Metal and metalloid concentrations in the livers of Eurasian otter (Lutra lutra) from England and Wales.

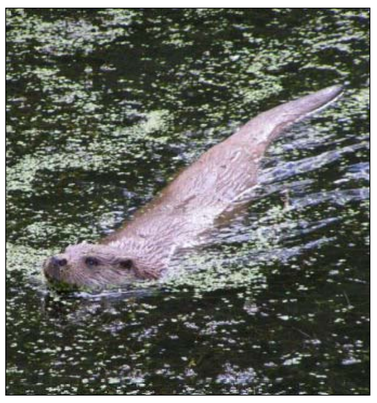
Centre for Ecology & Hydrology
NATURAL ENVIRONMENT RESEARCH COUNCIL
enquiries@ceh.ac.uk
www.ceh.ac.uk

Lee A. Walker[1], Elizabeth A. Chadwick[2], Alan Lawlor[1], M. Gloria Pereira , Elaine D. Potter & Richard F. Shore[1]

[1]Centre for Ecology & Hydrology, UK, [2] Cardiff University, UK. **E-mail: leew@ceh.ac.uk**

Introduction & Objectives

As a top predator, the Eurasian otter (*Lutra lutra*) is exposed, through its diet, to contaminants that bioaccumulate and, in particular, bioconcentrate through food chains.



There is surprisingly little information on metals concentrations the Eurasian otter and very few studies have been conducted in the UK.

Those studies in the UK that have reported metals in otters are from limited spatial distributions or do not report the timeframe over which the samples were taken.

This study aims to

- Quantify exposure by measuring liver metal concentrations.
- Test whether hepatic residues vary with age and sex.
- Determine if residues vary spatially.
- Compare our results to other studies in Europe and relate them to levels associated with possible adverse effects.

Methods

- Livers were collected from otters found dead in all regions of England & Wales between 2007 and 2009.
- Age, sex and body condition were determined during a post mortem examination.
- Liver samples were kept frozen prior to analysis, a 1g subsample was microwave-digested in 70% nitric acid.
- A suite of 17 metals and metalloids were quantified using inductively couple plasma – mass spectrometry (ICP-MS).

Results & discussions

Variation of residue magnitude with age and sex (Fig. 1).

There were no consistent differences in liver concentrations of metals between males and females. Cadmium and mercury liver concentrations generally increased with age, although statistically significant differences between age classes were only evident in females.

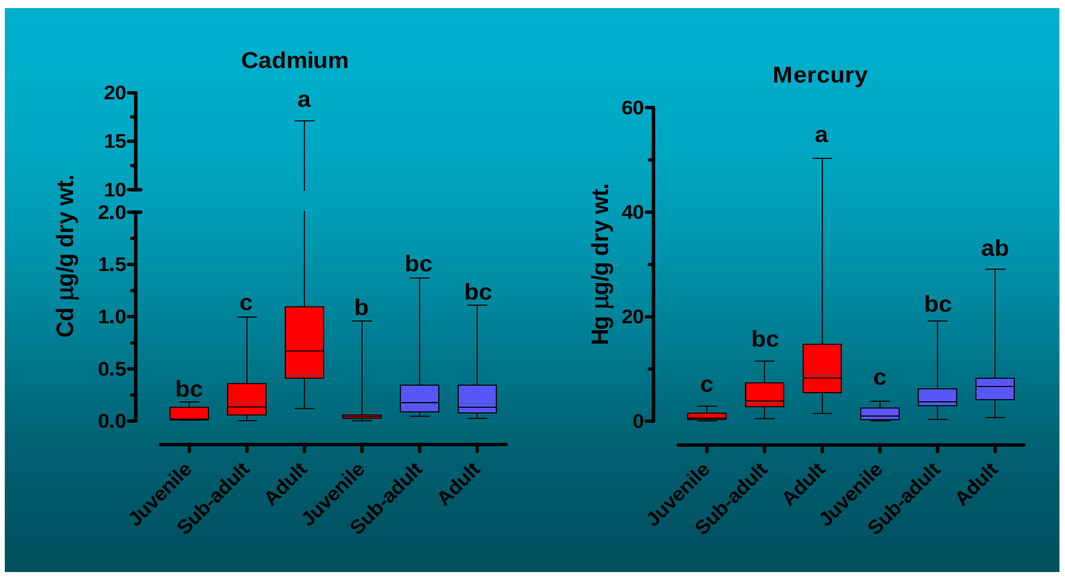


Figure 1. Box and whiskers plot of liver concentrations of Cd and Hg in otters of different age class and sex. Red and blue boxes indicate female and male otters, respectively. Data were analysed by Kruskall-Wallis test and Dunn's post-hoc comparisons across the six sex/age classes. For each element, columns with same superscripts indicate that those classes are not significantly different from each other.

Results & discussions (continued)

Spatial variation of residue magnitude (Fig. 2).

- Cadmium, lead, iron and molybdenum concentrations were significantly higher in northern England, compared to other regions.
- This may be due to natural variation in sources of metals, resulting from weathering of under-lying metal rich rocks, or pollution resulting from local industrial activities such as manufacturing, mining and metal ore smelting.

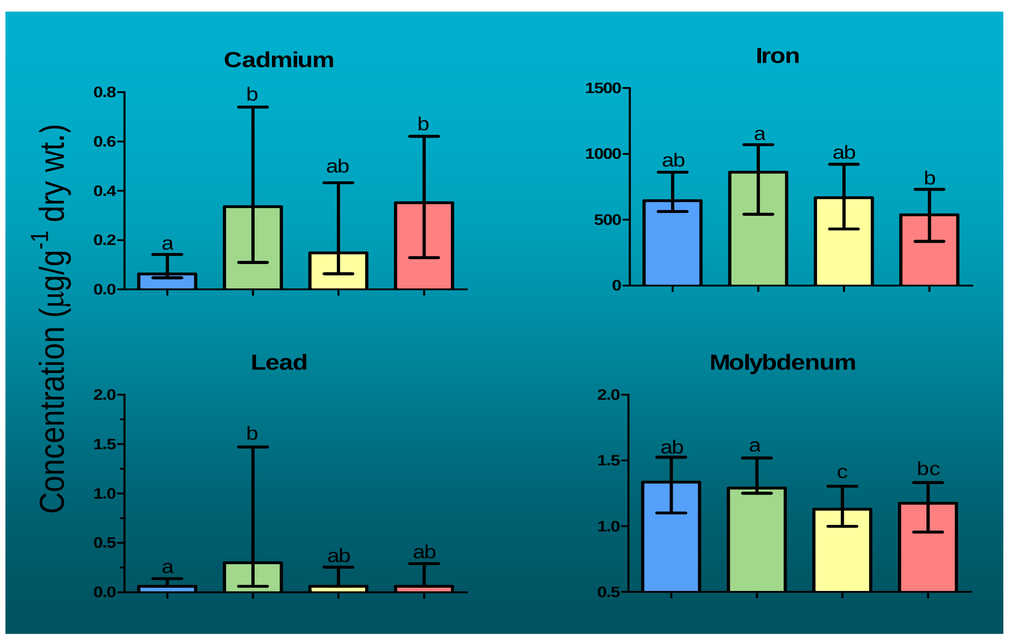


Figure 2. Median (± inter-quartile range) concentrations of Cd, Fe, Pb and Mo in livers of otters that died in east England (blue), north England (green), south-west England (yellow) and Wales and mid-west England (red). For each element, columns with same superscripts indicate that those classes are not significantly different from each other as tested by Kruskall-Wallis test and Dunn's post-hoc comparisons.

Comparison with other studies (Fig. 3).

The residues of cadmium and mercury measured in the current study are similar to those previously reported in otters from Scotland, Great Britain, and eastern Europe.

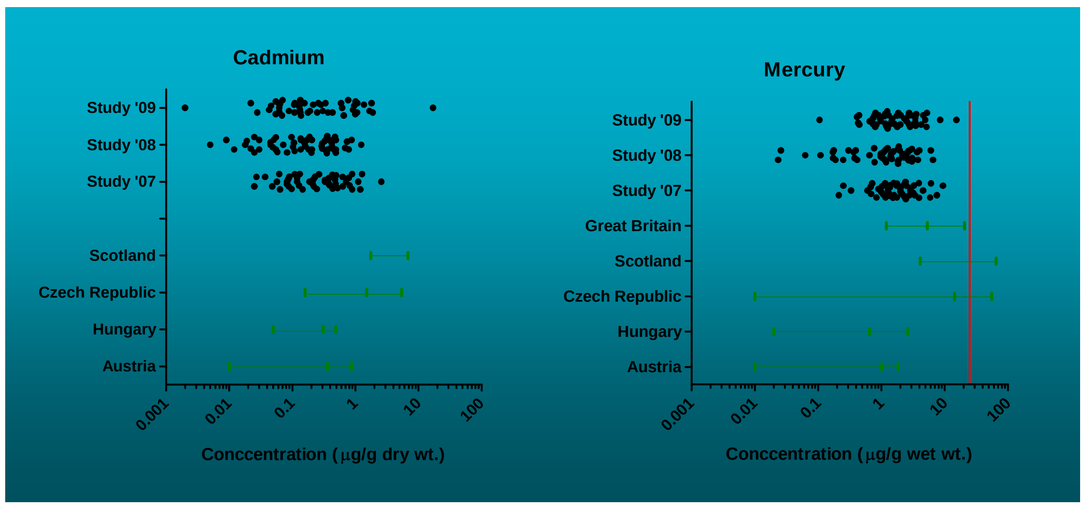


Figure 3. Comparison of data from current study (data for mercury converted to a wet weight concentration) to data from other European studies. Each set of points for previous studies represents minimum, mean and maximum concentrations. Red line indicates concentrations associated with toxic effects.

Conclusions

- Significant differences between demographic groups were detected for a number of metals.
- The concentrations of four of the elements reported varied spatially within England & Wales.
- The concentrations of inorganic elements measured in the present study were within the range previously reported for Eurasian otters and below those generally associated with toxic effects in mammals.

Predatory Bird Monitoring Scheme

Further results & information can be found on the Predatory Bird Monitoring Scheme website at:- https://wiki.ceh.ac.uk/display/pbms

NATURAL ENVIRONMENT RESEARCH COUNCIL