Monitoring the dynamics of fish populations and fisheries behaviour

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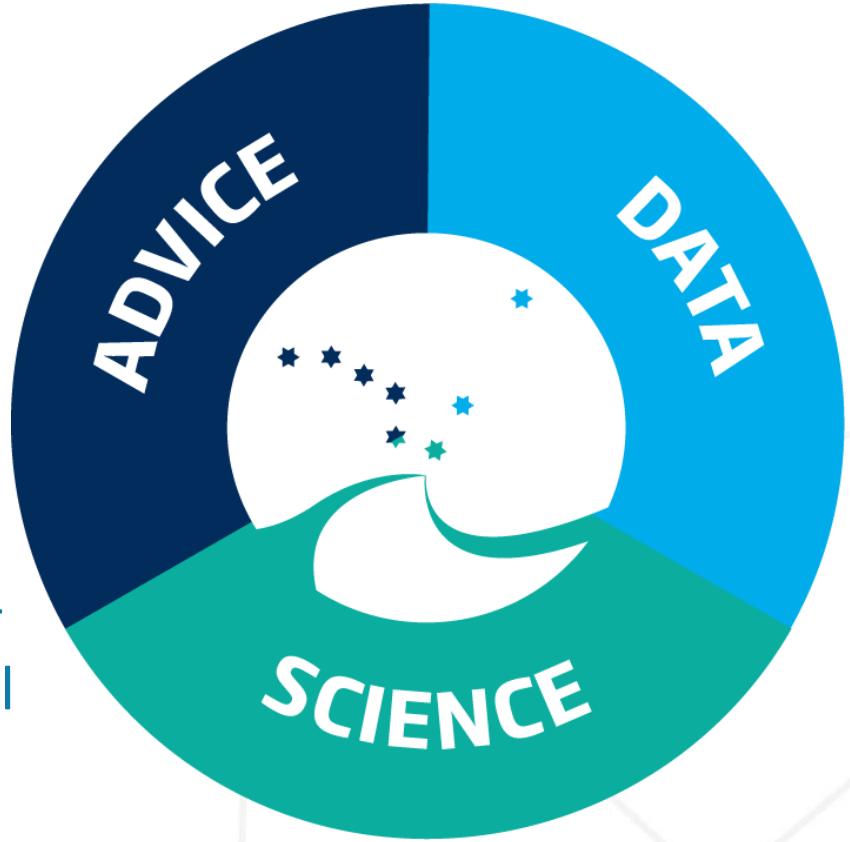
ICES
CIEM

Science for sustainable seas

ICES
an intergovernmental science organisation

Provides independent, transparent, quality assured evidence for marine management



Holds world leading centre of North Atlantic data, managed to international standards

Coordinates the biggest ship-based monitoring & biological sampling programme in the Atlantic

Runs a curiosity driven science programme preparing for future societal evidence needs

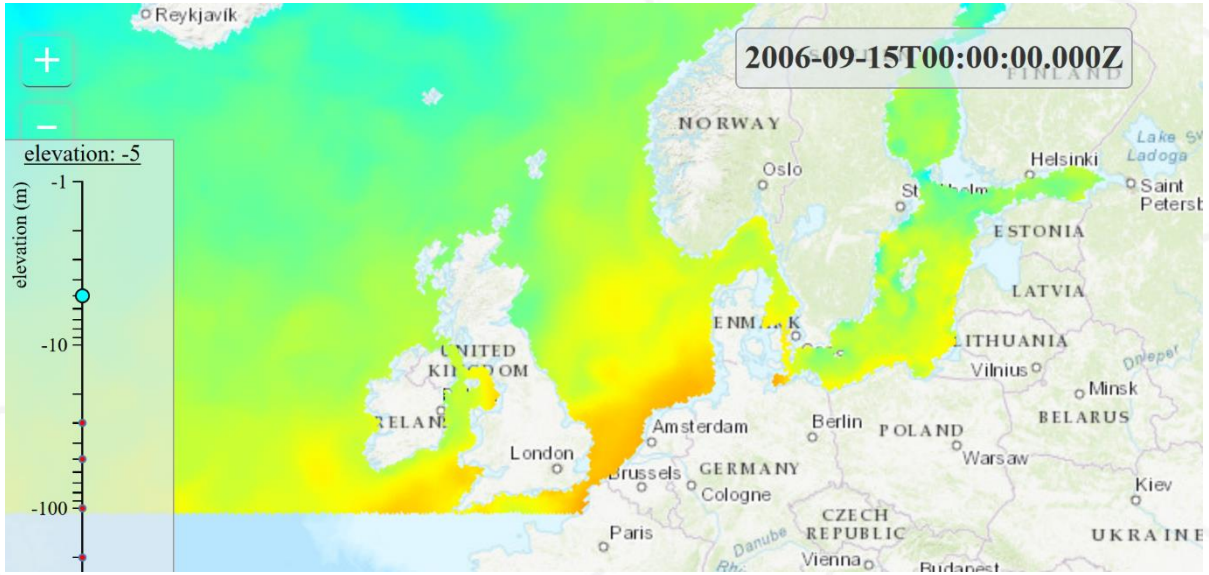
Copernicus information for fisheries

- Habitat description & change
- Indicators of ecosystem health
- Ecosystem productivity
- Spatial mapping of vessel activities
- Marine hazards
- Forecasting and predictions of future scenarios

Habitat description and change

Assist:

- understanding ecology
- finding fish
- avoiding fish
- reducing bycatch (e.g. turtles)

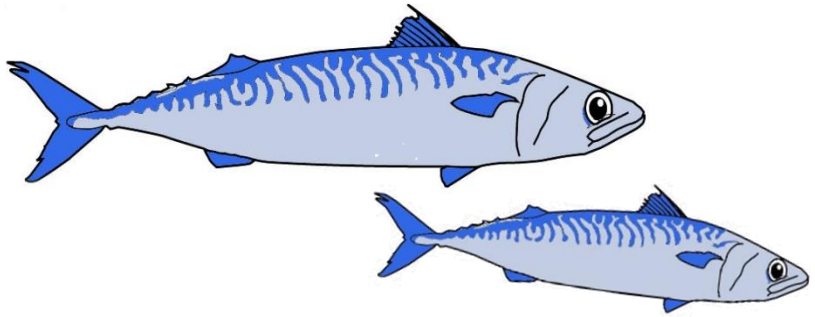


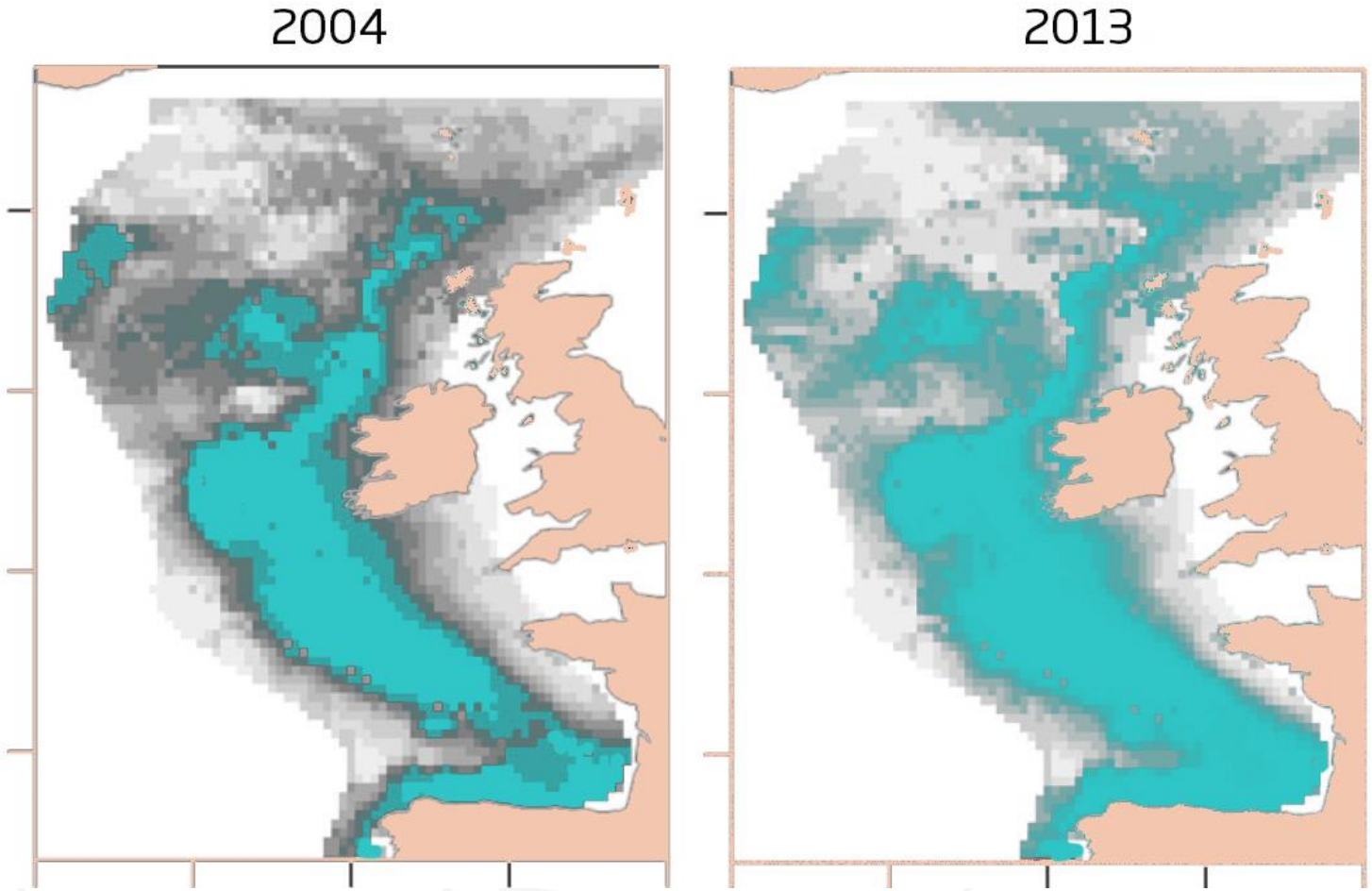
Copernicus CMEMS data brought into ICES data centre via web feature service

Mesoscale features

Example – North East Atlantic mackerel

Modelled spawning habitat of mackerel using CMEMS data





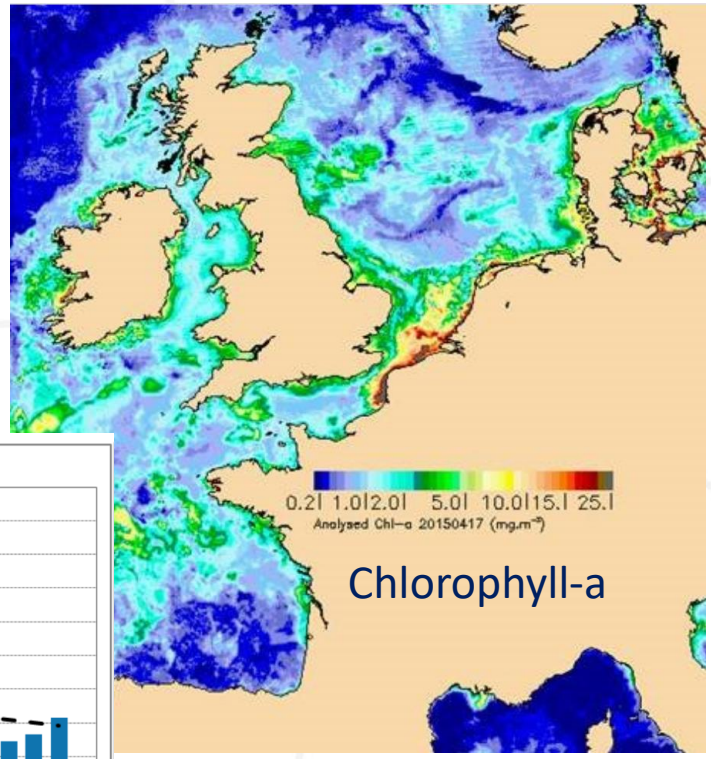
Brunel et al., 2018. Fisheries Oceanography

Indicators of ecosystem health

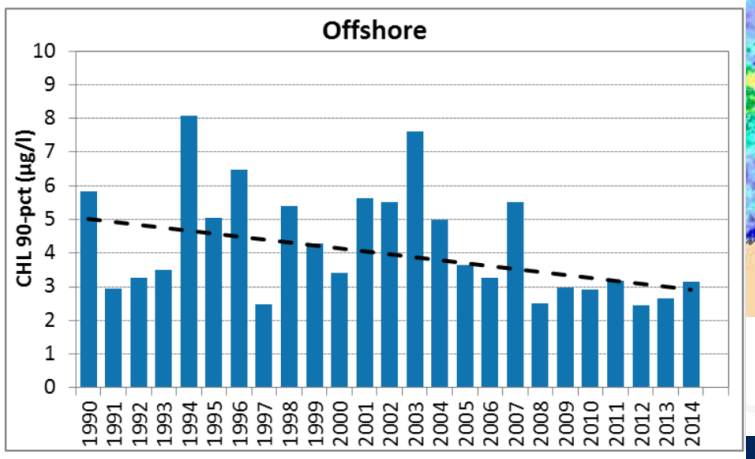
Indicators used to assess the state of the ecosystem & monitor effects of management action.

Developing indicators for OSPAR quality status reports, ICES ecosystem overviews, HELCOM HOLAS & EEA European Assessment.

Relevant to ecosystem approach to fisheries.



OSPAR 2018 website

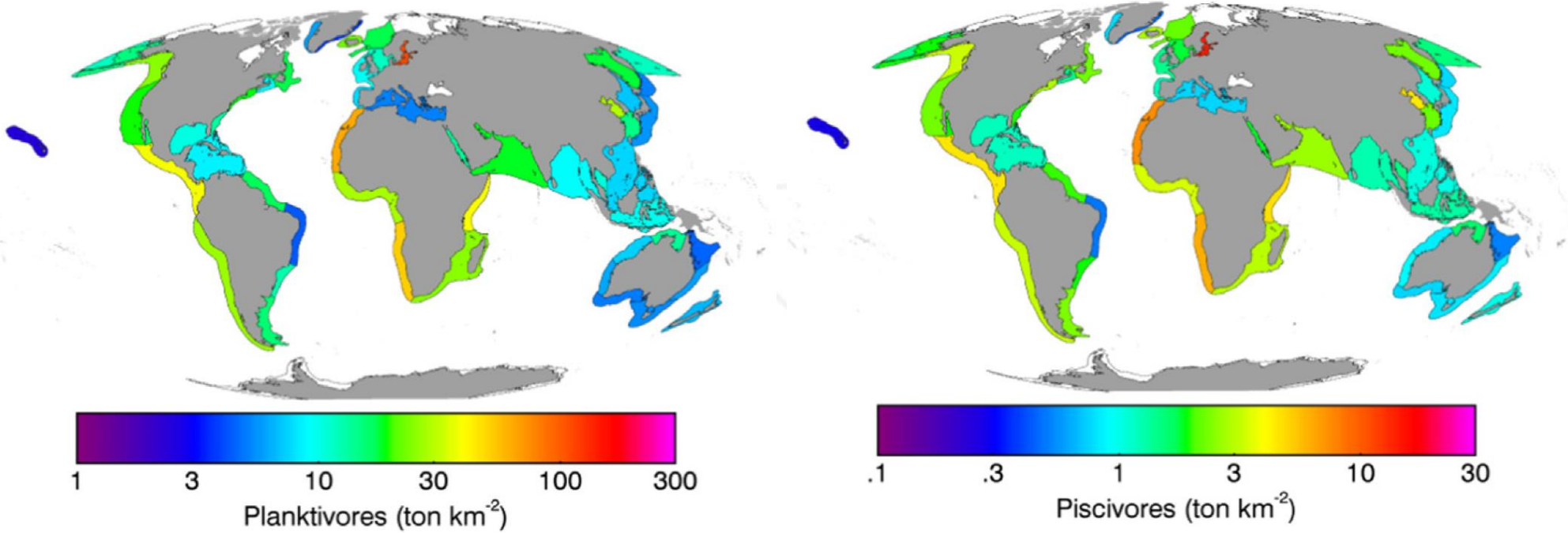


Skagerrak

Ecosystem productivity & fisheries

Growing interest in changes in ecosystem productivity/carrying capacity & its impact on fisheries and biomass reference points.

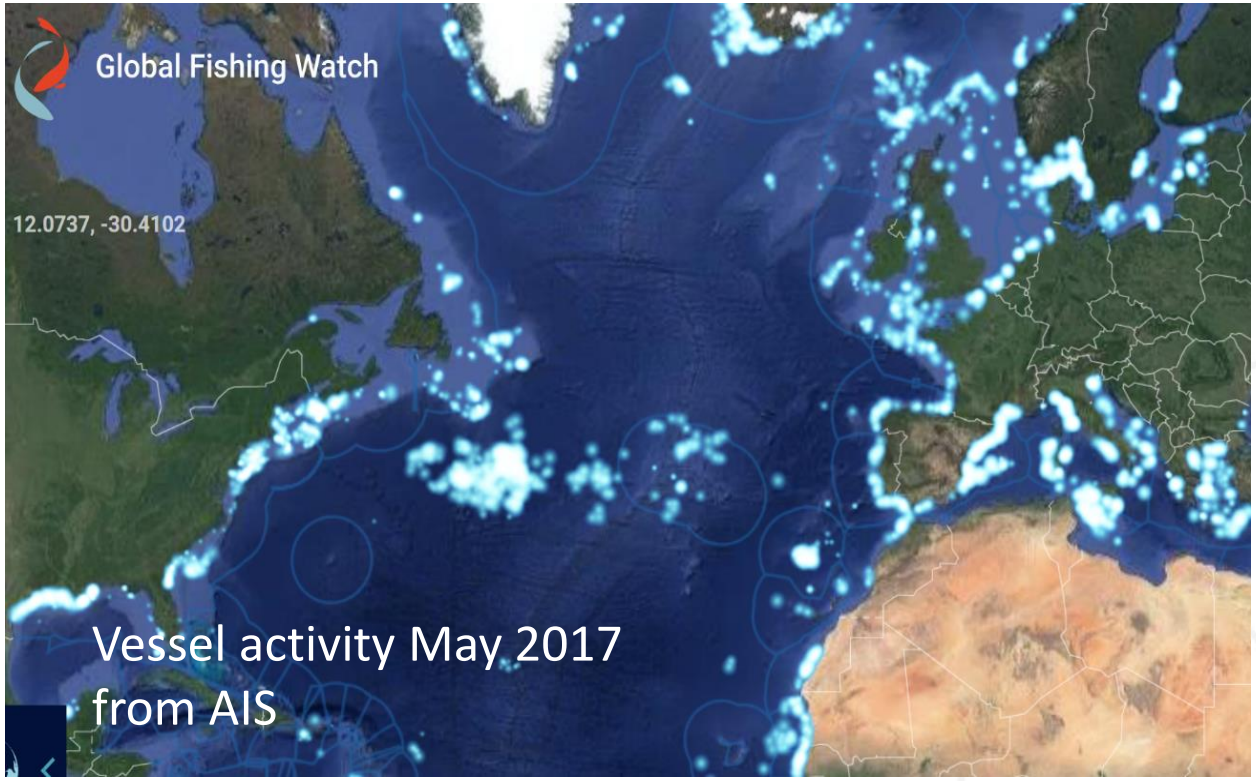
In some regions have caps on total combined catches (e.g. Alaska)

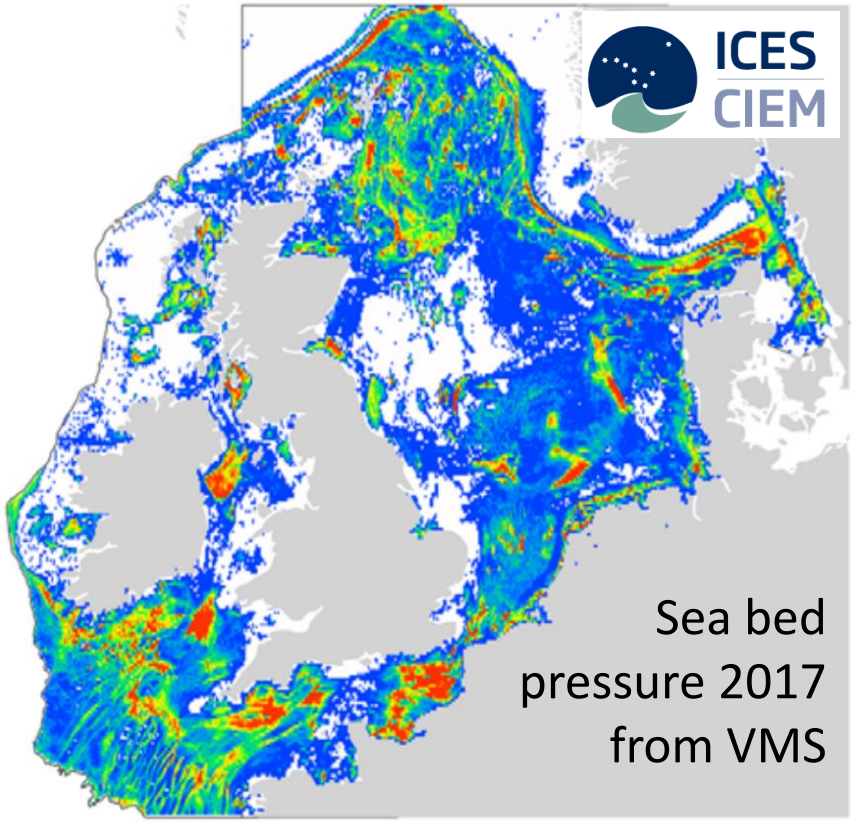


Fogarty et al. 2016. Environmental Development

Spatial mapping of fishing vessel activities

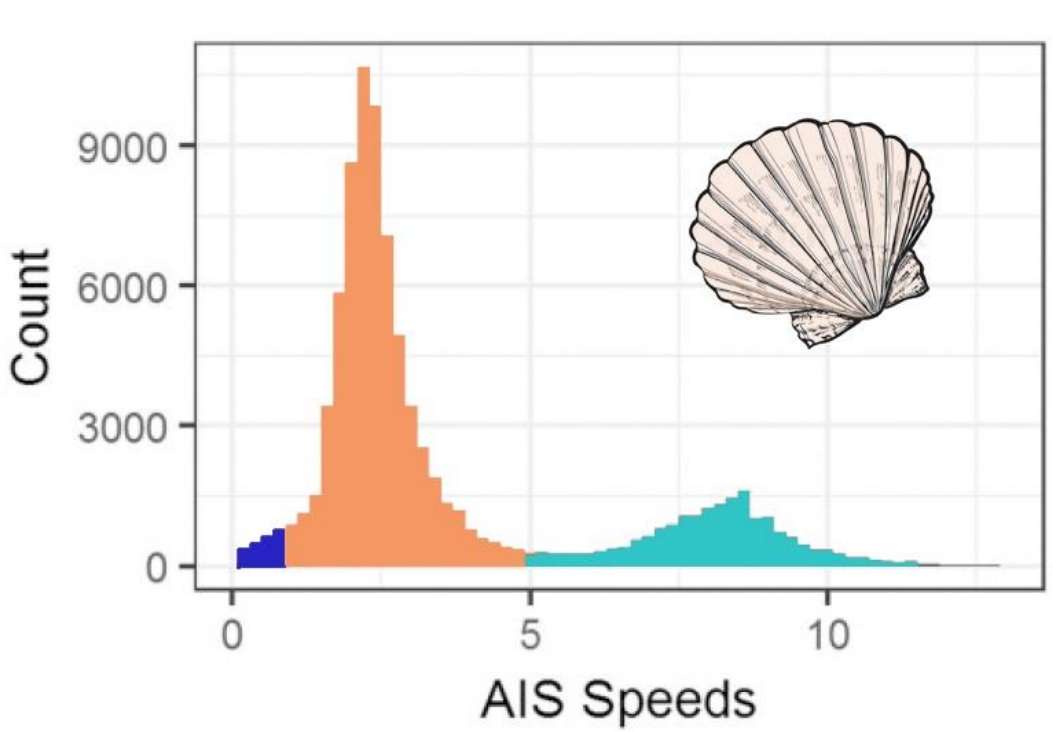
e.g. AIS (automatic identification system) & VMS (vessel monitoring system) information

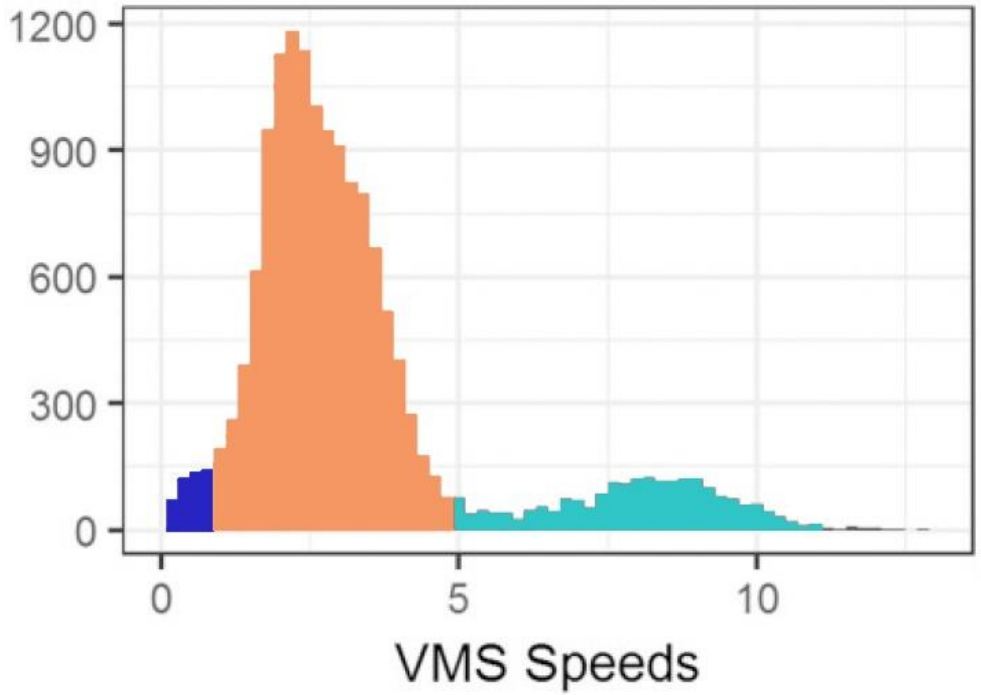


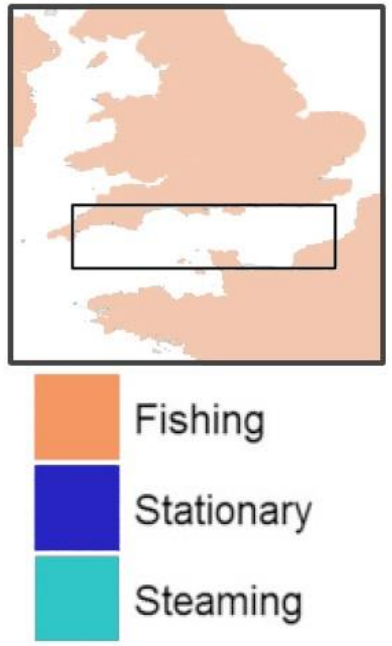


What does the data really show?

Analysis of scallop fishing activity in the Channel





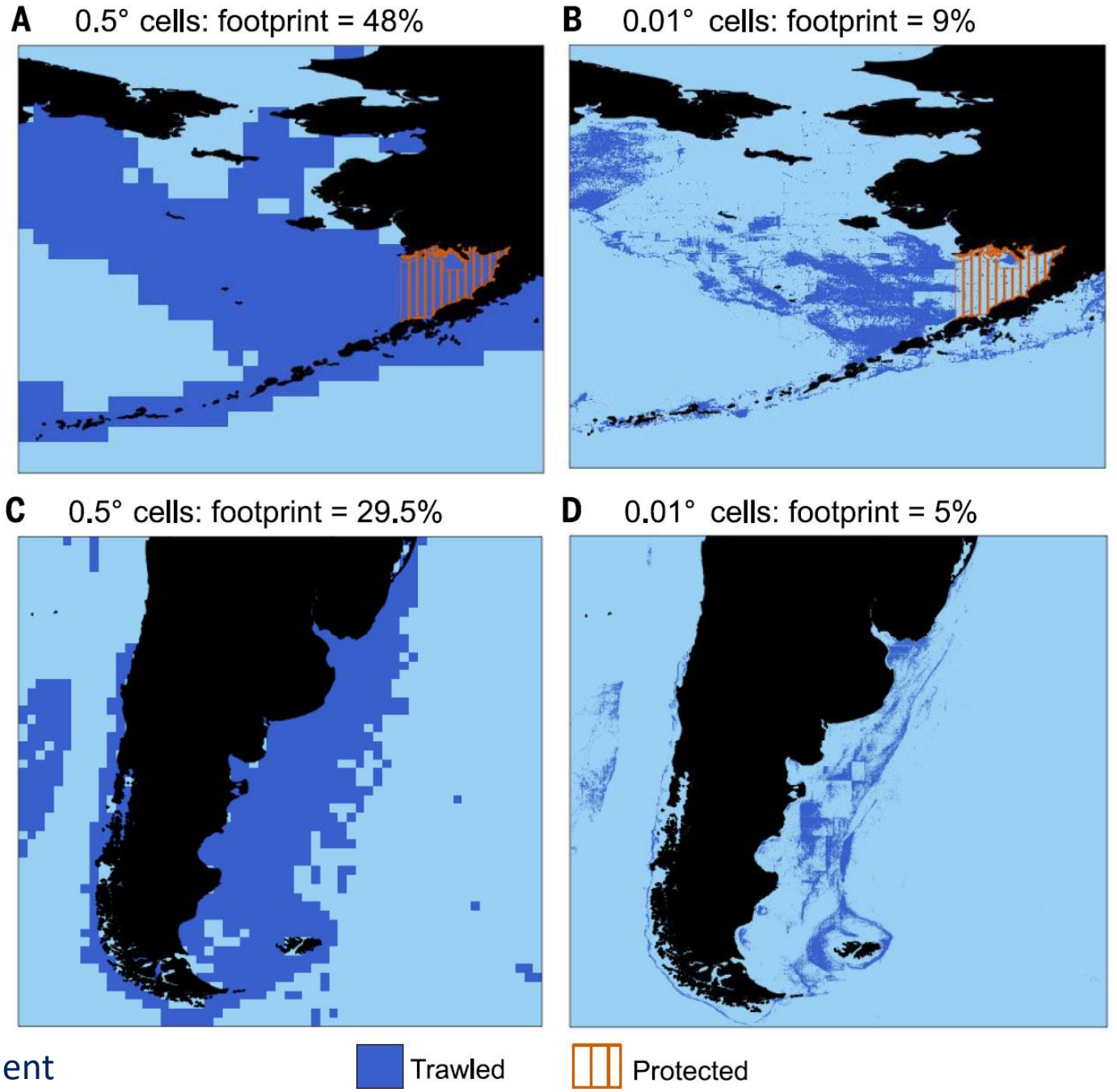


Shepperson et al. 2017. ICES J Mar Sci

Careful how you analyse data...

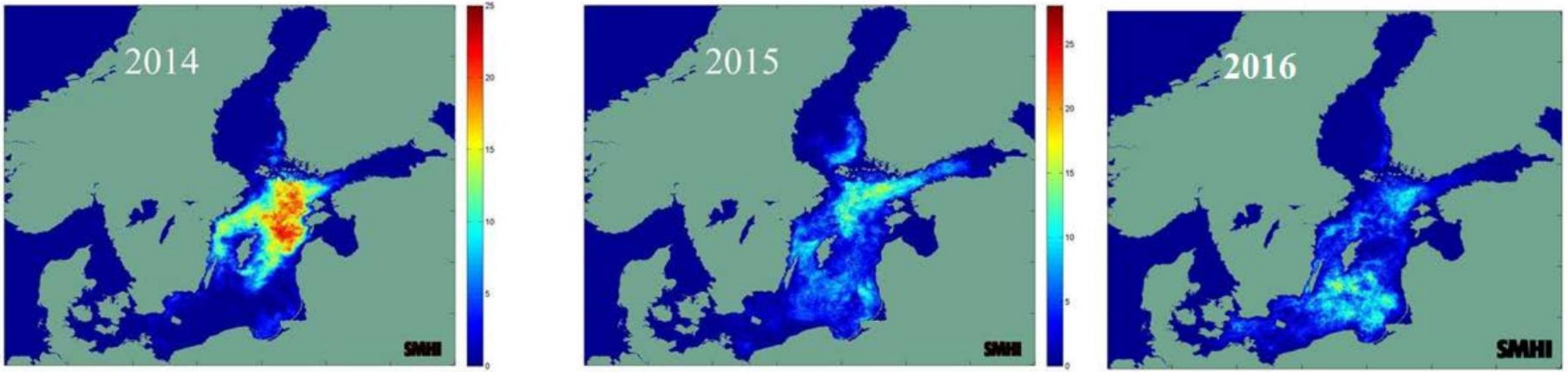
Global Fishing Watch used automatic identification system (AIS) data to track vessels, classified as “fishing”, estimated fishing activities occurred in **55%** of the world’s oceans in 2016.

Others re-analysed at finer resolution estimated **4%** fished.



Amoroso e al., 2018. Science Research, Technical comment

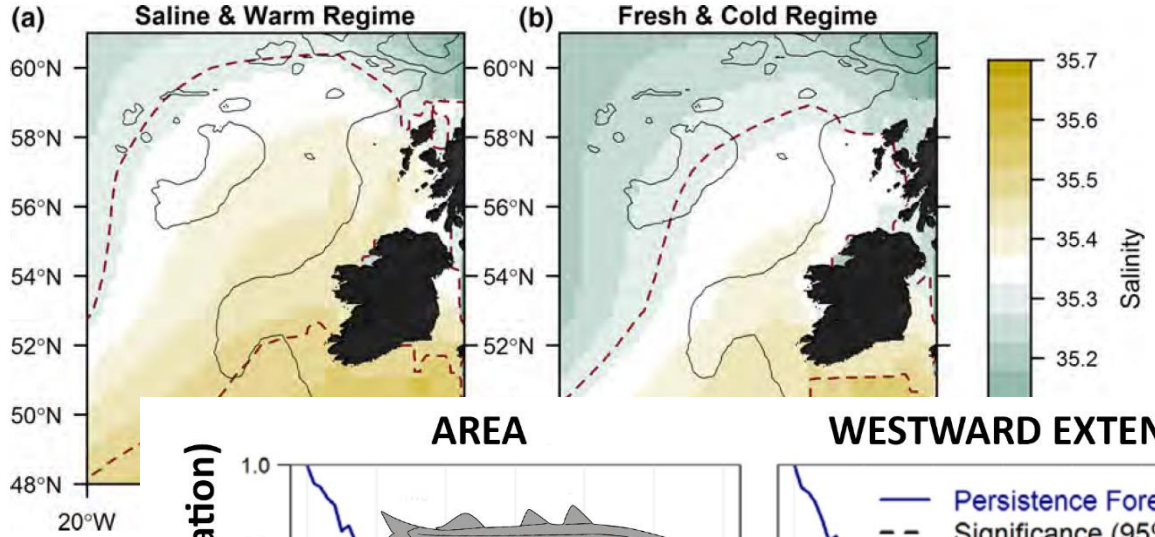
Marine hazards – including harmful algal blooms and turbidity events.

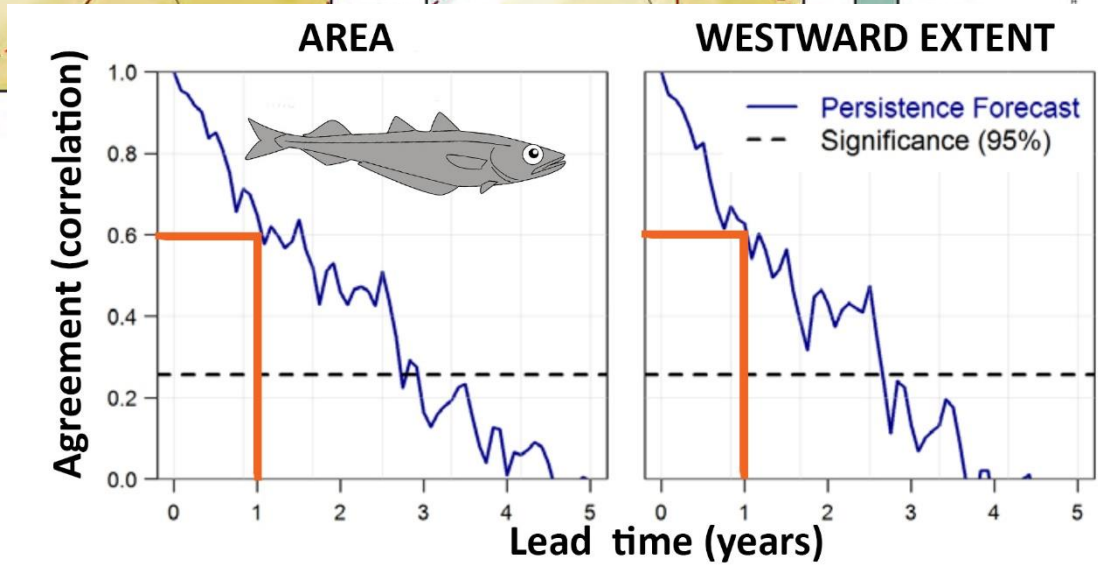


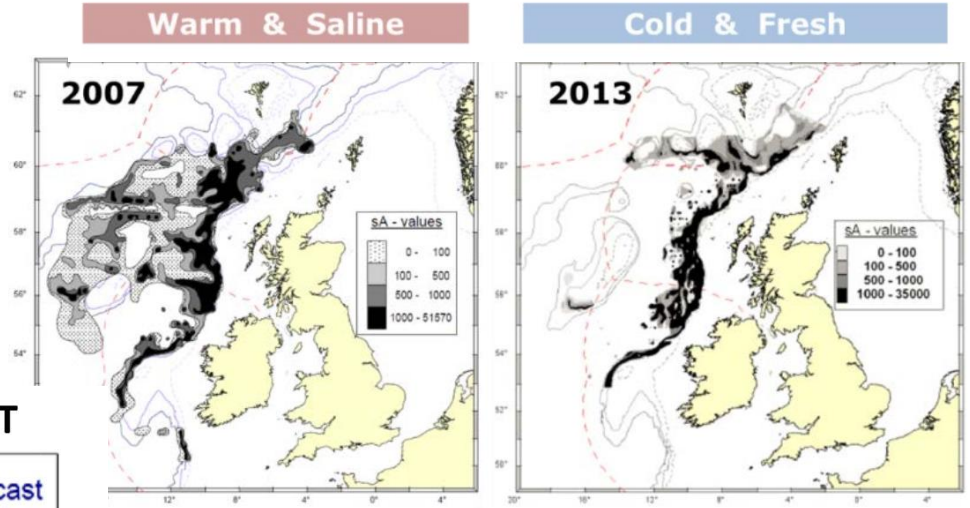
Number of days of observations of cyanobacteria surface accumulations.
Data from the SMHI Baltic Algae Watch System, Öberg. 2014–2016.
ICES-IOC Working Group on Harmful Algal Bloom Dynamics 2017.

Forecasting and predictions of future scenarios

North Atlantic subpolar gyre & spawning of blue whiting





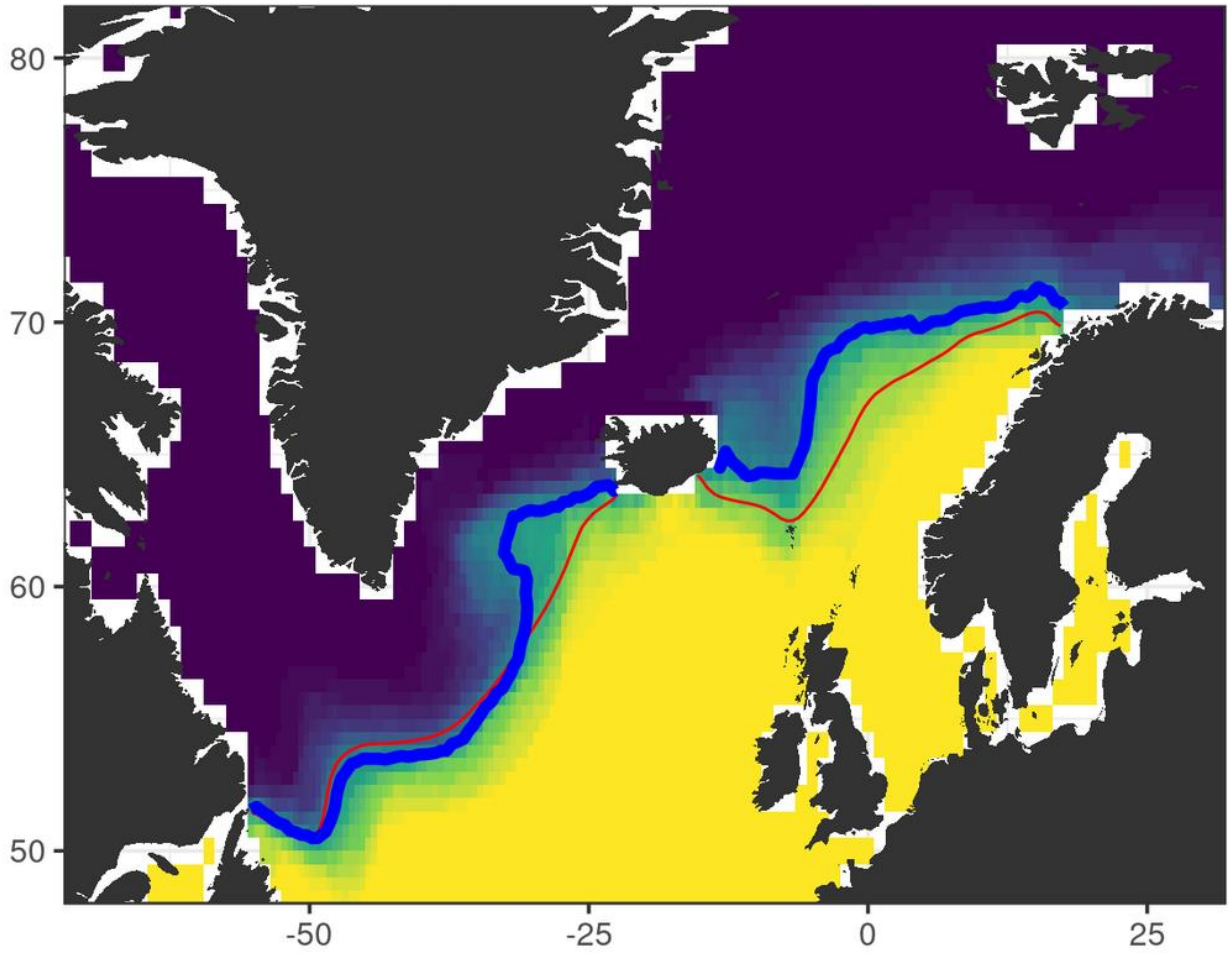


Acoustic survey

Forecast skill assessment - ICES Working Group on Seasonal to Decadal Prediction of Marine Ecosystems 2017

Miesner & Payne 2018. Fisheries Oceanography.

Bluefin tuna feeding habitat forecast 2019



Habitat Boundary

2019

Mean

Habitat Probability

1.00

0.75

0.50

0.25

0.00

Challenges with Copernicus type data

- Data (especially satellite) can be difficult to access, manipulate and process so training is often required
- Working across research fields challenges existing experts e.g.
  - front locations from SST fields;
  - climatologies required to generate anomalies;
  - merging data sets from integrated oceanographic or satellite data with biological or fishery records;
- Time-series of oceanography & satellite data are relatively short compared to many fisheries datasets

Bundy et al. 2009. IOCCG Report Number 8, Chapter 7.

ICES experience of CMEMS…

- Modular/regional approach – harmonised/integrated
- Help desk service - be aware that partners do not understand the internal functioning of Copernicus
- Development - a conversation approach should underlie the working partnership, rather than a technical delivery approach
- Data provision - web feature & web map services should be the main form of data supply

Thank you

Icelandic Wilderness