

MERCURY IN THE ZOOBENTHOS OF THE COASTAL ZONE OF THE PUCK BAY (SOUTHERN BALTIC SEA)

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Introduction

Mercury (Hg) is one of the most dangerous global pollutants. It is a neurotoxin, which spreads rapidly in the environment, accumulates in organisms tissues and biomagnifies in the higher trophic levels, reaching concentrations many times greater than in the surrounding media (Förstner & Wittman, 1981). The important way that Hg may be included into the trophic chain is its absorption by benthic organisms constituting a significant food source. The aim of the study, conducted within the framework of a National Science Centre project (No. UMO 2011/01/B/ST10/07697), was to determine the spatial variability of Hg concentration in the macrozoobentos of the coastal zone of the Gulf of Gdańsk, taking into account the influence of Hg sources into the marine environment.

Methods

Studies were carried in the coastal zone of the Gulf of Gdańsk, at 2 stations: C1 (located near Osłonino, in bay with limited water exchange, influenced by surface runoff caused by rivers inflow and coastal abrasion) and C2 (located near Chałupy, in a distance from the mainland, influenced by open sea waters). Macrozoobentos samples were collected monthly from January 2012 to May 2013, at the depth ca. 1m. Methods of sample collection, storage and preparation, as well as the biological analysis and the determination of total mercury (Hg_{TOT}) have been described in earlier study by Beldowska et al. (2016).

Results

The macrozoobentos samples contained 20 species belonging to Bivalvia, Crustacea, Gastropoda, Polychaeta, Oligochaeta, Nemertea and Insecta larvae. The species composition and the number of identified species were varied stations in Osłonino and Chałupy. Only 9 species were common to both stations and did not constitute an accidental taxa. Hg_{TOT} concentrations in zoobentos of the coastal zone of the Puck Bay ranged from 7 ng g⁻¹ dw to 521 ng g⁻¹ dw and differed significantly in individual taxa and trophic groups, as well as between the sampling stations (Fig. 1).

Conclusion

The diverse composition and structure of the zoobentos at the sampling stations was associated with nature and configuration of the bottom character, and with the influence of local runoff (Kotwicki 1997).

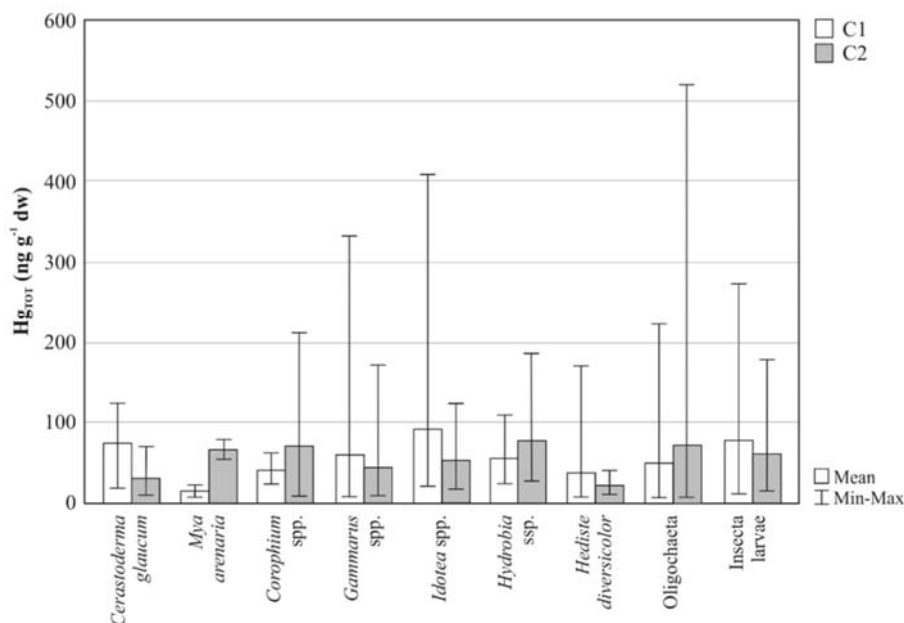


Figure 1. Hg_{TOT} concentration in zoobenthos taxa in the coastal zone of the Puck Bay (stations C1 and C2)

Land-based Hg sources contributed to greater inflow of suspended matter (SPM) to the coastal zone (station C1), which led to increases in the concentrations of Hg in organisms feed on large particles of suspension. SPM underwent sedimentation close to the source which influenced the increase of Hg_{TOT} concentration in sediments, benthic diatoms and phytobenthos, and consequently an increase in the Hg level in zoobenthos taxa that feed on them. In the case of the area subjected to the influence of the open sea (station C2), the main source of Hg was resuspended sedimentary material from deeper parts of the basin transported along with the sea currents. Hg-rich fine-grained sediments led to increase of Hg_{TOT} in zoobentos fed on smaller suspension particles, as well as in detritivores (Fig. 1). Furthermore, the Hg concentrations measured in the coastal zone of the Puck Bay, in case of most zoobenthos species, were similar in comparison to the deeper parts of the bottom near the study area (accumulation zones). This means that Hg sources described by the authors (even the local ones), play an important role in the Hg load into the marine coastal zone and its introduction into the trophic chain.

References

- Beldowska, M.; Jędruch, A.; Zgrundo, A.; Ziółkowska, M.; Graca, B.; Gebka, K. (2016). The influence of cold season warming on the mercury pool in coastal benthic organisms. *Estuar Coast Shelf Sci*, 171, 99-105.
- Förstner, U.; Wittman, G. (1981). Metal pollution in the aquatic environment. *Springer*, Berlin
- Janas, U.; Kendzierska H. (2014). Benthic non-indigenous species among indigenous species and their habitat preferences in Puck Bay (southern Baltic Sea). *Oceanologia*, 56, 603-628.
- Kotwicki, L. (1997). Macrozoobenthos of the sandy littoral zone of the Gulf of Gdańsk. *Oceanologia*, 39, 447-460.