TP156: INSIGHTS FROM THE SPATIAL AND TEMPORAL DISTRIBUTIONS OF MERCURY SPECIES AND ISOTOPES IN BIVALVES FROM THE FRENCH COASTLINE

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Introduction

Mercury (Hg) is a contaminant of particular environmental concern, being toxic towards most organisms. It presents a strong affinity for both dissolved and organic matter, and is bioaccumulated and biomagnified through food webs mainly under its organic form methyl-Hg (MeHg). Besides, for a long time, bivalves have been used as a biomonitoring tool of coastal chemical contamination. Although they accumulate contaminants from both dissolved and particulate phases, the trophic pathway (particles) dominates the medium to long-term intake of metals. In addition, the stable isotope composition of carbon and nitrogen (δ13C and δ15N values) of filter-feeding bivalves has been proven useful for identifying the composition of the particulate organic matter (POM) assimilated by coastal primary consumers.

In this context, we aim at tracing the origin of the bioaccumulated Hg in the coastal environment, using several parameters including total Hg (THg), MeHg, δ13C and δ15N and Hg stable isotopes determined in the soft tissues of bivalves.

Do the origin and composition of POM integrated in coastal food webs influence transfer and bioaccumulation of mercury?

Materials & Methods

Bivalves from the environmental sample bank **ROCCH**: Mussels (*M. edulis, M. galloprovincialis*) and oysters (*C. gigas*) that were collected in February and March 2014

- **Hg speciation** => AMA-254
- **C, N isotopes** => Elemental Analyzer (NC2500, CarloErba®) connected to an IRMS (Isoprime, GV Instruments®)

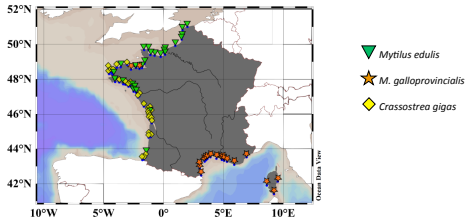
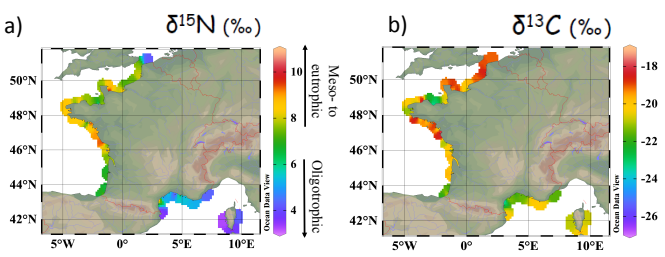
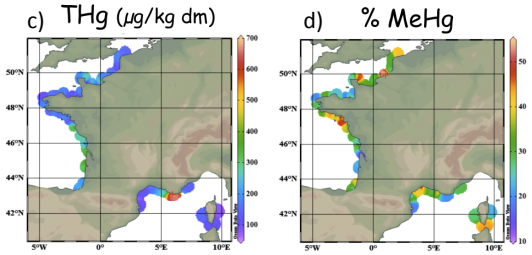


Fig. 1: Map of sampling sites and bivalve species

Results & Discussion

Spatial distribution (**Fig. 2**)

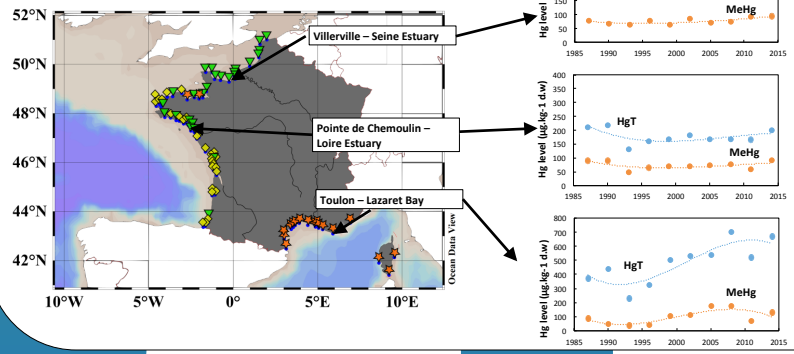




=> δ15N values differentiate oligotrophic (Mediterranean Sea) and meso- to eutrophic ecosystems (Channel and Atlantic Ocean seaboards) (**Fig. 2a**).
=> δ13C values point to local specificities for assimilated POM sources (**Fig. 2b**).
=> No significant relationships between either THg or MeHg concentrations and δ15N or δ13C values (Spearman correlation coefficient tests, all $p > 0.05$).

- THg and MeHg concentrations co-varied (Spearman test, $r^2 = 0.525$, p-value < 0.001 ; **Fig. 2c & d**).
- Yet unexplained local "hotspots" (*i.e.*, high THg/MeHg ratio) were revealed (**Fig. 2d**).

Time series (**Fig. 3**)



International regulations to decrease mercury uses for human activities do decrease GLOBAL Hg atmospheric deposition since the 1990's (Zhang et al. 2016)

➔Yet, French bivalve HgT levels have not decreased significantly since 1987

MeHg fraction fluctuates between 20 and 50% of HgT. This is consistent with balance between methylation/demethylation being determined NOT ONLY by HgT.

Other factors like bacterial methylation, organic matter quality and quantities or sulfate concentrations are more limiting (Choi and Bartha 1994; Heyes, Miller and Mason 2004).

➔ In a context of global change, one or more of these factors may become less limiting, and possibly increased future MeHg concentrations at the base of the food web.

Conclusions

- Trophic status of coastal ecosystems explains the spatial variation of bivalve δ13C and δ15N,
- Multi-decadal THg and MeHg concentrations time series show no decrease since 1987,
- Bivalve Hg species, C and N isotopes don't allow to determine specific ecosystems signatures and trace the source of Hg to individual sites.

➔ Can Hg isotopes be used for this purpose?

See companion poster TP041 dealing with spatial and temporal series in selected sites to assess the evolution of their isotopes ratios, and an examination of bivalve signature from various ecosystems

Bibliography:
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