LEVELS OF HEAVY METALS IN BIVALVES, SEDIMENT, AND SEA WATER AT THE NORTH COAST OF MOUNT MURIA, JAVA.

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ABSTRACT

Mercury was not detected in *Anadara granosa*, *Anadara inflata*, *Crassostrea* sp., sediment, and sea water collected at the north coast of Mount Muria, Java, Indonesia. Pb, Cd, Cu and Zn were found in low concentrations in the same material, indicating that there is no pollution with heavy metals in that area.

INTRODUCTION

At low concentrations, heavy metals serve as micronutrients which are needed by living organisms, *e.g.*, Zn and Cu (Waldichuk 1974) while other metals have no known function, *e.g.*, Hg, Pb, and Cd (Laws 1981). At high concentrations, all heavy metals constitute an environmental problem. Heavy metals can be concentrated via the food chain and accumulate in benthic fauna, such as bivalves which, consequently, may be dangerous to consume. The bivalves *Anadara granosa*, *Anadara inflata,* and *Crassostrea* sp. are consumed by the coastal community around the study area.
We have measured concentrations of selected heavy metals in bivalves, and compared these values with sediment and sea water from the habitat. The aim was to estimate if bivalves indicate pollution with heavy metals on the north coast of Mount Muria.

MATERIALS AND METHODS

Samples of bivalves, sea water, and sediment were collected from three stations referred to as Station I (Bringin-Balong), Station II (Metawar-Benteng Portugis), and station III (Banyutawa).
Anadara granosa was encountered at station I, II and III, *Crassostrea* sp. at Station I and II, and *Anadara inflata* only at station III. The shell length of *Anadara granosa* ranged from 17.4-36.6 mm, *Anadara inflata* from 21.1-36.9 mm, and *Crassostrea* sp. from 17.0-39.3 mm.
Cockles and oyster were kept in sea water with aeration for 12 hrs. Next, they were stored in a freezer until analysis. Heavy metals were measured by Flameless Atomic Absorption Spectrophotometer (standard procedure) at the Industrial Research and Development Laboratory (BPPI), Semarang.

RESULTS AND DISCUSSION

Concentrations of **Zn**: in bivalves 0.308-5.719 µg/g; in sediment 0.091-0.447 µg/g; in sea water 0.016-0.021 ppm.
Concentrations of **Cu**: in bivalves 0.129-4.974 µg/g; in sediment 0.192-0.512 µg/g; in sea water 0.012-0.019 ppm.
Concentrations of **Pb**: in bivalves 0.558-6.052 µg/g; in sediment 0-0.243 µg/g; in sea water 0-0.005 ppm.
Concentrations of **Cd**: in bivalves 0.063-0.543 µg/g; in sediment 0.031-0.175 µ/g; in sea water 0.003-0.012 ppm.

The average concentrations of heavy metals are shown in Fig. 1a-d.

Hg was not detected in bivalves, sediment or sea water from the study area. Razak (1986) suggested that the content of Hg in water is affected by industrial waste and runoff from farming areas. The north coast of Mount Muria does not have such activities. This is probably the reason why Hg could not be detected.
The content of Zn, Cu, Pb and Cd was higher in *Crassostrea* sp., than in the cockles *Anadara granosa* and *Anadara inflata*. This difference may be related to specific differences in the efficiency of kidneys; the cockles being the more efficient. Cooper and Langlois (1982) found that mussels have a more efficient kidney than oysters, influencing the half-life of the metals in these bivalves.

Laws (1981) found that the concentration of Pb in surface water is influenced by human activity. Supriharyono *et al.* (1980) emphasized that Cd is released to water from ceramic, plastic, textile, paint, and other industries. Razak (1986) pointed out that high concentrations of Zn and Pb can be caused by volcanic activity. Mount Muria has been an active volcano, but it is a long time ago. However, sea water had high concentrations of Zn which could be related to volcanic activity. The concentrations of Pb were low in sediment and sea water, but bivalves obviously accumulated lead from the environment. Bivalves also accumulated Cu, resulting in higher values than found in sediment and sea water.

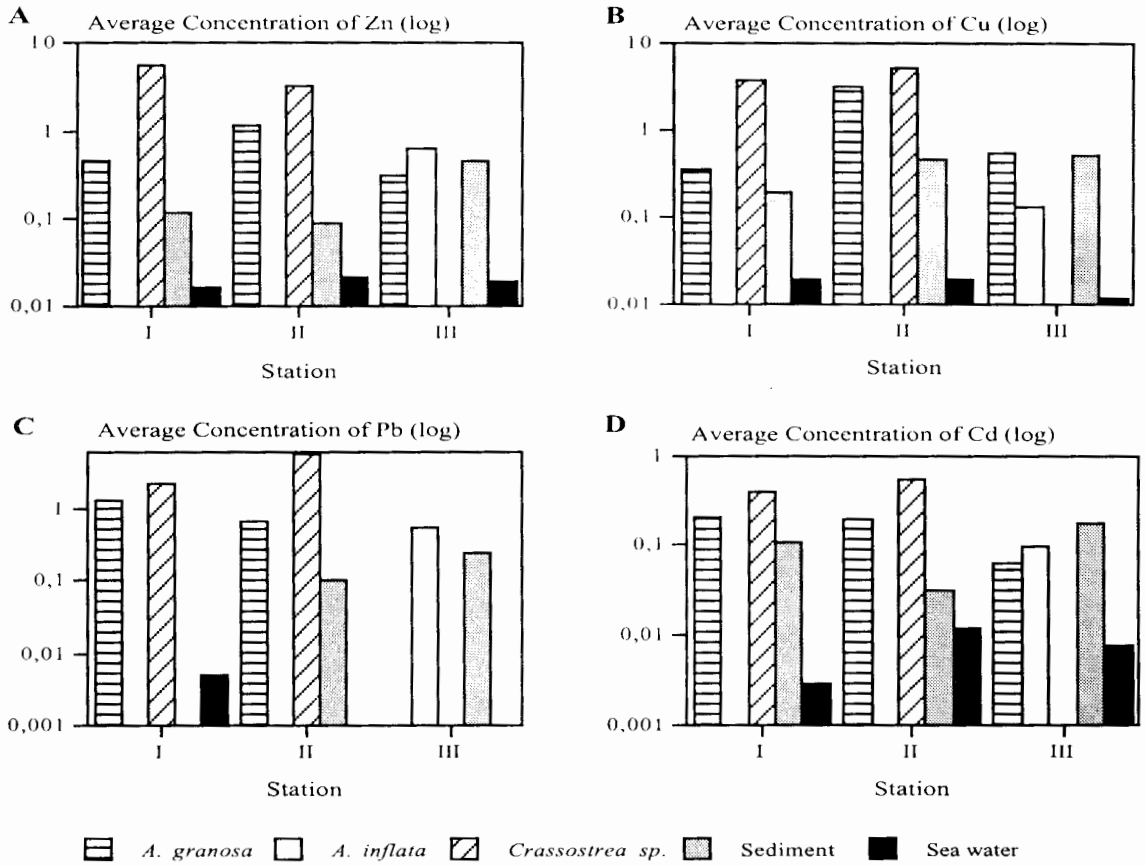

Figure 1. The average concentration (log_{10}) of **A**: Zn; **B**: Cu; **C**: Pb; and **D**: Cd in Bivalves (µg/g), sediment (µg/g), and sea water (ppm) at station I, II, III.

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