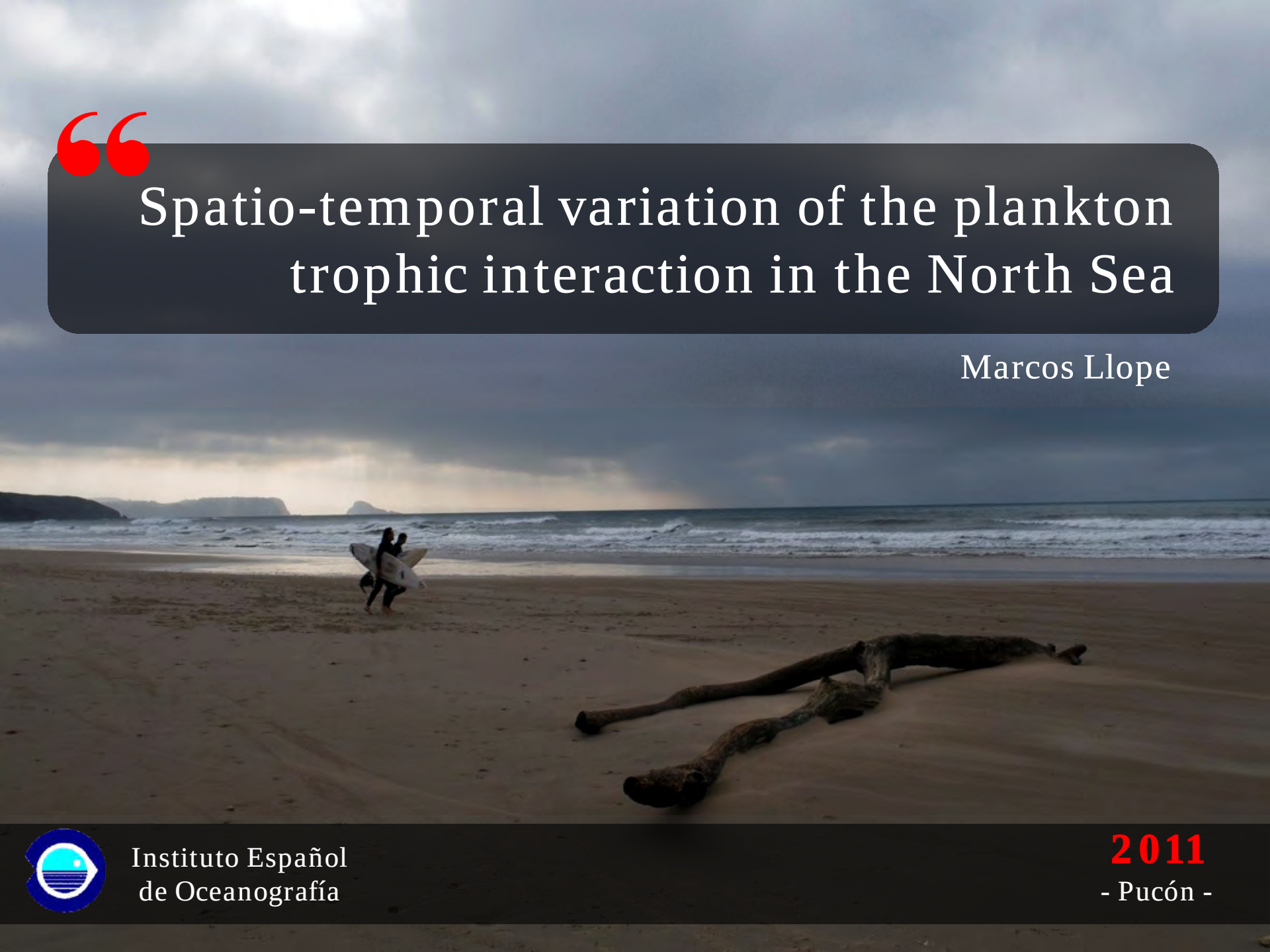


Spatio-temporal variation of the plankton trophic interaction in the North Sea

Marcos Llope

Instituto Español
de Oceanografía

2011

- Pucón -

Spatio-temporal variation of the plankton trophic interaction in the North Sea

Marcos Llope

Priscilla Licandro

Kung-Sik Chan

Nils Chr. Stenseth

The University of Iowa

CEFES
Center for Ecological and Evolutionary Synthesis

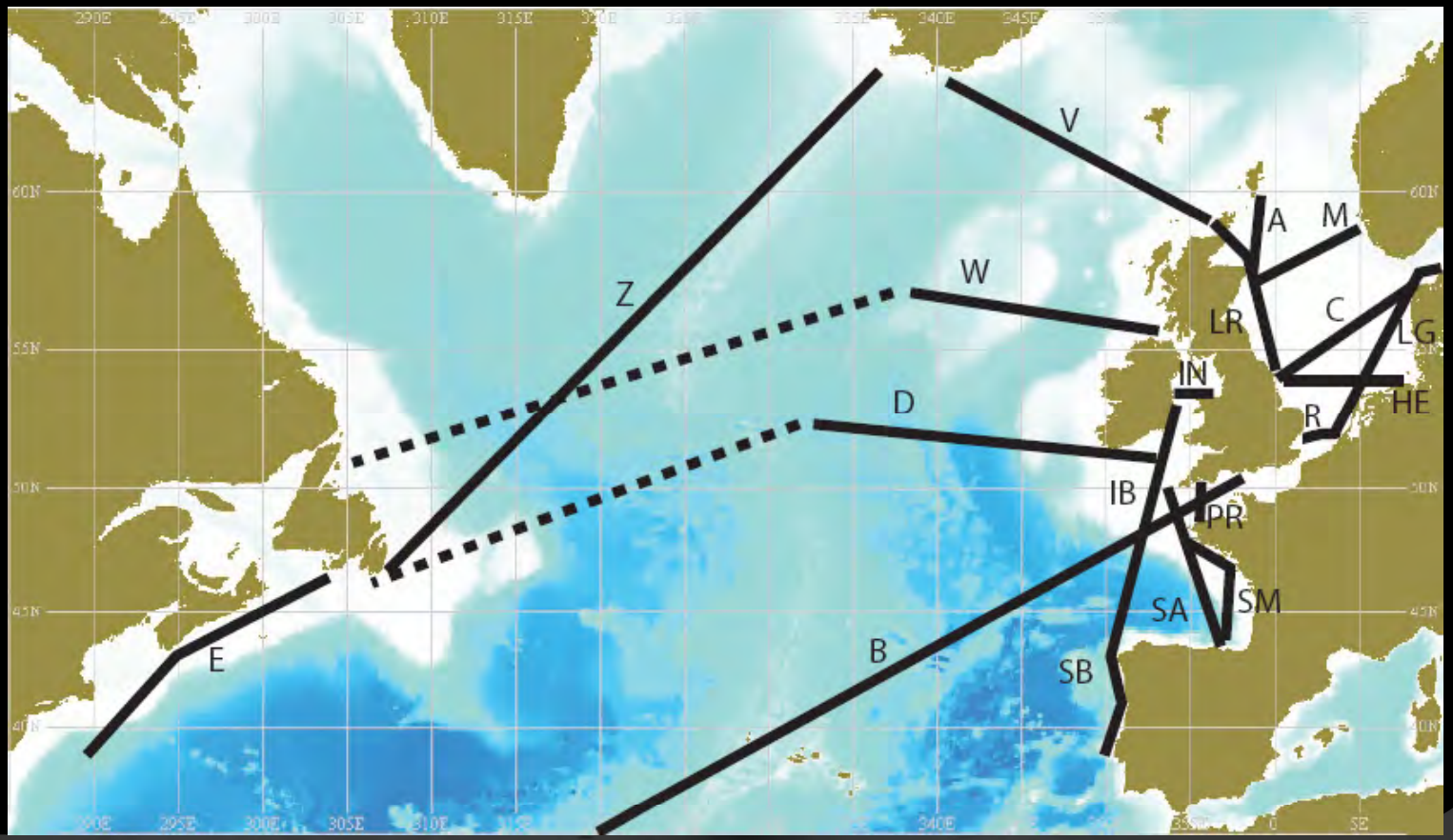
Instituto Español de Oceanografía

2011

- Pucón -

database

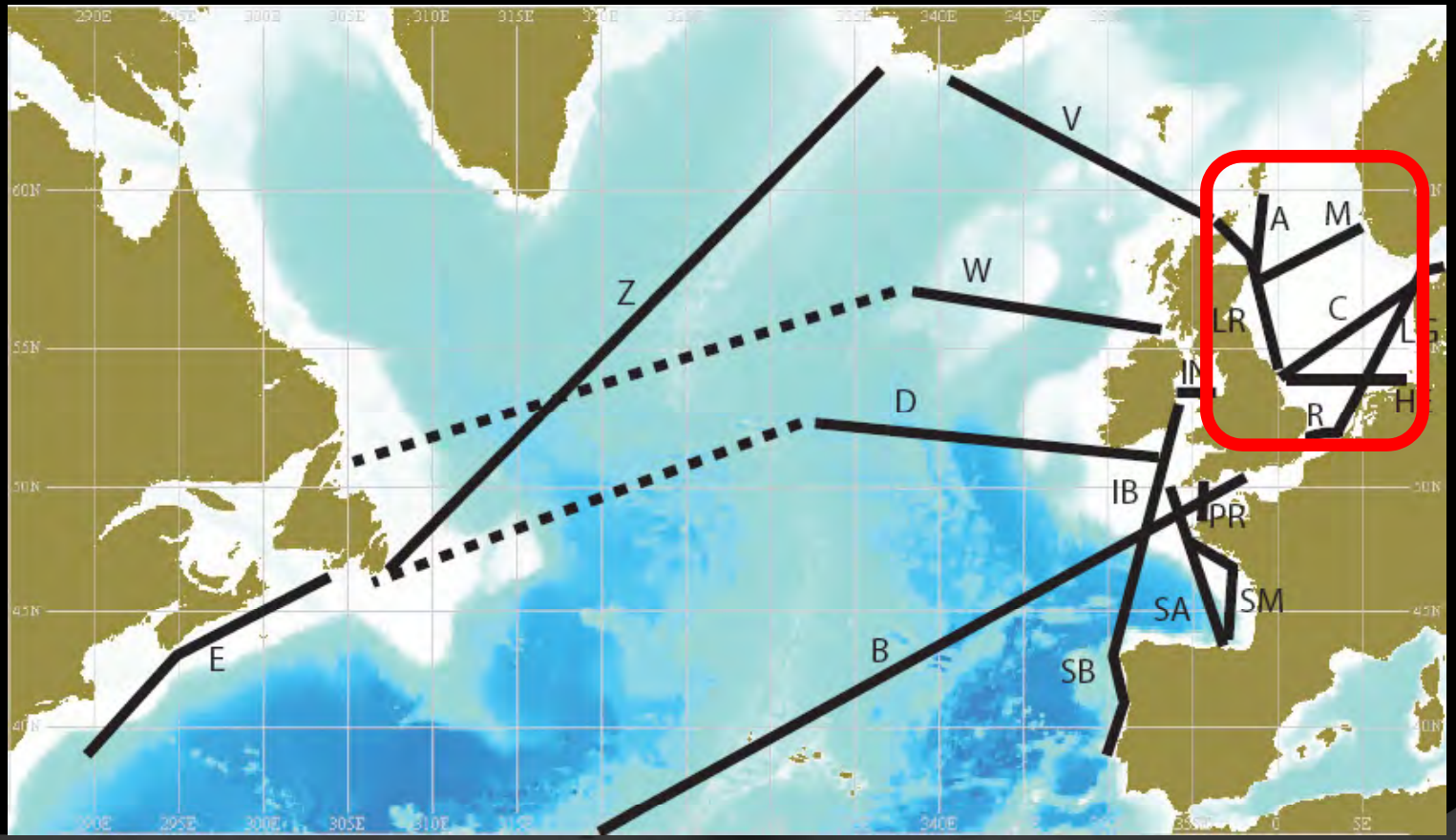
CPR routes



Sir Alister Hardy Foundation For Ocean Science

database

CPR routes



Sir Alister Hardy Foundation For Ocean Science

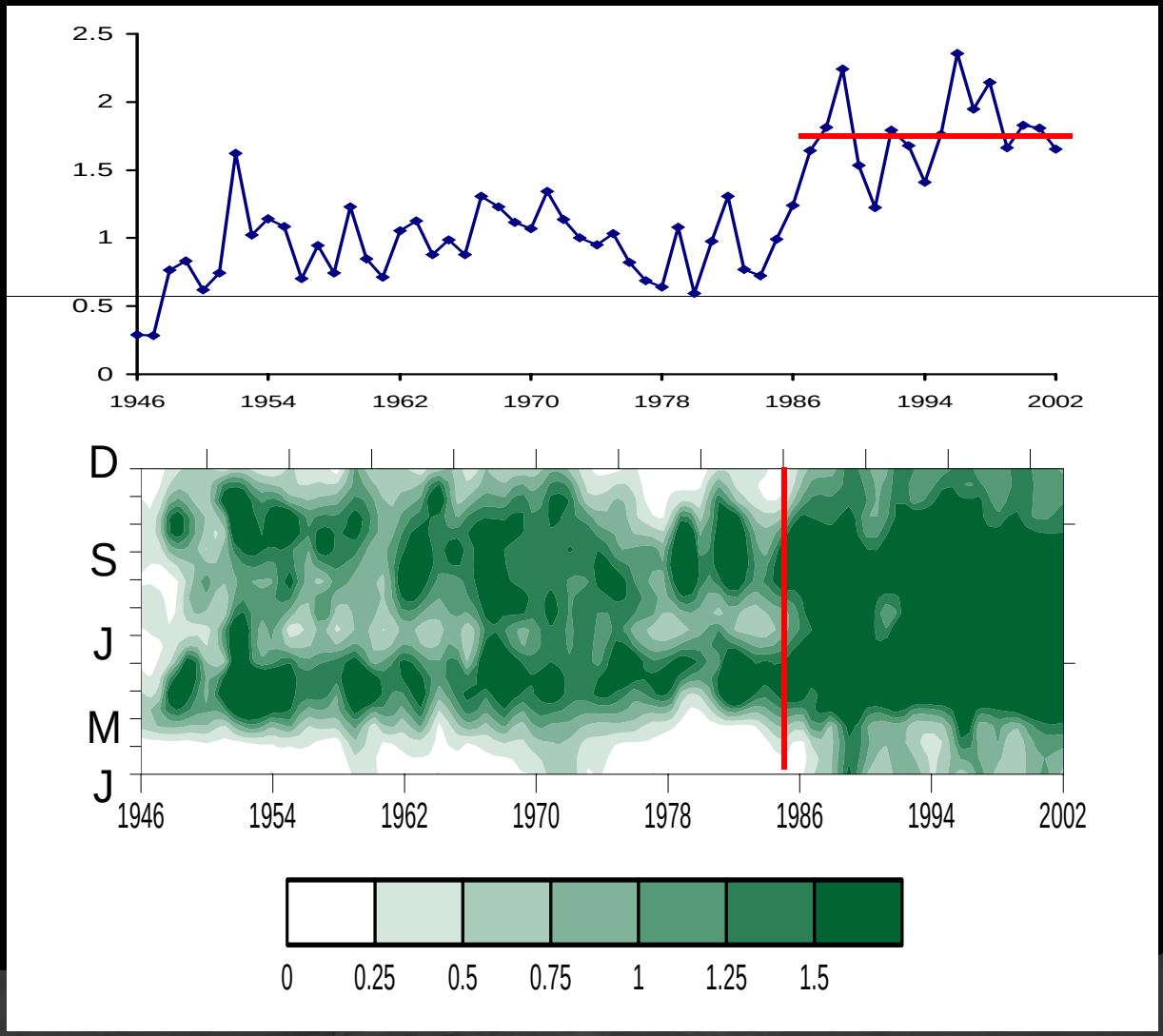
database

CPR staff

Sir Alister Hardy Foundation For Ocean Science

regime shifts

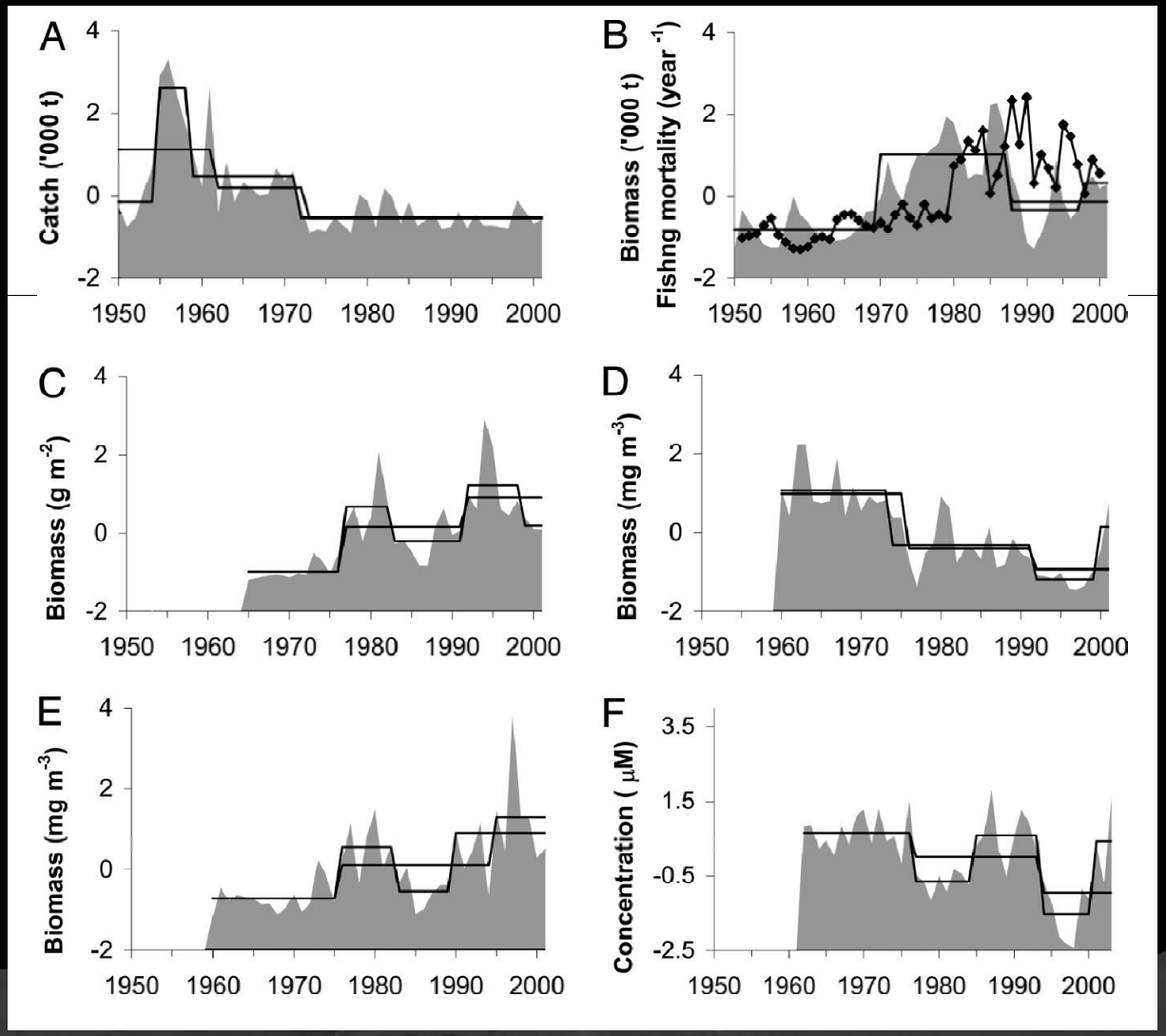
North Sea



Reid *et al.* (1998) updated

regime shifts

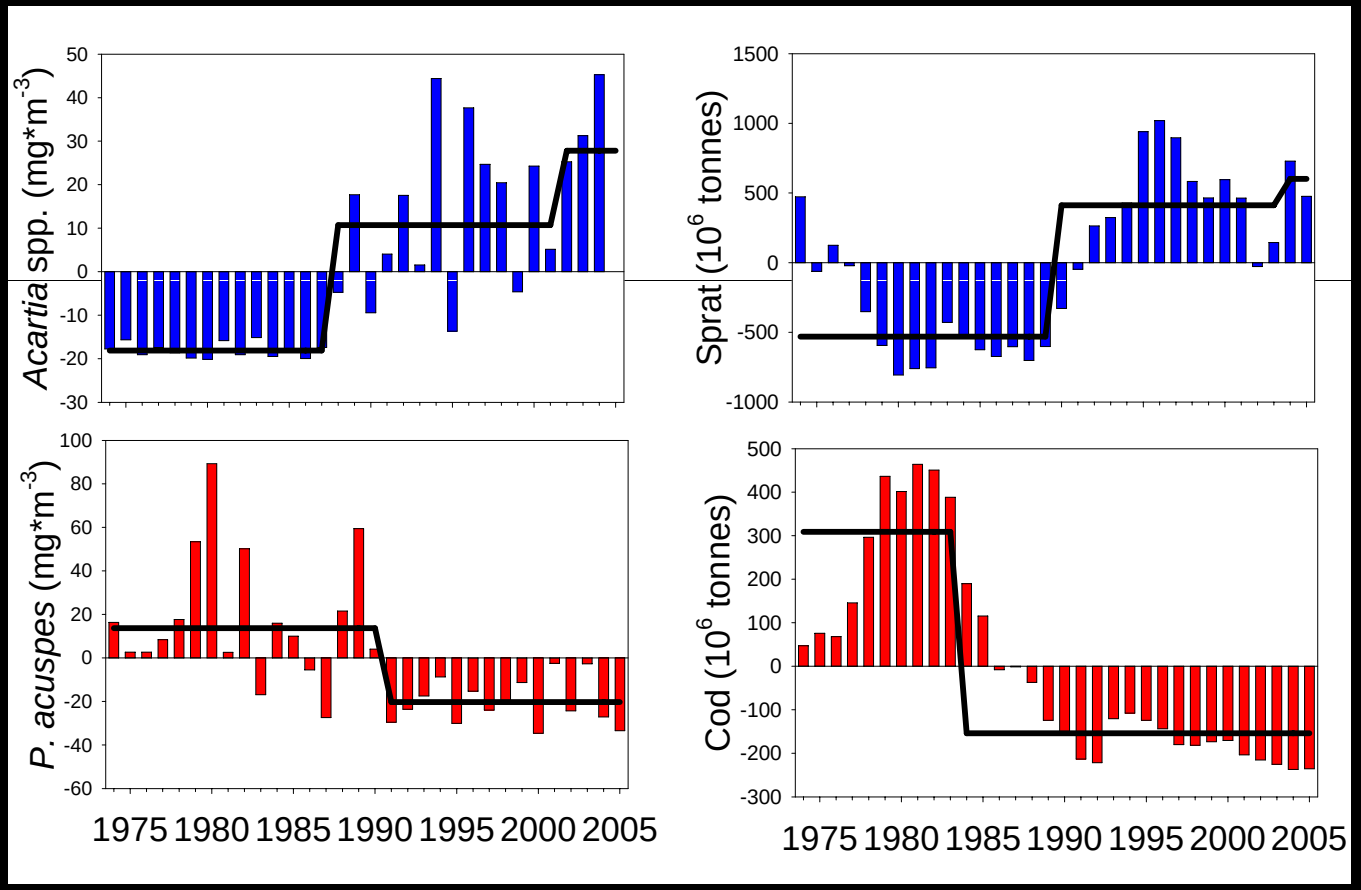
Black Sea



Daskalov *et al.* (2007)

regime shifts

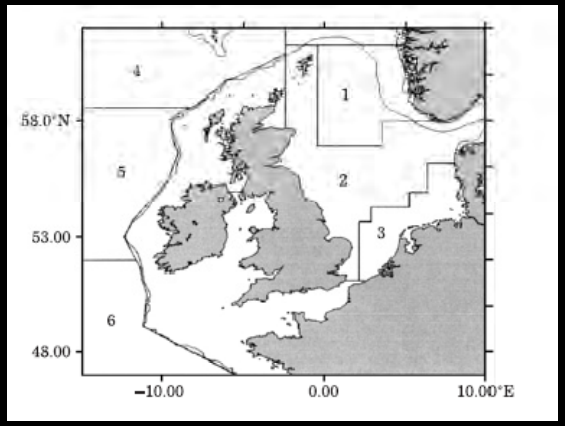
Baltic Sea



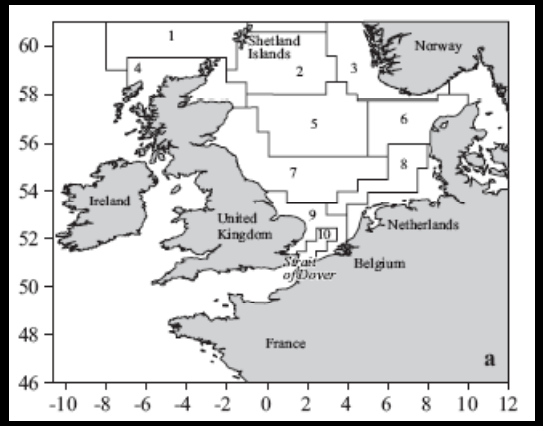
Möllmann *et al.* (2008)

spatial info

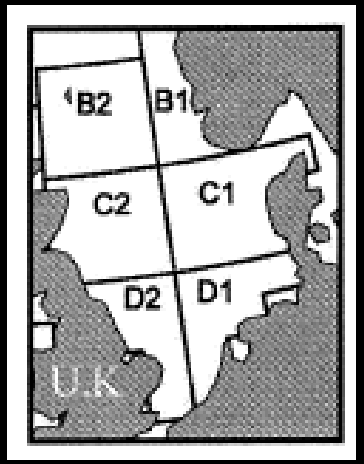
regionalization



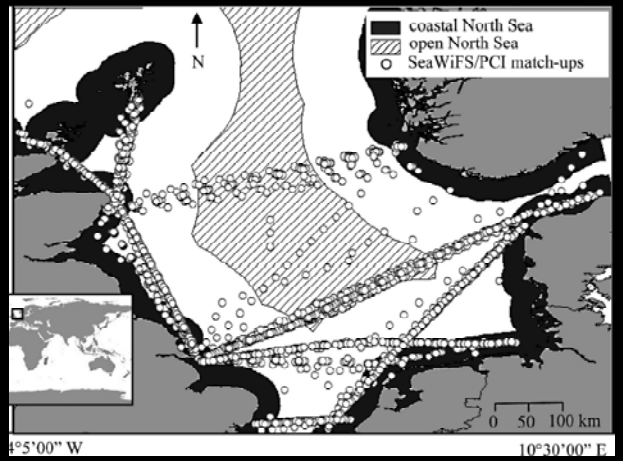
Edwards *et al.* (2001)



Leterme *et al.* (2008)



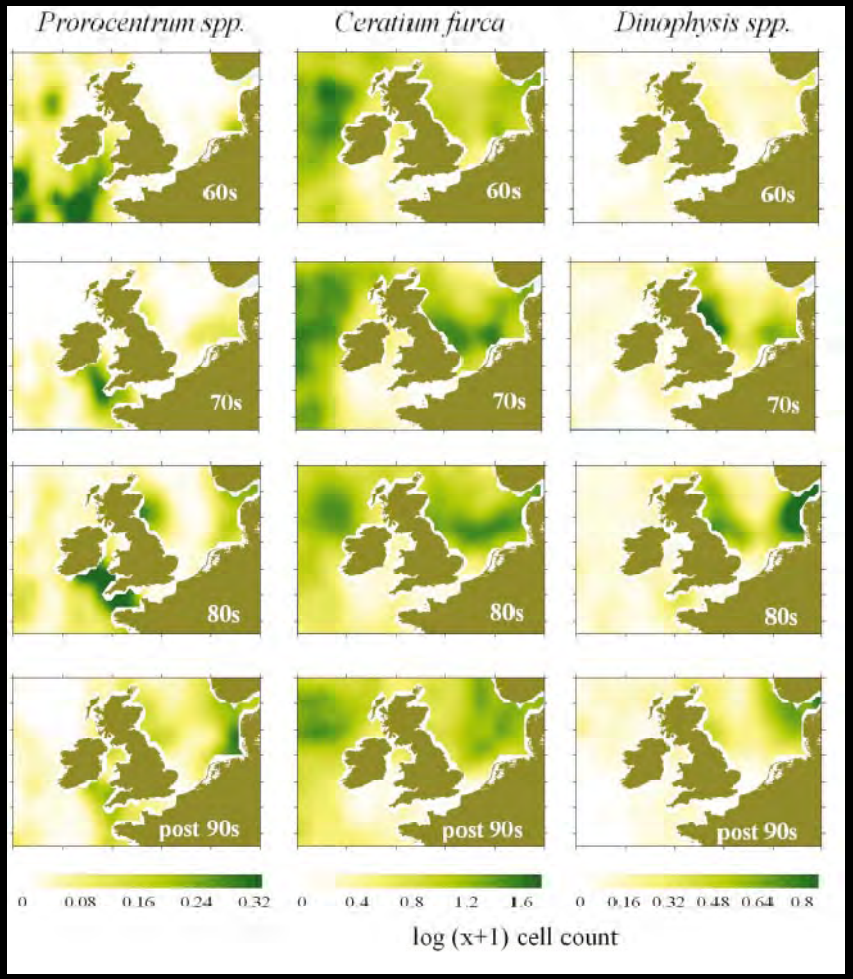
Several studies



McQuatters-G. *et al.* (2007)

spatial info

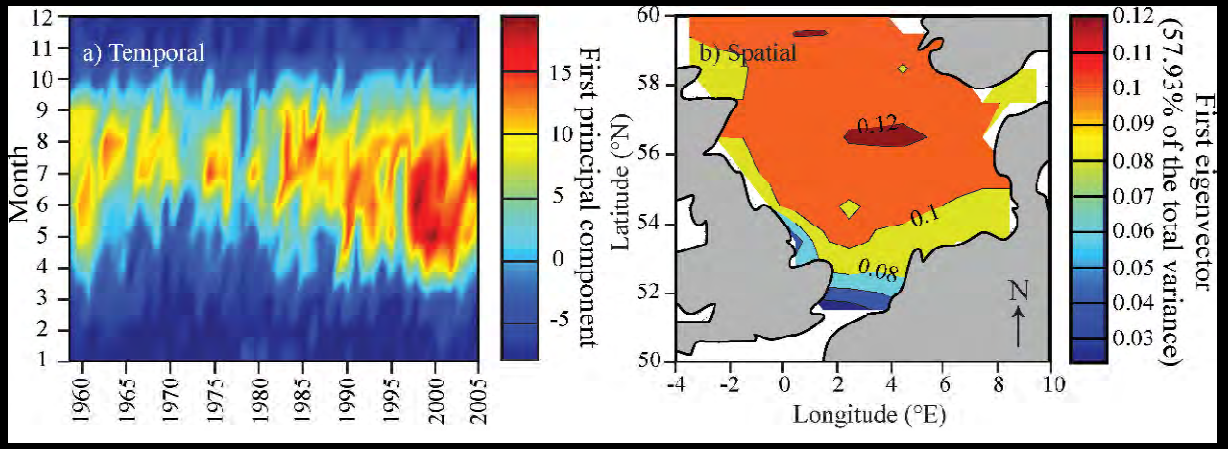
- regionalization
- **decadal averaging**



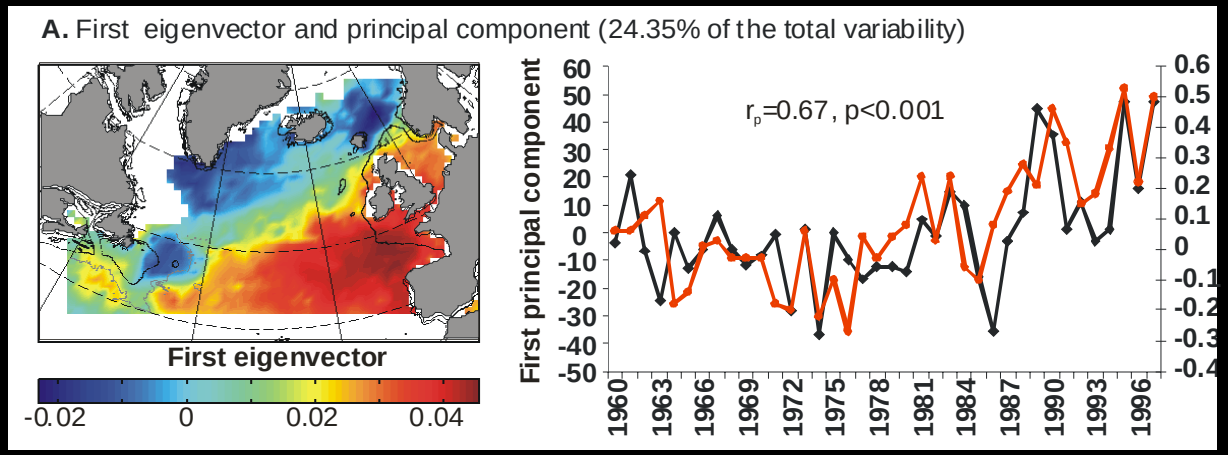
Edwards *et al.* (2006)

spatial info

- regionalization
- decadal averaging
- spatialized PCA

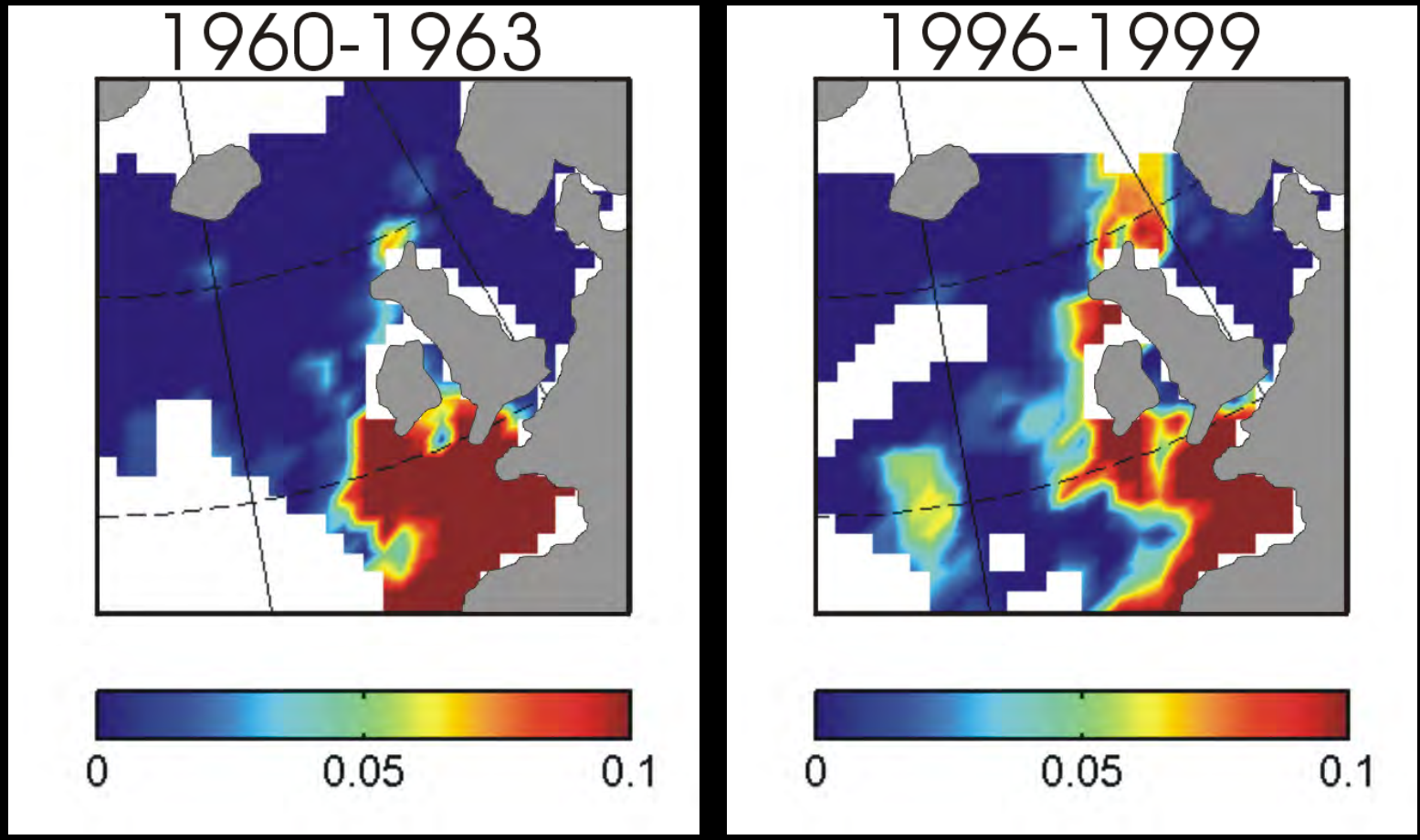


Kirby *et al.* (2008)



Beaugrand *et al.* (2002)

spatial info



Beaugrand *et al.* (2002)

Only a few studies focused on distributional changes

objective

- Look into the distributional patterns by using the spatial information explicitly

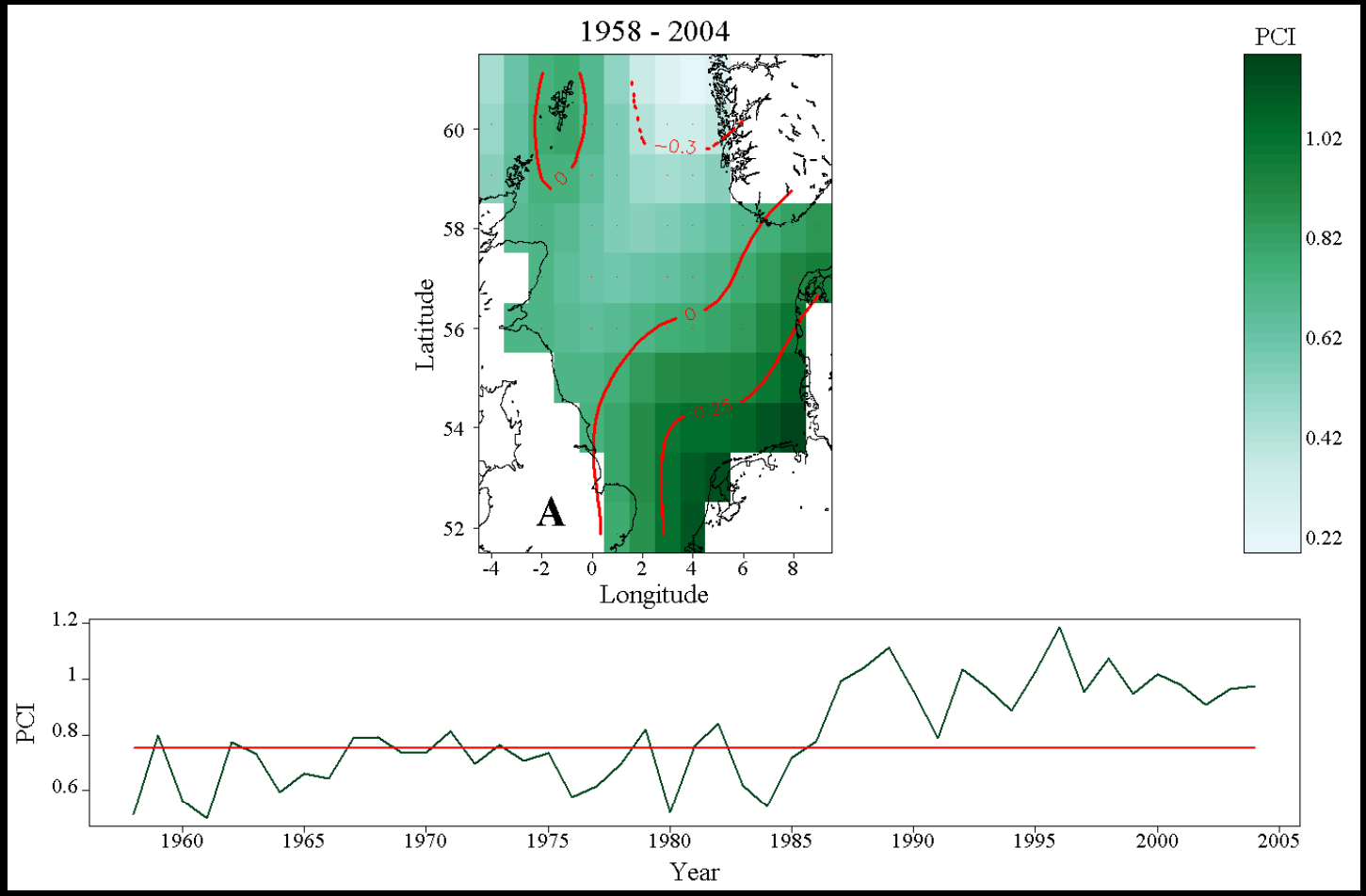
  Simultaneously include temporal and spatial variation in a single statistical model

- Have this reorganization affected the spatial distribution of plankton?

  Biomass of functional groups – trophic interactions

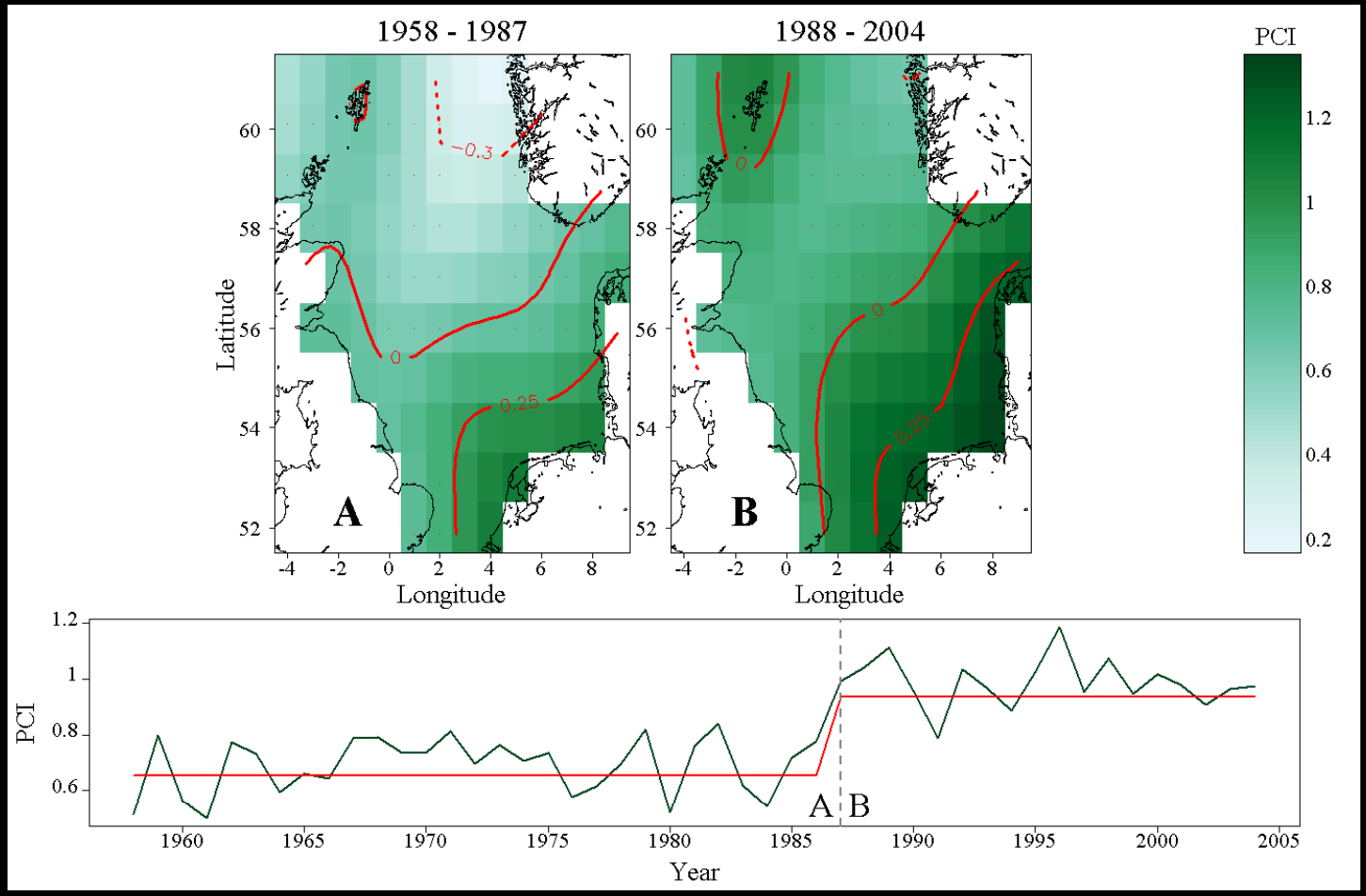
methods

1 distributions



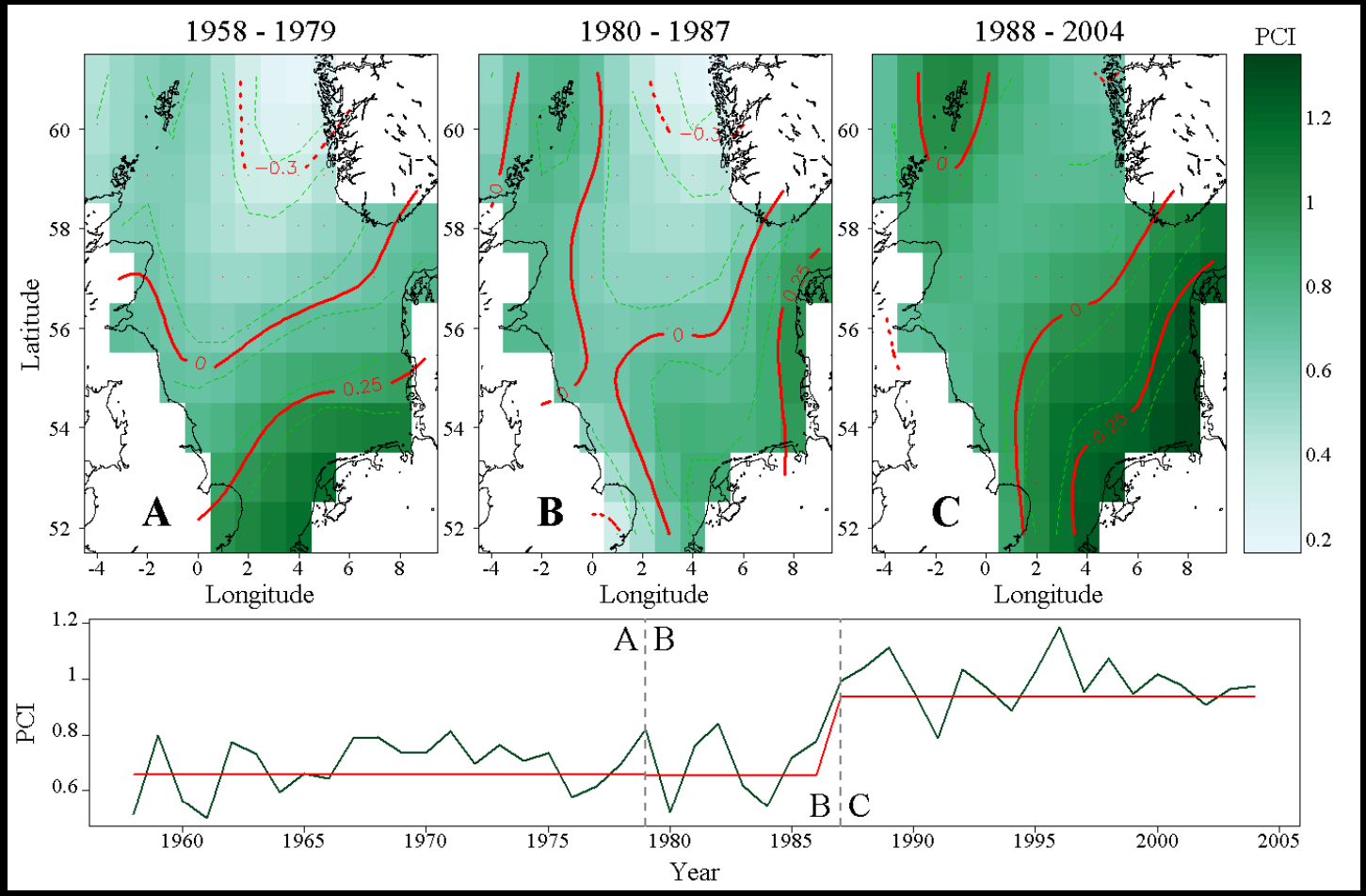
methods

2 distributions



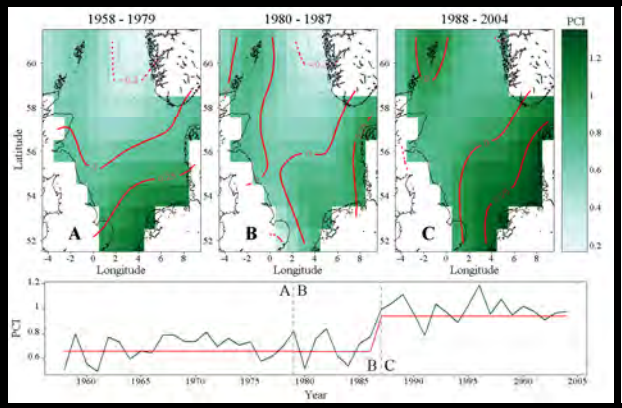
methods

3 distributions



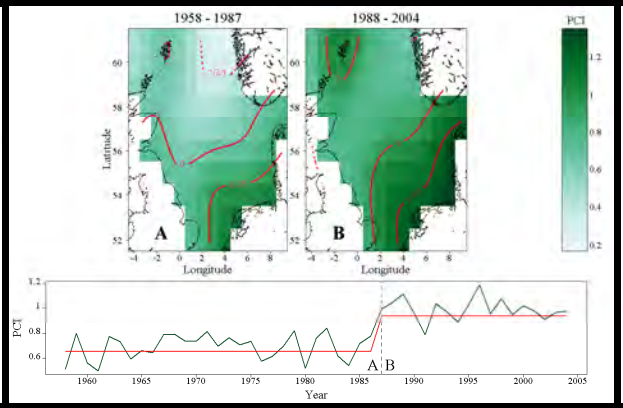
methods

3 spatial regimes



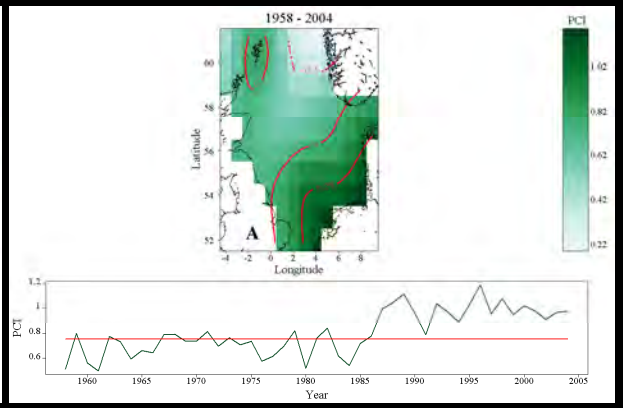
gCV: **0.2453**

2 spatial regimes



gCV: **0.2499**

1 spatial regime



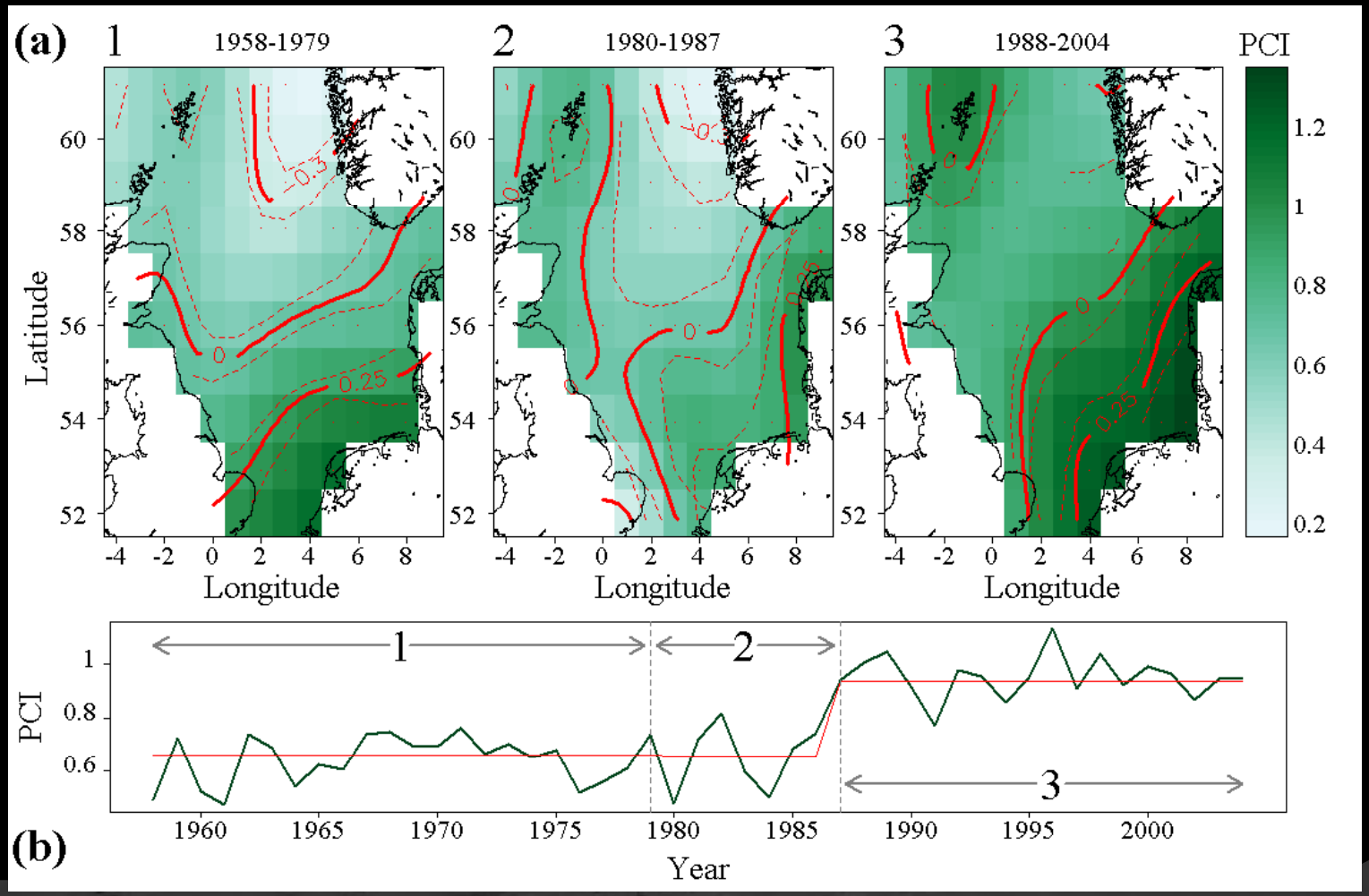
gCV: **0.2771**

Cross Validation

model's out-of-sample predictive performance

results

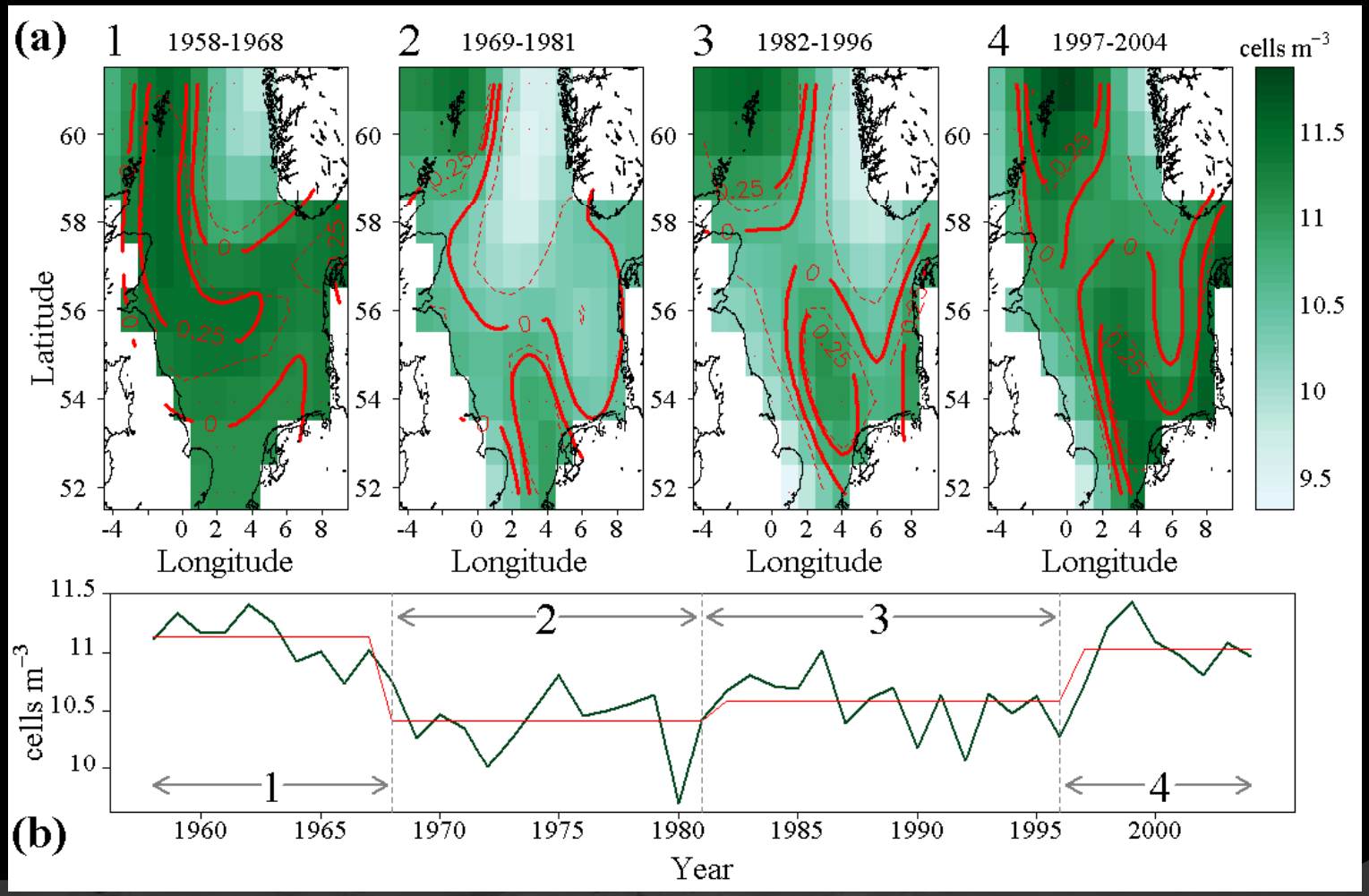
Phytoplankton Colour



Llope *et al.* (under review)

results

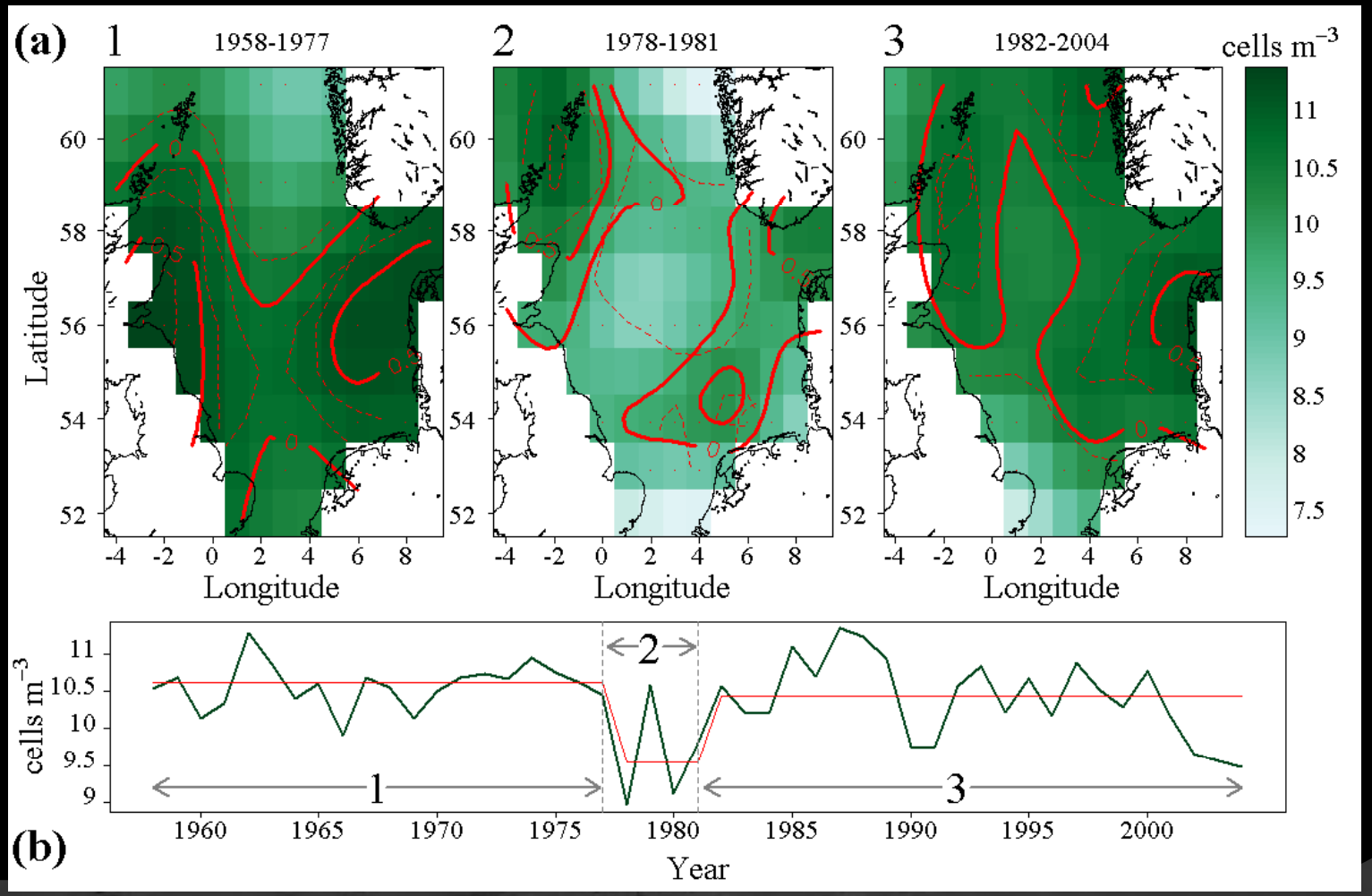
Diatoms



Llope *et al.* (under review)

results

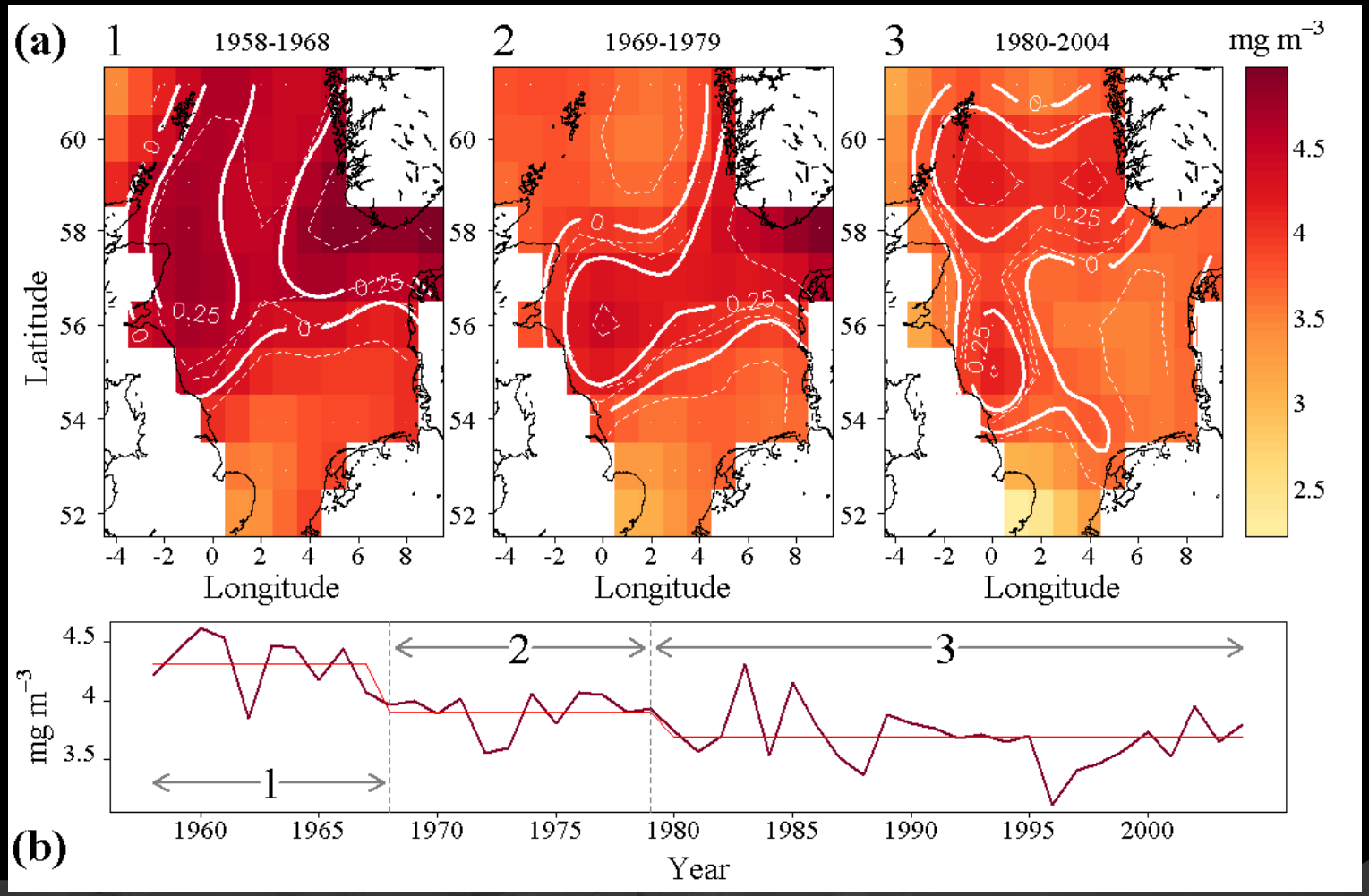
Dinoflagellates



Llope *et al.* (under review)

results

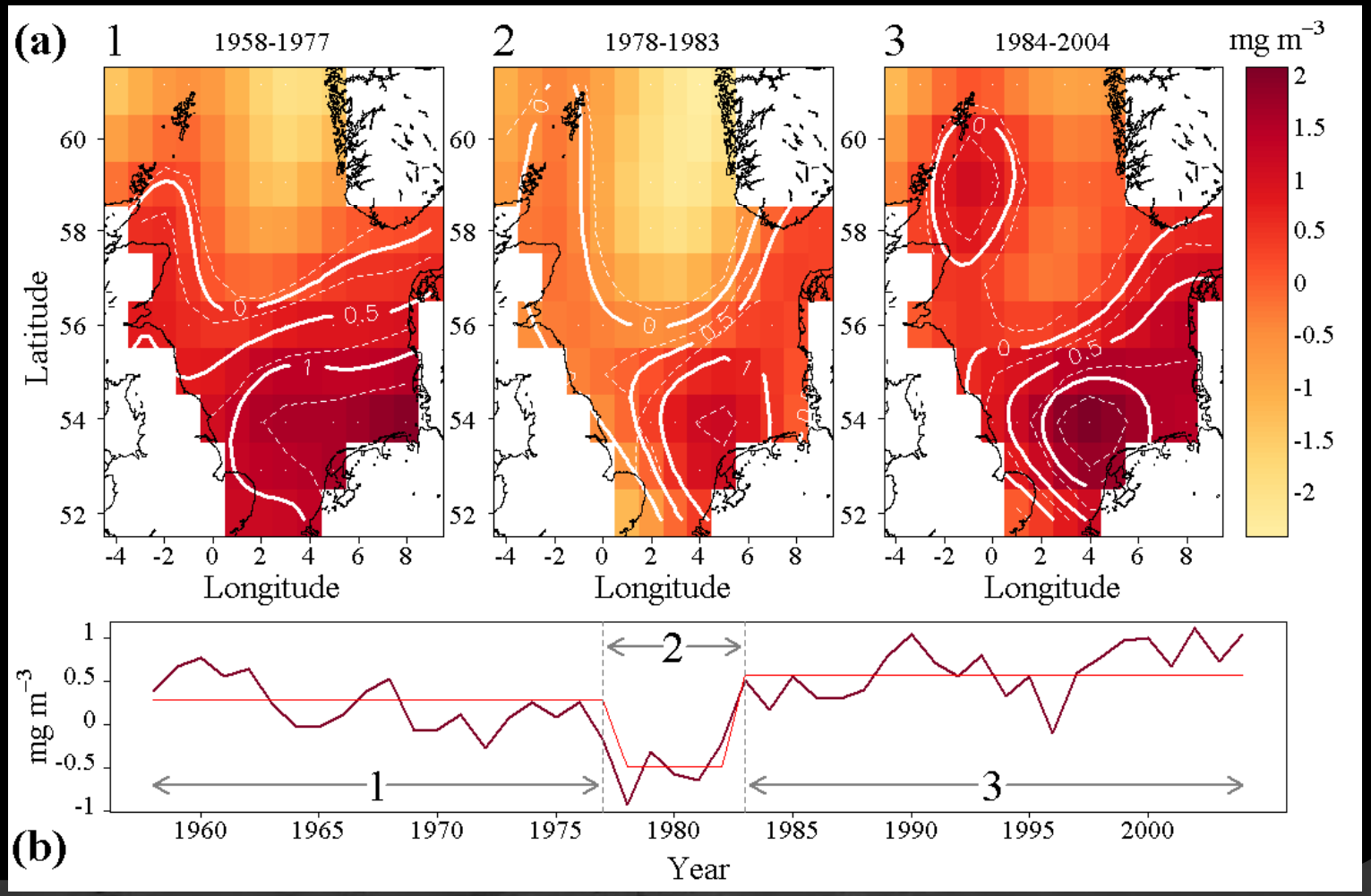
Zooplankton Biomass



Llope *et al.* (under review)

results

Meroplankton Biomass



Llope *et al.* (under review)

conclusions

1. Large spatio-temporal variability with ~3 different distribution over the last 50 years

conclusions

1. Large spatio-temporal variability with ~3 different distribution over the last 50 years

2. The late-80s don’t concentrate the most Important changes across functional groups!

Functional diversity ≠ Response diversity

2nd question

Do trophic interactions play a role?

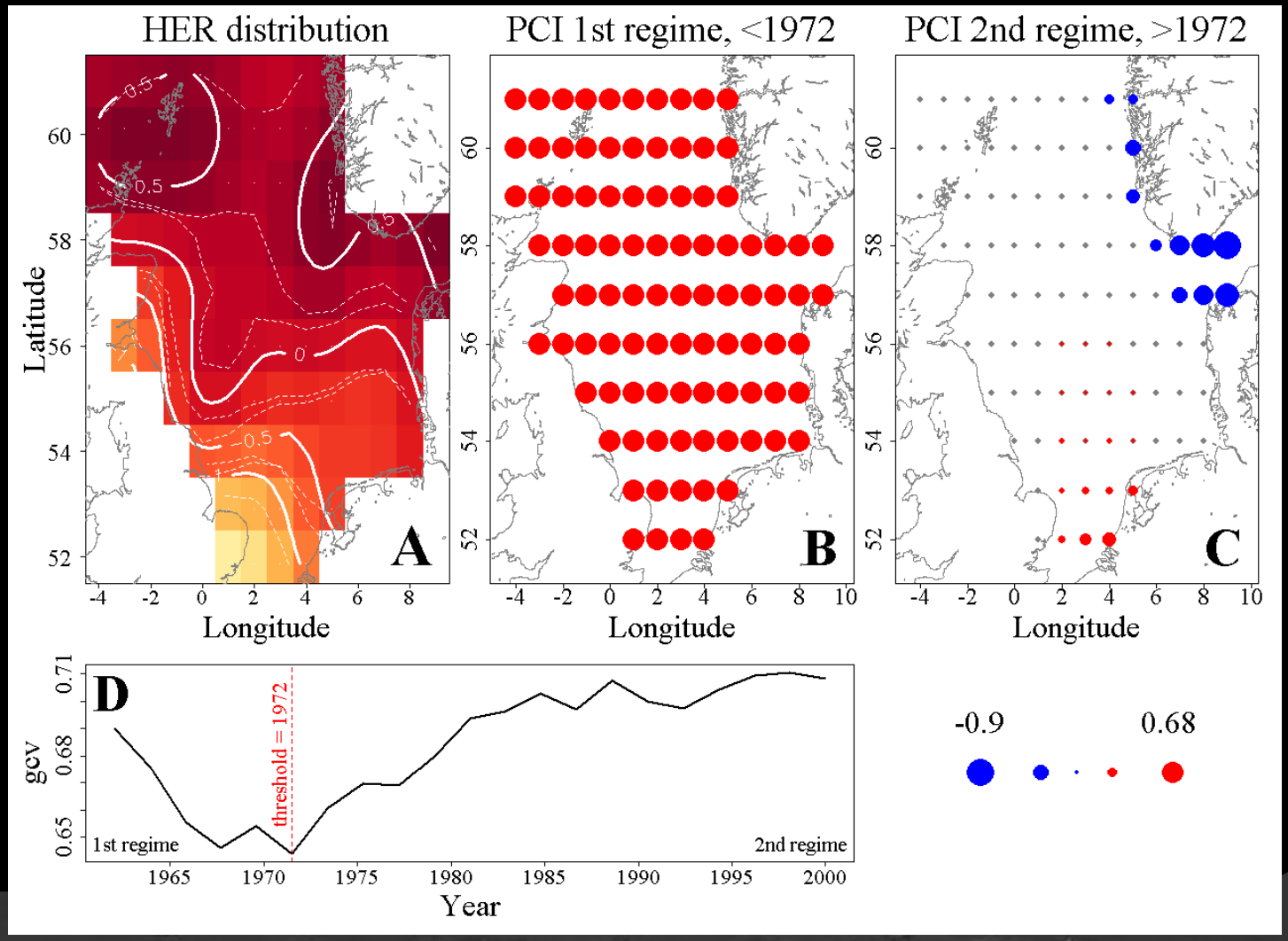
Look into interactions between herbivores and phytoplankton [both total and main groups]

methods

- Spatially-explicit
- Accounts for non-additivity
- Includes varying-coefficient

results

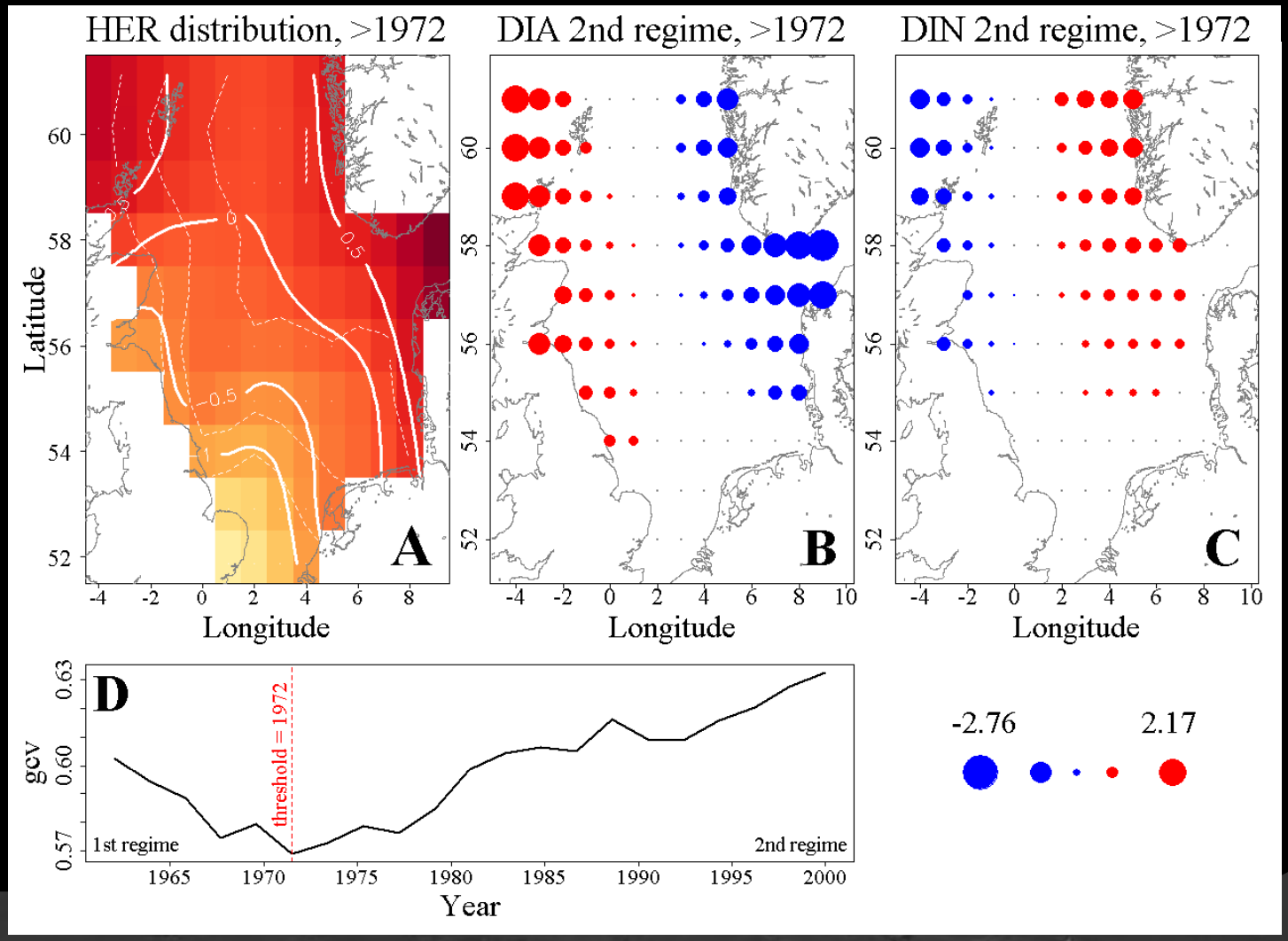
Herbivores - Total phytoplankton



Llope *et al.* (in preparation)

results

Herbivores - Diatoms/Dinoflagellates

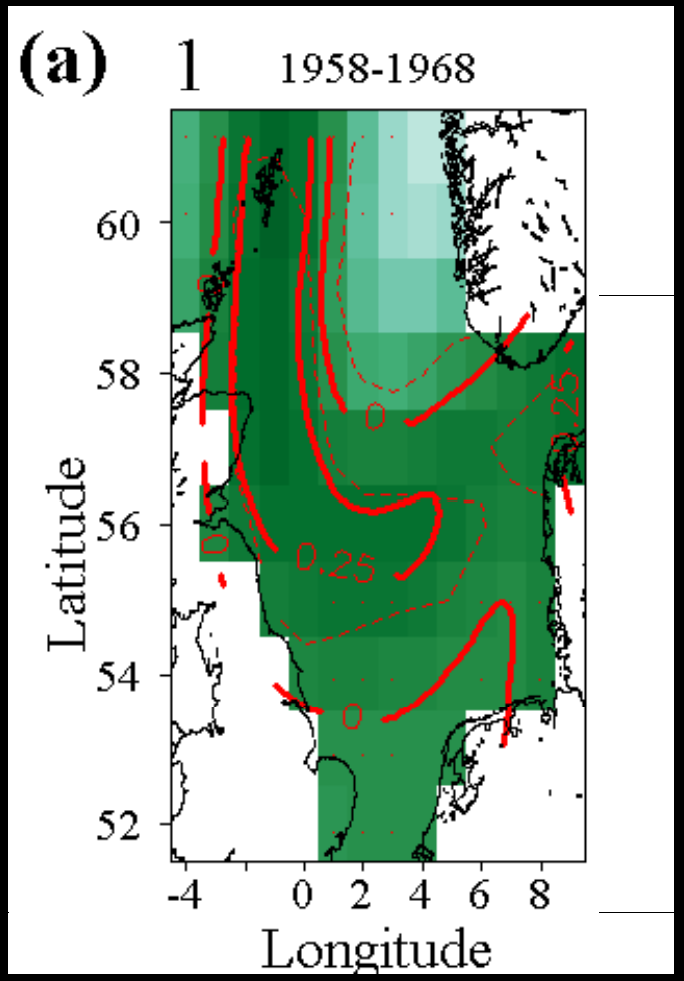


Llope *et al.* (in preparation)

conclusions

Trophic regulation as a dynamic property

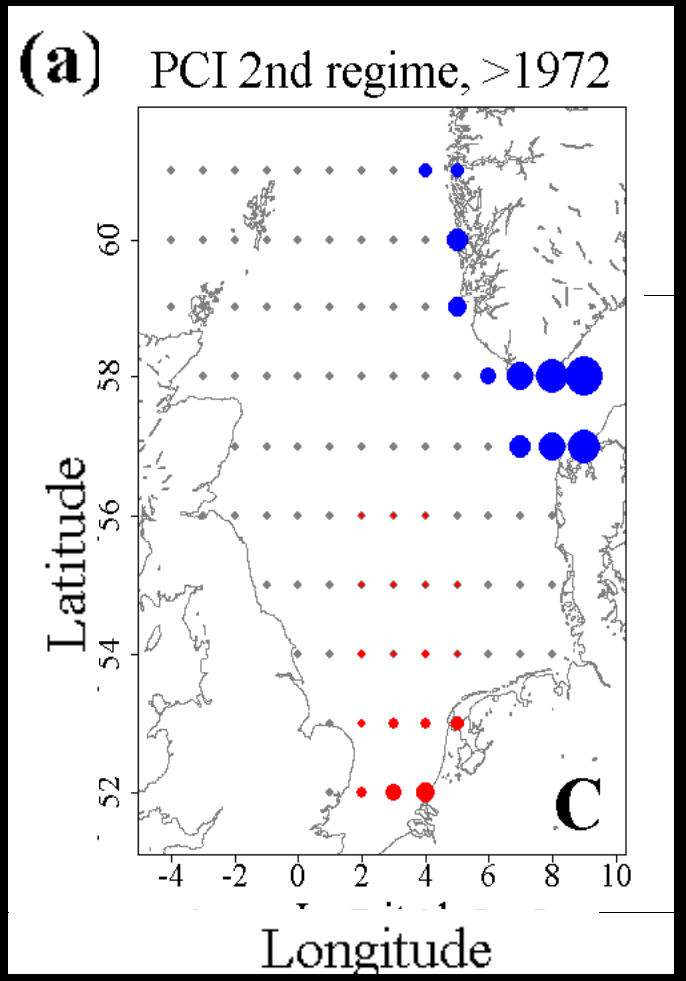
the North Sea system has become a more regionalized system since the drastic decrease in diatoms of the late 1960s



conclusions

Trophic regulation as a dynamic property

the North Sea system has become a more regionalized system since the drastic decrease in diatoms of the late 1960s

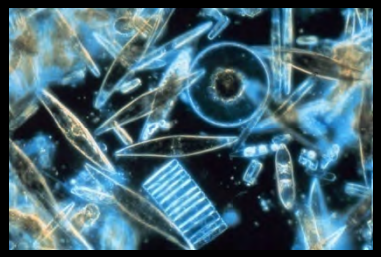


conclusions

Trophic regulation as a dynamic property

the North Sea system has become a more regionalized system since the drastic decrease in diatoms of the late 1960s

from bottom-up to top-down?

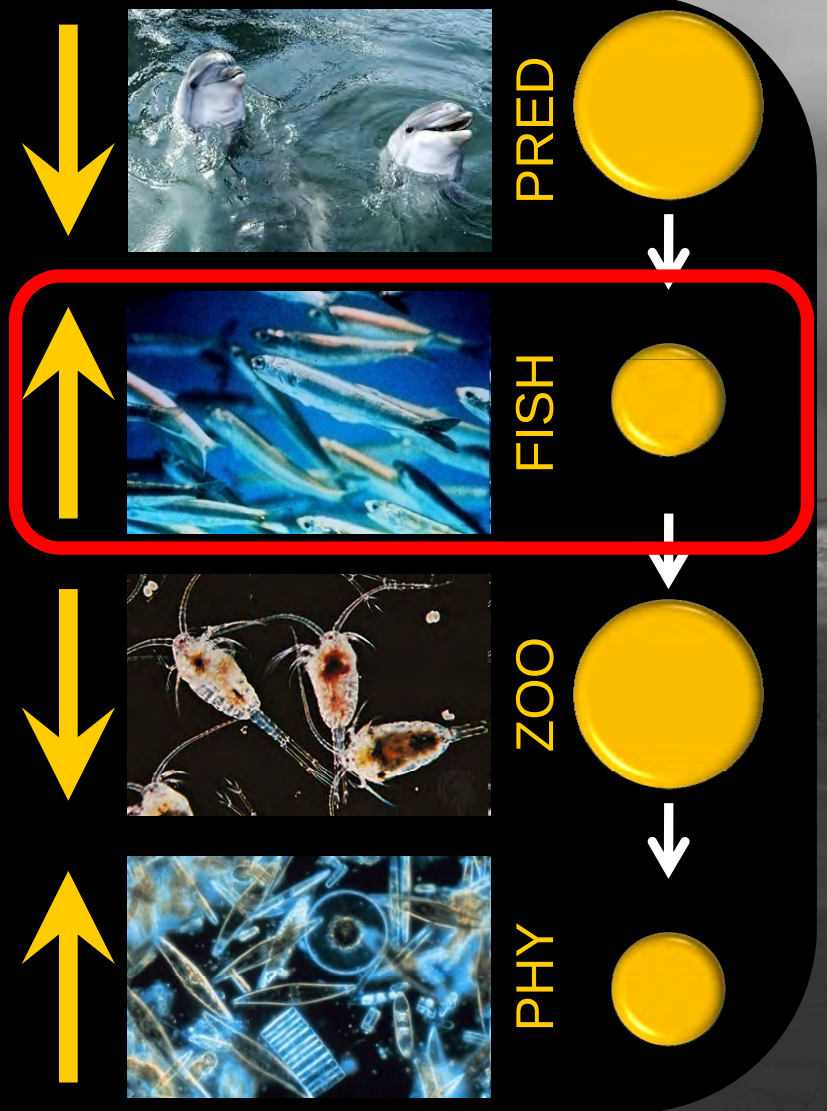


conclusions

Trophic regulation as a dynamic property

the North Sea system has become a more regionalized system since the drastic decrease in diatoms of the late 1960s

from bottom-up to top-down?

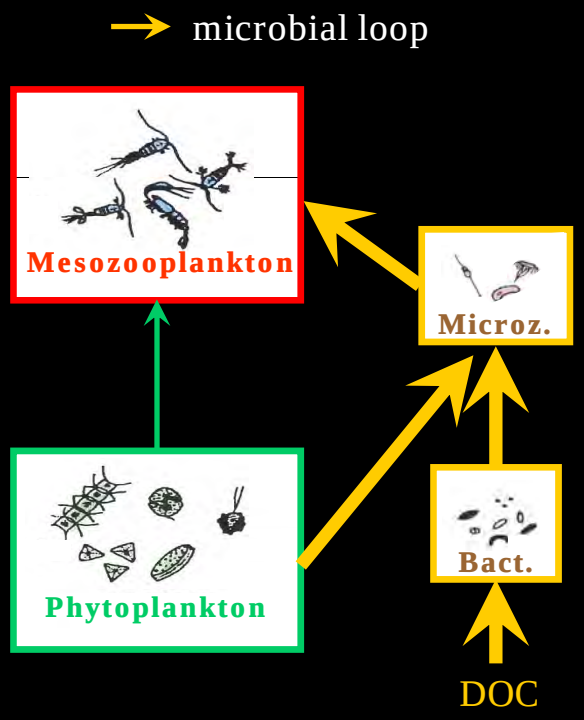


conclusions

Trophic regulation as a dynamic property

the North Sea system has become a more regionalized system since the drastic decrease in diatoms of the late 1960s

from classic diatom-dominated phytoplankton community to a more microbial loop type of community?



thanks!

funding:

MARIE CURIE ACTIONS

CONTINUOUS PLANKTON RECORDER SURVEY

EXCELLENCE IN SCIENCE

Instituto Español
de Oceanografía

2011
- Pucón -