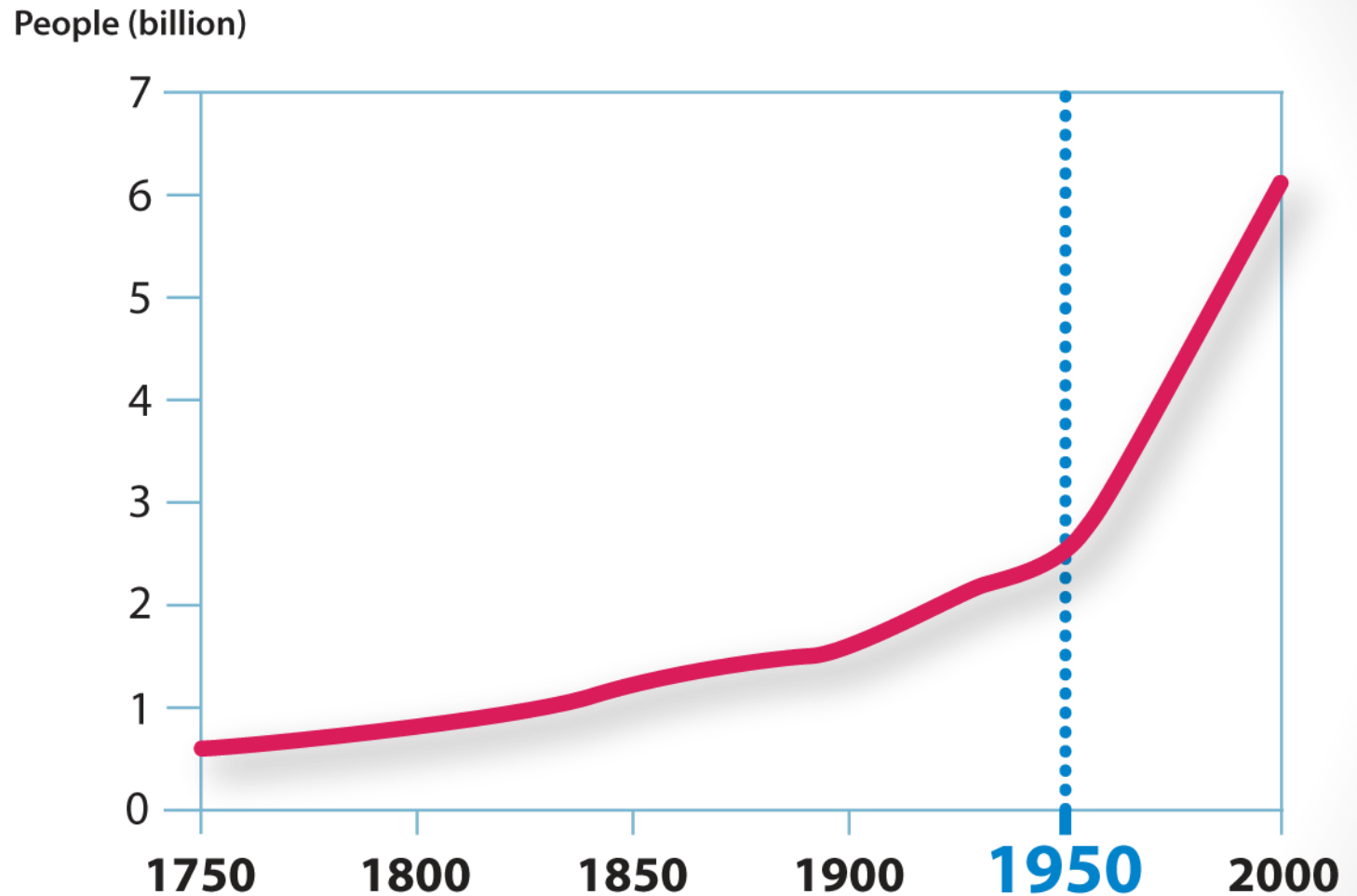


Reports from the front line of the current mass extinction: ocean acidification, fisheries and ecocide

Jason Hall-Spencer
Plymouth University

Coastal Futures meeting January 2015

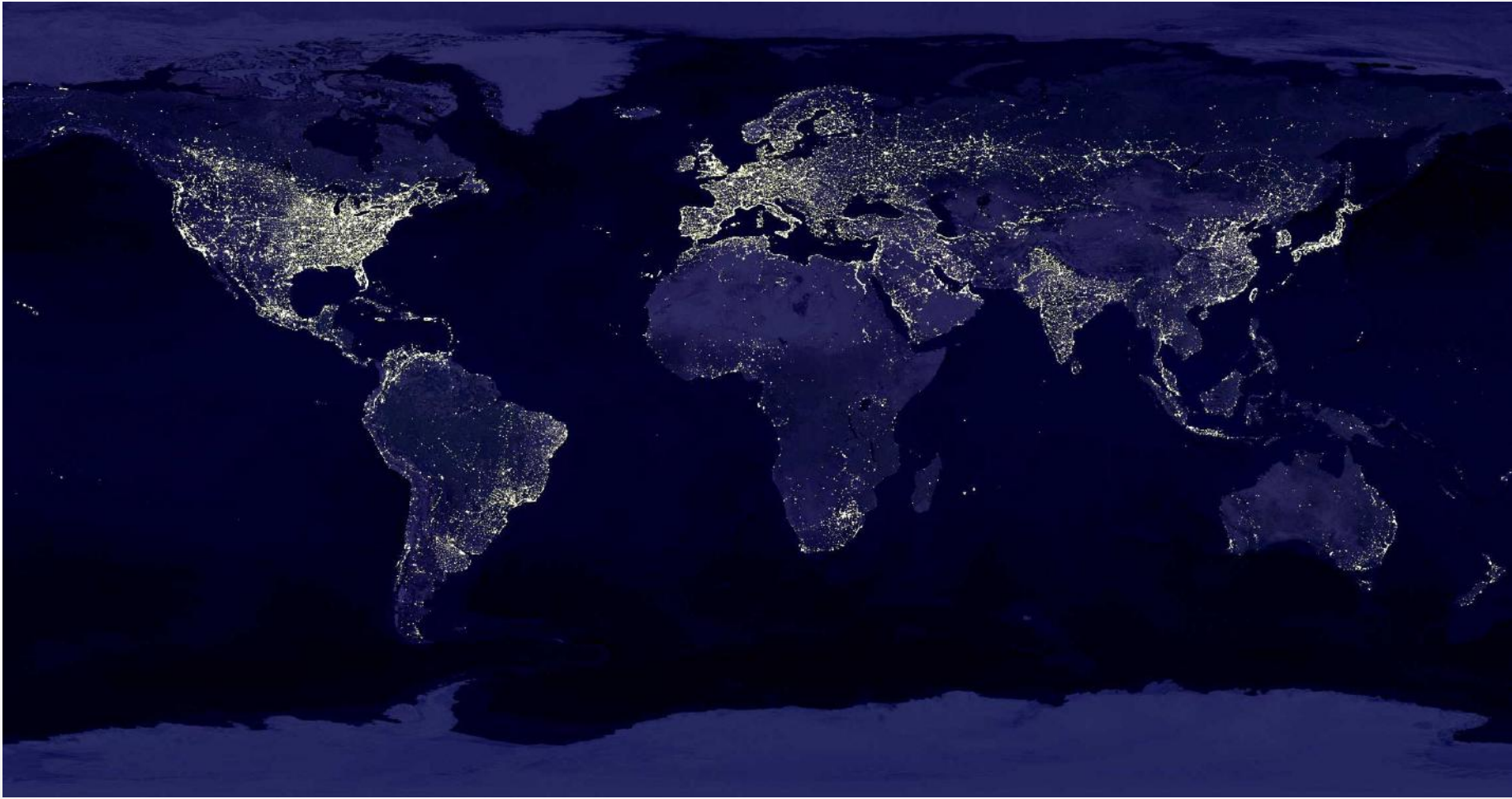
Population



US Bureau of the Census (2000) International database

The Anthropocene

– a planet under pressure





Only 15 marine species known to have gone completely (vs. 100s on land)

Last Caribbean Monk seal seen in the 1950s



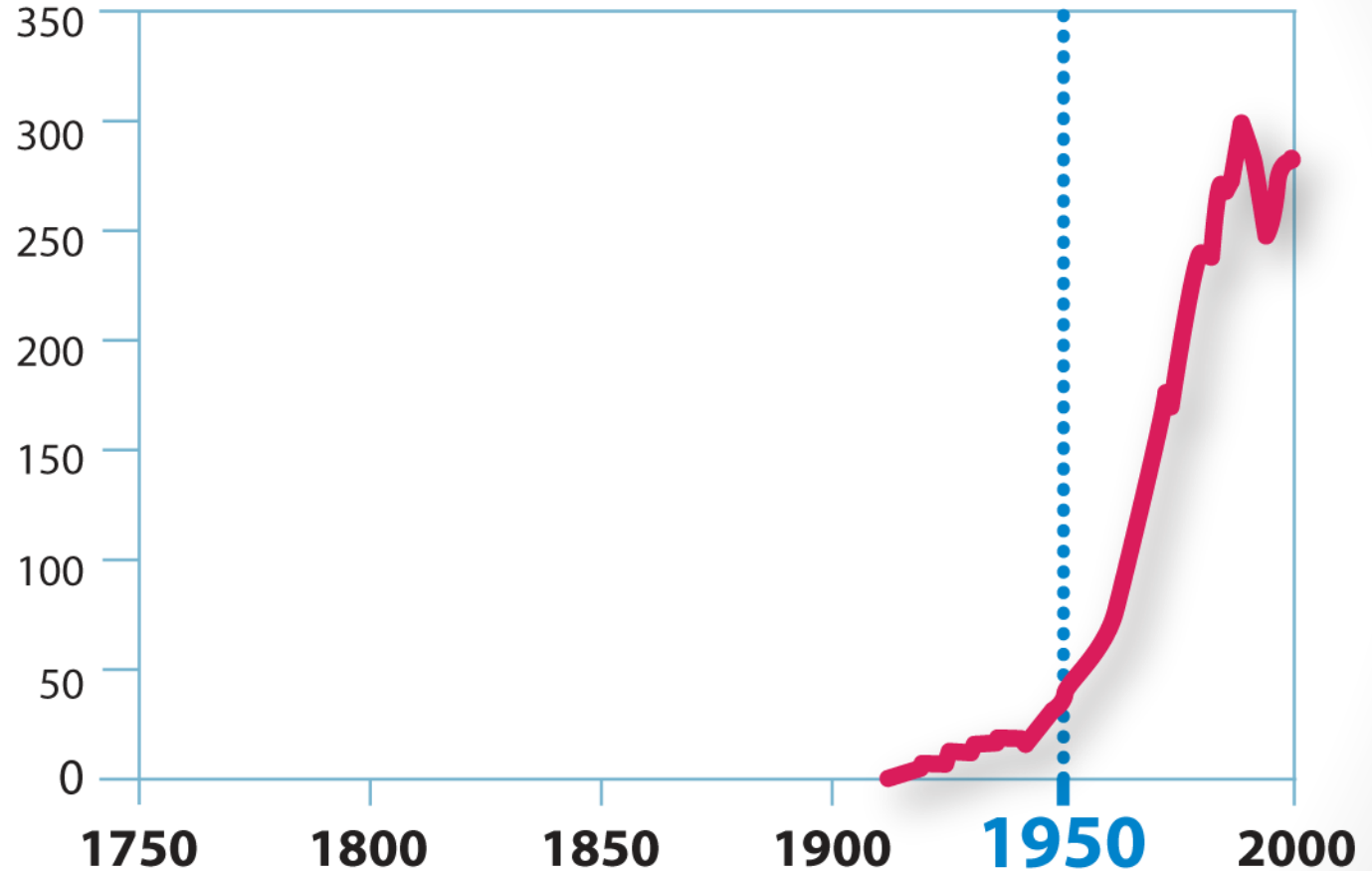
Japanese sea lion hunted to extinction in the 1970s

1981 no 'common skate' left in the Irish Sea

Lots of species commercially extinct e.g. Clyde Basking Shark collapse 1980s.

Fertiliser consumption

Tonnes of nutrients
(million)

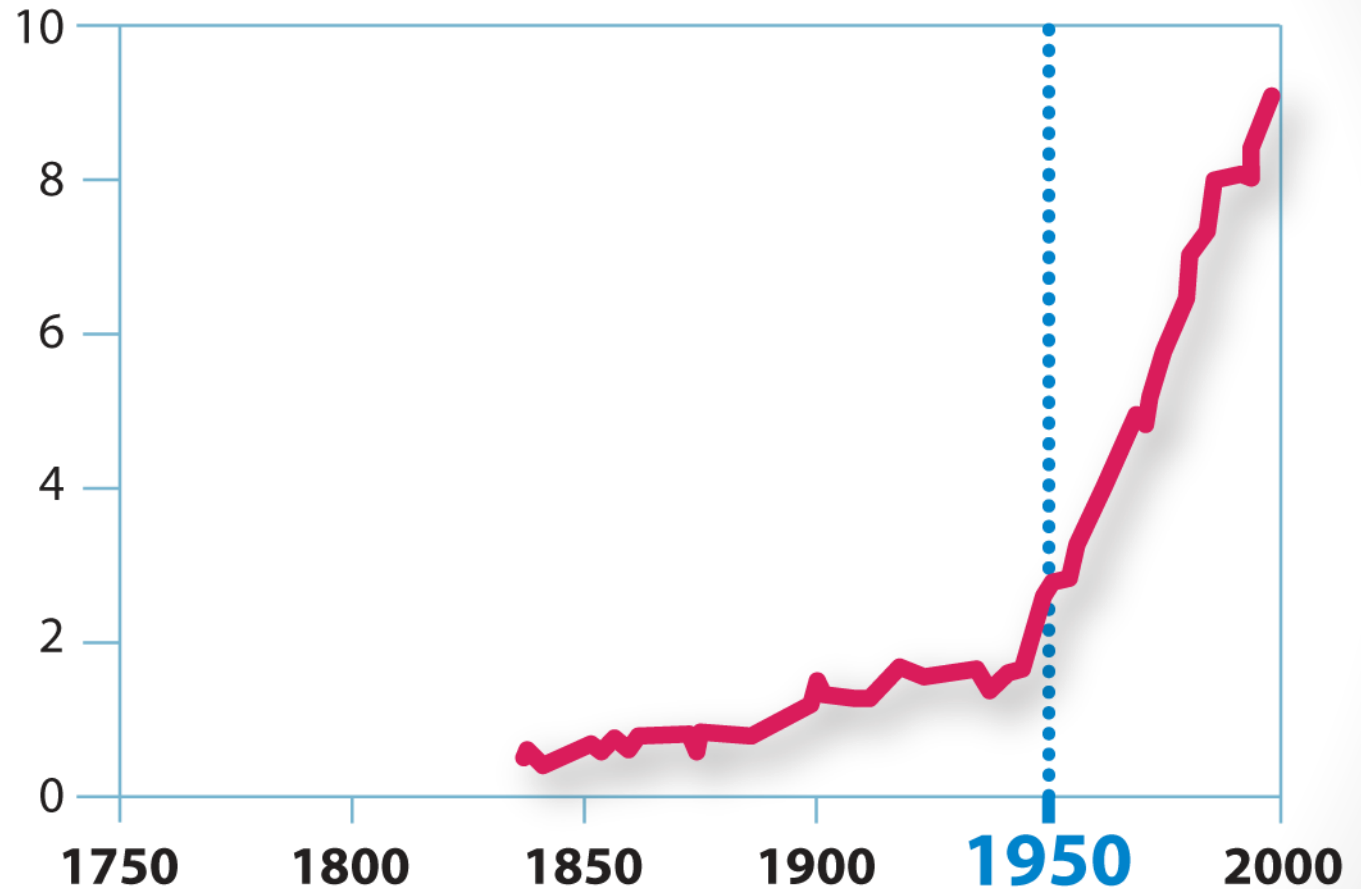


International Fertilizer Industry Association (2002)

IGBP synthesis: Global Change and the Earth System, Steffen et al 2004

Coastal zone nitrogen flux

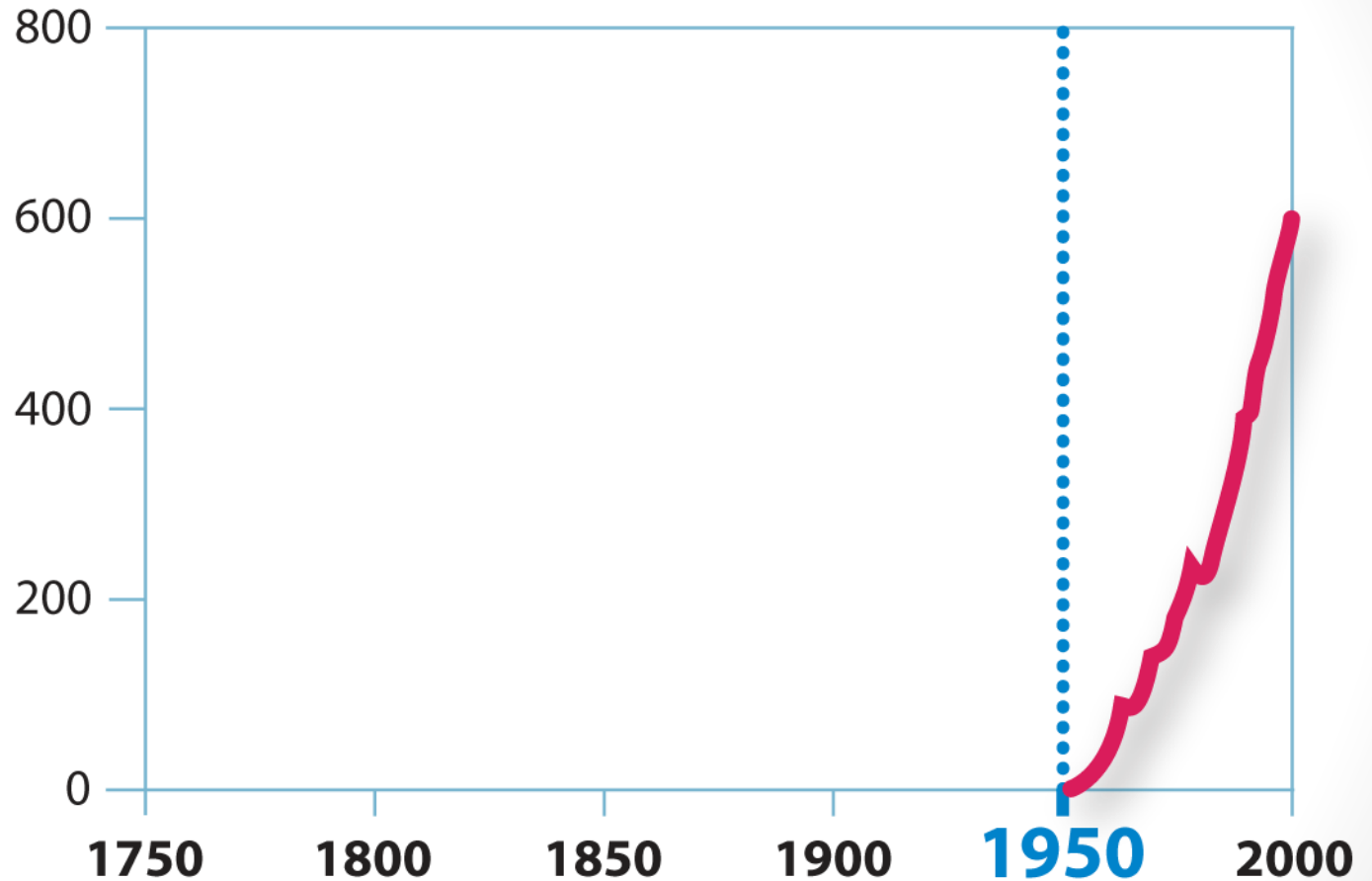
(10¹² moles year⁻¹)



IGBP synthesis: Global Change and the Earth System, Steffen et al 2004

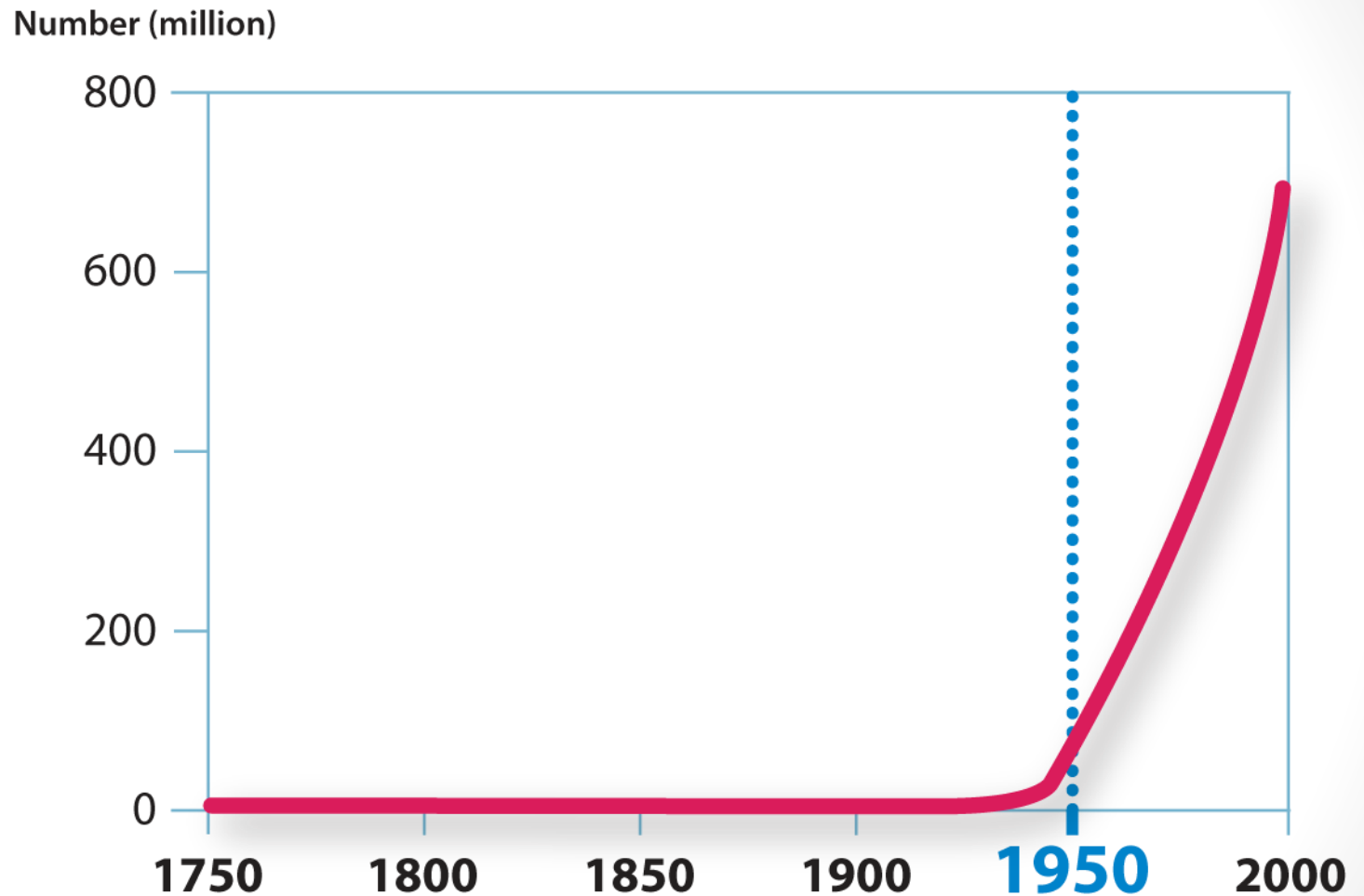
International tourism

Arrivals:
million people



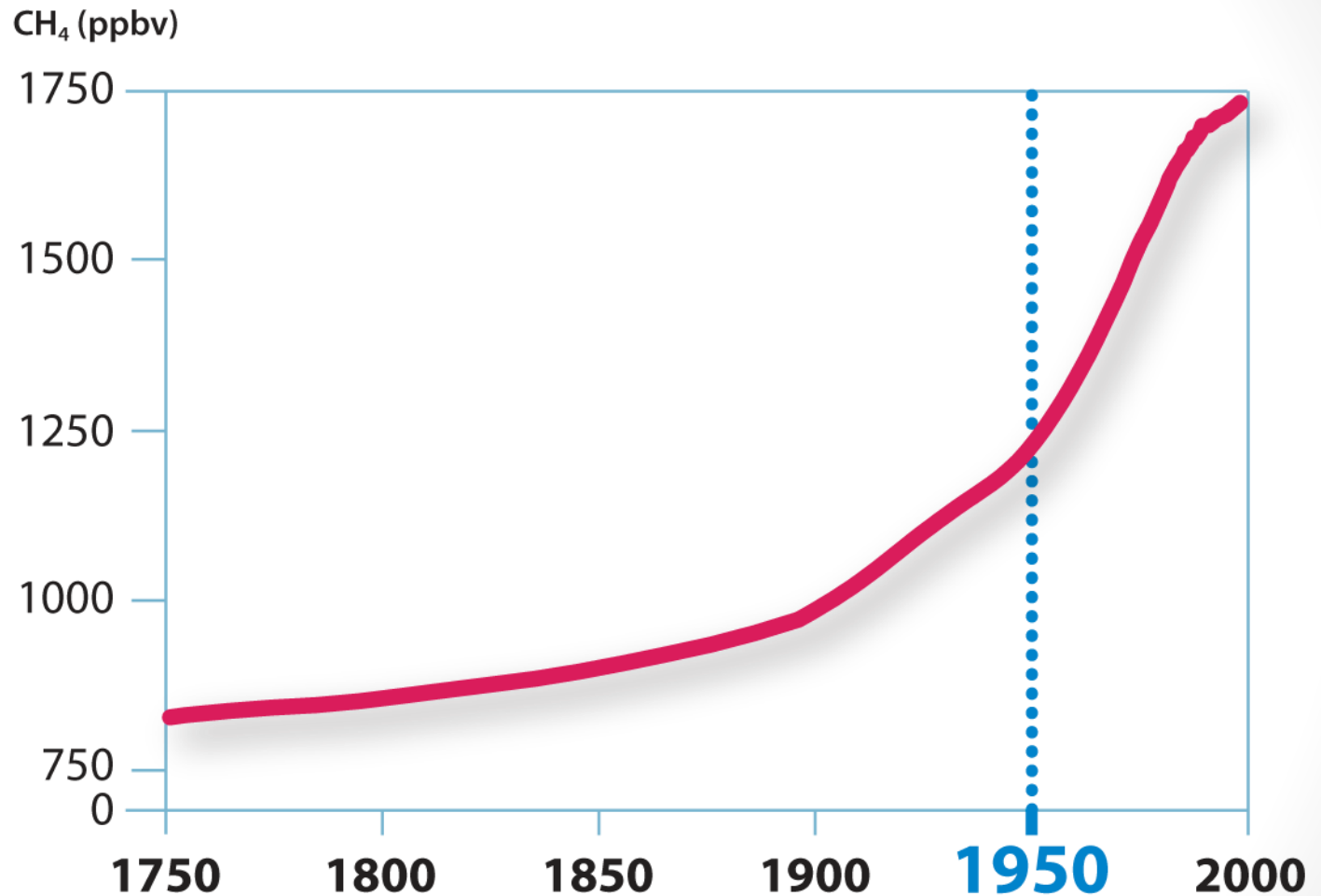
World Tourism Organization (2001) Tourism industry trends

Motor vehicles

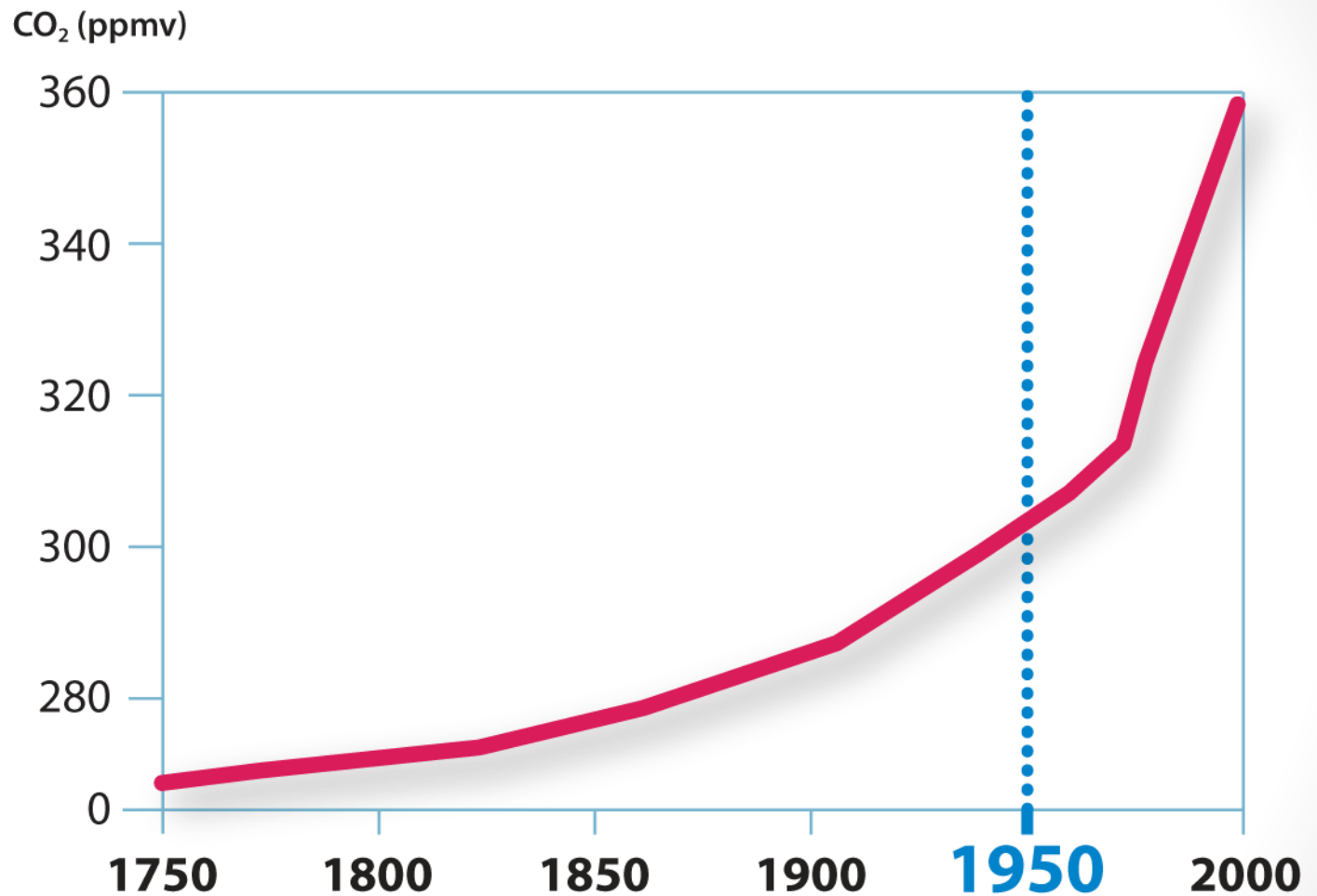


Global environmental outlook (2000)

Atmospheric CH₄ concentration



Atmospheric CO₂ concentration

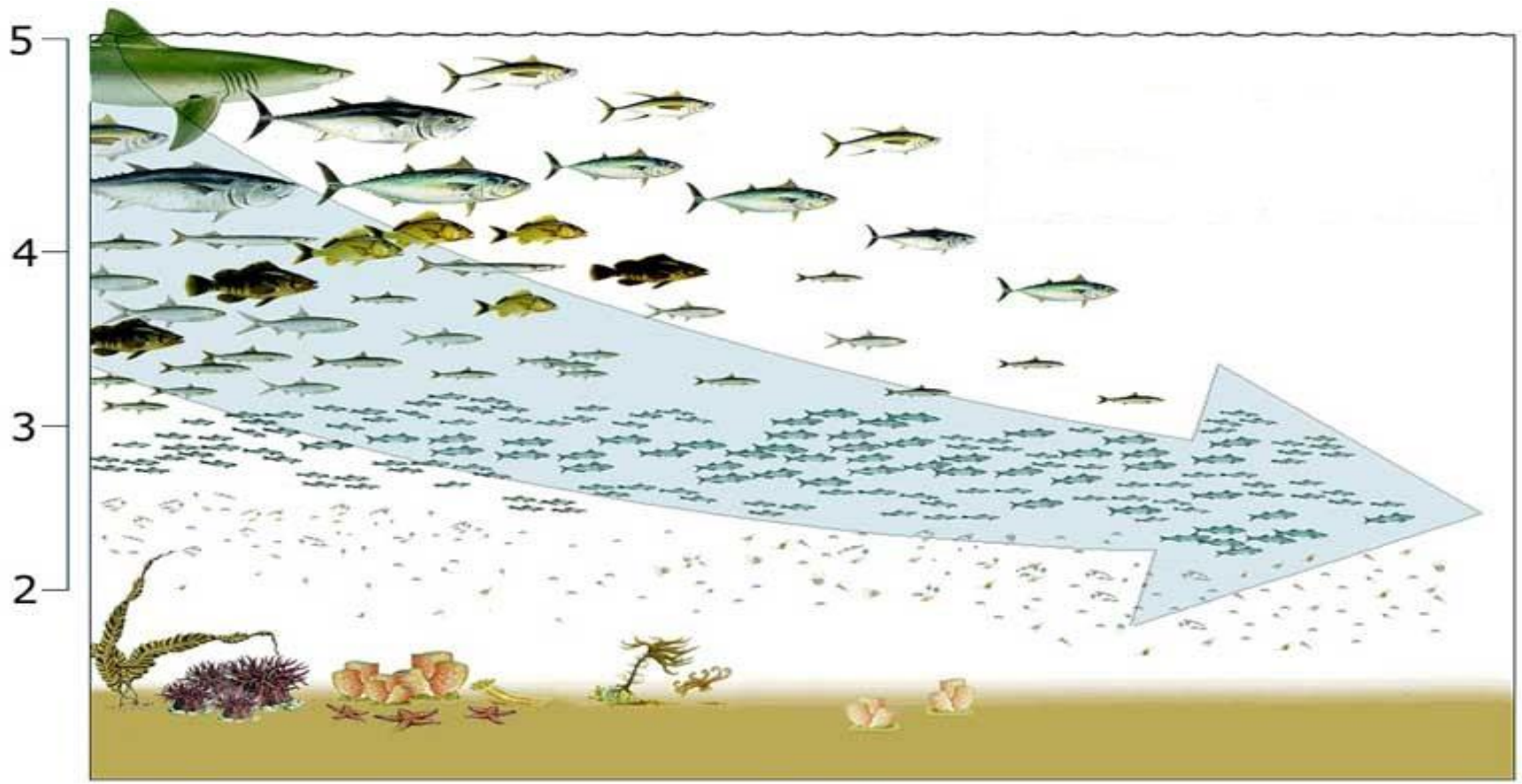


Etheridge et al. Geophys Res 101: 4115-4128



Pauly et al. (1998): Fishing Down Marine Food Webs

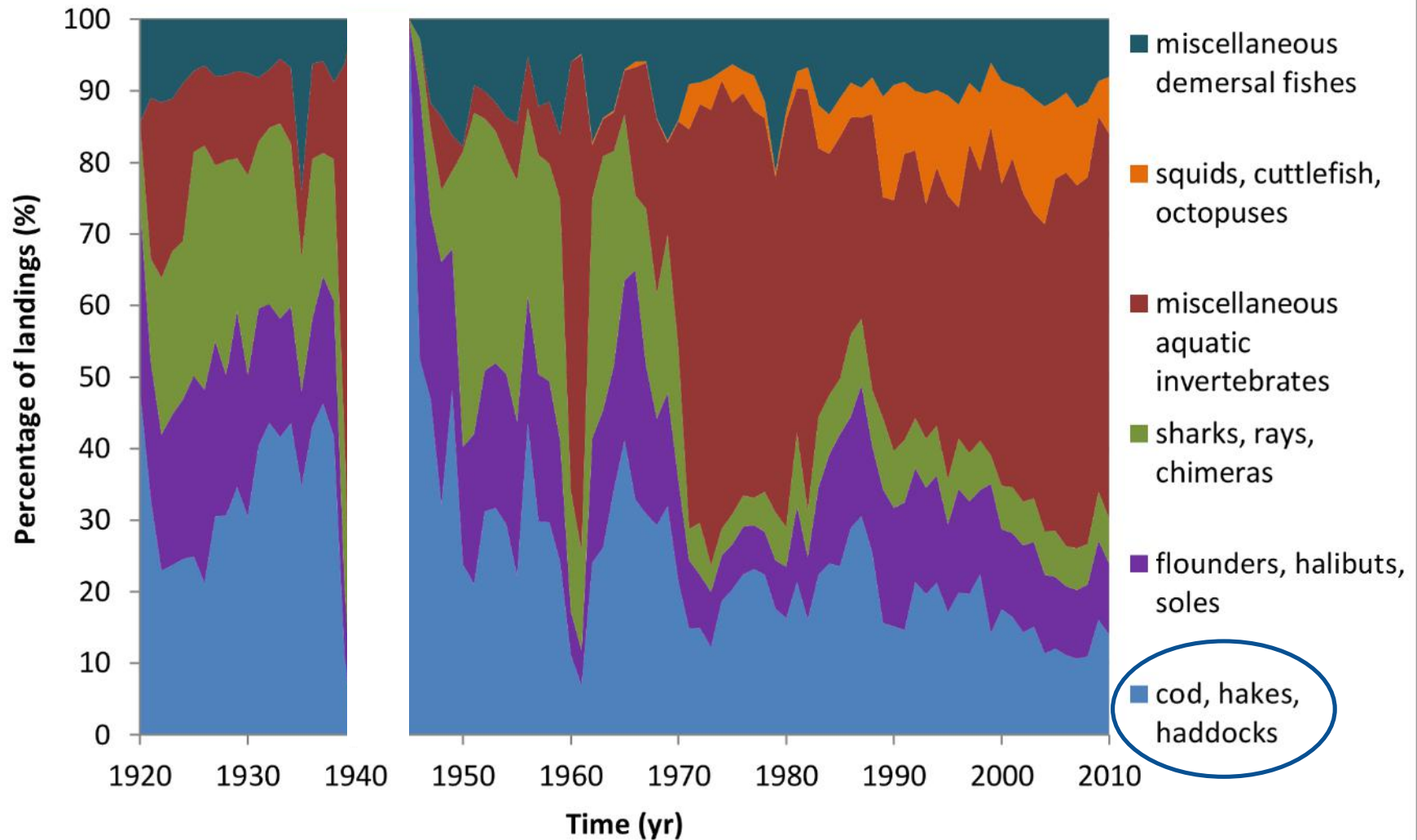
- mean Trophic Level of global fisheries landings declining
- NW Atlantic cod → shrimps, crabs, lobsters
- Firth of Clyde finfish → *Nephrops* and scallops



Current study

- 90-year English Channel landings dataset
- Is there a 'Fishing down' trend in the English Channel?
- Have there been major changes in species landed?

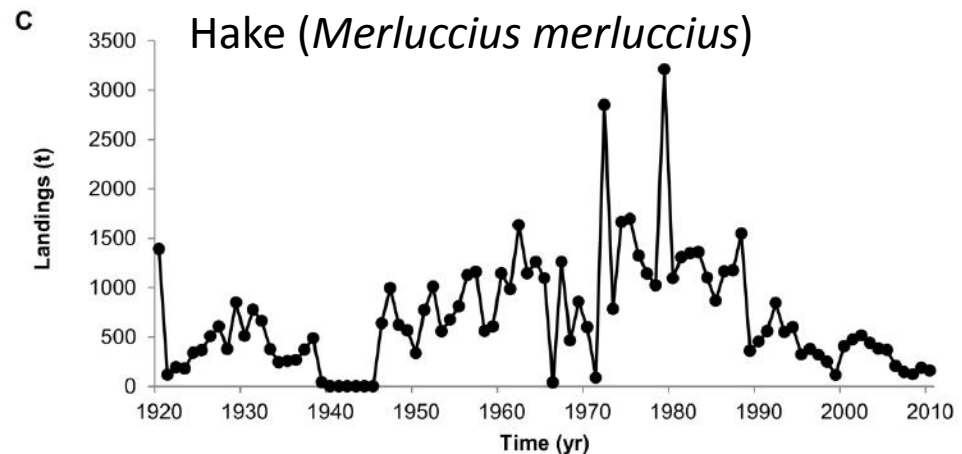
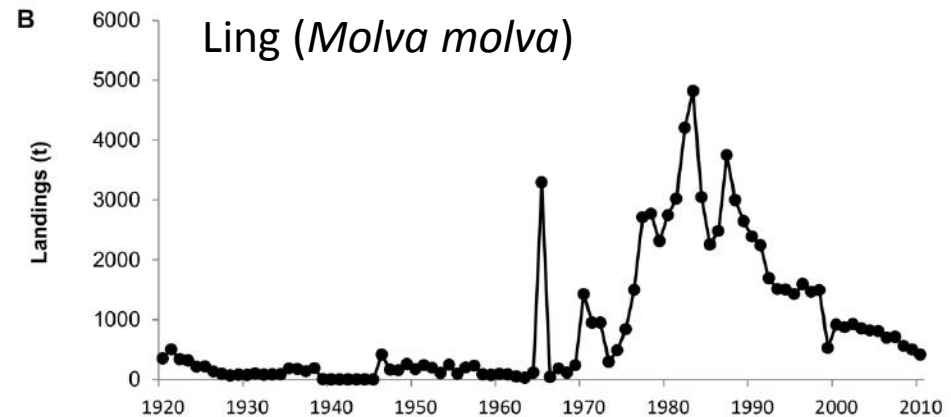
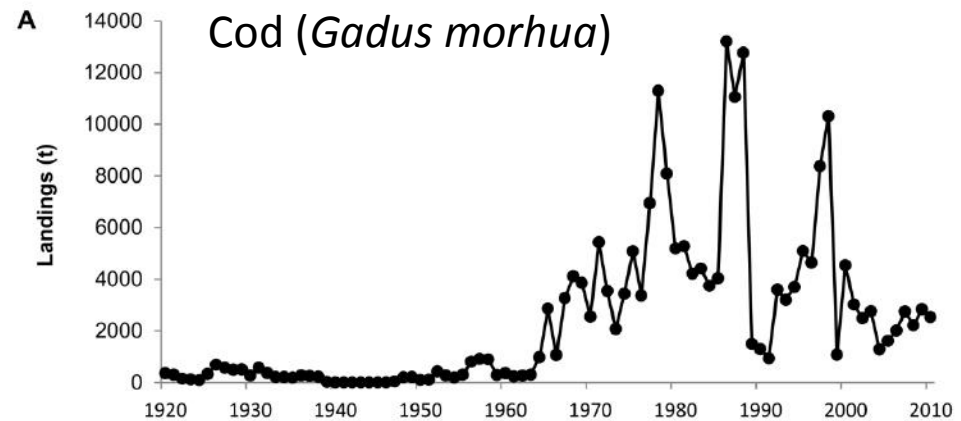
Catch composition



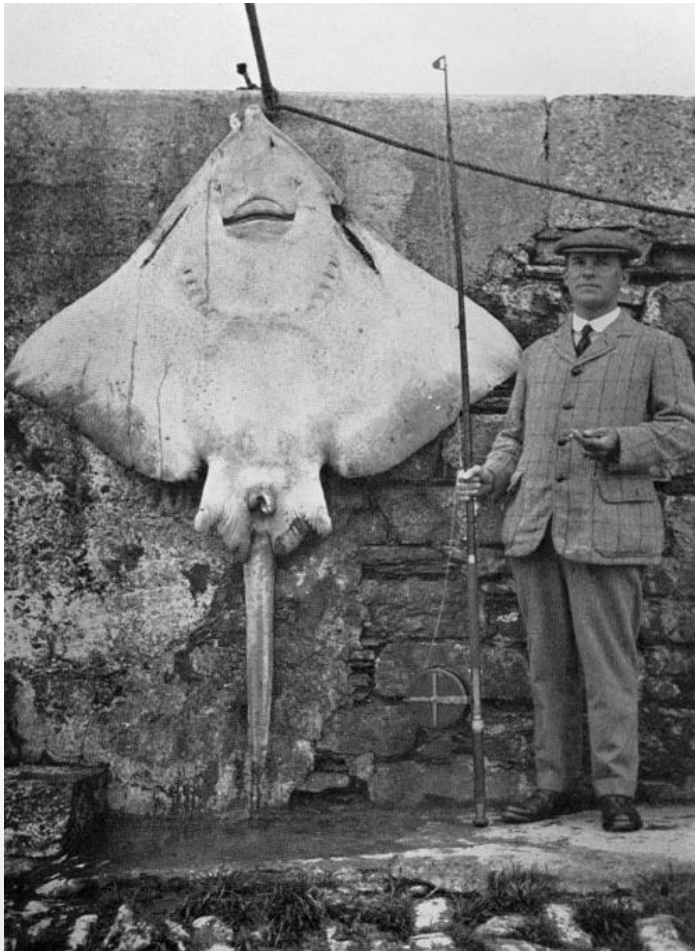
Gadoids

Landings now low

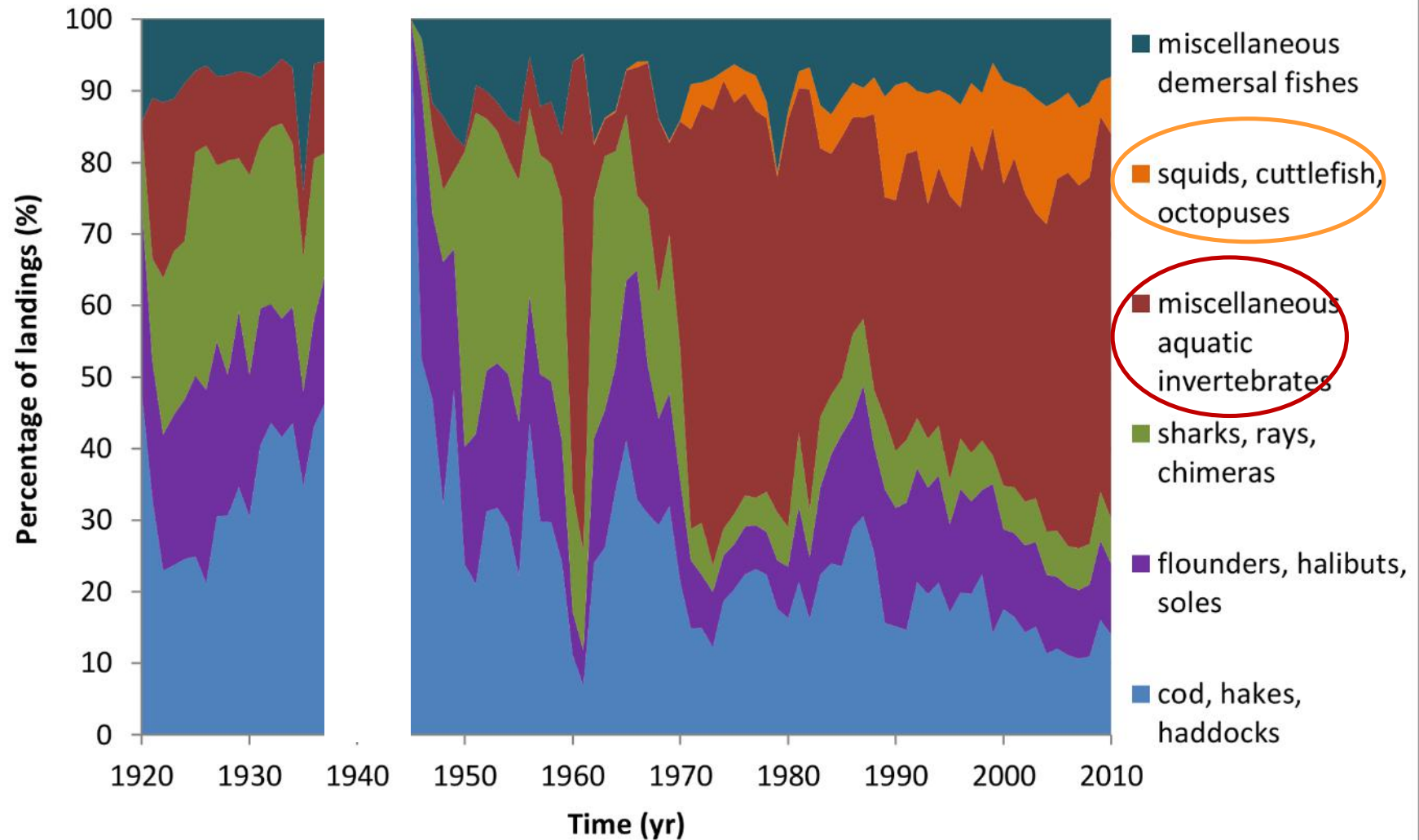
We import them to meet demand



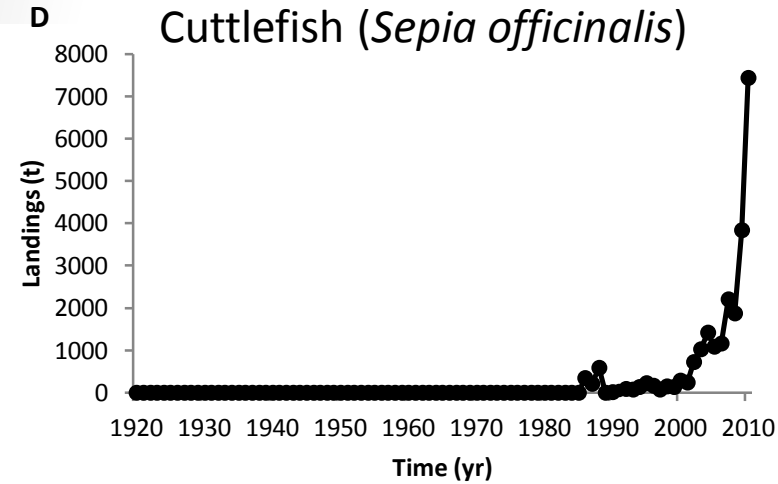
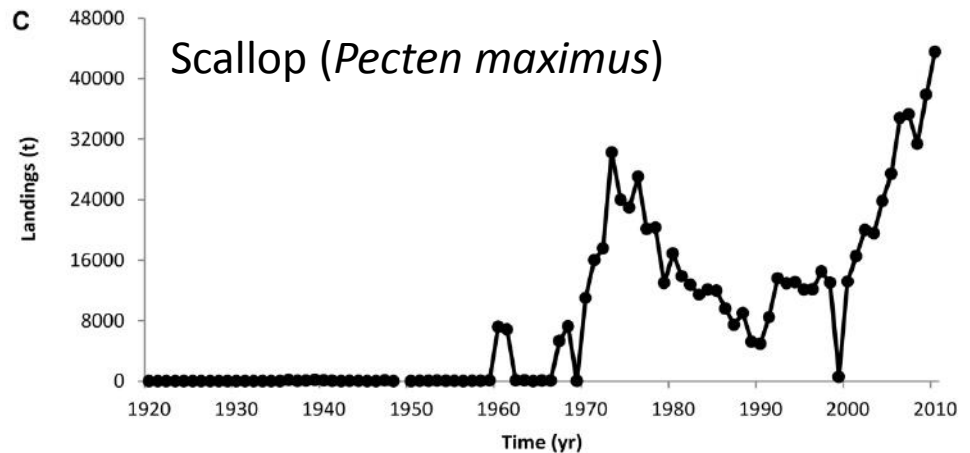
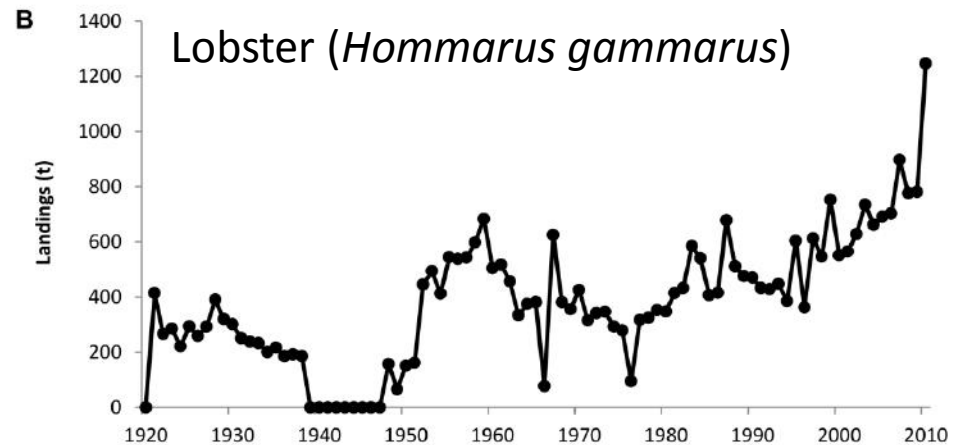
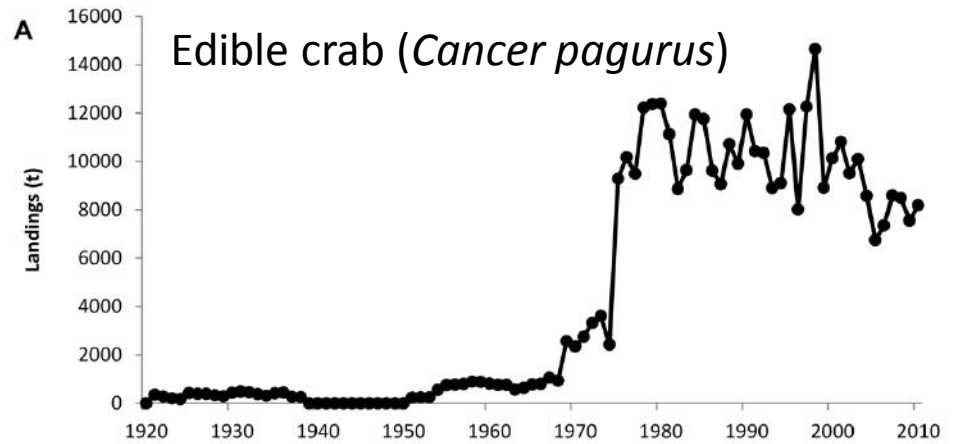
There were more big fish before
widespread use of heavy towed
gear



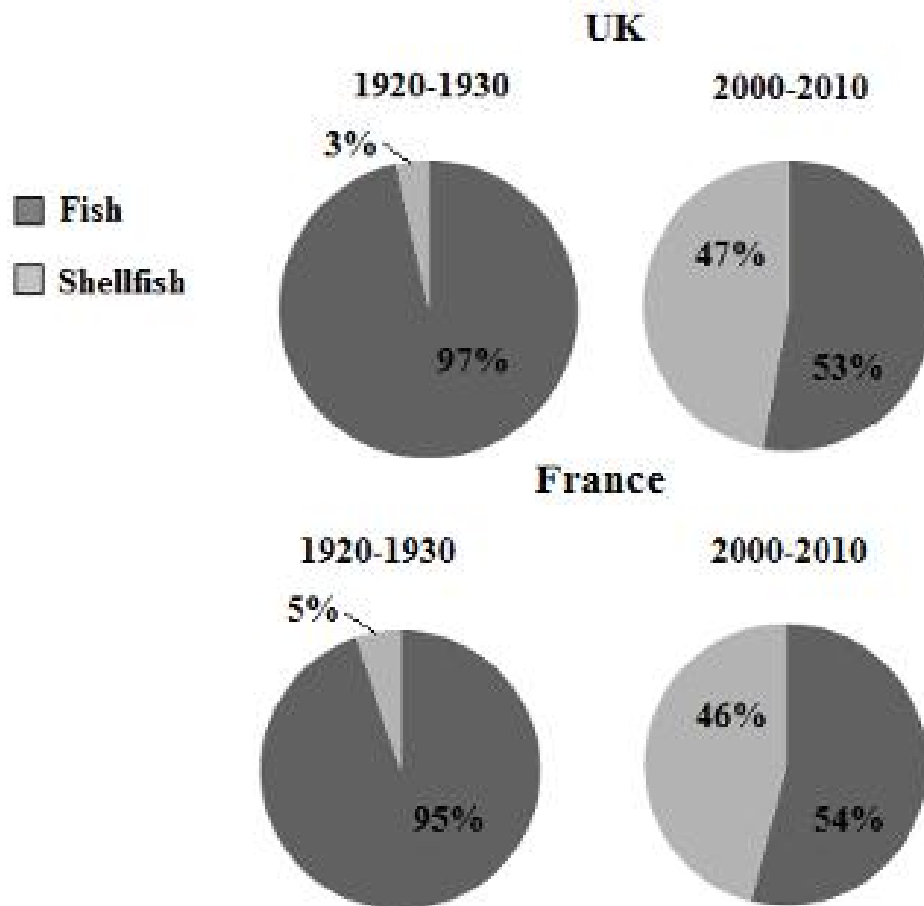
Catch composition



Invertebrates

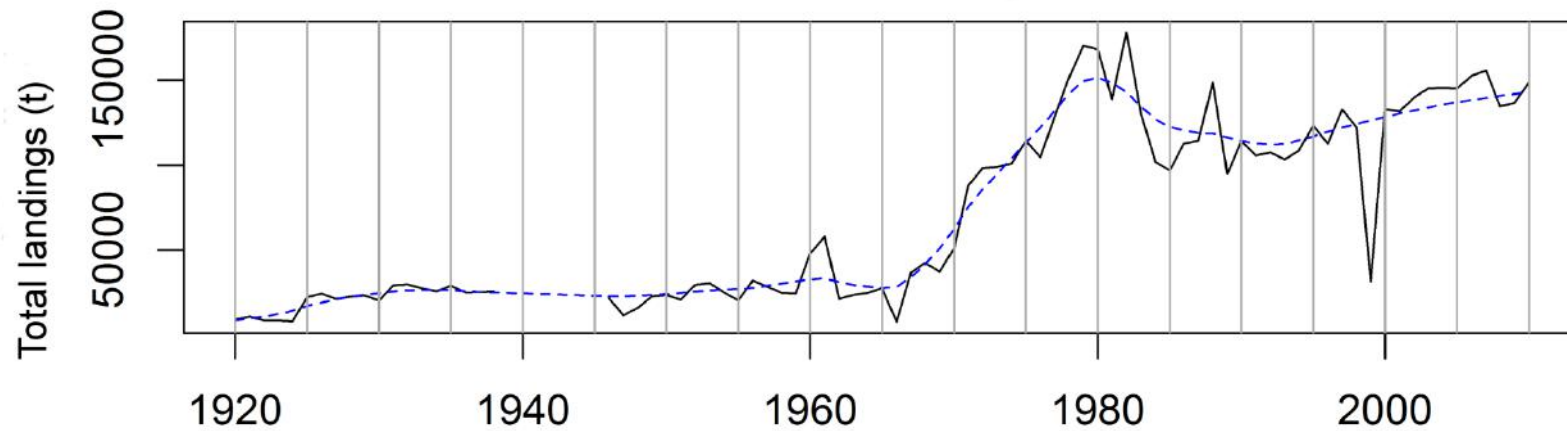


Shellfish (e.g. scallops) now more prevalent in Channel landings.

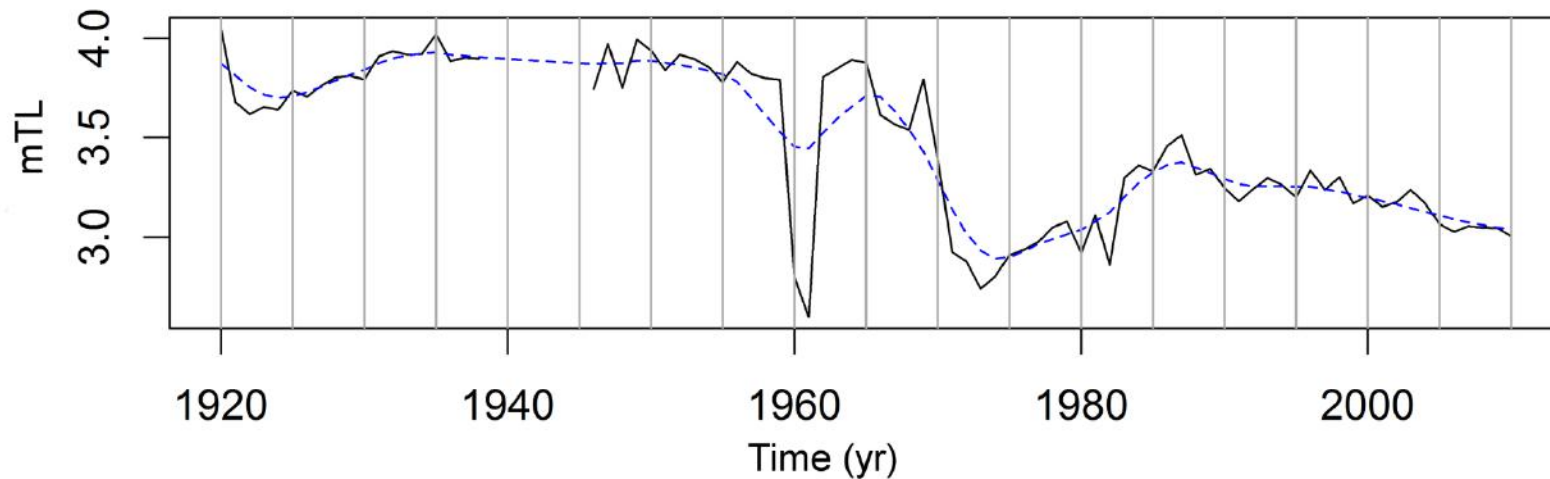


Landings and trophic level

A



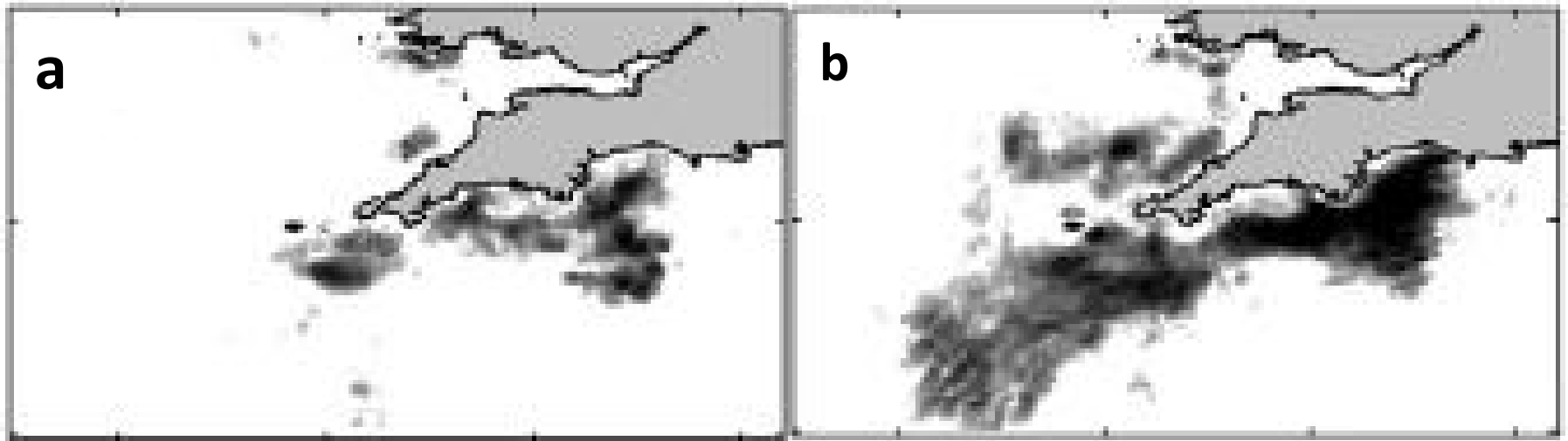
B



Scallop dredges and trawls alter the seabed; scallops are resilient but many long-lived organisms (e.g. maerl) are not

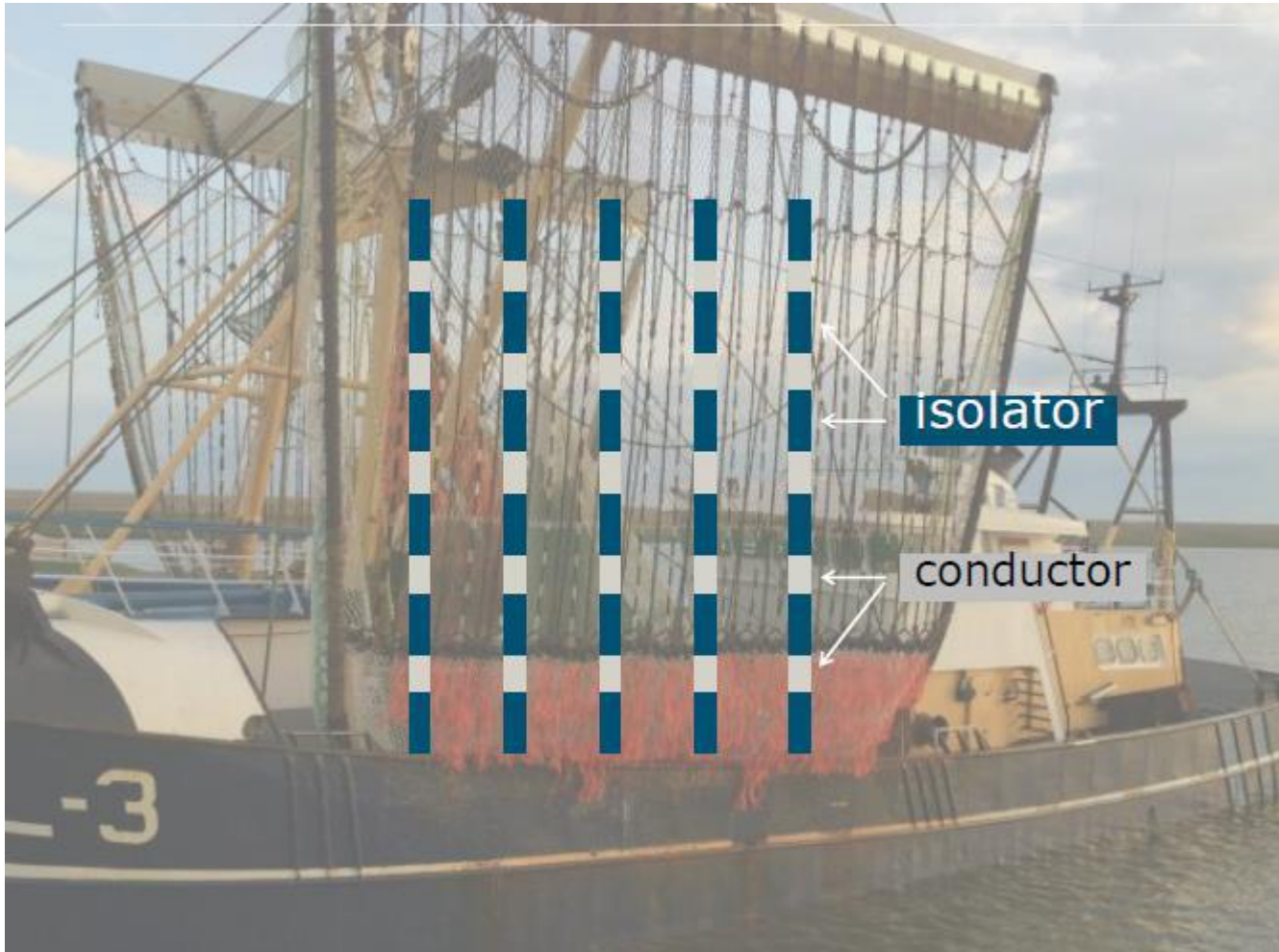


Satellite data show the large area affected by modern heavy gear types in the English Channel



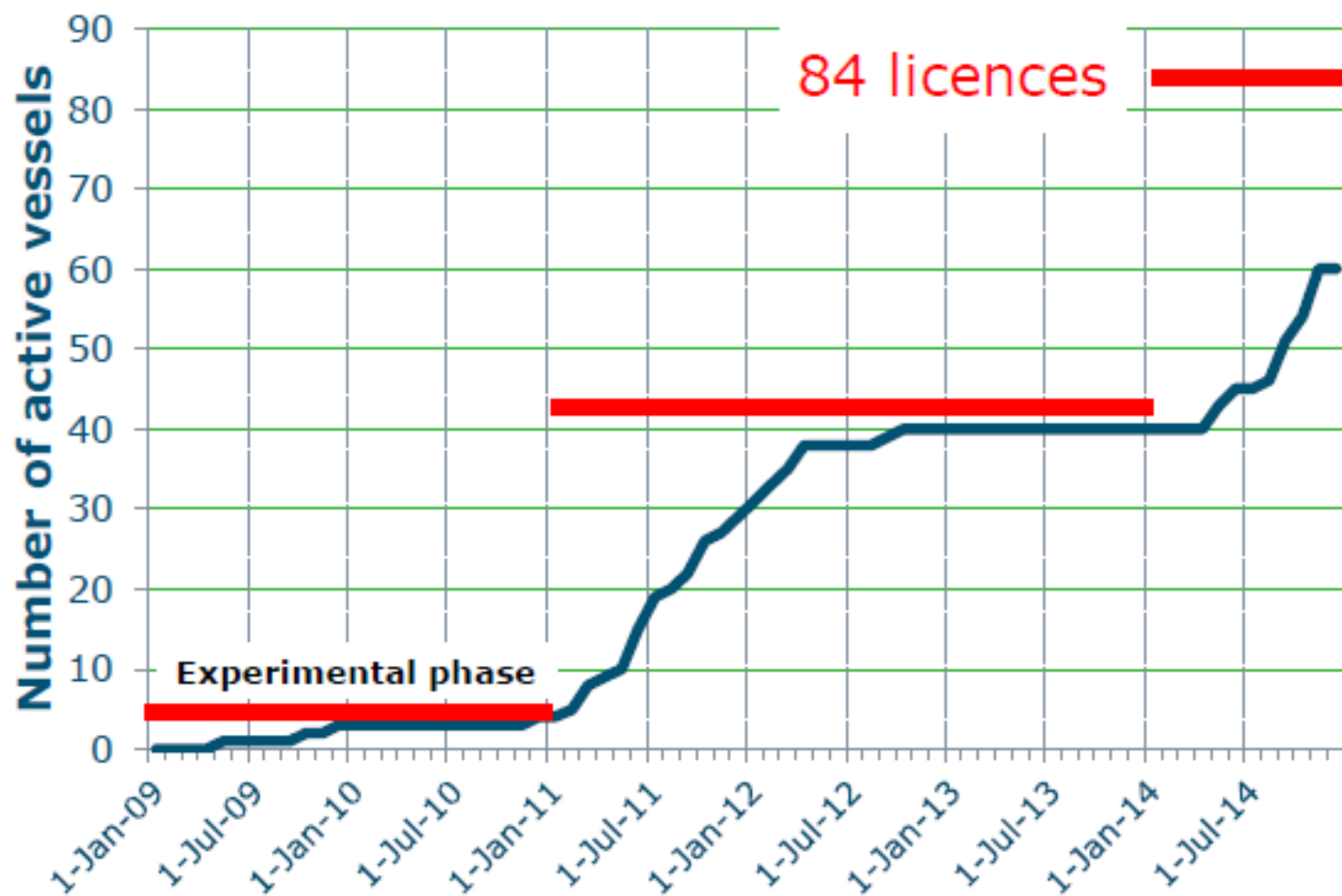
Footprint of a) UK scallop dredgers and b) beam trawlers >15 m length (Campbell et al. 2014 *Marine Policy*)

We need to ensure that measures we put in place are not maladaptive

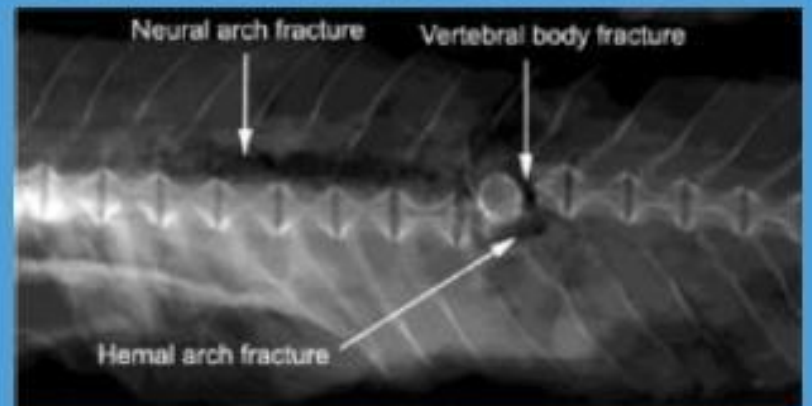


Electric pulse fishing by the Dutch fleet

Number of pulse trawlers in North Sea



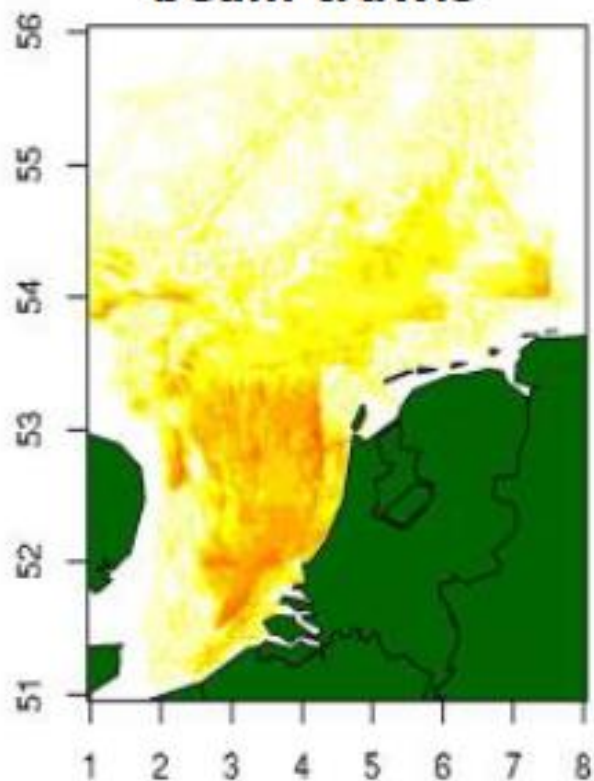
Electric pulse lab. tests
cause significant
increases in viral
infections in shrimp
(*Crangon crangon*) and
severe injuries in cod
(Rinsjorp pers. comm)



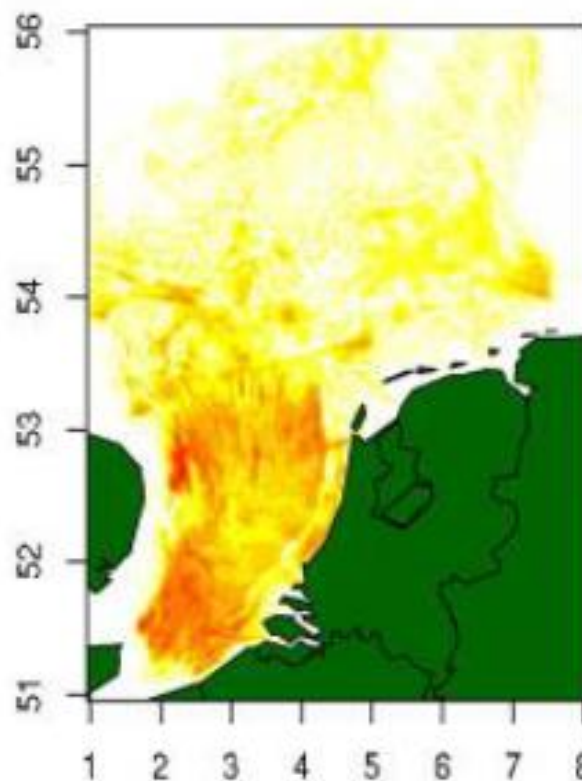
Change distribution pulse trawlers: consequences for ecosystem effects



**Tickler chain
beam trawls**



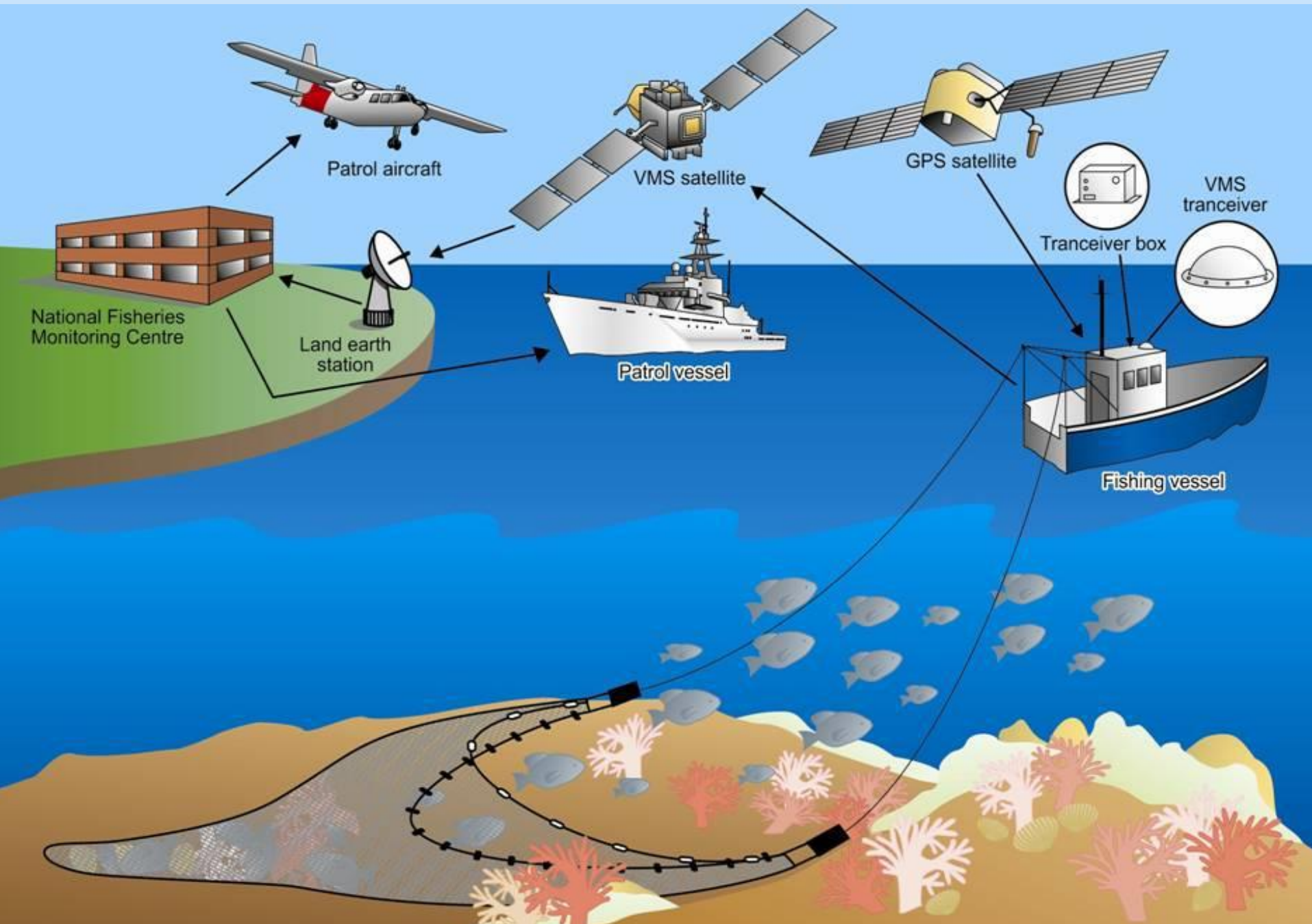
Pulse trawls



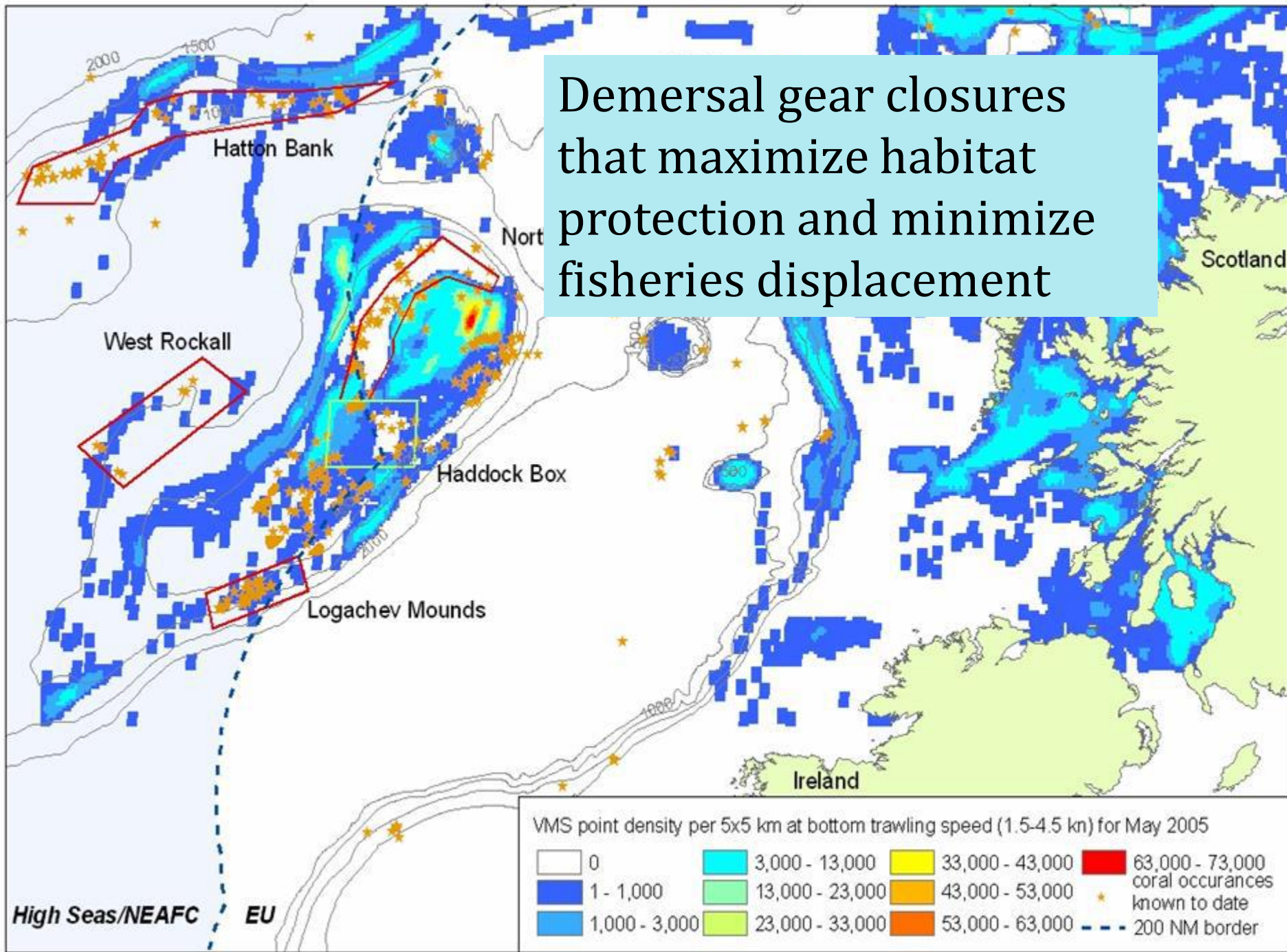
Its not too late to stop marine ecocide



Technology that puts marine life at risk can be used to protect it



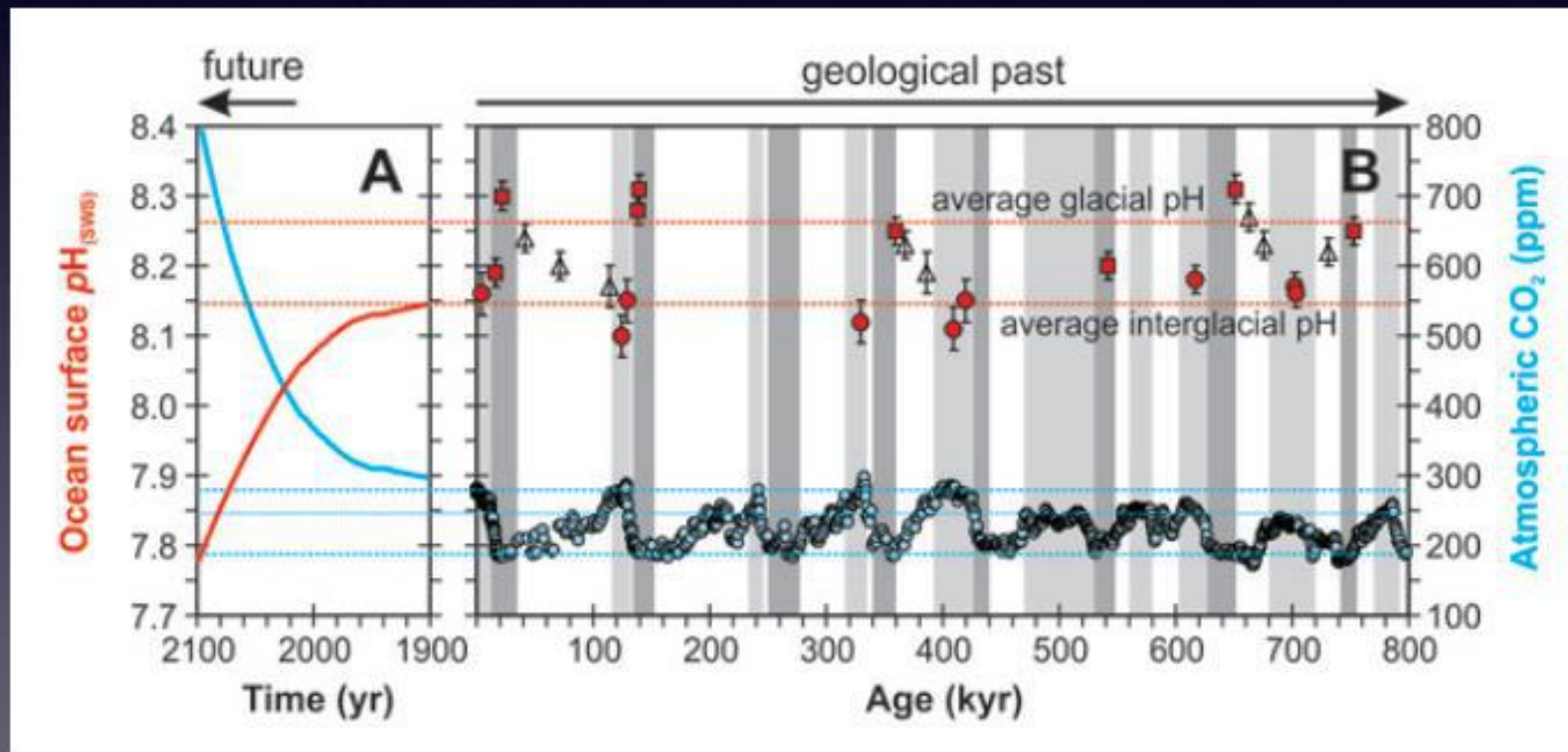
Demersal gear closures
that maximize habitat
protection and minimize
fisheries displacement



Good progress

- Industry input helped make sensible use of available data in designing seabed recovery zones
- Industry benefits by avoiding being seen to be wilfully damaging the environment at the same time as being engaged with the design of measures to maximise long-term profitability

Can regeneration areas really work in the anthropocene?



Earth's history shows us that marine communities change



often in response to changing climatic conditions

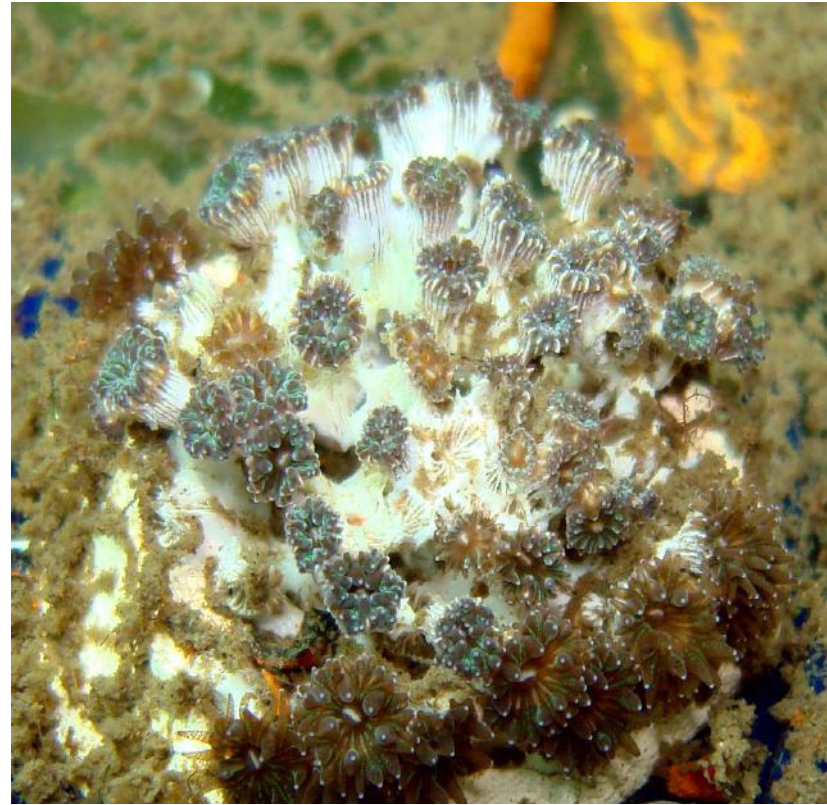
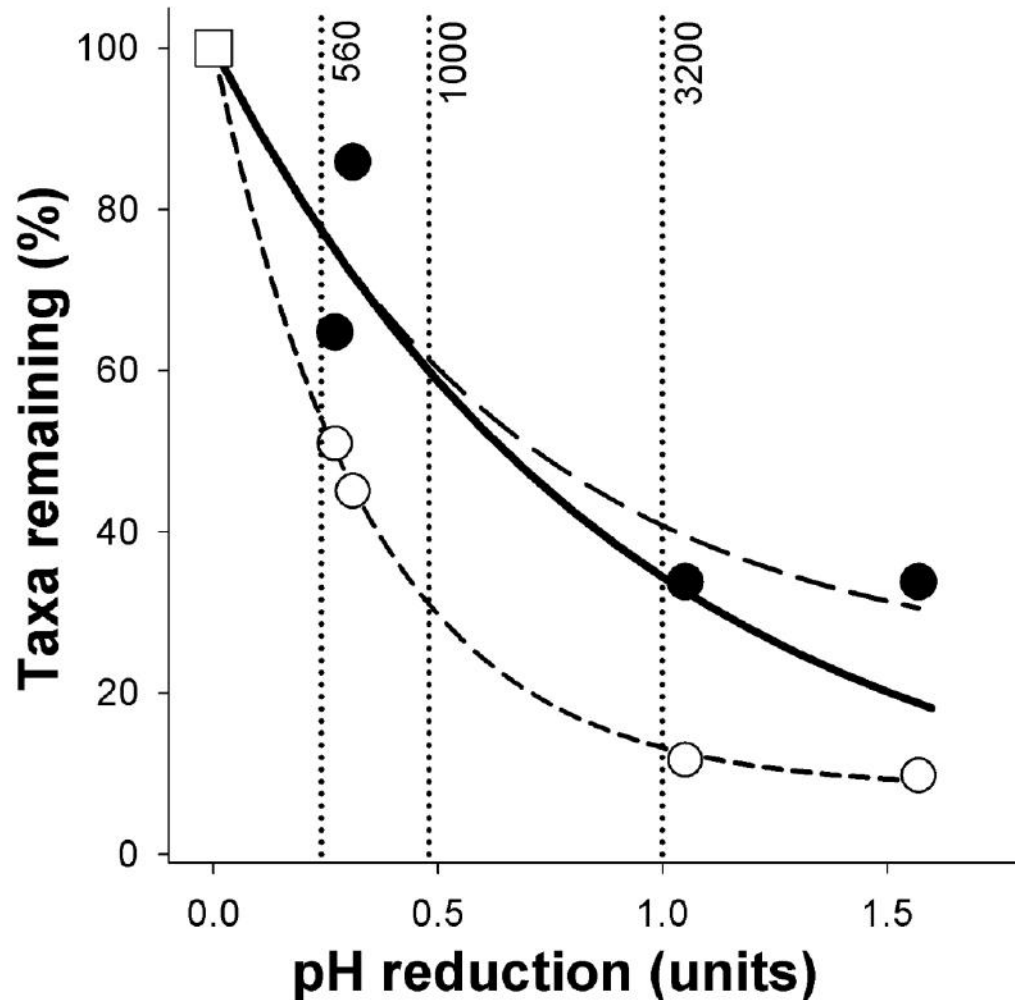


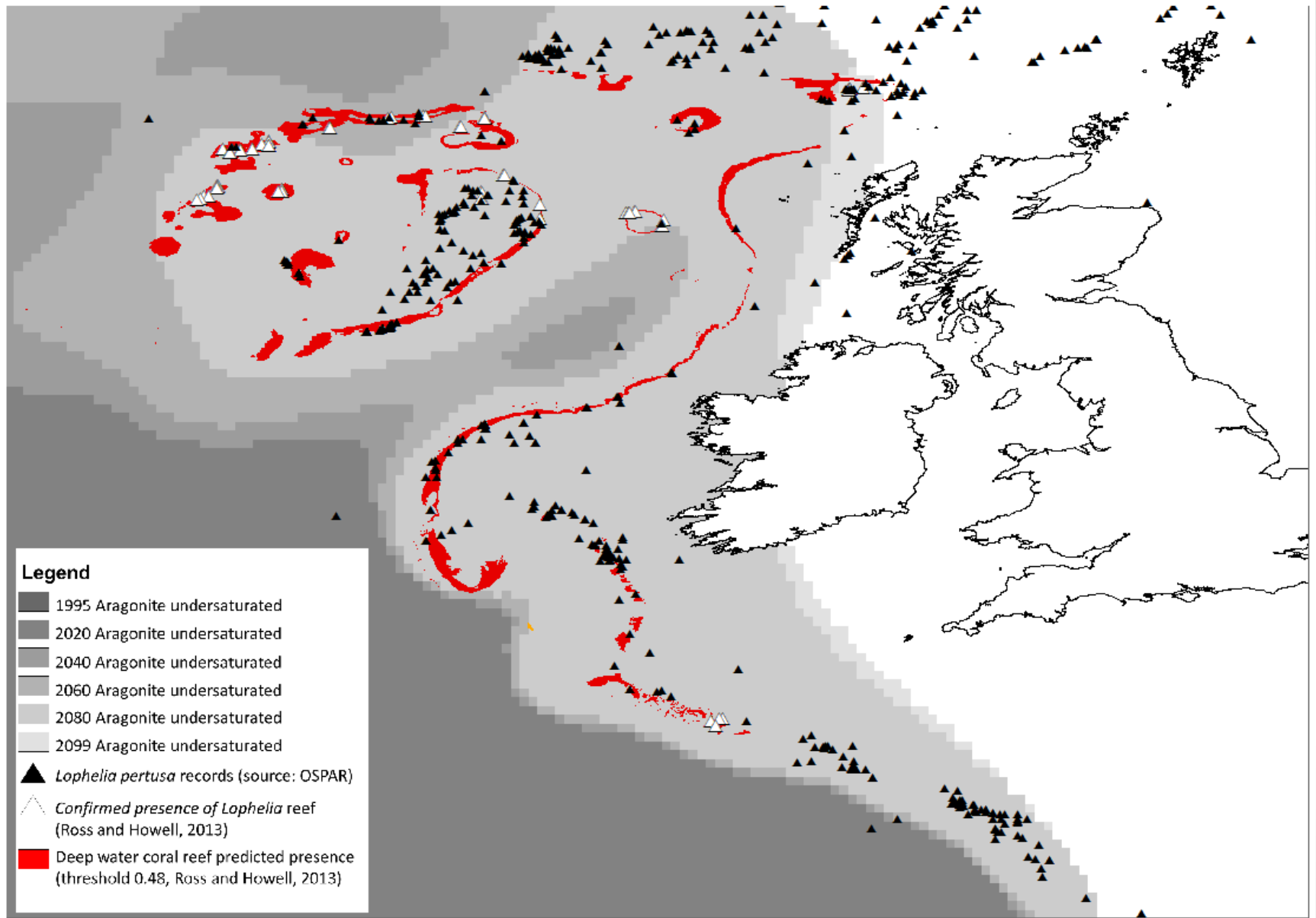
What will the ecological communities of the future look like?





Consistent patterns of marine ecosystem change: as CO₂ levels increase biodiversity declines.





Corrosive water depth for 1995, 2020, 2040, 2060, 2080 and 2099.
Confirmed stony coral presence records and predicted reef extent

We know we are causing the current planetary mass extinction – what survives will depend on how sensible we are in protecting the resources we still have.

Because there have been far fewer extinctions in the oceans, we still have the raw ingredients needed for recovery.

Monterey Bay in California was devastated by pollution and overfishing 80 years ago, but has rebounded under an economic model that values environmental quality as well as continued ocean use.



50,000
years ago

10,000

100

10

present

10

100

