



5th International Zooplankton Production Symposium: March, 14-18, 2011



Populations connections, Community dynamics and Climate variability

Workshop 3: "Updates and comparisons of zooplankton time series"

Zooplankton trends in an oligotrophic area of the Central Western Mediterranean: The Balearic Sea : 1994-2008

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National Project "Oceanographic time-series in the Spanish coast" supported by the I.E.O during the years 1994-2008 (Hercule, Ecobaleares, Radmed projects).

Acknowledgements: L. Mendoza, M. Serra, P. Sanchez, B. Salamanca from the COB/IEO on collecting and analyzing samples during the whole studied period



Mallorca channel: St. 1 (75 m) 5 nm from the coast

Sampling station: (39°28'10N; 2°25'E)



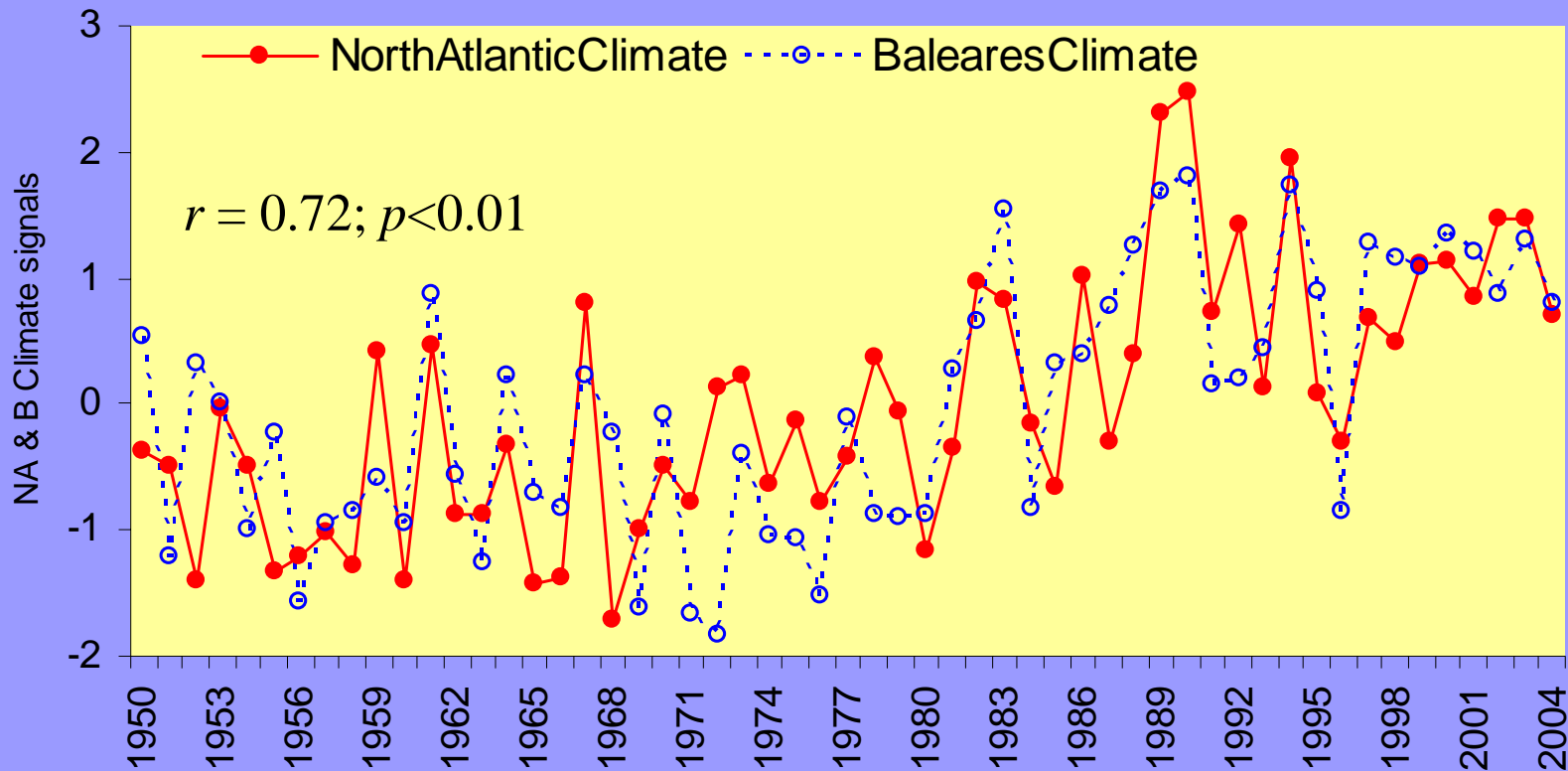
Sampling period

1994 –2005 Every 10 days

2006-2008 Seasonal sampling

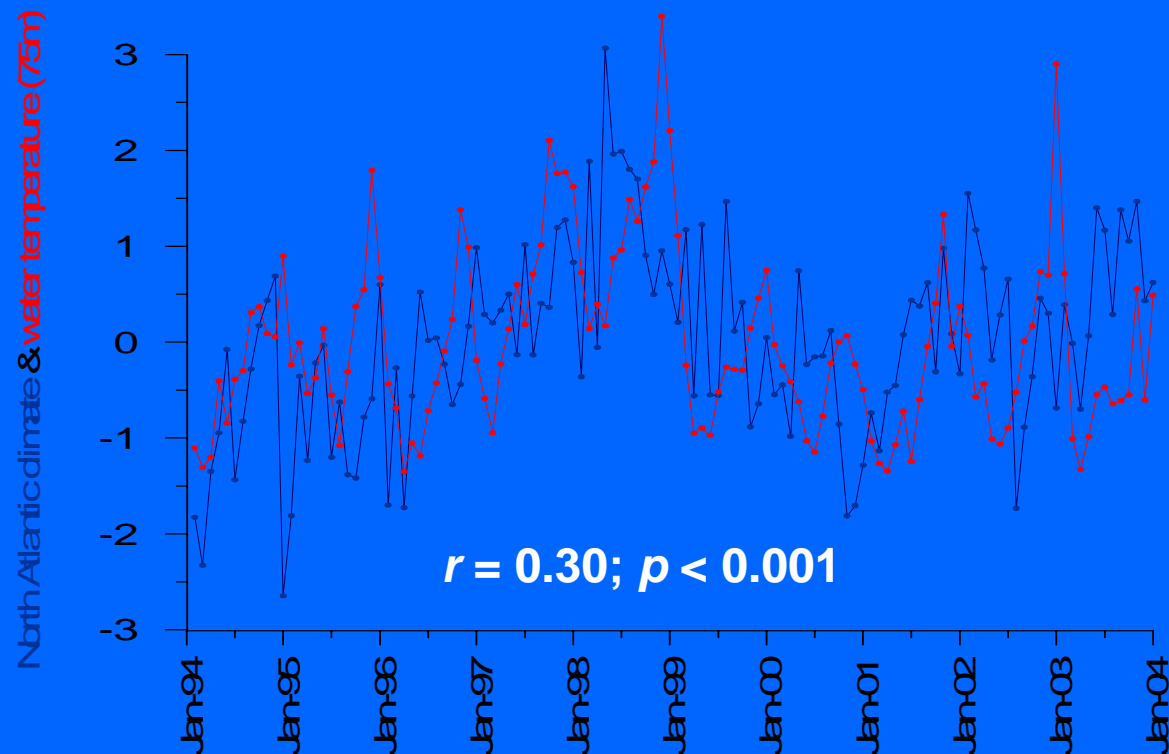


North Atlantic & Balearic climate



The atmospheric circulation pattern governing the Balearic region appears tightly linked to the North Atlantic climate variability

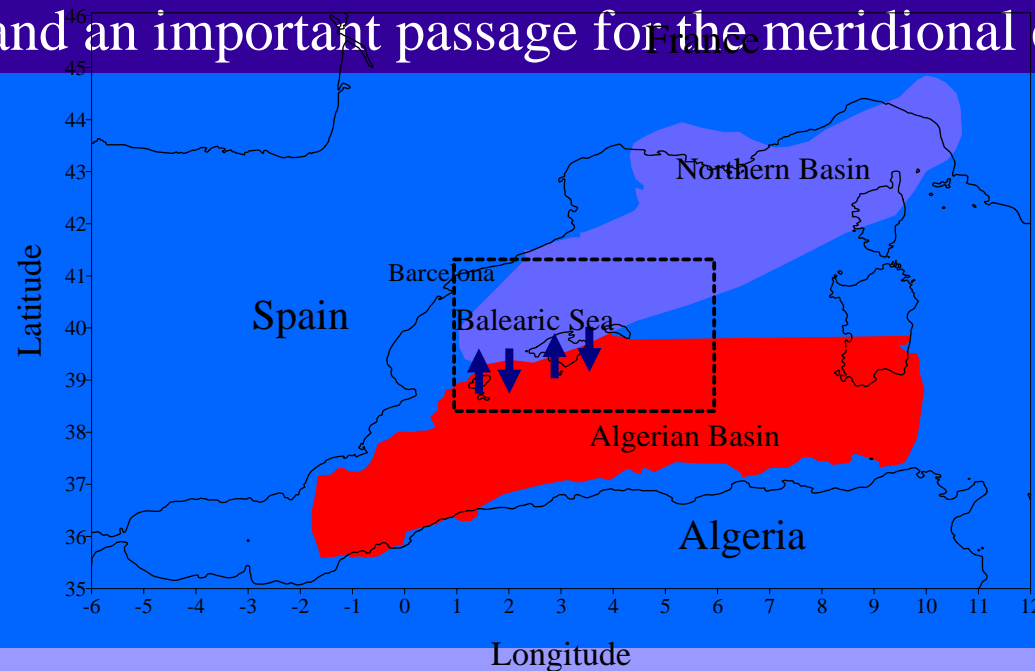
North Atlantic Climate and Balearic hydrology



75 m depth temperature tracks the variability in climate and hydrography in the Balearic Sea

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The mallorca channel is in the boundary area between different water masses and an important passage for the meridional exchanges



* The cooler, more saline water of the Northern basin

* the warmer, fresh waters of the Algerian basin of the WM

* Hence, the BS appears as an ideal site to investigate the dynamics of the water masses characterizing the WM basin and therefore to track their effects on the functioning of the pelagic ecosystem in relation to climate changes.

Data

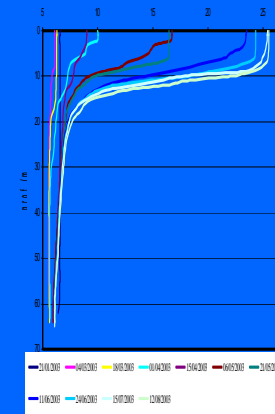
Biological data

- 15 year time -series of zooplankton,
 - Mesozooplankton community
 - Small mesozooplankton (100 μ m -250 μ m)



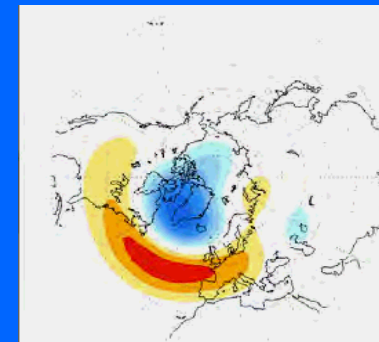
Physical ,chemical and chlorophyll data

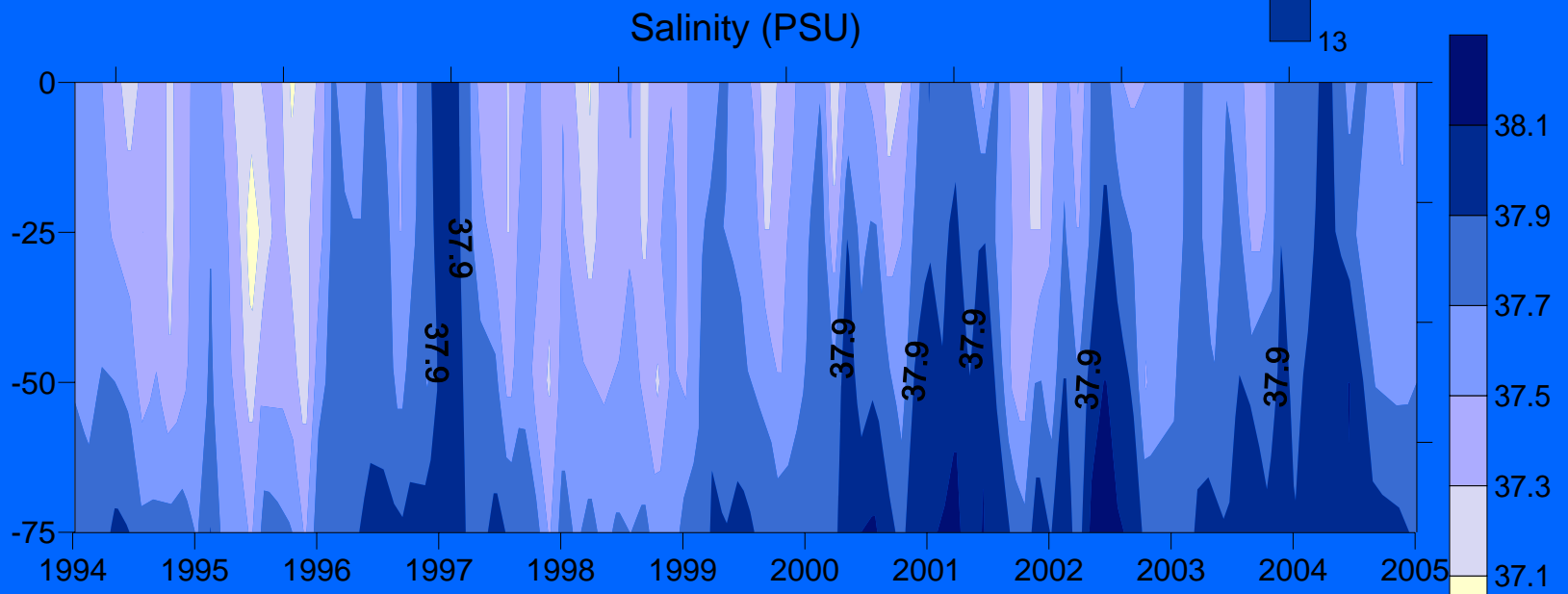
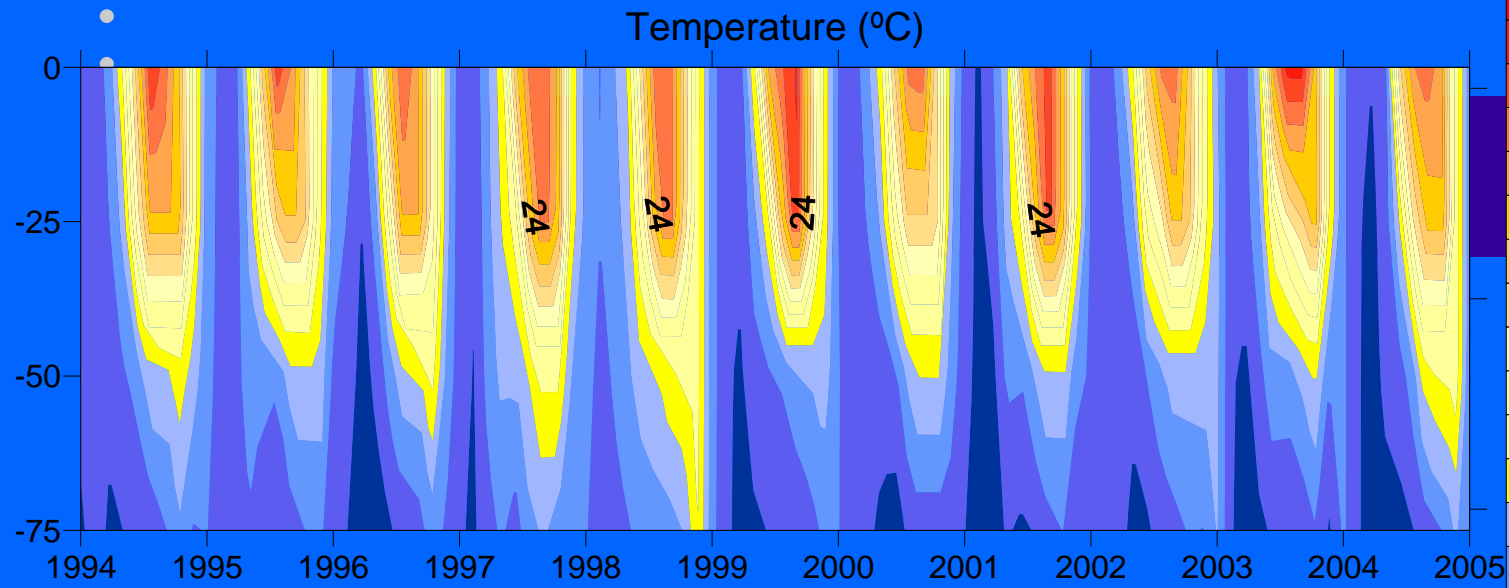
- Temperature, salinity, nutrients (depths)
- Chlorophyll a



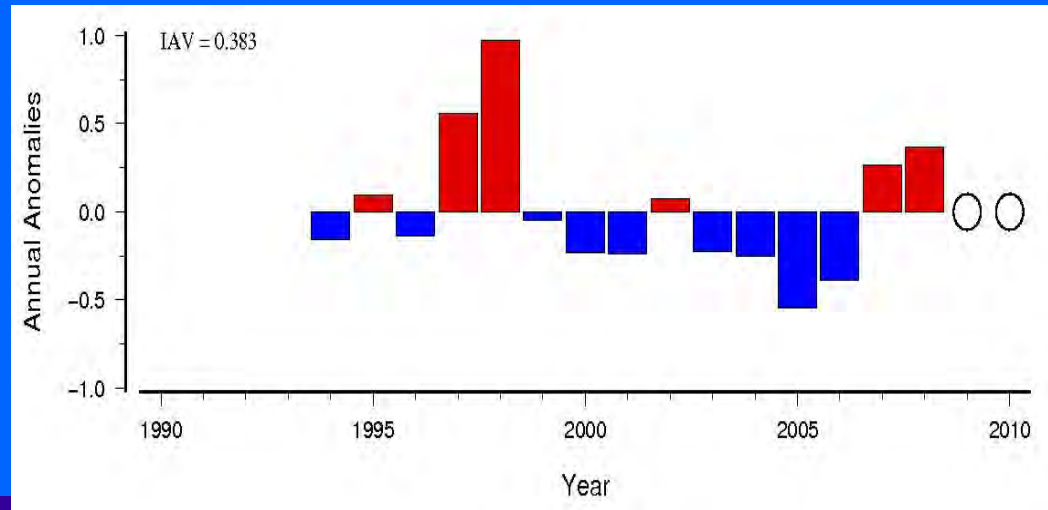
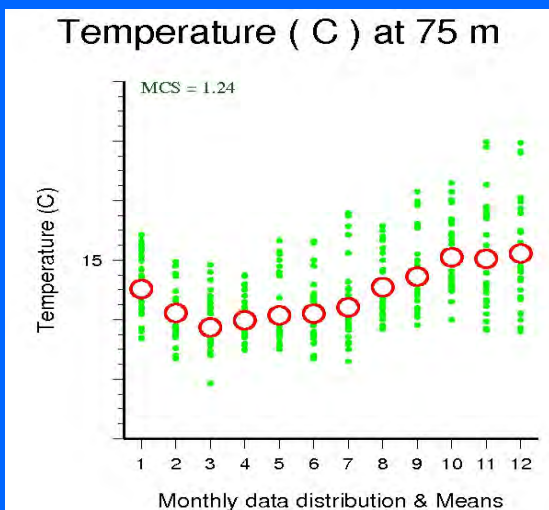
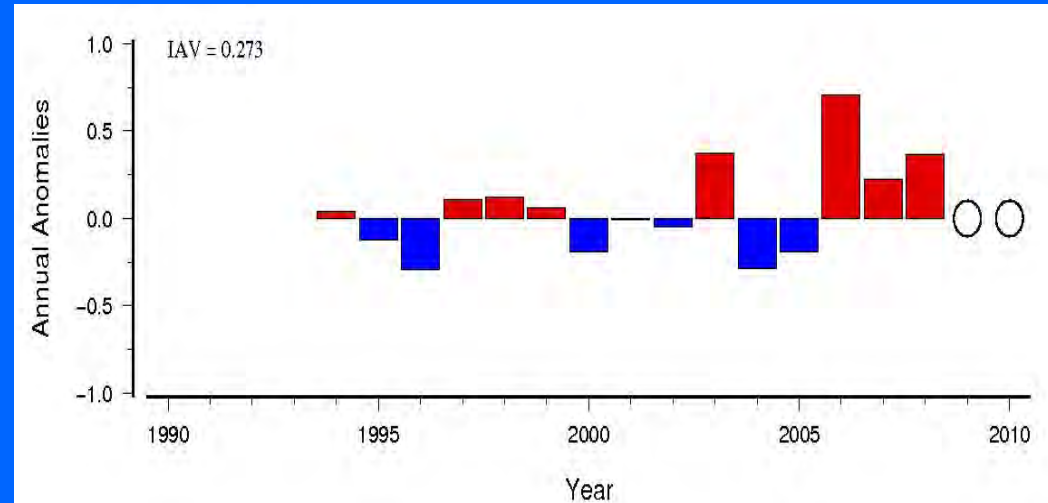
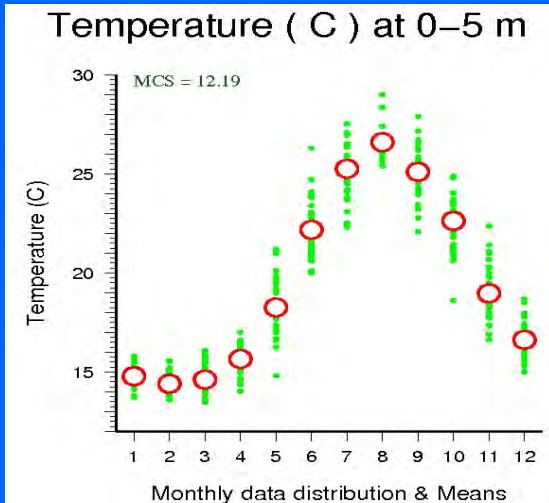
Long time-series analysis and climate

- The “SCOR-WG125 methodology”, based on the work of *Mackas et al., 2001* and visualized using the COPEPOD Interactive Time-series Explorer

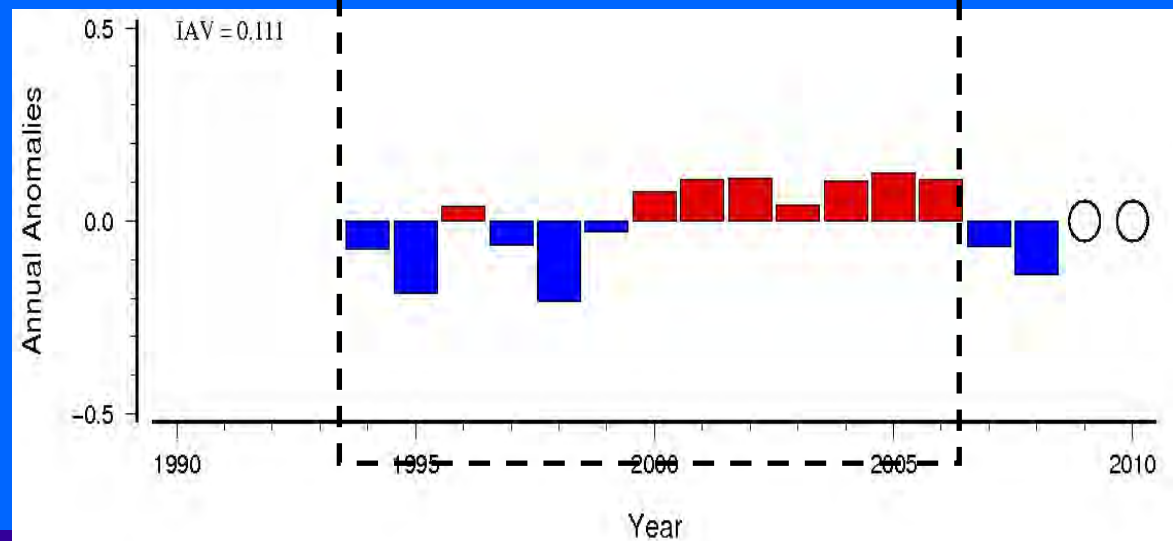
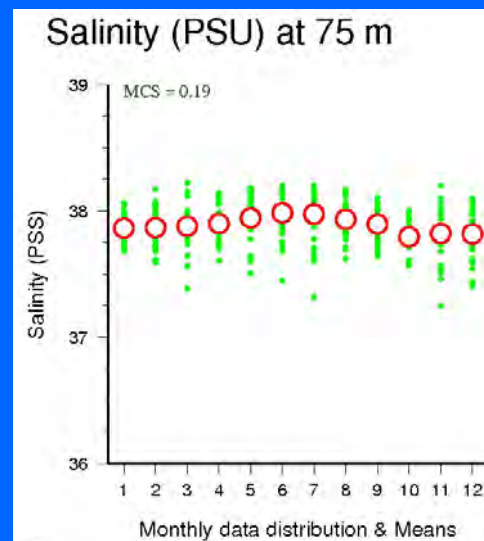
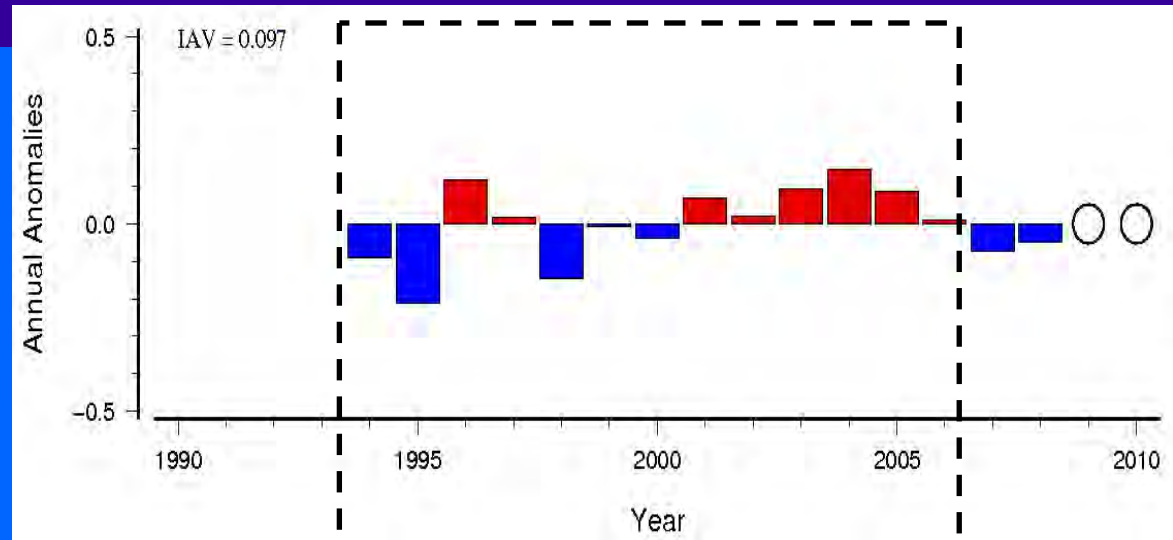
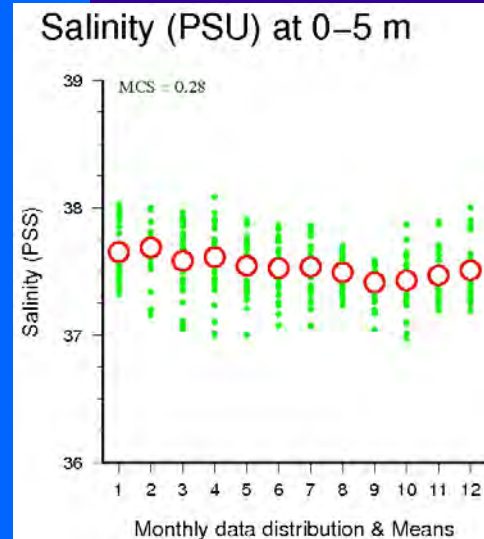




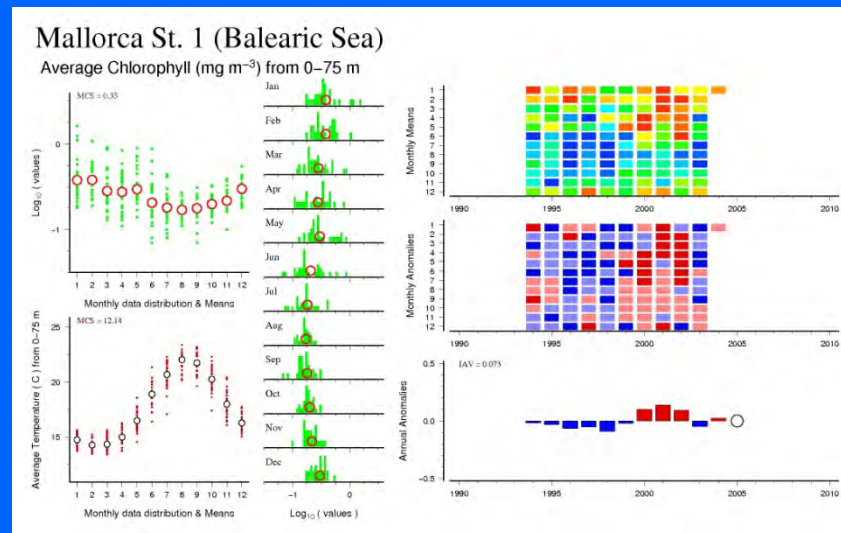
Water Temperatures at the Mallorca Site: 1994-2008



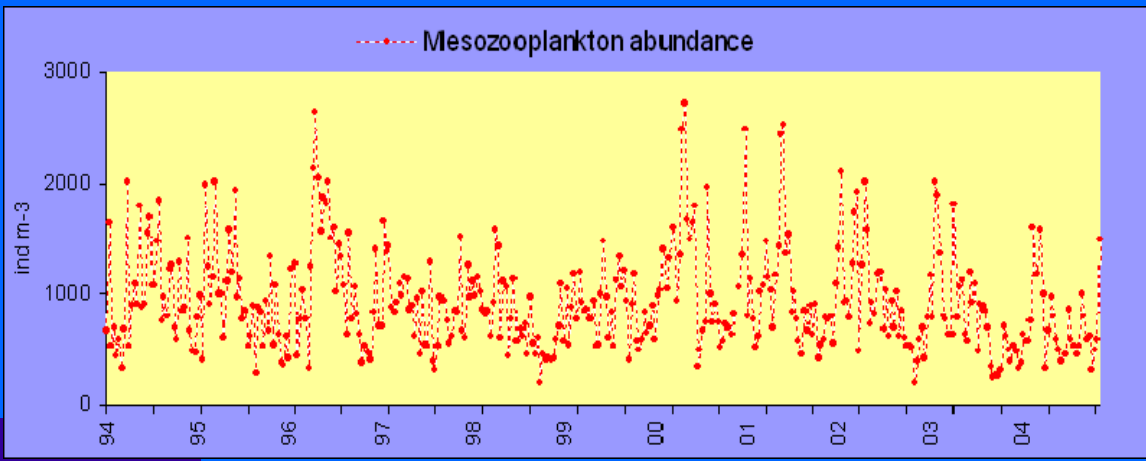
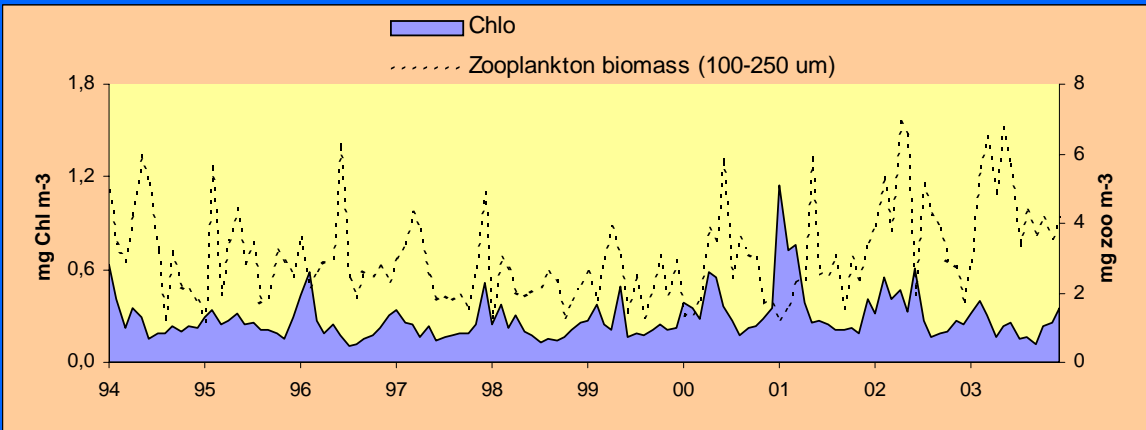
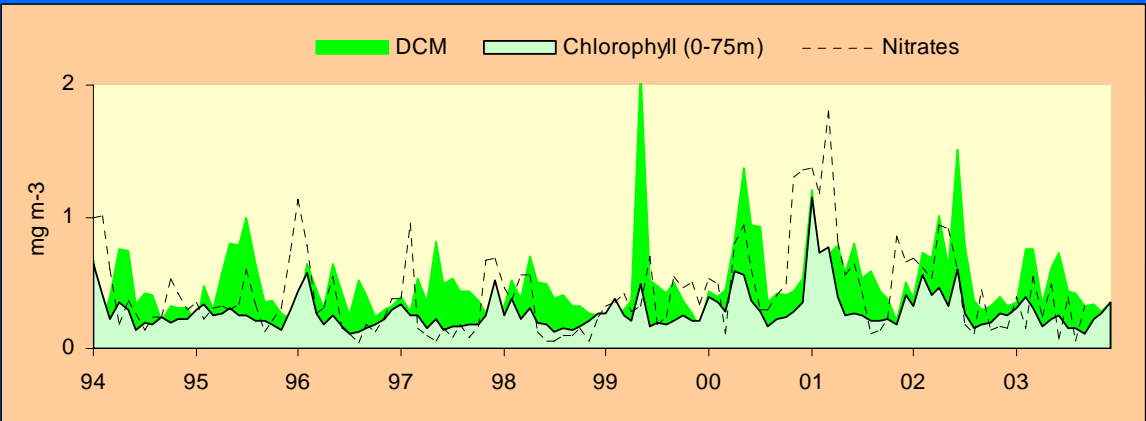
Salinity (Surface and 75m depth) : 1994-2008



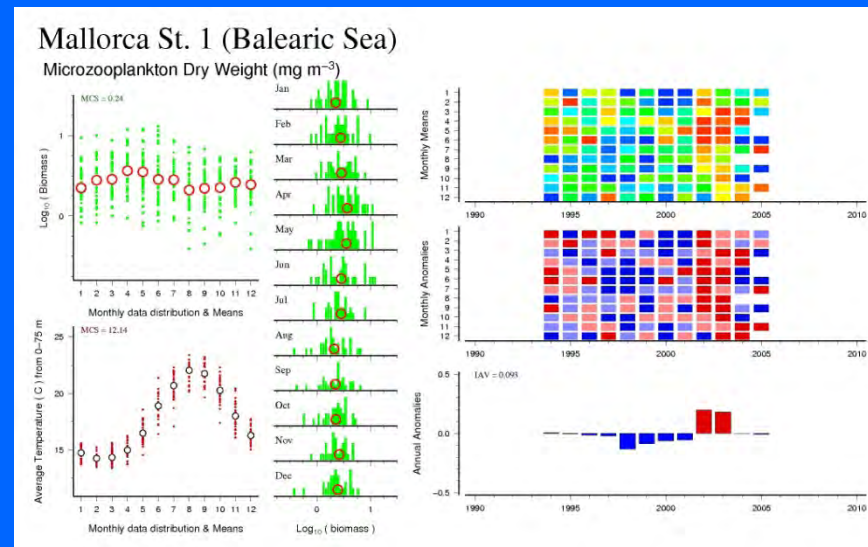
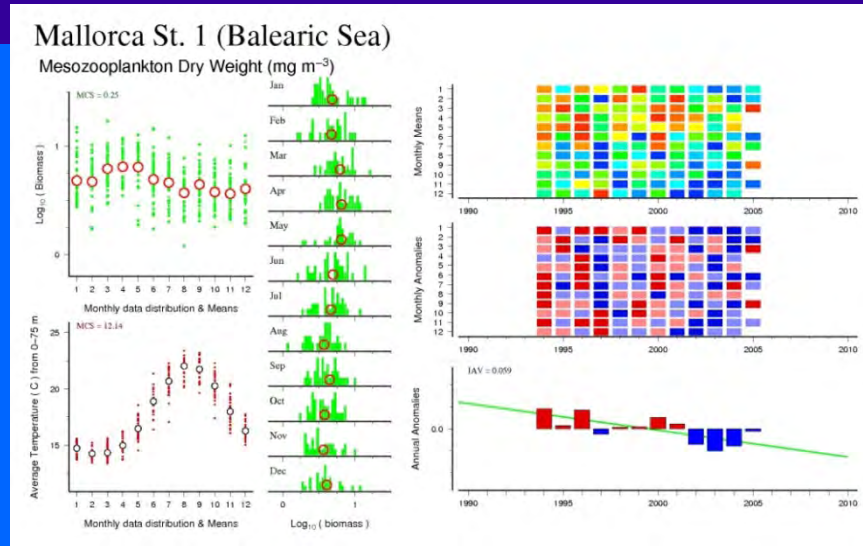
Chlorophyll *a* interannual variability



Chl *a* and zooplankton



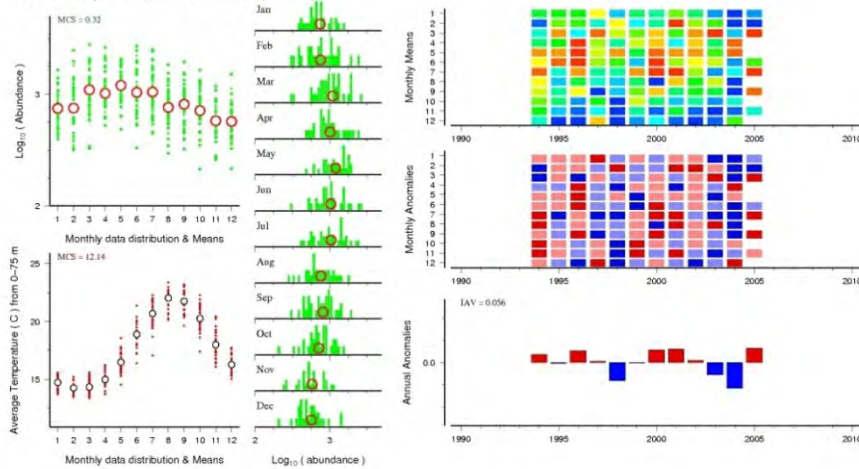
Zooplankton biomass (0-75 m)



Mesozooplankton and copepod abundance

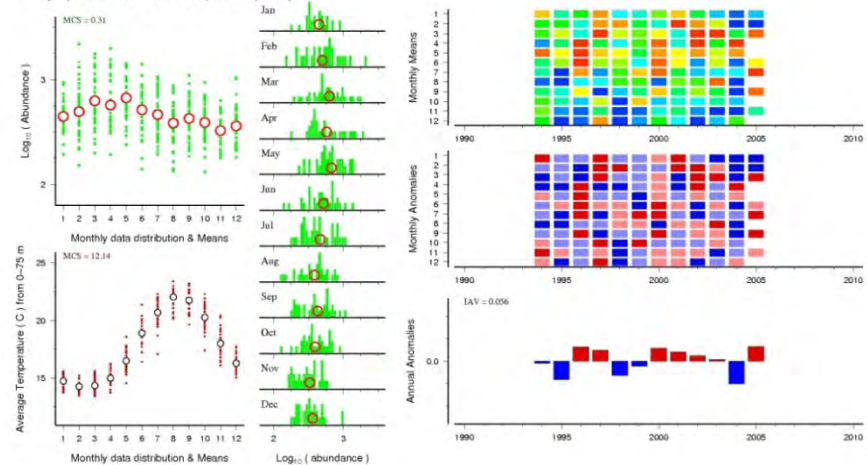
Mallorca St. 1 (Balearic Sea)

Total Zooplankton Abundance ($N\ m^{-3}$)

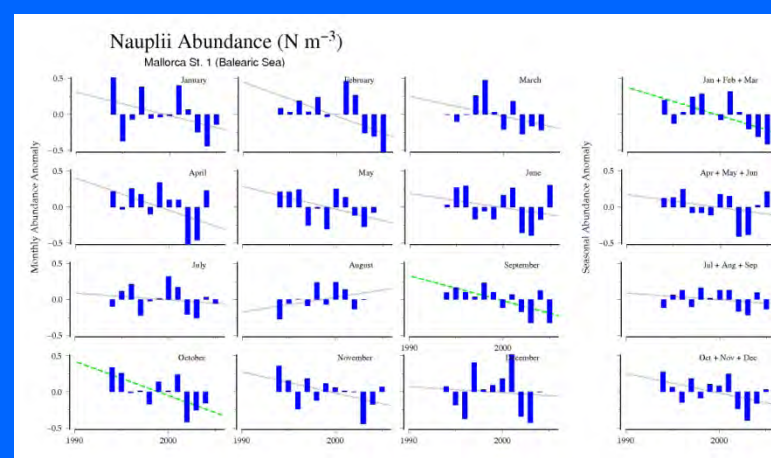
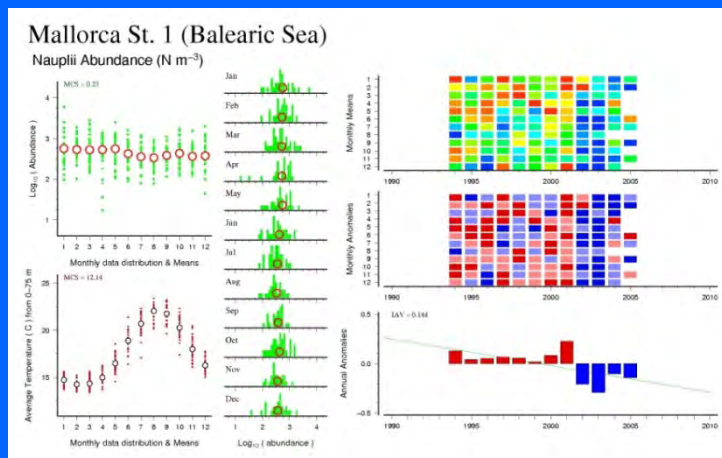
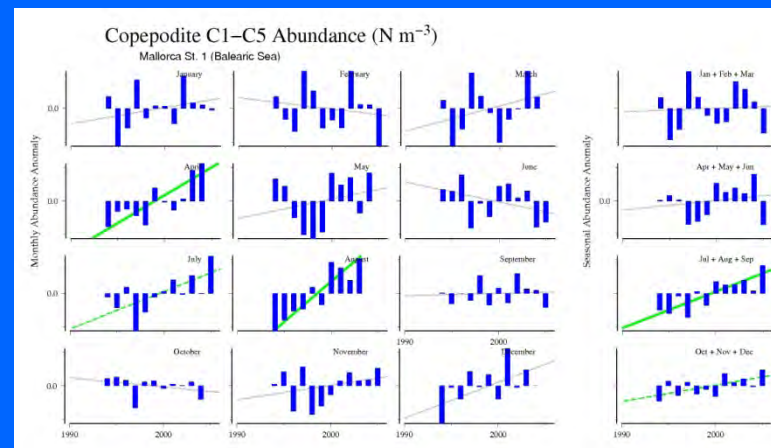
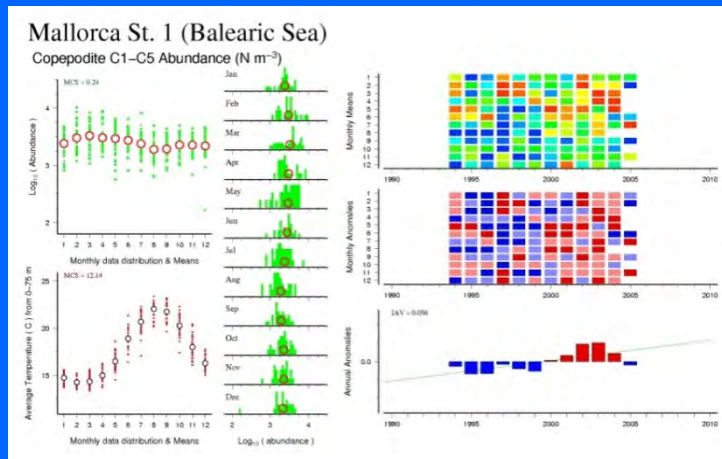


Mallorca St. 1 (Balearic Sea)

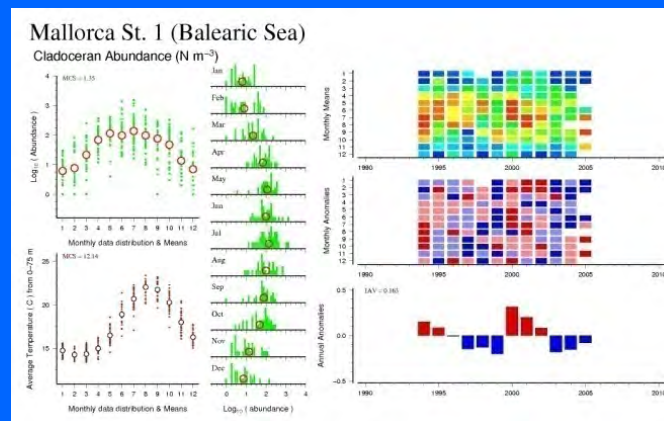
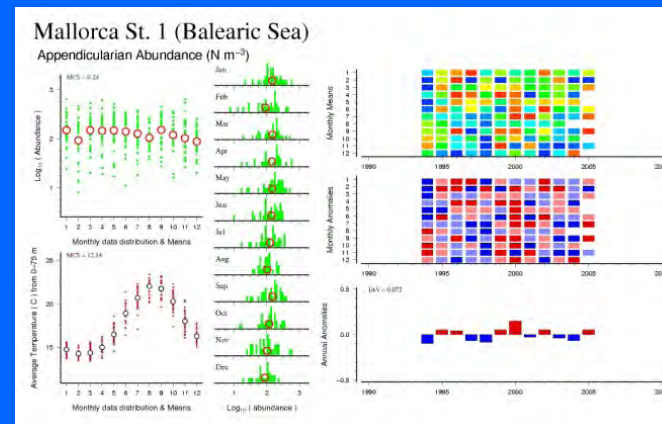
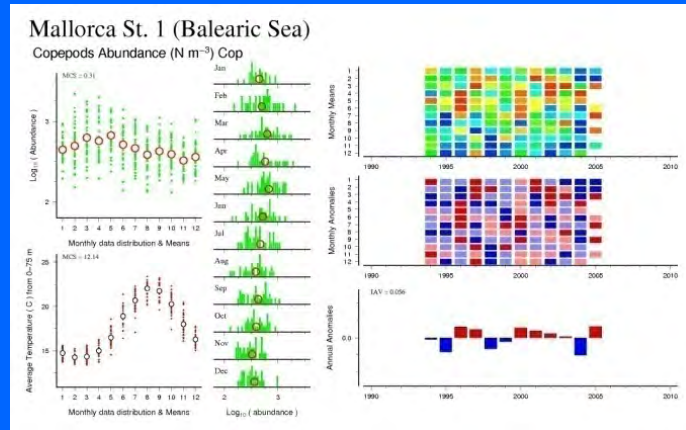
Copepods Abundance ($N\ m^{-3}$) Cop



Small mesozooplankton abundance 100-250 μm fraction

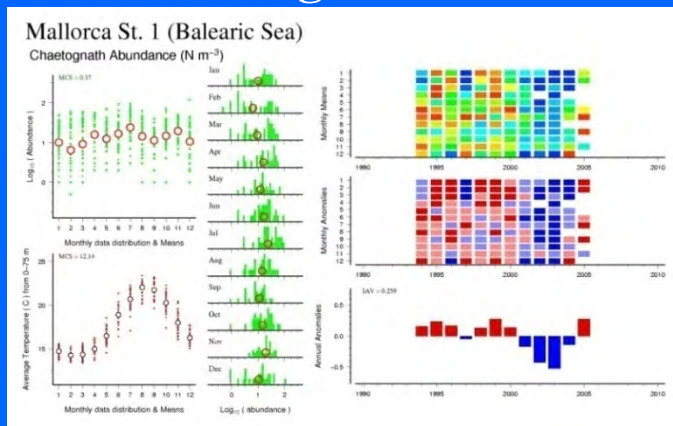


Interannual variability of main zooplankton groups

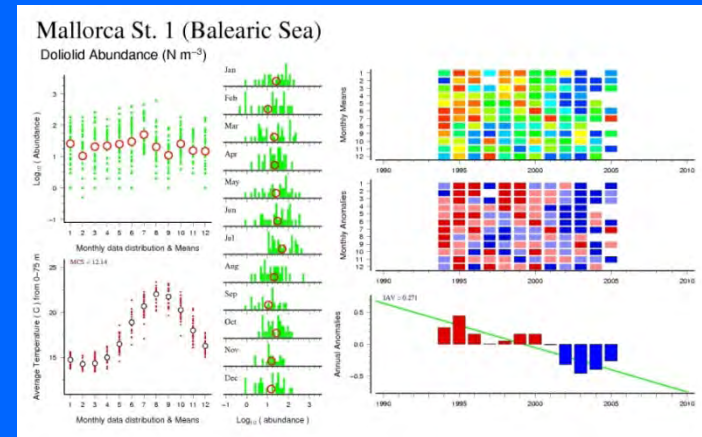


Other less abundant groups

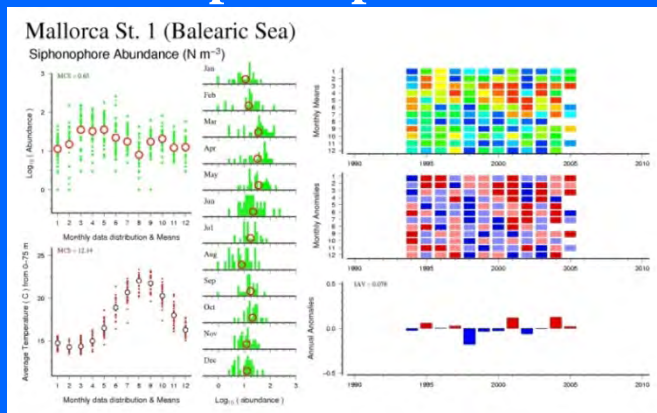
Chaetognaths



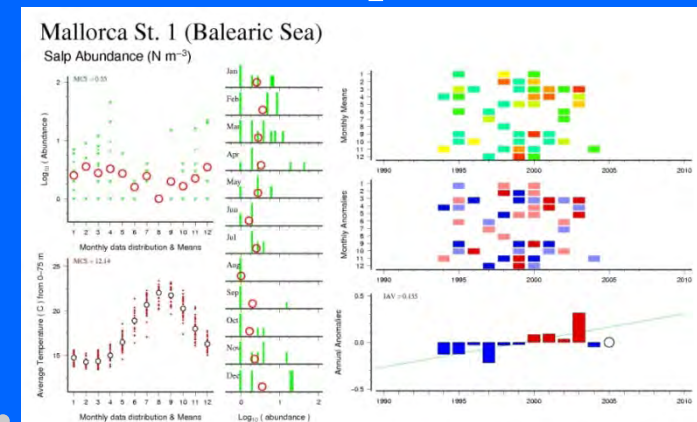
Doliolids



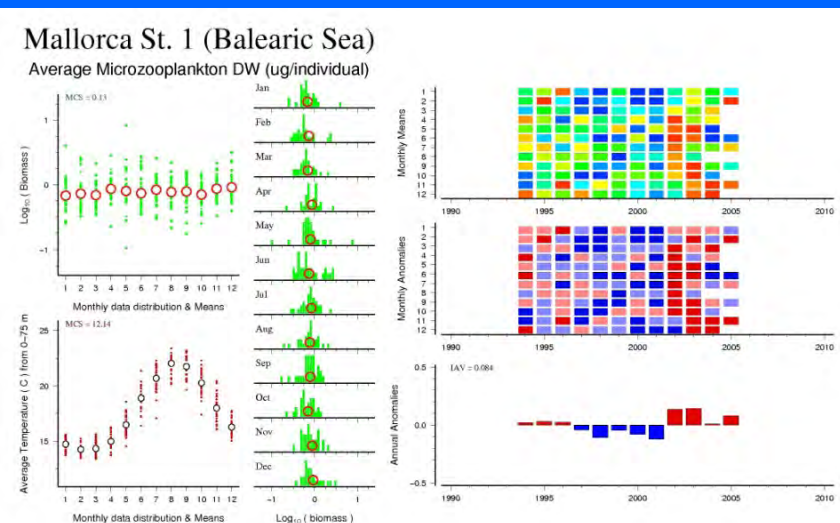
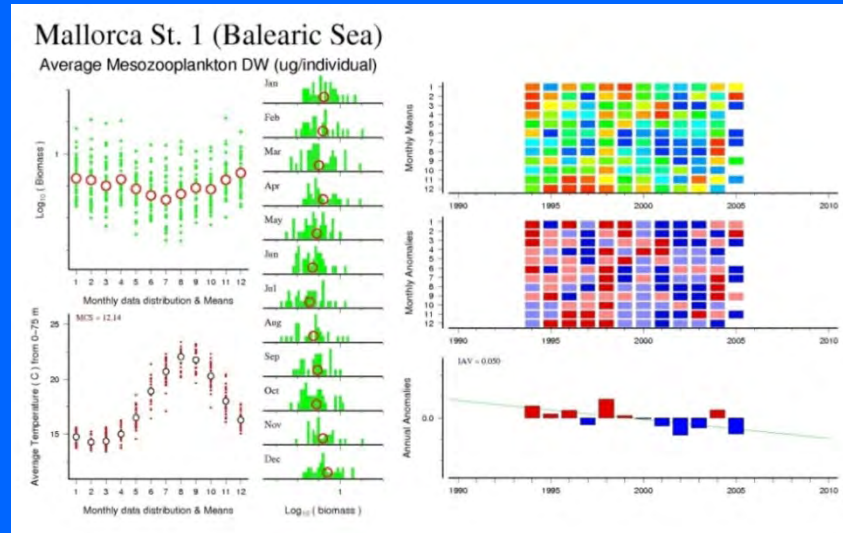
Siphonophores



Salps



Mean individual weight of zooplankton ($\mu\text{gr DW/ ind}$)



Summary

- Based on 15 year period we have observed main trends of the zooplankton community in waters off the Balearic area, that can represent the oligotrophic water of the Western Mediterranean .
- Although SST was warming, cooler and saline waters were found in the bottom indicating northern water influence, that increased stratification period.
- The mesozooplankton showed a decrease in biomass and abundance and a lower individual weights was found, likely due to changes in the zooplankton composition .
- The synchronous variations between zooplankton and their environment indicates the rapid response to these organisms to changes and consequently, can be considered as a good hydrographic and climatic indicator.
- Additional and longer times series are needed to understand signals of climate change at Mediterranean scale but it is specially necessary to consider this boundary area for further studies of Mediterranean climatic change.

These results may have important implications for the assessment of small pelagic fish (i.e. anchovy, sardine) which are indirectly affected by climatic effects on copepods (e.g. their main food source).

Thanks