

## Spatial distribution of heavy metals (Zn, Cu, Pb, Co, Ni and Cd) in water and algae *Spirogyra* sp. in the southern Iranian coasts of the Caspian Sea

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### Abstract

Environmental pollution by heavy metals is one of the critical issues due to its toxic nature and persistent characters. Heavy metals in marine environments originate from both natural processes as well as anthropogenic activities. They are non-biodegradable, tending to rapidly accumulate in the environment and are able to reach toxic levels within a short span, while its removal is rather difficult or sometimes being impossible. Therefore, research on the heavy metals concentrations in marine ecosystems can help to protect human health and reduce the risks of heavy metal contaminations. In this study, in order to evaluate the concentrations of heavy metals (Zn, Cu, Pb, Co, Ni and Cd) in seawater and in algae, samples of water and algae (*Spirogyra* sp) samples from 12 stations in the southern Iranian coasts of the Caspian Sea were collected and analyzed in summer 2015. Voltammeter and atomic absorption spectroscopy techniques were used to analyze heavy metals in digested samples. The concentration of heavy metals in water and algae samples followed the order; Zn > Cu > Ni > Pb > Co > Cd. In water samples, the elements; Zn (18.38) and Cd (0.6) were found to be the highest in the western zone, Pb (3.09) and Cu (18.92) in the eastern coasts and Ni (6.93) and Co (2.36)  $\mu\text{g L}^{-1}$  in the central zone. While in algae samples; Zn (12.90), Co (0.21) and Cd (0.21) were the highest in central zone, the highest Ni (0.18) and Pb (0.14) was detected in western and Cu (0.27)  $\text{mg kg}^{-1}$  in the eastern coasts of the Caspian Sea. The results from metal concentrations in seawater also showed that lower than the standard limit of World Health Organization (WHO) and metals Zn, Pb and Cu were higher than Russian system of chemicals management standards (RSCM) as well as the State Environmental Protection and Administration of China (SEPA). Heavy metal bioaccumulation factor (BAF) in *Spirogyra* sp followed by Zn (1150) > Co (163) > Pb (44) > Cu (36) > Cd (33) > Ni (27) which indicates the ability of algae for high adsorption levels of heavy metals. The Caspian coast is polluted with zinc, copper and lead metals. Most of this pollution is due to the presence of agricultural, industrial, and household waste.

**Keywords:** Caspian Sea, Heavy metals, Water pollution, Algae *Spirogyra* sp.