Surface warming, decreasing upwelling intensity and plankton off Galicia (NW Spain)

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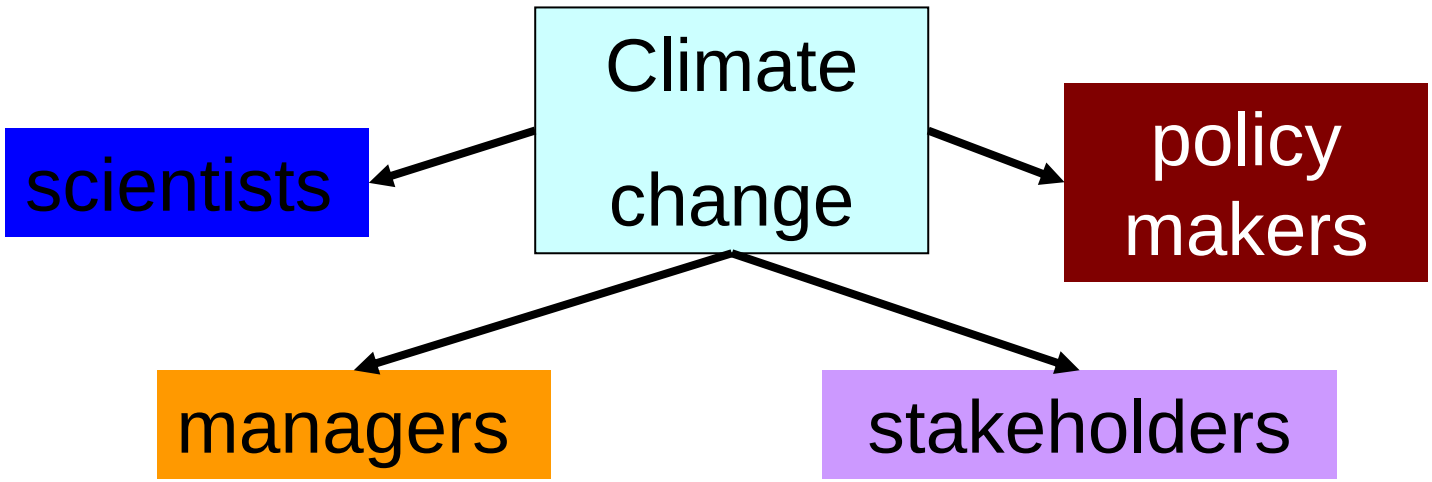
Introduction

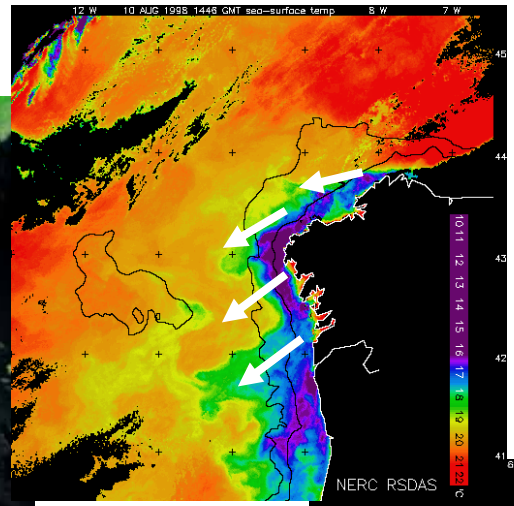
Changes occur at global scale…

but the also at regional (and lower) scales

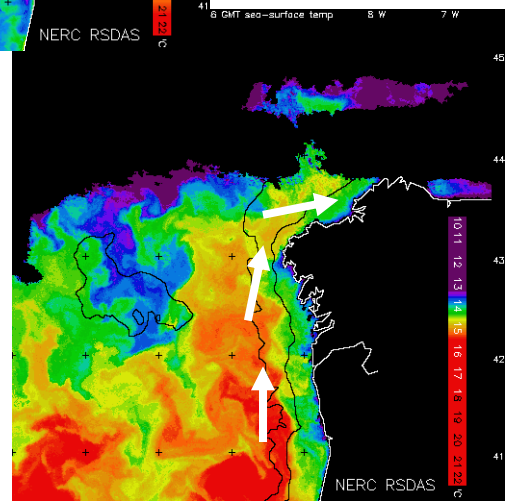
Global issues need to be addressed at regional and local scales



Introduction



upwelling



downwelling &

poleward currents

Galicia and the sea

- High yield in marine resources:
  - ➢200,000 Tons y^{-1} mussels
  - ➢200,000 Tons y^{-1} fish & shellfish
- High dependence on marine products and services (eg. canneries, aquaculture, transport, ship-building, …) [>70% economic activity]
- Tourism concentrates in the coast [>80%]
- Most of the human population near the coast

  (2 Million out of 2.8 Million)

The CLIGAL Study

CLIGAL is a multidisciplinary study sponsored by the Regional Government aimed to ascertain the significance of changes in atmospheric, terrestrial and marine environments in Galicia.

The objectives of the marine study were focused in the patterns of change in:

1. **marine climate and oceanography**
2. **biological communities**
3. **living resources**

see also

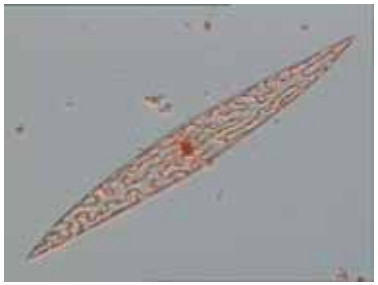
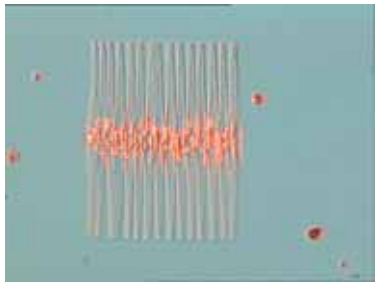
Poster S4.1 4672

Poster S4.2 4665

XUNTA DE GALICIA
CONSELLERÍA DE MEDIO AMBIENTE E DESENVOLVEMENTO SOSTIBLE

http://www.siam-cma.org/cligal

Objective

To determine long-term variability patterns in plankton biomass and species composition in relation to climatic and oceanographic changes in Galicia




Sources of data

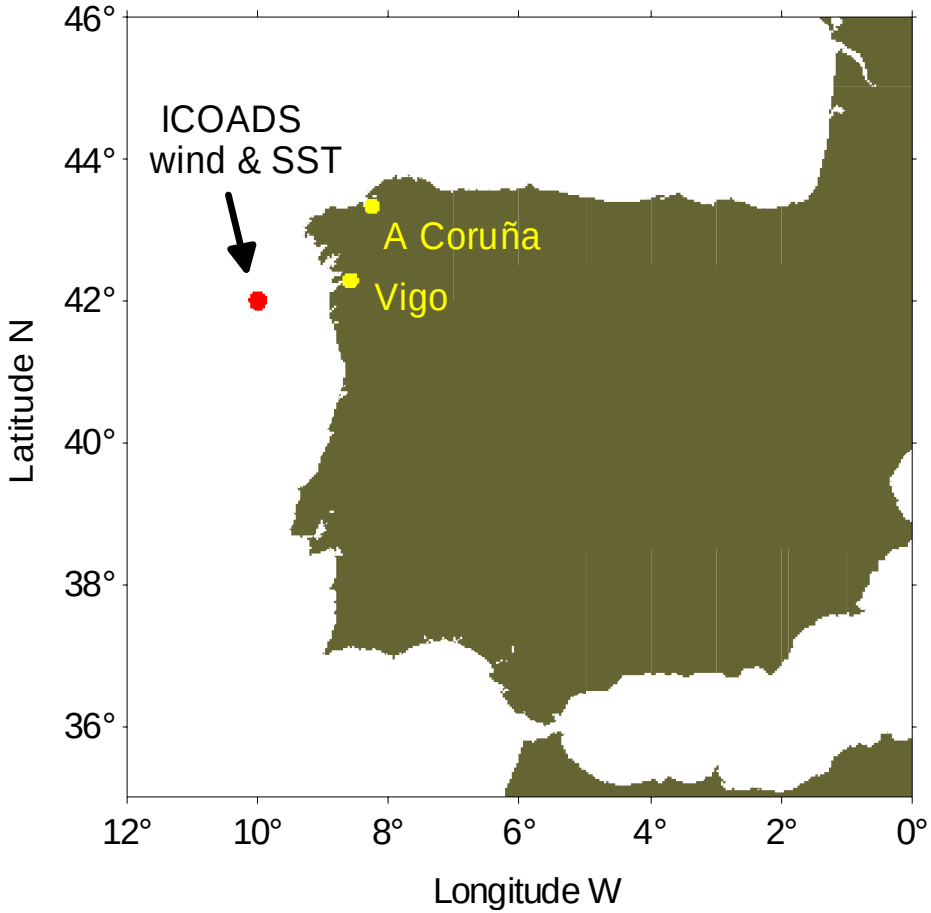
Frequency	Site / Area	Period	Variables	Source
Daily	42ºN,10ºW	1905-2006	Wind	NOAA
Daily-weekly	A Coruña	1996-2006	Phytoplankton	IEO
	Vigo	1987-1995	Phytoplankton	IIM-CSIC
Monthly	A Coruña	1990-2006	Phytoplankton	IEO
	A Coruña	1990-2006	Zooplankton	IEO
	Vigo	1990-2006	Phytoplankton	IEO
	Vigo	1990-2006	Zooplankton	IEO
	NE Atlantic	1958-2006	Phytoplankton	CPR-SAHFOS
	NE Atlantic	1958-2006	Zooplankton	CPR-SAHFOS

http://www.ncdc.noaa.gov/oa/climate/coads ICOADS Programme (NOAA)

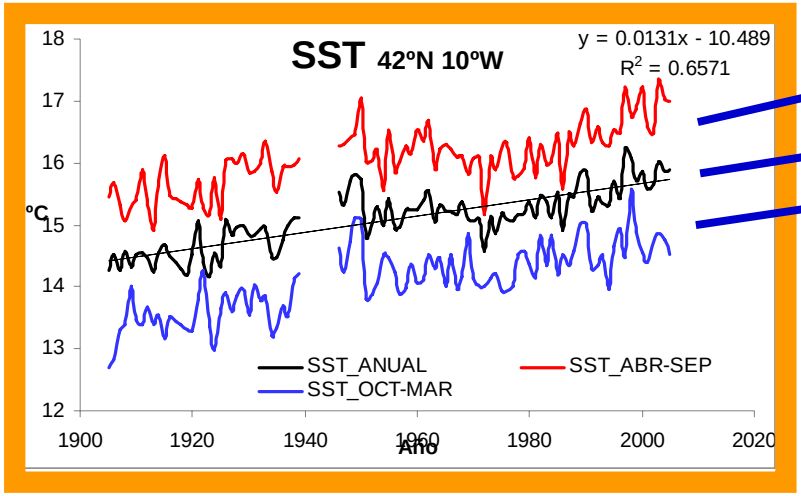
http://www.seriestemporales.net RADIALES Programme (IEO)

http://www.sahfos.org/CPR Continuous Plankton Recorder Survey (SAHFOS)

Changes in the ocean

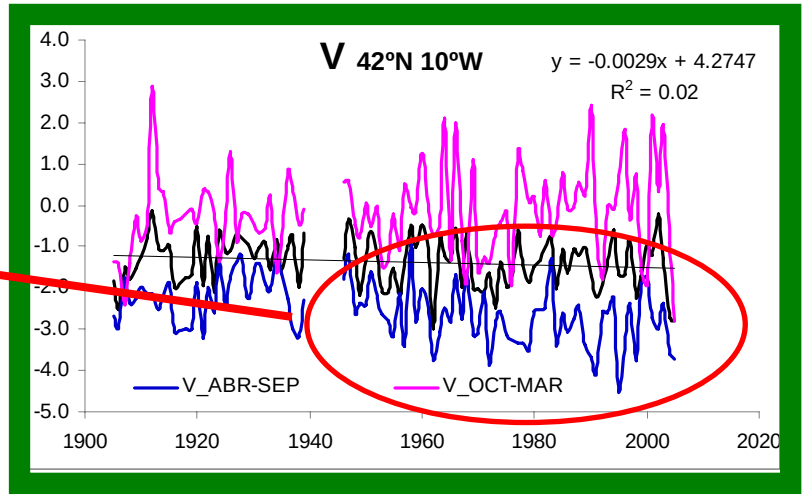


Changes in the ocean

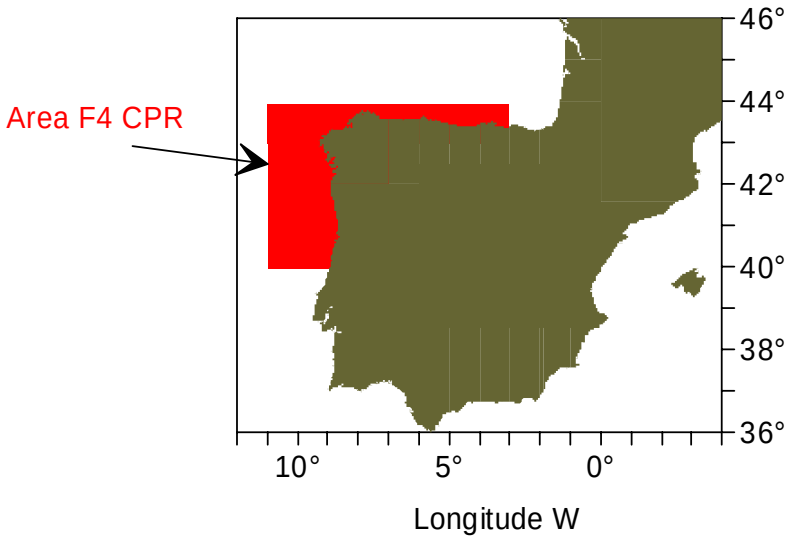


temperature increases…

… and upwelling weakens

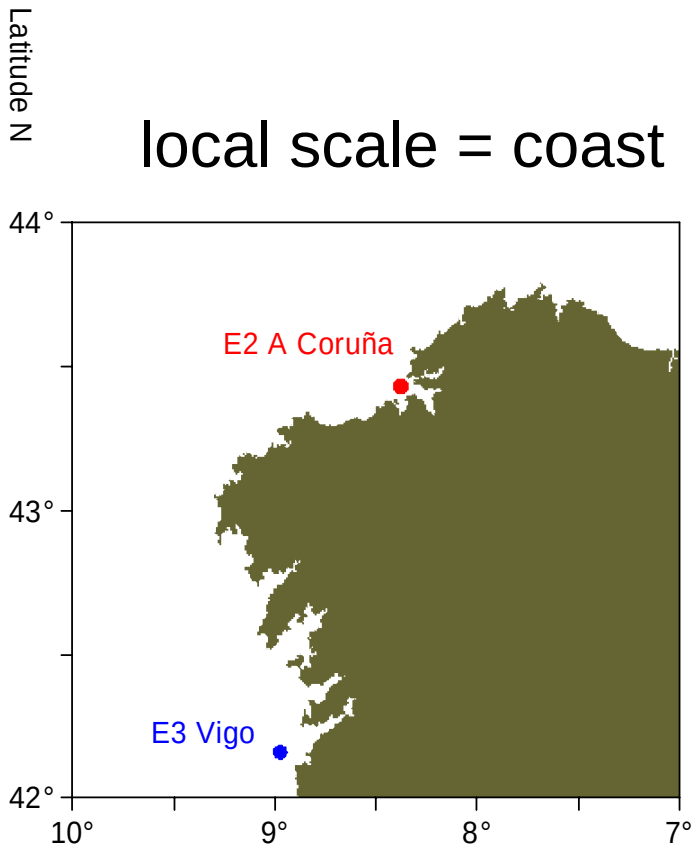


Phytoplankton

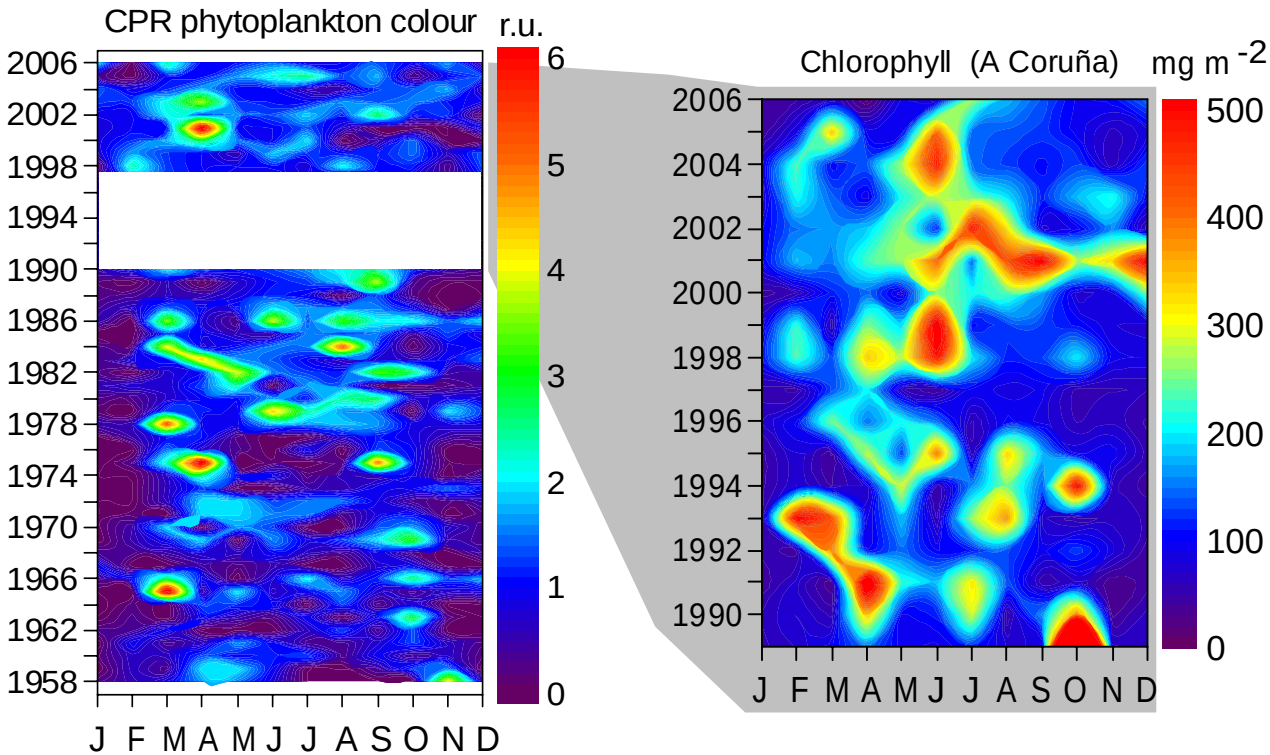


regional scale = ocean

local scale = coast



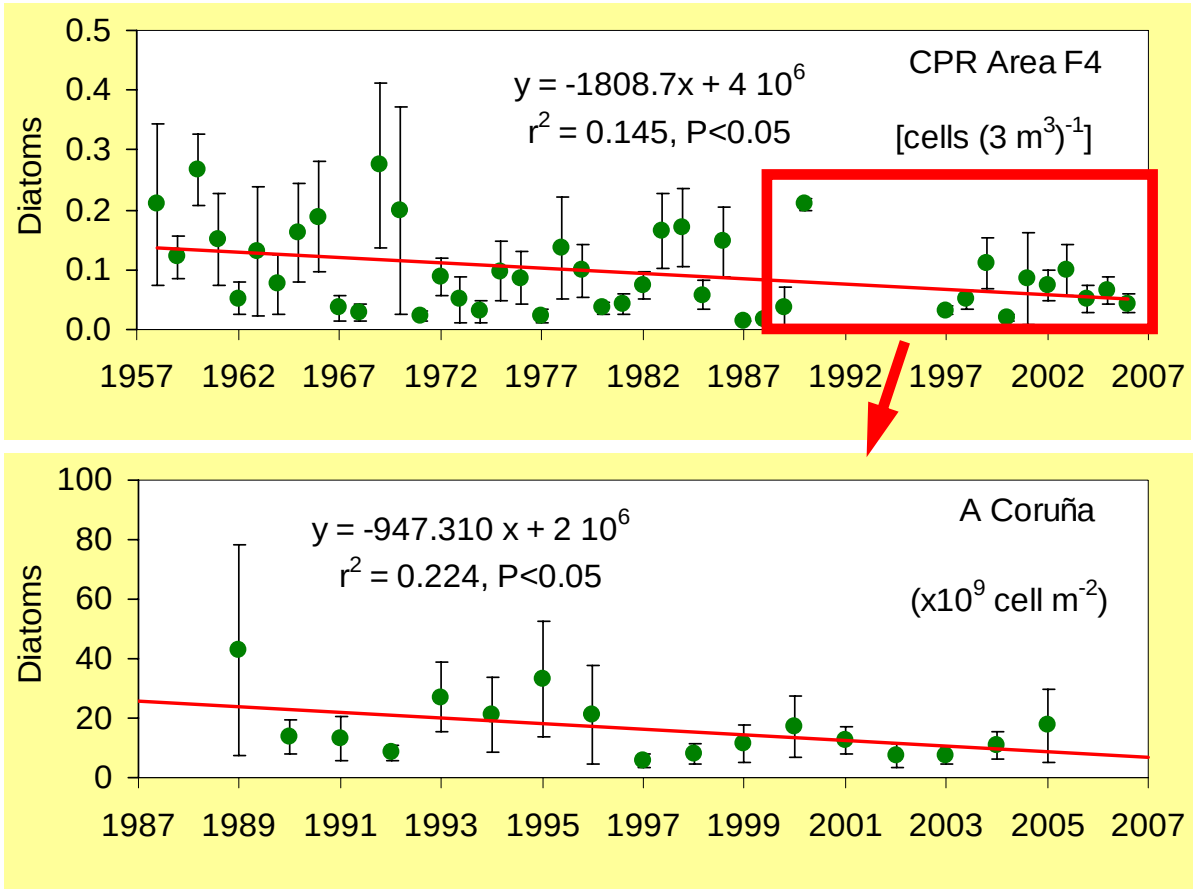
Phytoplankton biomass



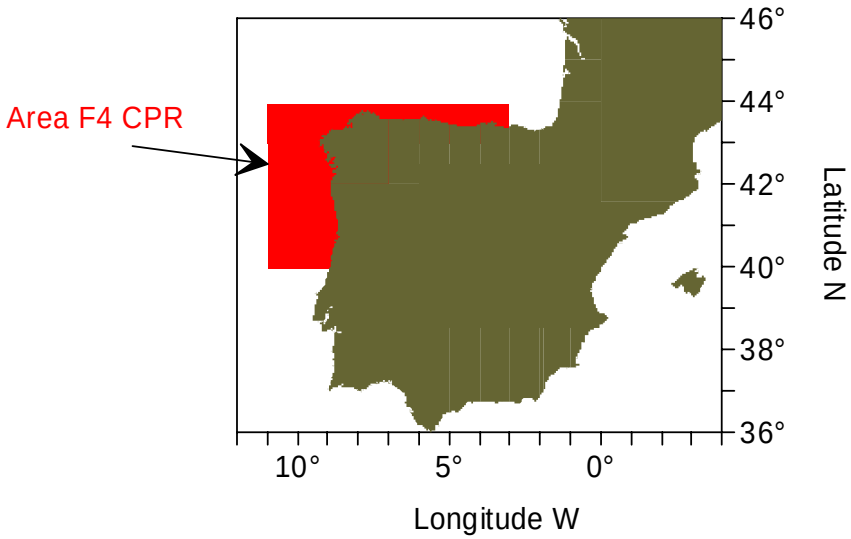
non significant trends in biomass, but…

Phytoplankton species

a significant decrease in diatoms

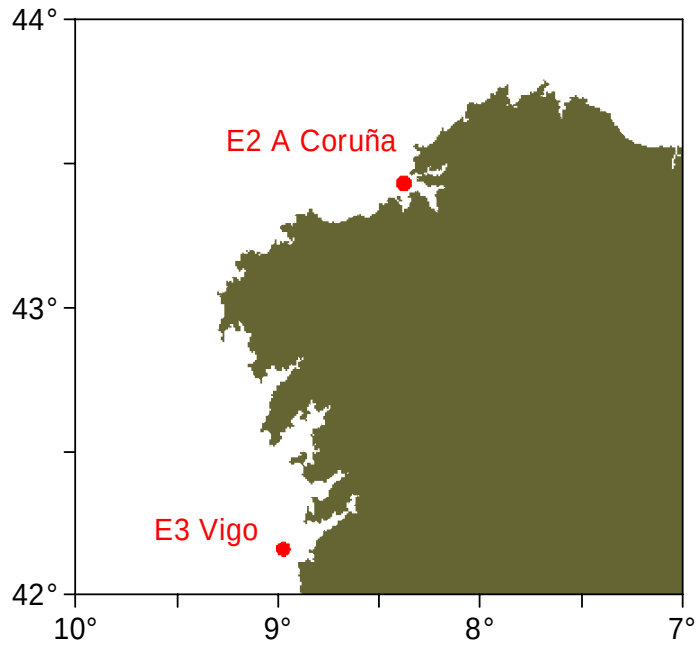


Zooplankton



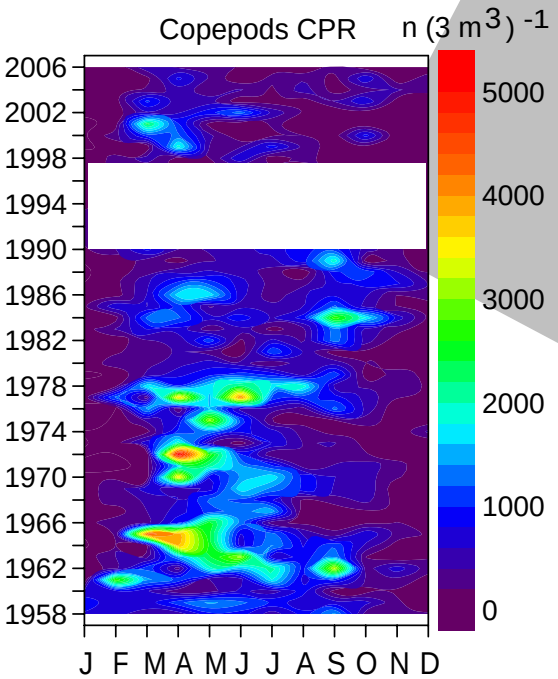
regional scale = ocean

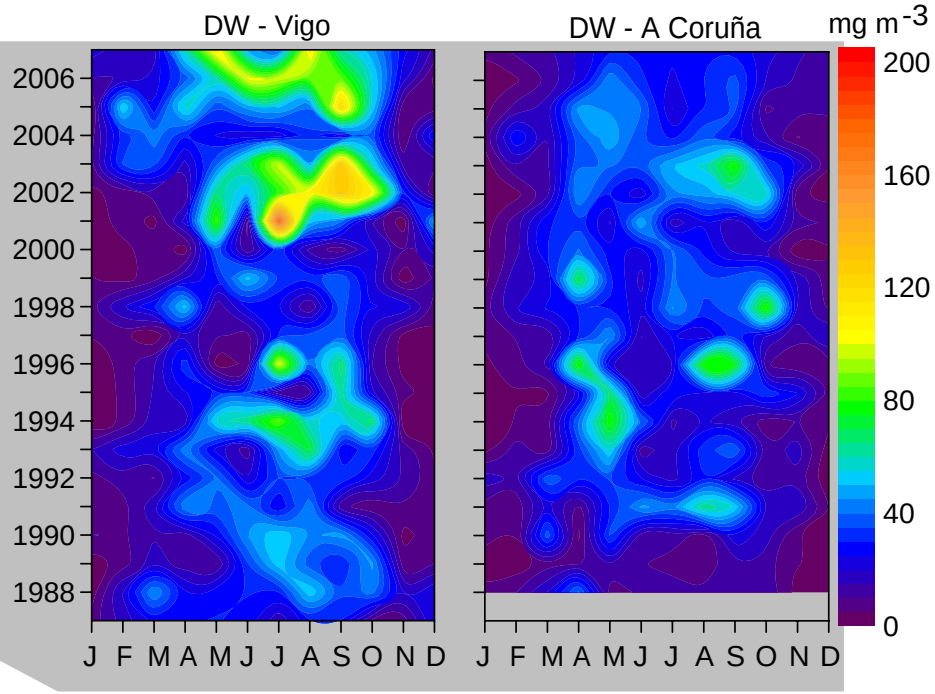
local scale = coast



Zooplankton biomass

decrease in the ocean

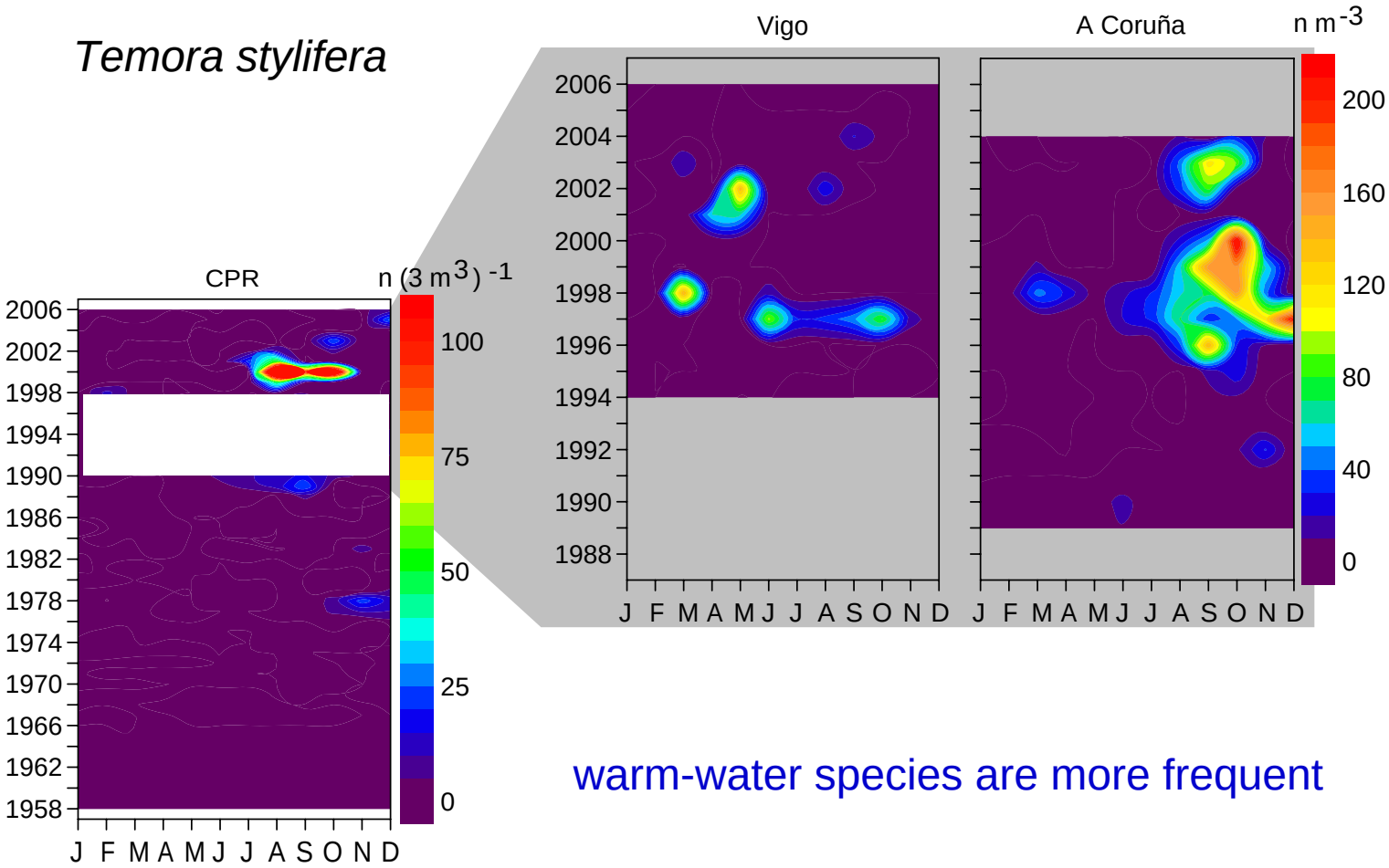




different trends in the coast

Zooplankton species

Temora stylifera



warm-water species are more frequent

Conclusions

- **Galicia** = transition zone (upwelling – Bay of Biscay)
- Trends and prediction at climatic scales difficult because:
  - High plankton variability at all scales
  - Short time-series
- **Phytoplankton:**
  - non significant trends in biomass
  - significant decrease in diatom abundance (= weak upwelling)
- **Zooplankton:**
  - significant decrease in the ocean but increase in the coast
  - increasing presence of warm-water species
  - accumulation near the coast = weak upwelling

CLIGAL

CENTRO TECNOLÓGICO DEL MAR
FUNDACIÓN CETMAR

INSTITUTO ESPAÑOL DE OCEANOGRAFÍA

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