

A 16th century shipwreck mercury legacy and present mercury bioaccumulation in intertidal species

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Introduction and Objectives

- Over the centuries, mercury (Hg) has been used by humans for a variety of purposes.
- Hg is used in gold and silver mining processes through a process called amalgamation.
- The amalgamation process became increasingly popular in the 16th century by Spanish colonizers. Hg was carried in galleons along the Atlantic, from Spain to the new world.
- In 1583, after Philip II of Spain became King of Portugal, all the Iberian ships coming from overseas passed then through the Azores, however, occasionally some of these vessels sank due to storms or collisions with reefs.
- In the environment, Hg has the ability to bioaccumulate and biomagnify in aquatic food webs.
- Marine organisms are used to monitor the marine environment through the analysis of pollutant concentrations in the organism tissues (bioindicators).

Objectives evaluate the [Hg] in sediments and intertidal species caught in a bay that contains a shipwreck (Iberian construction from the last quarter of sixteen-century) and other bays without evidence of shipwrecks.

Material and Methods

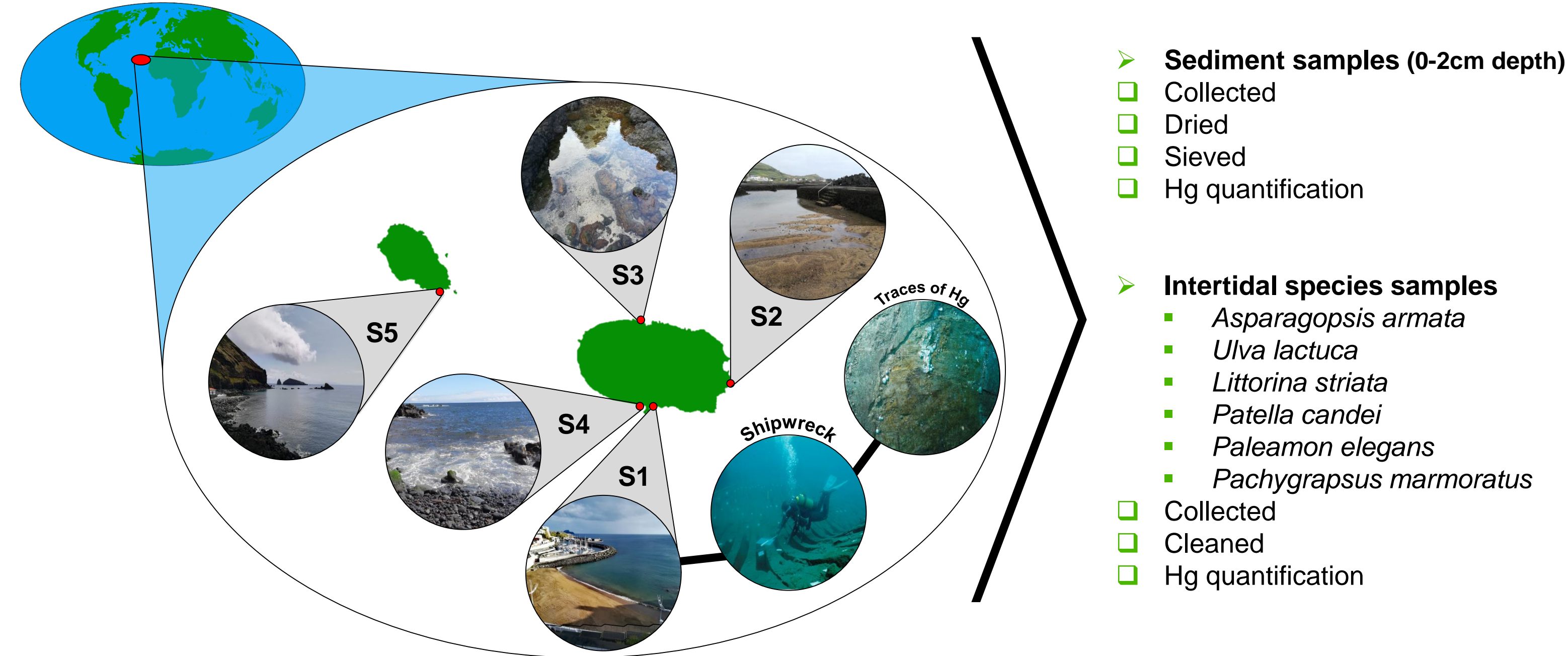


Fig 1 / Sampling sites in Terceira island and Graciosa island (Azores archipelago)

Results

Mercury in sediments

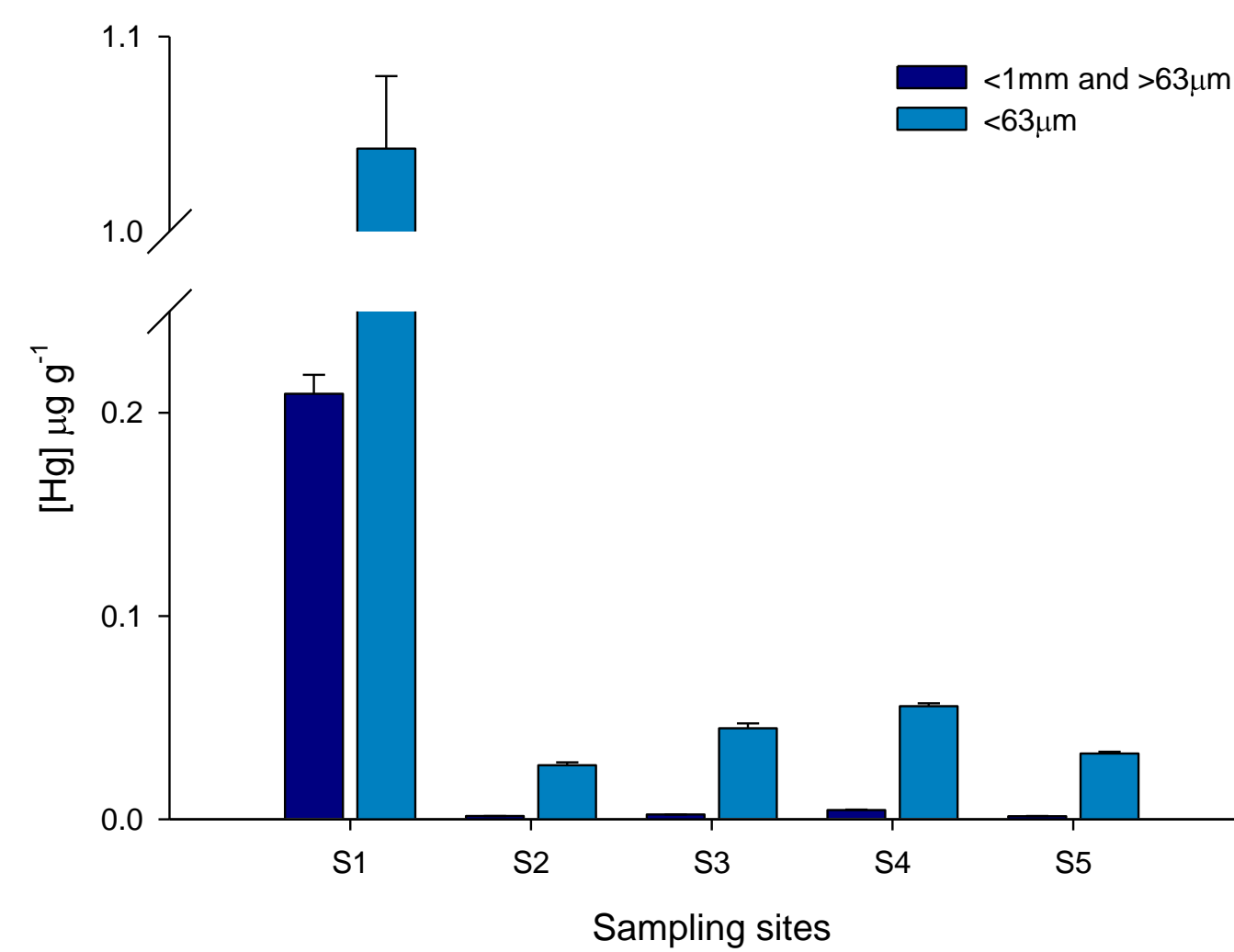


Fig 2 / Hg concentration ($\mu\text{g g}^{-1}$) in the sediment fraction between 1mm and 63µm and <63µm.

- [Hg] increased in the shipwreck area in both sediment fractions.
- Significant differences ($p < 0.05$) in [Hg] were found:
 - sampling sites in both sediment fractions
 - sediment fractions

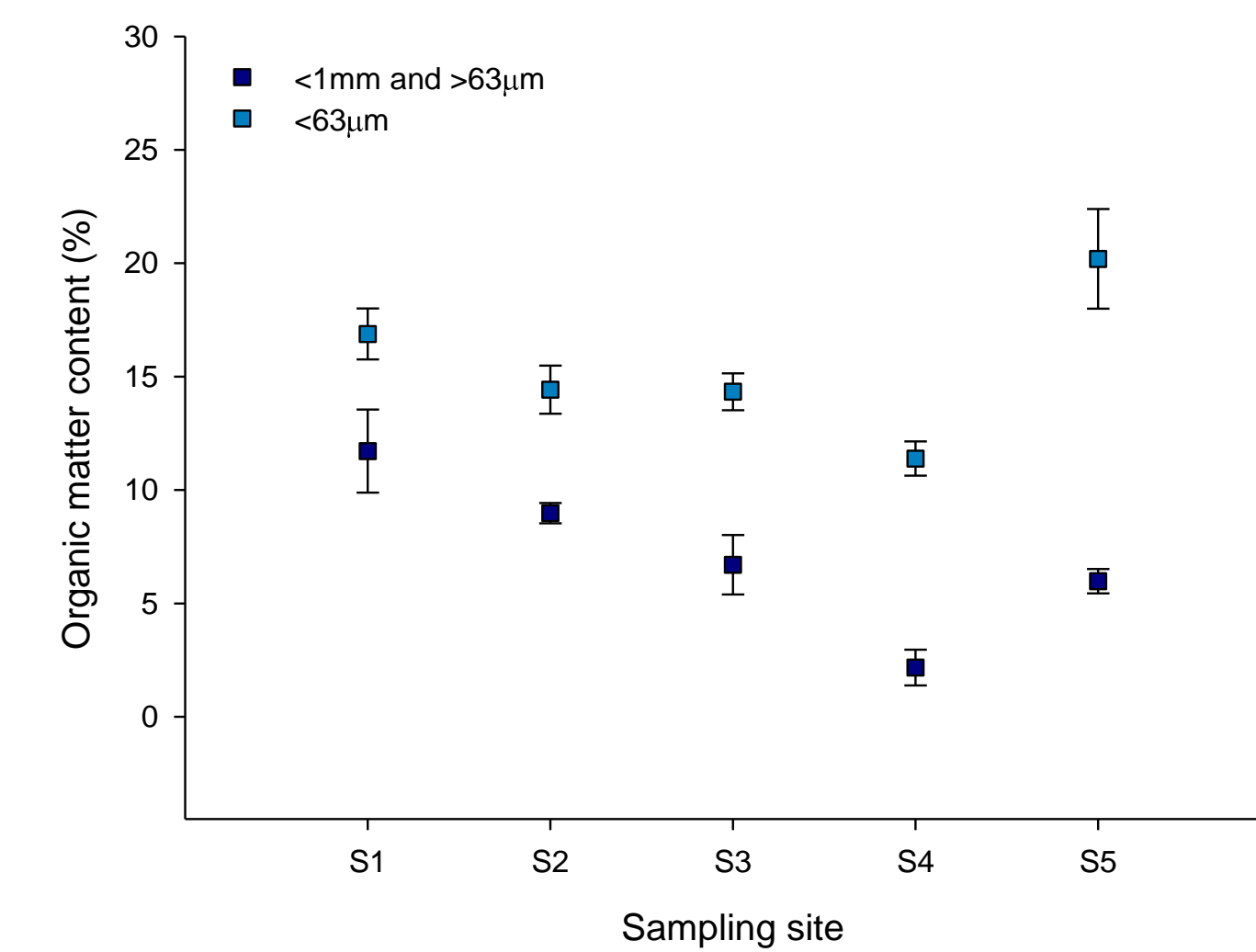


Fig 3 / Percentage of organic matter in the sediment fraction between 1mm and 63µm and <63µm.

- Fine sediment fraction (<63µm) presents higher content of organic matter.
- Significant differences ($p < 0.05$) in organic matter content were found between sediment fractions.

Mercury bioaccumulation in intertidal species

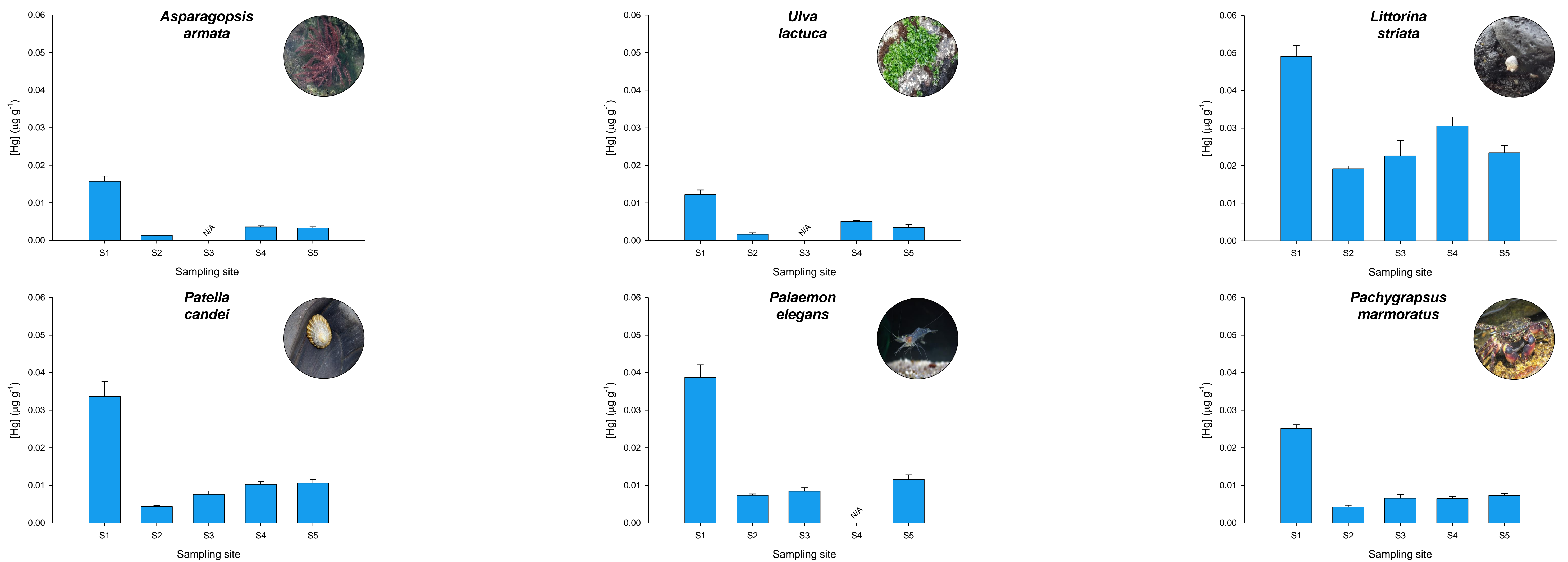


Fig 4 / [Hg] in different intertidal species. N/A present in the graphics means that species were not analyzed in these sampling sites.

- Hg bioaccumulation is significant higher in species from S1

- Algae have lower [Hg] ($p < 0.05$) than crustaceans and gastropods

Discussion and Conclusions

- Shipwrecks may influence the surrounding environment.
- Surface sediments from the shipwreck bay (S1) present higher levels when compared with the other sampling sites.
- Organic matter plays an important role in Hg accumulation dynamics in marine sediments.
- [Hg] found in all species reflects the proximity of sampling site to the shipwreck bay.
- Differences on [Hg] were found between producers (algae) and consumers (crustaceans and gastropods), suggesting a potential biomagnification.

Acknowledgments

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