

MERCURY CADMIUM AND SELENIUM IN LIVER AND MUSCLE OF MEDITERRANEAN SPEARFISH

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Introduction

The Mediterranean spearfish *Tetrapturus belone* (Rafinesque, 1810) is a large pelagic fish belonging to the family *Istiophoridae*. Available information on biology and feeding habits is scarce. Its distribution is limited to the Mediterranean Sea, mainly in the upper 200 m water layer above or within the thermocline. It feeds on pelagic fishes and cephalopods (Castriota et al., 2008). Since fish stocks of traditional large fish prey like tuna or swordfish are running out, the commercial interest towards *T. belone* is increasing. This fish is considerably abundant around Italy, particularly in the Tyrrhenian Sea (Castriota et al., 2008). Here we report first data on Hg, Cd and Se levels in muscle and liver of 38 *T. belone* specimens caught in the Strait of Messina from 2008 to 2015. Limited information is available for this specie concerning ecotoxicological aspects. Along with other toxic compounds, there are no data on tissue levels of trace elements even though this specie inhabits the Mediterranean Sea, a semi-closed basin surrounded by heavily populated and industrialized countries and known to be rich in mercury deposits.

Methods

Specimens of *T. belone* (17 female, 4 male and 17 unknown) were caught by harpoon from traditional Sicilian “*passerella*” fishing boats. Biometric and sex data were recorded. Muscle and liver samples were collected and preserved in a freezer. Aliquots of tissues were oven dried at 105°C to constant weight and the water content (%) was calculated. Trace elements were determined by atomic absorption spectrometry on lyophilized tissues after microwave-assisted acid decomposition 4:1v/v nitric acid (HNO₃) and hydrogen peroxide (H₂O₂). The method of internal additions was used and procedural blanks and Standard Reference Materials were analyzed to fulfill QA/QC requirements. Concentrations are given as mean of three replicates. To check for differences and correlations within and between variables, non parametric statistics Mann-Whitney U test and Spearman Rs test were used with significant level for $p < 0.05$.

Results

The *T. belone* specimens ranged from 6 to 22 kg (130-190 cm as lower jaw fork length, LJFL). The water content was 68% in liver and 76% in muscle. Table 1 reports results on Cd, Hg and Se in liver and muscle.

Table 1. Trace elements concentrations, as mg/kg on a dry weight basis (dry wt.) in tissues of *T. belone*.

	Cd liver	Hg liver	Se liver	Cd muscle	Hg muscle	Se muscle
mean	5.51	2.19	7.44	0.019	2.89	1.85
st.dev.	3.15	2.12	3.85	0.015	1.97	0.563
min	1.05	0.196	3.145	0.001	0.522	1.24
max	13.2	7.51	22.6	0.060	8.56	4.54

Cadmium was mainly accumulated in liver, whereas Hg showed similar levels for both tissues analyzed; Hg in muscle and liver were significantly correlated ($R_s=0.616$, $p<0.005$). As edible part, muscle Hg mean value, on fresh weight basis (0.982 mg/kg), exceeded the European Union maximum residue limit (0.5 mg/kg) for food stuffs, fishery products. Concentrations were found to increase with specimen size (Fig. 1) for Hg in both tissues analyzed and for Cd in liver, only liver Hg were however significant ($R_s=0.430$, $p<0.05$). Mercury in liver was positively correlated with Cd ($R_s=0.617$, $p<0.05$) but not with Se which is known to have a protective role against Hg (Cuvin-Aralar and Furness, 1991). Instead, Se-Cd correlation in liver was significant ($R_s=0.407$, $p<0.05$) likely due to high Cd intake with a cephalopods rich diet (Bustamante et al. 1998). No significant differences were found between males and females.

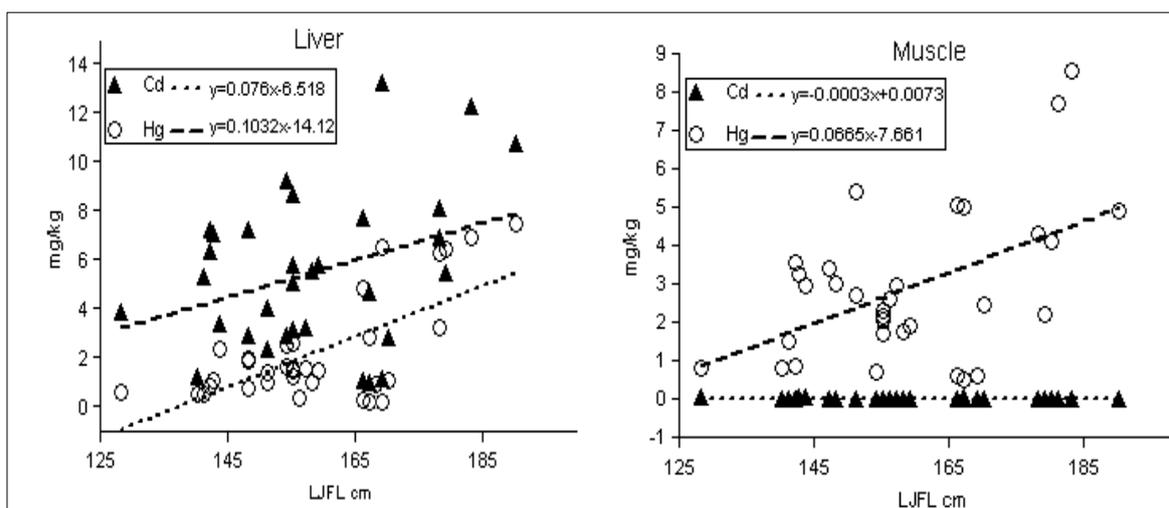


Figure 1. Cadmium and mercury concentrations (mg/kg dry wt.) in *T. belone* tissues as function of specimens size as LJFL cm.

Conclusion

This research reported a first set of data on Cd, Hg and Se in Mediterranean spearfish *T. belone*. Results allowed to draw some ecotoxicological and ecophysiological considerations. Moreover levels found in muscle as edible part may be of concern for human consumption as potential risk for human health.

References

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