

Lead and Zinc levels in some commercial fish species collected from Al-Shoggig coast, Red Sea at Jazzan south of Saudi Arabia.

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ABSTRACT

A study was conducted to determine the concentrations of lead and zinc in three of the commercial fishes collected from Al-shoggig coast on Red Sea South of Saudi Arabia. The values obtained were compared with the Saudi Arabian standards organization (SASO, 1977) and the Environmental Protection Agency (EPA). In this study, zinc was found in higher concentrations in tissues of gills and liver in fish species compared with lead. However, both metals are still within the permissible levels.

Recommendation for further studies is given .

Key words: lead, zinc, fish, Red Sea, tissue, Saudi Arabia.

INTRODUCTION

Bioaccumulation is a process in which a chemical pollutant enters into the body of an organism and not excreted, but rather collected in the organism's tissue (Zwieg,1999). Metals that are deposited in the aquatic environment as a result of human activity may accumulate in the food chain and cause ecological damage, while also posing a threat to human health (Grim anis,1978). These health concerns are quite considerable, for example ,cancer ,damage to the nervous system, and to other tissues have been documented in humans as a result of metal consumption (Zwieg, 1999).

Heavy metals pollution of aquatic ecosystems is often more obvious in aquatic animals than in elevated concentrations in water (Linnik, 2000). Thus, aquatic ecosystems are typically monitored for pollution by heavy metals, using biological assays (Ramelow, 1989) and many fish species have been used as bioindicators (Yang,1989), since they have the advantage of allowing the comparison of metal concentration among sites, where water samples are near or below the detection limits of the atomic absorption technique (Widianarko, 2000). Heavy metals like, lead and zinc can enter the aquatic food chain including fish, either through the digestive tract or across permeable membranes such as gills (Handy,1993).

This study focuses on three of the common fishes that were collected from Al-shoggig coast on the Red Sea, South of Saudi Arabia, where they are abundant at a wide range of sites, and a comparison can be done between them

and other fish collected from the Arabian Gulf. Moreover, it also aimed to compare the concentrations of zinc and lead present with the guidelines set down by the Saudi Arabian Standards Organization (SASO,1977), for the safe consumption limits of fish.

MATERIAL AND METHOD

All laboratory work was carried out at the University of King Saud, College of Science, Riyadh. Three species of the common fishes namely: *Epinephelus chdostigma*, *Plectropomus maculates* and *Scarus chobbana* were collected from Al-shoggig on the Red Sea coast, South of Saudi Arabia, which is located approximately 110 km North of Jazan. Upon arrival to the laboratory, fish were immediately stored in a freezer for no longer than one week. The frozen fish were thawed and classified according to size. All the fish were dissected and from each fish, 10 g samples were taken from the liver and gills and placed onto glass Petri dishes and put into an oven at 60°C for 24 hours, then the dried sample was added to an acid washed beaker. The samples were cooled for 15 minutes. Five drops of 30% hydrogen peroxide was then added into each flask and heating was resumed at 100°C until only 1 ml of the digested sample remained. On completion of digestion, the samples were filtered into acid washed volumetric flasks and diluted to 50ml for metal analysis. Concentrations of zinc and lead were then determined, using a flame Atomic Absorption Spectrophotometer (AAS) in parts per million. The data were analyzed statistically using a general linear model in SAS.

RESULTS AND DISCUSSION

Statistical analysis of zinc and of lead concentrations showed a significant ($P < 0.01$) difference between the three examined species and between organs. High concentrations of zinc in the study area as in any other part of the world are due to naturally occurring processes. Zinc is an abundant element found in most rocks and soils (Nnriagu,1970). It is found in large quantities in the vertebrate body under natural conditions. It is known to be an essential biological mineral, which is regulated and maintained at certain concentrations in fish (Powell,2001). On the other hand, there is often little accumulation of lead in marine and freshwater species. Consequently, lead is not a threat to fisheries resources except in case of extreme pollution (Moor, 1983). In the present study, the concentration of Zn and Pb in the liver and gills of *E. chdostigma*, *P. maculates* and *S. chobbanaa* are shown in Tables 1 and 2. Zn concentrations varied significantly between the three species ($P < 0.01$) and the liver and gills within each species ($P < 0.01$). *E. chdostigma* had nearly twice Zinc more than either *P. maculates* or *S. chobbanaa*, although the lowest concentration of Zn was recorded in the gills in all species. The three species differed markedly in their relative Zn concentration in tissues. Hence, relative Zn levels in *E. chdostigma* and *S. chobbanaa* followed the order liver>gills, while

the corresponding Zn content for *P. maculates* followed the order gills>liver, while *S. chobbanaa* had considerably higher Zn content. Another study reported that Zn was higher in fish liver than in gills (Al –Suwiti, 2002).

Species and tissue differences were also recorded in this study with respect to lead levels (Table 2). High concentrations were recorded in both *E. chdostigma* and *P. maculates* and lower in *S. chobbana*. In all the three species, however, the relative Pb contents followed a similar order in liver>gills (Table 3). The general average of Zn and Pb contents in the three species, *E. chdostigma*, *P. maculates*, *S. chobbana* however was still below the seniors levels.

Similar results were previously reported by other workers on. Zn, Cd, Pb, Hg and Ni in 15 different species of marine fishes from the Barents Sea, where they had much higher Pb level in certain species (Al – Yuosif, 2000).

Form the present data, Zn concentration were much higher than Pb in different fish tissues. This was expected since Zn is an essential micronutrient for fish and other aquatic organisms and therefore tends to be present at low levels for supporting cellular functions (Zauke,1999).

The present results also indicated generally low Zn and Pb contents in the studied species of fish, which are within the normal ranges reported for other species in other parts of the Arabian Gulf (Al-suwiti, 2002). Further studies are recommended to elaborate on the potential role of these species as biomonitors of different minerals in Red Sea, taking into consideration the age, sex and size of the fish as well as the abiotic factors such as seasonal fluctuations, temperature, salinity and other factors that might influence the concentration and distribution of metals in various tissues of these fish species

Table 1: Least Square Mean (\pm SE) of Zn Concentration in Tissues of Fish from the Shoggagi coast (ppm)

SPECIES	LIVER	GILL
<i>Epinephelus chdostigma</i>	133.60 ^a \pm 0.22	65.15 ^a \pm 0.20
<i>Plectropmus maculates</i>	152.49 \pm 0.22	228.79 \pm 0.21
<i>Scarus chobbana</i>	386.60 b \pm 0.22	166.19 \pm 0.20
Overall	218.23 \pm 0.13	153.38 \pm 0.12

Figures in the same column bearing different superscripts are significantly different ($p < 0.01$).

Table 2: Least Square Mean (\pm SE) of Pb Concentration in Tissues of Fish from the Shoggagi coast (ppm)

SPECIES	LIVER	GILL
<i>Epinephelus chdostigma</i>	22.44 ^a \pm 0.57	1.04 ^a \pm 0.16
<i>Plectropmus maculates</i>	8.18 \pm 0.18	6.01 \pm 0.31
<i>Scarus chobbana</i>	29.44 \pm 0.12	2.59 \pm 0.10
Overall	20.02 \pm 0.33	3.21 \pm 0.20

Figures in the same column bearing different superscripts are significantly different ($p < 0.01$).

Table 3: Average Zn and Pb Concentration in Tissues of Fish from the Shoggagi coast (ppm)

SPECIES	Zn	Pb
<i>Epinephelus chdostigma</i>	70.50 ^a ± 0.30	0.59 ^a ± 0.16
<i>Plectropmus maculates</i>	140.78 ± 0.28	0.92 ± 0.21
<i>Scarus chobbana</i>	180.69 ± 0.22	0.11 ± 0.18

Figures in the same column bearing different superscripts are significantly different ($p < 0.01$).

CONCLUSION

This study shows that the concentration levels of lead and zinc in fish species such as *Epinephelus chdostigma*, *Plectropomus maculates* and *Scarus chobbana* collected from Al-Shoggig coast, Jazzan, south of Saudi Arabia are within the normal ranges.

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