

ABSTRACT

Birds of prey, particularly scavengers, may be exposed to lead (Pb) shot and ammunition fragments when they feed on unretrieved game animals. We compared exposure to Pb in scavengers (common buzzard, red kite) and non-scavengers (sparrowhawk, barn owl) in the UK by measuring liver total Pb and Pb isotope ratios. Median total liver Pb concentrations ranged between 0.03 and 0.6 µg/g dry wt across the species and were highest in scavengers, but residues in all species were lower than those associated with adverse effects. Isotope ratios varied between scavengers and non-scavengers but were not clearly diagnostic of exposure to shot and ammunition.

Introduction

Lead (Pb) is highly toxic, can adversely affect multiple body systems, and high exposures can impact growth and survival.



There are few restrictions on the use of Pb shot and ammunition in terrestrial systems. Raptors, owls and scavenging birds can ingest Pb from ammunition and shot lodged in the carcasses of wildlife that have been killed but remain unretrieved or that are shot but survive. They also ingest Pb residues accumulated in the tissues of their prey.

Aims

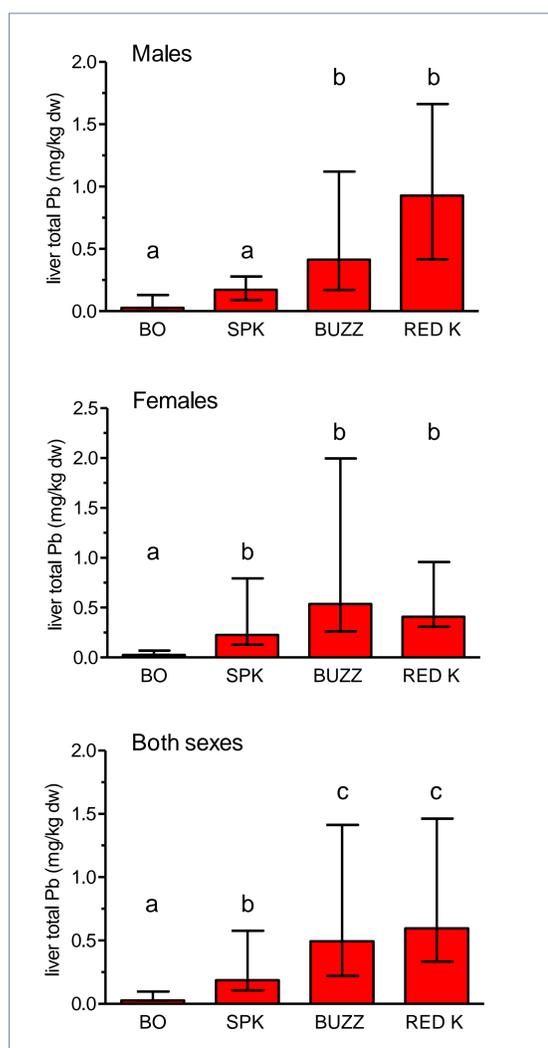
- To compare Pb exposure in common buzzard *Buteo buteo* and red kite *Milvus milvus* [scavengers] with that in barn owl *Tyto alba* and Eurasian sparrowhawk *Accipiter nisus* [non-scavengers]
- This involved measuring liver total Pb and Pb isotope ratios in birds found dead in the UK predominantly between 2009 and 2012
- We predicted that, if exposure to Pb shot and ammunition in UK scavengers is significant, Pb residues in buzzards and red kites will be greater than in barn owls and sparrowhawks

Results

Median liver Pb residues varied between 0.03 and 0.6 µg/g dry wt. in the four species (Fig. 1).

Female sparrowhawks had significantly higher liver Pb residues than males but there was no effect of sex in the other species or of age in any species.

Fig. 1. Median (± Inter Quartile Range) liver total Pb concentrations in barn owl (BO), sparrowhawk (SPK) buzzard (BUZZ) and red kite (REDK). Significant (P<0.05) differences between species are indicated by different letters. Sample sizes (male: female: sexes combined) were 14:14:30 (BO), 37:46:87 (SPK), 33:25:60 (BUZZ) and 18:14:38 (REDK); information on sex was unavailable for some individuals.



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Inter-species comparisons of liver Pb were conducted for males and females and for both sexes combined. Differences between species were similar in all three analyses. Median Pb concentrations in barn owl and sparrowhawk were lower than in buzzard and red kite (Fig. 1).

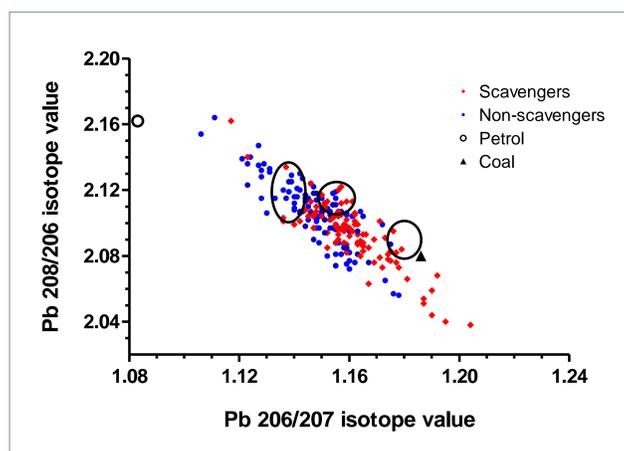


Fig. 2. Liver Pb isotope ratios in scavenging and non-scavenging birds of prey and in gunshot (elipses), coal and petrol¹.

Initial analysis indicates some separation in liver Pb isotope ratios between scavenging and non-scavenging species (Fig. 2). This may be influenced by differences in the extent of exposure to shot and ammunition but isotope ratios suggest exposure to mixed sources of Pb in all species.

Discussion

- Liver Pb levels in red kites and buzzards were 3 and 20 fold higher than in sparrowhawks and barn owls respectively, suggesting scavengers are indeed at greater risk from exposure to Pb



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- However, liver Pb in all birds in this study were below levels thought to cause adverse effects in Falconiformes²
- Liver Pb concentrations in red kites were similar to levels reported in one earlier UK study³ but lower than in another⁴
- Liver Pb residues in sparrowhawks and buzzards were similar to those in birds that died between 1982 and 1992⁵, suggesting there has been little change in Pb exposure in these species over the last 20 years.

References ¹Sugden CL et al., 1993. Isotopic ratios of lead in contemporary environmental material from Scotland. *Environ Geochem Health* 15 59–65. ²Franson, J C, Pain, D J 2011. Lead in Birds. In: Beyer WN & Meador, JP (eds.) *Environmental Contaminants in Biota: Interpreting Tissue Concentrations*. 2nd ed. Boca Raton, FL: CRC Press. ³Shore, R F et al., 2000. Rodenticide and lead concentrations in red kites *Milvus milvus*. Centre for Ecology & Hydrology Contract Report to English Nature. ⁴Pain, DJ et al., 2007. Lead contamination and associated disease in reintroduced red kites *Milvus milvus* in England. *Sci. Total Environ.* 376, 116–127. ⁵Pain, DJ et al. 1995. Lead concentrations in birds of prey in Britain. *Environ. Pollut.* 87, 173–180.