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THE EFFECTS OF SOME HEAVY METAL POLLUTANTS ON THE HEART BEAT OF GAMMARUS PULEX (L.) *)

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Heavy metal salts either singly or in combination constitute an important form of water pollution. Pollution from heavy metals comes from a variety of sources, including among others sewage, agriculture, and industrial wastes. Pollution is brought about by the release into water of metals at a concentration from several times to several orders of magnitude above normal background levels. Highly toxic metals include mercury, cadmium, lead, copper, and zinc. These constitute severe hazards because they may be cumulative in the biota and are passed up the food chain to higher trophic levels. On release into water they can be absorbed into the benthic communities and the sediments, causing severe problems. On particles and sediments, they can be concentrated up to 10^4 to 10^5 times their free water concentrations and are not decomposed as some chemical pollutants are, but they may be suspended and liberated upon disturbance.

The toxicity of heavy metals and their toxic action to fish have been extensively documented (see reviews of Doudoroff & Katz, 1953; Hynes, 1960; Jones, 1964; and Battelle Columbus Laboratories, Water Quality Criteria Data Book 3, 1971). However, information regarding the biological effects of heavy metal salts on other animals, especially crustaceans, is meagre compared to fish.

Gammarus pulex (L.) is a benthic inhabitant of clear running waters in the temperate regions and forms an important item in the food of fishes. Already the effects of several metallic salts and their toxic action on *Gammarus pulex* are well known (Jones, 1937). Costa (1966) studied the reaction behaviour of *Gammarus pulex* to several heavy metals and showed that they displayed mostly negative responses depending on the concentration levels, and that their tendency to produce an avoidance reaction decreased in the following order: mercury, copper, lead, and zinc.

The heavy metal solutions could bring about physiological stress on the animals which could become lethal depending on the concentration levels. In the present series of experiments, the pulsation rate of the heart was employed as a criterion to study the biological consequences of various concentrations of a few heavy metal salts of zinc, lead, copper, and mercury.