Accumulation of Mercury in a marine food web of the Mediterranean

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High levels of mercury in some marine organisms from the Mediterranean have been explained by accumulation processes in the food chain (Buffoni at al., 1982).

Aim of this research is to investigate the mechanism of bioamplification of mercury in a marine food chain. This is a crucial step towards understanding the biogeochemical cycle of mercury in the marine ecosystem.

The characterization of a food chain in the Mediterranean is a difficult task due to the great number of species and to the lack of specialization in predation. The food web of the Red Shrimp has been studied in detail (Relini Orsi and Wurtz, 1977) and several species of this food chain (*Meganycthiphanes norvegica, Gennadas elegans, Pasiphaea sivado, Pasiphaea multidentata, Aristeus antennatus*) have been chosen as representing increasing trophic levels even if a strict distinction is not possible.

The presence in the environment of different chemical forms of mercury with different chemical behavior makes necessary to examine the distribution of the different chemical species separately. All samples have been thus analyzed for the total mercury content and for organic mercury content. Inorganic mercury is obtained as difference between total mercury and organic mercury.

Sampling and classification of specimens have been realized with the help of Prof. L. Relini Orsi and Prof. G. Relini of the Department of Zoology (university of Genova). All samples have been stored deep-frozen until the analysis was performed.

Samples have been freeze-dried before analysis to calculate the fresh weight/dry weight ratio without any loss of sample and to help its homogeneisation.

Organic mercury determination was carried out on an aliquot of the dried samples by graphite furnace atomic absorption spectrometry (GFAAS) after extraction in toluene and back-extraction in 0.01M sodium thiosulfate solution. The sensitivity of the method was 0.007 µg/g dry weight.

Total mercury was determined on the residual sample, after mineralization by nitric acid, by cold vapor atomic absorption spectrometry with gold amalgamation preconcentration (Au-CVAAS). The sensitivity of the method was 0.003 µg/g dry weight.

Accuracy of the whole procedure was tested as follows: (a) no loss of mercury occurs during freeze-drying process (personal communication), (b) organic mercury determination has been compared to other laboratories, and (c) total mercury determination has been checked with standard reference materials.

Results obtained are summarized in Figure 1, where the distributions of the logarithms of the concentrations found for inorganic and organic mercury are compared. Even if the distributions in the various species are overlapping, a noticeable increase in mercury (both inorganic and organic) can be detected. Along the trophic chain the accumulation of organic mercury is more marked than those of inorganic mercury.

The trophic chain proposed is a rough simplification of the natural processes, however the accumulation of mercury can be clearly seen.

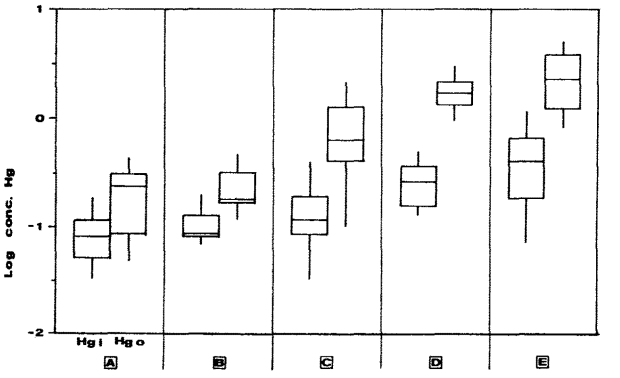

Figure 1. Box and whiskers plots of the concentrations of inorganic and organic mercury (as µg/g dry weight) of the selected species. On the vertical axis is reported the common logarithm of the concentrations. [A] *Meganycthiphanes norvegica*, [B] *Gennadas elegans*, [C] *Pasiphaea sivado*, [D] *Pasiphaea multidentata*, [E] *Aristeus antennatus*.

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