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ORGANIC (PBDEs, NDL-PCBs) AND INORGANIC (Pb, Cd, Hg, As, Ni, Mn) CONTAMINANTS ASSESSMENT IN WILD BOAR (*Sus scrofa*) BY GC-MS/MS AND ICP-MS

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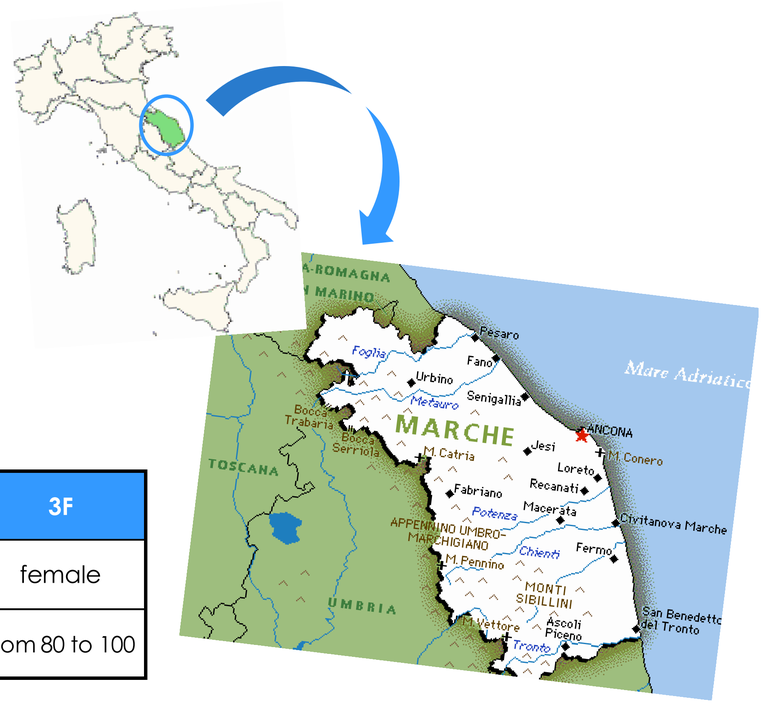
Introduction

Wild boar is an omnivore species often used as environmental pollution sentinel. Moreover it is hunted and consumed as food, therefore it may be a source of contaminants dietary exposure for the population. This study investigate the presence of some organic (PCBs and PBDEs) and inorganic (Cd, Hg, Pb, As, Ni, Mn) pollutants in wild boars caught in Central Italy; the aim was to evaluate environmental pollution and the possible negative effects of contaminants on animals and humans.

Method

Samples were caught in six hunting districts located in rural areas in the **Apennine Mountains** (Macerata - Marche). **Muscle, fat** and **liver** of 44 wild boars hunted in 2017-18 were collected. Sex, weight and age were registered. The samples grouped by organ, sex and weight resulted in **3 selected tissues** and **7 gender-age-pools,** for a total of **21 laboratory samples**. **6 NDL-PCBs** (28-52-101-138-153-180) and **15 PBDE congeners** (28-47-49-66-77-85-99-100-138-153-154-183-197-206-209) were analyzed by GC-MS/MS [1,2]. Lead (**Pb**), Cadmium (**Cd**), Arsenic (**As**), Nichel (**Ni**) and Manganese (**Mn**) were measured by in ICP-MS and Mercury (**Hg**) by AAS (FIMS).



POOL I.D.	1M	2M	3M	4M	1F	2F	3F
SEX	male	male	male	male	female	female	female
Weight (kg)	up to 40	from 40 to 80	from 80 to 100	>100	up to 60	from 60 to 80	from 80 to 100

***Table 1**: sample pools*

Results

POOL I.D.	1M	2M	3M	4M	1F	2F	3F
MUSCLE							
Σ PCB *u.b.* (ng/g fat)	4,1	7,7	29	27	12	5,5	5,3
ADIPOSE TISSUE							
Σ PCB *u.b.* (ng/g fat)	4,4	4,2	21	26	6,9	4,4	3,7
LIVER							
Σ PCB *u.b.* (ng/g fat)	4,6	6,0	12	14	8,6	5,4	3,9
Σ PCB *u.b* (ng/g wet weight)	0,28	0,29	0,89	0,61	0,48	0,32	0,29

***Table 2**: **NDL-PCBs sum** (upper bound (u.b.): concentrations lower than MDL were set at MDL) in muscle, adipose tissue and liver (MDL = 0,25 ng/g fat in muscle and adipose tissue; 0,025 ng/g w.w in liver)*

POOL I.D.	1M	2M	3M	4M	1F	2F	3F
MUSCLE							
Σ PBDE *l.b.* (pg/g wet weight)	99	3044	78	164	222	512	108
LIVER							
Σ PBDE *l.b.* (pg/g wet weight)	145	<MDL	<MDL	<MDL	<MDL	<MDL	<MDL

***Table 3**: **PBDEs sum** (lower bound (l.b.): concentrations lower than MDL were set at 0.0) in muscle, adipose tissue and liver (MDL = 10 pg/g)*

PCBs were all below MRLs [3]. The **highest levels** were **measured in muscle** (mean ΣPCBs =13 ng/g fat) and not in liver (mean ΣPCBs =8,4 ng/g fat). **Congener 153 was dominant**, followed by **138** and **180**. The **concentration increases with weight in males, while decreases in females**. Females generally show lower levels, probably because they can transfer contaminants to their progeny during pregnancy [4]. In liver no correlation was observed between PCBs and sex or weight.

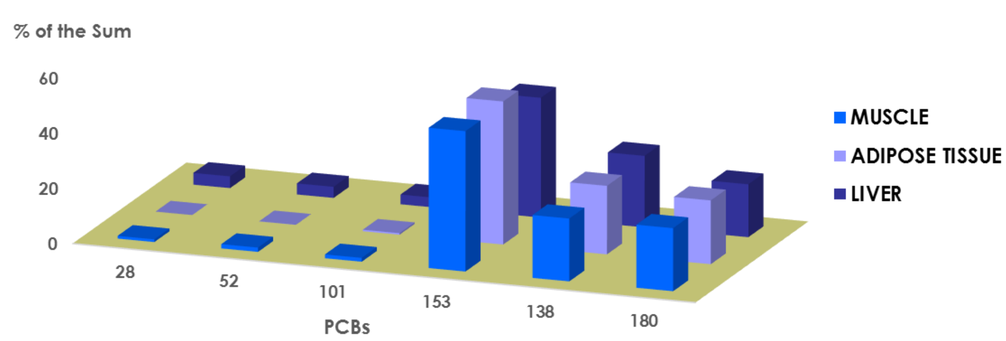


***Figure 1**: NDL-PCBs pattern (mean of the seven pools analysed)*

Also **PBDEs** were **higher** in **muscle than in liver** where almost all the congeners were below MDLs. **47> 99> 100** dominate the contamination pattern. Σ15PBDEs measured in muscle (mean 604 pg/g) was generally higher than levels already reported [5].

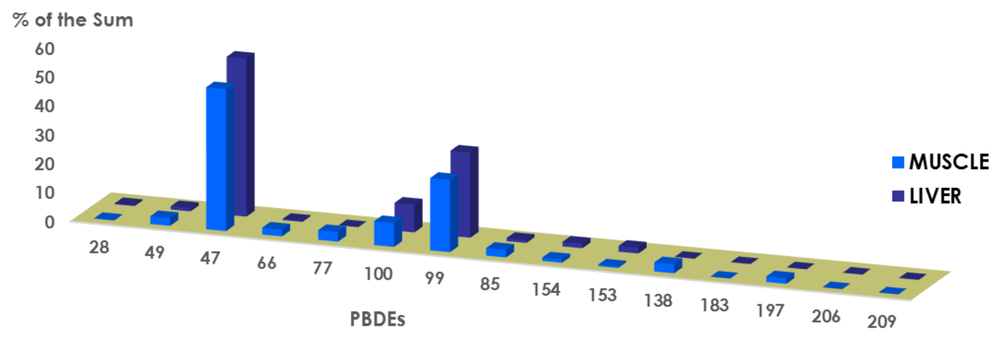
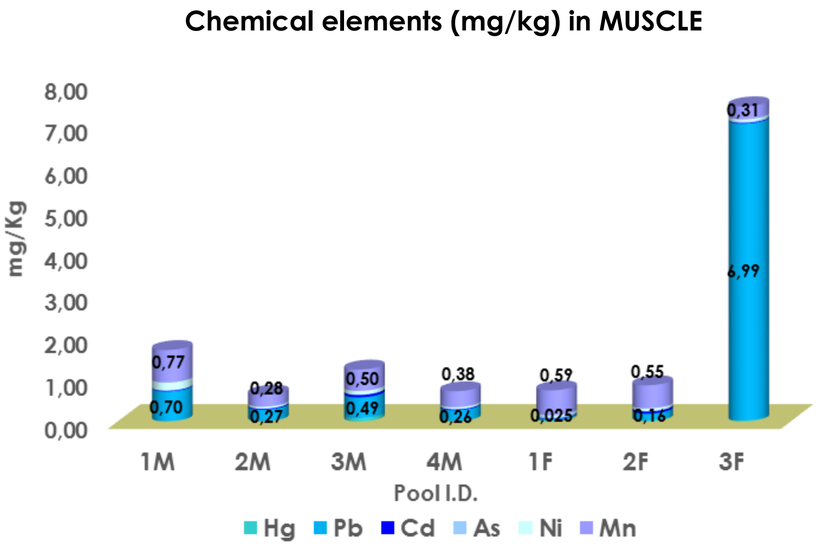


***Figure 2**: PBDEs pattern (mean of the seven pools analysed)*



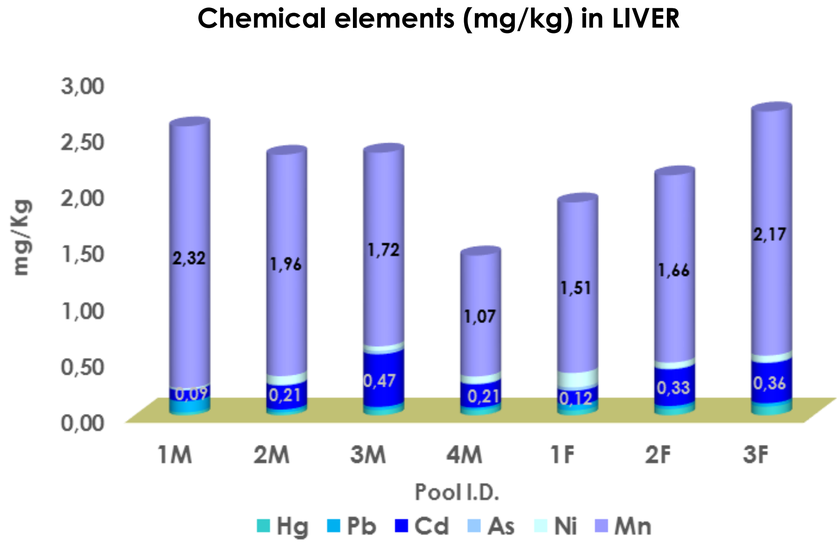


***Figure 3**: Chemical Elements in muscle and liver*

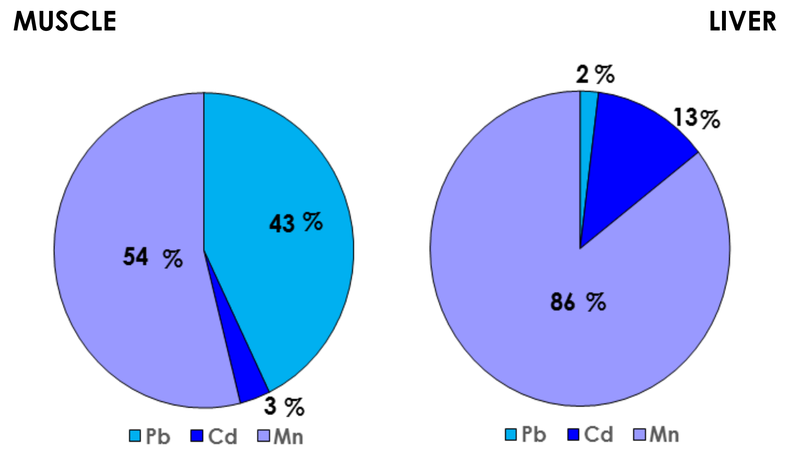


***Figure 4**: Average percentage contribution of the different elements measured above MDL to the total in muscle and liver*

As was not detected in almost all the samples while traces of **Ni** and **Hg** were measure only in livers. **Cd** in muscle (mean 0.028 mg/Kg) was lower than MRL (0.050 mg/kg) except for two samples (0.057 and 0.053 mg/Kg). None of the livers exceeded MRL (mean 0.25 mg/Kg) [3]. The results are comparable with previous studies [6, 7]. **Pb** values fell between 0.025 and 6.99 mg/kg in muscle while in liver the mean level was 0.04 mg/kg. **Six out of 7 muscles exceeded MRL for Pb** (0.10 mg/kg); this could be related to Pb dispersion in muscle due to bullet fragmentation. Mean levels of **Mn** were 0.482 (muscle) and 1.774 mg/kg (liver).

Conclusions

Muscle resulted to be the most contaminated tissue respect to liver and fat for all the considered contaminants. Pb residues in muscle were very high as a result of bullets fragmentation. Few data are available about contamination of wild fauna in Central Italy, therefore these results may help to start assessing background levels.

Acknowledgements
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