



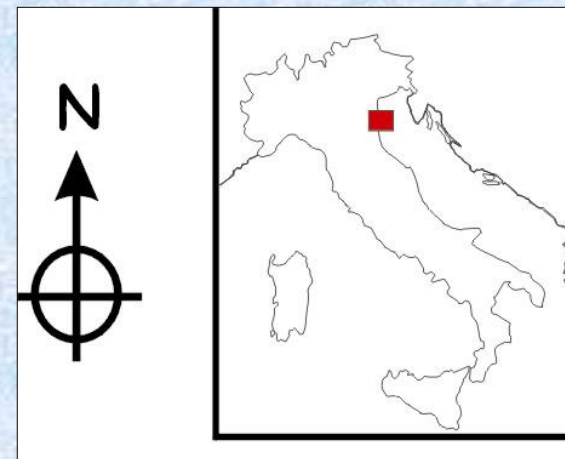
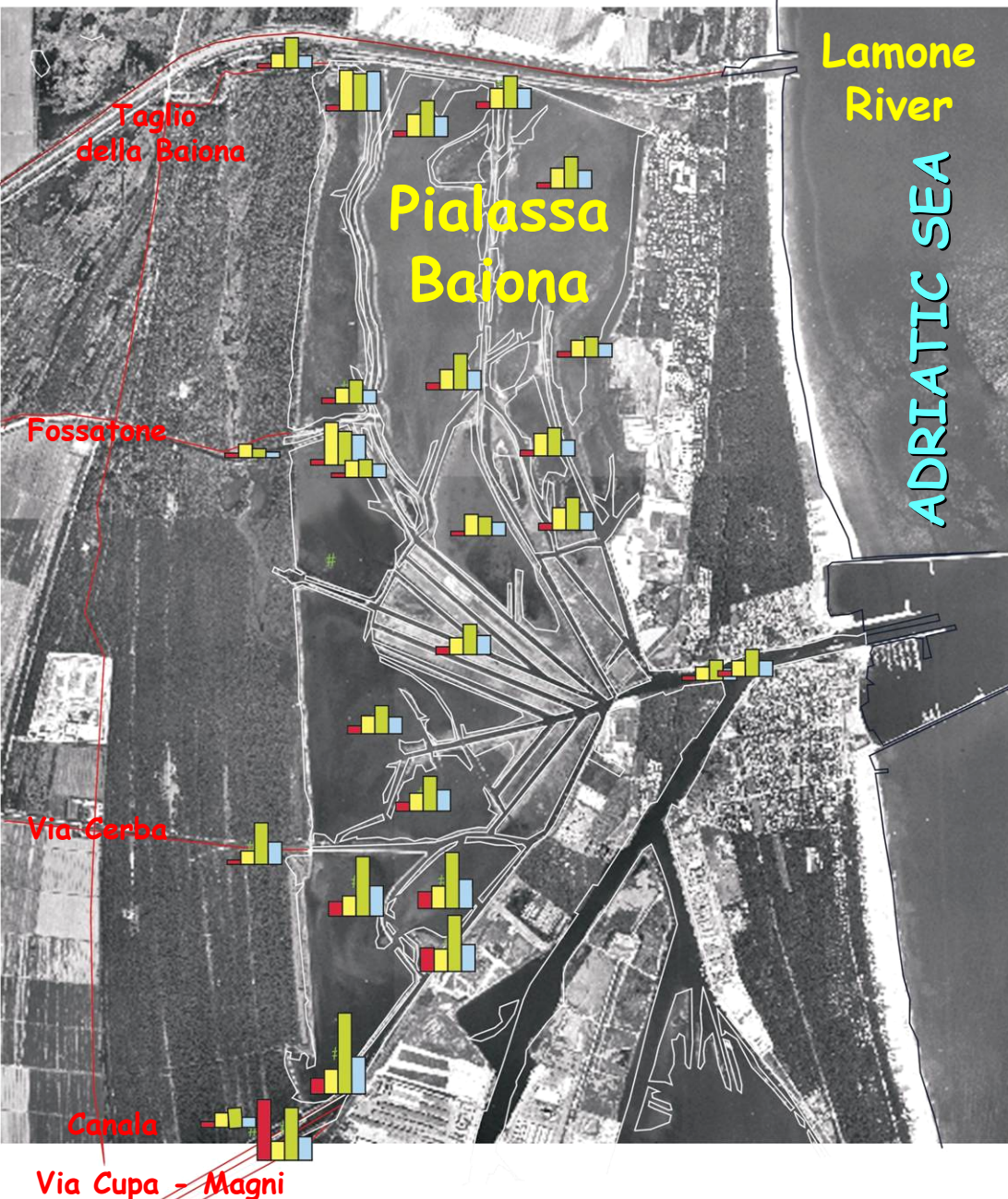
Sediment-biota interactions in a polluted coastal lagoon (Piallassa Baiona, northern Italy): integrated geochemical and biological investigations

Enrico Dinelli, Francesca Sangiorgi, Filippo Donnini, Michela Fraternali, Elena Fabbri



Hg
 Pb
 Zn
 Cu

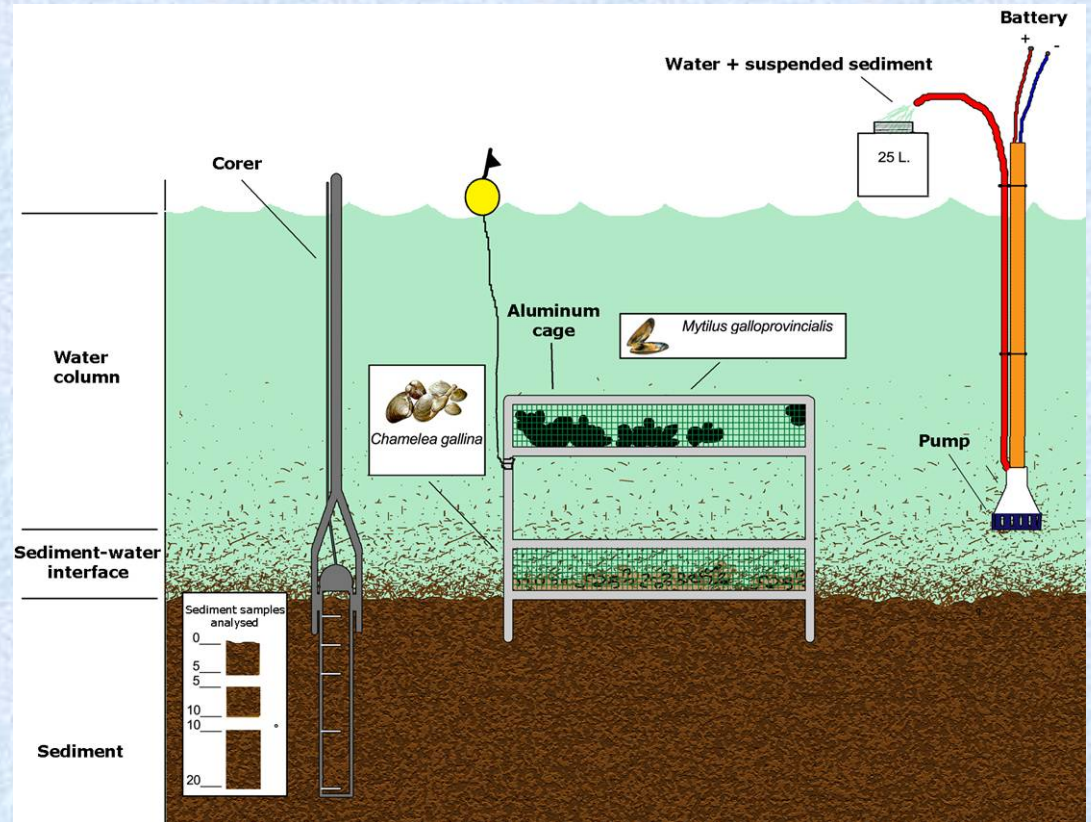
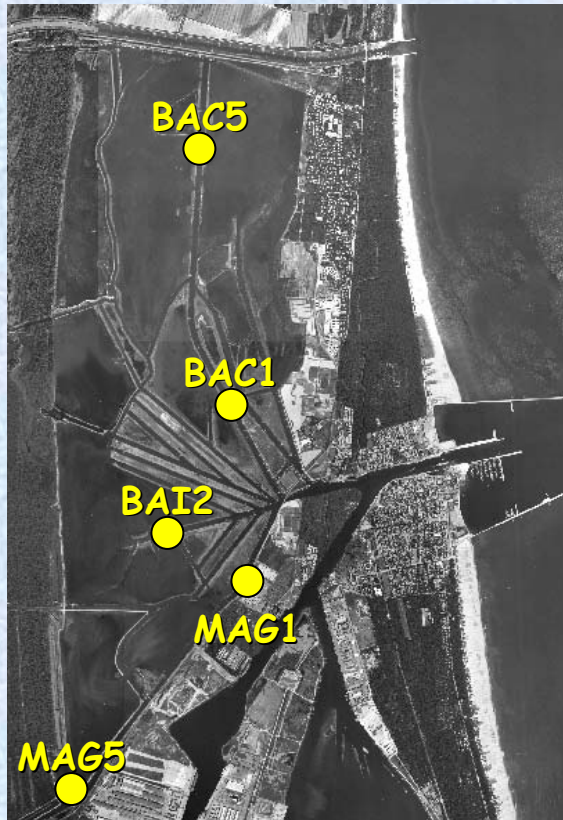
□ = 100 ppm



- Extension: 1000 ha
- Protected area
- Shallow ponds, deeper channels;
- Freshwater + seawater inputs

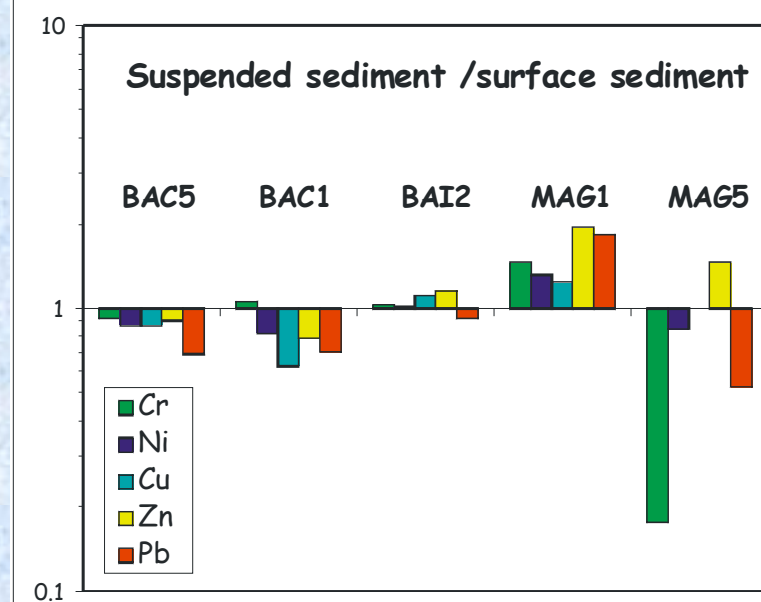
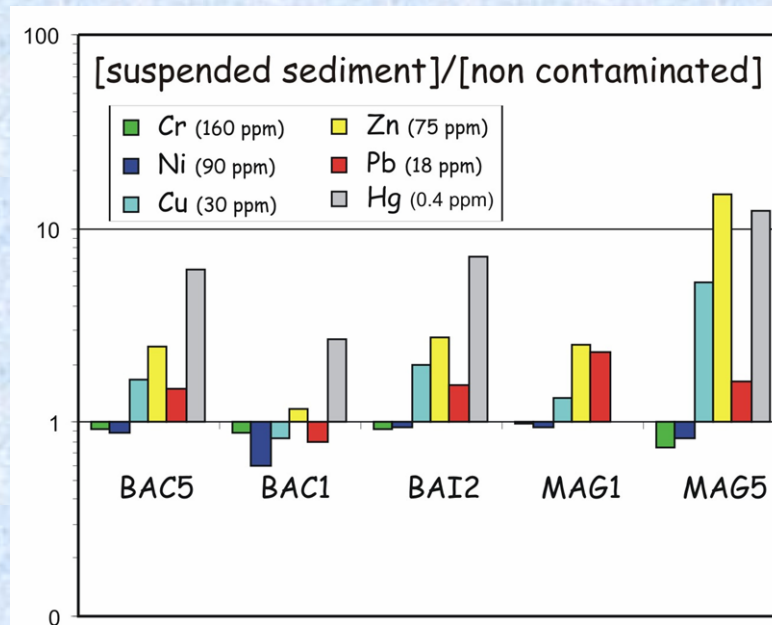
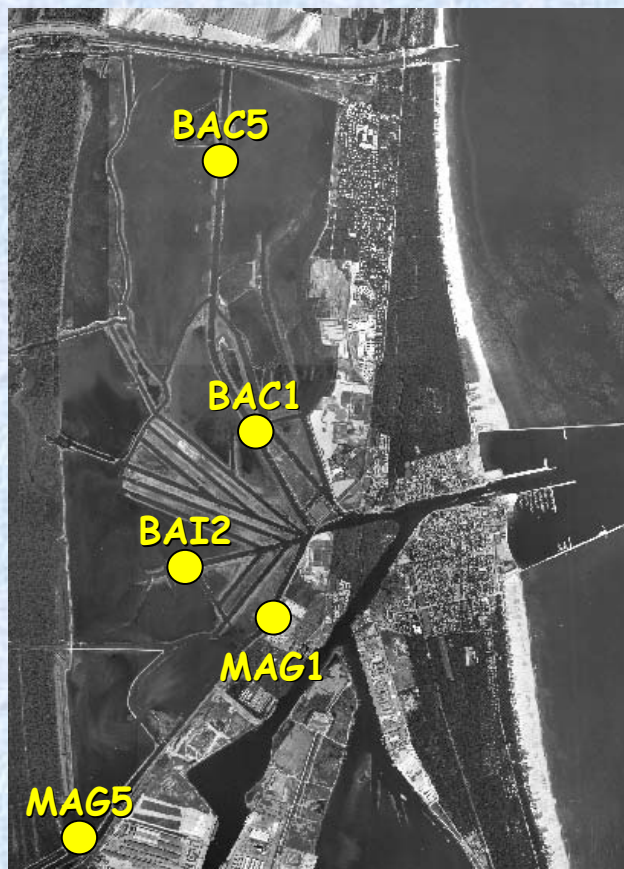
Aim of the research

- ▶ To collect and integrate new biological and geochemical data on a heavily polluted lagoon environment;
- ▶ To develop a biomonitoring strategy based on sentinel organisms and measurements of physiological processes potentially useful as "**biomarkers**".
- ▶ The results will be primarily useful for establishing the relationship between the geochemical/chemical data (focusing on pollutants in the environment) and the biological responses.



- 5 sampling stations along the Magni, Baiona and Baccarini channels (at water depth = 1.5m)
- Geochemistry on suspended, superficial and core sediment samples (XRF for major elements and trace metals: e.g., Cu, Zn, Pb, Cr, etc.)
- Battery of 6 Biomarkers on *Mytilus galloprovincialis* exposed for 30 days to the lagoon waters. Methodologies according to UNEP/MAP protocols

Results: sediment geochemistry

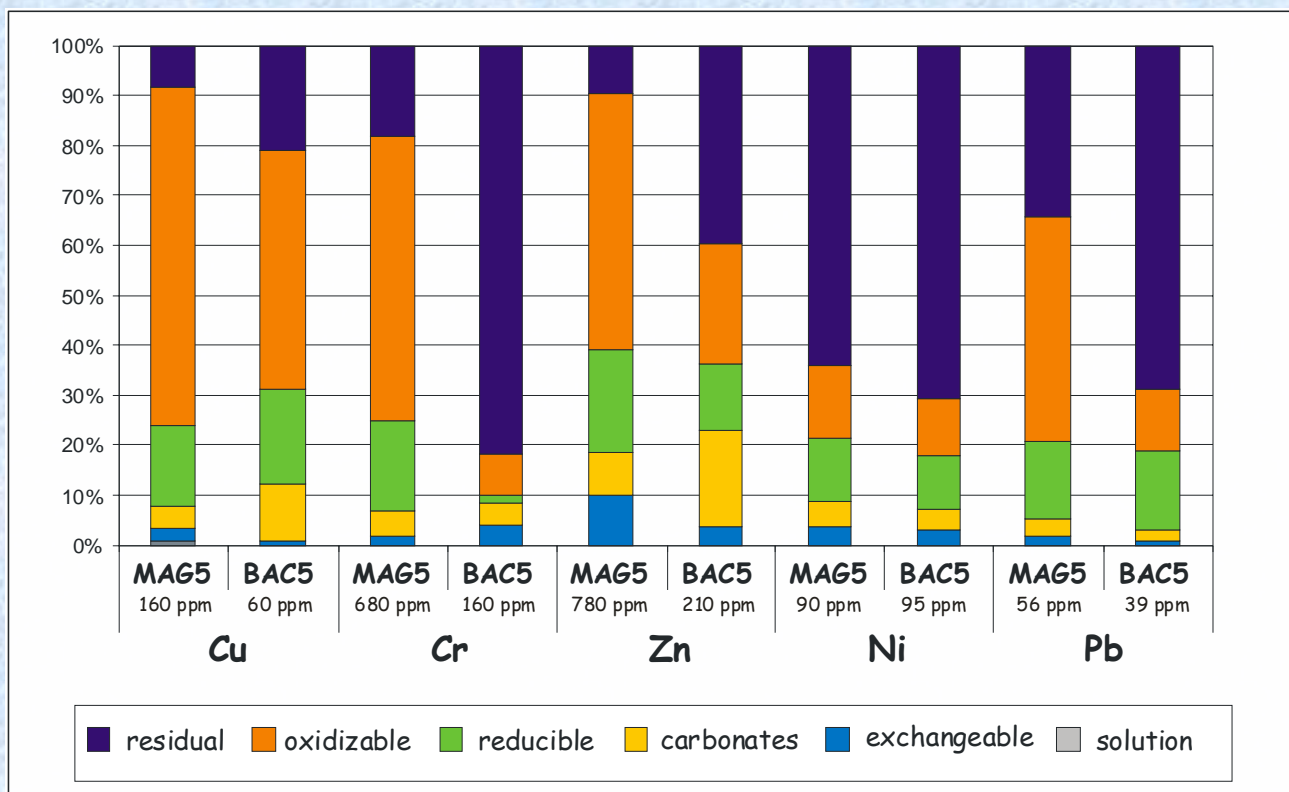
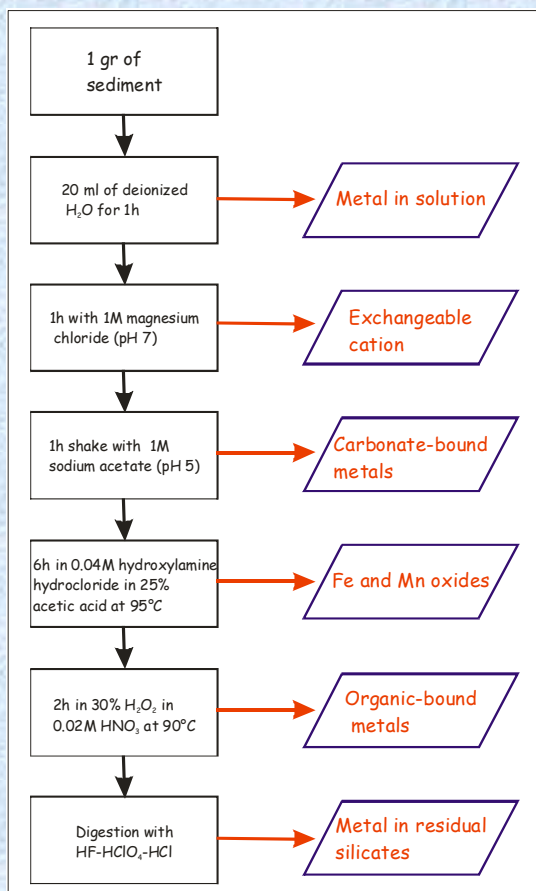


- Very high values of Hg in surface samples, particularly in the southernmost samples (15 p.p.m.). Suspended sediments are from 1.5 to 7 times more enriched in Hg than surface samples (in all the stations but MAG5)
- Also Cu, Zn and Pb reach the highest levels in the southern area, but there is no systematic enrichment in the suspended sediments and a large depletion in station MAG5.

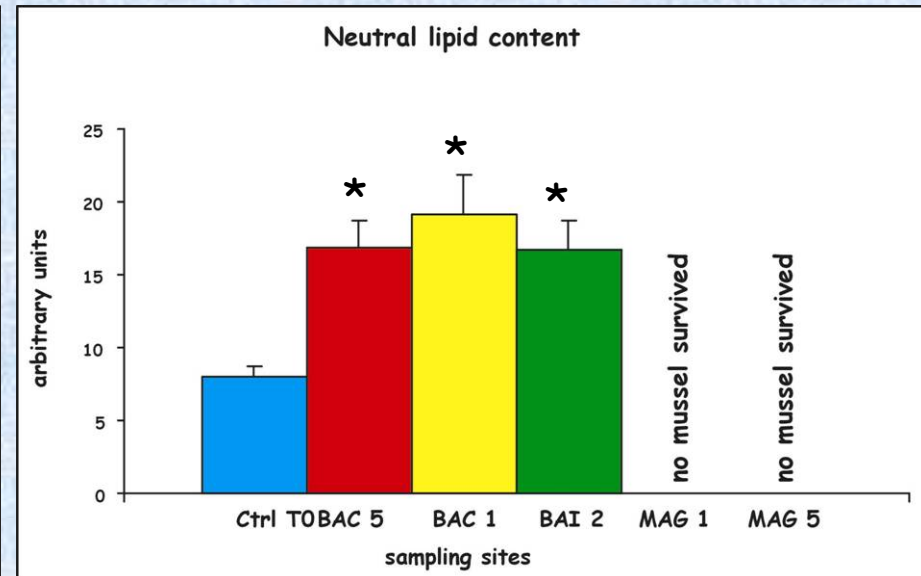
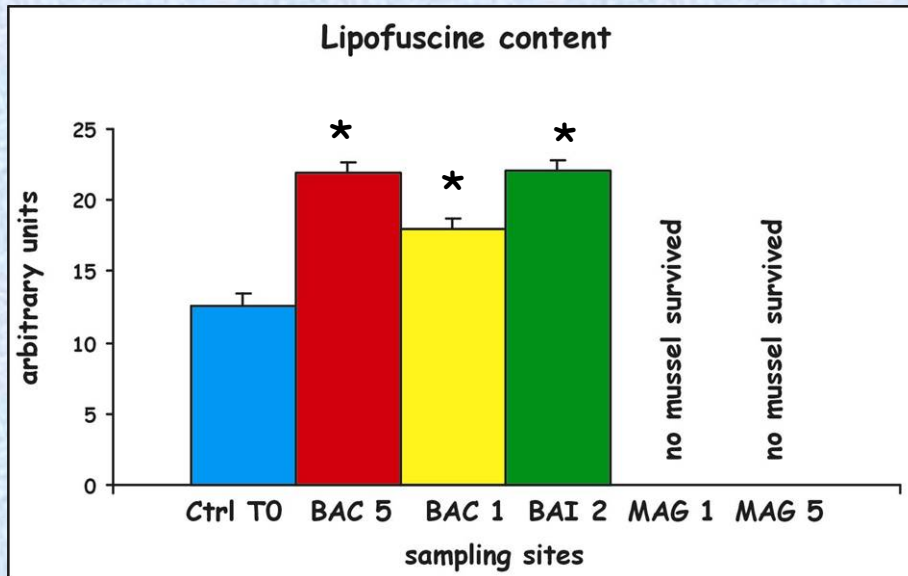
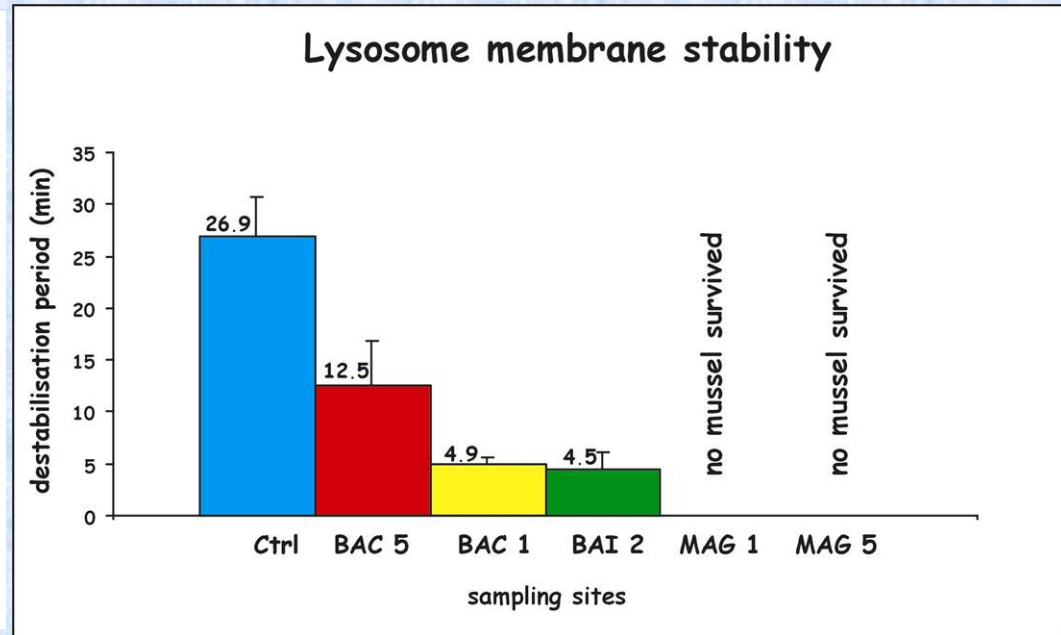
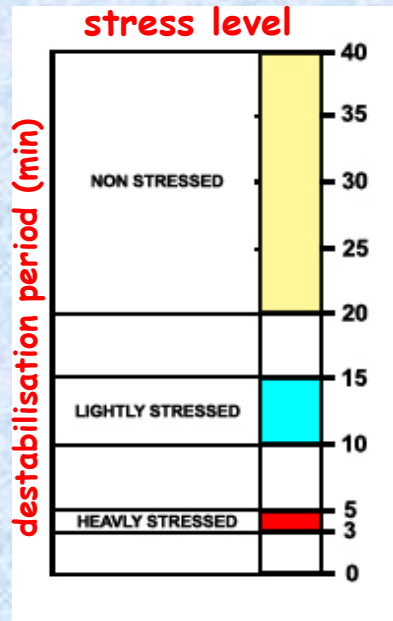
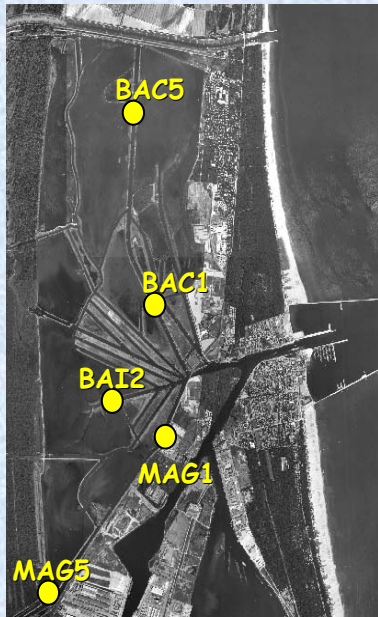
Results: sediment geochemistry

Metal fractionation in the sediments

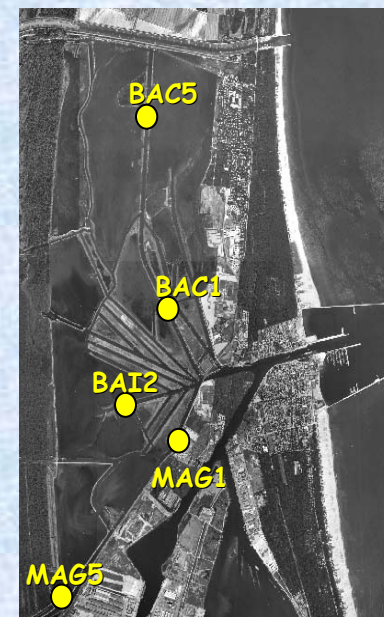
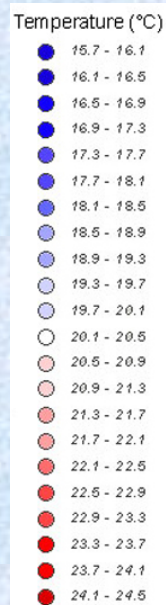
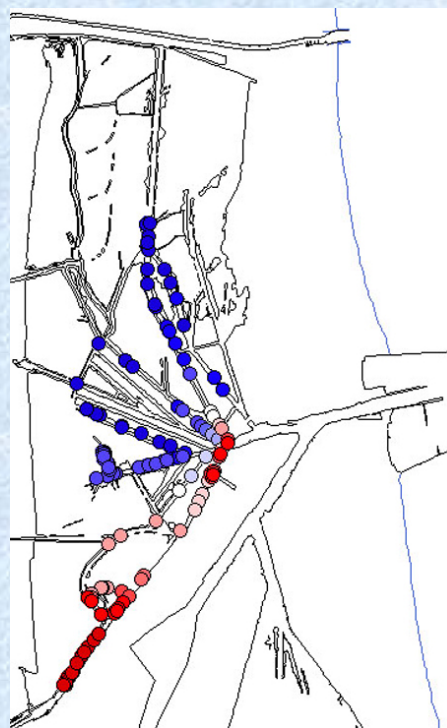
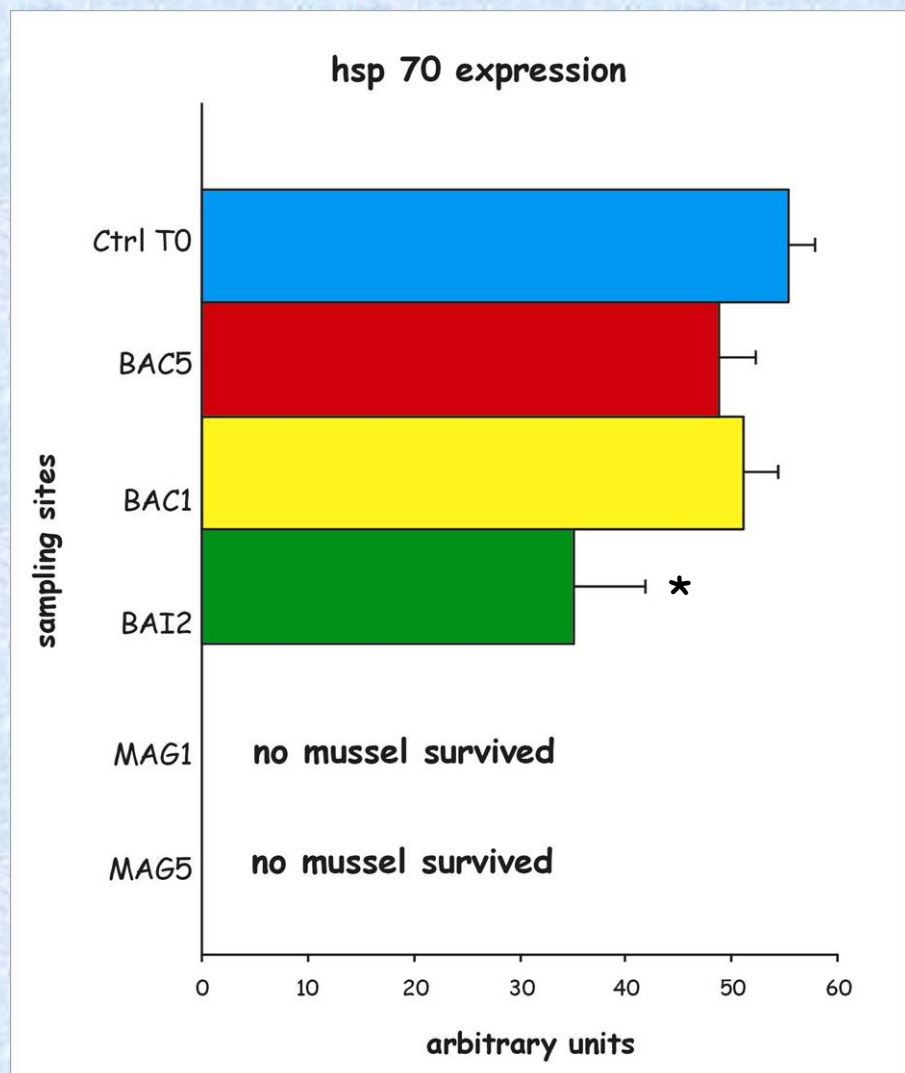
- Sequential extraction (Tessier et al., 1979) in two station the more and the less polluted
- In the more polluted site (MAG 5) Cu, Cr, Zn, Pb are associated to an oxidizable fraction of the sediment



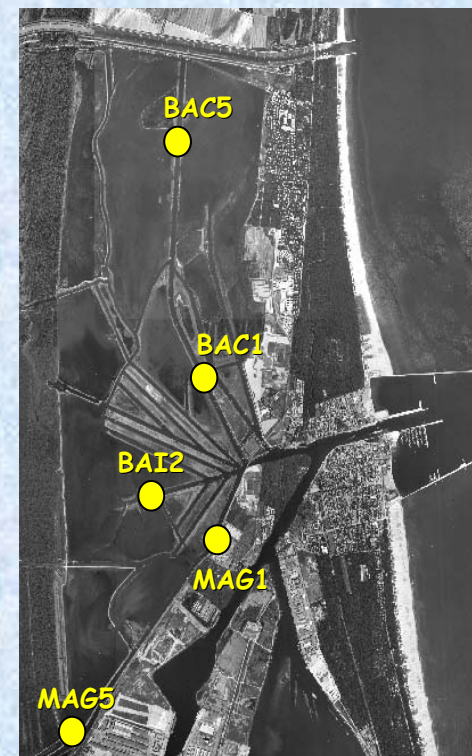
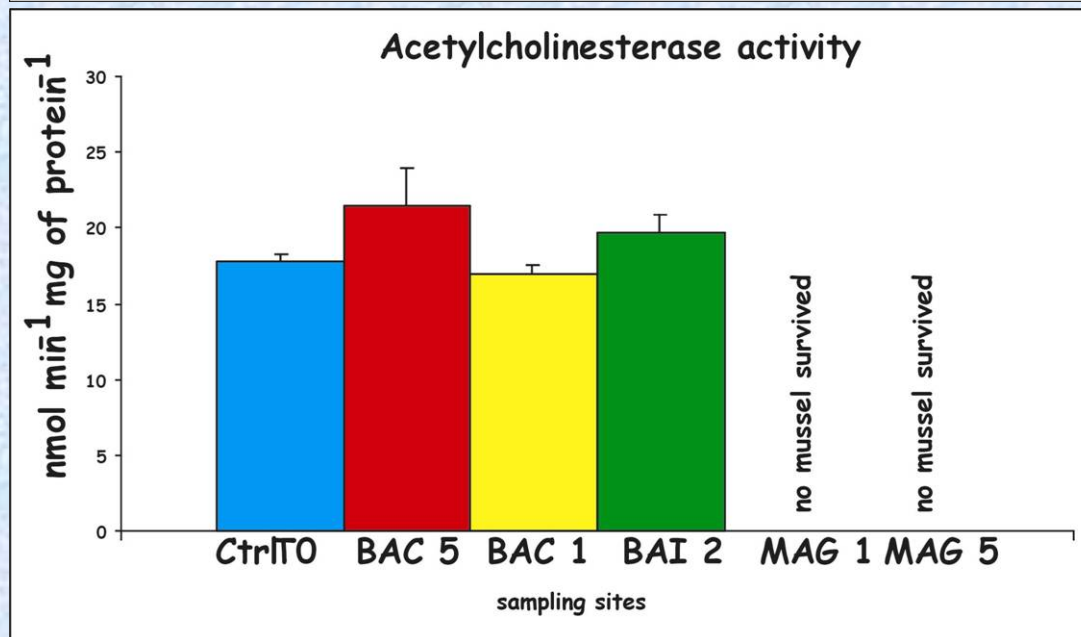
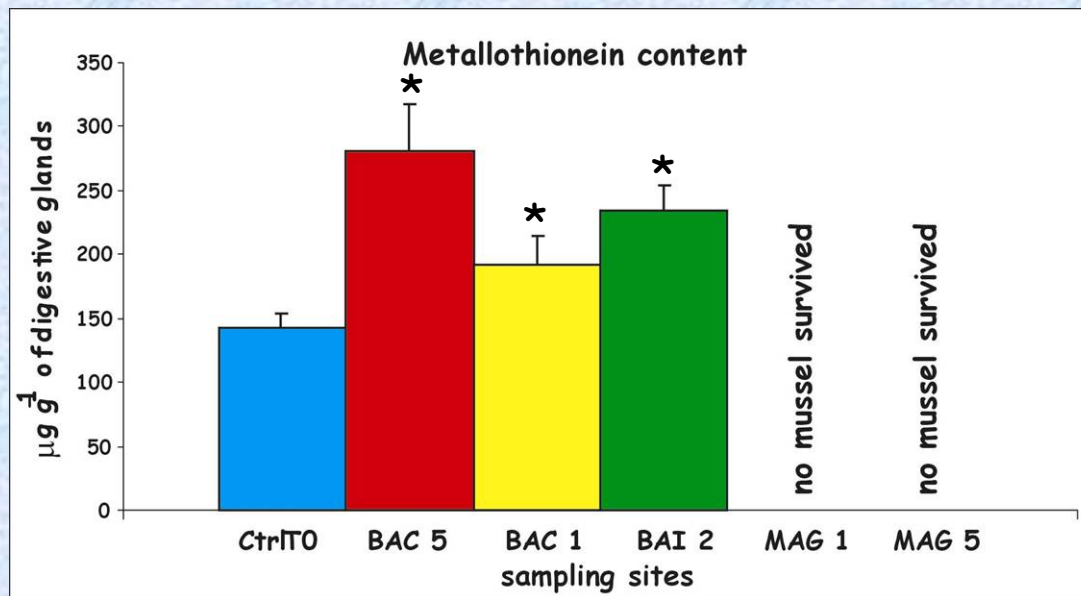
Results: Lysosome biomarkers in *Mytilus galloprovincialis*



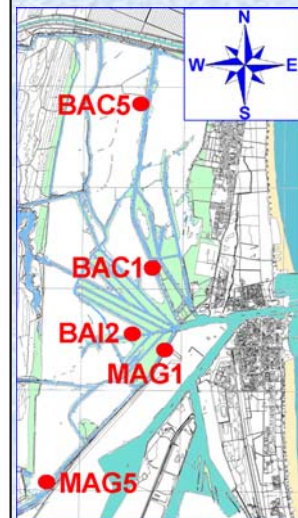
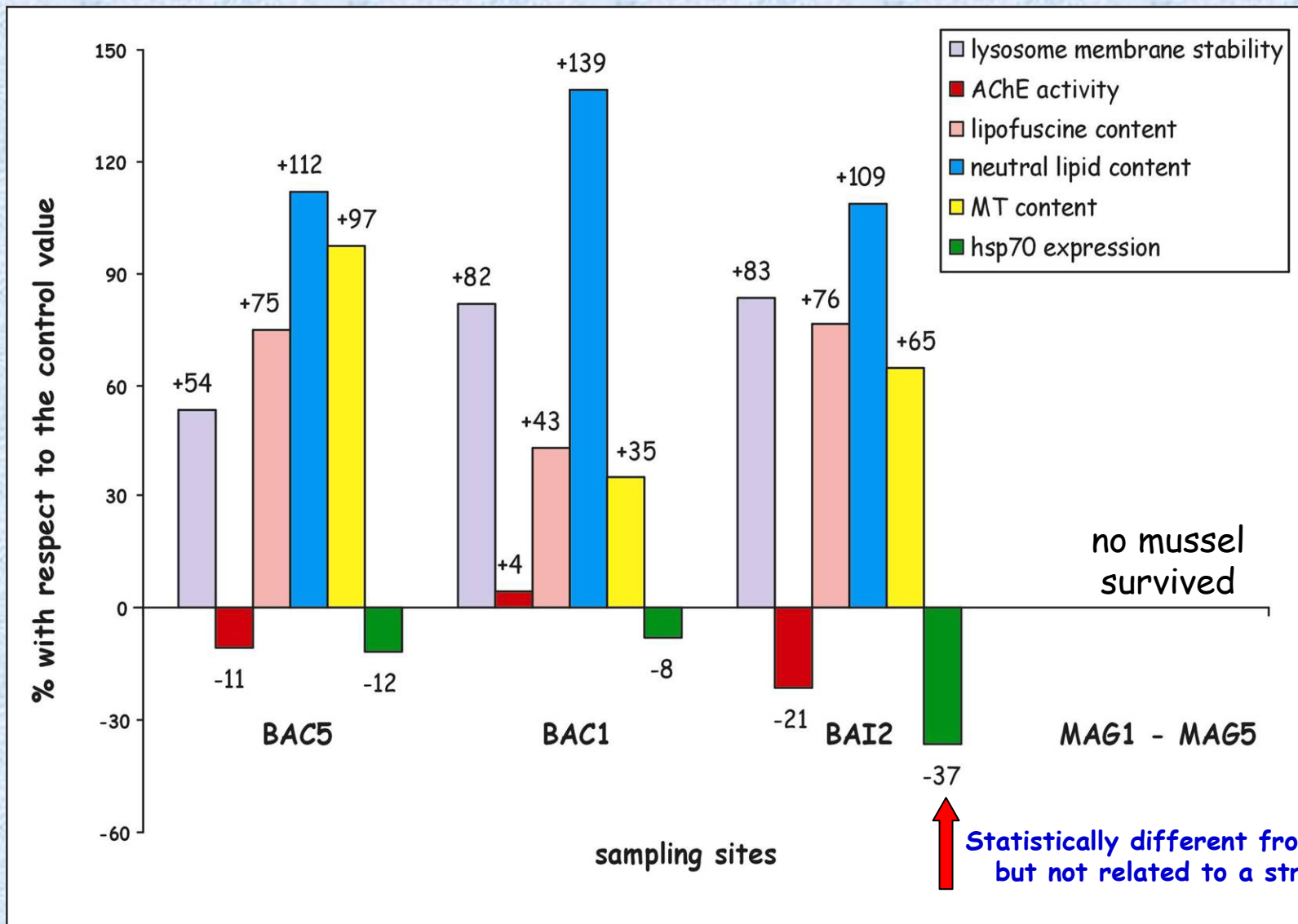
Results: hsp70 expression in *Mytilus galloprovincialis*



Results: Metallothionein content and Acetylcholinesterase activity in *Mytilus galloprovincialis*



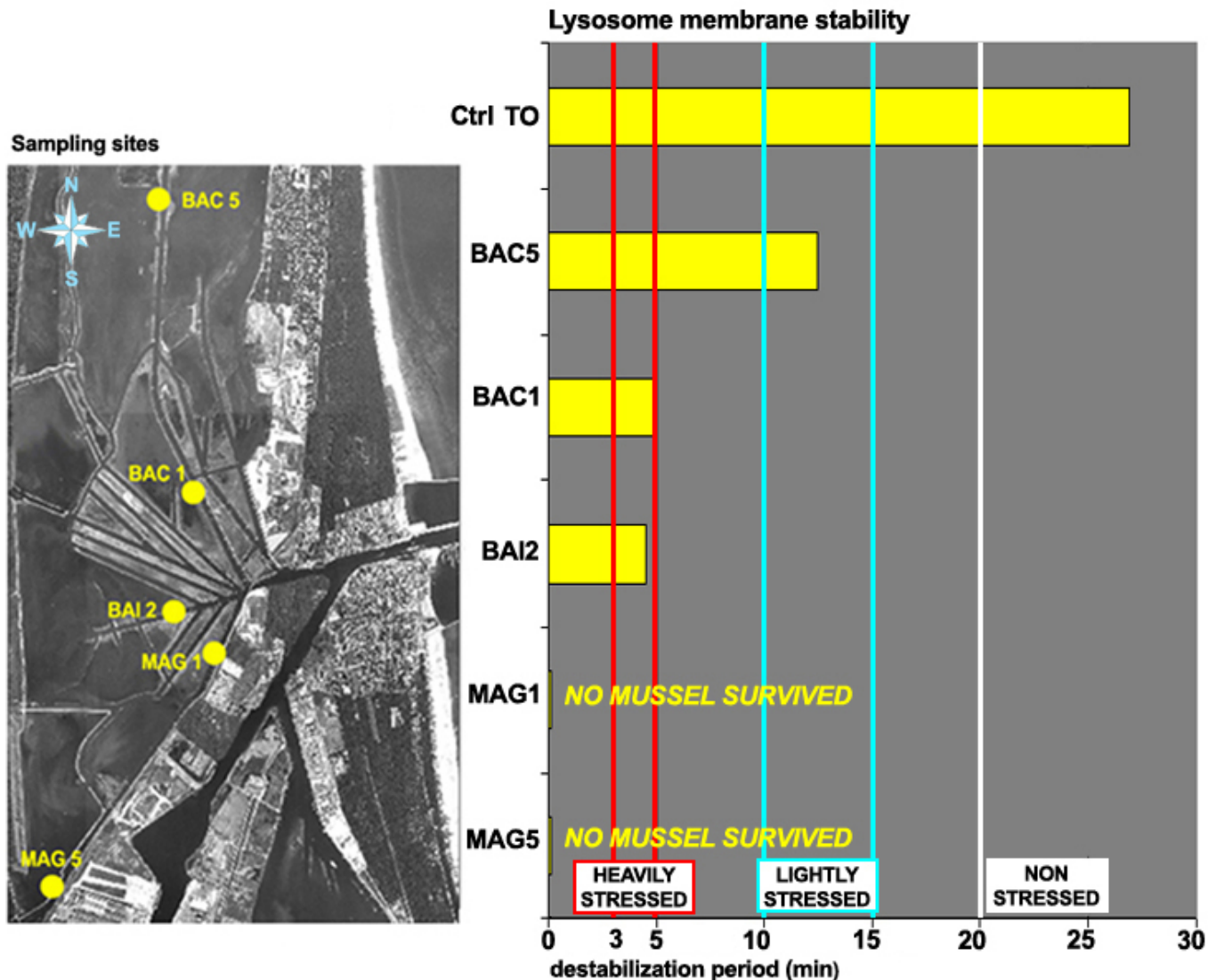
Summary: general biomarker response



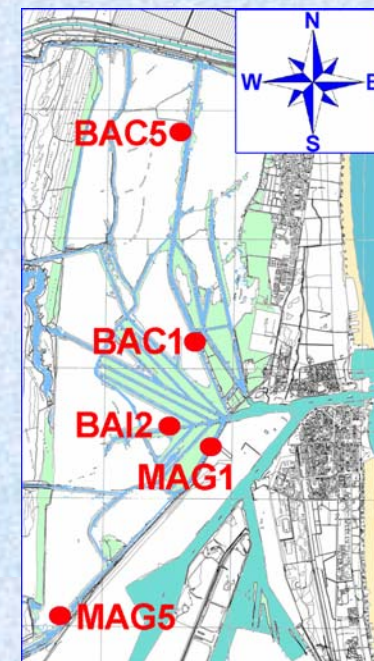
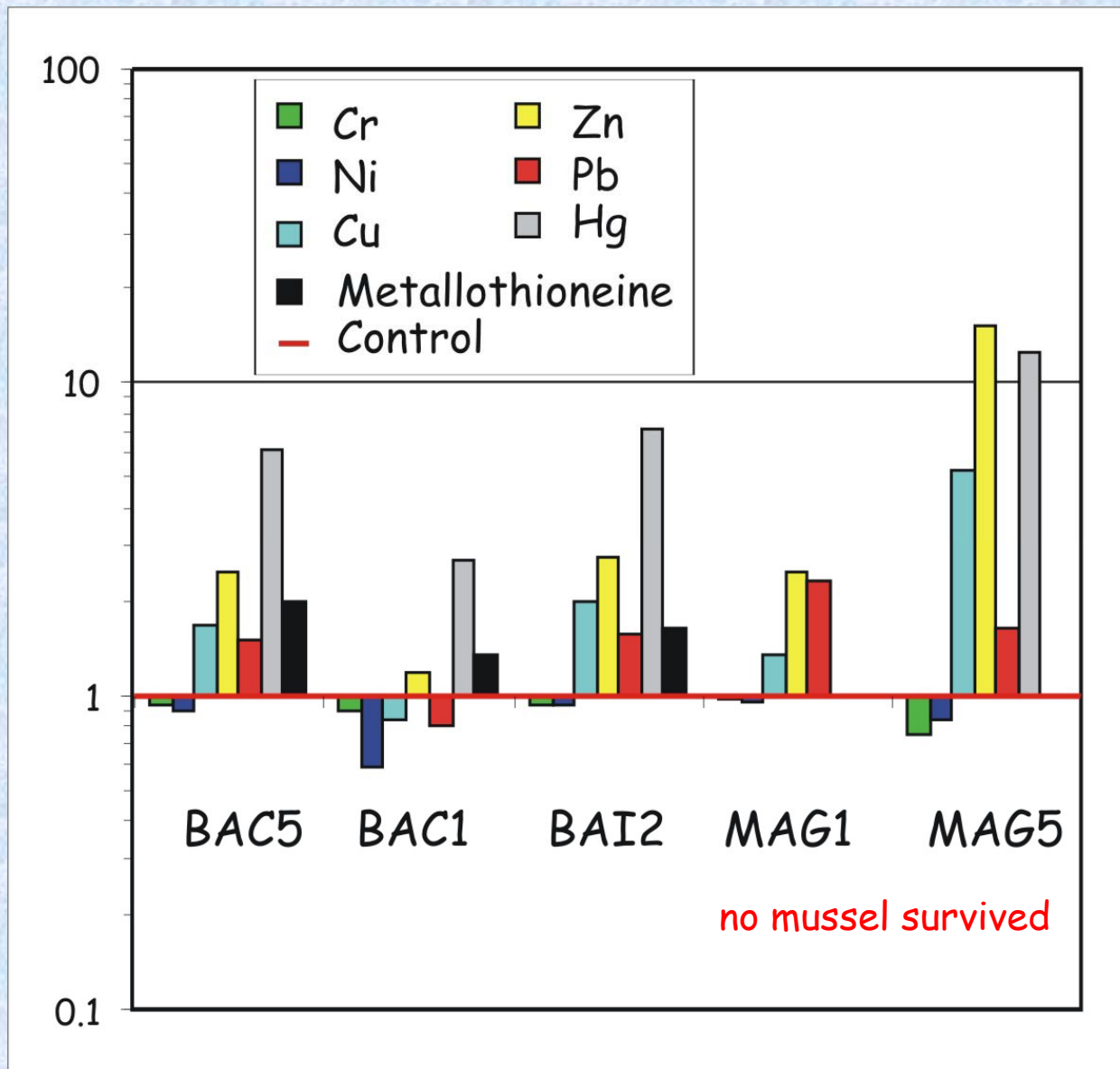
Positive values indicate stressful conditions

Summary: correlation between lysosome membrane stability and pollution gradient

supposed pollution gradient



Summary: correlation between metals enrichment in the suspended sediment and MT content





CONCLUSIONS and future researches



... the GEOCHEMICAL APPROACH:

- a) the area is under the influence of several pollution sources that heavily affect the ecosystem;
- b) many potentially toxic pollutants (e.g., heavy metals) are present in high concentrations, especially in the suspended sediments;
- c) pollution varies within the lagoon mainly according to the distance from sources.

... the BIOLOGICAL APPROACH:

- a) mussels do live in these transitional habitats and can be used as sentinel organisms;
- b) the battery of biomarker analyses applied generally well responded to the questions posed

It appears therefore that most of the analyses performed can be used in an **integrated approach**, although some improvements are needed.

Specific data (e.g., grain-size) on the sediment fraction filtered by the organisms and specific experiments on heavy metal bioavailability are to be obtained. More potentially useful sentinel organisms need to be tested (work is in progress on *Chamelea gallina*)