

EFFECT OF INDIVIDUALS' SIZE ON THE CONCENTRATION OF HEAVY METALS IN THE GASTROPOD *PHORCUS TURBINATUS* (BORN 1778)

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Abstract

This work is an estimation of the variation in the rate of five heavy metals (zinc; copper; cadmium; lead and mercury) in the individuals of *Phorcus turbinatus* species based on organisms' size and season. The results revealed that Kelibia station is more contaminated with lead than La Goulette station. This could be related to the nature of lead-rich discharges at this level. The increased of zinc and cadmium levels, denoted in summer, appears to be related to the filling of saline warm water of heavy metals. The decrease in the metals' concentrations according to the sizes could be explained by biological dilution phenomenon.

Keywords: *Gastropods, Ecotoxicology, Zinc, Tunisian Plateau*

Introduction

The increasing marine pollution, of anthropic origin, requires continuous control strategies in some benthic organisms. *P. turbinatus* (Born 1778) is a bio-indicator species which has been subject of several metallic pollution assessment works. However, no study has focused on the effect of organisms' size on the heavy metals concentrations. This deficiency of data led us to compare the concentrations of five heavy metals (Cd, Cu, Zn, Pb and Hg) belonging to three size classes of *P. turbinatus* individuals.

Material and methods

Three samples of 20 individuals each, belonging to three size classes were taken from two stations (La Goulette and Kelibia) during winter 2014 (cold season) and summer 2014 (warm season). The two selected stations are characterized by high metallic pollution. Indeed, La Goulette station represents a mooring area while Kelibia station has a large fishing harbor. The studied Size classes are: [<12.99 mm]; [13 mm - 19.99mm] and [>20 mm]. After drying and grinding, about 1 g of biological tissue was digested in a volume of HNO_3 and H_2O_2 [1]. Thereafter, concentrations of heavy metals (Cd, Cu, Zn, Pb and Hg) were estimated by atomic absorption spectrophotometry (mg / kg dry weight). The differences significance was tested by Kruskal-Wallis test.

Results

The comparison of the concentrations of analyzed metals (Tab. 1) revealed a significant difference in the lead rates between stations (higher in Kelibia). The contents of zinc and of cadmium increase significantly in summer in both stations. As for copper and mercury their concentrations were similar in the two stations and in both seasons.

Tab. 1. Kruskal-Wallis test to compare metal rates changes

	Between stations	Between seasons
Zn	p-value = 0.8880	p-value = 0.0090
Cu	p-value = 0.9554	p-value = 0.8076
Cd	p-value = 0.3031	p-value = 0.0054
Pb	p-value = 0.0103	p-value = 0.2197
Hg	p-value = 0.4809	p-value = 0.2634

The rates of the metals decline non-significantly with the increasing of the individuals' size (Fig. 1) (La Goulette winter p-value=0.878; La Goulette summer p-value=0.656; Kelibia winter p-value=0.714; Kelibia summer p-value=0.778).

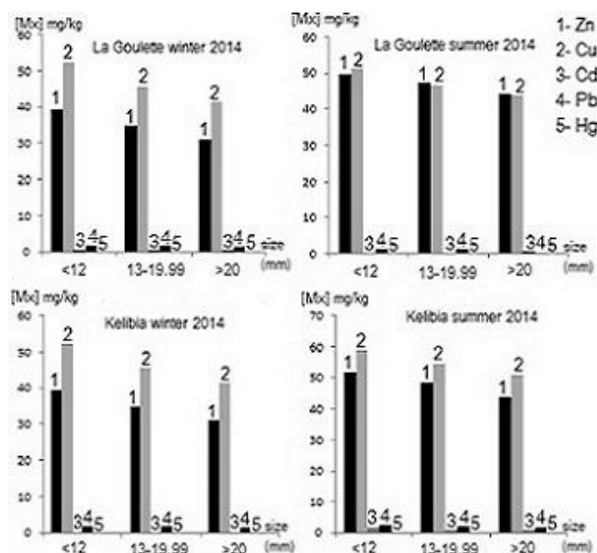


Fig. 1. Concentration of heavy metals according to size classes

Discussion and Conclusion

The results suggest that Kelibia station is more contaminated with lead than La Goulette. This seems to be related to the nature of lead-rich discharges of the fishing activity in the great harbor of Kelibia. The increasing of zinc and cadmium levels in warm period could be related to the evaporation and the filling of waters by salts and heavy metals that become more bio available for the organisms. Although the high level of metallic pollution in the two studied areas (fishing harbor / mooring area), a moderate decreasing in the metals' concentrations depending on size was observed. This seems to be linked to biological dilution phenomenon. Indeed, metals concentrations assimilated from the environment would be reduced in large-sized organisms.

References

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