Recent threats on coastal ecosystems by new pollutants: a multiple trace element study

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Introduction

The Mediterranean Sea is highly submitted to anthropogenic pressures. Chemical pollution primarily affects its coastal ecosystems. Appropriate sentry species are useful tools for the early warning of marine pollution. We investigate the use of the marine phanerogam *Posidonia oceanica* and its grazer, the purple sea urchin *Paracentrotus ilvidus* (fig. 1) as bioindicators to monitor the Mediterranean coastal pollution by poorly studied trace pollutants (V, Mo, Ag and Al). Classic trace metals (Cd, Cr, Cu, Zn, Ni, Pb, Co and Fe) are also studied.

Figure 1. *Paracentrotus lividus* in *Posidonia oceanica* meadow.

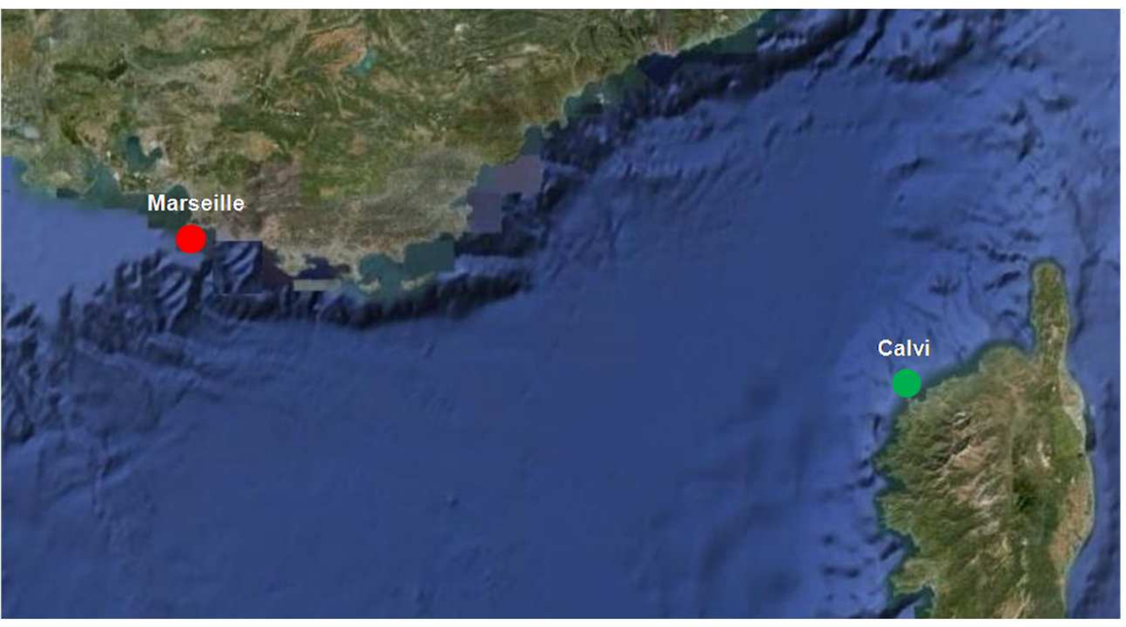

Figure 2. Northwestern Mediterranean bassin showing seasonal sampling sites (Marseille, Calvi).

Material and methods

Organisms were seasonally collected in march and june 2008 in a reference site and a polluted one, respectively Calvi (Corsica) and Marseille (fig. 2). Trace element concentrations were determined by ICP-MS in urchin gonads and *Posidonia* adult leaves.

Results and discussion

Trace elements in bioindicators:

Cu, Zn, Ni, Pb and Fe, Mn concentrations are similar in both sampling sites (fig. 3). Significant differences in Cd, Cr and Co contents are measured in both tissues. This is also the case for Mo, V and Ag (fig. 4).

Higher Al contents in Calvi's urchins and *Posidonia* (fig. 5) can be explained by the granitic nature of its rocky shore.

Gonadal Zn contents:

Gametogenesis requires large amounts of Zn. This demand is less for spermatogenesis than for oogenesis (fig. 6). *P. lividus* shouldn't be used for Zn biomonitoring during its reproduction time. All other elements show similar concentrations in female and male gonads.

Seasonality:

Neither *Posidonia* nor sea urchin trace element concentrations were seasonally influenced. These data will have to be compared to winter collected samples.

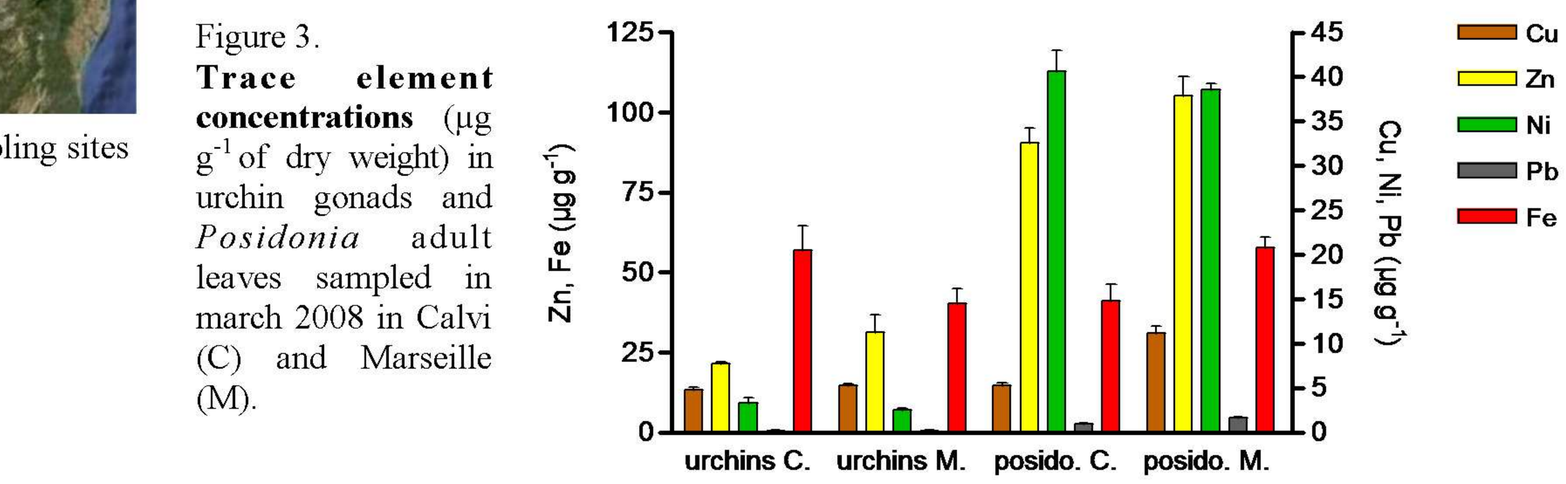

Figure 3. **Trace element concentrations** (µg g^{-1} of dry weight) in urchin gonads and *Posidonia* adult leaves sampled in march 2008 in Calvi (C) and Marseille (M).

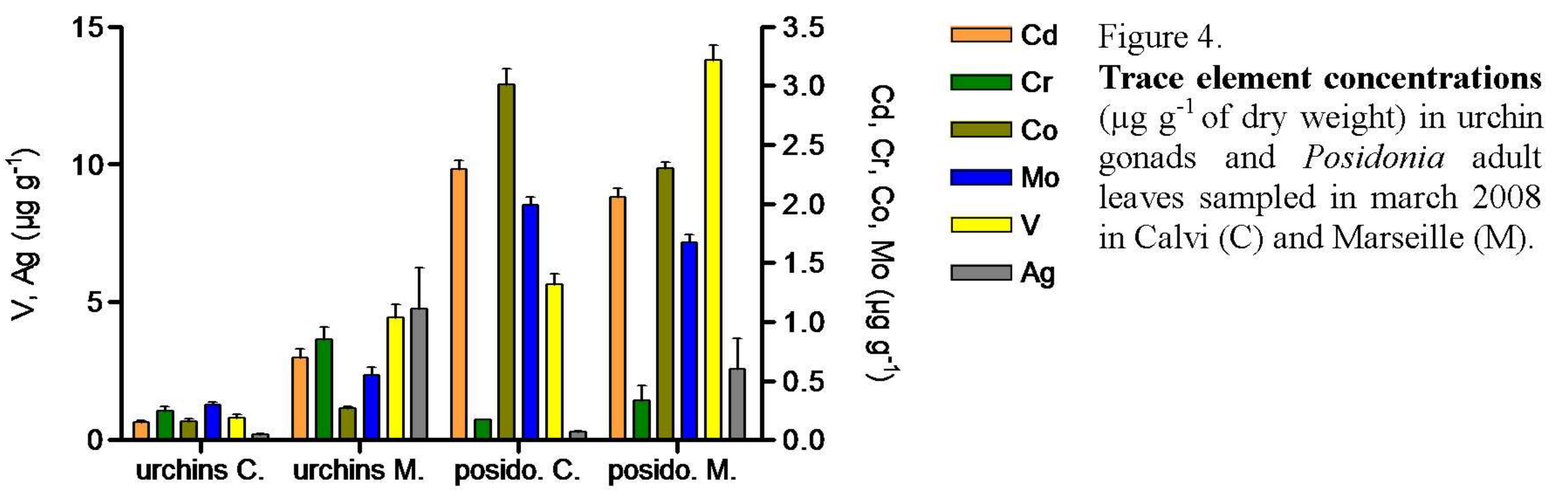

Figure 4. **Trace element concentrations** (µg g^{-1} of dry weight) in urchin gonads and *Posidonia* adult leaves sampled in march 2008 in Calvi (C) and Marseille (M).

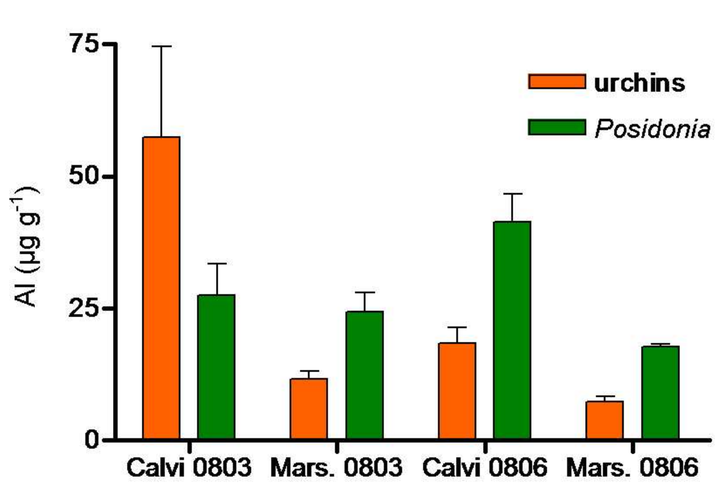

Figure 5. **Al concentrations** (µg g^{-1} of dry weight) in male urchin gonads and *Posidonia* adult leaves sampled in Calvi and Marseille in march and june 2008.

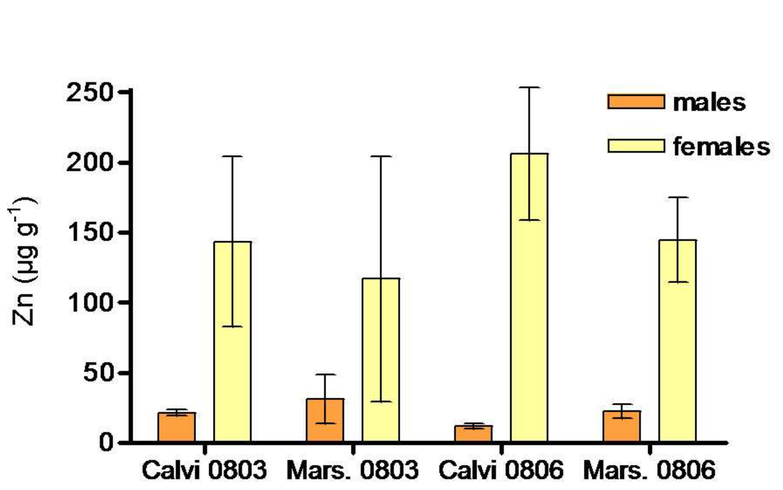

Figure 6. **Zn concentrations** (µg g^{-1} of dry weight) in gonads of female and male sea urchins sampled in Calvi and Marseille in march and june 2008.

Conclusions and perspectives

Some classic trace metal concentrations in sentry species seem to be brought back to their baseline levels in Marseille, previously considered as a polluted site. However, other ones such as Mo, Co, Cr, Cd, V, or Ag threaten the coastal ecosystem. Chemical pollution evolves and has to be monitored continuously.

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Acknowledgments :

This project is financially supported by the « Fond National de la Recherche Scientifique » and the « Communauté Française » (ARC RACE), Belgium.

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