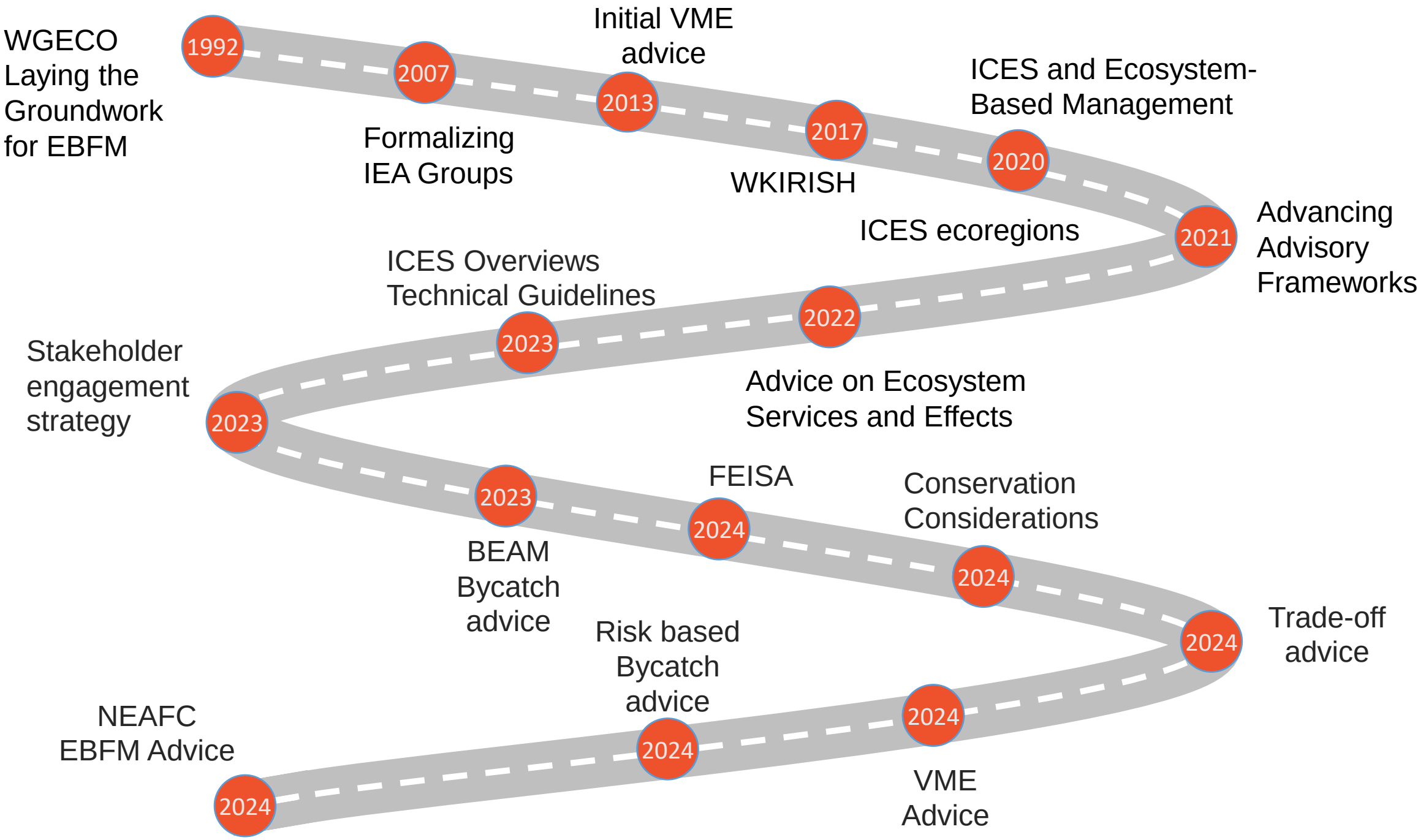
ICES
CIEM

VISION

To be a world-leading marine science organization, meeting societal needs for impartial evidence on the state and sustainable use of our seas and oceans.

MISSION

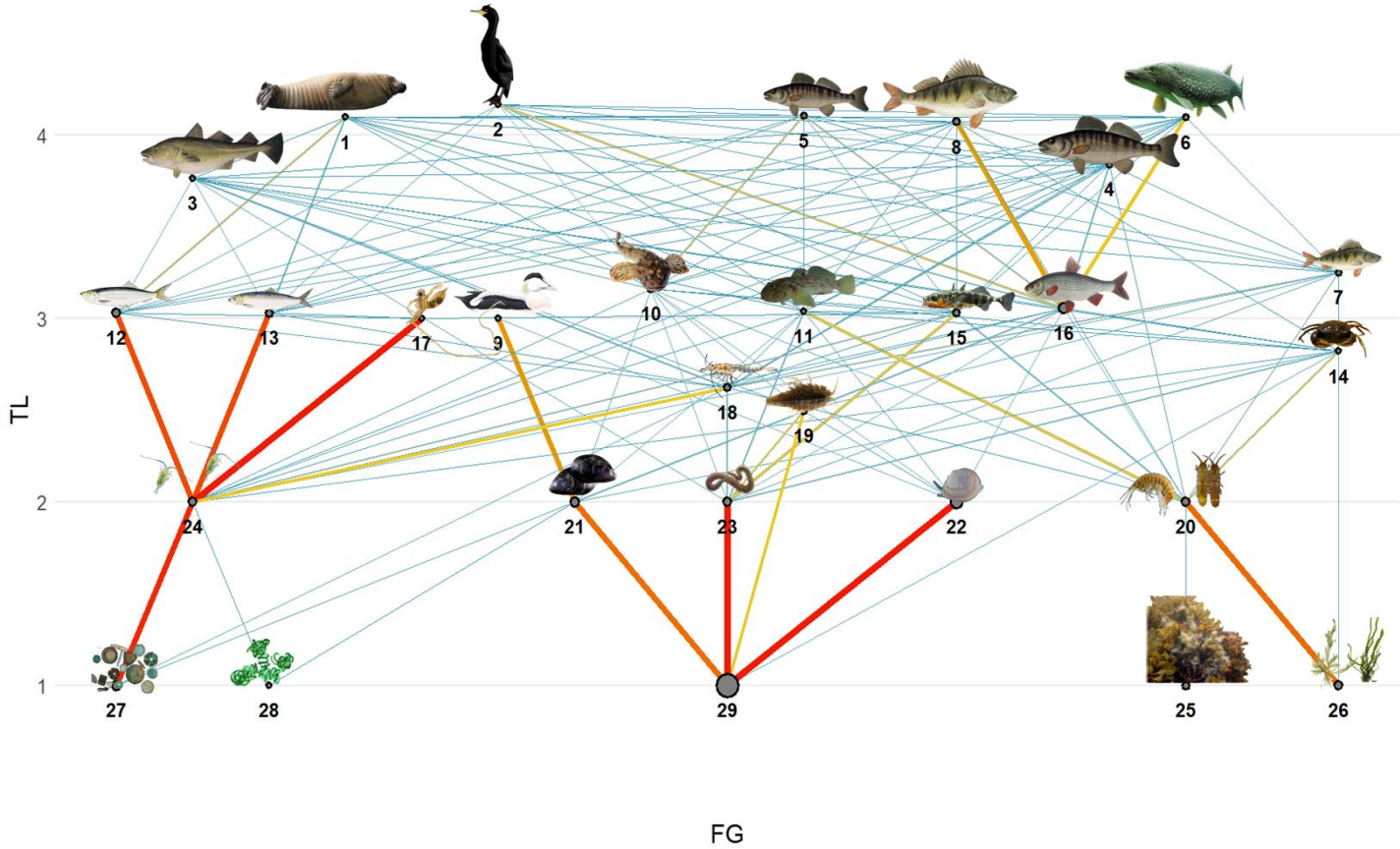
To advance and share scientific understanding of marine ecosystems and the services they provide and to use this knowledge to generate state-of-the-art advice for meeting conservation, management, and sustainability goals.


WGECO
Laying the Groundwork for EBFM
1992
2007
Formalizing IEA Groups
Initial VME advice
2013
2017
WKIRISH
ICES and Ecosystem-Based Management
2020
ICES ecoregions
2021
Advancing Advisory Frameworks
ICES Overviews Technical Guidelines
2023
2022
Advice on Ecosystem Services and Effects
Stakeholder engagement strategy
2023
2023
BEAM Bycatch advice
FEISA
2024
Conservation Considerations
2024
Trade-off advice
2024
Risk based Bycatch advice
2024
2024
VME Advice
NEAFC EBFM Advice
2024

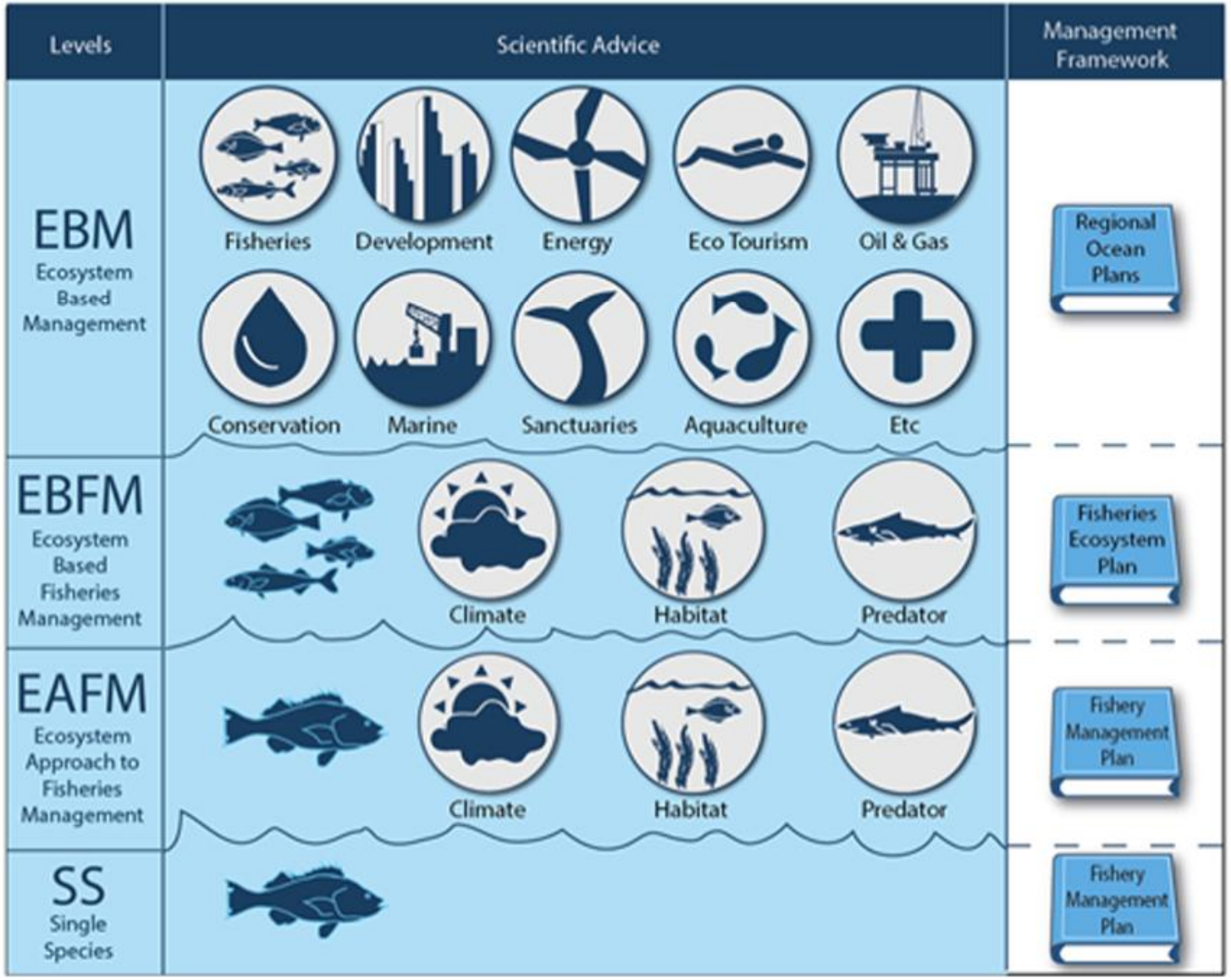
WGIAB – Integrated assessments of the Baltic Sea

- Produce science to promote **adaptive and holistic marine management** strategies in the Baltic Sea

- Analyse long-term trends and develop methods and tools for integrated assessments.



Definitions



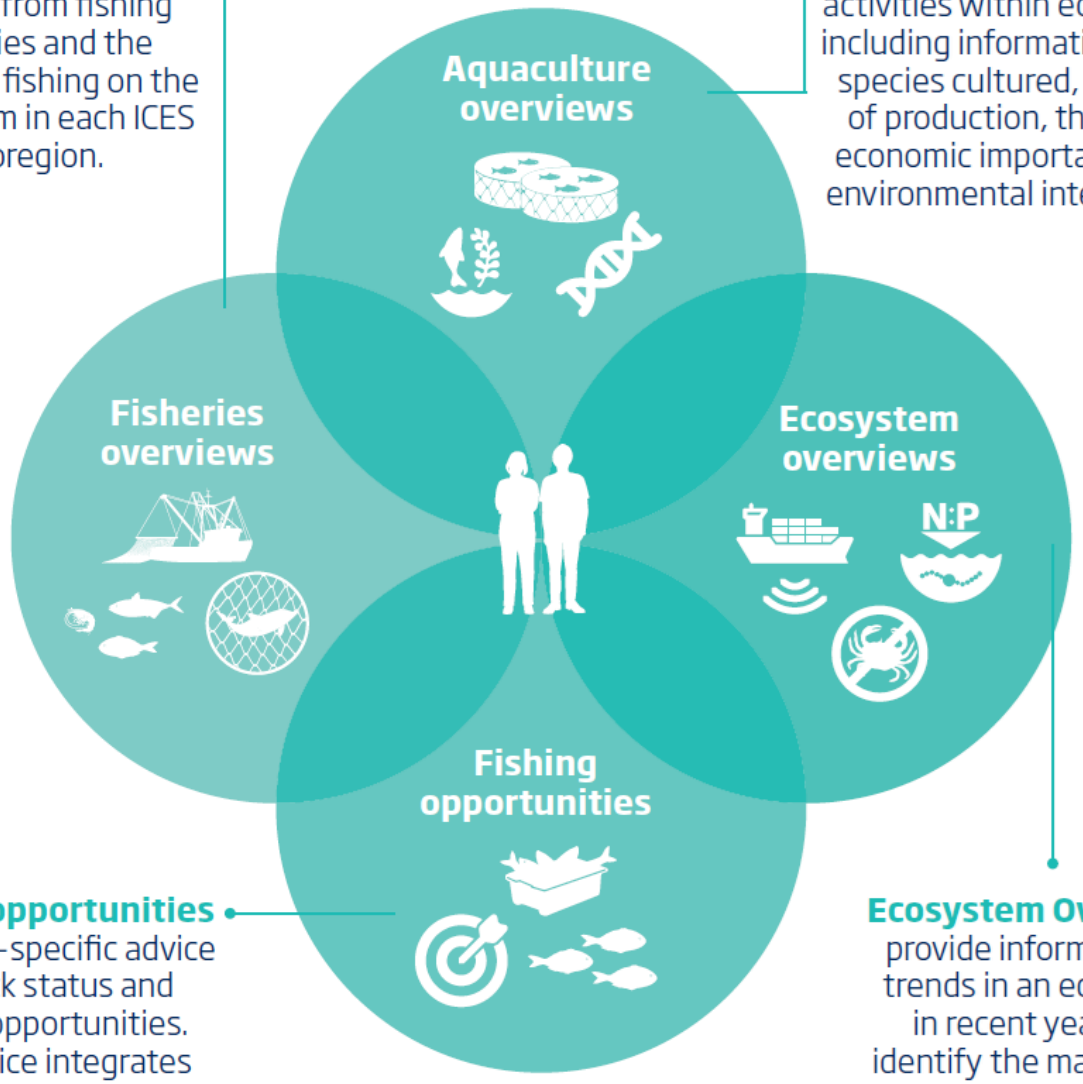
Making advice for EBFM operational

1. Influence of a dynamic ecosystem on fisheries
2. Impact of fisheries on the ecosystem
3. Put fisheries into context of other maritime activities & pressures
4. Consequences of tradeoffs between management objectives

Overviews

Fisheries Overviews summarize the services derived from fishing activities and the effects of fishing on the ecosystem in each ICES ecoregion.

Aquaculture Overviews summarize aquaculture activities within ecoregions, including information on the species cultured, the level of production, the socio-economic importance, and environmental interactions.



Fishing opportunities give stock-specific advice on stock status and fishing opportunities. This advice integrates the precautionary approach, with the objective of achieving maximum sustainable yield (MSY).

Ecosystem Overviews provide information on trends in an ecosystem in recent years and identify the main human pressures, explaining how these pressures affect key ecosystem components.

ICES CIEM

Science for sustainable seas

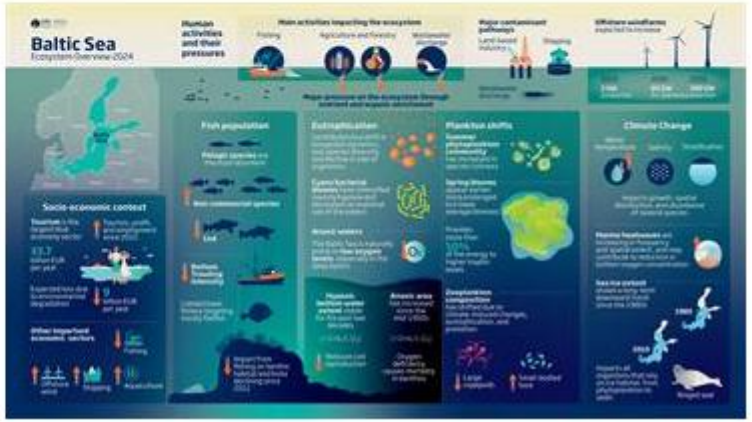
ECOSYSTEM OVERVIEWS

Baltic sea ecosystem overview

Our Ecosystem Overviews use risk-based methods to identify the main human pressures and explain how these affect key ecosystem components in each ICES ecoregion

The Baltic Sea is one of the largest brackish water bodies in the world, covering 420 000 km^2. It is a semi-enclosed shallow sea with an average depth of 60 m, where one third of the area is less than 30 m deep. This ecoregion has many islands and a long and diverse coastline, especially in the northern areas. It is characterized by strong temperature and salinity gradients, from relatively warmer and saline waters in the southwestern part to cold and almost freshwater in the northernmost parts.

Many species and habitats of the Baltic Sea are not in good condition, according to recent assessments. This affects foodweb functionality, reduces the resilience and resistance against further environmental changes, and diminishes prospects for socioeconomic benefits, including fishing opportunities.



DOWNLOAD THE LATEST BALTIC SEA ECOSYSTEM OVERVIEW

DOWNLOAD THE LATEST WKBALEO REPORT

Baltic Sea

Ecosystem Overview 2024

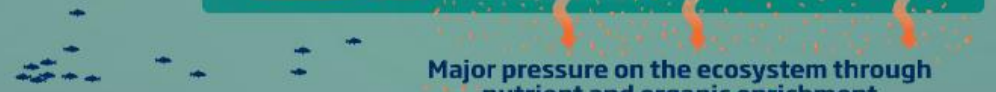
Human activities and their pressures

Main activities impacting the ecosystem

Fishing

Agriculture and forestry

Wastewater discharge



Major pressure on the ecosystem through nutrient and organic enrichment

Major contaminant pathways

Land-based industry

Shipping

Wastewater discharge

Offshore windfarms expected to increase

2019	2030	2050
2 GW production	**60 GW** EU planned production	**300 GW**

Socio-economic context

Tourism is the largest blue economy sector

Tourists, profit, and employment since 2010

33.7 billion EUR per year

Expected loss due to environmental degradation

9 billion EUR per year

Other important economic sectors

Fishing

Offshore wind

Shipping

Aquaculture

Fish population

Pelagic species are the most abundant

Non-commercial species

Cod

Bottom Trawling intensity

Limited trawl fishery targeting mostly flatfish

Impact from fishing on benthic habitat and biota declining since 2012

Eutrophication

Contributes to a shift in ecosystem dynamics, less species diversity, and decline in size of organisms

Cyano bacterial blooms have intensified causing hypoxia and decreased recreational use of the waters

Anoxic waters

The Baltic Sea is naturally prone to **low oxygen levels**, especially in the deep basins

O_2

Hypoxic bottom water extent stable for the past two decades

(< 2 mL/L O_2)

Reduces cod reproduction

Anoxic area has increased since the mid-1950s

(< 0 mL/L O_2)

Oxygen deficiency causes mortality in benthos

Plankton shifts

Summer phytoplankton community has increased in species richness

Spring blooms appear earlier, more prolonged but lower average biomass

Provides more than **50%** of the energy to higher trophic levels

Zooplankton composition has shifted due to climate-induced changes, eutrophication, and predation

Large copepods

Small-bodied taxa

Climate Change

Water temperature

Salinity

Stratification

Impacts growth, spatial distribution, and abundance of several species

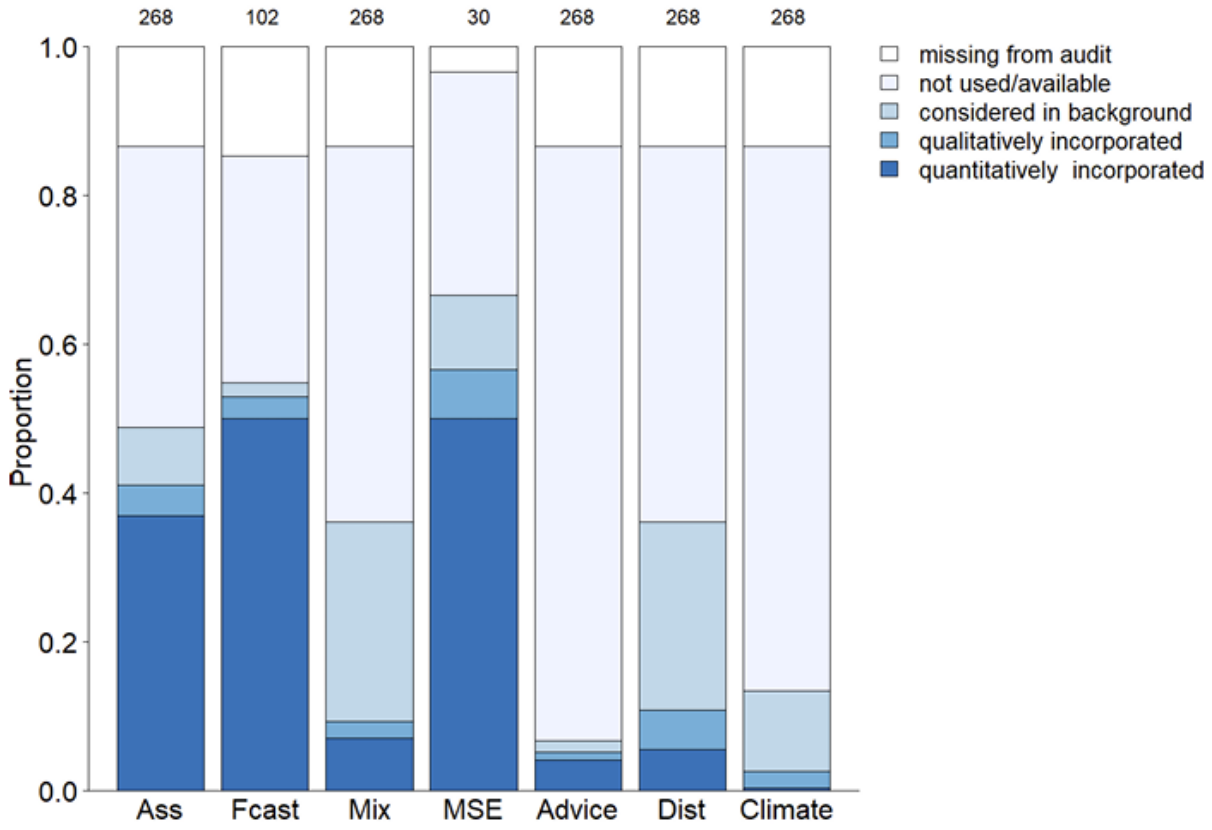
Marine heatwaves are increasing in frequency and spatial extent, and may contribute to reduction in bottom oxygen concentration

Sea ice extent shows a long-term downward trend since the 1980s

Impacts all organisms that rely on ice habitat, from phytoplankton to seals

Ringed seal

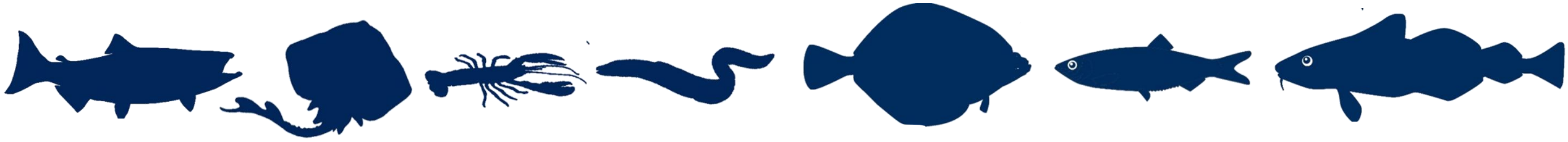
Influence of a dynamic ecosystem on fisheries



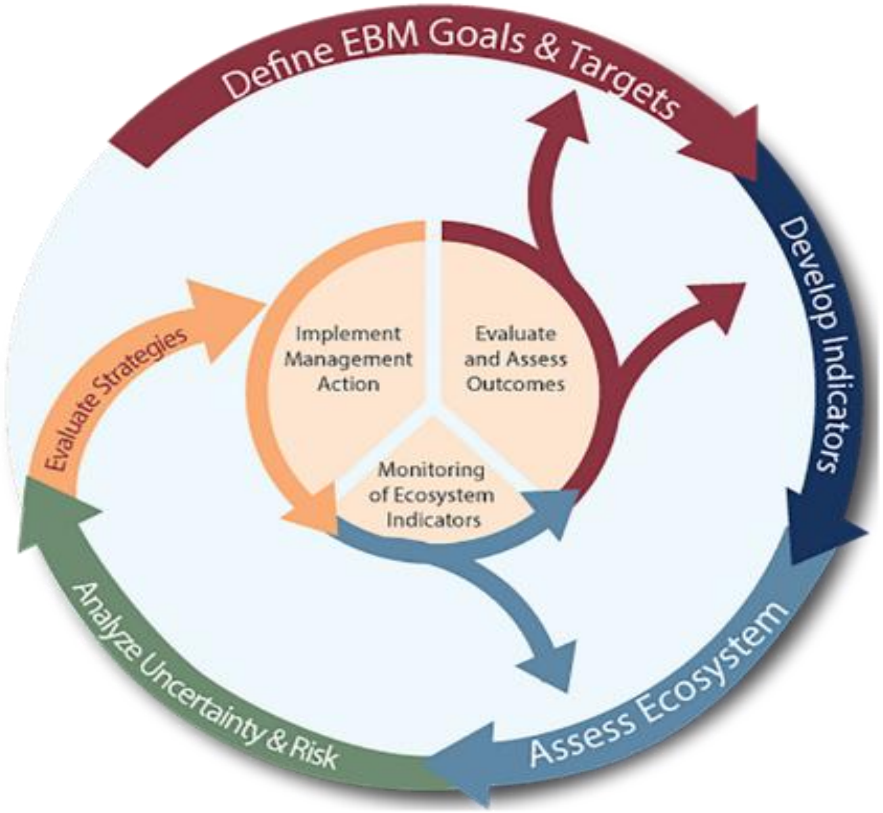
Proportion of stocks for which ecosystem trends and variability are accounted for

Trenkel et. al 2023 https://www.int-res.com/abstracts/meps/v704/p81-97/

“a move from implicit to explicit instructions with routine documentation is required to accelerate on the path to EBFM in a transparent manner”



Adaptive environmental management: Ecosystem Based Fisheries Management



FROM	TO
Individual species	Ecosystems
Small spatial scale	Multiple scales
Short-term perspective	Long-term perspective
Humans: independent of ecosystems	Humans: integral part of ecosystems
Management divorced from research	Adaptive management
Managing commodities	Sustaining production potential for goods and services

Global governance
EBFM management approach
robust decision making
public participation

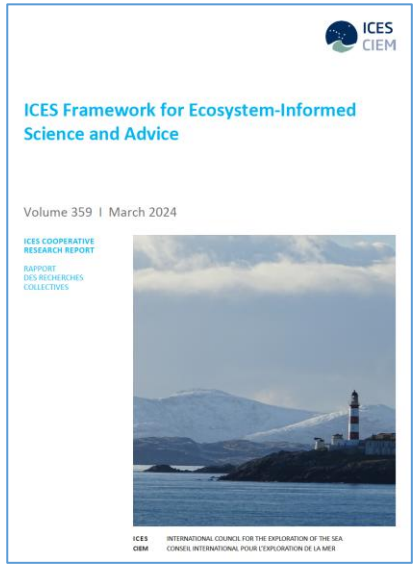
→ conservation of biodiversity
sustainable use of ecosystem services
in a changing climate

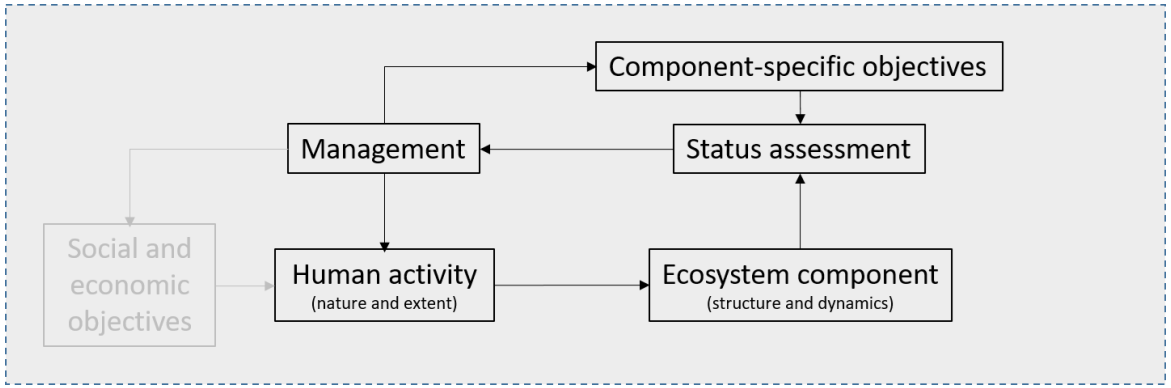
ICES Framework for Ecosystem-Informed Science and Advice (FEISA)

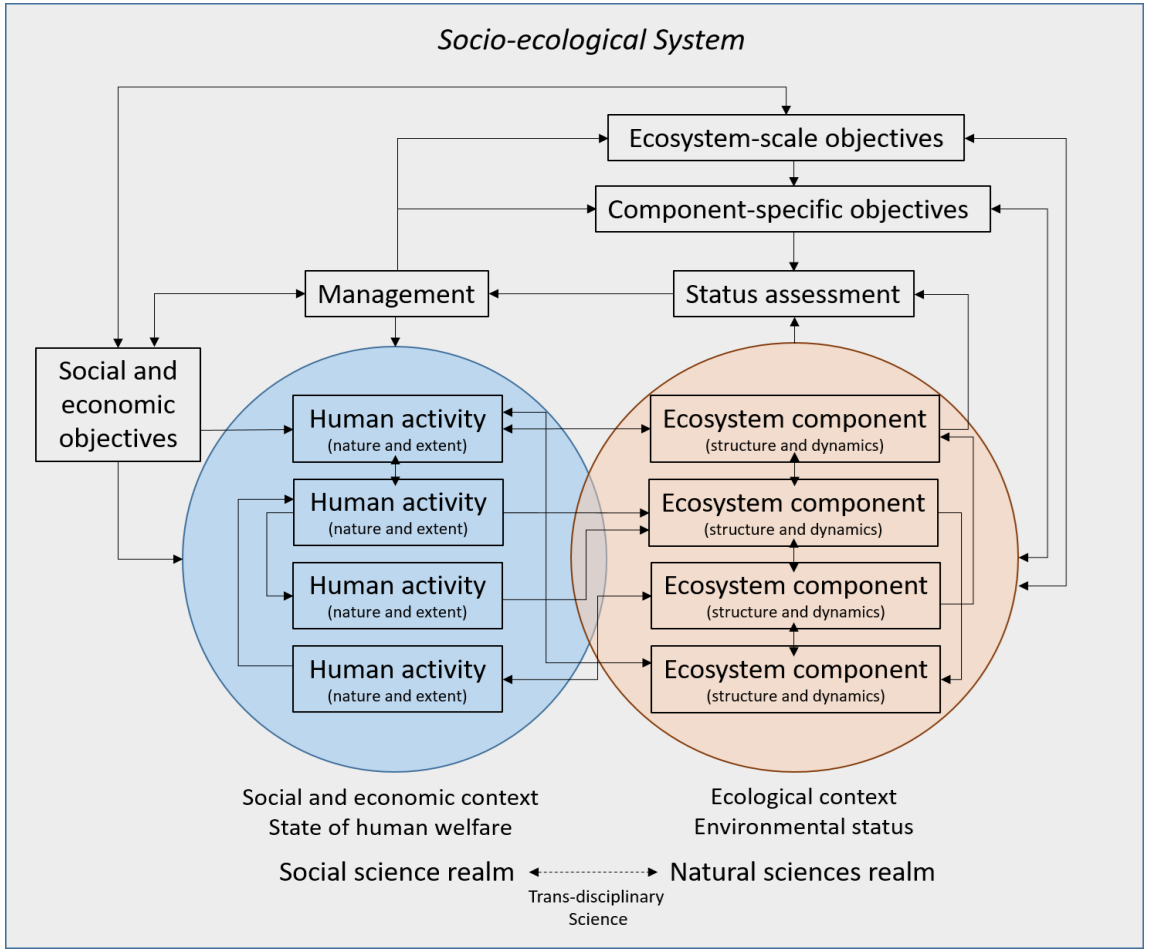
To guide knowledge development in support of EBM and its practical implementation into ICES advice

To support and evaluate incremental progress from conventional to ecosystem- informed science and advice

https://doi.org/10.17895/ices.pub.25266790



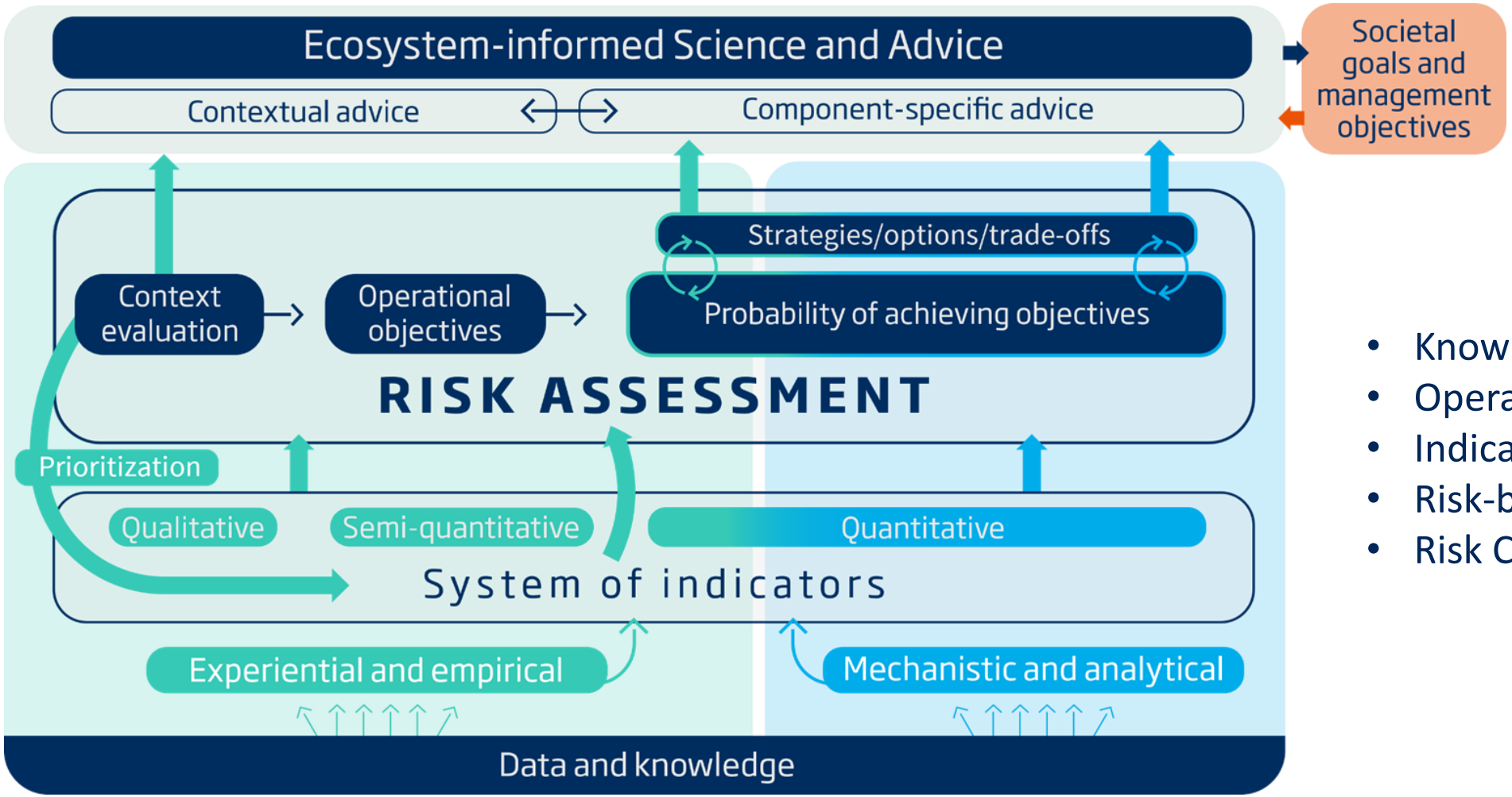




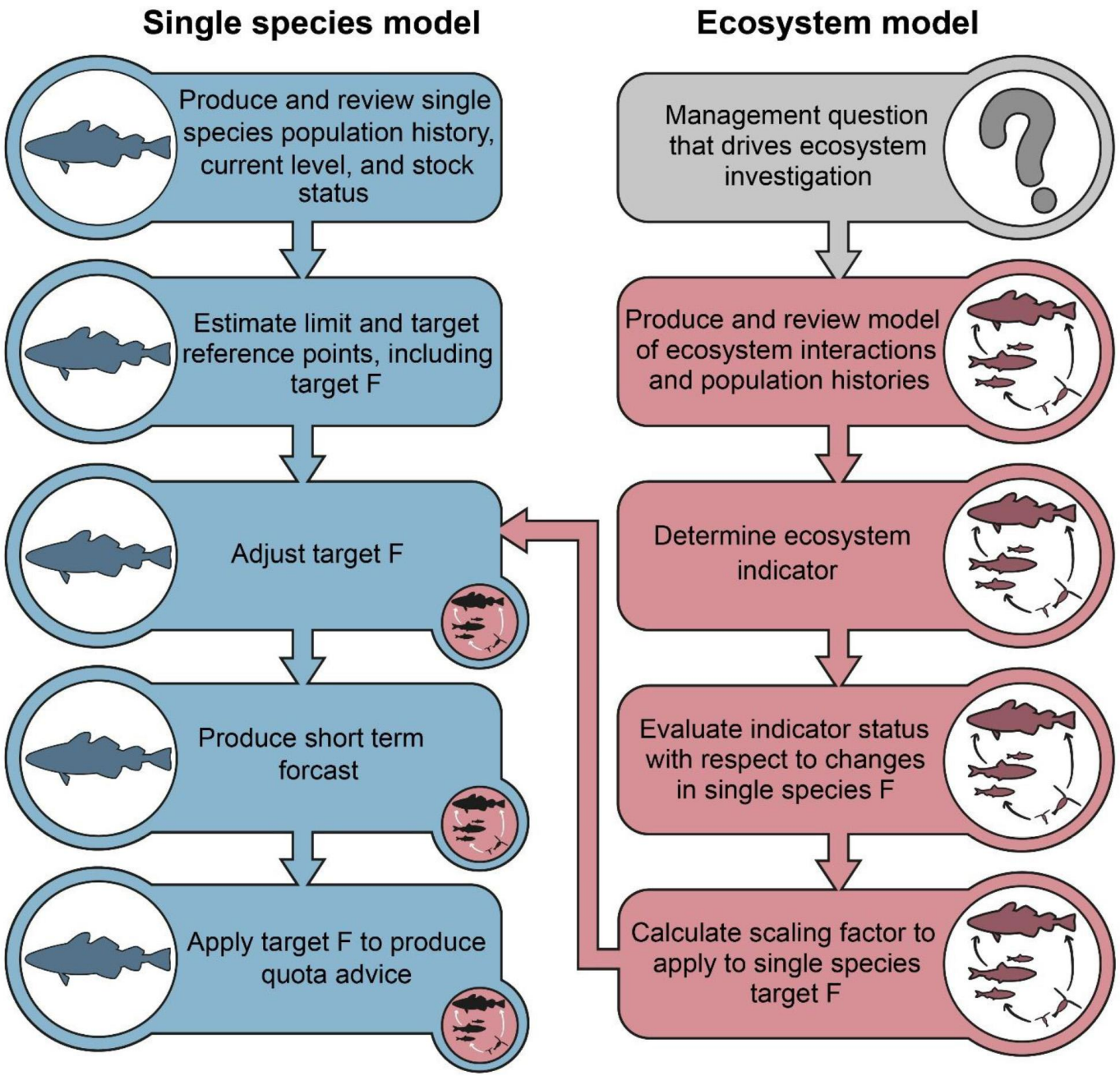
From conventional science and advice…

…to ecosystem-informed science and advice

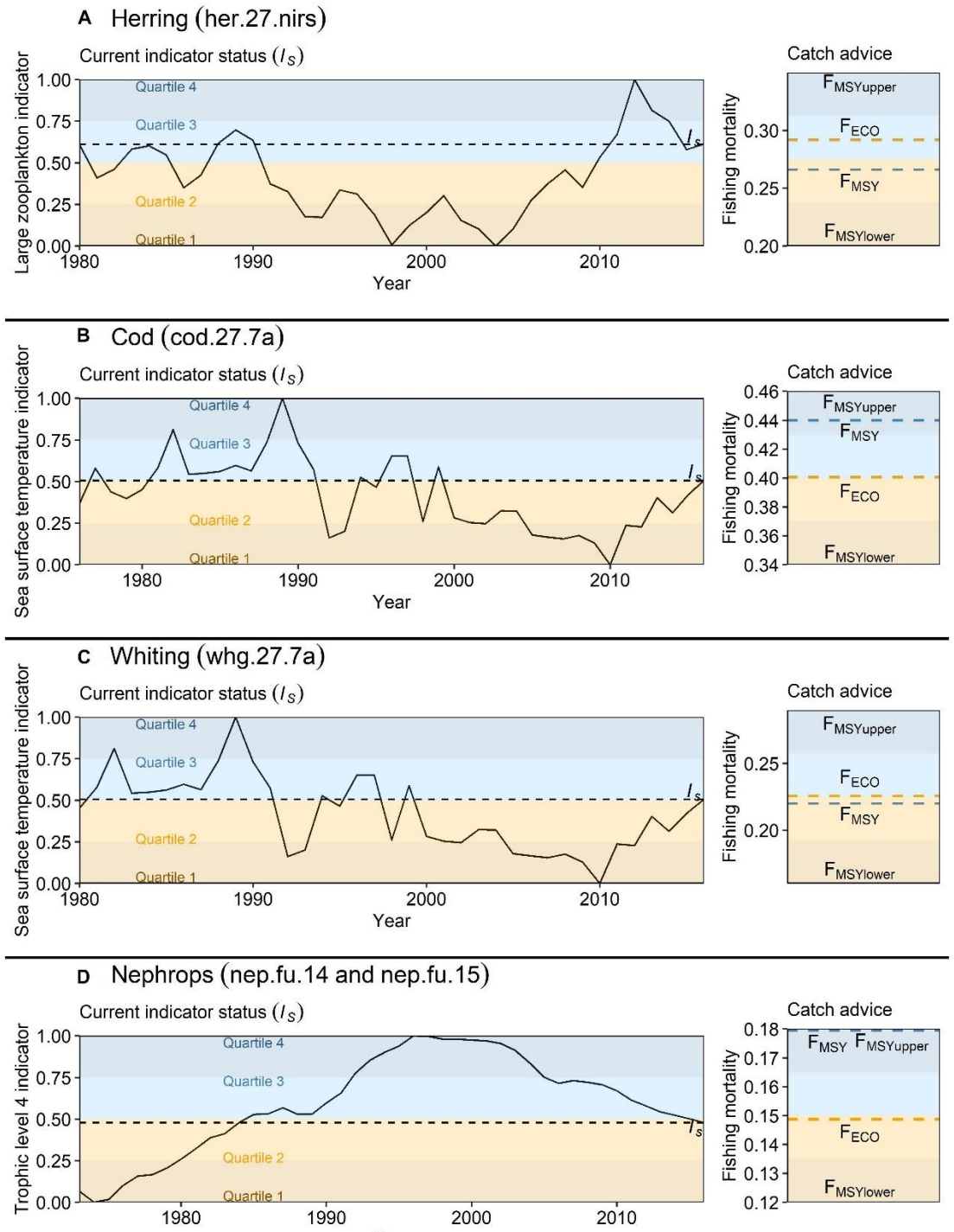
FEISA architecture – main components



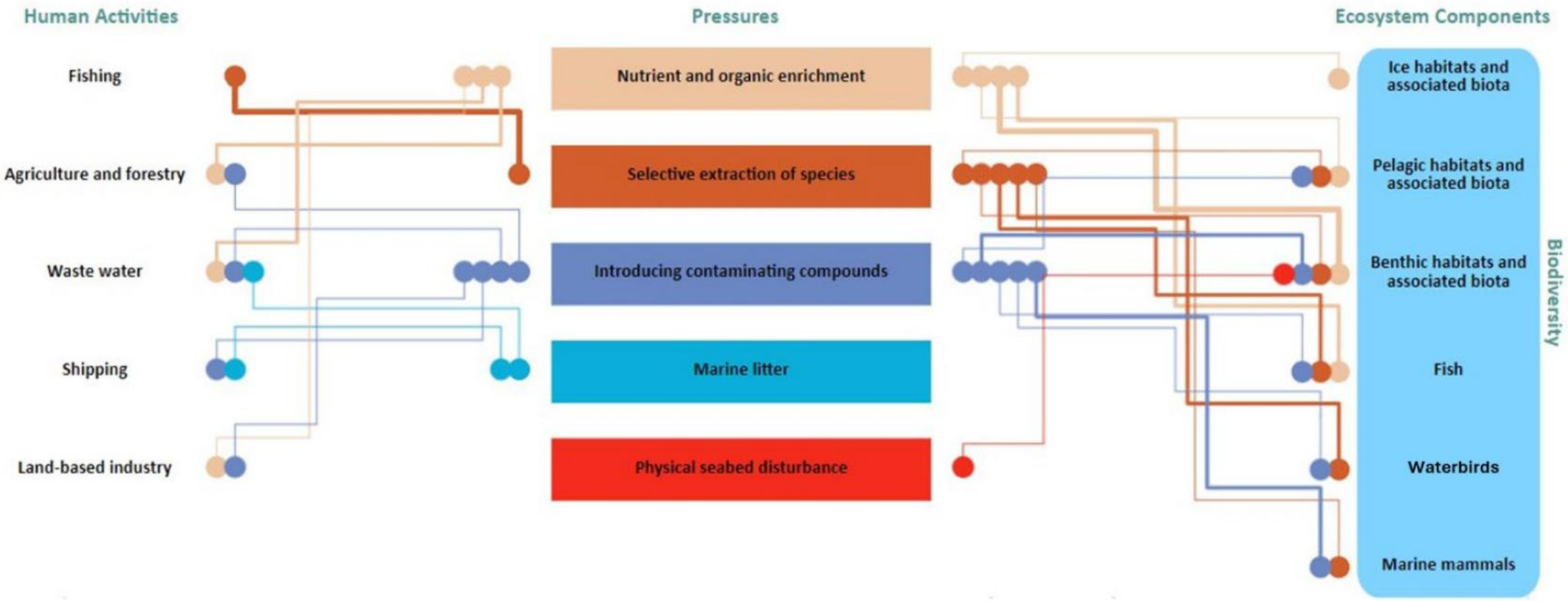
- Knowledge plurality
- Operational objectives
- Indicators
- Risk-based approach
- Risk Communication



Howell et al 2021 0.3389/fmars.2020.607831



Put fisheries into context of other maritime activities & pressures



Ecosystem aspects important to fisheries management in the Bothnian Sea

What is the problem?

DAGENS NYHETER. Nyheter Sverige Världen Ekonomi Kultur Sport Klimatet Ledare DN Debatt

SVERIGE

Provfiske visar: Alarmerande låga nivåer av strömming

Uppdaterad 2023-01-31 Publicerad 2023-01-31

Hotet mot skivan – brist på surströmming: "Man får hänga på låset"

Publicerad: 11 augusti 2022, 13:58

DAGENS NYHETER. Nyheter Sverige Världen Ekonomi Kultur Sport Klimatet Ledare DN D

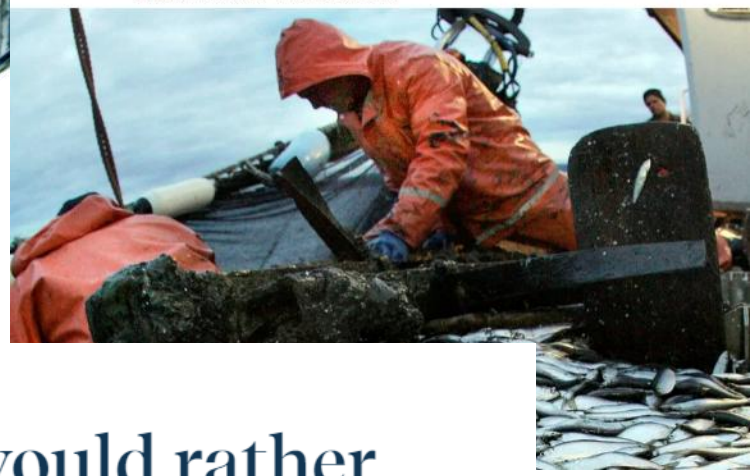
Miljöorganisationer överklagar beslut om fiskekvoter

Publicerad 2024-01-16

VÄRLDEN

Rött ljus för strömming och sill från Östersjön

Uppdaterad 2023-09-28 Publicerad 2023-09-28

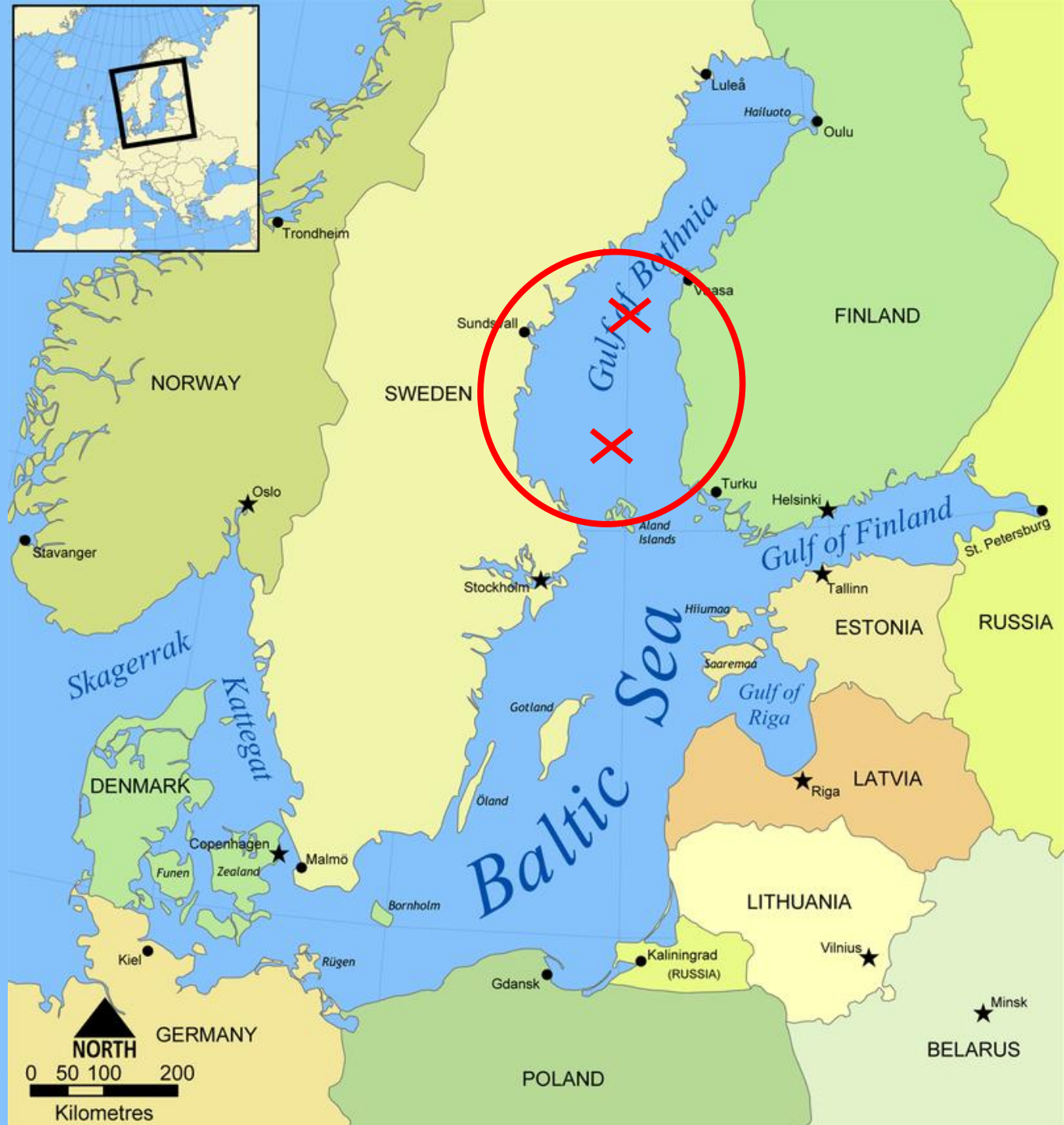


12 March 2024

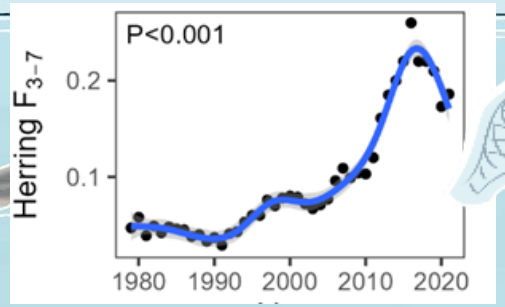
Baltic Sea Brief 63: Ministers would rather break laws than save the fish in the Baltic Sea

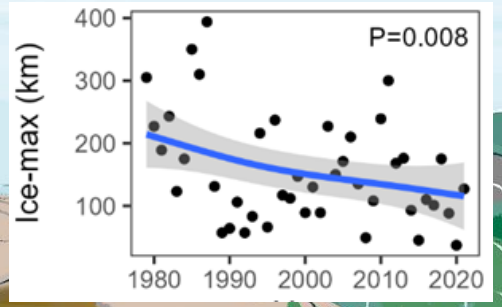
Bothnian Sea

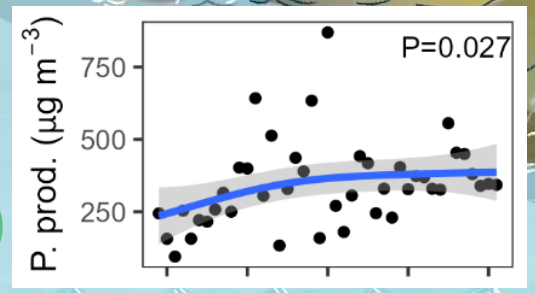
Data collection

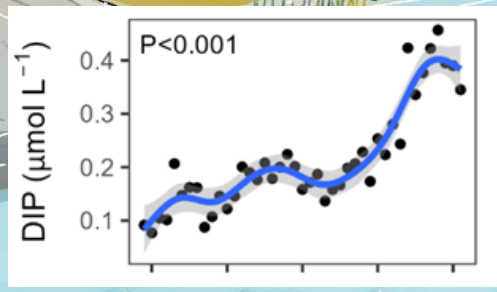


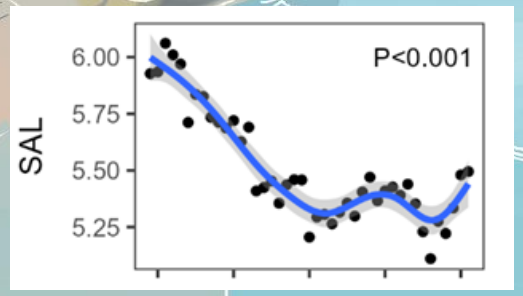
Trends over time

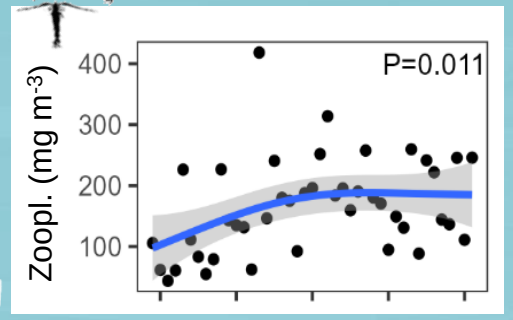


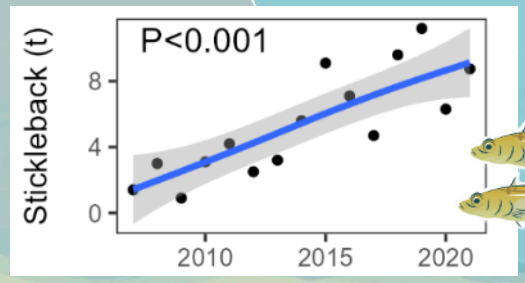


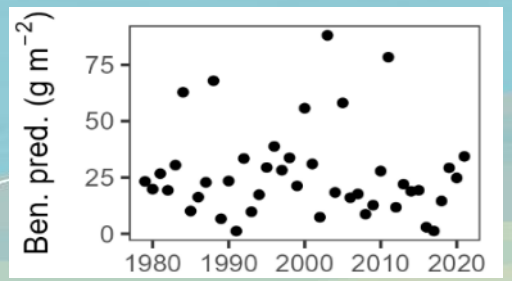


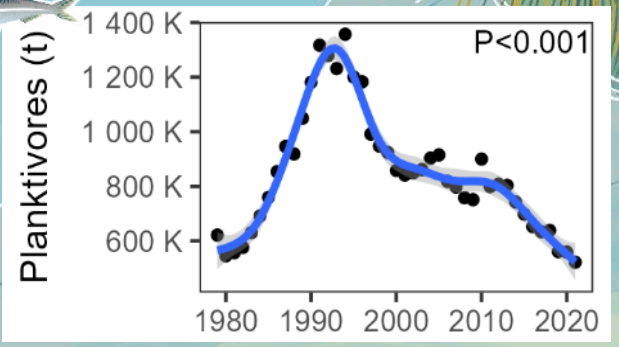




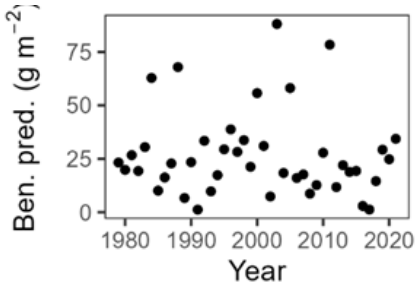


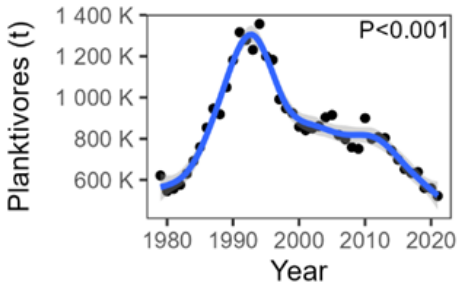


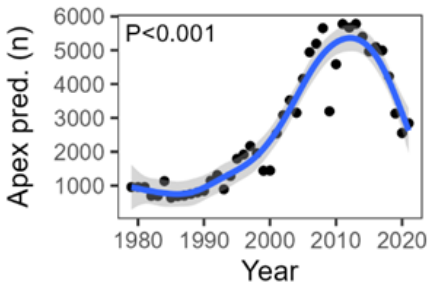




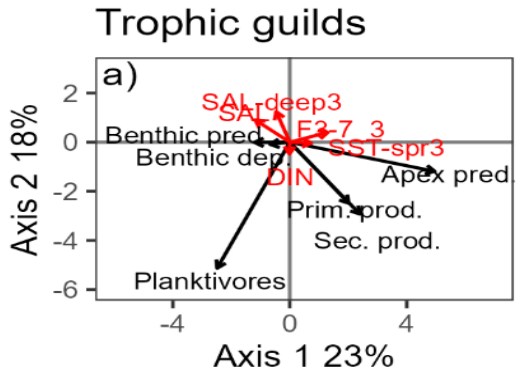
Exploratory graphs
- 1979-2021





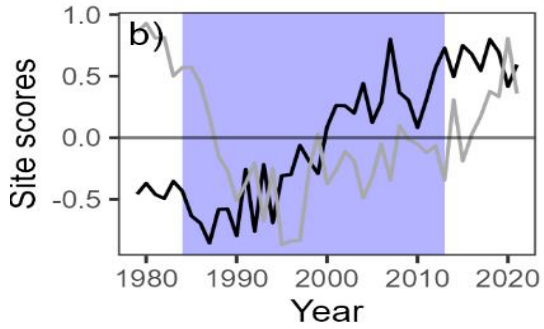


PCO
-Chord distances, z-standardised
-environmental variables



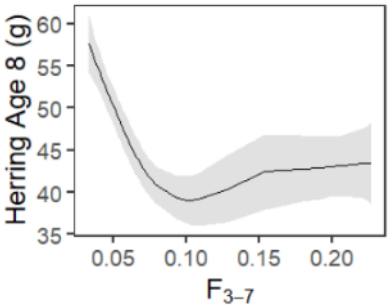
Multiple time series analysis – Linear

Breakpoint analyses
Chronological clustering
Changepoint analysis



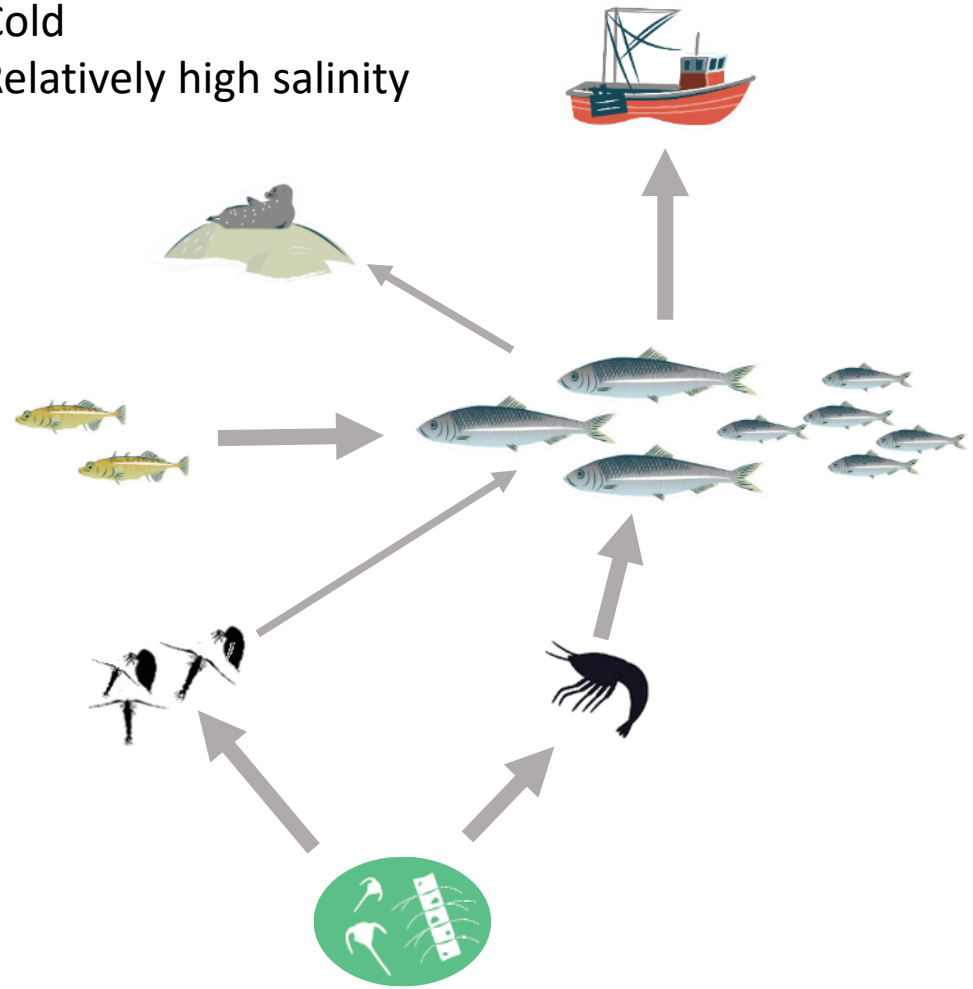
Multiple time series analysis – Non-linear

GAM
Correlations of PCO axes with pressures



1979-1984

Nutrient poor
Low herring mortality
Cold
Relatively high salinity



1979-1984

Nutrient poor
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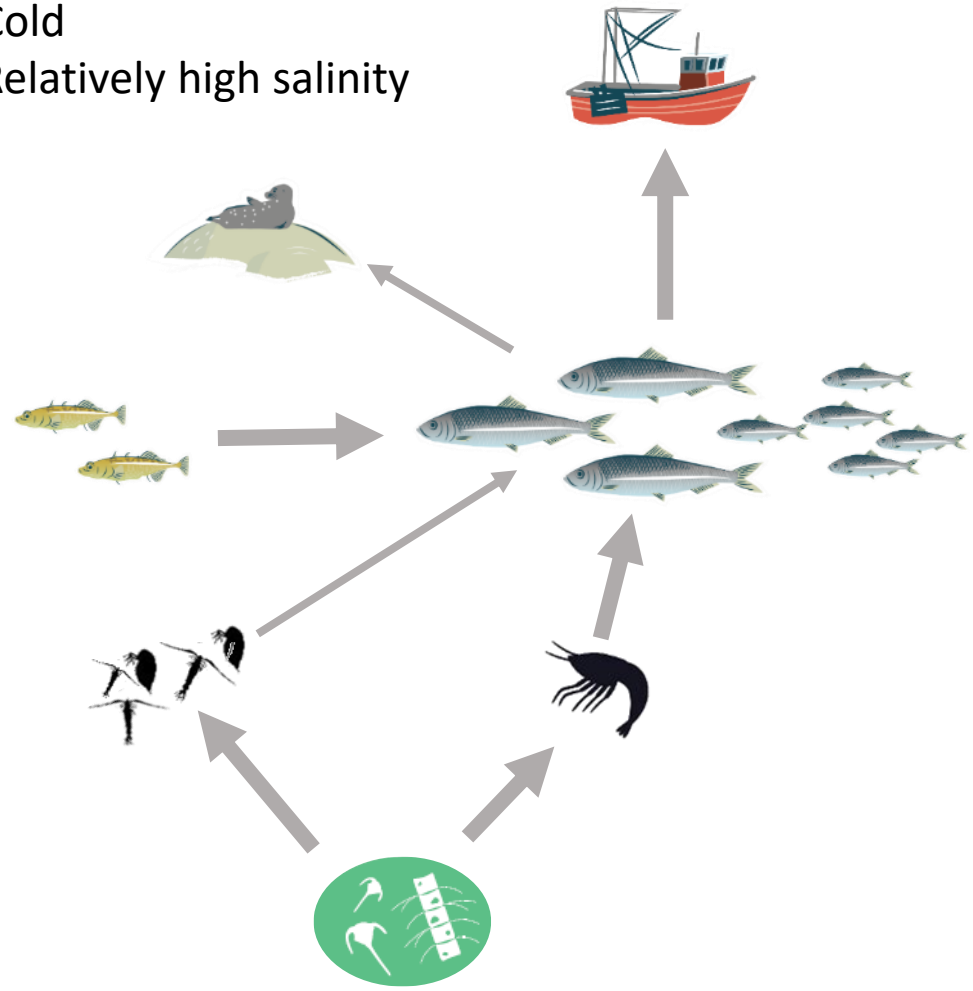

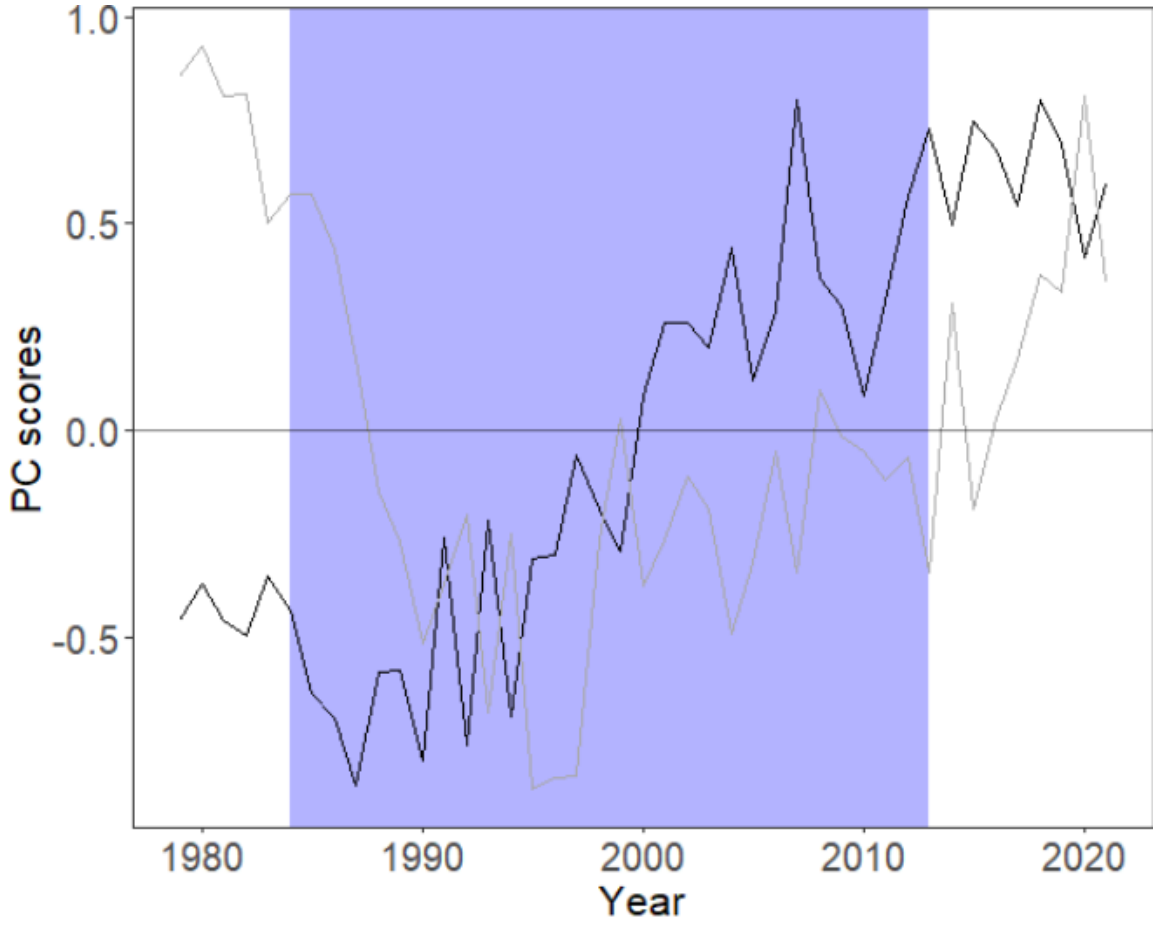

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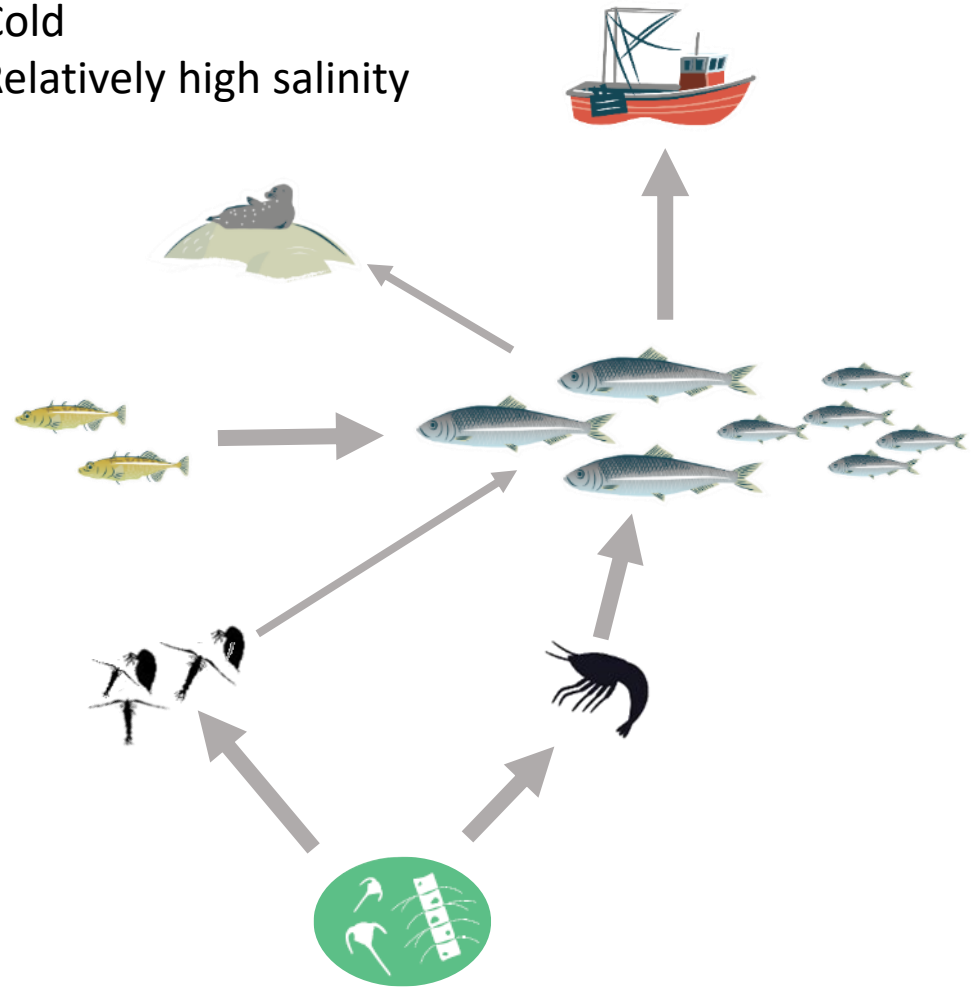
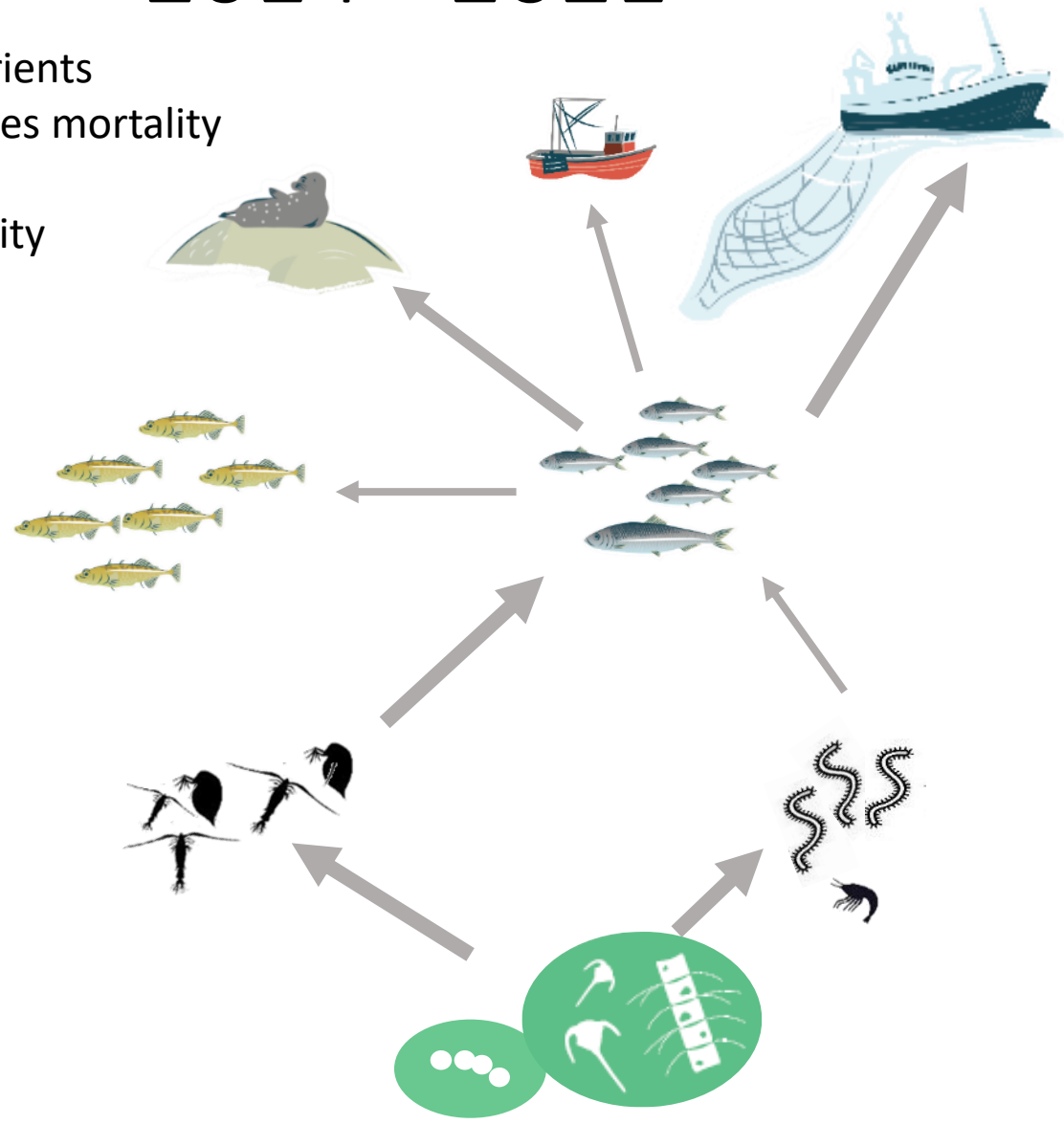
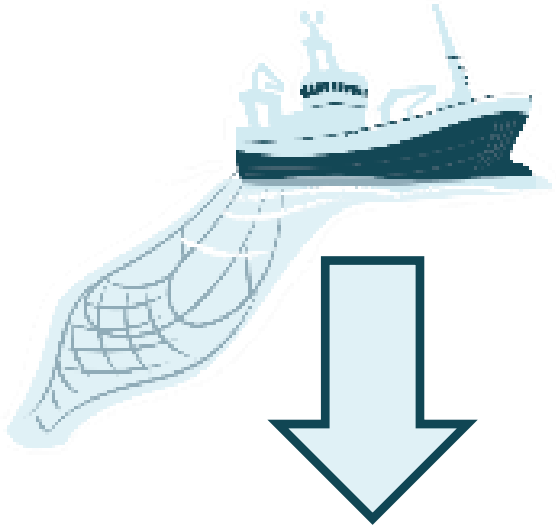


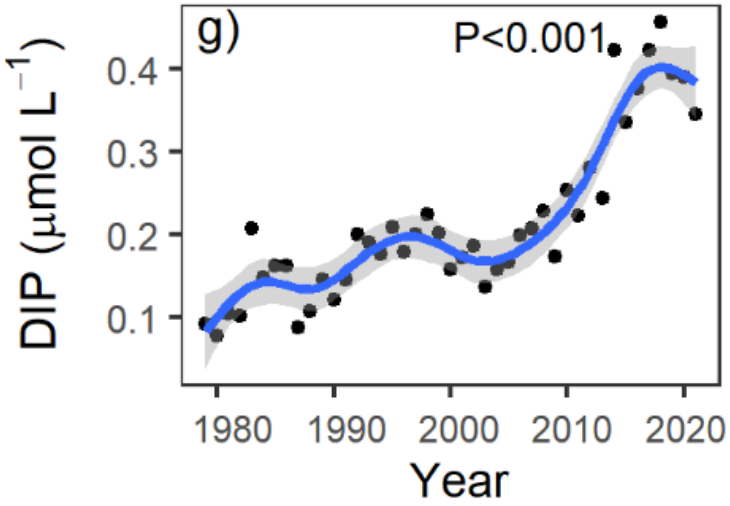
2014 - 2021

Higher nutrients
High fisheries mortality
Warm
Lower salinity



Implications for management





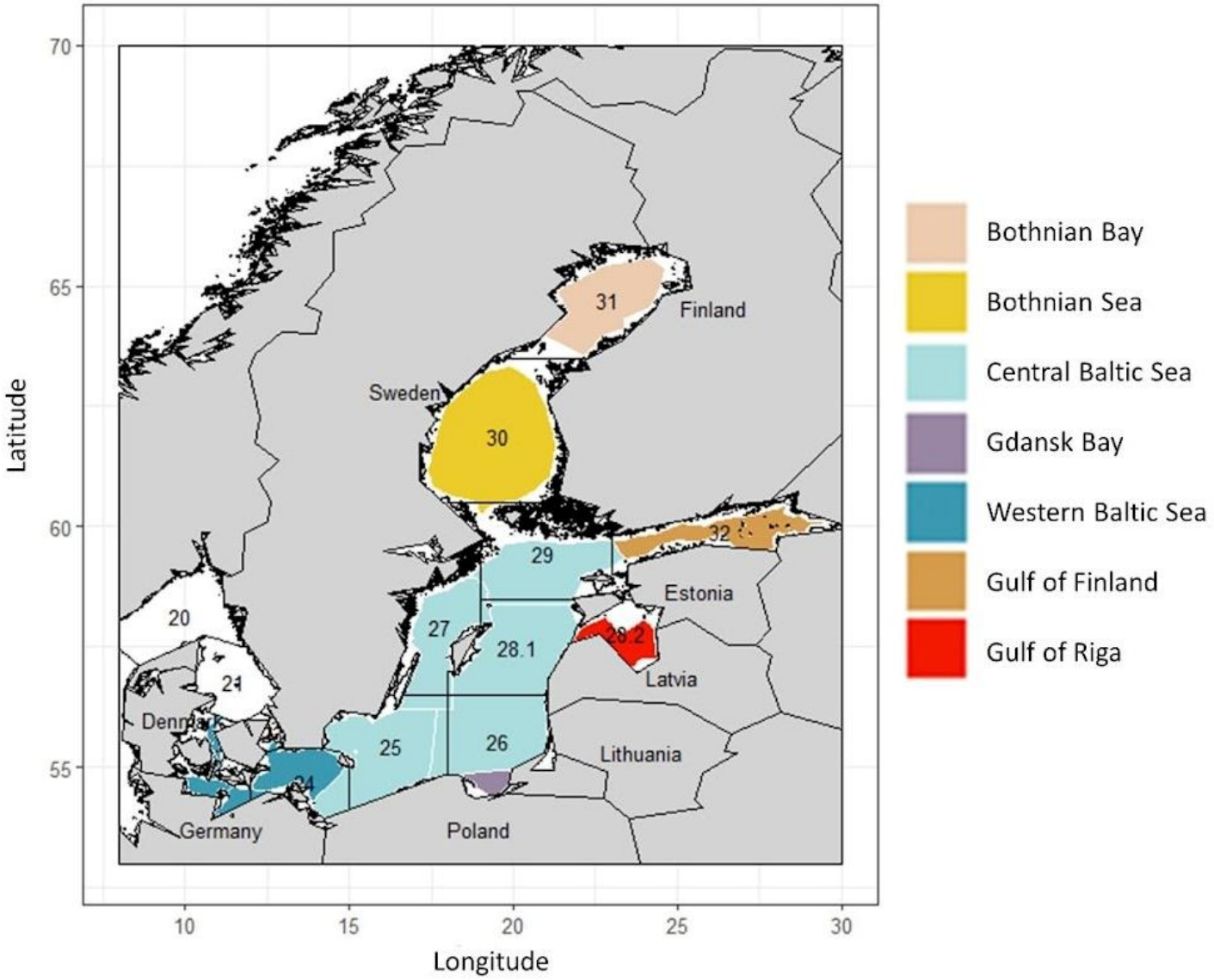
Reduce fisheries mortality

- There are too many pressures on herring
- Predict: increase in herring size and recruitment

Reduce phosphorus loads

External loads have remained constant, but open-sea concentrations have increased.

Future directions



Thank you!

HELCOM Foodwebs group

WGIAB