Discrimination of two geographically distinct populations of sea bass *Dicentrarchus labrax*, using stable isotopic signatures of mercury ($\delta^{202}Hg$, $\Delta^{199}Hg$)

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Context

Hg emissions are increasing worldwide and concentrations found in some marine predators remain (too) high. Efforts have been made in Europe to reduce emissions in the last decades, BUT it is still unclear how local measures impact local Hg loads. Indeed, Hg has a residence time in the atmosphere over 1 year, enabling it to travel long distances.

→ Many questions on its biogeochemical cycle remain.

Objectives

We investigate the possibility to use mercury isotopic signature in fish as a tool to discriminate different polluted areas and potential pollution sources.

Indeed, Hg can exhibit both :

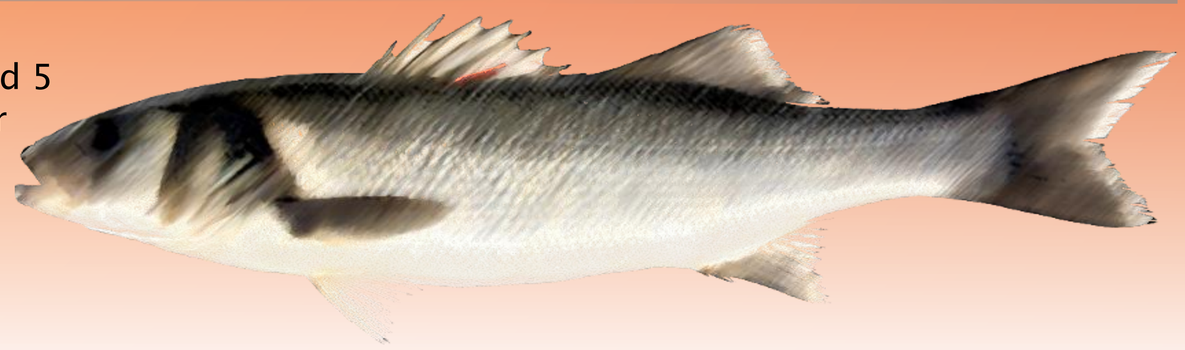
mass-dependent (MDF) and mass-independent fractionation (MIF)

- may occur during biological cycling
- could be used to understand bioaccumulation processes
- Usually measured through δ^{202} Hg

- unique fingerprint of specific chemical pathways like photochemical transformations
- Measured through Δ^{199} Hg or Δ^{201} Hg

How ?

We sampled 10 common sea bass from the Aegean sea, in Greece and 5 from the North Sea. T-Hg was analysed by direct mercury analyser (DMA), speciation by gas chromatography inductively coupled plasma mass spectrometer (GC-ICP-MS) and Hg isotope analysis were performed using cold vapour generation with multicollector ICP-MS (only on 5 and 4 specimens from each site).
Liver and muscles were both analysed.



Results and discussion

Fig. 1 : [Hg]total (µg.kg^{-1}DW), Median, Min et Max

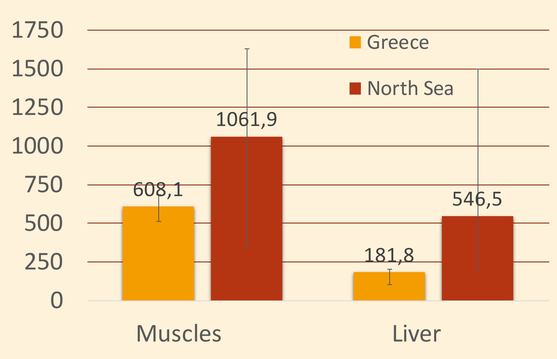
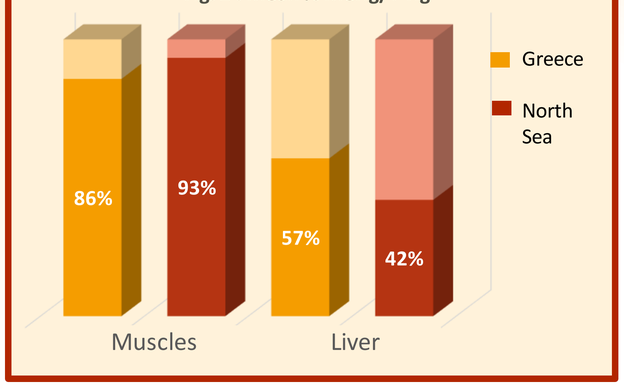


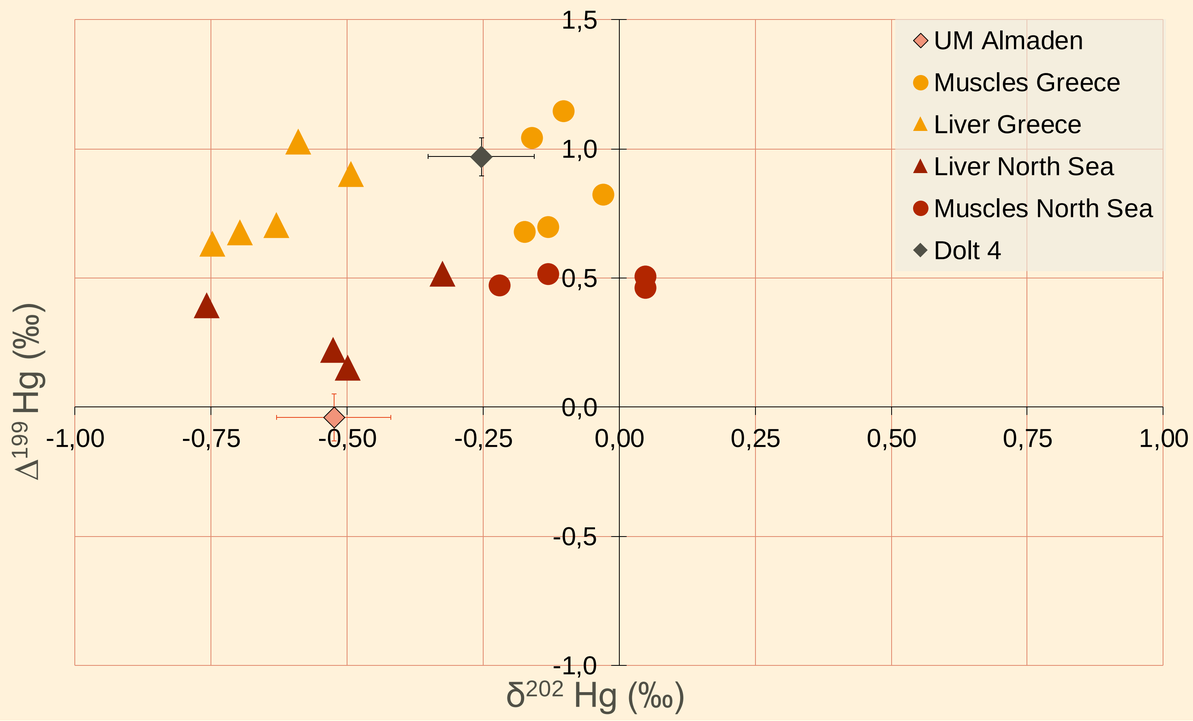
Fig. 2 : Mean % MeHg/T-Hg



- Total Hg concentrations were higher in individuals from the North Sea than from Greece, both in muscles and liver. (Fig. 1)
- Speciation analysis are very similar between both sampling areas. They show that MeHg was the highly predominant form of Hg in muscle while it was not the case in liver. (Fig. 2)

- Isotopic mass dependent values ($\delta^{202}Hg$) were always higher in muscle than in liver (Fig. 3) and are to be related to Hg species distribution (Fig. 2).
- For mass independent isotopic signature, sea bass from Greece had a systematically higher $\Delta^{199}Hg$ value than individuals from the North sea. (Fig.3)
- While mass dependent isotopic signature probably reflects some internal Hg metabolism, mass independent isotopic signature seems definitely site dependent.
- Such isotopic discrimination might be in agreement with difference in both mercury sources and cycling in the North and Aegean Seas.

Fig. 3 : Δ199Hg versus δ202Hg in Greece and in the North Sea



Conclusions

These preliminary results indicate that Hg isotopes may thus help to discriminate fish from different areas. We suggest this could be linked to Hg sources and cycling. This promising outcome must be further confirmed by extending the number of individuals and locations to be investigated.

Acknowlegment

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