

# Study of the content of Pb, Cd, Zn, Ni and Cu in the bones of *Phocoena phocoena relicta* in the Bulgarian Black Sea region

Violeta Ivanova Evtimova - vilka@abv.bg

Department Zoology and Anthropology  
Faculty of Biology  
Sofia University  
Bulgaria

## SUMMARY REPORT

Bones were collected from 33 harbour porpoises stranded in 2017 along the Bulgarian Black Sea coast (Fig.1). The samples were processed in a laboratory by drying, grinding and mixing with concentrated acids. Metal concentrations (Cu, Pb, Zn, Cd and Ni) were determined by an inductively coupled plasma optical emission spectrometer (ICP-OES) Optima 7000 DV. Statistical analysis was performed using SPSS v.21.

Mean bone concentrations of metals determined in harbour porpoises from the Southern and Northern Bulgarian Black Sea coast are presented in Table 1. The results show that, Zn had the highest mean levels in bones of porpoises followed by Pb, Cd, Cu and Ni.

For the geographical comparison, Cu, Pb, Zn, Cd and Ni concentrations displayed significantly higher levels in the harbour porpoises stranded in the Northern Black Sea coast compared with those from Southern Black Sea coast. In addition, harbour porpoises found in Aheloy (Southern region) and Shabla (Northern region) had the highest levels of Cu (3.75 mg/kg and 3.5 mg/kg, respectively), while animals found in Krapets (Northern region) had significantly higher bone concentrations of Ni (1.87 mg/kg) in comparison with the other sites.



**Fig. 1** Map of the Western Black Sea showing the sampling sites along the Bulgarian Black Sea Coast.

**Table 1** Trace metal (mg/kg) concentrations in bones of harbour porpoises stranded between 2006 and 2013 along the Southern and Northern Bulgarian Black Sea Coast. Mean  $\pm$  SD; range of concentrations (minimum – maximum); n - number of samples.

<b>Metal concentrations (mg/kg)</b>					
	<b>Cu</b>	<b>Pb</b>	<b>Zn</b>	<b>Cd</b>	<b>Ni</b>
Southern region	2.61 $\pm$ 0.88	1.45 $\pm$ 1.30	275.02 $\pm$ 177.86	2.17 $\pm$ 0.40	0.76 $\pm$ 0.34
n=14	0.97-3.82	9.18-13.82	100.24-814.20	1.57-3.07	0.41-1.45
Northern region	2.09 $\pm$ 1.07	15.53 $\pm$ 3.55	309.25 $\pm$ 247.38	2.66 $\pm$ 0.71	1.13 $\pm$ 0.60
n=19	0.21-3.91	8.84-25.23	102.80-922.90	1.44-3.96	0.50-2.56
Total	2.31 $\pm$ 1.01	13.80 $\pm$ 3.46	294.73 $\pm$ 218.11	2.45 $\pm$ 0.64	0.98 $\pm$ 0.53
n=33	0.21 - 3.91	8.84-25.23	100.24-922.90	1.44-3.96	0.41-2.56

Heavy metals, such as Cu and Zn are essential elements, and thus they are homeostatically regulated and their concentration can significantly change for a particular tissue in different specimens. Cu concentration in harbour porpoises bone tissues from Shabla and Aheloy were the highest registered. This result should be related with possible contamination in these regions.

Present evidence suggests a possible enrichment of the studied heavy metals in the Northern Black Sea Coast, where farming activities are present. These novel results fulfill the information gap existing about heavy metals pollutants presence in the Western Black Sea waters. Nevertheless, further studies are necessary in order to clarify the contamination and bioaccumulation process of heavy metals in the marine mammals from this region.

Several authors reported different feeding habits and diet related to age in harbour porpoises. Some prey species are more important in the diet of young porpoises, such as gobies and shrimps, compared to adult ones. Our data suggest that the different Zn levels between juveniles and adults may also be related to the maturity status.

In the present study a passive monitoring of stranded animals was presented, which can provide insight into environmental impacts on marine mammals. Our findings indicate that we cannot reject the hypothesis that metallic contaminants may influence the health of harbour porpoises and contribute to the increased stranding events.

I am grateful to the Society for Marine Mammalogy for supporting the effort to study the heavy metals in the bones of harbour porpoises in the Bulgarian Black Sea region.