Estimation of experimental conditions to maximize clams shell capability in trace metals accumulation

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keywords

Clam

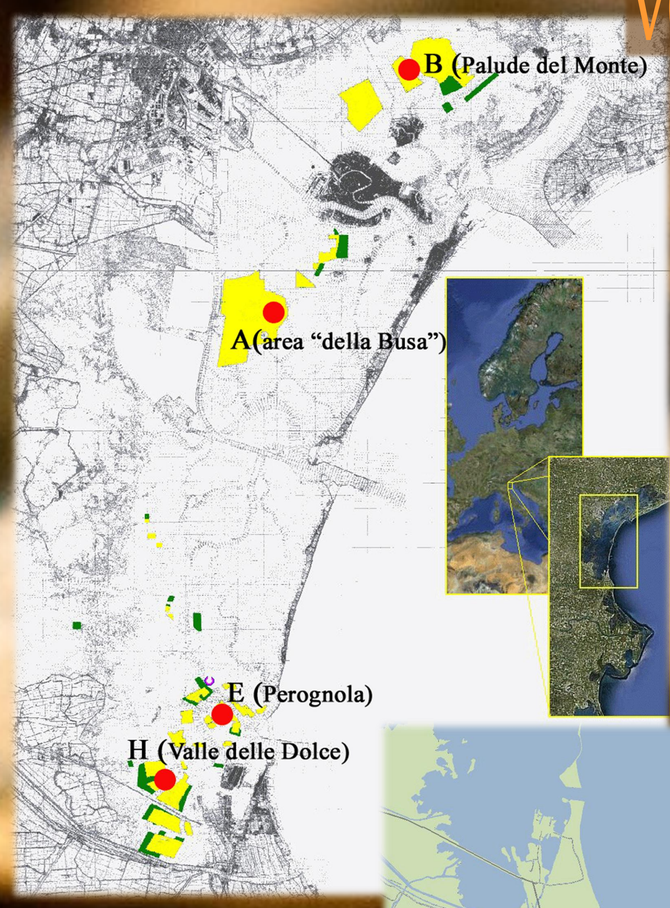
Heavy metals

Accumulation

Shell

Samples of *Tapes philippinarum* were collected in 2009 in the study areas. The valves were kept in refrigerator before cleaning and preparation steps. The cleaning phase was carried out in water with a plastic bristles brush, with subsequent rinsing with deionized water. The shells were dried in an oven at 80 °C for 48 hours, after which the dry weight was determined with an analytical balance. The left valve was then ground with a teflon instrument, resting on a slider suitable for finely chopped sample collection (tool developed by the workshop of the University Ca' Foscari of Venice). Subsequently an aliquot of the fragmented shell is subjected to treatment with nitric acid and hydrogen peroxide and placed in the digester for 45 minutes for complete disintegration of the sample. The digest is then analyzed as such in ICP-MS (Inductively Coupled Plasma Mass Spectrometry).

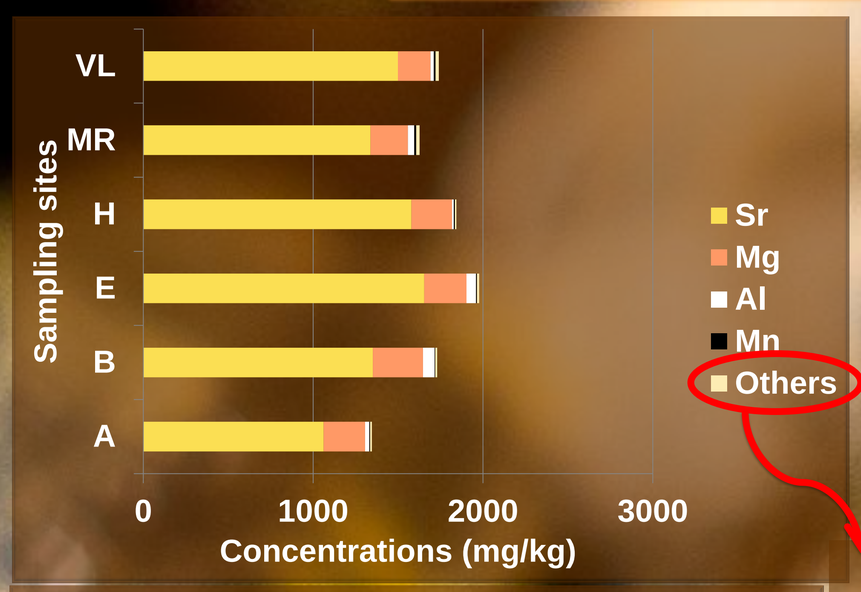
Venice Lagoon



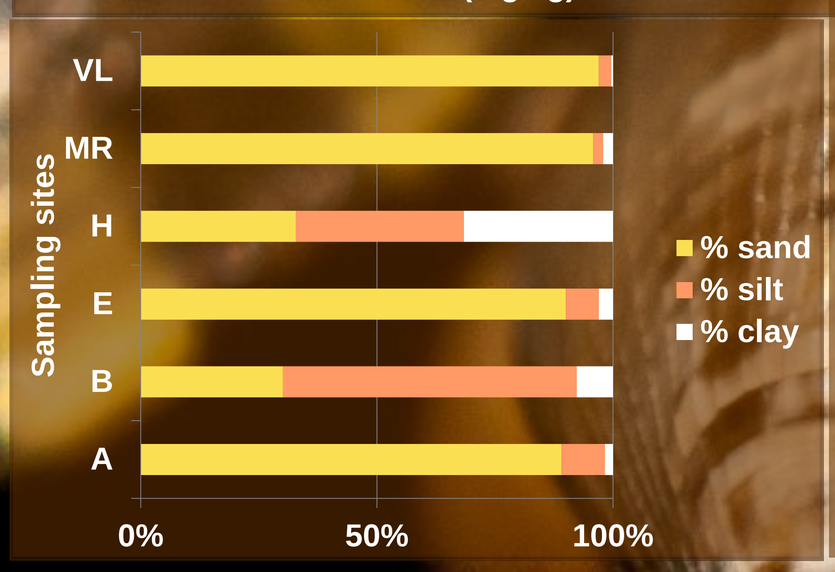
The selected sampling sites cover the main basins in which the lagoon is divided, and therefore have certain hydrological characteristics that reflect the macro-area in which they are inserted.

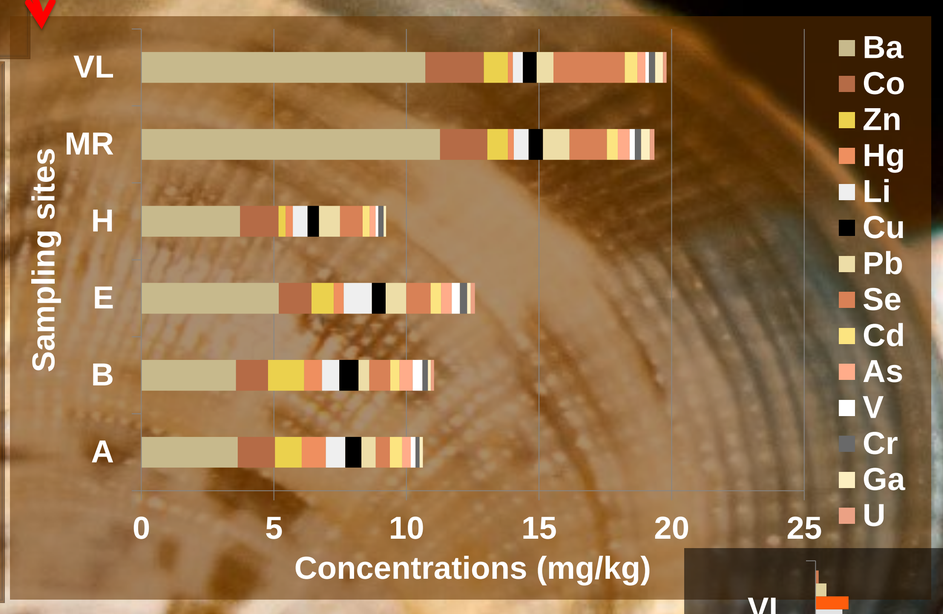
Sampling sites

Po delta

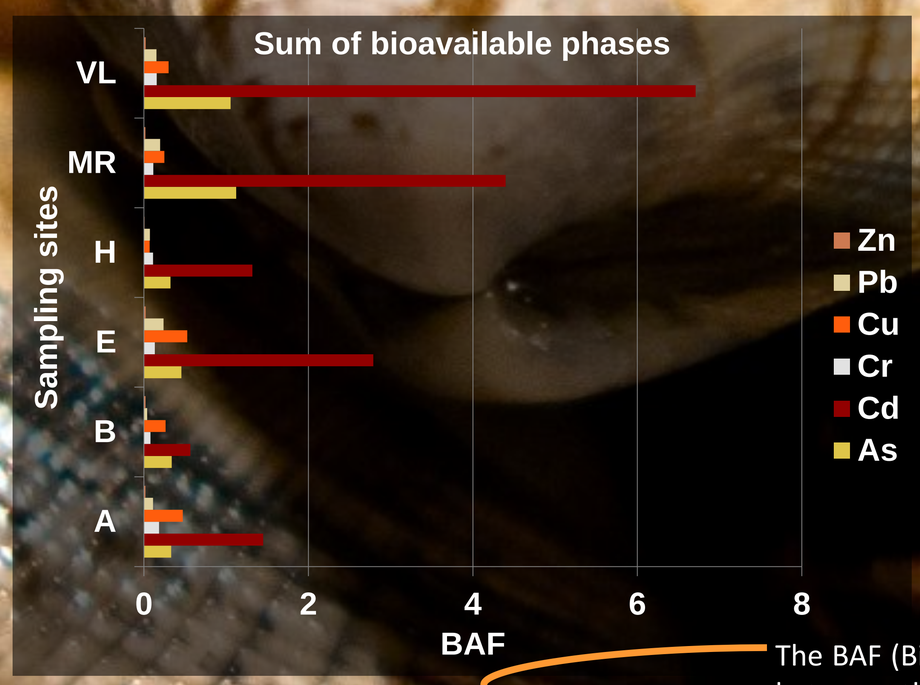


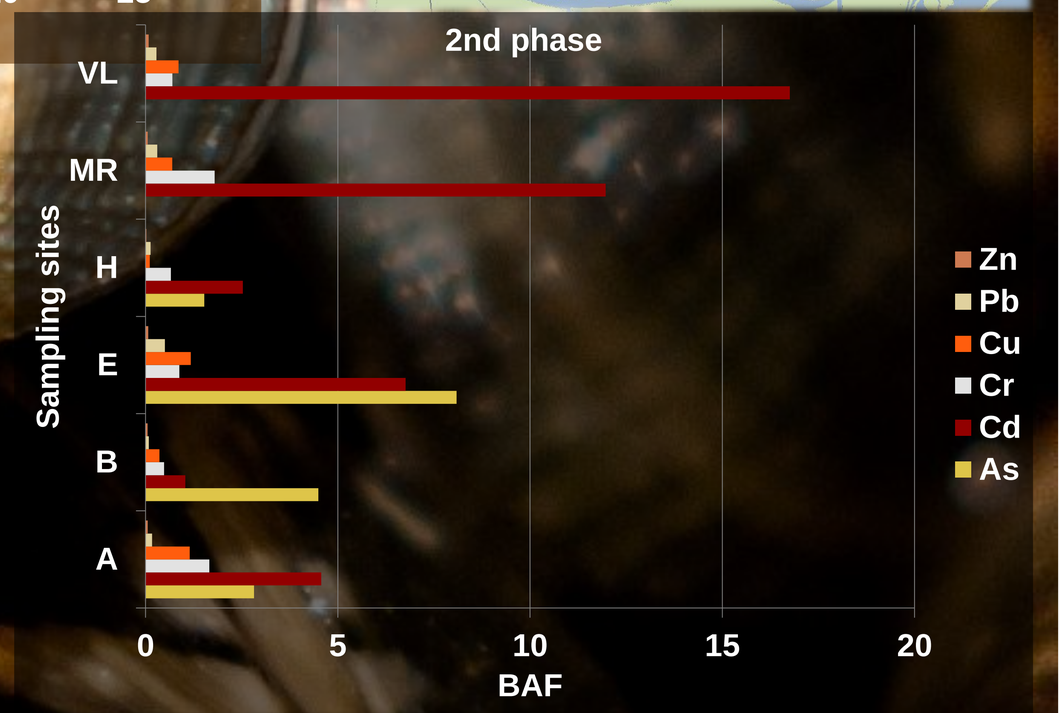
The bar graphs show that, for the sites of the Po Delta (VL and MR) the content of Ba is much higher: this result certainly depends on the different environmental conditions in the two areas and it can be correlated with the sediment size distribution that in the two considered sites shows a prevalence of sand (it is known in fact that sand is able to function as a filter at the micro-environmental level and to prevent the complexation of elements such as Ba so that they remain bioavailable).





This explanation is not sufficient (note that site A has a prevalence of sandy component, but this does not correspond to a high content of Ba): the other thing to consider is salinity. The lower salinity of the Po Delta (7-24‰ against 25-35‰ of the Venice lagoon) ensures that chloro-complexation phenomenas are less strong and therefore elements such as Ba are more bioavailable.





Tapes philippinarum

$$BAF_{X\ phase} = \frac{[Metal]_{Shell}}{[Metal]_{X\ phase}}$$

The BAF (Bioaccumulation Factor) trend in different sites reveals a fundamental subdivision between the Venice lagoon samples and the Po Delta ones. In particular as regards the values calculated for the second phase, it can be observed elevated BAF for Cd in the VL and the MS sites and for As in the lagoon sites. This fact suggests that Cd accumulated in the shells of *T. philippinarum* coming from the Po Delta sites comes mainly from the phase II (which does not happen in the lagoon sites); on the other hand, the Venice lagoon shells samples are characterized by the presence of As coming from the second phase.

Essential references

- Zatta P., Gobbo S., Rocco P., Perazzolo M., Favarato M. (1992). *Evaluation of heavy metal pollution in the Venetian lagoon by using Mytilus galloprovincialis as biological indicator*. The Science of the Total Environment 119: 29-41.
- Bernardello M., Secco T., Pellizzato F., Chinellato M., Sfriso A., Pavoni B. (2006). *The changing state of contamination in Lagoon of Venice. Part 2: Heavy metals*. Chemosphere, 64: 1334-1345.
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considerations

It must be stressed that these are preliminary data: informations collected so far to better allow us to better understand factors controlling metals accumulation in Bivalve shells in order to determine, at a later time, the optimal experimental conditions to maximize this process of bioaccumulation. Soon it will be possible to settle physical, chemical and physiological parameters in order to maximize the shell metal content and set the basis for implementation of bioinertization strategies exploiting mussels metabolic activity and detoxification mechanisms.