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Accumulation of Two Metallic Elements (Zn, Pb) in the Mule (Flathead Grey Mullet Linnaeus 1758) Fishing in the Bay of Oran

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ABSTRACT

Our present study focused on the evaluation of two concentrations of heavy metals (Pb, Zn) in the mullet (Mugil cephalus Linnaeus. 1758) caught in the Bay of Oran. This fish reflects very well the quality of its habitat, it is a very abundant species in Algerian coastal waters and much appreciated by the Algerian consumer. The monthly sampling took place over a period of six months from February to July 2010, three bodies have been considered: the liver detoxification organ, the gonads, reproductive organs and muscle representing the portion consumed by 'Man.The heavy metal concentrations were determined by the atomic absorption spectrophotometry flame in function of several parameters (gender, month, organs, and the sampling site).It appears from this study that the mullet (Mugil cephalus) contains the two wanted metal pollutants, the most important grades are those of Zinc is 80.55mg / kg and the lowest are those of the Lead 0.03 mg / kg. The results obtained treated showed no statistically significant difference between the heavy metal content of both sexes at the target organs and between the sampling area. The levels of trace metal concentrations reflect a certain pollution of target areas.

Keywords: Mulet, Flathead Grey Mullet, heavy metals, Lead, Zinc, contamination, pollution, Oran.

I. INTRODUCTION

The marine environment is contaminated by many chemicals including metal elements discharged by industries, agriculture and urban communities. Estuarine and coastal areas under strong continental influence, are the most affected by this contamination. The latter can affect the health of the marine environment, since it does not undergo any biological or chemical degradation. It can therefore accumulate in food chains of different links to toxic concentrations in marine organisms (Neathery & Miller, 1975).

Bay of Oran is the site of a very high industrial concentration including eastwards ie Arzew which is the seat of incessant pollution. Note also the use of coastal waters for cooling thermal power stations in addition to discards a lot of waste and pollutant that can cause many strandings of certain marine fauna, observed on the Oran coast (Boutiba et al., 2003). For this reason it seemed so interesting to begin a study on the bioaccumulation of heavy metals and to detect the level of contamination in a target species, mullet (Mugil cephalus Linnaeus, 1758), fished in the bay Oran, since it forms an important link in the trophic chain.

II. METHODS AND MATERIAL

Our study area is located on the Algerian west coast (Figure 1). The Oran coast is a set of landforms including shaping depends directly or indirectly shares in the sea. Bay of Oran occupies the central part of Oran coast and opens from west to east; it is bordered on 30 km of high ground and draw a half circumference roughly steady from Cape Falcon to Cape Aiguille. It is between the Andalusian Bay and the Gulf of Arzew. (Leclaire 1972).

The species Flathead Grey Mullet waschosen in this study because it plays an important role in ecological energy flow in marine communities. Through its regular abundance in the Mediterranean Sea, it is a characteristic link in the food chain and it also serves as prey (BESTER, 2004). Many studies have been devoted to his eating habits (SUZUKI, 1965; ODUM 1968; ZISMANN et al, 1975;. & MIGLARESE BISHOP, 1978). Finally, it is of great local importance because it is one of the most consumed fish and appreciated by the Algerian population.

Sampling took place over a period of six months from February to July 2010; 110 individuals were sampled at these two bays. After measurements, liver, muscle, and gonads were removed, weighed and frozen until the time of chemical analysis.

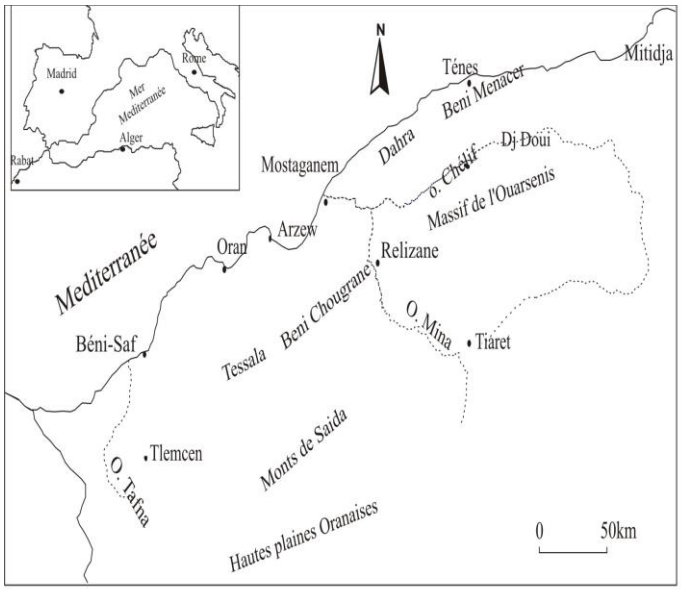

Figure 1 : Geographical location of bay of Oran(Perrodon, 1957).

1-Chemical analysis

The determination of trace elements in the fish commonly used for atomic absorption spectrometry method (SAA). Indeed, sample Mugil cephalus must first undergo mineralization.

Mineralization wet samples was performed according to the method of AMIARD et al. (1987): 1 ml of nitric acid is added to 1 g of sample and then adjusted to 4 ml of bidistilled water after one hour at 95 ° C.

This mineralization samples is accompanied on the one hand, by the white, consisting of solutions containing the mineralization reagent (nitric acid) and undergoing the same experimental conditions as the sample, and on the other hand, the series of intercalibration samples on a standard biological material tissue of Mytilus galloprovincialis (SRM 2976) from the International Agency for Atomic Energy of Monaco, allowing us to determine the coefficients of variation for each of the desired metals and control accuracy and the precision of the analytical protocol.

2-Statistical treatment

The statistical data processing was carried out using the Stastica software, and the results are shown as mean with standard error (m ± SD) mg / kg. Student's t test (T) was used to determine the significance of differences between the calculated average. The difference was considered significant at a confidence level (p) of less than 5% (p> 0.05).

III. RESULT AND DISCUSSION

Both sought metal pollutants, zinc (Zn) and lead (Pb), are present in the targeted sub Flathead Grey Mullet samples from study sites. These concentrations are not entirely heterogeneous.

A- Monthly change in average concentrations of heavy metals in Flathead Grey Mullet (Figures 2)

In general, in the Bay of Oran, we see episodes of rising and falling concentrations of metallic elements. The average concentration of zinc in fish, higher during the month of April, reaching 36.5 mg / kg. Plombiques the concentrations are very low during all sampling months. Nevertheless, we found that lead concentrations recorded during all months are very low and almost homogeneous. The latter is a xenobiotic contained in the list of dangerous substances (CEE 1982), and is also considered highly toxic and polluting non-biodegradable (EEA 1997).

Note that in target sites during the month of April, the average concentrations are highest, while during the months of June and July, the average concentrations are minimal.

The sexual rest period is a gametogenesis phase characterized by increased accumulation of nutrient reserves with a summary and Storage of carbohydrate materials, lipid and protein (Webb, 1979). A spawning, nutrient reserves to draw automatically the heavy metal concentrations drop (release of metals that time) and reserve accumulation will slowly resume at the beginning of the period of sexual rest (WEBB, 1979).

According Landret, (1974), GREELY et al. (1987) and IBAÑEZ, (1994), reproductive Flathead Grey Mullet occurs from October to January. In the Mediterranean, M. cephalus different populations breed between June and October (FAOUZI 1938; ERMAN 1959; Morovic 1963 Farrugio 1975; BRUSLE & BRUSLE 1977; BRUSLE 1981).

The Student t test gave no significant difference at all concentrations of heavy metals (Pb, Zn) found in the study area (P> 0.05).

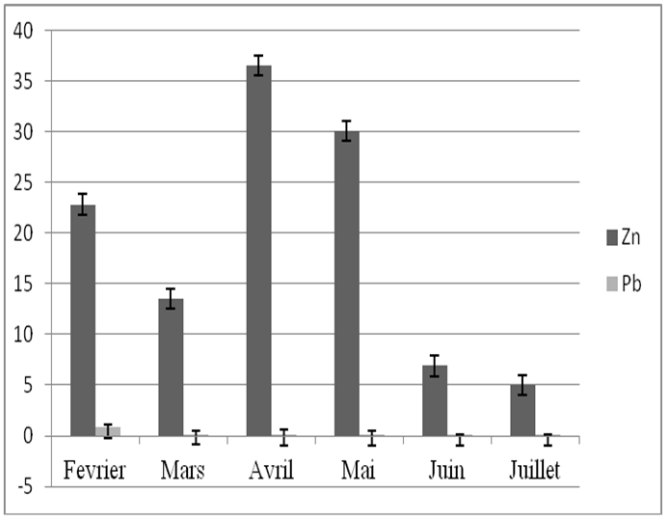

Figure 2: Monthly evaluation of the average concentrations in heavy metals (Pb, Zn) in mg/kg of P.F at *Mugil cephalus* in bay of Oran.

B- Monthly change in average concentrations of heavy metals in sex functions (Pb, Zn) in Flathead Grey Mullet

Based on the results in Figure 3, we can say that bioaccumulation of both inorganic pollutants is higher in females than in males individuals individuals. Comparing the average concentrations of sex indicates that zinc is accumulated by more females than males. Lead has a low concentration in both sexes and in all organs. Metals are more accumulated in the liver of females than males.

In fact, Powell et al. (1981) had already shown that heavy metals were concentrated in the organs of the teleost in descending order: Liver> Kidney> Muscle. The liver is considered the primary organ accumulation. Some authors (GUNS et al, 1984;. Nabawi EL et al, 1987;. & HORNUNG RAMELOV, 1987), muscle tissue, specifically the fish is barely involved in the metabolism. The preferred accumulation of these metals, in particular zinc, in females compared to males, this may be due to differences in concentrations of the gonads.

According SIDOUMOU et al. (1991), the female gonads focus more zinc than males. Females are more infected than males, this may be due to their migration to the coast polluted compared to spawning, which explains the high contamination with heavy metals via the various sources of pollution.

The results obtained by THIBAUD (1976) contents slightly higher trace metals were detected in fish caught near the coast.

For the entire population of the study area, the Student t test does not record any significant difference (P> 0.05) between the concentrations of separate sexes specimens.

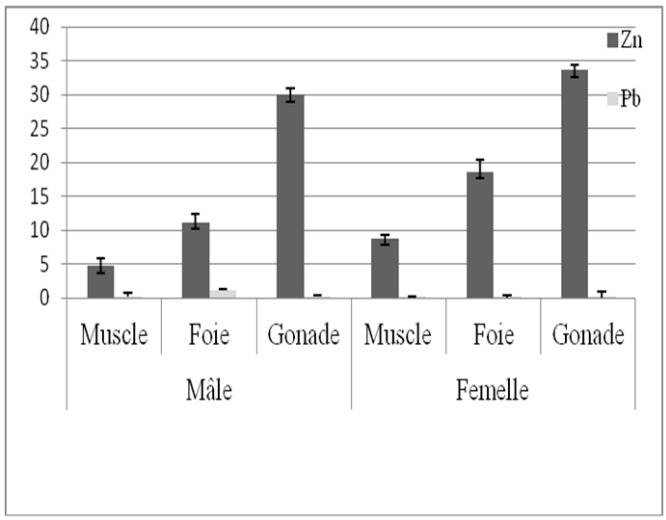

Figure 3 : Variation of the average concentrations in heavy metals according to sex (Pb, Zn) at *Mugil cephalus* fished in bay of Oran.

IV. CONCLUSION

The study we have undertaken demonstrates that, given the results obtained and compared with the limit values found in the literature, we can conclude that the bay is not polluted, despite the presence of metal contaminants but with no significant difference. Both metals studied (Pb and Zn), bioaccumulation is preferentially in the liver and gonads relative to Mugil cephalus muscle. Moreover, the dominant metal, zinc stands out clearly in relation to the other member, and it has very high contents.

Regarding sexual maturity, a relationship was established between the laying period and high values of trace metals which corresponds to increased hepatic activity occurring Lord fattening of the case after the breeding season. Compared to sex, females are more heavily infected than males.

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