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Determination of Cu, Cd, Pb and Zn Concentration in Edible Marine Fish *Acanthopagurus berda* (DANDYA) Along Baluchistan Coast–Pakistan

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ABSTRACT

The role of trace metals in marine ecosystems has been intensively investigated during recent years. The present study is related to the monitoring of heavy metal distribution in the edible marine fish, 'Dandya'. The fish samples were digested by using a mixture of 5 mL HNO_3 (65%) and 0.5 mL $HClO_4$ (70%) and analyzed by Atomic Absorption Spectrophotometer. The result comprise of concentration level of Cu, Cd, Zn, and Pb in nine different samples of fish. The concentration in fish muscles have been found to range from 0.3-0.55 (Cu), 0.04-0.15 (Cd), 3.65-4.32 (Zn) and 0.25-0.5 (Pb) μg/g. The fish is mostly found on Baluchistan coast and is one of the fishes that fetch high price in Karachi Market. Correlation of metal concentration with weight and length has been discussed and periodic variations are also being reported. The result showed that change in length has not been found to be proportionate with weight. Cu and Zn concentrations show that there is no significant variation with weight and length due to rough sea. Cd concentration increases gradually as weight and length increases but Pb concentration shows that smaller size fishes have same concentration. It may be due to different sites of sampling area or may be due to different depths.

Key Words: Heavy metals; Atomic absorption; Spectrophotometer; *Acanthopagurus berda*

INTRODUCTION

The seas and oceans, which cover 70% of the world's surface, are one of the man's great hopes for future food supplies. As human populations multiply and industrialization increases, the problems of environmental pollution become more critical (Jerome & Williams, 1979). The concentrations of heavy metals in aquatic environment and marine organisms have been of considerable interest because of their toxic effects which are important in human beings (Von Schiruding *et al*., 1991; Ipinmoroti *et al.*, 1997).

Heavy metals have the tendency to accumulate in various organs of marine organisms, especially fish, which in turn may enter into the human metabolism through consumption causing serious health hazards (Puel *et al*., 1987).

All around the world a lot of research work have been documented on trace metal concentration in marine and fresh water fishes (Papadopoulon *et al*., 1980; Romeo, 1987; Tariq *et al*., 1993; Asaolu, 2002). In Pakistan, the coast of Baluchistan, also known as a Mekran coast, is 550 km long. Much of this coast is rocky and sandy and its fishery potential is considered to be extensive. This area, in general is very thinly populated and is virtually devoid of industry. The different kinds of waste produced at this site may affect the marine fauna and flora of the beaches adjacent to this state (Ahmed, 1979).

The present work was undertaken to study the concentration levels of selected trace metals in commercially important fish species and correlate the concentration of metals with respect to their weight and length.

MATERIALS AND METHODS

Marine fish (Dandya) samples were obtained from the site (Gadani beach). Fish samples of 9 different sizes, were carefully transferred to the plastic bags. Total length was also recorded for all specimens by extending the caudal fin towards the midline of the body. The samples were then dried to constant weight. The fish edible muscle was analyzed after Analytical Methods Committee (1960), by using a mixture of 5 mL (65%) HNO_3 and 0.5 mL $HClO_4$ (70%). After cooling, each sample was redissolved in 5% HNO_3 (v/v) and filtered through whatmann No. 40 filter paper and was diluted to 25 mL with 5% HNO_3 prior to analysis by using atomic absorption spectrophotometer (Jaffar, 1988). Blank solution was prepared for the background correction.

RESULTS AND DISCUSSION

The variation of weight and length is shown in Table I, and Fig. 1 and 2. From the graph, no idea can be made about the correlation of weight and length because no proper order is followed viza viz these two variables. Change in length

Fig.1. Variation of different sample of fish with weight (g)

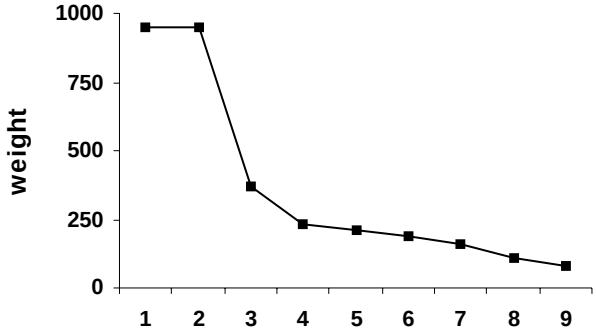


Fig. 2. Variation of different sample of fish with length (g)

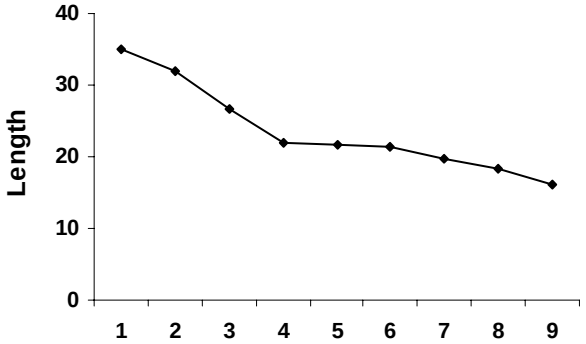


Fig. 3. Concentration of Cu in different samples of fish

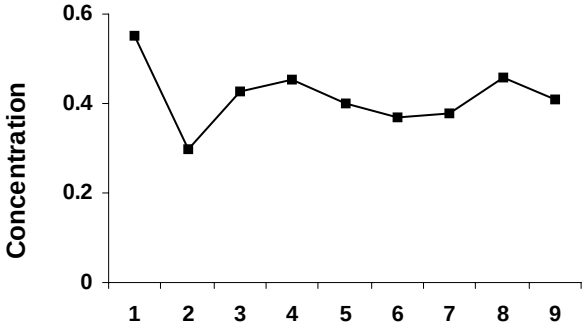


Fig.4. Concentration of Cd in different samples of fish

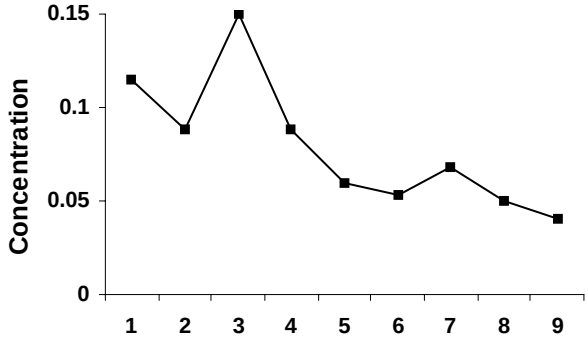


Fig. 5. Concentration of Pb in different samples of fish

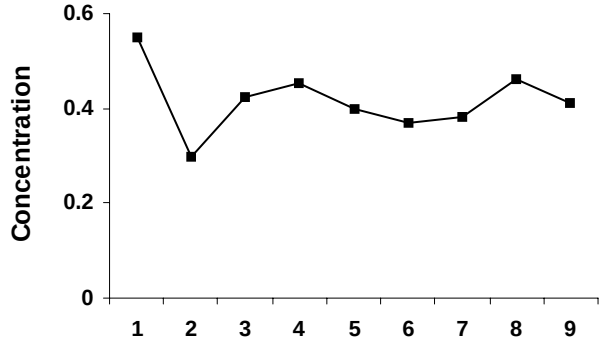
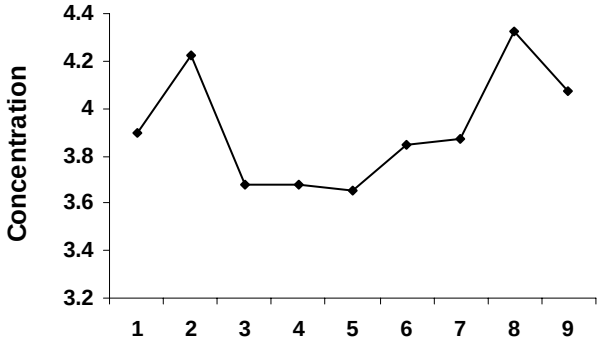


Fig. 6. Concentration of Zn in different samples of fish



Number of Samples

has not been found to be proportionate with weight. For a very small change in length, corresponding change in weight is very large i.e. at 26.8 cm length, weight was 370 g and in case of 32 cm length, weight was 950 g. This order less change between these two variables (length and weight) is due to season. July is the month in the middle of monsoon and October is the ending part of the monsoon. In monsoon season sea is very rough and more and more nutrients are available.

Table II shows the change in concentration of different samples of fish with respect to weight and length. Fig. 3 shows that there is no significant variation of Cu concentration with weight and length. Result shows a random data which may be due to rough sea. Cu concentration at 950 g of two fishes was different, it may be due to change in length because two fishes have same weight but they differ in length. Fig. 4 shows that as weight and length increase, Cd concentration increases gradually. By comparing our results and results from literature, it is clearly evident that variation of Cd concentration with weight or length is specie specific.

Pb concentration distribution pattern shown in Fig. 5, demonstrate that smaller size fishes have same concentration. Near 200 g and above show an increase in the concentration of Pb. At 950 g two fishes of different length have very small difference in length but a large

Table I. Variation of different samples of fish (Dandya) weight with Length

Sample No.	Length (cm)	Weight (g)
1	35	950
2	32	950
3	26.8	370
4	22	232
5	21.7	209
6	21.4	191
7	19.8	159
8	18.4	111
9	16	82

Table II. Trace metal concentrations (μg/g) and related statistical parameter for various samples of fish

Sample No.	Zn	Pb	Cu	Cd
1	3.90 ± 0.20	0.50 ± 0	0.55± 0.1	0.11 ± 0.00
2	4.22 ± 0.50	0.25 ± 0	0.30 ± 0.07	0.08 ± 0.01
3	3.67 ± 0.42	0.30 ± 0.11	0.42 ± 0.07	0.15 ± 0.04
4	3.67 ± 0.06	0.32 ± 0.12	0.45 ± 0.06	0.08 ± 0.00
5	3.65 ± 0.39	0.44 ± 0.11	0.40 ± 0.10	0.06 ± 0.01
6	3.85 ± 0.27	0.37 ± 0.12	0.37 ± 0.03	0.05 ± 0.00
7	3.87 ± 0.20	0.25 ± 0	0.38 ± 0.03	0.06 ± 0.00
8	4.32 ± 0.23	0.25 ± 0	0.46 ± 0.02	0.05± 0.02
9	4.07 ± 0.06	0.25 ± 0	0.41 ± 0.01	0.04 ± 0.01

Mean ± SD

difference in concentration. It may be due to different sites of sampling area or may be due to different depth.

Zn concentration in fish (Dandya) was independent of length and weight (Fig. 6). Correlation of Zn concentration with weight and length may be specie specific. The difference in concentration of these metals in fish samples can suggest to what degree a particular specie picks up the matter from the sediment and water during feeding. It is well known fact that bottom feeders are known to concentrate more metal levels than the surface feeders.

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