Small fish with a big impact

The Baltic Sea is home to two main species of forage fish: European sprat and Atlantic herring. These small, pelagic fish are crucial to the region; they play a key role in the marine ecosystem while also representing significant economic value for the fishing and processing sector. However, three of the four herring stocks have been in decline, with western Baltic herring in particularly poor condition. More recently, the Baltic sprat population has had several years of very low recruitment.

A new scientific report published by FishSec emphasises the key role that small pelagic fish - forage fish - play in the Baltic Sea, showing that changes in their stock status have not been sudden but rather the result of ongoing longer processes, driven by high fishing pressure in combination with other factors such as increasing water temperatures, lower salinity and changes in food availability. This decline is affecting both the Baltic ecosystem and the fishing sector in the region. Most of the sprat catch is destined for industrial processing rather than direct human consumption, while herring is used both for human consumption and for fishmeal and fish oil production, particularly as feed in aquaculture.

The report summarises current knowledge on forage fish in the Baltic Sea. Based on an extensive review of scientific literature and reports, it provides an overview of population health and the significance of sprat and herring stocks. The report includes:

- An examination of stock status and the vital role of forage fish in the Baltic sea ecosystem.
- An overview of pressures affecting their populations.
- A brief review of the EU fisheries management and implementation of key existing EU fisheries rules.
- Suggested policy measures for improved forage fish management.

Key findings

Herring and sprat are two of the main fish species in the relatively species poor Baltic Sea. These populations are distinct and uniquely adapted to the brackish waters of the Baltic. As prey for top predators such as cod, salmon, seabirds and marine mammals, and as predators of zooplankton, sprat (*Sprattus sprattus*) and herring (*Clupea harengus*) occupy a pivotal position in the Baltic Sea food web. Of the four herring stocks, only the small Gulf of Riga stock appears healthy and more stable, whereas Gulf of Bothnia and Central Baltic stocks have experienced steep declines. The western Baltic spring-spawning herring is at a critically low level and the International Council for the Exploration of the Sea (ICES) has recommended zero catch for this stock since 2019; while this was largely followed in the Baltic management area, catches remained far too high in the Kattegat and Skagerrak, preventing a recovery of the stock.

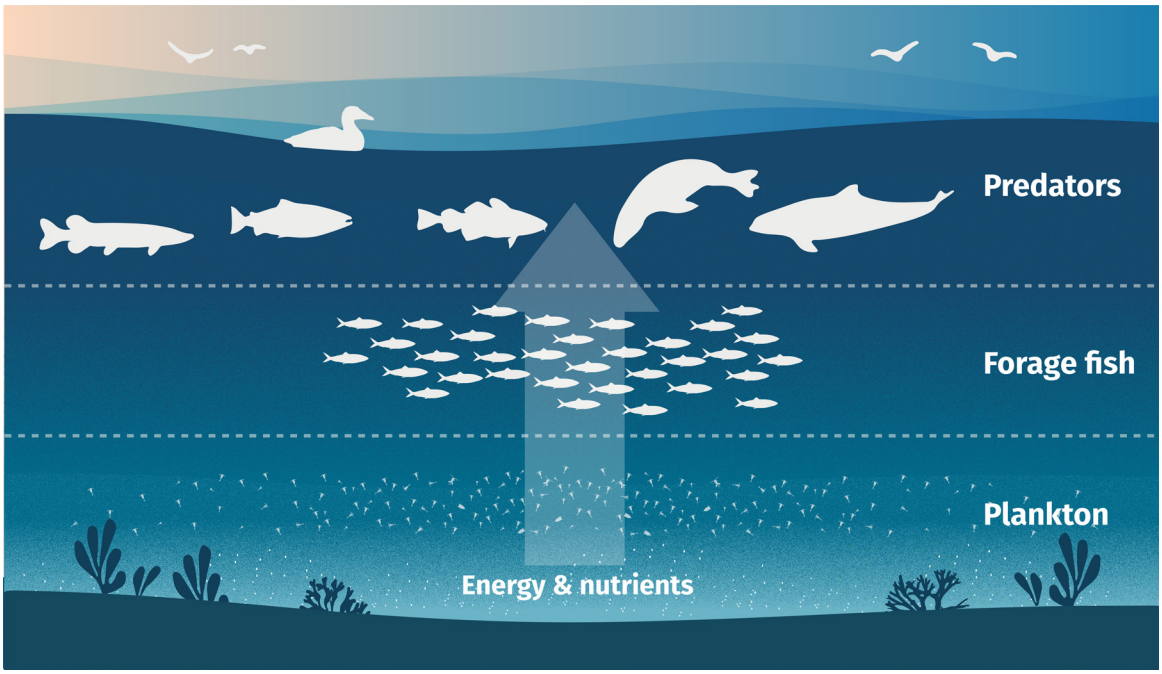
Sprat, managed as a single stock, increased during the 1990s and remained relatively stable until recently. However, due to very low recruitment from 2021 to 2023, the stock has recently declined.

Pivotal role in the ecosystem

Much of the scientific literature focuses on the relationship between forage fish and their predators, as well as on their role in transferring energy and nutrients from lower to higher trophic levels. In addition to their key role as prey, sprat and herring are planktivores that act as a link for energy and nutrients between tiny plants and animals and large predators. This underscores their central role in the marine ecosystem. The health of forage fish populations is critical, not only for their own sustainability but also for the broader marine ecosystem. Larger herring may also act as piscivores, potentially helping to regulate the increasing stickleback population. This is important as stickleback numbers have surged largely because of a lower predation pressure and favorable environmental changes.

Stressors

Beyond periods of intense fishing pressure, several other factors have affected forage fish in the Baltic Sea. These include climate-driven



Forage fish play an important role in the Baltic Sea ecosystem as prey for a range of predators and by transferring energy and nutrients from lower to higher trophic levels.

changes in water temperature, salinity and stratification, eutrophication, habitat degradation and pollution - all of which affects the health of forage fish populations. The availability, size and species composition of zooplankton also have direct effects. Moreover, competition among planktivores, egg predation and interactions with the growing stickleback population and invasive species can all simultaneously impact the health and condition of sprat and herring populations.

Climate change, as described above, is a stressor to all marine life and reduces overall ecosystem resilience. In the shallow, enclosed Baltic Sea, these effects are especially pronounced, particularly for cold-water species sensitive to warming and reduced salinity. This makes efforts to reduce human pressures and restore weakened fish populations even more urgent.

Forage fish management

All Baltic Sea fish populations targeted by commercial fisheries are managed under EU laws, governed by the EU's Common Fisheries Policy (CFP). Despite legal obligations to restore stocks to biomass levels above Maximum Sustainable Yield, political decisions have resulted in stocks remaining near or below the limit biological reference point for spawning stock biomass (B_{lim}), increasing the risk of collapse and failing to meet legal obligations under both the Baltic Multiannual Plan and the CFP. For example, the agreement on quotas for 2024 for Central Baltic and Bothnian herring did not comply with the safeguard set out in the multiannual plan, which aims to keep the probability of stocks falling below critical spawning stock biomass limits (Blim) to less than 5%.[1] Scientific advice indicated that even zero catch of the CBH and GoBH stocks would not meet this threshold, yet fishing limits were set above precautionary levels. Prematurely increasing fishing quotas before fish populations have fully recovered to healthy levels is short-sighted and jeopardises these vulnerable stocks.

Key recommendations

Considering the importance of forage fish in the Baltic Sea ecosystem, implementing ecosystem-based management strategies is imperative to restore ecological resilience and ensure the sustained delivery of socio-economic benefits. To achieve these objectives, we recommend the following policy interventions:

1. Precautionary fishing limits

- Reduce fishing limits well below FMSY to account for ecosystem uncertainties, species interactions and catch misreporting.
- Maintain precautionary fishing limits until spawning-stock biomass is at healthy levels for at least three consecutive years. Premature quota increases risk setting back fragile stock recovery.
- Always set fishing limits in line with the legal provisions, including Article 4.6 of the Baltic Multiannual Plan, which ensures that the risk of stocks falling

1 Article 4.6 of the Baltic Multiannual Plan

below critical levels (below Blim) is less than 5 %.

- Address bycatch issues, such as the western Baltic herring catches in the North Sea herring fishery, through area-specific and seasonal fishing restrictions.

2. Initiate Stock Recovery Plans

- Prioritise the three vulnerable Baltic herring populations for immediate, time-bound recovery plans.
- Consider following the ICES guidance,2 by using specific biomass thresholds that trigger recovery measures, and setting shorter recovery target timelines to allow for rapid stock recovery.

3. Preserve the genetic diversity of herring populations

- Shift from single-stock to population and sub-population levels management by developing strategies for Central Baltic and Gulf of Bothnia herring that divide current Total Allowable Catch into multiple, spatially explicit management units aligned with documented genetic population structure to protect vulnerable and distinct spawning components.
- Increase research on the distinct population structures and genetic diversity of Baltic forage fish.
- Set fishing limits and implement measures that rebuild a healthy age and size structure of forage fish populations, as required by the EU Marine Strategy Framework Directive.

4. Protect and restore critical spawning habitats

- Implement habitat restoration in known spawning grounds and nursery habitats.
- Use spatial measures/seasonal closures in the relevant areas during spawning periods.
- Promote further scientific research into spawning periods and areas for sprat and herring populations.
- Collect improved data on migration routes, growth and maturity differences among the various spawning components and sub-populations to tailor local conservation measures.

5. Improve compliance, monitoring and data quality

- Fully implement and enforce the Landing Obligation and catch reporting rules.
- Make Remote Electronic Monitoring (REM) on vessels mandatory.
- Implement independent port sampling and weighing with third-party inspectors for pelagic vessels to mitigate catch misreporting.

6. Continue research and monitoring of environmental stressors, diet and food web interactions

- Perform continuous studies on diet preferences for herring and sprat, and competition between them. Introduce regular monitoring of plankton, as availability, distribution and species composition of large zooplankton, for example, affect the size and condition of herring.
- Continue to study the interaction with sticklebacks and effects of the surge in their numbers (as prey for large herring, as predators of eggs, and as competitors).
- Continue research on the effects of climate change and eutrophication on recruitment, health and condition of sprat and herring.
- Update and improve data related to natural mortality to account for ecosystem changes, such as decreased cod predation, and adjust the assumed natural mortality currently used in ICES stock assessments accordingly.

2 ICES. 2023. Workshop on guidelines and methods for the design and evaluation of rebuilding plans for category 1-2 stocks (WKREBUILD2).

7. Shift to an ecosystem approach to fisheries advice & address knowledge gaps

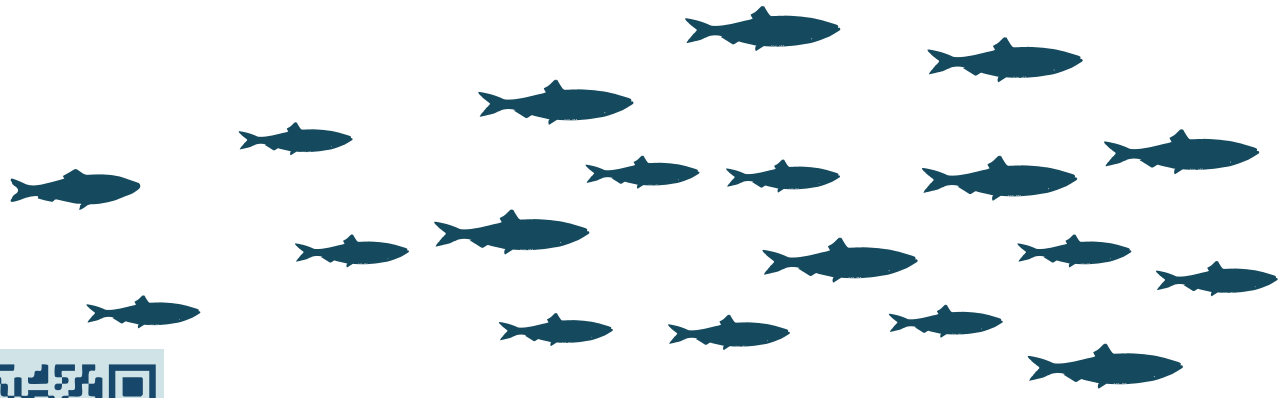
- Expand the request for ICES advice beyond single-species catch limits to incorporate multi-species ecosystem interactions.

- Improve the structure of scientific advice on fishing opportunities to better highlight the uncertainties and risks.

Change the request for ICES advice on fishing opportunities to:

a) aim for rapid recovery of fish populations, particularly depleted or at-risk stocks, within a concrete timeframe and for maintaining them above sustainable levels in the near future,
b) ensure that the headline advice is in line with legal obligations,
c) prevent or minimise the risk of fish populations falling below safe biological limits, consistent with the legal so called "5% rule" in the Baltic multiannual plan,
d) fully reflect ecosystem dynamics and needs, as well as multispecies considerations,
e) deliver on all relevant elements of Good Environmental Status under the Marine Strategy Framework Directive, such as healthy population structures and/or food web integrity (i.e. leaving enough food in the sea for other marine life), in line with an ecosystem-based approach to fisheries management, and
f) provide sufficiently precautionary alternative catch options where a full incorporation of these aspects is not yet possible, to minimise risks to stocks and the overall ecosystem.

Considering the current state of the Baltic Sea ecosystem, the overall decline that can be seen in many species and the continued issues related to climate change and other stressors in the region, key species such as the unique forage fish populations adapted to the particular brackish waters of the Baltic Sea need to be managed in a much more precautionary way that ensures resilience. Improved management of Baltic sprat and herring stocks offers clear benefits, not only for the health of the Baltic Sea ecosystem and the recovery of its predators, but also for the viability of fisheries in the long term.



Download the full report and read more about the project here or by scanning the QR code

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THE FISHERIES SECRETARIAT

FishSec is an independent non-profit organisation dedicated to the protection and restoration of marine ecosystems, with a focus on fisheries. We advocate for fisheries within the limits of the marine ecosystem, preserving marine resources as well as their habitats. This report was funded by The Swedish Postcode Lottery Foundation as part of the project "Small Fish – Big Impact, The importance of forage fish" and by the Swedish Agency for Marine and Water Management.