

Trace element kinetics in caged *Mytilus galloprovincialis*

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Introduction

Since the mid-70^{ies} when Goldberg proposed the mussel-watch concept to record the quality of marine waters (Goldberg, 1975), mussels from the genus *Mytilus* of which *M. galloprovincialis* Lamarck, 1819 (Fig. 1) have been widely used as bioindicators. Among the diversity of contaminants, trace elements (TEs) remain chemicals of concern because of their persistence, ability to concentrate in organisms and toxicity. However, little research has studied so far the combined influence of environmental condition changes and physiological processes on their kinetics in *M. galloprovincialis*. TE accumulation in caged mussels (Fig. 2) was thus surveyed over 4.5 months in 2011 in 2 contrasted pristine Corsican (France) coastal environments, the semi-enclosed Diane salty pond and the open Calvi Bay (Fig. 3).



Fig. 1. Picture of *Mytilus galloprovincialis*.

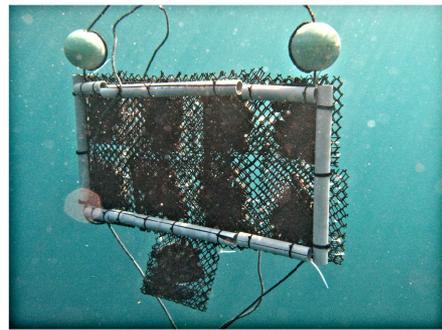


Fig. 2. Conchylicultural pouches for regular sampling.



Material and methods

Mussels were regularly sampled to study the kinetics of 19 TEs in their flesh; dissolved and particulate TEs were also monitored. The primary production and the water physico-chemical variables were measured, and meteorological data were purchased from Météo-France.



Fig. 3. Map of Corsica (France; centre) and Google Earth pictures of the Diane pond (right) and the Calvi Bay western side (left). The 3 monitored stations Arena, Cages and Stareso are reported on pictures.

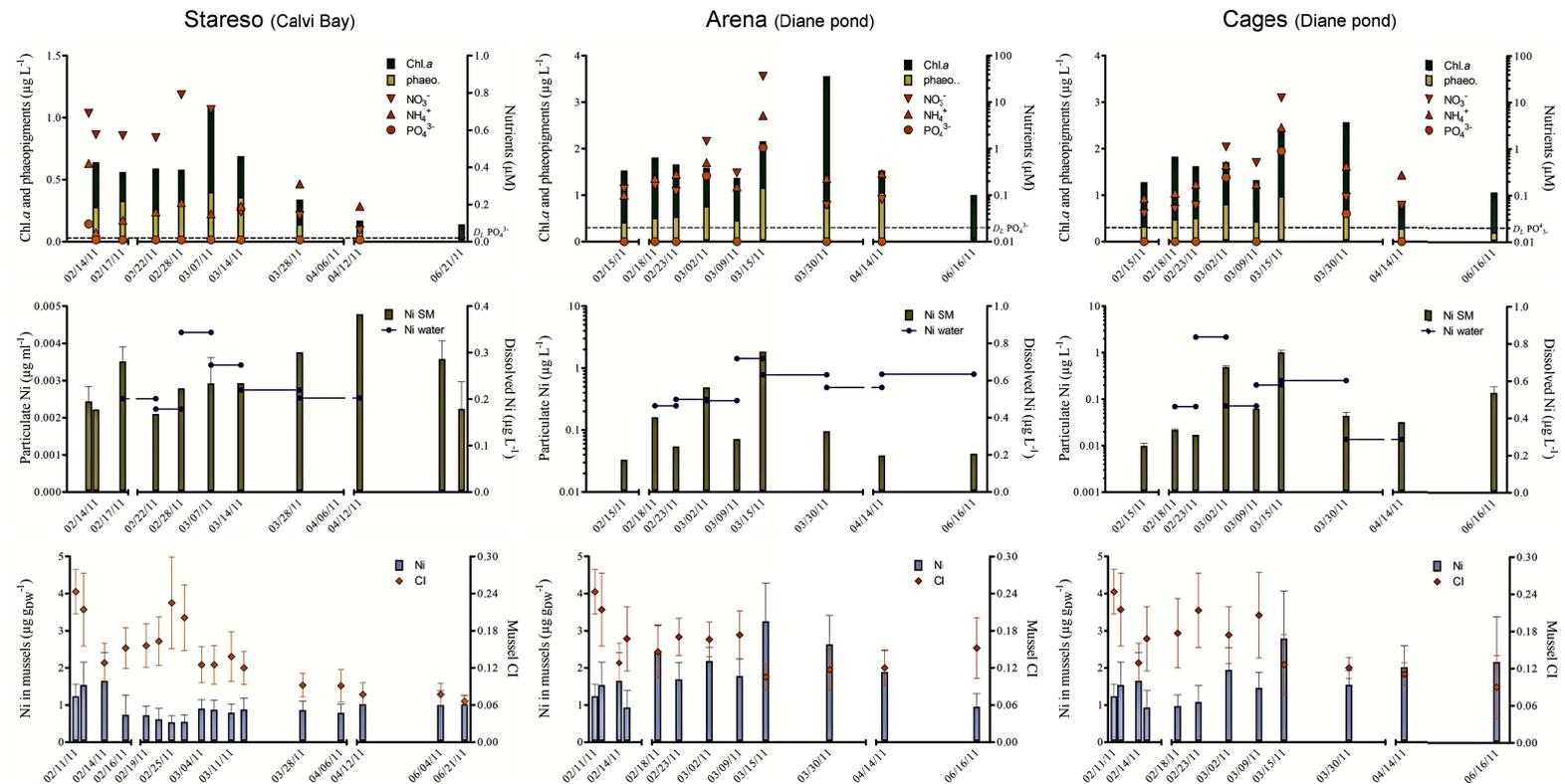


Fig. 4. Temporal evolution of nutrients (µM), chlorophyll a and phaeopigment concentrations (µg L⁻¹; above graphs) and dissolved and particulate Ni concentrations (µg L⁻¹; central graphs) in surface water samples from Stareso (left graphs; Calvi Bay), Arena (central graphs) and Cages (right graphs; Diane pond) stations where caged *M. galloprovincialis* were immersed from February to June 2011. Ni concentration temporal evolution (µg g_{DW}⁻¹; below graphs) in the mussel flesh is given together with mussel condition index values (CI = flesh DW over shells DW; Andral et al., 2004).

Results and discussion

TE kinetics in mussels differed between sites. Mussel spawning (condition index dropping), a temperature and saline or stress-induced physiological process, was followed by a short time increase of TE levels in the mussel flesh. Mussel contamination also evolved according to changes of their respective environmental TE levels. Raining events temporary led, in the Diane pond, to the water enrichment with TEs, nutrients and detrital material, to peaks of primary production and to the increase of TE concentrations in the mussel flesh. This step by step evolution of TE levels in the environment and mussels was afterwards followed by a rapid return to initial conditions. In the open Calvi Bay, these fast and balanced kinetics were not so obvious, because of the rapid dilution of environmental constrain effects in the bay (Fig. 4).

Conclusion

Mussels are often used as bioindicator in estuaries and coastal enclosed meadows with rapidly changing environmental conditions. In such conditions, the influence of the environment on TE kinetics in mussels must be considered, in addition to physiological processes.