Study of trace metals during estuarine mixing of Jarahi River water with the Musa Estuary water

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Abstract

Flocculation of metals is one of the most important estuarine processes that occur due to the mixing of seawater and river water and colloidal metals undergo this process come in the form of flocculants. Due to the important role of flocculation process in producing suitable food sources for aquatic organisms and reducing the amount of input pollution into aquatic environments, the present study examines the mechanism of heavy metals flocculation in the estuary of the Jarahi River. In the present research, flocculation of dissolved Cd, Ni, Zn, Pb and Mn in the 5 aquariums with salinities ranging from 1 to 3‰ during laboratory mixing of Jarahi River water with the Musa Estuary water (2017) was studied for the first time in 2017. After preparation of samples, the concentrations of elements were measured by ICP. Cluster analysis, a statistical method, was used to determine the effect of chemical and physical parameters of estuarine environment on the flocculation process. The average final flocculation rates of metals are in the following order: Cd (94.9%) > Zn (85.5%) >Pb (58%) >Ni (19%) >Mn (11%). The highest flocculation of metals occurred between salinities of 1 to 2%. Due to the flocculation of trace metals during the estuarine mixing, about on average 64.7, 65.8, 231.7, 52 and 61.4 ton/year of Cd, Ni, Zn, Pb and Mn, respectively, were removed from the river water. Statistical analysis showed that the flocculation rates of Ni, Zn, Pb and Mn are controlled by the same factor. Moreover, it was found that all the investigated parameters (electrical conductivity, salinity, potential reduction, sulfate, chloride and pH) control the flocculation of cadmium but do not play any role in the flocculation of other studied metals (Ni, Zn, Pb and Mn).

Keywords: Musa Estuary, flocculation, heavy metals, estuarine mixing, Jarahi River.