Long-term (1988-2014) dynamics in the winter zooplankton size distribution and corresponding environmental drivers from a so far unconsidered data series taken in the southern North Sea

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Background

Winter situation in the English Channel

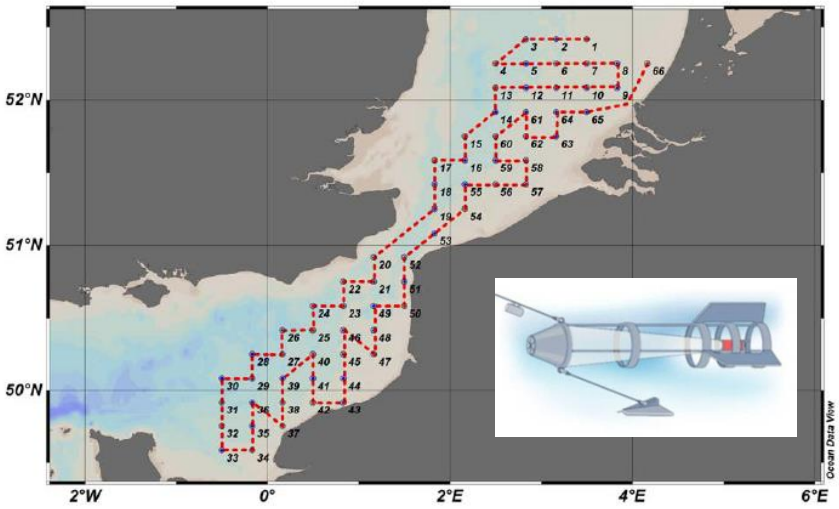
- hardly investigated
- only local (WGZE stations) or CPR data available
- low production, assumed to be undynamic
- Status Quo?

Zooplankton size

- not available for most zooplankton datasets
- has potential as indicator
- may detect changes in environments that go unnoticed if only taxonomic composition is considered
- how does size affect higher trophic levels?

Methods

- zooplankton samples from International Herring Larvae Survey (IHLS) 1988-2014 Q1
  - mod. Gulf III net, 280-300 µm
  - south-west North Sea and eastern English Channel
- 637 stations
- analysis using Zooscan for standardised size measurement



Rohlf, Norbert. IHLS cruise report 2013. ICES HAWG.

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Methods

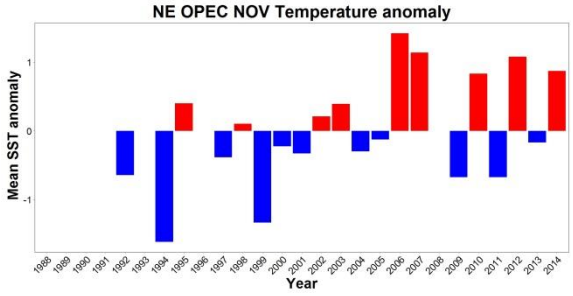
- Taxonomic composition
  - coarse taxonomic groupings: copepoda, *Candacia armata*, *Temora sp.*, calanoida, echinodermata, chaetognaths, malacostraca, zoea larvae, amphipods, shrimp-like, cumacea, appendicularia, polychaeta, cladocera

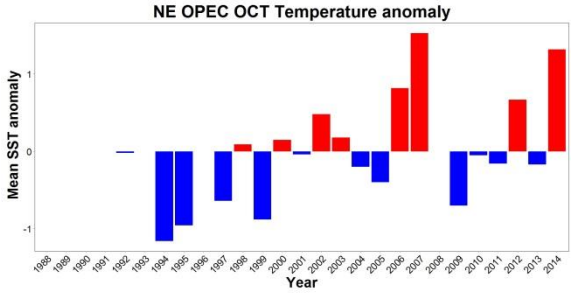
- Size as equivalent spherical diameter (ESD)

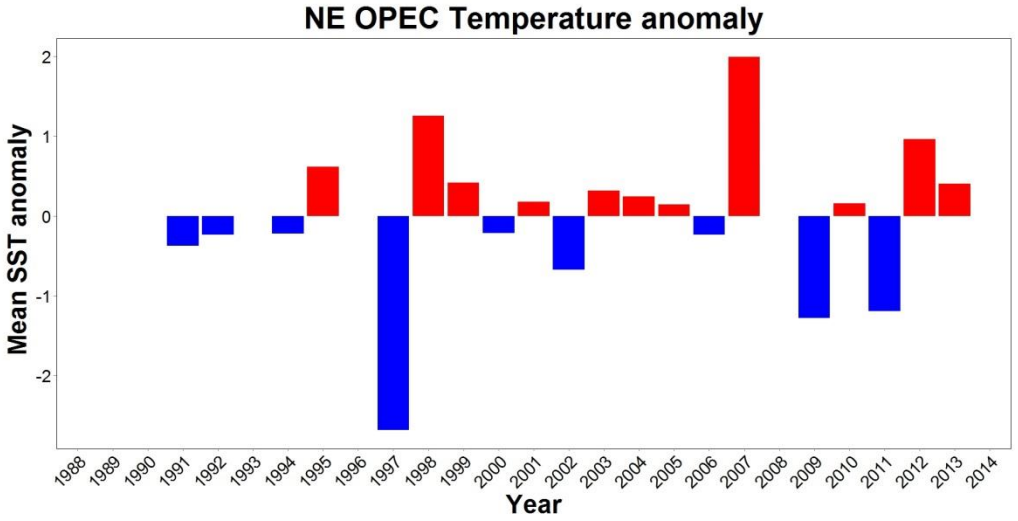
- Temperature and Chlorophyll α from *in situ* measurements and Operational Ecology (OPEC) data

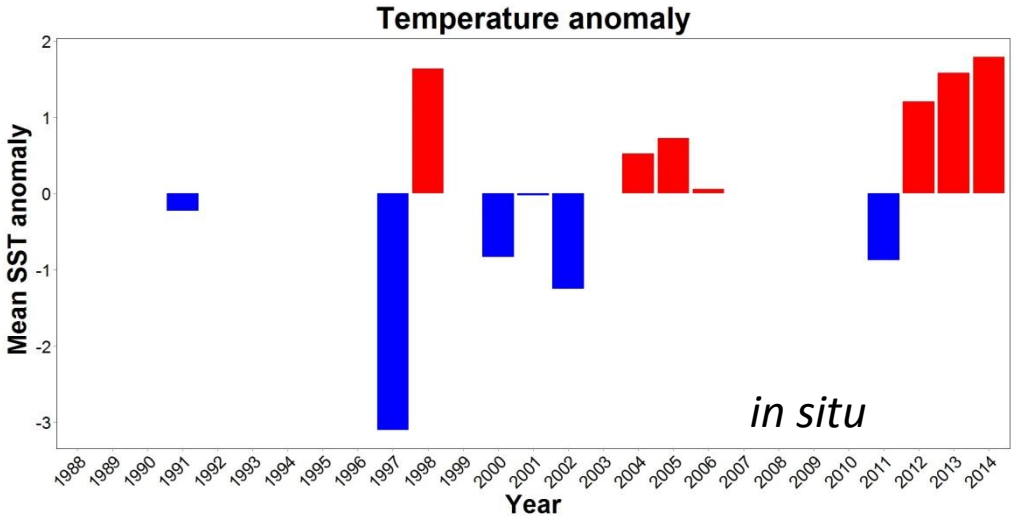
Temperature

- OPEC and *in situ* temperature data show no consistent pattern in January
- October/November show a warming trend



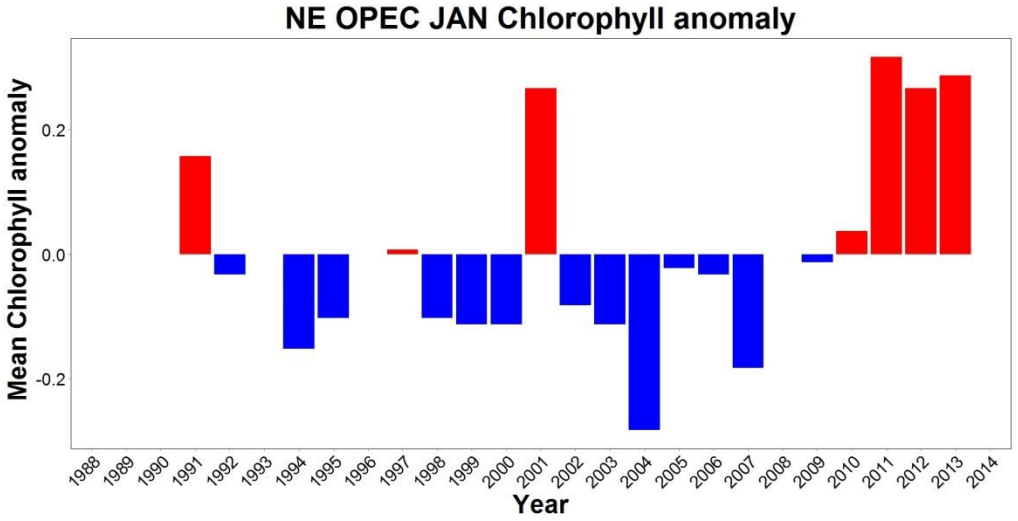


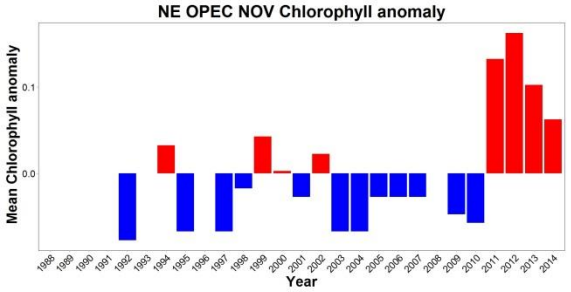


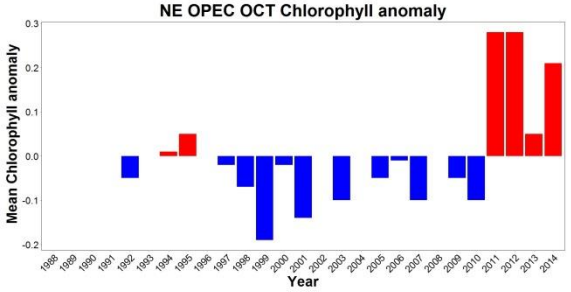


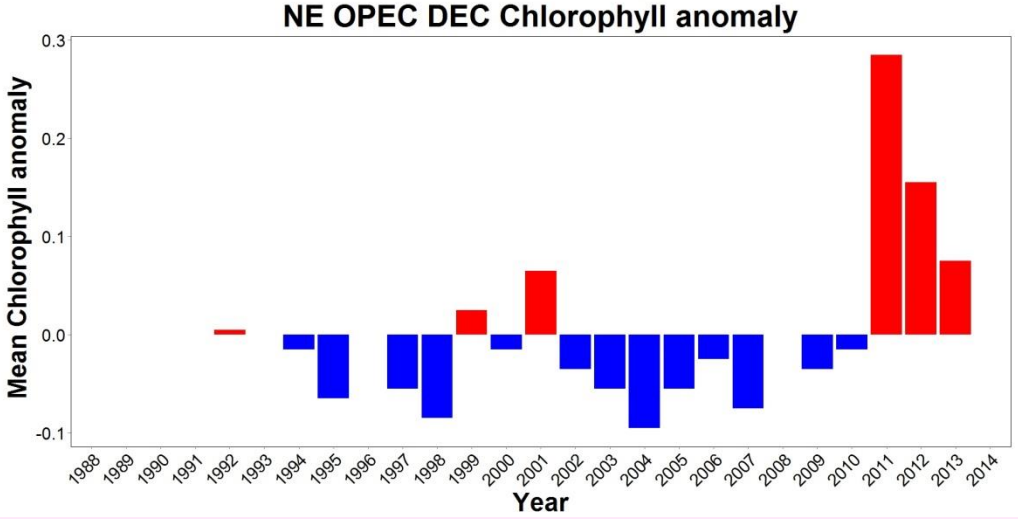
Phytoplankton

- OPEC chlorophyll α data indicate more primary producers in recent years
- chlorophyll α level is low



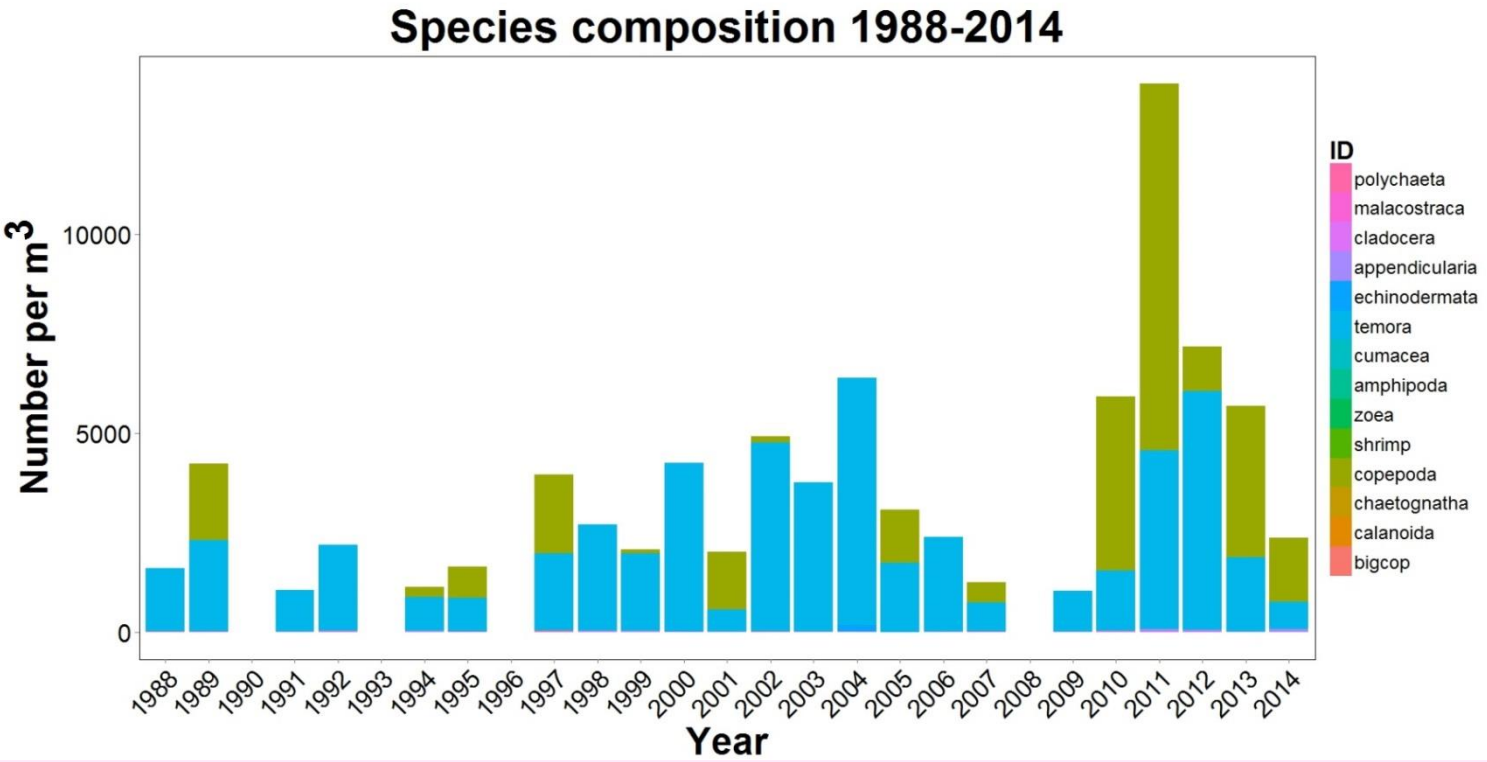






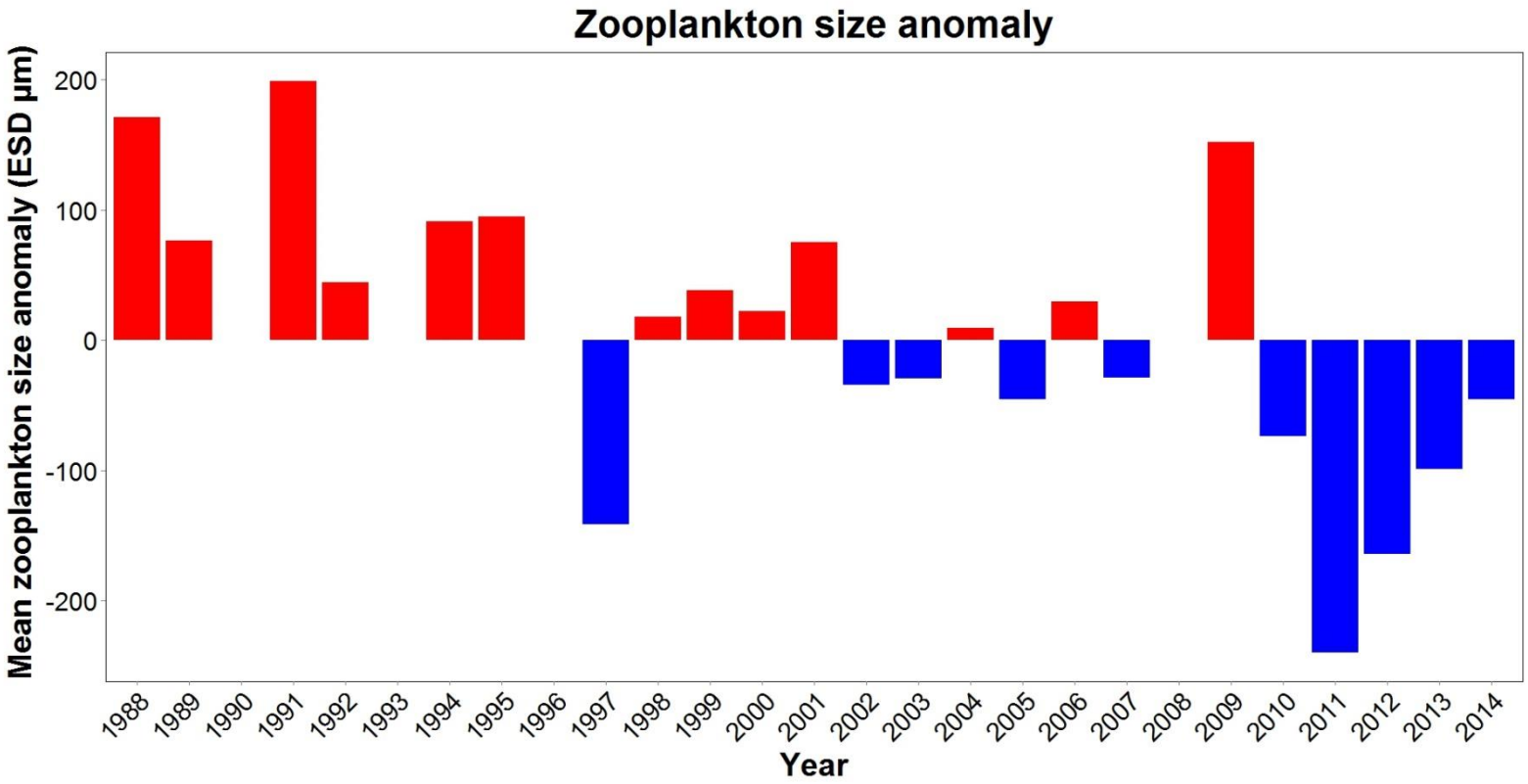
Composition

- zooplankton composition is mainly made up of copepods
- *Temora sp.* dominating
- recent strong occurences of small unidentified copepods
- fluctuations in abundance attributed to them too



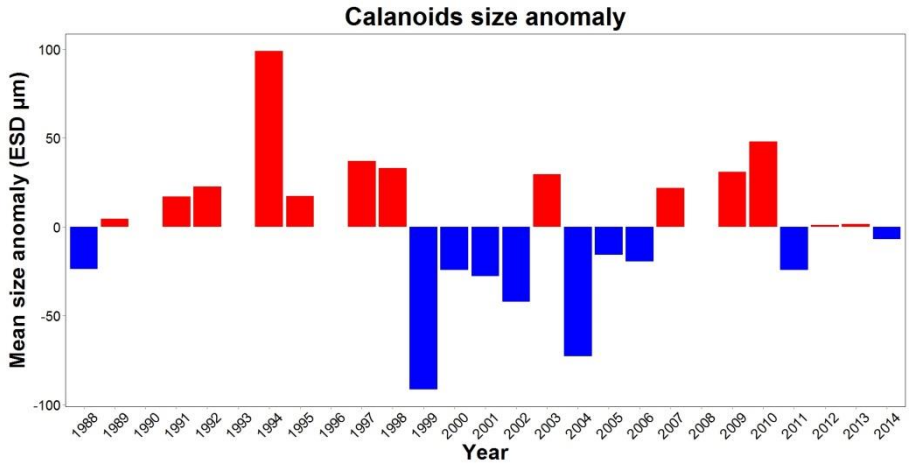
Zooplankton size

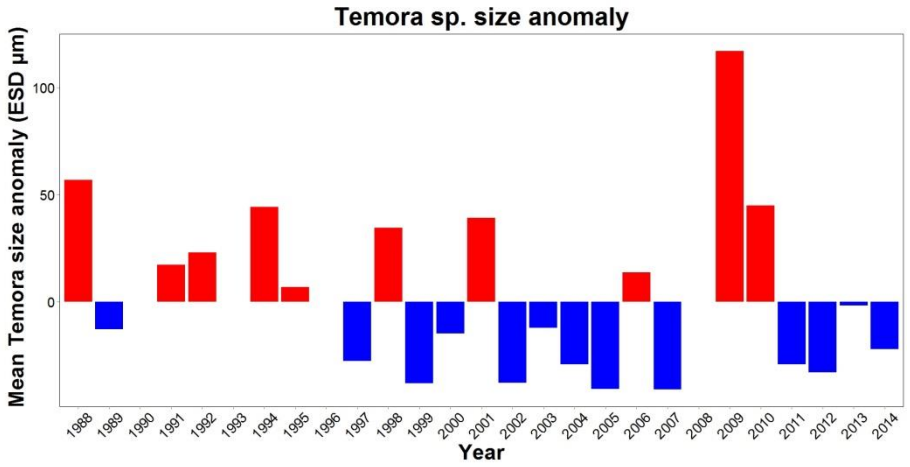
- generally decreasing trend with large deviations
  - largely attributed to composition changes

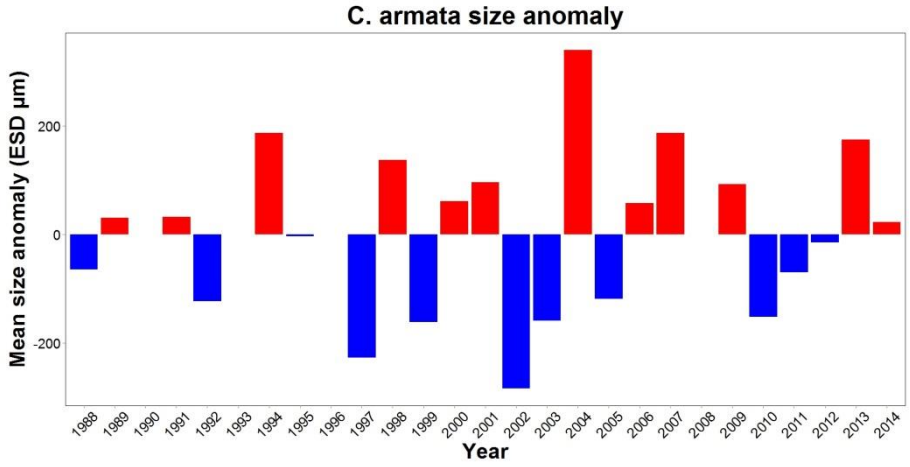


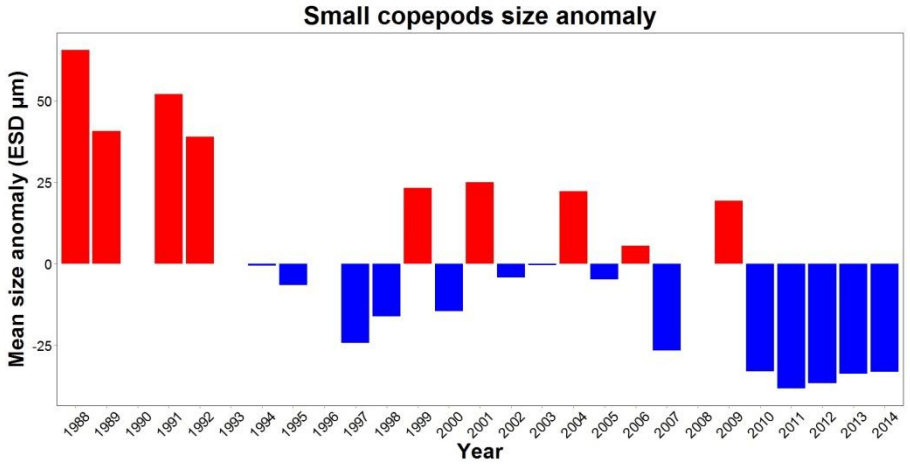
Zooplankton size

- Size of individual copepod groups



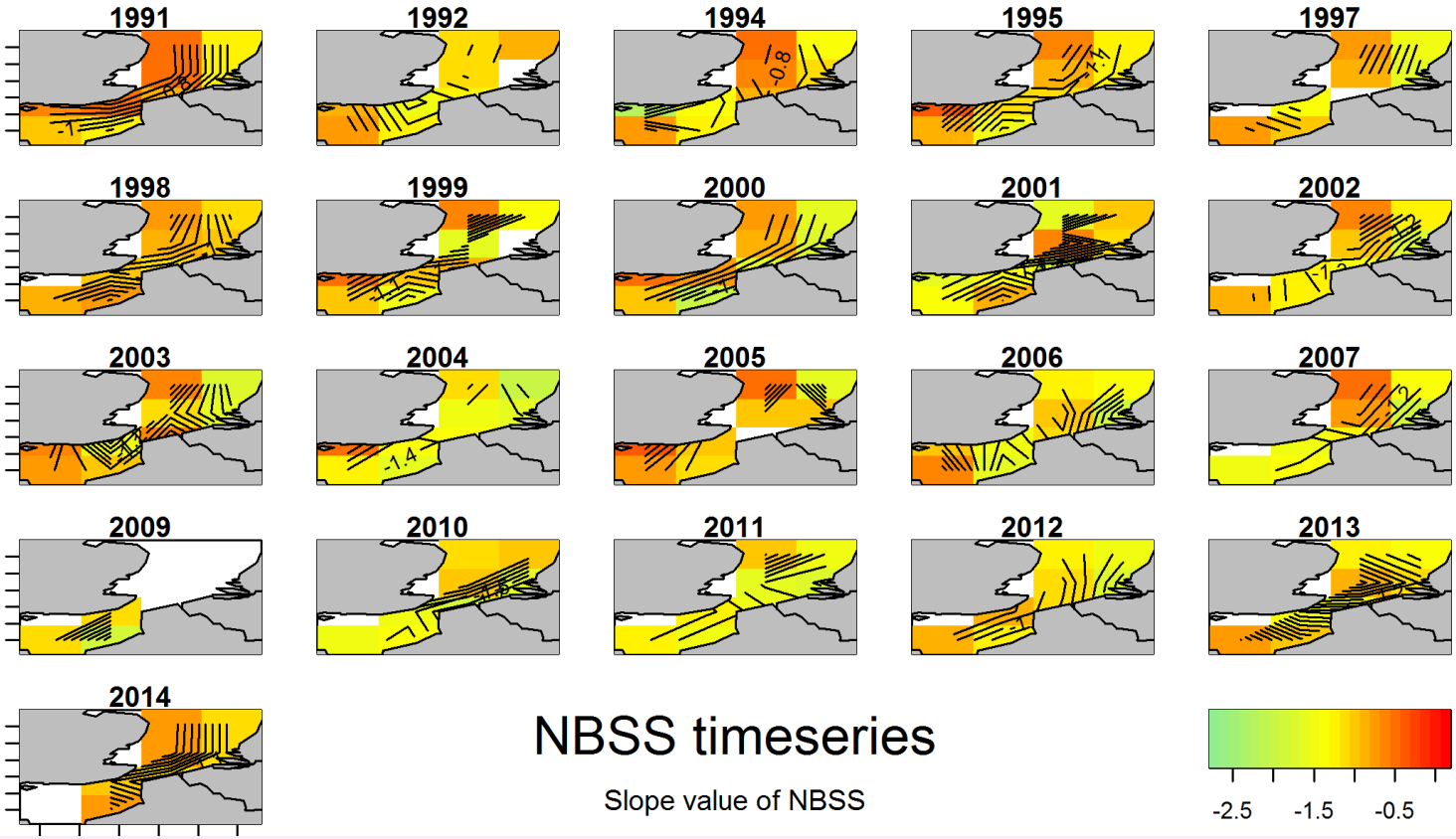






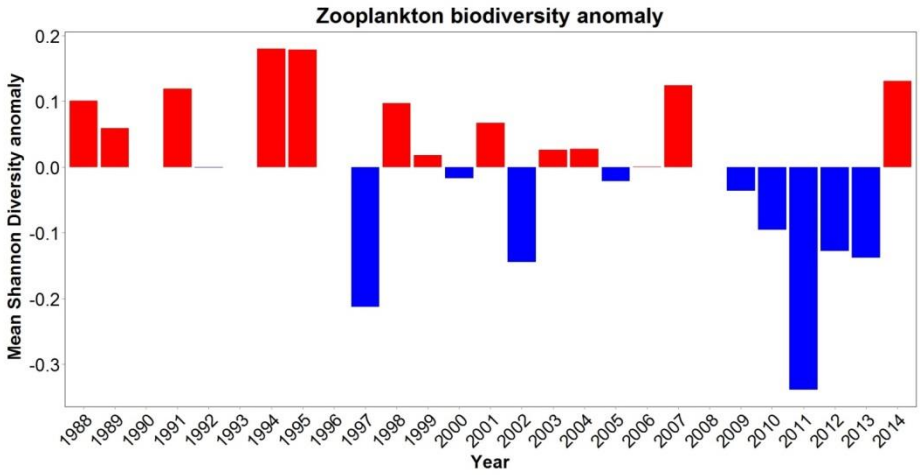
NBSS

- steeper NBSS slope due to occurence of small copepods along Dutch shores
  - secondary production due to Rhine-Meuse-Delta?



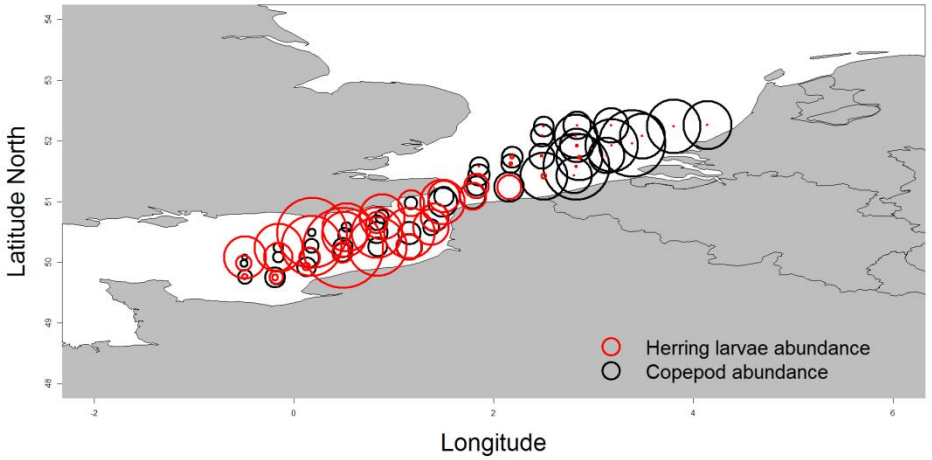
Climate responses

- size of zooplankton, individually and as a community, has decreased
- abundance and plankton production has been variable
- both correlate with temperature, but it needs to be put into a macroecological context
  - regime shifts
  - top-down control
  - atlantic and river inflow



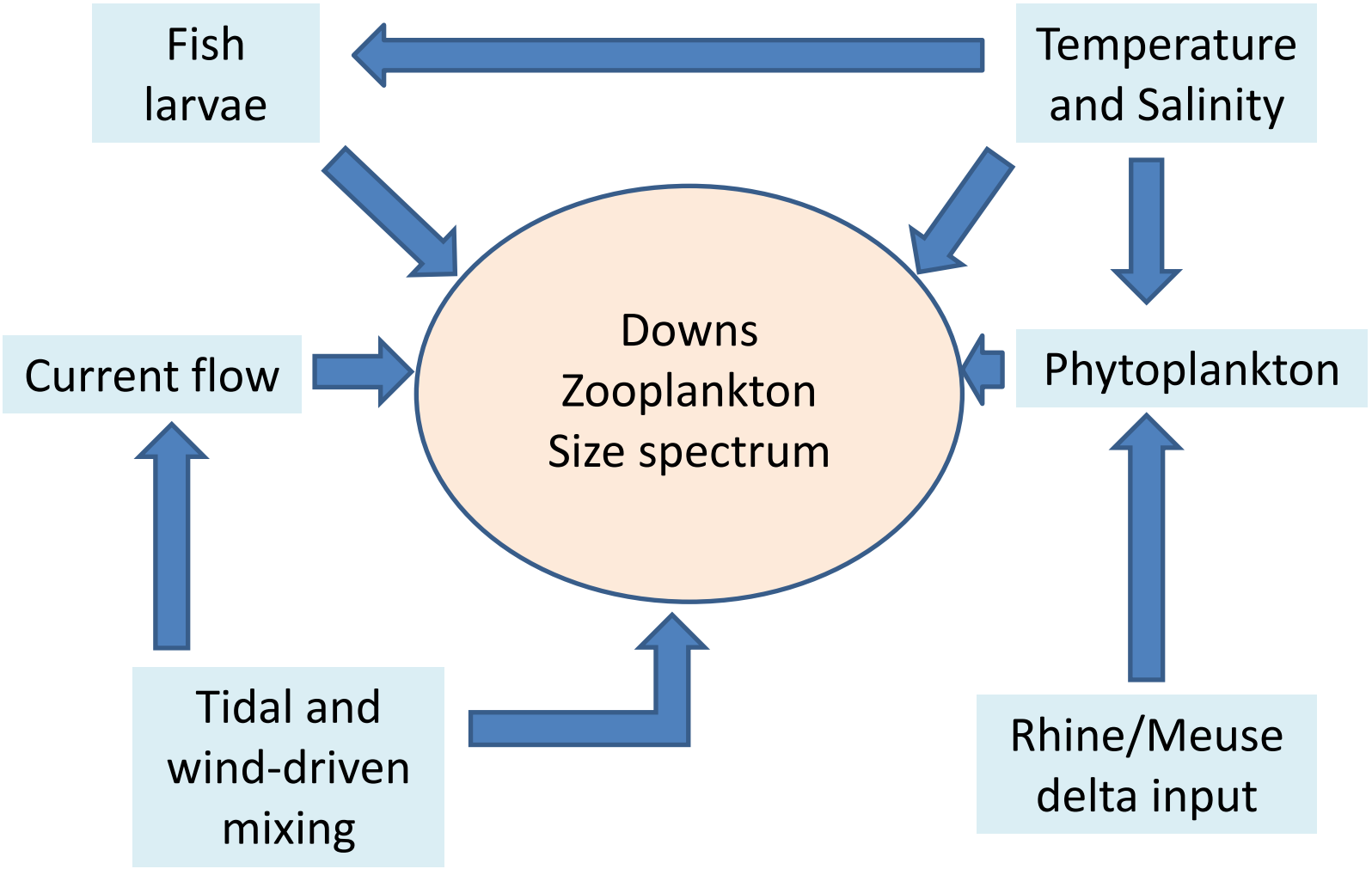
Implications

- trophic interaction and effect on herring larvae
  - herring larvae released in region of low productivity, but drifts towards smaller copepod dominated region of higher productivity



-> bottom-up or top-down control of zooplankton size?

More drivers



Concluding

- disentangling potential drivers and their effect on size difficult

- timeseries going to be updated each year

- specific relationship between zooplankton size and herring larvae dynamics is going to be analysed

- range of NBSS will be widened
  - microzooplankton (see talk by Bils *et al.* in S5)
  - fish and other fish larvae

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THÜNEN

Thank you for your attention!

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