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Policy Brief

Östersjöcentrum | Stockholms universitet

Stop all fishing and restocking of European eel

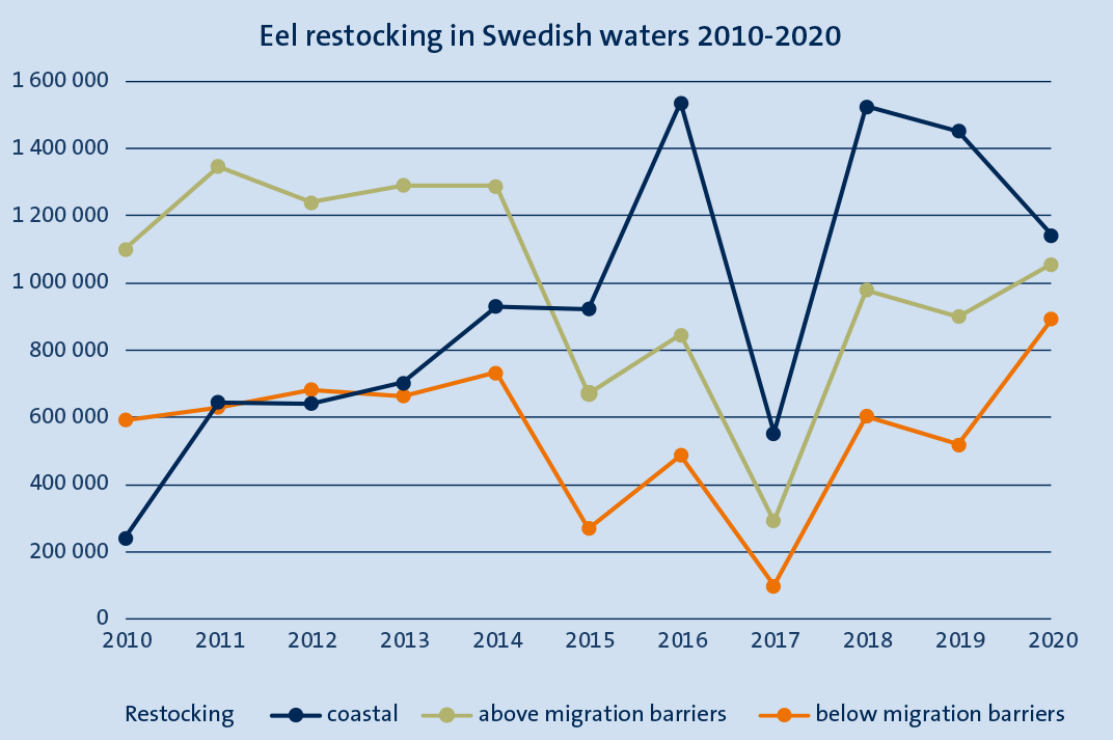
The European eel is under acute threat. Many of the measures that could help it are either missing or being implemented too slowly. The most important measures to promote the eel stock are to immediately stop all eel fishing and restocking of eel, and to intensify efforts to remove migratory barriers and open up migratory routes in inland waters.

All available data on the European eel (*Anguilla anguilla*) clearly show that the stock is in very poor condition. The species is red-listed as critically endangered by the International Union for Conservation of Nature (IUCN).[1] The International Council for the Exploration of the Sea (ICES) believes that the European eel population today is so decimated that all fishing, including glass eel fishing, should cease. ICES also notes that there is no scientific support for claims that restocking benefits the stock's ability to reproduce.[2]
At the same time, 6,000-7,000 tonnes of adult eel are killed annually (2020) in Europe's commercial eel fishery (including aquaculture).[3] That's the equivalent of six to seven million eels, who would otherwise have had a chance to reproduce. In addition, more than 100 million glass eels are caught annually, mainly for restocking in coastal and inland waters.[4]
Since 2010, a relatively large proportion of the restocking in Swedish inland waters has been done above hydropower and in ponds, where the eels have little chance of contributing to the spawning migration.

Restocking above hydropower

Between 2010 and 2020, an average of 2.5 million glass eels per year were restocked into Swedish waters, according to data from the Swedish University of Agricultural Sciences (SLU). About 40 percent of these were deployed in coastal waters and 60 percent in inland waters. The Baltic Sea Centre's analysis of Swedish restocking in relation to data from the SMHI's dam register, and the website vattenkraft.info, shows that over half (65%) of the restocking in inland waters was done in watersheds above hydropower plants or other power-related migration barriers.[5]
This means that about 40% of the total amount of glass eels that were restocked in Swedish waters in 2010-2020 were deployed in watersheds where they are threatened by fishing throughout their upbringing, and then run a very high risk of being killed by hydropower when they finally start migrating towards the sea.

In recent years, the proportion of restocking done in coastal waters has increased. In 2020, the largest share of the Swedish restocking (just over 1.1 million glass eels) was stocked in coastal waters where there is no hydropower. That same year, more than 1 million glass eels were restocked in inland waters above hydroelectric barriers, and about 900,000 glass eels in inland waters without power-related obstacles.



The analysis is based on restocking data from SLU. Information on hydropower plants and other power-related obstacles is from SMHI's dam register and the website vattenkraft.info. The material lacks detailed information on the operation and size of the individual power plants, as well as on possible eel conductors or other alternative eel migration routes.

Not a conservation measure

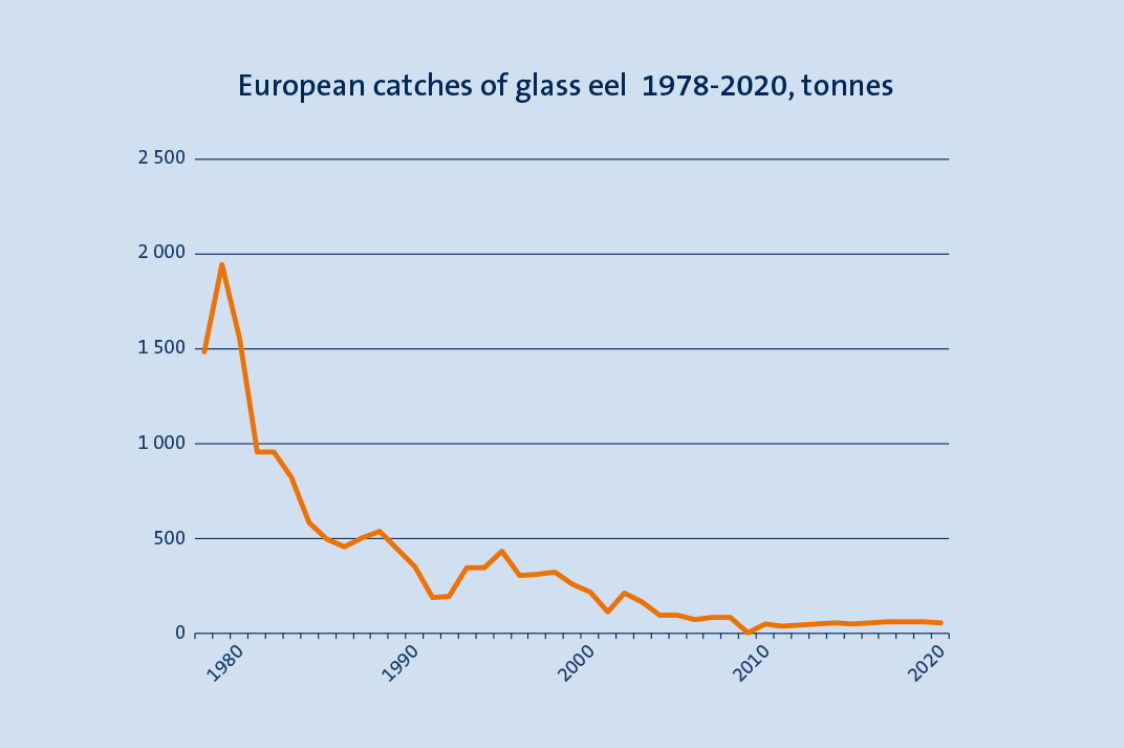
Eel restocking in Swedish waters has been going on since the early 20th century. For a long time, restocking was mainly based on young yellow eels that had been fished on the west coast. Nowadays, imported glass eels, fished mainly in the French Bay of Biscay, are used (after Brexit, imports from the British Severn ceased).

The purpose of restocking was previously to support inland fishing and biodiversity. Nowadays, it is primarily presented as a conservation measure to increase the emigration of silver eels in accordance with the EU Eel Regulation[6] and Sweden's National Eel Management Plan.[7] According to ICES, however, there is no scientific evidence that restocking will benefit the European eel population.

No surplus of glass eel

The system of eel restocking is partly based on the assumption that there is a large surplus of glass eels that die every year as hydropower and other human exploitation prevent them from swimming up to freshwater environments in, for example, the Bay of Biscay. With restocking, the surplus glass eels are "saved" by being transported to better growing environments in, for example, Swedish waters, where they can eventually contribute to the spawning migration. However, it is unclear whether such a surplus still exists.

The recruitment of glass eels reaching Europe's coastal waters from the Sargasso Sea has decreased by more than 90 %since the 1970s. I In the North Sea region, the decrease is more than 99%.[8] Glass eel catches have also decreased, which is a clear indication of reduced supply. At the end of the 1970s, 1,500-1,900 tonnes of glass eels were caught annually, which corresponds to at least 3-3.8 billion glass eels (calculated on the average weight of 0.5g/glass eel). By 2020, catches had fallen by up to 97%, to just under 60 tonnes[9], equivalent to 120 million glass eels. ICES now assesses that the eel stock is so weak that all fishing, including glass eel fishing for restocking, should cease.



Glass eel catches in Europe (France, The United Kingdom, Spain, Portugal and Italy). The decrease in catches of glass eels reflects the increasingly deteriorating status of the eel. Source: ICES

Difficult to navigate correctly

The glass eel fishery and stocking system may impair the ability of eels to return to the Sargasso Sea to reproduce. In 2021, new findings revealed that eels are likely to use the earth's electromagnetic fields to navigate.[10] As eel larvae drift with ocean currents towards Europe, their routes are imprinted in them by the magnetic field. When migrating back to the Sargasso Sea 10-15 years later, the eels follow their magnetic memory, but backwards, to find their way back, scientists say. If so, there is a risk that imprinting – and thus spawning – will be disrupted when eel larvae are caught and transported hundreds of kilometers for restocking.

The ability to spawn is also likely to be affected by where the eels are released. Eels released in Swedish inland waters flowing to the east coast of the Baltic Sea have difficulty finding their way back to the Atlantic Ocean. It has been shown by a tagging experiment in Lake Mälaren, where restocked eels did not even find their way back to the Baltic Sea.[11] In another tagging experiment in a lake on Gotland, restocked eels showed confused migration behaviour in the Baltic Sea.[12]

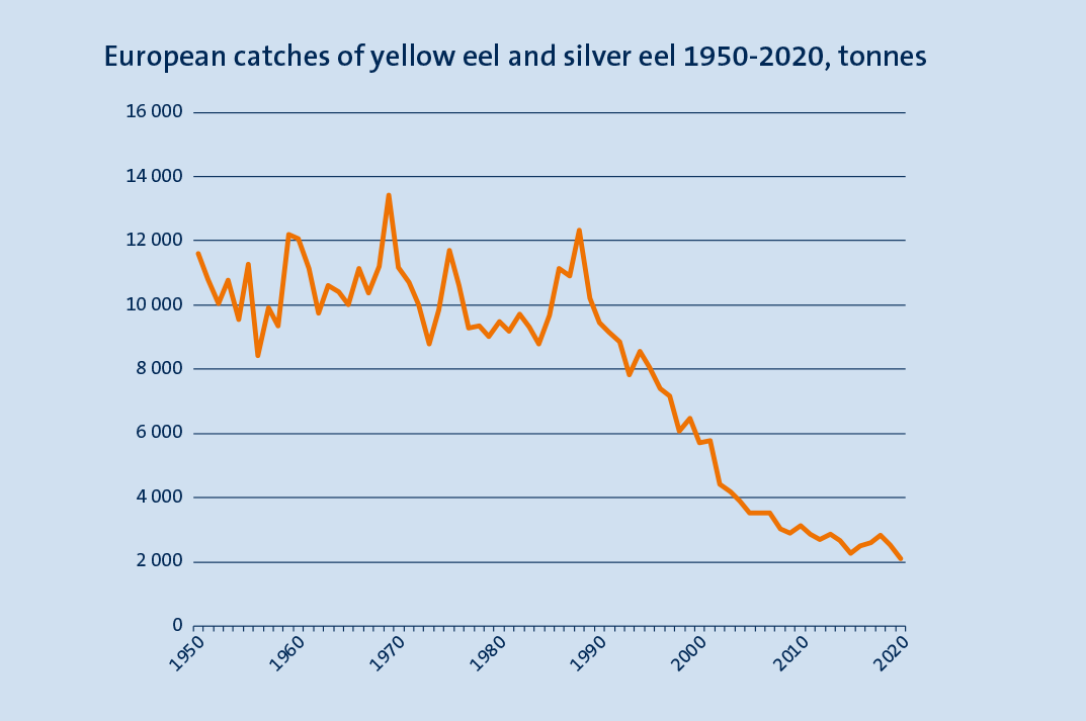
Since 2015, the largest proportion of Sweden's eel restocking has taken place in the sea – and on the west coast, where eel fishing has been banned since 2012. In a tagging trial in a river in Bohuslän (naturally immigrated eels) and in a river in Halland (both stocked and naturally immigrated eels), eels showed adequate out-migration behaviour to the North Sea. However, the results from the Halland river are uncertain as it could not be determined whether the eels that "swam correctly" were restocked or had migrated naturally.[13]

The myth of the catadromous eel

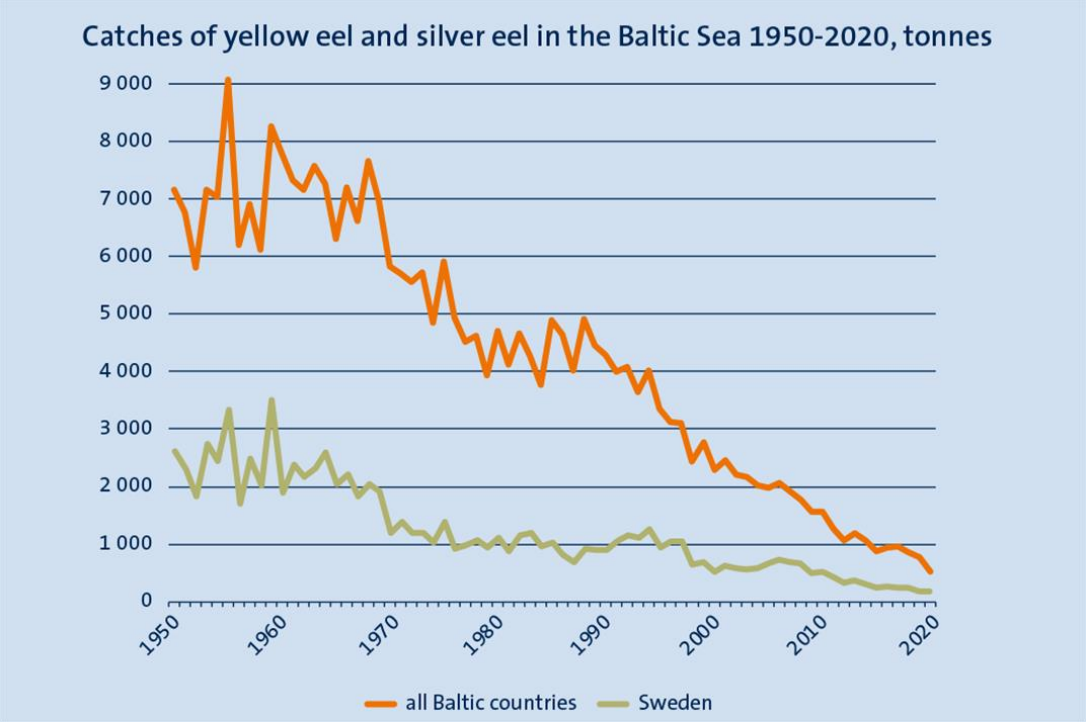
Eels are often referred to as a purely catadromous species, which must migrate up into freshwater to survive and grow. However, this is not the case. Emerging yellow and silver eels are also adapted to live in less salty seas. In fact, the majority of all eels that come naturally to Swedish waters do not migrate to freshwater. This is confirmed, for example, by an otolith study from Öresund and the west coast where most of the silver eels caught had lived all or almost all their lives in the sea.[14]

Most of the eel's habitats in Swedish inland waters were blocked in the late 19th and early 20th centuries when the rivers were used for hydropower. Thereafter, eels could no longer

migrate up (or down) in these waters. Despite this huge loss of freshwater habitats, large numbers of yellow and silver eels have been caught in the Baltic Sea and Kattegat/Skagerrak over the past 100 years.



Commercial catches of yellow and silver eels in Europe (including Turkey, Tunisia and Morocco) have decreased by about 80% in a few decades. Source: ICES



Total catches in Sweden, Finland, Denmark, Germany, Poland, Estonia, Latvia and Lithuania. In the Baltic Sea region, total catches of yellow and silver eel have decreased by just over 90% over the past 50 years, from around 7,500 tonnes per year in the 1960s to 533 tonnes in 2020. The downward trend for Swedish catches is somewhat weaker than for the Baltic Sea region as a whole. Source: ICES

Fix the hydropower and stop fishing

Opening up eel migration routes and freshwater habitats is an important long-term conservation measure - particularly along the west coast of Europe and in south-west Britain, where the largest numbers of glass eels arrive. In June 2020, the government decided to review the environmental permits for hydropower in Sweden.[15] Hopefully, this assessment will lead to more freshwater habitats being made available for migrating eels in the long term.

Most of the eels that migrate naturally to Sweden do grow up along the coast. But increasing the opportunities for eels to also migrate up into lakes and freshwater rivers would probably further benefit the stock and spawning migration - provided that no fishing is allowed either in inland waters or along the coast. This could be done, for example, by speeding up the demolition of dams and unprofitable hydropower stations and improving free migration routes both upstream and downstream of existing hydropower.

No restocking – less turbine mortality

Demolishing or rebuilding hydropower plants and restoring freshwater habitats is a slow and costly process, and should be focused primarily on rivers flowing into the West Sea and down to the Sound between Denmark and Sweden, where naturally immigrating eels arrive from the Sargasso Sea.

But the urgent situation of the eel stock also requires rapid action. The fastest and most effective measure to promote eel survival and reproduction is to stop all eel fishing, including glass eel fishing, in accordance with scientific recommendations.

Approximately 90% of all eels in Swedish inland waters are restocked eels.[16] Consequently, virtually all eels killed in hydroelectric turbines today are restocked eels. Without glass eel fisheries, eel stocking would also cease, which would lead to a dramatic reduction in eel mortality caused by hydropower.

POLICY RECOMMENDATIONS

- Stop all Swedish eel fishing immediately, in accordance with scientific recommendations.
- The Swedish government should promote an immediate end to all eel fishing in all EU member states.
- Stop import and restocking of glass eel in Swedish waters as long as there is no scientific evidence that glass eel fishing and restocking is not damaging neither eel spawning migration nor the European eel stock as a whole.
- Exclude restocking of eel from the list of priority measures in Sweden’s National Eel Management Plan, and review old water licenses that require eel restocking.
- Urgently implement the national plan for modern environmental conditions for the hydropower plants affected by it.
- Intensify regional and local efforts to remove migration barriers and open up migration routes for naturally migrating eels.

FACTS: Restocking of eel in Swedish waters

Every year, between 2.3 and 3 million glass eels are released into Swedish waters every year. Most of this restocking is done by the government, with funding from the European Maritime and Fisheries Fund (EMFF) as part of Sweden's National Eel Management Plan. IN 2021, no government-funded restocking was made, as that year was between two programme periods for co-financing from the EMFF. Other glass eel releases, both in inland waters and on the coast, resulting from old hydropower permits. Smaller quantities of glass eel are also released in some inland waters by individual owners of specific fishing waters, after authorization by the country administrative board.

FACTS:

Fishing kills more eel than hydropower

The Swedish Agency for Marine and Water Managment (HaV), and the Swedish University of Agricultural Sciences (SLU) estimate that Swedish hydropower killed about 93 tonnes of eel in 2020 (Aqua Reports 2020:12, SLU 2021). In the same year, Swedish eel fisheries killed in total 195 tonnes of eel (ICES, 2021).

Eels are farmed for food

Sweden and several other EU member states import large quantities of glass eel every year, which are grown to adult size in aquaculture farms and then killed and sold for food. The total production of European eel farms reached 8,000 – 9,000 tons per year in the mid-2000s. Then production fell to around 4 600 tonnes per year (2020), which corresponds to about 5 million adult eels (average weight of 1 kg/eel).
Source: Joint EIFAAC/ICES/GFCM Working Group on Eels (WGEEL) Volume 3 I Issue 85, ICES 2021)

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[1] IUCN (2020) https://www.iucnredlist.org/species/60344/152845178#assessment-information
[2] ICES advice on fishing opportunities for European eel (4 November 2021) https://www.ices.dk/sites/pub/Publication%20Reports/Advice/2021/2021/ele.2737.nea.pdf
[3] ICES advice (2021)
[4] ICES advice (2021)
[5] Stockholms universitets Östersjöcentrums analys av svenska ålutsättningar under perioden 2010-2020 bygger på data över utsättningar från Sveriges lantbruksuniversitet, SLU. Uppgifter om var vattenkraftverken och andra kraftrelaterade hinder är placerade är hämtade från SMHIs dammregister och webbplatsen vattenkraft.info. Materialet saknar detaljerade uppgifter om de enskilda kraftverkens verksamhet och storlek, samt om eventuella alternativa vandringsvägar.
[6] https://eur-lex.europa.eu/legal-content/SV/ALL/?uri=CELEX%3A32007R1100

[7] https://www.havochvatten.se/download/18.19fef33c13a77c96b19134a/1352105325201/nationell-alforvaltningsplan.pdf
[8] JOINT EIFAAC/ICES/GFCM WORKING GROUP ON EELS (WGEEL) Volume 3 I Issue 85 (ICES, 2021)
[9] ICES advice (2021)
[10] Durif, C. M. F. et al: *A unifying hypothesis for the spawning migrations of temperate anguillid eels* (Fish and Fisheries, 2021) https://onlinelibrary.wiley.com/doi/full/10.1111/faf.12621
[11] Sjöberg B et al: *Migration of eels tagged in the Baltic Sea and Lake Mälaren – in the context of the stocking question* (2016) https://onlinelibrary.wiley.com/doi/10.1111/eff.12296
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[13] Westerberg, H. et al: *Behaviour of stocked and naturally recruited European eels during migratio*n (Marine Ecology Progress Series 496:145-157, 2014)
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[14] Limburg et al: *Do stocked freshwater eels migrate? Evidence from the Baltic suggests "Yes"* (American Fisheries Society, 2003)
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[15] Havs- och vattenmyndigheten (HaV, 2021) https://www.havochvatten.se/vattenkraft-och-arbete-i-vatten/vattenkraftverk-och-dammar/nationell-plan-for-omprovning-av-vattenkraft/nationell-plan-for-omprovning-av-vattenkraft.html
[16] Aqua Reports 2021:12 Assessment of the eel stock in Sweden spring 2021 (SLU, 2021)
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