU catch.

The Eel Regulation stipulates that 60 % of glass eel catches must be used for restocking.

Figure 3 – Commercial landings of yellow and silver European eel, 1988 to 2022 (aggregated total for 26 countries, EU and third countries, in tonnes)



Data source: [Report of the joint EIFAAC/ICES/GFCM Working group on eels](#), ICES, November 2023.

European Parliament position

In its [resolution](#) of 21 November 2023 on the implementation of the Eel Regulation, Parliament highlights in particular that the implementation measures taken at EU and Member State levels do not reflect the whole range of options available. According to the resolution, more work needs to be done on non-fisheries factors that have an impact on eel mortality, such as habitat loss or degradation, migration barriers, and illegal catches and trade. For instance, Member States are called on to remove obsolete dams and other barriers, or to create solutions that allow the species' migration. Parliament also points to existing options to make water pumps and hydropower stations passable for fish. Other factors, such as pollution, parasites and predators, should equally be tackled. Moreover, Member States are urged to update their EMPs regularly, given that the long-term target cannot be achieved with a one-time EMP. The resolution also highlights the lack of data arising from Member States' non-compliance with reporting requirements. Parliament calls on Member States to continue the practice of restocking as a necessary measure until the problem of migration barriers is solved. Parliament also suggests the establishment of an eel-specific expert group representing all relevant stakeholders.

In preparation of the resolution, the PECH committee in June 2023 organised a [public hearing](#) on the implementation of the Eel Regulation.

Back in September 2013, Parliament had adopted a [resolution](#) calling for new legislation to save the European eel stock. The resolution urged the European Commission to present a proposal, which should include sanctions against EU Member States that are slow to provide the data needed to assess the stock and measures to close loopholes in the current legislation.

As early as November 2005, in the light of the scientific advice, Parliament had adopted a [resolution](#) calling on the European Commission urgently to submit a proposal for a regulation for the recovery of European eel stocks.

Outlook

In its November 2023 [annual advice](#) on fishing opportunities, ICES reiterated that there should be zero catches in all habitats in 2024 and, in addition, that all non-fisheries-related anthropogenic mortalities should be zero. The organisation refers in particular to the application of the precautionary principle, which would not even allow restocking or aquaculture, as both measures rely on glass eel catches from existing stock.

In 2023, the European Commission published its [marine action plan](#) as part of the fisheries and oceans package. In the action plan, which aims to reconcile fishing activities and marine environment protection, the Commission urged Member States to improve conservation of the European eel stock. By the end of June 2024, Member States are asked to adopt or update existing EMPs in order to strengthen the conservation and management measures. The EMPs should address the impact of fisheries as well as non-fisheries-related factors. For the latter in particular, existing legislation, such as the Water Framework Directive, the Habitats Directive and the Marine Strategy Framework Directive, should be applied. The Commission underlined the necessity of further implementation efforts with a stronger focus on non-fisheries-related measures. The recovery of European eel is likely to remain an issue in the next parliamentary term, not least in the context of the wider debate on the future of the CFP and environmental protection policy.

MAIN REFERENCES

[Report of the Joint EIFAAC/ICES/GFCM Working Group on Eels](#) (WGEEL report), International Council for the Exploration of the Sea, November 2023.

[Research for PECH Committee – Environmental, social and economic sustainability of European eel management](#), Policy Department for Structural and Cohesion Policies, European Parliament, 2019.

ENDNOTES

- ¹ [Annex 7](#) to the 2023 WGEEL report p.15.
- ² The [AMBER](#) research project assembled 1.2 million instream barriers in Europe in its first comprehensive estimate of river fragmentation in Europe.
- ³ [Environmental, social and economic sustainability of European eel management](#), Policy Department for Structural and Cohesion Policies, European Parliament, 2019, p. 30.
- ⁴ Austria, Cyprus, Hungary, Malta, Romania and Slovakia are exempted, as their river basins or maritime waters cannot be identified as natural habitats for the European eel.
- ⁵ Applicable between 1 April 2024 and 31 March 2025.
- ⁶ 2018 [WGEEL report](#).
- ⁷ However, six EU countries still landed over 100 tonnes in 2022: the Netherlands, France, Germany, Denmark Poland and Sweden.

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