

Climate-related Change in Marine Ecosystems

3) Consequences of Climate Change - Fish, Marine Mammals and Birds



Fig. 1: Cod, herring and sprat are the predominant pelagic fish species in the Baltic. Photo: Juha Kääriä.

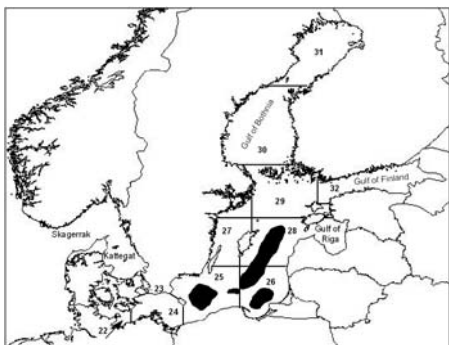


Fig. 2: Salinity determines the spawning areas (reproductive volume) of the Baltic Cod.

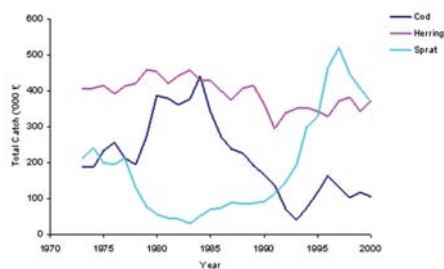


Fig. 3: Sprat stocks have increased, possibly due to decreased predation by cod or increased crustacean zooplankton, or both.

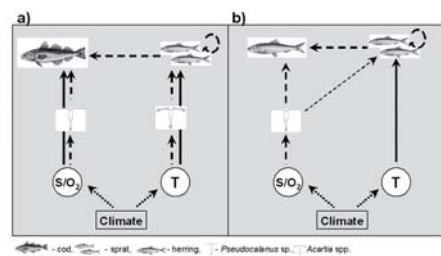


Fig. 4: Conceptual model of climate effects on recruitment (a) and growth (b) of Baltic fish stocks. Dotted arrows – effect of climate on hydrography, dashed arrows – indirect effects, and solid arrows direct effects; S – salinity, O₂ – oxygen, T – temperature.

Fish and Fishing - Background

- Fishing is the largest impact by humans
- Biodiversity of fish communities is much lower in terms of species richness than in other marine areas
- Low salinity imposes a physiological stress
- Fishing can reduce genetic variability

Fish

- Climate affects recruitment
- Decreasing reproductive volume cause poor cod egg survival
- Growth rates depend on the quality of available food, e.g. zooplankton, which in turn is regulated by climatic factors such as salinity and temperature
- High fishing pressure in combination with climate change (low salinity, low oxygen) results in a collapse of cod population due to poor egg survival
- Reproductive volume is essential for egg survival
- The abundance of marine mammals has been drastically reduced which possibly led to an increase in the biomass of the Baltic fish community

Marine Mammals

Sea ice extent, length of ice season and surface water temperature are essential for the survival of the stocks.

Species:

- Harbour porpoise
- Harbour seal (land breeder)
- Baltic ringed seal (ice breeder)
- Grey seal

- ACIA (Arctic Climate Impact Assessment) report predicts a poleward shift in arctic species distribution
- Harbour and grey seal increase, ringed seal decrease

Birds

- Distribution ranges during breeding and non-breeding seasons affected
- Abundances during breeding and non-breeding seasons affected
- Evolutionary trait changes
- Migratory routes and stopover sites affected
- Timing of spring and autumn migration affected
- Migratory tendencies within species/populations changed
- Short distance species are „winners“
- Long distance migrants are „losers“



Fig. 5: The weight at age of Baltic herring has decreased due to changes in its food, crustacean zooplankton or due to competition for food, or both. Photo: Juha Kääriä.



Fig. 6: Harbor porpoise is the only cetacean species in the Baltic. Photo: Antti Halkka.



Fig. 7: Grey seal stocks have increased due to ban of hunting, and decreased levels of contaminants. Photo: Antti Halkka



Fig. 8: The Baltic Sea is an important migratory route between North Sea, White Sea and Siberia. Tens of millions of birds migrate through it twice a year. Some birds nesting in the Baltic also migrate considerable distances. Finnish ospreys over-winter in Africa and Arctic terns may spend the austral summer in Antarctica.