Data Descriptor

Mercury in various components of the environment (Gulf of Gdańsk, southern Baltic Sea)

Magdalena Bełdowska[1*]

[1] Faculty of Oceanography and Geography, Institute of Oceanography, University of Gdańsk, (46 Marszałka Józefa Piłsudskiego Street, Gdynia, Poland)

[*] Correspondence author: magdalena.beldowska@ug.edu.pl; ORCID: 0000-0002-3585-9283

Abstract

Total mercury concentration was determined monthly form January 2012 to May 2013 in the water (microlayer and the surface), plankton, epilithon, epiphyton, benthos and sediment. The study was conducted in the coastal zone of the Gulf of Gdańsk. The abundance and biomass of plankton, benthos; the concentration of suspended particulate matter, particulate organic carbon and nitrogen; δ13C and δ15N in the suspended matter; sediment and water parameters were also measured. The Hg concentration in the biotic and abiotic components of the marine coastal zone was higher during the warm cold season.

Keywords: Mercury, coastal zone, estuarium, microlayer, surface water, suspended particulate matter, phytoplankton, zooplankton, phytobentos, zoobenthos, epilithon, epifithon, sediment

https://doi.org/10.34808/x55q-sz53_dyr_roz20

Specification table (data records)

Subject area	Marine chemistry
More specific subject area	Biogeochemistry of mercury
Type of data	text
How the data was acquired	The analysis were conducted in the Institute of Oceanography University of Gdańsk and in the Institute of Oceanology of the Polish Academy of Sciences

Data format	xlsx
Experimental factors	no
Experimental features	Chemical analysis; biological analysis
Data source location	MOST Wiedzy Open Research Catalog, Gdańsk University of Technology, Gdańsk, Poland
Data accessibility	Creative Commons Attribution Non Commercial

Background

Climate change in the southern Baltic region manifests itself inter alia by warming of the cold season. Warming of the cold season leads to an increase of sea temperature, enabling the growth of phytoplankton. This contributes to the accumulation of mercury entering the Gulf via dry deposition by the plankton and inclusion of this metal into the food chain, instead of deposition to the sediments. Additionally, the lack of icing causes the biomass of plankton in early spring to be larger than in years where icing occurs. In a similar way, icing affects the biomass of fauna and flora of the sediments of the Bay. In this case, in years with no icing, the average annual mercury pool in the phytobenthos is higher than in years where icing would last for 90 days (Bełdowska and Kobos, 2016; Bełdowska et al., 2016).

The extension of the vegetative season (and accompanied by a lack of icing) and improvement of the water quality, contribute to extended coverage of sediments by flora. Underwater meadows formed in the Puck Bay are a habitat where animals are abundant – many of them herbivores, which are directly accumulating mercury by ingestion of phytobenthos. In this way, intense development of phytobenthos contributes to faster inclusion of mercury into food webs (Bełdowska et al., 2015).

Climate changes contributes on one hand to the depuration of water and sediments by flora, but on the other hand they transfer mercury relatively biounavailable for animals from sediments to higher trophic levels. It was also observed that in coastal sediments, in the absence of icing, mercury persisted in bioavailable forms for a larger proportion of the year (Bełdowski et al., 2018).

Methods

The collected samples were freeze-dried and analysed by means of a thermo-desorption advanced mercury analyser (AMA 254). Qualitative analysis of plankton was carried out in accordance with the procedure set out by Helcom Combine (2014). Macrobenthic organisms were identified to the highest possible taxonomic separation using the taxonomic keys of Bernatowicz and Wolny (1969), Braune and Guiry (2011), Barnes (1995) and Żmudzinsk, (1990).

Data records

Samples and environmental data were collected at three coastal stations: Chałupy (54 44 20.605 N, 018 33 54.912 E), Osłonino (54 40 06.516 N, 018 27 58.377 E) and Gdynia (54 29 18.740 N, 018 34 06.401 E). Analyses were conducted at the University of Gdańsk, Gdynia, Poland. The tables are in .xlsx format.

Data quality

All chemical measurements were controlled by analysis of reference materials within the certified ranges. The dataset is accessible and is publicly and freely available for any research or educational purposes.

Data availability

Dataset DOI
10.34808/5pe0-g310

Dataset License
CC-BY-NC

Acknowledgements
This study was performed within the framework of the National Science Centre project No. 2011/01/B/ST10/07697.

References

Barnes, R. S., (1995) '*The Brackish-water Fauna of Northwestern Europe*', Cambridge University Press, p. 304.

Bełdowska, M. et al. (2015) 'Macrophyta as a vector of contemporary and historical mercury from the marine environment to the trophic web', *Environmental Science and Pollution Research,* 22, pp. 5228–5240. DOI: 10.1007/s11356-014-4003-4.

Bełdowska, M. et al. (2016) 'The influence of cold season warming on the mercury pool in coastal benthic organisms', *Estuarine, Coastal and Shelf Science*, 171, pp. 99–105. DOI:10.1016/j.ecss.2016.01.033.

Bełdowska, M. and Kobos, J. (2016) 'Mercury concentration in phytoplankton in response to warming of an autumn – winter season', *Environmental Pollution,* 215, pp. 38–47; DOI: 10.1016/j.envpol.2016.05.002.

Bełdowski, J. et al. (2018) 'Seasonal changes of mercury speciation in the coastal sediments', *Journal of Soils and Sediments,* 18, pp. 3424–3436. DOI: 10.1007/s11368-018-1993-4.

Bernatowicz, S. and Wolny, P. (1969) '*Fishing Botany*', National Agricultural and Forestry Publisher, Warszawa (in Polish).

Braune, W. and Guiry, M. D. (2011) '*Seaweeds. A Colour Guide to Common Benthic Green*','Brown and Red Algae of the World's Oceans' Koeltz Scientific Books, Koenigstein.

HELCOM COMBINE (2014) Part C. 'Programme for monitoring of eutrophication and its effects. Annex C-6: Guidelines concerning phytoplankton species composition, abundance and biomass'.

Żmudzinski, L. (1990) '*The Fauna of the Baltic Sea*', Atlas Macrofauna, Wydawnictwo Szkolne i Pedagogiczne, Warszawa, p. 196 (in Polish).