

HEAVY METALS DYNAMICS IN SEGARA ANAKAN ESTUARINE ECOSYSTEM

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Segara Anakan is a tropical lagoon estuary, located in the south coast of Java, Indonesia, which plays a critical role in the productivity of the coastal waters. Due to sedimentation, however, its supporting capacity function as nurseries for the rich fisheries resource within its boundaries was reduced due to the reduction of its size of both area and depth, especially after the volcanic eruption of Galunggung in 1981. This work includes studies on the distribution of heavy metals trapped and transported by the sediments into the estuarine ecosystems, in both abiotic and biotic; in a period of July 2003 to May 2004.

In this work, many different spatial samples were used, including surface waters, top 5 cm sediment layers, sedentary bivalves *Geloina* sp, and migratory fish *Mugil* sp., samples simultaneously collected at low tide in three months intervals, and hair samples of local residence were taken at the end of the study. The total concentrations of heavy metals were quantitatively evaluated for Cu, Zn, Cd employing flame AAS, and Hg using cold vapor generation AAS. Their distribution coefficients of abiotic ecosystem and their bioaccumulation factors were compared to sorption constants obtained from simulated sediment - seawater and sediment - brackish water (seawater : freshwater = 1 : 1) systems.

The results showed that the total concentrations of metals obtained in sediments of different sources were differ significantly. Moreover, it was observed that in the sediment samples, the Cu and Zn concentrations decreases with time, the Hg concentration decreases with salinity, and no Cd was detected. These trends were in agreement with their sorption-desorption characteristics. The sorption data obtained

experimentally were fit well to the Langmuir model for adsorption isotherm. It was found that the Cu and Zn sorption constants in brackish water were significantly higher than in seawater. On the contrary, the sorption constant in brackish water for Cd and Hg were lower than in seawater. This indicates that there are different types of interactions between the sediments and the metals studied, suggesting Cu and Zn exist as aquo complexes, and Cd and Hg as chloro complexes.

Except for Cd, similar trends in sediment were observed for Zn and Hg in *Geloina* sp and *Mugil* sp. Furthermore, it was also observed that the metal concentrations in *Mugil* sp were lower than in *Geloina* sp. Since their metal concentration ratios to sediment were similar, it suggests that the route of metal bioaccumulation in *Geloina* sp. and *Mugil* sp. were dominated by the sediment intake, which is confirmed by the Hg and Cd concentrations found in local human hair samples.

Key words: dynamics, heavy metal, sorption-desorption, bioaccumulation.