50th European Marine Biology Symposium
Helgoland, Germany; 21-25 September 2015

Geographic patterns of biodiversity in European coastal marine benthos

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EMBOS

Content of this presentation:

- 1. Introduction EMBOS
- Networks preceding EMBOS
- EMBOS aims and study area

- 2. The EMBOS Pilot
- Hard substrates, soft sediments, pelagic
- Harmonised tools and methods

- 3. Biodiversity patterns in Europe
- Examples on zoomacrobenthos of soft sediments

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The COST Action EMBOS is based on a range of FP5, FP6 and FP7 EC projects initiated firstly by the MARS Foundation (in red: those directly linked to EMBOS)

- EC 5th FW : Concerted Actions and e-conferences
  - 1999-2001: ERMS - European Register of Marine Species
  - 2000-2002: Concerted Action BIOMARE
  - 2002-2004: e-conferences by M@rble and Marbena

- EC 6th FW: Networks of Excellence
  - 2004-2009: MarBEF
  - 2005-2009: MGE - Marine Genomics Europe
  - 2005-2009: EurOceans
  - 2007-2011: ESONet - European Seas Observatory Network

- EC 7th FW: Larger (Networks of) Networks
  - 2009-2020: EModNet - European Marine Observation and Data Network
  - 2009-2013: ASSEMBLE
  - 2011-2013: EuroMarine = MarBEF, MGE, EurOceans
  - ++ ESFRI - European Strategy Forum on Research Infrastructures
    - 2008-2010: LifeWatch
    - 2011-2014: EMBRC

Even after the first initiatives there was and is still the need for large networks, since:

- **Knowledge on the marine realm in Europe is <u>fragmented</u> within and between disciplines. The research community has been unable to overcome its fragmentation :**
  - **by habitat: pelagic vs. benthic, deep sea vs. shallow coastal**
  - **by discipline: ecology vs. taxonomy, genomics, vs. physics, vs. chemistry**
  - **by nationality**
- **Studies on (patterns, function of) marine system were hitherto <u>ad hoc and local</u>, mainly by a regional or national focus in research.**
- **<u>No agreed common methodology</u> for many aspects is available.**

Consensus has grown that:

- **<u>concertation and co-ordination at European scale</u> is urgently required to:**
  - **implement <u>long-term</u> and <u>large-scale</u> marine research**
  - **plan adequate use of the European research infrastructure**

To this end, the members of the MARS network, developed afore mentioned joint actions, culminating in a.o. EMBOS.

The COST Action EMBOS, the European Marine Biodiversity Observatory System, aims:

- **to install a permanent pan-European large-scale network of marine biodiversity observatories**
- **with an optimized and standardized methodology**

In order:

- **to assess long-term changes in marine biodiversity and the services they provide**
- **to assess the possible causes of changes**
- **to facilitate knowledge-based environmental management**
- **to install an early warning system for biodiversity changes**

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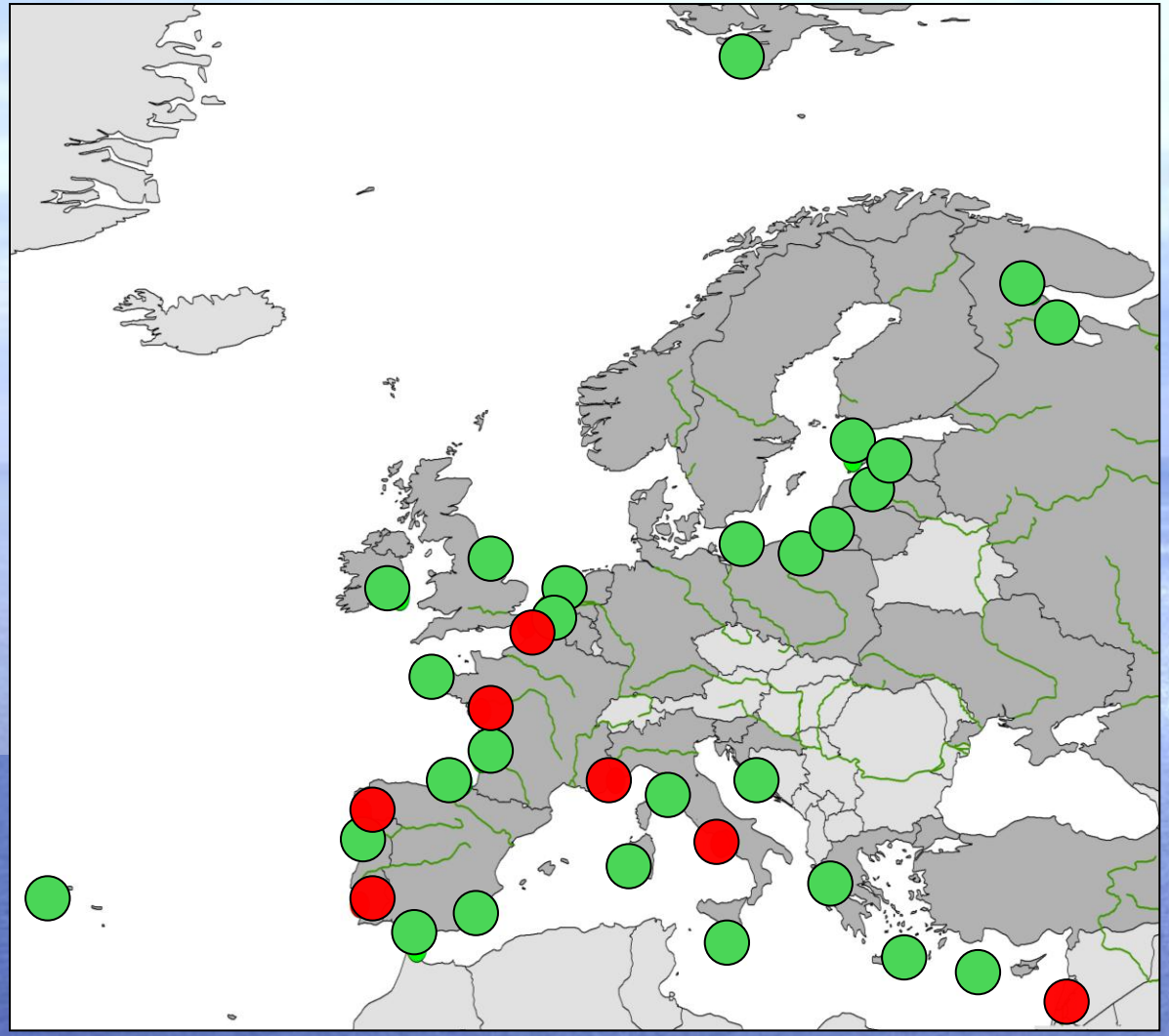
The most practical indicators

			EMBOS Subgroups					
ID	1. Name of indicator	BIOMARE Recommen-dation	**NE Atlantic**	**Baltic**	**Medi-terranean**		Remarks plenary discussion	Description
1	Taxonomic distinctness	4	**1**	**0**	**1**	1	Easy to be included in Multi metric index that is based on species (abundance) lists	Taxonomic spread of species, independent of sample size and sampling effort. A measure of the average degree to which species in an
3	Number of species	3	**1**	**1**	**0.5**	1	The number of species and their abundances are the basis for the Multi metric	Simple concept, but notoriously sample-size dependent and therefore difficult to measure accurately. Of use in rigorously controlled
5	Measurement of functional diversity	3	**1**	**1**	**1**	1		Knowledge of functional roles per species needed - for plants by morphology, for animals either by morphology, life history, trophic or
7	Conspicuous species by visual	3	**0**	**1**	**0.5**	1	Only regional (as also Envrionmental engineers). Can be part of the Multi	Superficial visual survey recording of only the conspicuous species (e.g. cover of fucoids algae, mussels, sponges, etc.; distibution and
10	Environmental engineers	4	**0**	**1**	**0.5**	1	Only regional (as Conspicuous species). Can be part of the Multi metric	
11	The log normal distribution	2	**1**	**1**	**1**	1	Can be part of the Multimetric indices	Unimpacted communities have a log normal distribution of the numbers of individuals among species, so that cumulative percentage
14	Ratios between pollution	2	**1**	**1**	**1**	1	Delete pollution and widen up towards other environmental factors. Yet,	Ratios are established between taxa regarded as pollution sensitive and those considered insensitive.
18	AMBI	2	**1**	**0**	**1**	1	BQI is preferred (can be part of the Multimetric indices)	Pollution or disturbance classification representing benthic community 'health' based upon proportions of five ecological groups. The
19	BQI		**1**	**not discussed**	**1**	1	Preferred above AMBI. Can be part of the Multimetric indices	

EMBOS Pilots (2011-2015), using harmonised methods, are carried out with observations at 34 stations on:

- **Hard-substrate**
- **Soft-substrata**
- **Pelagic**



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Our question:

Can we observe patterns of (variation in) diversity in Europe by combining information from a large-scale range of marine stations

To this end we measured

- **the species (community) diversity of benthos**
- **in the intertidal or upper subtidal zone**
- **in spring**
- **together with several abiotic factors in water and substrate**

In this presentation focus on soft sediment zoomacrobenthos

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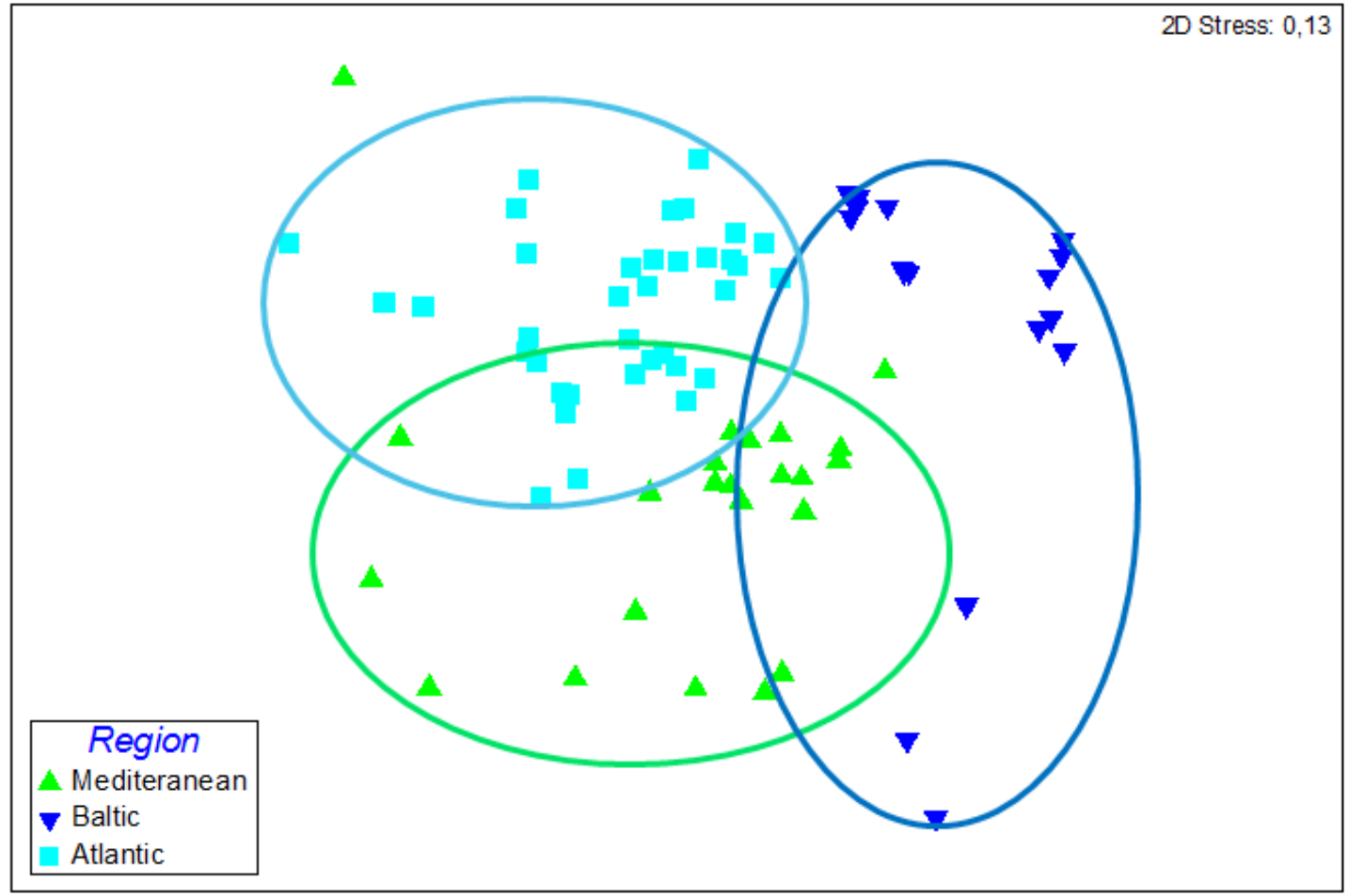
MDS on species diversity (square root transition of densities)
(3 replicates per plot; 3 plots per station;; Bray Curtis similarities)



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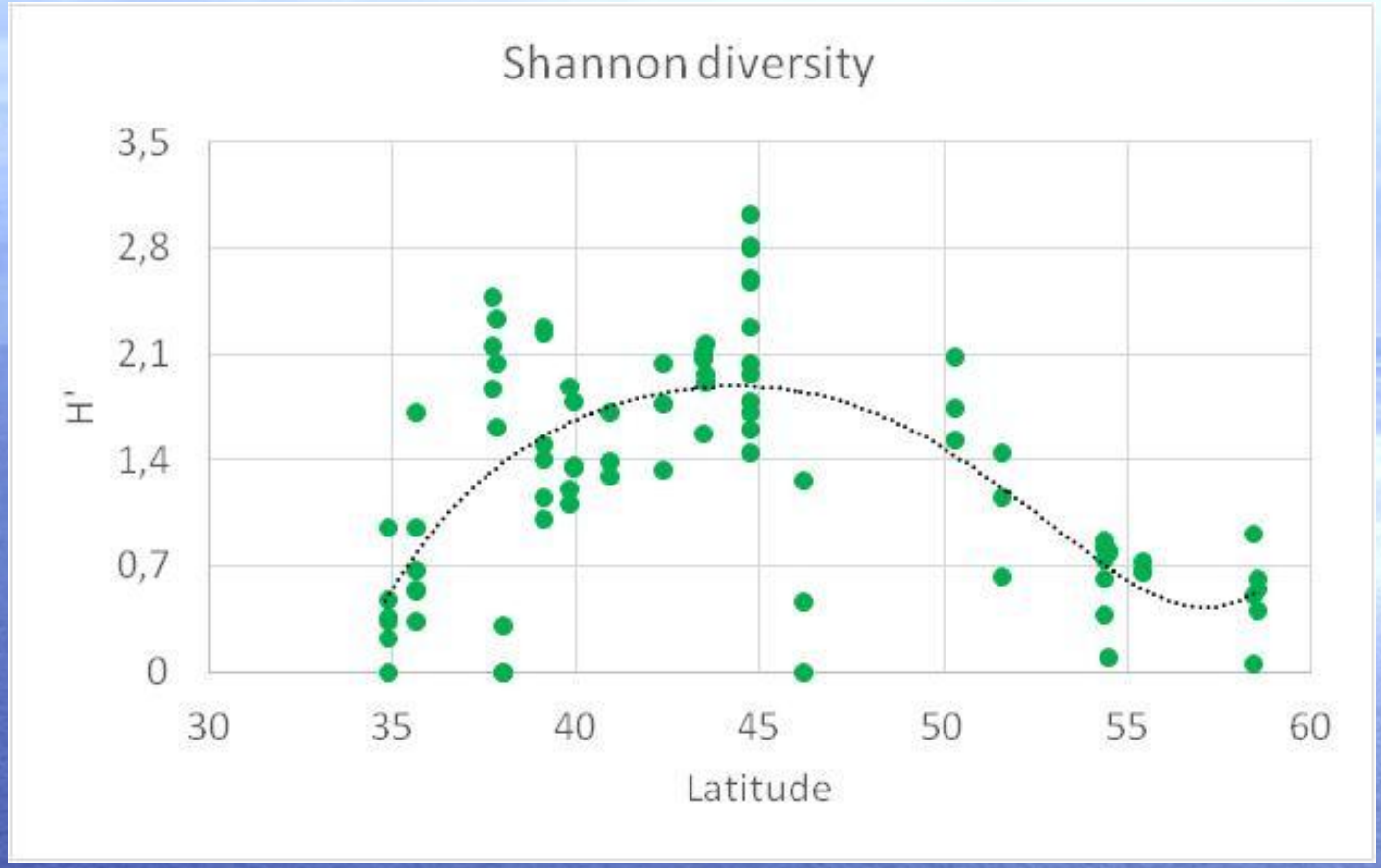
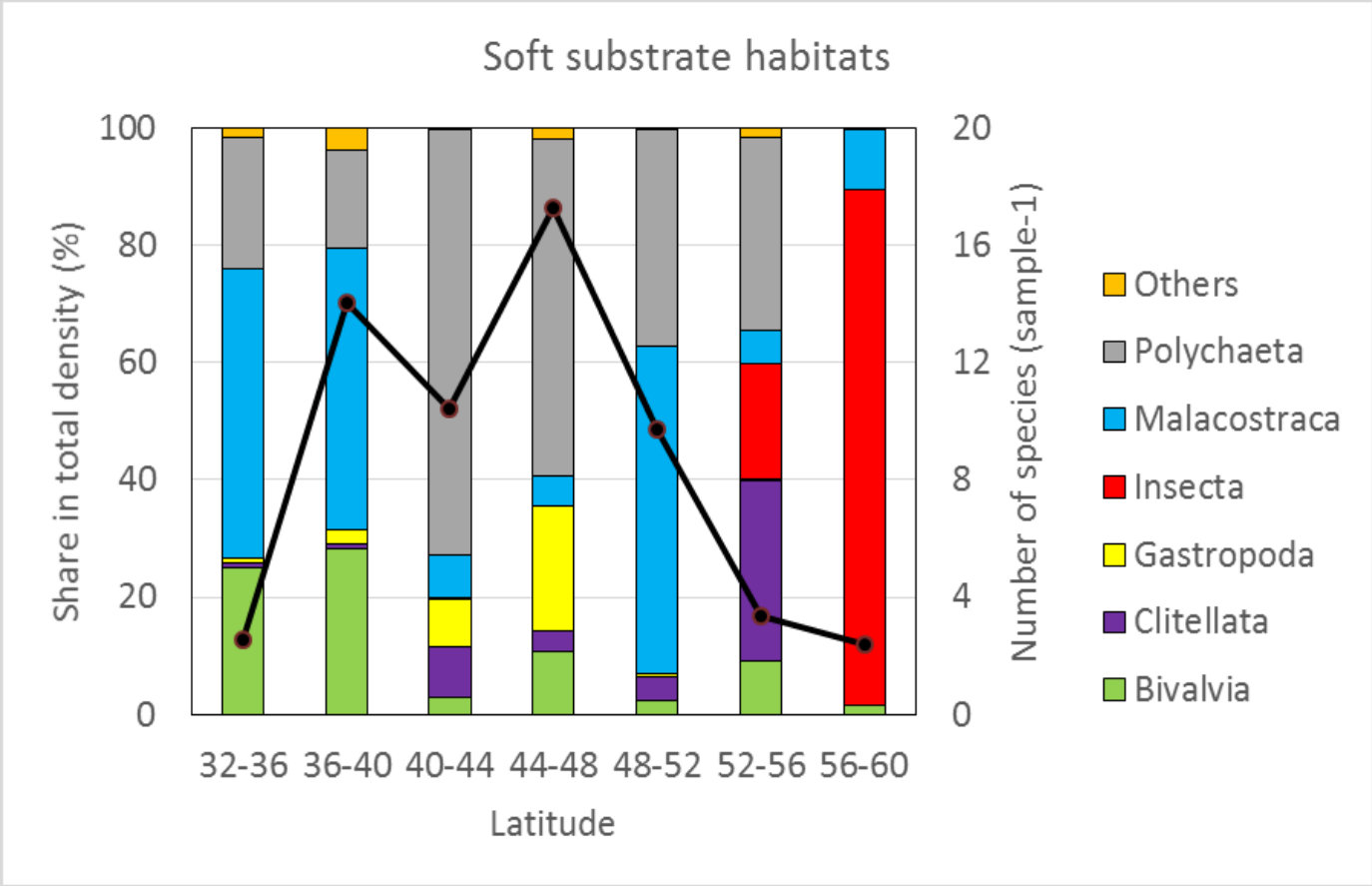
Distribution of diversity with latitutde along European coast



Species composition of benthos along the latitudinal gradient

(3 replicates per plot; 3 plots per station)



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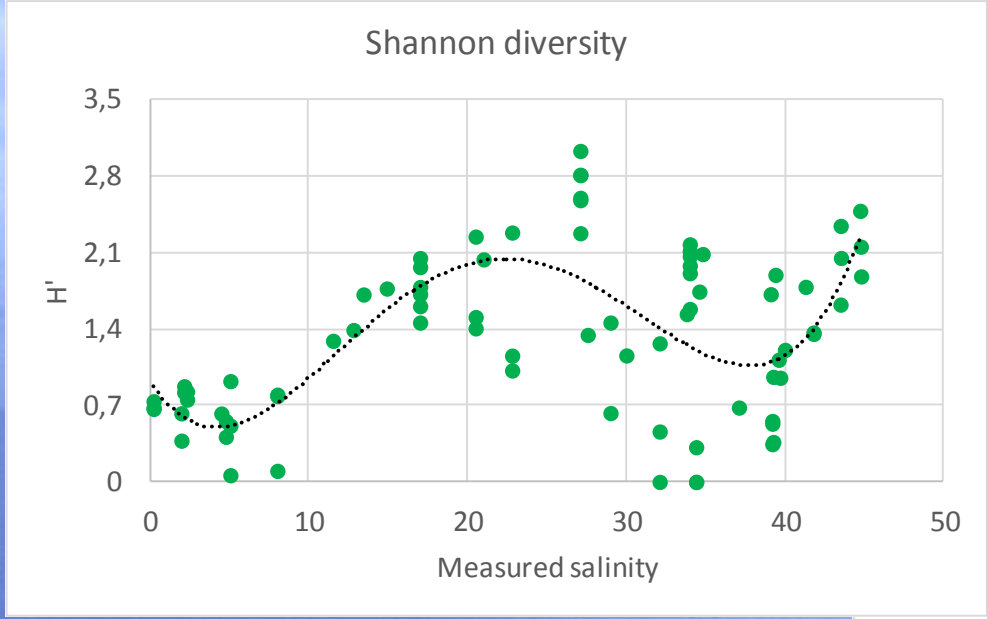
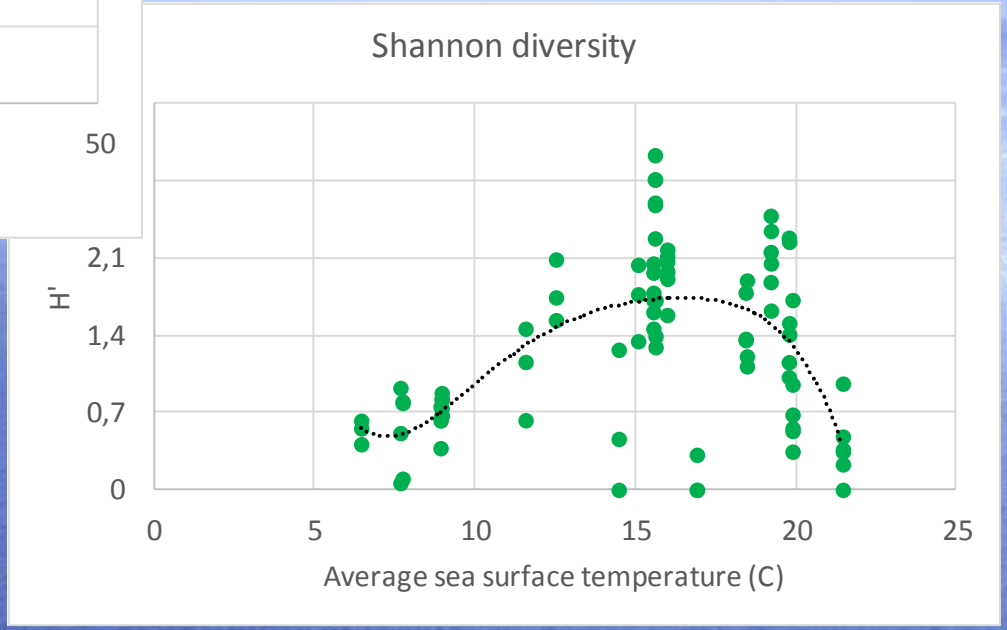
Species diversity in relation to salinity and temperature





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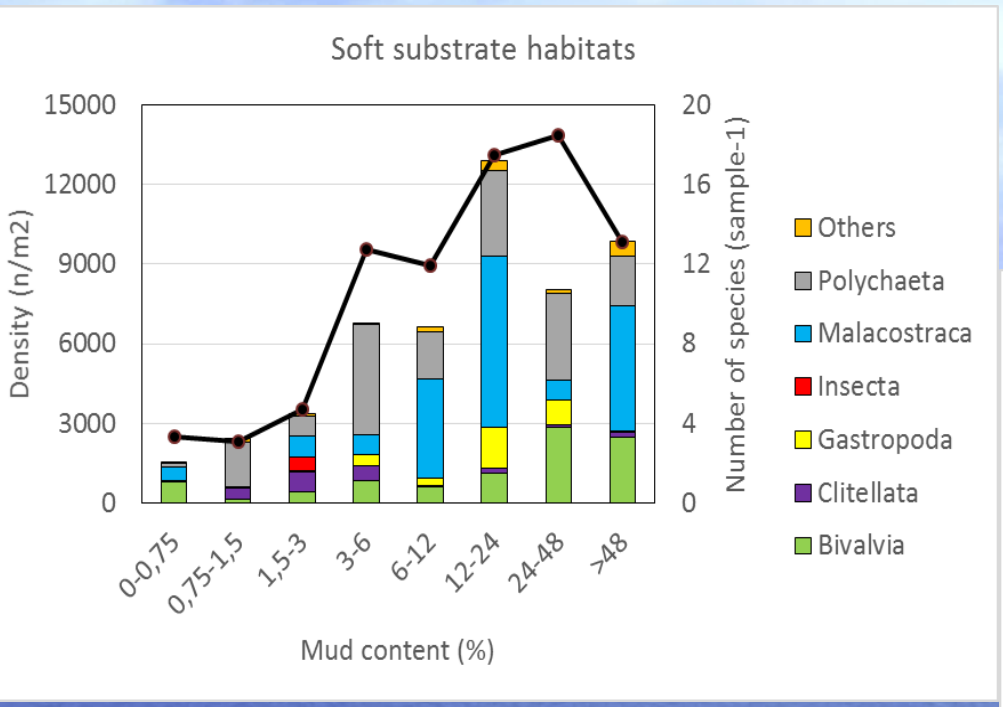
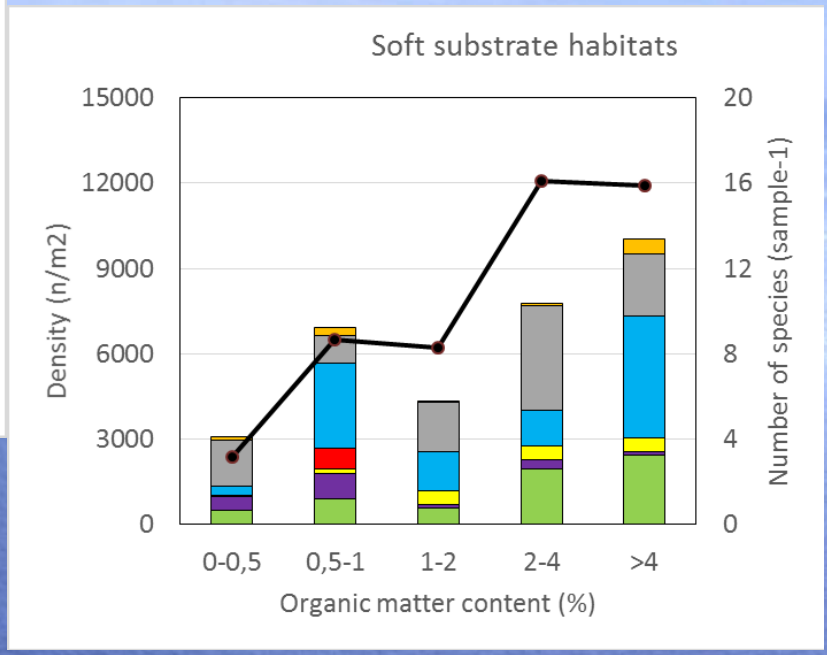
Densities and species diversity in relation to mud and organic matter content





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Conclusions

- **The EMBOS system delivers accurate comparable data over a large-scale gradient along the European coastline**
- **Species diversity has no linear relationship with latitude**
- **Taxonomic diversity can be related to environmental factors** (T, S, mud content, grain size)
- **Latitudinal trends (in diversity and biomass) and regional differences are result of including areas like Baltic with typical salinity clines and taxa (insects) and Mediterranean with higher temperatures (and crustaceans)**
  Trends with latitude and regional differences are indirect and can be a-typical.

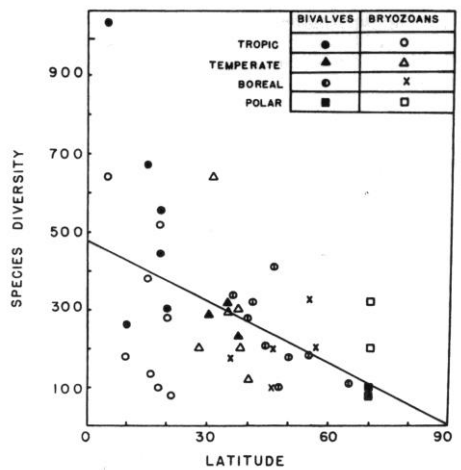

Figure 3. Species diversity as a function of latitude for bryozoa and bivalves. The least-squares best fit is Y = -5.29X + 481.8; r = 0.51**; n = 41.

Thank you all for your attention

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