

Trace metals in three species of Fish of the Mullidae Family from the Mediterranean Coast, Israel

Hava HORNUNG and Nurit KRESS

National Institute of Oceanography, Israel Oceanographic and Limnological Research Tel-Shikmona, P.O.B. 8030, Haifa 31080 (Israel)

The Mullidae family is common throughout the Mediterranean. *Mullus barbatus* and *Mullus surmuletus* are Atlantic-Mediterranean species, and *Upeneus moluccensis* is of Red Sea origin (BEN-TUVIA, 1971). These fish inhabit sandy and muddy sea beds, and their prey's habitat is benthic.

To establish a baseline of the existing levels of trace elements (Hg, Cd, Pb, Cu, Zn, Fe) in these commercially important species, their muscle tissue and inner organs were analyzed. Specimens were obtained from trawl catches along the coastline at depths between 10-100 m. Specimens of *Mullus barbatus* (484 specimens; 40 composite samples included 318 fish and 166 individuals), 222 specimens of *Upeneus moluccensis* (18 composite samples included 136 and 56 individuals) and 70 individual specimens of *Mullus surmuletus* were used in this study.

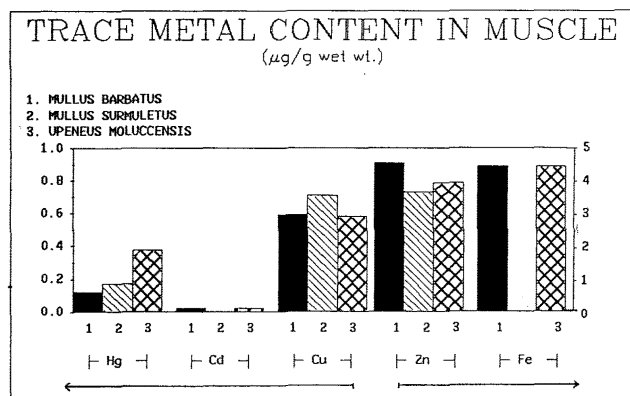
The highest values of total mercury were recorded for *U. moluccensis*, which is known to accumulate higher mercury levels in its muscle than the other Mullidae species, *M. barbatus* and *M. surmuletus*, even though they inhabit similar areas and feed on the same food items. However, levels were low in most cases (see table) and typical for these species, when compared to other areas in the Mediterranean (UNEP, 1986). Mercury content in the muscle correlated significantly with the weight of the fish for *U. moluccensis* ($r = 0.801$), but for *M. barbatus* and *M. surmuletus*, the relationship was poor ($r = 0.28$ and 0.27 , respectively). The highest levels were detected in the liver ($0.12-0.62 \mu\text{g g}^{-1}$) followed by the kidneys ($0.089-0.56 \mu\text{g g}^{-1}$) and the heart (undetectable to $0.28 \mu\text{g g}^{-1}$). Low, undetectable values of mercury were found in the gills, spine, gonads and intestines in all three mullets.

Cadmium levels in the muscle tissue were consistently low and ranged from undetectable to $0.11 \mu\text{g g}^{-1}$, with most values below the approximate detection limit of $0.030 \mu\text{g g}^{-1}$ (see table).

Ranges, averages and standard deviation of trace metal concentrations ($\mu\text{g g}^{-1}$ wet wt.) in muscle tissue of *Mullus barbatus*, *Mullus surmuletus* and *Upeneus moluccensis* (lead was undetectable).

Species	Year	Hg	Cd	Cu	Zn	Fe
<i>Mullus barbatus</i>	1975-	0.035-0.475	0.007-0.114	0.18-1.29	1.94-10.0	--
	1980a	0.122 ± 0.08	0.026 ± 0.02	0.60 ± 0.32	4.41 ± 1.8	
	1984-	0.008-0.313	BDL-0.093	0.20-1.39	3.01-6.14	1.89-7.72
	1989b	0.108 ± 0.06	0.026 ± 0.02	0.57 ± 0.29	4.66 ± 0.77	4.45 ± 1.44
<i>Mullus surmuletus</i>	1975-	0.069-0.316	0.005-0.026	0.35-0.66	2.90-3.76	--
	1980a	0.170 ± 0.05	0.016 ± 0.01	0.50 ± 0.22	3.33 ± 0.61	
	1984-	0.092-0.164	BDL	0.71-1.12	3.07-4.98	--
	1989b	0.135 ± 0.02		0.88 ± 0.15	4.04 ± 0.59	
<i>Upeneus moluccensis</i>	1975-	0.095-1.02	0.002-0.08	0.10-1.34	2.14-7.60	--
	1980a	0.412 ± 0.18	0.04 ± 0.02	0.52 ± 0.36	3.86 ± 1.07	
	1984-	0.005-1.12	BDL-0.048	0.20-1.35	2.75-5.96	2.48-7.01
	1989b	0.240 ± 0.18	0.006 ± 0.01	0.64 ± 0.30	4.04 ± 0.68	4.43 ± 1.03

- a MED POL - Phase I.
b MED POL - Phase II.
c Below detection limit.



The levels of lead were generally below the detection limit of this element and therefore were not recorded.

Copper, zinc and iron are distributed uniformly in the muscle tissue in these species (Fig. 1). The highest values were recorded in the livers and in the food content associated with the feeding habits of these fish.

A comparison of the data for the years 1975-1980 and 1984-1989 shows no differences in the metal content of the muscle tissue in these species. Moreover, there are no significant differences in the values among the three species studied, even though they were collected from different locations along the coast.

This study is part of a comprehensive study on mercury in *M. barbatus* carried out within the framework of the MED POL Phase I and II program and was partly supported by the Mediterranean Trust Fund.

All given values are expressed as $\mu\text{g g}^{-1}$ wet weight.

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