

Mercury and Lead Concentrations in Some Species of Fish from the Tuscan Coasts (Italy)

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The knowledge of the contamination of fish tissues by toxic elements provides informations such as 1) safety of fish as food (CAVIGLIA & CUGURRA 1978), 2) type and degree of aquatic pollution and 3) size of toxicological risk for fish survival (REICH et al. 1974, BRUCE et al. 1977). We report in this paper on the chemical findings of Pb and Hg concentrations in some tissues of marine fishes caught near the Tuscan coasts (Italy) during spring and summer of 1977.

MATERIALS AND METHODS

The species sampled for chemical analysis were those marketed as "frittura mista" (mixed fried fish), namely Mugilidae, Cupleidae, Mullidae, Sparidae, Scomberidae, Triglidae, Pleuronocidae, Anguillidae and Gobiidae.

These fishes were at most 10 cm in length. The specimens were fished with trawls at different spots in the shallow coastal water in the neighbourhood of La Spezia and Livorno.

Composite samples obtained by mixing homogeneous specimen samples taken from individual fishes (for each size and for each catch) were analysed for lead and mercury.

Homogenated composite samples of muscle (fillet free from skin, scales and bones), liver and kidney were wet digested by the method of PEARCE et al. 1976. The acid digests were analysed by Flameless Atomic Absorption. All reagents were analytical grade. Thoroughly cleaned glassware was tested with dithizone.

The results quoted in table 1 are expressed as ug/g on wet weight basis.

RESULTS AND DISCUSSION

The whole data show that both mercury and lead are consistently present in composite samples corresponding to the various fishing locations.

The maximum absolute values are reached by both metals in the same samples. The maximum relative values have been measured for mercury.

As a comment on the magnitude of measured values, we observe that they are similar to those determined by previous measurements in the Tyrrhenian sea and elsewhere (REIMER et al. 1975, BERNHARD & ZATTERA 1975, BROWN & CHOW 1977, CAVIGLIA & CUGURRA 1978).

TABLE 1

Hg and Pb levels in fish samples expressed as ug/g on wet weight basis

Samples	Mercury			Lead		
	Muscle	Liver	Kidney	Muscle	Liver	Kidney
1	-	0.31	0.12	-	0.12	0.39
2	0.10	0.12	1.03	0.16	0.10	0.12
3	-	0.37	0.11	-	0.13	0.22
4	0.64	0.80	0.25	0.50	0.14	0.10
5	0.70	0.57	0.86	0.16	0.11	0.14
6	0.31	0.40	0.01	0.15	0.11	0.10
7	0.53	0.66	0.52	0.52	0.13	0.13
8	0.01	0.22	0.01	0.13	0.18	0.20
9	0.57	0.29	0.49	0.17	0.25	0.10
10	0.29	0.53	1.26	0.10	0.16	0.13
11	0.27	1.21	5.43	0.36	0.10	0.10
12	0.13	0.26	0.01	0.19	0.10	0.11
13	0.27	0.01	1.31	0.11	0.41	0.10
14	0.14	0.21	0.24	0.20	0.27	0.42
15	0.14	0.50	0.41	0.34	0.18	0.29
16	0.17	0.27	0.53	0.12	0.22	0.10
17	0.18	0.18	0.38	0.16	0.30	0.39

From a hygienic sanitary point of view, only the samples 4 and 5 (see table 1) show higher Hg levels than the limits determined by the Italian law. However, one should take into account that for small-size fish the viscera are often not fully or not all removed, such that the kidney remains in the eatable part. It might therefore be advisable to establish a different control procedure for the small-size fishes that traditionally are eaten after a partial removal of the viscera. This is also true for those commercial mixture of small-size fish in which one cannot distinguish between truly small fishes and not grown-up fishes.

As far as the pollution level and the pollution origin are concerned we feel that indeed one is dealing with a not-negligible spread-out pollution. This would check with the observation of sizable levels of other pollutants (VANNUCCHI et al, 1978) in seagulls from the same areas. We cannot exclude that the same pollutants were also present (although at very low levels) in our fish samples. In fact it is well known that the seagulls close a food chain which contains fish as an essential part. On the other hand, it is in general not possible to trace back to a unique origin pollutions as the ones being considered, in particular when the fishing areas are adjacent to densely populated coasts and in presence of random displacements of large volumes of water.

An estimate of the danger for the examined species should take into account many other parameters of marine eco-system and is therefore difficult. On the other hand, the first effects of a spread-out pollution, even if it is of very low level, are biochemical alterations. These in turn depend not only on the amount of toxicants but also on the detoxification ability of the various individuals, on their age, species etc., as well as on the combined and synergistic action at subcritical levels of many pollutants.

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