Coastal fish, habitats and MPAs

LIFE REEF conference, Latvia 2025-10-29

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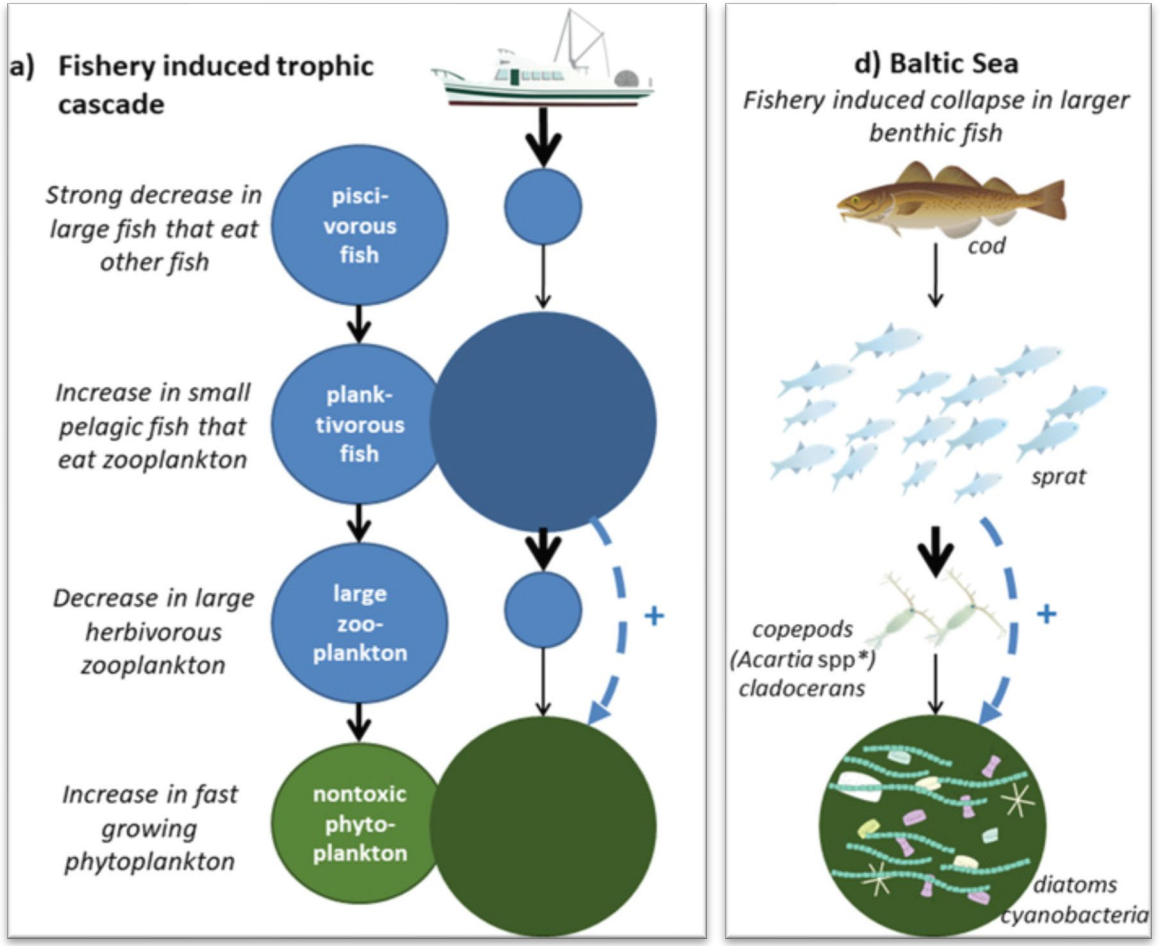
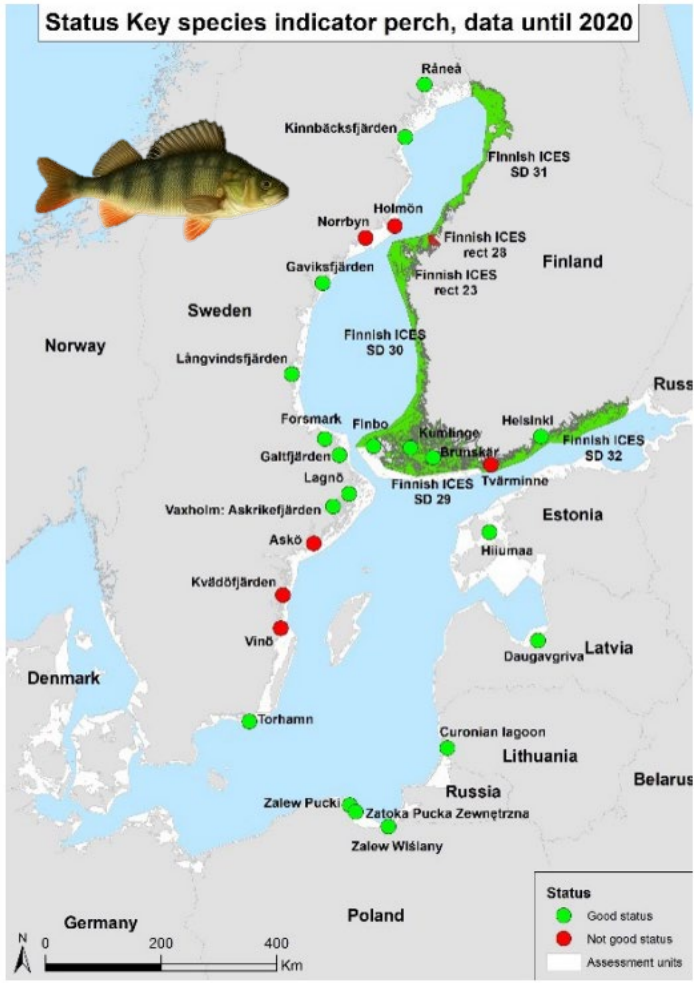
Collapse of the populations of cod in the Baltic

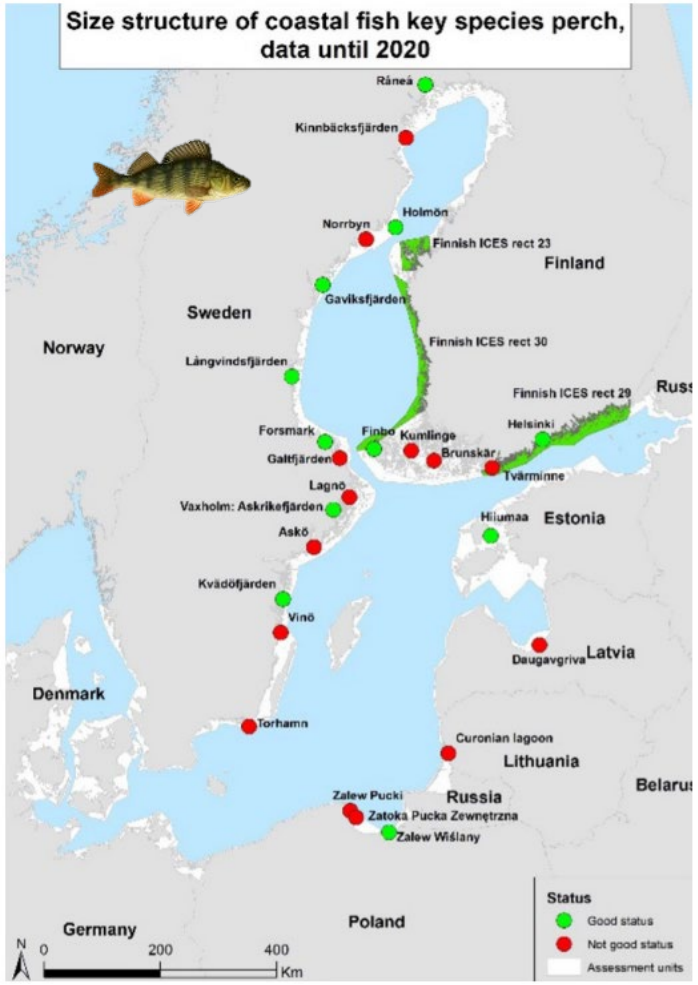
Fisheries-induced trophic cascade



From Eriksson et al. 2023. Study by Casini et al. 2008

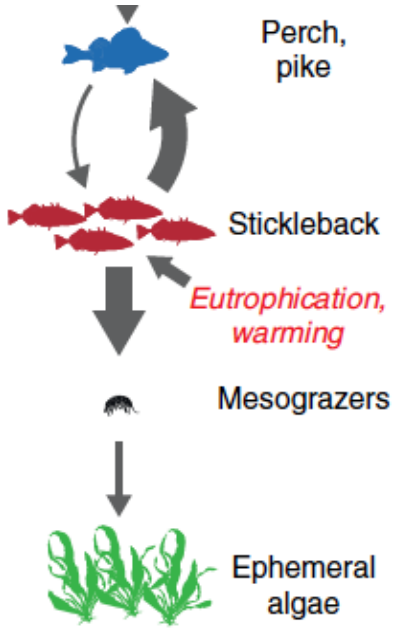
Poor status of coastal predatory fish

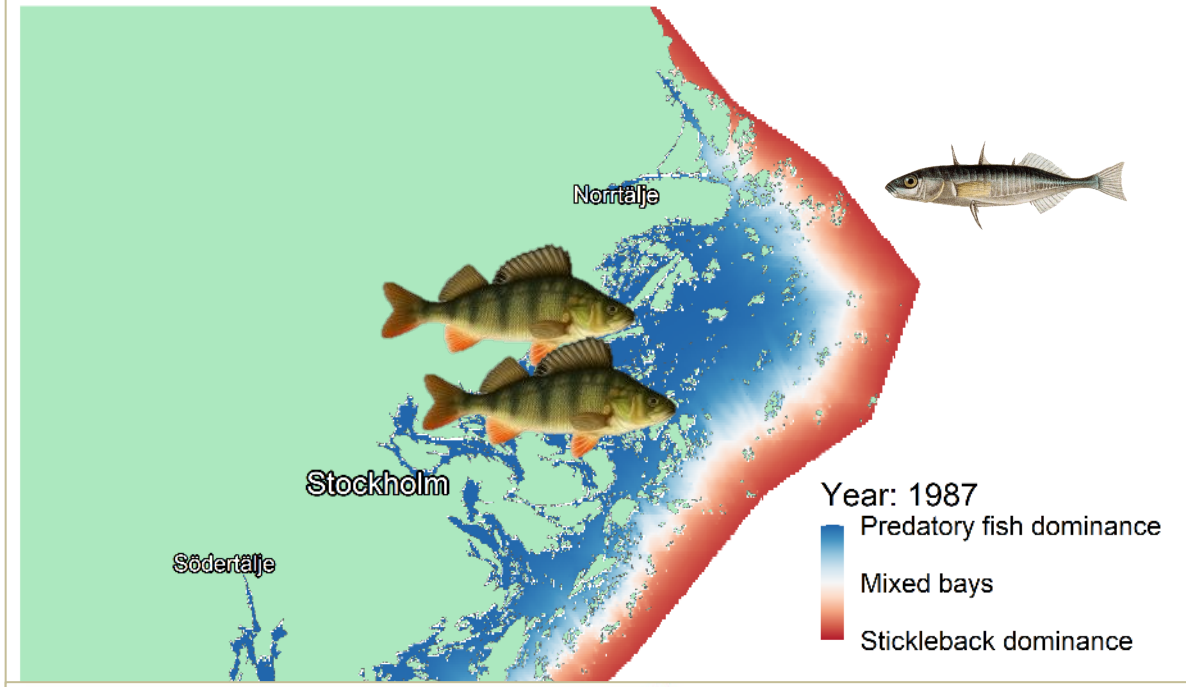


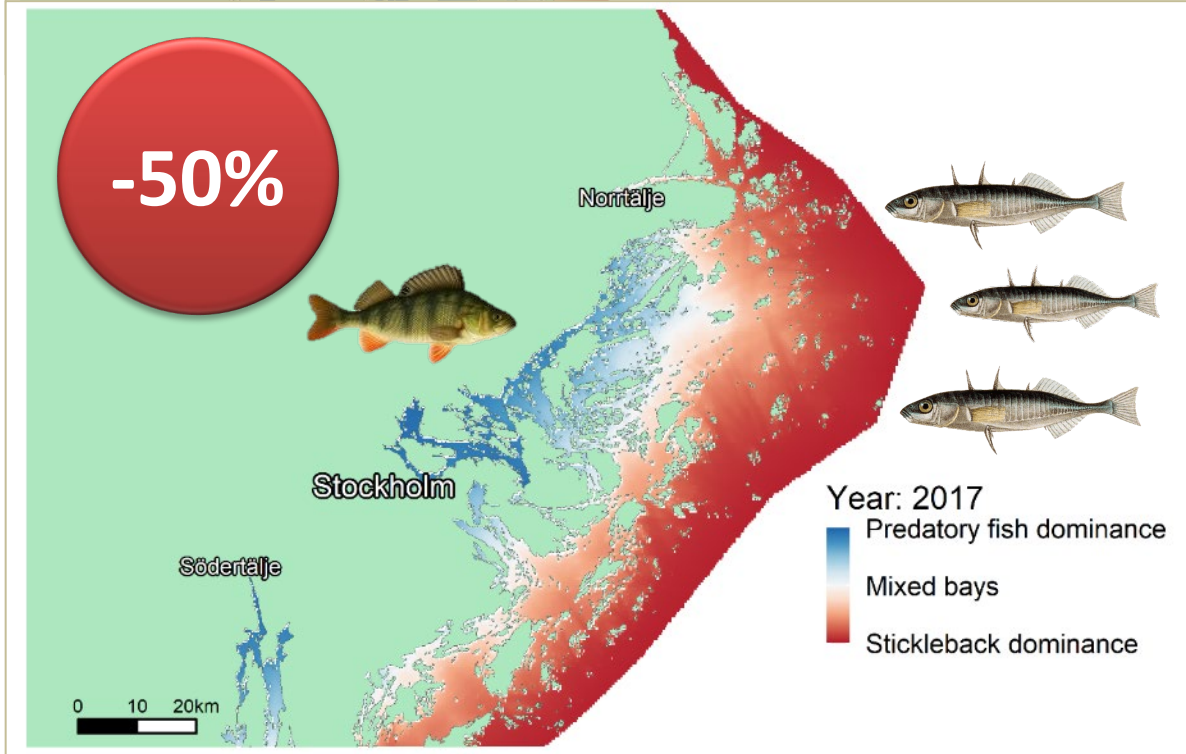


https://helcom.fi/wp-content/uploads/2024/10/Status-of-coastal-fish-communities.pdf

A coastal regime shift with consequences for habitat status



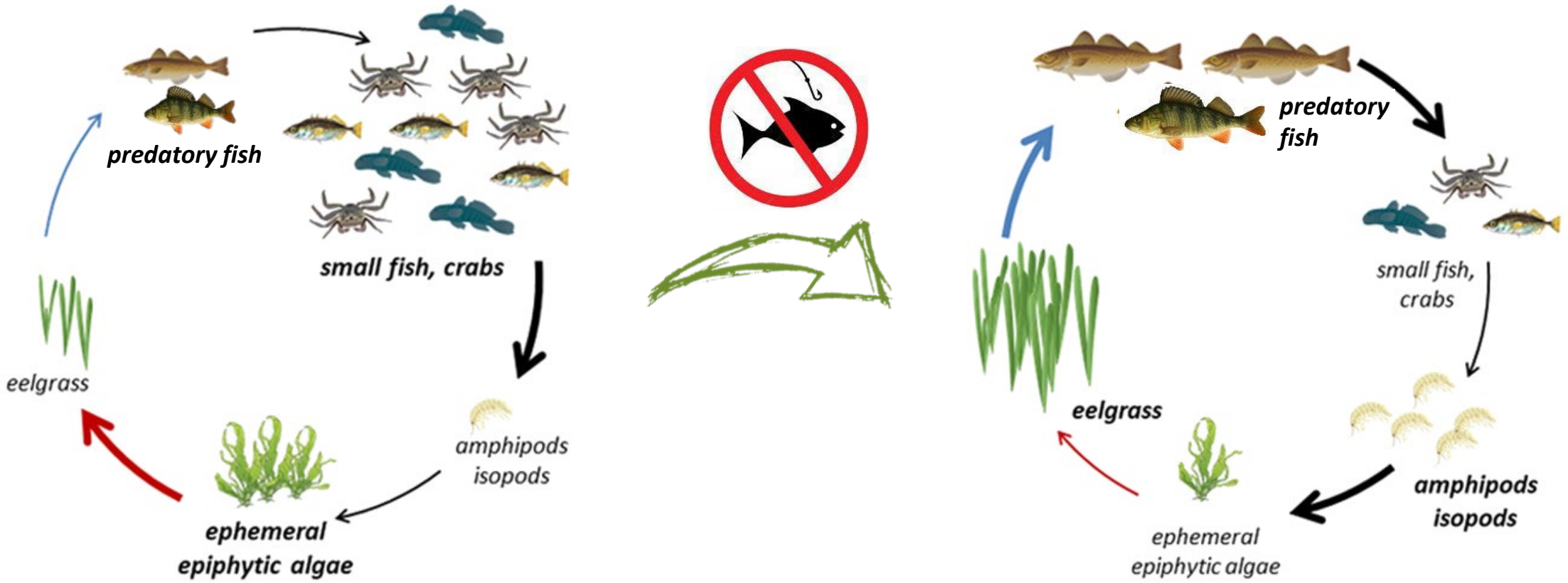




Donadi et al 2017. Proc P Soc Lond B
Eklöf et al 2020. Comm Biol

FORCE
Facilitating Ocean Recovery in a Changing climatE

Can no-take areas/strict MPAs be a way of restoring fish stocks and habitat status?

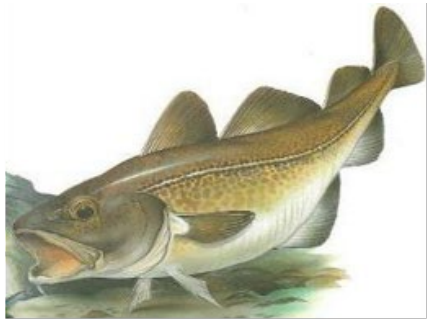


Eriksson et al 2023

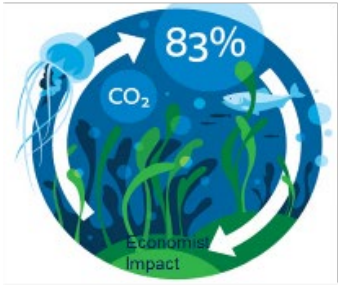
Strictly protected areas important for many ecosystem services

Resilience

Positive effects of strict protection

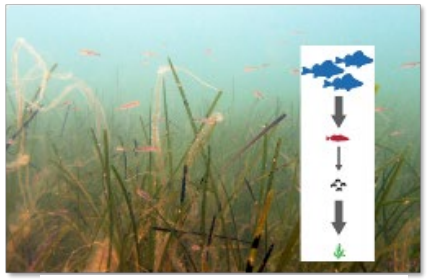


Fish production



Carbon storage

Biodiversity



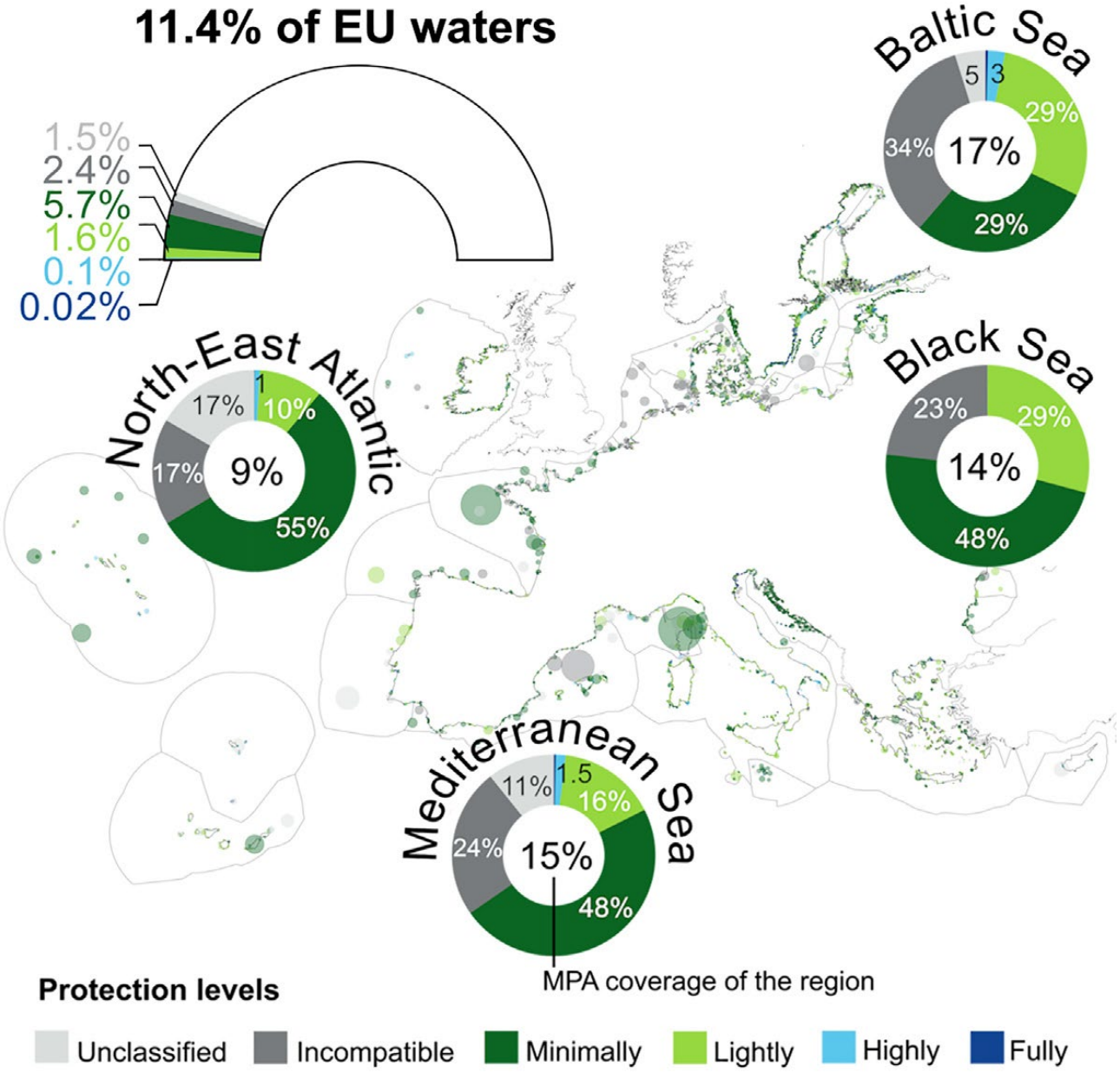
Healthy habitats

Few strictly protected MPAs in the Baltic and in Europe

Baltic: MPAs cover 17% , highly/fully protected 0.5%

EU: 0.1% highly/fully protected

Majority are ”paper parks”



Aminian-Biquet et al. 2024

MPAs – not a universal solution

Good at addressing local-scale pressures

- Construction (marinas, piers, wind farms, shipping lanes)
- Fishing (both effects on fish and on habitats) – when regulated!
- Other extractive activities (e.g. sand, minerals, macroalgae)
- Shipping and boating

Not efficient for counteracting broad-scale pressures, such as climate change or eutrophication

…but strictly protected MPAs may increase resilience of ecosystems to these pressures

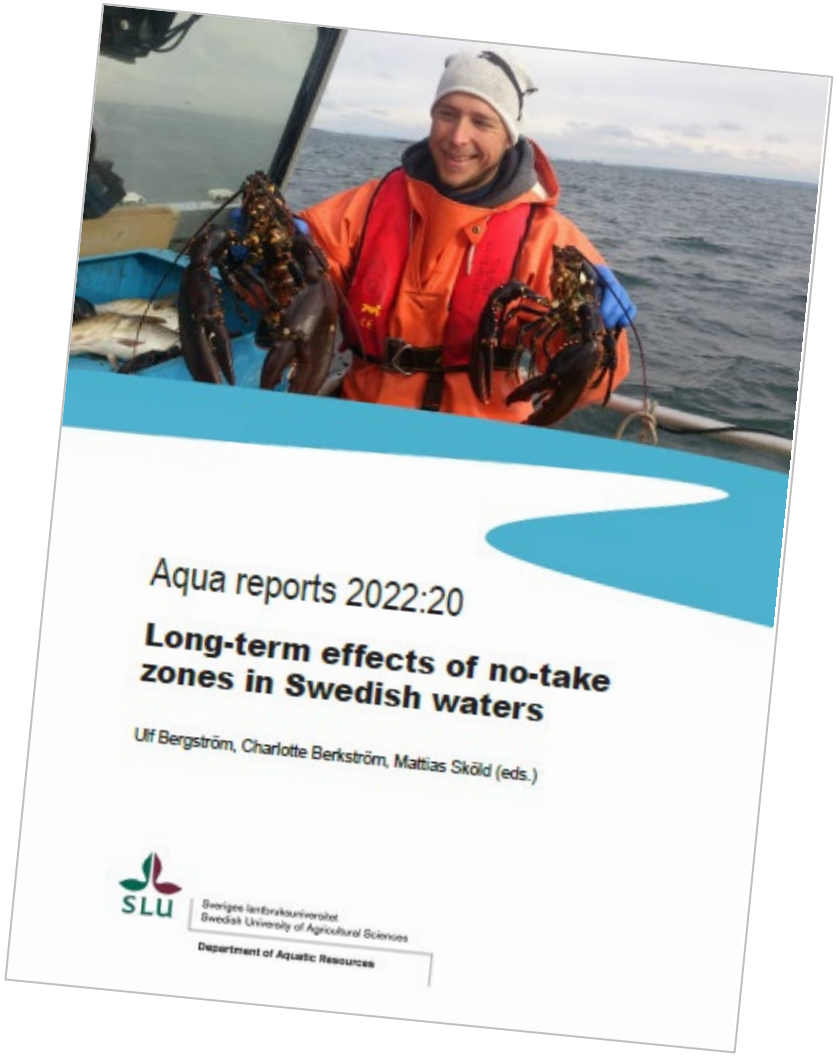
Sweden has long experience from no-take zones

Evaluation of long-term effects on fish populations and ecosystems in 8 no-take zones in Sweden

Effects on target species

Effects on ecosystems

Effects of areas re-opened to fishing

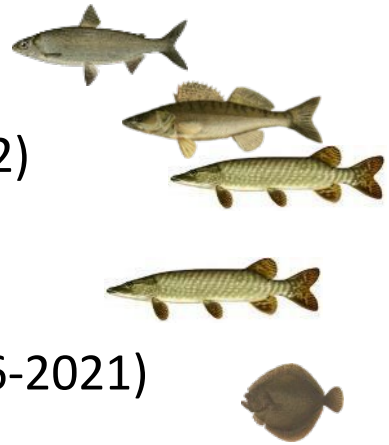


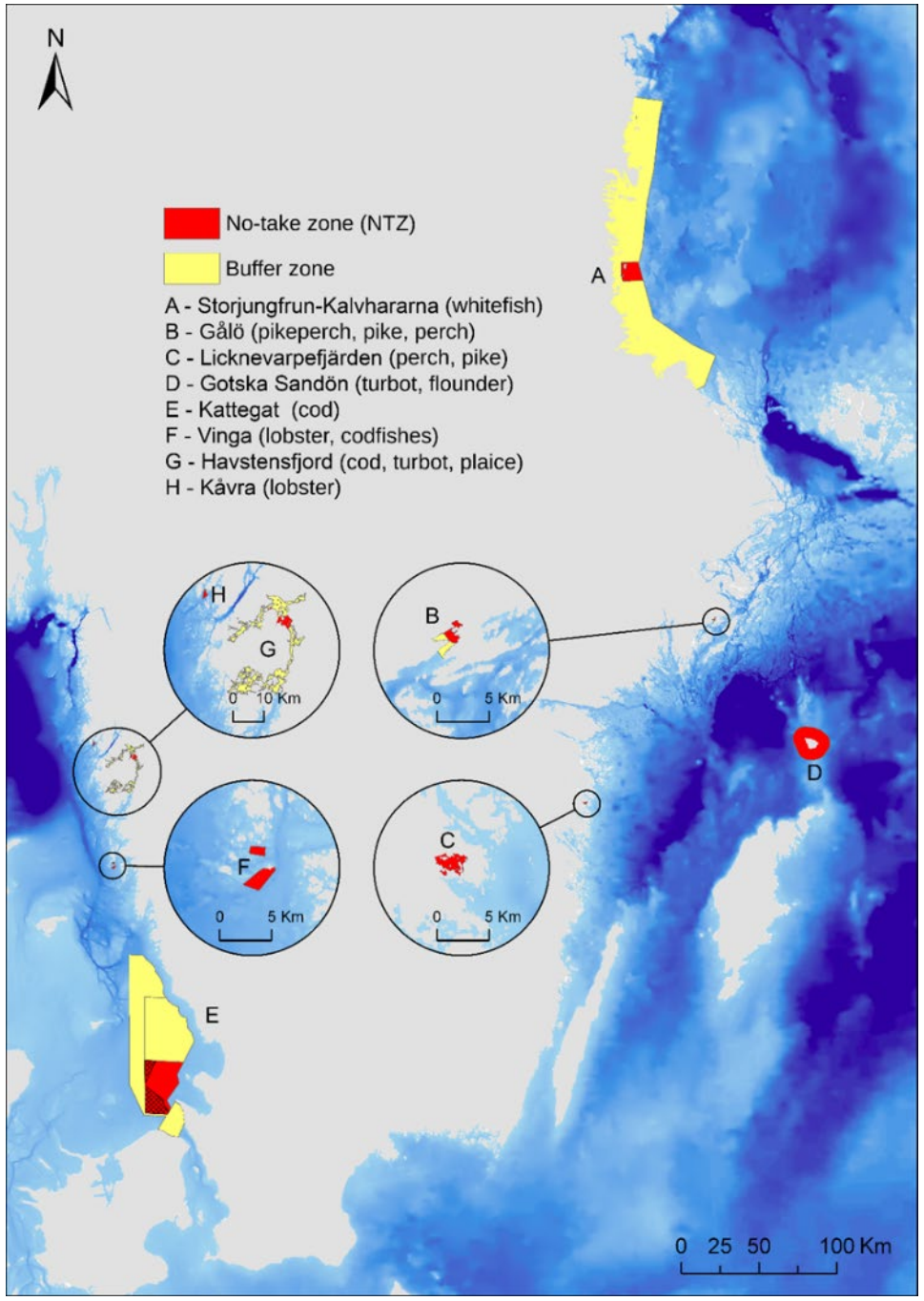
https://res.slu.se/id/publ/120390

Havs och Vatten myndigheten

NTZs evaluated

- Bothnian Sea whitefish (2011-2020)
- Stockholm pikeperch and pike (2010-2022)
- Licknevarp perch and pike(1980-2020)
- Gotska Sandön turbot and flounder (2006-2021)
- Kattegat cod (2009-2021)
- Vinga lobster and gadoids (2002-2015)
- Havstensfjord cod and flatfish (2010-2021)
- Kåvra lobster (1989-2021)

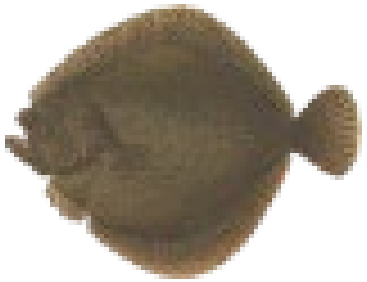


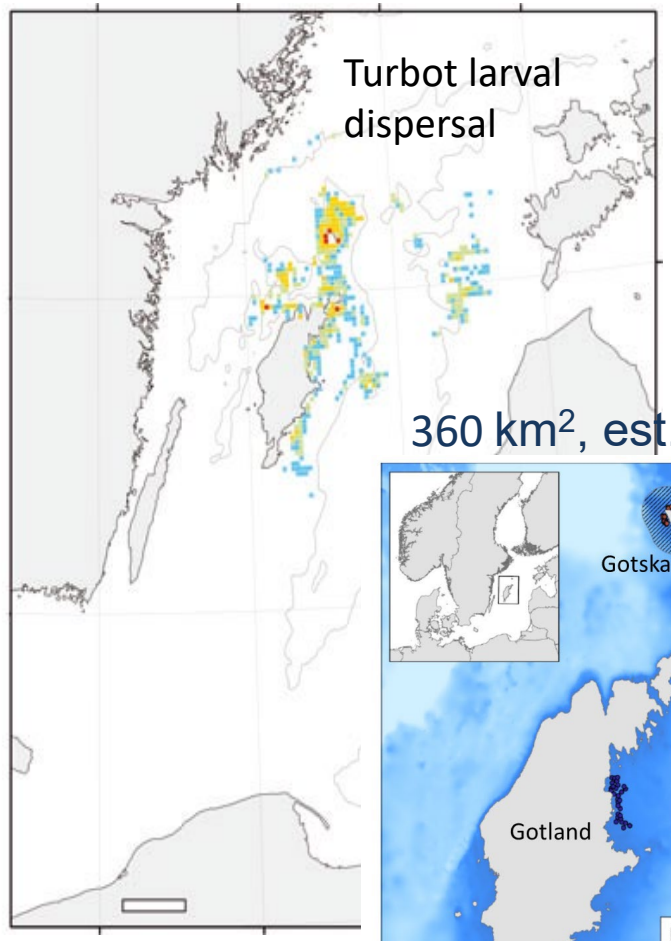


Turbot and flounder at Gotska Sandön

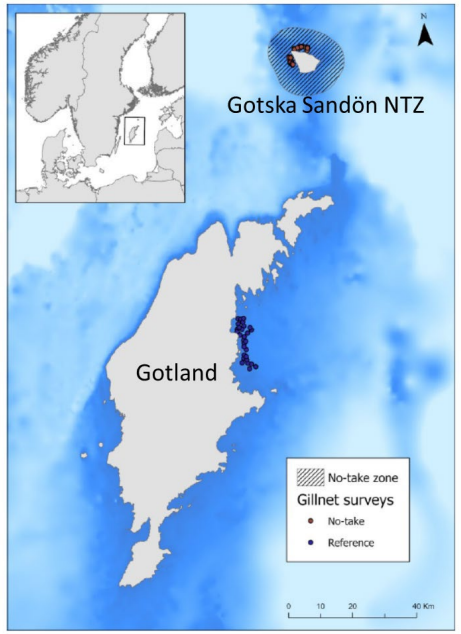
- Quick increase after establishment. Thereafter decline, but still more than reference area
- Significant larval dispersal to Gotland

Turbot >30 cm





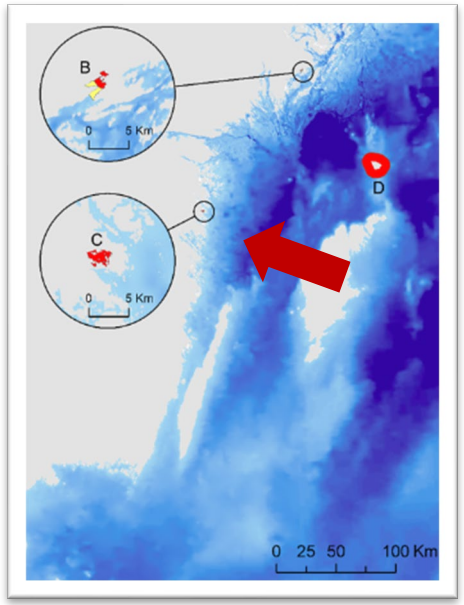
360 km^2, est. 2006



Van Hoey et al. 2024

Bergström et al. 2022

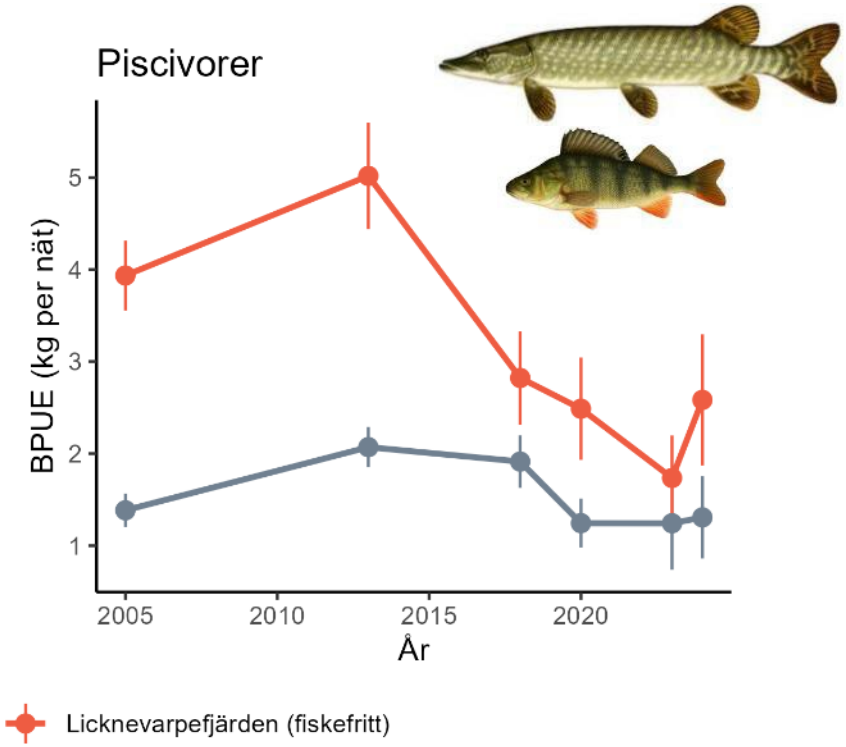
4 km^2, est. 1980



Pike and perch, Sweden's oldest NTZ

2-4 times more perch and pike in NTZ

Increase in predation from seals and cormorants after 2013 → loss of predatory fish, increase in cyprinids



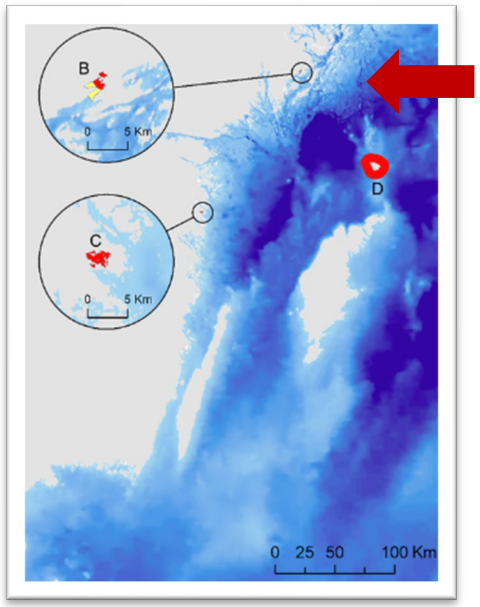
Pikeperch and pike, Stockholm archipelago

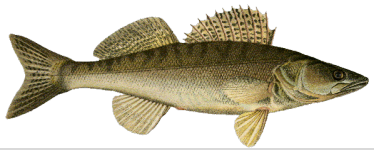
Quick recovery of predatory fish after NTZ was established

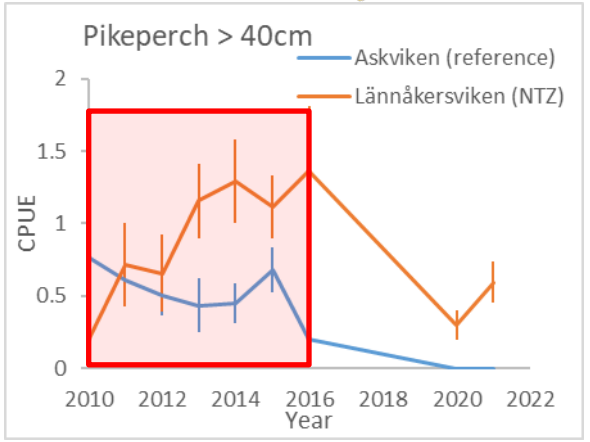
After reopening in 2016 populations declined quickly again, while cyprinids increased

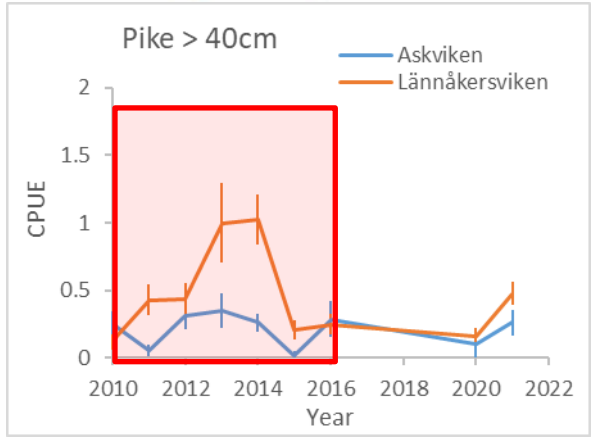
Spawning closure not enough to maintain pike and pikepech populations

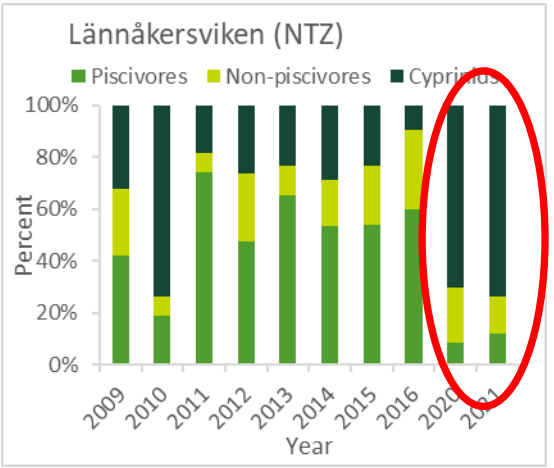
2 km^2, inrättat 2010



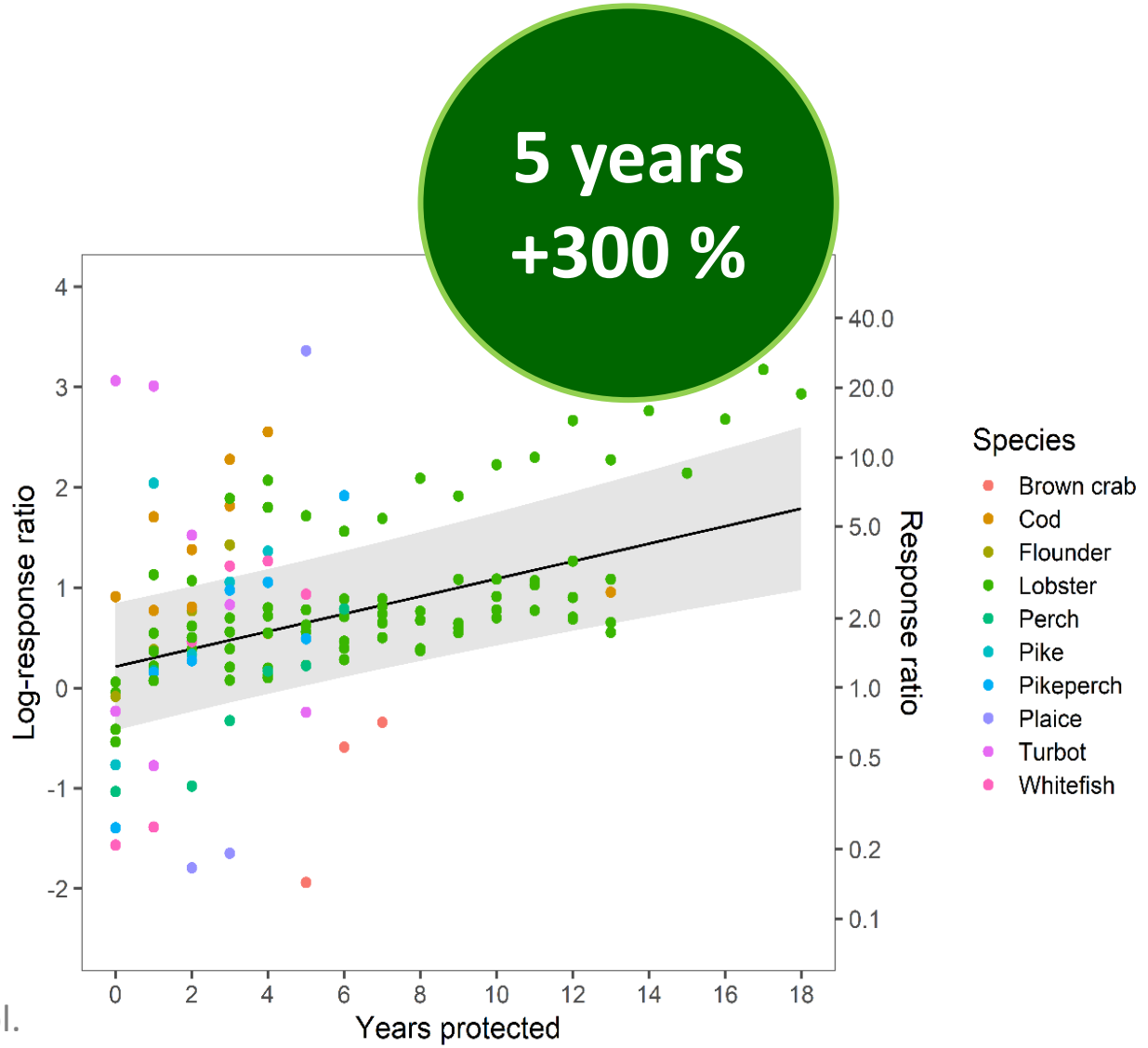








Meta-analysis of coastal NTZs in northern Europe

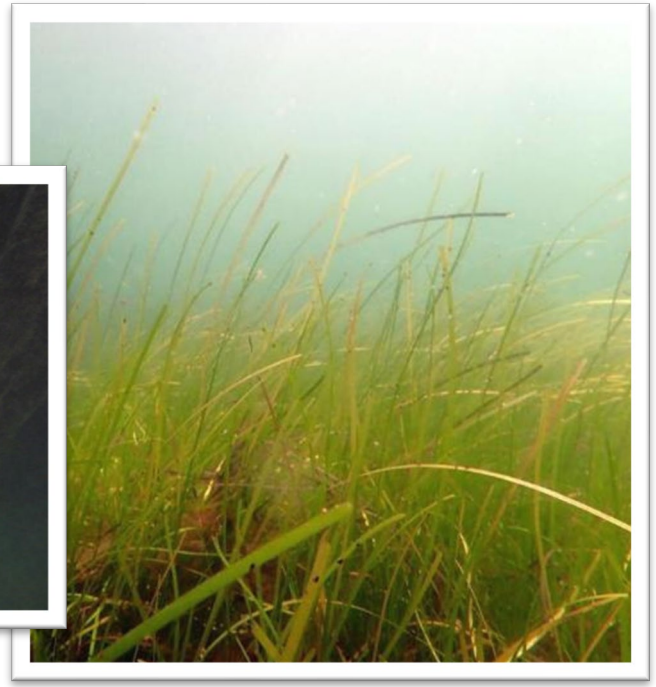


Berkström et al, unpubl.

Öresund is heavily impacted, still thriving habitats and fish populations

Densely populated, 4 million in the region
Heavily impacted area
Trawling ban since 1932

Strong cod populations and healthy habitats



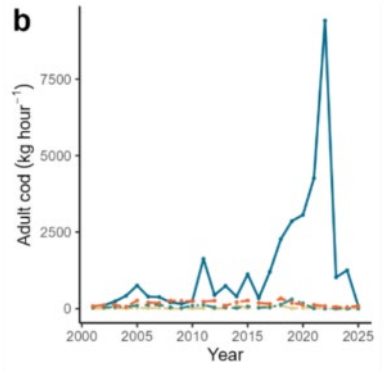
Cod maintains top-down control in Öresund

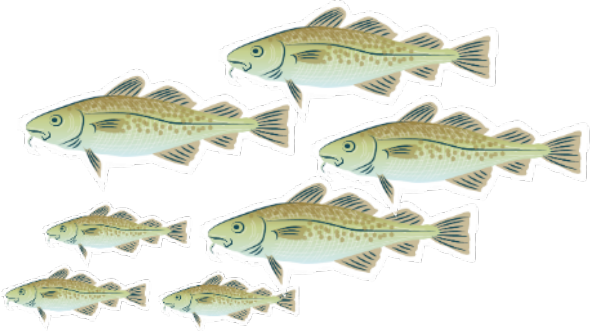
Fewer mesopredators – more grazers – more eelgrass

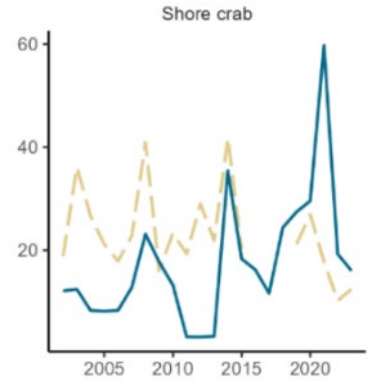
Worrying declines in cod last years, and increase in shore crab

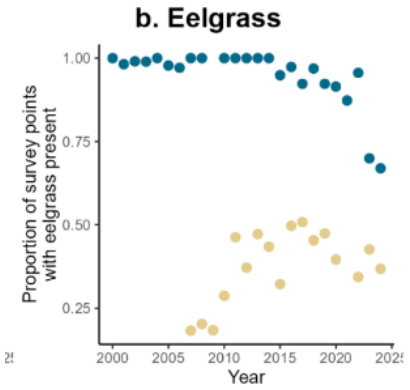
Cod fishing ban now

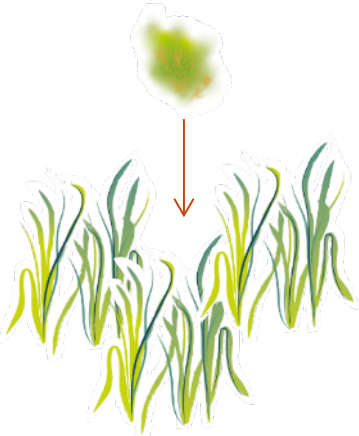
Area increasingly affected by higher temperatures









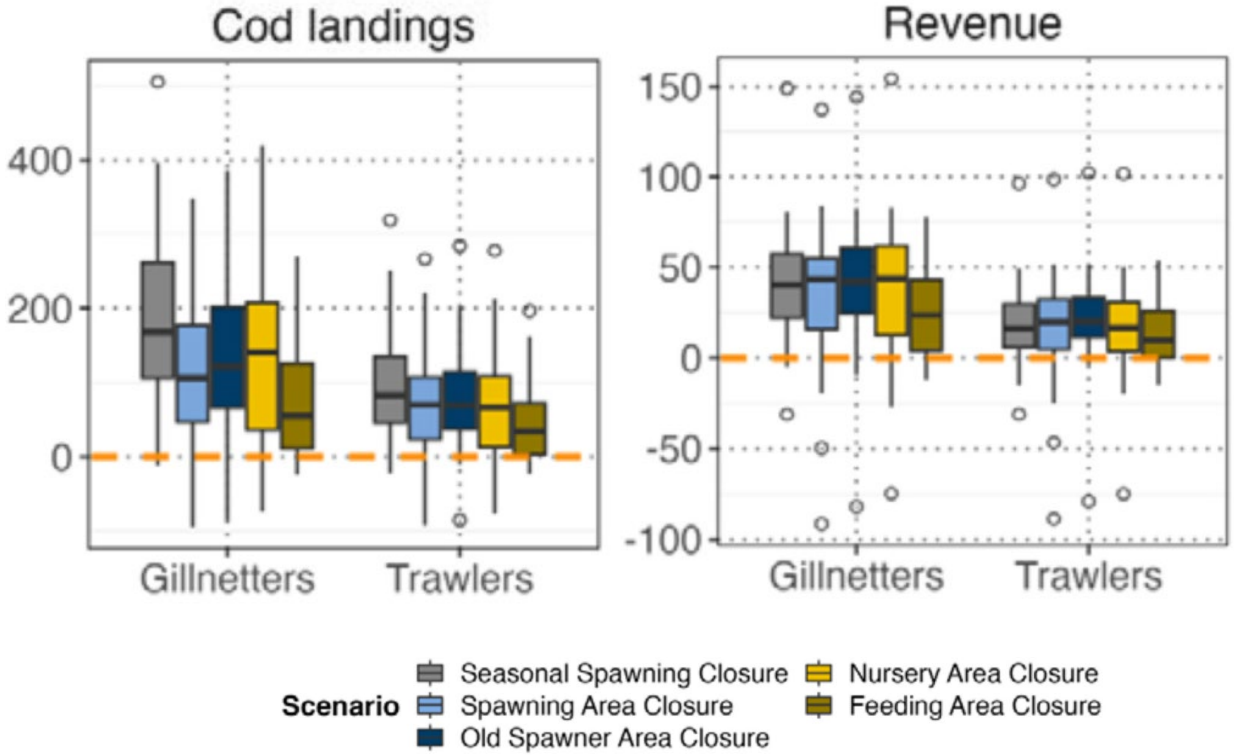


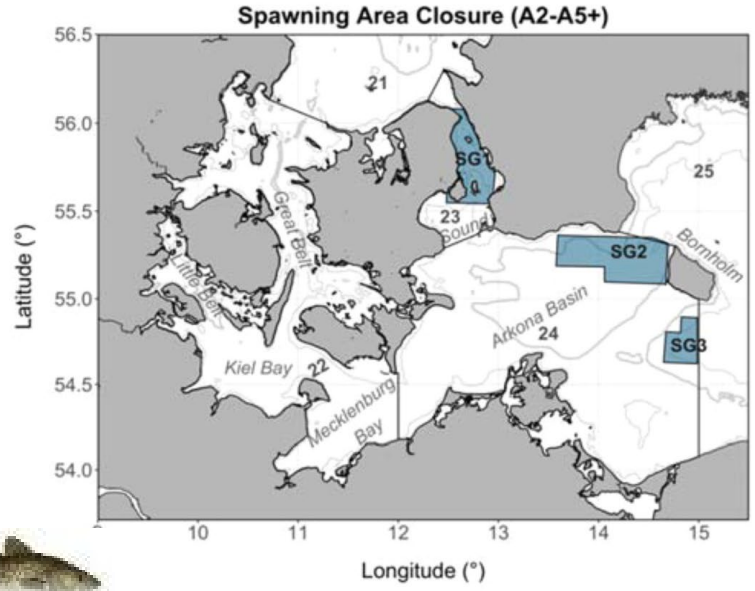
Olin et al, unpubl.

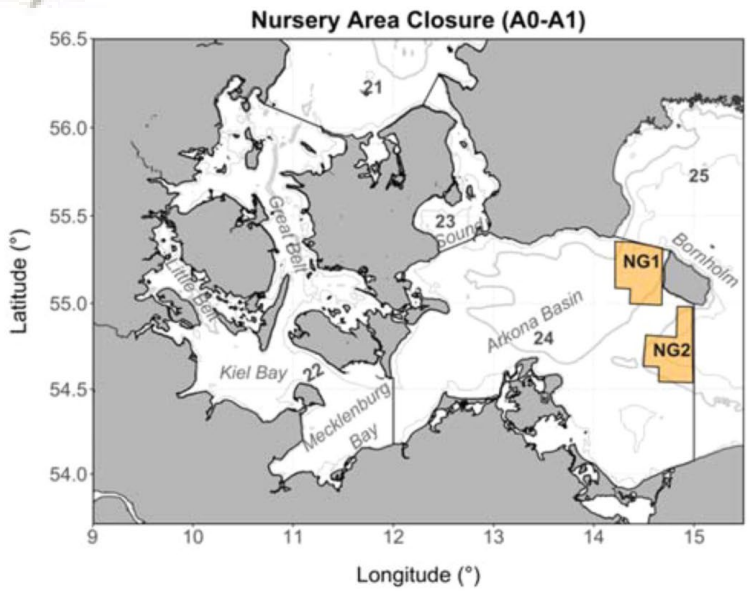
No-take zone/strict MPAs not welcomed by fisheries – but what do we know of their effects?

Closed areas may benefit fisheries despite loss of fishing areas

- Modelling study for Western Baltic cod
- All scenarios showed that closures would benefit fisheries







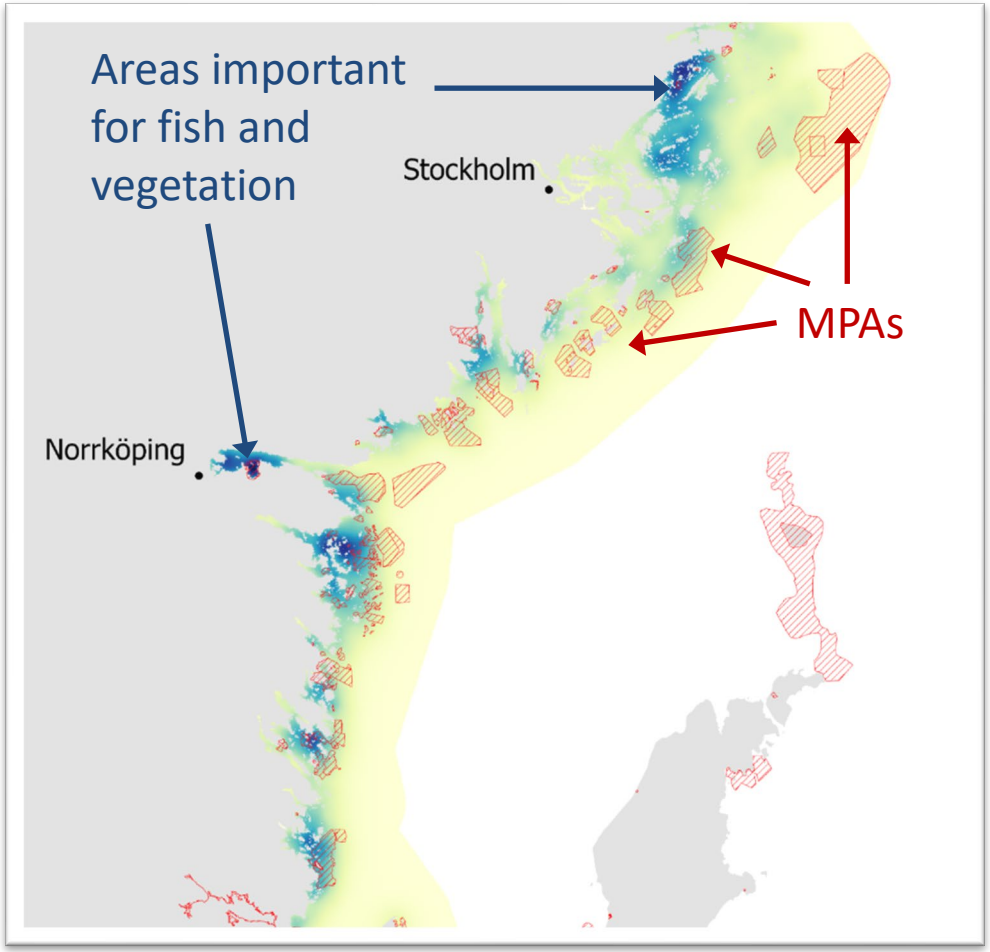
[Rufener et al 2023]

Networks of MPAs preferable for fisheries

Many small (but not too small) easier to handle for fisheries

Potential for spillover effect increases

Need to be correctly placed and designed - ecological coherence and prioritisation analyses central



Effects of no-take areas on fisheries

- A tool to strengthen threatened stocks or local coastal populations
- Buffer against mistakes in management (money in the bank)

- Effort displacement: problems may be moving
- Loss of fishing areas: spillover effects can make up for this, but not always fully
- Networks of smaller MPAs easier to adapt to for fisheries

- Fisheries become more stable - short-term pain for long-term gain

Effects of no-take areas on fish and ecosystems

- More and larger fish and a quick recovery of species targeted by fisheries – pikeperch, perch, pike, turbot, flounder, whitefish
- Increase in reproduction – spillover effects
- Protection against habitat damage and bycatches
- Restoration of top-down control → will help reach habitat-related objectives of MPAs

- Need to be long-term to gain ecosystem effects

We need strong fish populations for healthy habitats – and vice versa