15th International Conference on Heavy Metals in the Environment,19-23 September 2010, Gdansk, Poland

Trace Metal Concentrations in Antarctic Benthic Polychaetes

J. Hans, C. Jöst, G.-P. Zauke
Carl von Ossietzky Universität Oldenburg, ICBM, 26111 Oldenburg, Germany
e-mail: gerd.p.zauke@uni-oldenburg.de

INTRODUCTION

Marine organisms accumulate trace metals from the bioavailable fraction of food and water. Formerly the Antarctic environment was considered to be unpolluted and accumulations of toxic elements were expected to be at a physiological level. In order to differentiate human impact from natural variability, knowledge of background concentrations of metals and their fluctuations in biomonitor organisms is essential [1, 2].

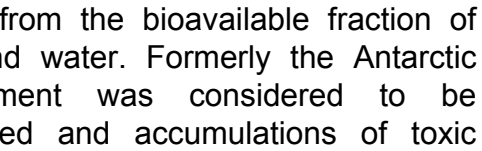
Since information on trace metals in polychaetes is almost completely lacking, the main goal of the present study is to provide preliminary data on trace-metal concentrations in polychaetes from the Weddell Sea and to derive some initial, tentative ideas on possible accumulation strategies.

MATERIAL & METHODS

- Sampling: “Polarstern” cruise ANT XXI/2; Weddell Sea; November and December 2003; 21 stations north of Kapp Norvegia and 4 stations west of Drescher Inlet at the Riiser-Larsen Ice Shelf.
- Metal determinations (Cd, Cu, Ni and Pb): Varian SpectrAA 300 with deuterium background correction and a GTA 96 graphite tube atomiser; Zn determinations: air–acetylene flame SpectrAA-30 with deuterium background correction; manual micro-injection method (100 µl sample volume).
- QA: certified reference materials (TORT-2 "*Lobster hepatopancreas*" and CRM 278 "Mussel tissue"); analysed values were in most cases in good agreement with the certified values.

RESULTS

- Metal concentrations are shown in Figs. 1-4 (median values and upper quantiles due to small sample sizes).
- A substantial intraspecific variability for all trace metals is obvious with sole exception of Pb (values not shown because below or close to limit of detection; <1 mg kg^{-1} DW for all samples analysed).



Harmothoe spinosa

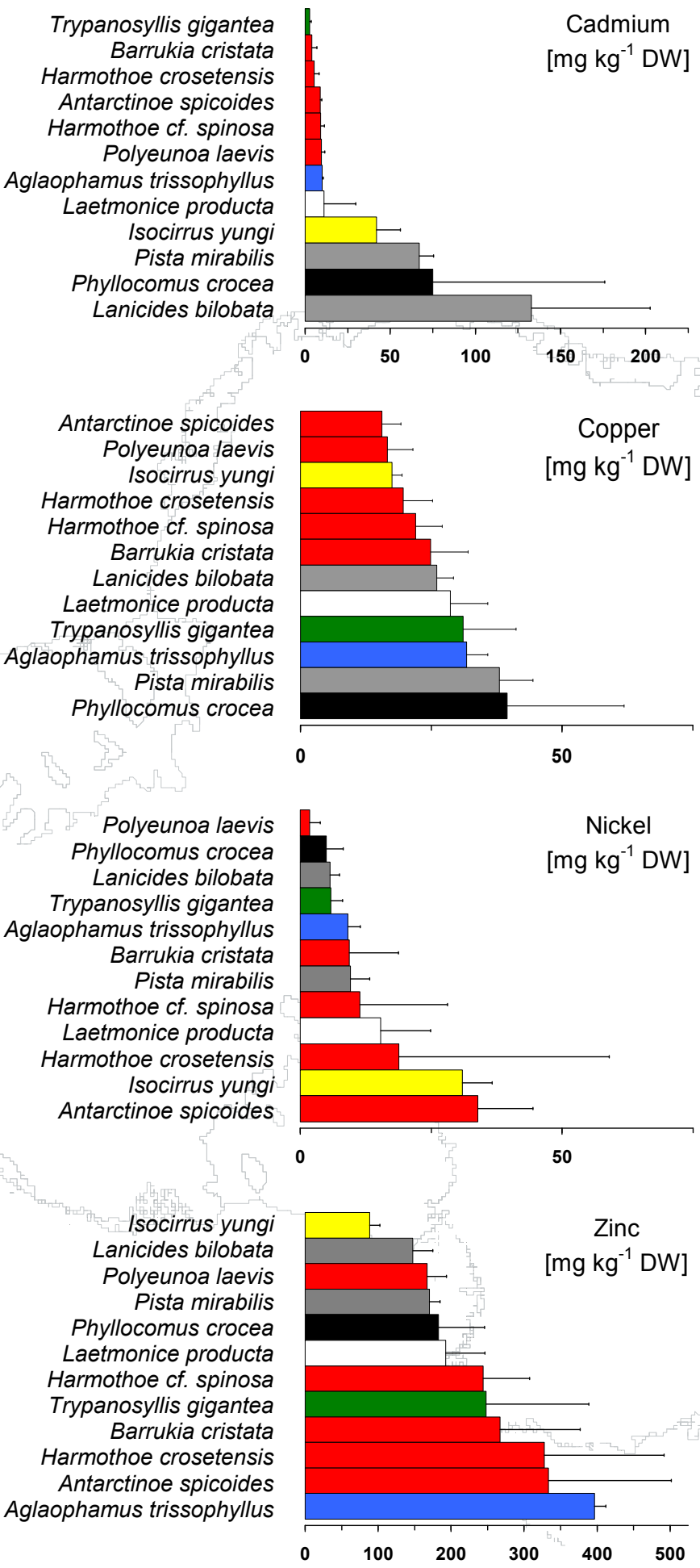


Fig. 1- 4:

Median metal concentrations in Antarctic polychaetes from the Weddell Sea. Black bars indicate upper quantiles.

Family codes: black = Ampharitidae, white = Aphroditidae, blue = Nephtyidae, yellow = Maldanidae, red = Polynoidae, green = Syllidae, grey = Terebellidae.

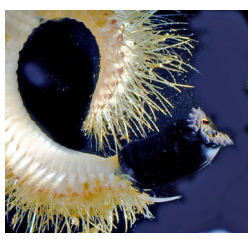
Laetmonice producta

DISCUSSION

- Pb: Most concentrations were low similar to other studies also indicating a low bioavailability of this element [2, 4].
- Cd: Investigated polychaetes show a similar range compared to data reported for pantopods collected on the same "Polarstern" cruise [2], but higher concentrations compared to polychaetes from the German Wadden Sea [4].
- Cu: Concentrations in our samples were in good agreement with data found for polychaetes from the German Wadden Sea [4], probably due to regulation mechanisms.
- Ni: Variability of this element was higher than in polychaetes from the German Wadden Sea [4], indicating increased concentrations in Antarctic polychaetes.
- Zn: Concentrations in polychaetes from this study substantially exceed the worldwide reported range for crustaceans suggesting that this element might be unregulated in polychaetes in contrast to crustaceans [3].

In summary, our study provides first information of heavy metal concentrations in polychaetes from the Weddell Sea as well as further evidence for the frequently reported “Cd anomaly” in Antarctic invertebrates [1]. Pb concentrations below 1.0 mg kg^{-1} DW might serve as a regional or even global background value. Furthermore, the enormous heterogeneity of Ni and Zn found in many Antarctic polychaete species suggest different metabolic demands for these essential elements.

Because of the ecological importance of polychaetes, these possibilities should be investigated in more detail in future studies involving, e.g. investigations on the intracellular sequestration of these elements.



Harmothoe crosetensis

REFERENCES: [1] *Bargagli R, Nelli L, Ancora S, Focardi S.* Polar Biol 1996; 16: 513-520; [2] *Jöst C, Zauke G-P.* Mar Pollut Bull 2008; 56: 1396-1399; [3] *Keil S, De Broyer C, Zauke G-P.* Int Rev Hydrobiol 2008; 93: 106-126; [4] *Zauke G-P, Bernds D, Janßen H-J, Clason B, Meurs H-G.* Ber Forschungsstelle Küste Norderney 1995; 40: 23-37.