Temporal Distribution of Heavy Metals in the Mussel Modiolus auriculatus at an Industrial Site on the Jordanian Coast of the Gulf of Aqaba; Indicator of the Seawater Environmental Quality

By

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ABSTRACT

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Concentrations of the five heavy metals (Cu, Zn, Ni, Pb and Cd) were measured in the whole soft tissue of the mussel *Modiolus auriculatus* transplanted at two sites on the Jordanian Coast of the Gulf of Aqaba; the Marine Science Station (MSS); a marine reserve area and the Industrial Area (IA), heavily occupied with industrial activities. The main aim of the study was to assess the seawater environmental quality at an Industrial Site with reference to the marine reserve. Transplanted mussels were sorted in two size subpopulations: small with shell length between 2.00-2.90 cm and large with shell length between 3.55-5.55 cm. Transplantation took place in February 2003 and sampling was carried out every two months starting April 2003 through to December 2003. Whole body soft tissue was digested in a mixture
of hot concentrated nitric and perchloric acids and metals were measured using atomic absorption spectrophotometry.

Metal concentrations in both mussel subpopulations were in the order: Zn>Pb>Cu>Ni>Cd. Copper, zinc and lead concentrations were significantly higher at the MSS. Nickel concentrations were significantly higher at the IA. Cadmium concentrations exhibited no significant difference between the two sites.

Net bioaccumulation of heavy metals was positive at both study sites and in both subpopulations. Maximum concentrations were recorded in fall and a high concentration peak appeared in August. Concentrations of some heavy metals exhibited a decrease between February and April. Small mussels exhibited higher metals concentrations than the large ones except for cadmium, which was below-detection limit in the small mussels. The ratio of maximum to minimum metal concentration was significantly higher in the large specimens, indicating higher net bioaccumulation. Also metal content (μg.individual⁻¹) was higher in the large mussels, suggesting that Modiolus auriculatus accumulate heavy metals during their entire life span, but large mussels exhibited lower metal concentrations due to biological dilution resulting from increased soft tissue weight.

Key Words: Metals, Mussels, Soft Tissue, Modiolus auriculatus, Aqaba, Bioaccumulation.