

Helcom ENCLIME - Coastal fish

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Effects of climate change on the Baltic Sea ecosystem

- In relation to different primary parameters
- Where is the change seen first? Is it already happening?
- What is expected to happen?
- Confidence
- All fish communities in the Baltic, divided on:
 - Demersal
 - Pelagic
 - **Coastal**
 - Migratory
- Other drivers, Knowledge gaps, Policy relevance

Climate change effects

Primary parameters:

1. Water temperature
2. Large Scale Atmospheric Circulation
3. Sea ice cover
4. Salinity and saltwater inflow
5. Stratification and ocean circulation
6. Changes in carbonate chemistry
7. Sea level and sea level extremes
8. Solar radiation and cloudiness
9. Wind and wind extremes
10. Precipitation and extreme events
11. Waves and extreme events
12. Sediment transportation
13. Run-off and extreme events
14. Riverine nutrient loads and atmospheric deposition (incl. dissolved organic matter and nutrients)



Where is the change seen first? Is it already happening?

High confidence:

Strong year classes of coastal fish stocks and increased body growth at smaller sizes with increased temperature

The exception is vendace



What is expected to happen?

Water temperature

High confidence:

Increased growth of younger/smaller fish, increased recruitment. Many coastal species prefer waters $> 18^{\circ}\text{C}$

Medium confidence: Earlier outward migration from beaches .

Low confidence:

Increased temperature facilitate resistance against pathogens



What is expected to happen?

Salinity and saltwater inflow

Low confidence:

Except vendace, salinity levels <6 PSU has little effect on growth, and abundance.

Salinity contract spatial areas for reproduction.



What is expected to happen?

Sea ice cover

Medium confidence:

Reduced distribution of vendace due to reduced ice cover.



What is expected to happen?

Riverine nutrient loads and atmospheric deposition

Medium confidence:

Decreased body growth of perch in darker waters



Other drivers

1. Fishing pressure locally high
2. Destruction/degradation of habitats in the coastal zone
3. Local eutrophication
4. Cormorants-seal impacts
5. Toxins and pharmaceutical residues

Knowledge gaps and policy relevance

1. Covariation of primary parameters, what drives what?
2. Interactive effects between climate changes and other human pressures
3. Some 1st parameters poorly studied, e.g. ice cover, brownification
4. Importance of extreme-events relative average changes
5. Management plans need in the future to be adaptive and adjustable fishing closures, protected areas to mitigate climate change effects on fish. Especially should extreme events trigger actions for recovery of fish populations.
6. Include climatic variation in reference levels and assessments of coastal fish, work in progress



**Thanks for listening and following
contributors**

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Next step?