



Baltic Sea Brief

21 October 2021

Baltic Sea Brief 35: A collapse of herring could threaten the Baltic Sea ecosystem

The species affects both humans and the environment

It is hard to overestimate the importance of herring for the Baltic Sea and for Sweden. Herring is perhaps one of the most important species for the Baltic Sea ecosystem. It is a food source for fish, mammals, and birds, and is one of the most economically important species. But due to an intensive industrial fishing for animal feed, the herring is presently at a critical stage.

Despite the high risk, EU recently decided, with the support of Sweden, to continue to allow large-scale fishing for herring next year. In addition to the sharp decline of the stock, assessments of the herring stocks are also uncertain, and neither the effects of climate change nor the effects of the high fishing pressure on the ecosystem are known. However, there is no doubt that the sharp decline in herring affects, for example, salmon, cod, and seals.

This is not the first time that a species has been overfished in front of researchers, authorities, and politicians. The cod in the eastern Baltic Sea has already collapsed, and the western cod stock is now close to collapse. The salmon, vendace, eel, and trout are at risk, or already extinct in many places, and we see worrying signs for the pike. The question is when the management will focus on building up fish stocks, instead of continuing to weaken them.

The development of herring in comparison with earlier all-time high

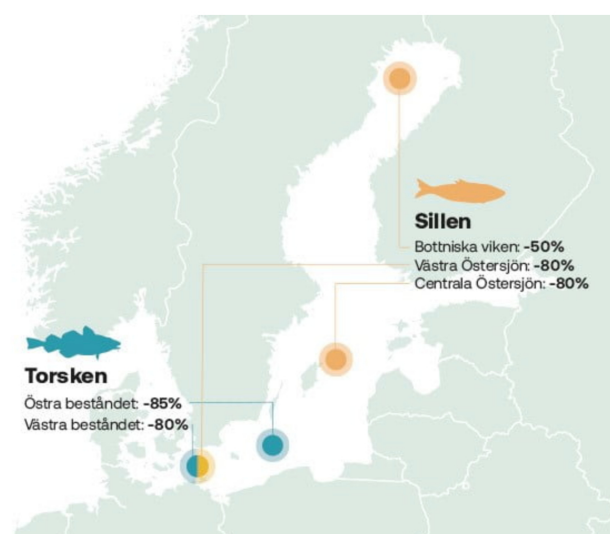
- In the central Baltic Sea, the herring stock has decreased by more than 80 percent compared with the 1950s. In the western Baltic Sea, the stock has decreased by more than 90 percent.

1970s. Over the past four years, the stock has declined by 40 percent, and is now at a critical stage.

- In the Gulf of Bothnia, the herring stock has decreased by more than 50 percent since the early 1990s.
- In the western Baltic Sea, the herring stock has decreased by more than 80 percent since the beginning of the 1990s.

The development of other Baltic Sea stocks

- **The western cod stock:** the stock has decreased with over 80 percent since the end of the 1990s.
- **The eastern cod stock:** the stock has decreased with 85 percent since the 1990s. A fishing ban was introduced as an emergency measure in 2019.
- **Salmon:** the catch has decreased from over 1.2 million salmon in 1990 to about 180 000 salmon in 2019, and ICES recommended a fishing ban for salmon in 2022.
- **Eel:** during the 1950- and 60s, around 2500 tonnes of eel were caught. Today, around 85 tonnes of eel are caught, and the fishing goes against the researchers' advice.
- **Perch:** three of twelve sample areas showed negative trends between 2002-2019, while the remaining nine were stable.
- **Pike:** the pike stocks along the Baltic Sea coast have [decreased with 90 percent](#) during the 2000s.



"Torsken" = Cod: Eastern cod stock -85%, Western cod stock -80%

"Sillen" = Herring: Bothnian Bay -50%, Western Baltic Sea -80%, Central Baltic Sea -80%

The herring fisheries impact on other species

A lost herring stock in the Baltic Sea would cause even larger consequences than the cod collapse. Herring is the engine of the Baltic Sea ecosystem, and the high fishing pressure on herring, that has moved closer to the coast, has a large impact on other species. [A study](#) shows, for example, that high fishing pressure on herring in the northern Baltic Sea can have major effects on the salmon fishery and its profitability, leading to a salmon fishery close to zero some years. Since herring is the main food source for amongst other seals, salmon can become a new target species when the seal seeks other food sources due to reduced herring stocks. The same reason is believed to contribute to [the sharp decline in pike stocks](#) in the archipelago in recent years, a development that Stockholm's County fisheries consultant Henrik C Andersson calls "an ecological disaster". Herring is also the main food source for porpoises, seabirds, and cod, and plays thus a major role in the recovery of cod stocks.

As herring stocks decrease, the food sources that herring normally eats increase. This development can be beneficial to other species, such as stickleback, as it competes for food with herring. In recent years, there has been a stickleback "explosion", a phenomenon that the [SLU Aqua researcher Ulf Bergström compare with "grasshopper swarms"](#). The stickleback eats other species' eggs and larvae which in turn can affect these stocks negatively – such as pike and perch. The dominance of sticklebacks in the ecosystem is looked upon as a regime shift, a tipping point, in the Baltic Sea, in addition the species also benefits from eutrophication, climate change and the shortage of cod.

A short-sighted management based on great uncertainties

When fishing quotas are decided, one rarely takes into account how one species affects other species, but the fishing is based on the idea of maximum catch on each specific commercial species. It is not uncommon to set the level above the scientific estimates, above the stocks reproductive capacity, even though scientific

models have the tendency to [overestimate the stocks](#) in the Baltic Sea.

The International Council for the Exploration of the Sea ICES estimated for example spawning biomass of herring in the central Baltic Sea (2017) to 1.3 million tonnes, but an update of the models this year (2021) showed that the spawning biomass never was that large. According to the revised estimate, the spawning biomass in 2017 was below 600,000 tonnes. The industrial fishing took a third of the entire herring stock in the central Baltic Sea that year. In addition, there is natural mortality due to diseases and predation by amongst others, seals, cormorants, porpoises, and cod. Now, four years later, the biomass of herring in the central Baltic Sea is estimated to 365,000 tonnes. The level is among the lowest in history.

Furthermore, the management does not consider the impact of climate change, despite that studies show that warmer water can, for example, affect [the fish size, migration](#), and [reproductive capacity](#) of herring. A few years ago, the Swedish Agency for Marine and Water Management carried out [an evaluation](#) of how climate change can be integrated into the management, but this has not yet been implemented.

Despite the fact that researchers and environmental organizations have highlighted the fisheries management's problems for years, little has happened to change the situation. The protection of Baltic Sea species and future fishing has been, and continues to be, a non-priority issue for our authorities and politicians. In recent decades, we have seen stock after stock drastically decline or collapse. An ecosystem-based management that protects viable stocks, acknowledging climate change, different populations, and species interactions, needs to be introduced promptly. Otherwise, the Baltic Sea ecosystem may change fundamentally.

The sensitive Baltic Sea ecosystem

When key species drastically decline or are wiped out, cascade effects can occur in other parts of the ecosystem. The decrease of key species in the Baltic Sea has had major consequences. Amongst others, [the cod collapse has caused more algal blooms](#), as lack of predatory fish has affected the food web all the way down to the plankton level.

Overfishing of cod, together with climate change, has led to [a tipping point in the Baltic Sea ecosystem](#). The species has passed a stage where it is no longer certain that the stock can recover – despite major efforts. A similar situation has been seen among [cod stocks in the North Atlantic](#), where the management has failed to contribute to a recovery of the collapsed stocks despite several years of measures with reduced fishing pressure or fishing bans.

The Baltic Sea, unlike the North Atlantic, is a shallow inland sea with a large surrounding population, generating a huge pressure on the sea. It makes the sea particularly vulnerable to climate change, oxygen deficiency, eutrophication, and contaminants. The Baltic Sea is also species-poor, implying that few species can replace other species' place and function in the ecosystem, which makes the situation extra vulnerable.

It is important to protect the ecosystem and its biodiversity as it provides the sea with a better resilience to environmental changes. The decline in fish stocks not only causes major changes in the ecosystem, but has also economic, social, and cultural effects for communities that depend on fishing or fishing tourism.



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