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Note

Concentration of lead and cadmium in some edible fishes from Tuticorin

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Abstract

Concentration of lead and cadmium in ten commercially important fishes was estimated using Flame Atomic Absorption Spectrophotometer. Lead was present in about 80% of the total stomach samples whereas cadmium was present only in detectable level in the gills (0.465 mg/kg) of *Catla catla*. The concentration of lead was high in the stomach tissue of *Oreochromis mossambicus* (0.420 mg/kg) and very low in *Sphyraena barracuda* (0.003 mg/kg). In the gills, the highest concentration of Pb was found in *Leiognathus splendens* (0.549 mg/kg) and the lowest in *Mugil cephalus* (0.006 mg/kg). The highest concentration of Pb in the muscle was recorded in *O. mossambicus* (0.252 mg/kg) and the lowest in *S. barracuda* (0.004 mg/kg). The concentrations of Pb and Cd were within the FAO recommended maximum permissible limit for food fish.

Many fish species are top predators in aquatic food webs and are therefore susceptible to bioaccumulation of toxic contaminants (Bervoets, *et al*; 2001). In such condition, high concentrations of metals in fish may present a health risk to human beings if consumed in large quantities. The present study was aimed at analyzing the concentration of toxic heavy metals, namely, lead (Pb) and cadmium (Cd) in some of the commonly available edible fishes.

Materials and methods

Three samples each of ten species of commonly available edible fishes (*Leiognathus splendens*, *Scomberomorus sp*., *Sphyraena barracuda, Oreochromis mossambicus*, *Catla catla, Platycephalus indicus, Epinephelus* sp., *Scatophagus* sp., *Sillago sihama* and *Mugil cephalus*) were collected from the market and landing centre at Tuticorin, Tamilnadu during December 2006 - January 2007. The brackishwater fishes were collected from the market and the marine fishes from the landing centre. The fishes were washed with sterile distilled water and dissected in hygienic environment. Stomach, gills and muscle were collected and washed thoroughly with acetone and then with distilled water. The washed tissues were transferred into clean, acid washed glass plates and dried in hot air oven at 70°C for two days. One gram of tissue sample was weighed and digested with 10 ml of nitric acid - perchloric acid (3:1) overnight at room temperature followed by keeping in boiling water in a water bath for one hour. The completely digested samples were allowed to cool to room temperature. After cooling, two m1 of hydrochloric acid was added to each sample. Finally, the samples were diluted to 50 m1 in a volumetric flask with de-ionised water and filtered through Whatman No.1 filter paper. All digested samples were analyzed in triplicate in Shimadzu-AA 6300 Atomic Absorption Spectrometer (AAS) with hollow cathode lamps (Table 1). The concentration of lead and cadmium was estimated by calibration curve method. The calibration standard solutions of 5, 10, 15, 20, 25 ppm were prepared from 1000 ppm AAS standard stock solutions. AAS was calibrated with standard solutions before measurement of each sample. The acid solutions made up with de-ionised water were used as blank. The homogenized samples (1g) were spiked with three different concentrations (Table 2) of heavy metals for the determination of recovery.

Table 1. *Method of analysis of trace elements by atomic absorption spectrophotometer*

Metals	Wavelength (nm)	Slit width (nm)	Lamp current (mA)	Fuel gas	Support gas
Pb	283.3	1.0	10	Acetylene	Air
Cd	228.8	0.7	9	Acetylene	Air

Results and Discussion

The results of spiked concentration analysis of standard showed good recovery with an average of above 94% for both Pb and Cd (Table 2). The concentrations of Pb detected in different tissues are given in Table 3.

Concentration of lead: Lead was present in 80% of the stomach samples. The concentration was below the detection limit (bdl) in *Leiognathus splendens* and *Scomberomorus* sp. High concentrations of Pb was detected in the following four species: *Oreochromis mossambicus* (0.420 mg/kg), *Catla catla* (0.350 mg/kg), *Platycephalus indicus* (0.374 mg/kg) and *Epinephelus* sp. (0.121 mg/kg). The remaining samples *Sphyraena barracuda, Scomberomorus* sp., *Sillago sihama* and *Mugil cephalus* showed very low concentrations of Pb.

Lead was found in 90% of gill samples except in *Sphyraena barracuda*. High concentrations were

Table 2. *Recovery (%) of heavy metals from tissue samples*

Metals	Sample wt (g)	Spiked concentration (mg/kg)	Recovery concentration (%)	Percentage of recovery
Pb	1.0	0.025	0.024	96
	1.0	0.050	0.0491	98
	1.0	0.100	0.0963	96
Cd	1.0	0.030	0.0282	94
	1.0	0.060	0.0599	100
	1.0	0.120	0.116	97

Table 3. *Lead concentration (mg/kg dry weight) in tissue samples*

Fish species	Stomach	Gill	Muscle
1. *Leiognathus splendens*	bdl	0.549±0.04	0.036±0.03
2. *Sphyraena barracuda*	0.003±0.01	bdl	0.004±0.01
3. *Scomberomorus* sp.	0.030±0.02	0.056±0.03	0.051±0.04
4. *Scatophagus* sp.	bdl	0.012±0.02	0.013±0.07
5. *Sillago sihama*	0.009±0.04	0.028±0.06	0.022±0.02
6. *Platycephalus indicus*	0.374±0.03	0.366±0.01	0.165±0.01
7. *Epinephelus* sp.	0.121±0.08	0.046±0.03	0.100±0.09
8. *Oreochromis mossambicus*	0.420±0.03	0.130±0.07	0.252±0.06
9. *Catla catla*	0.350±0.01	0.167±0.06	0.078±0.02
10. *Mugil cephalus*	0.005±0.01	0.006±0.02	0.007±0.03

bdl - *below detection limits*

observed in *Leiognathus splendens* (0.549 mg/kg), *Platycephalus indicus* (0.366 mg/kg) and *Catla catla* (0.167 mg/kg).

Lead was observed in all the muscle samples; higher amounts in *Platycephalus indicus* (0.165 mg/kg) and *Oreochromis mossambicus* (0.252 mg/kg).

Among all the samples analyzed, the highest concentration of Pb was recorded in the gills of *Leiognathus splendens*. However, the Pb concentration detected in the muscle tissues of all the samples were well below the legal limits of 0.4 mg/kg (EC, 2001) and 0.5 mg/kg (FAO, 1983).

Concentration of cadmium: Only the gills of *Catla catla* showed 0.465 mg/kg of cadmium which was above the recommended level of 0.1 mg/kg (EC, 2001). Cadmium concentration was below the detection limit in about 90% of samples.

The results of this study provide an indication on the metal concentration in the various tissues of fishes collected from Tuticorin. The heavy metal concentrations of edible muscle tissues of all the samples analyzed, irrespective of their origin, were well within the limits prescribed.

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