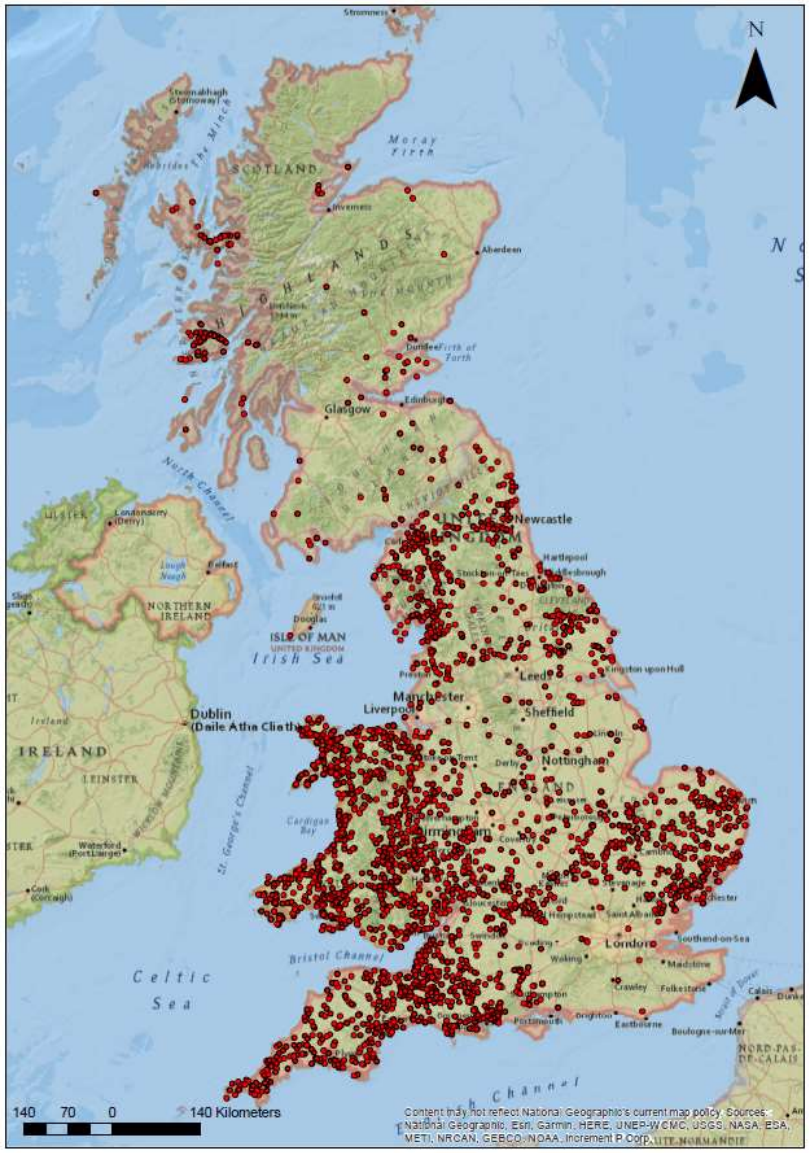
Cardiff University Otter Project

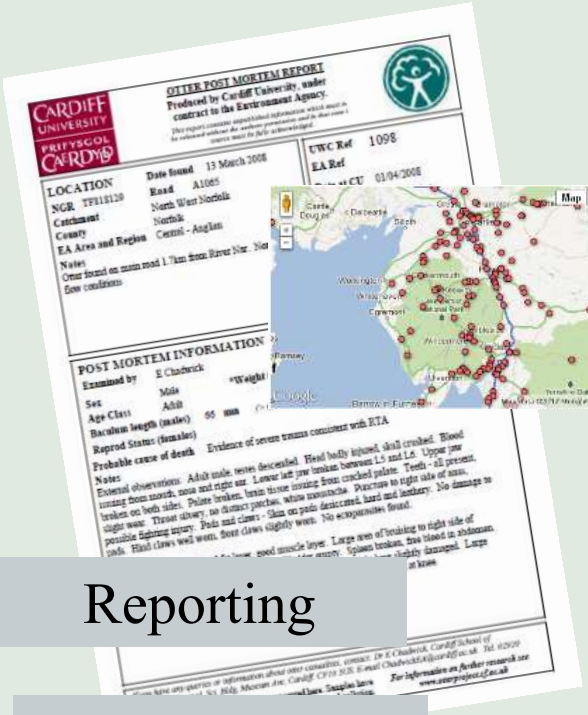
Dr E A Chadwick

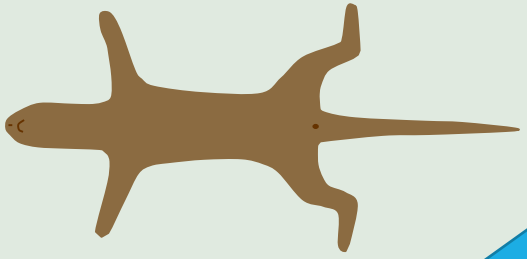
The Cardiff University Otter Project

- Since 1992
- England, Wales – more recently, Scotland
- Initially 10/yr, now up to 250/year
- Total sample/data bank ca. 3500 individuals



Procedure





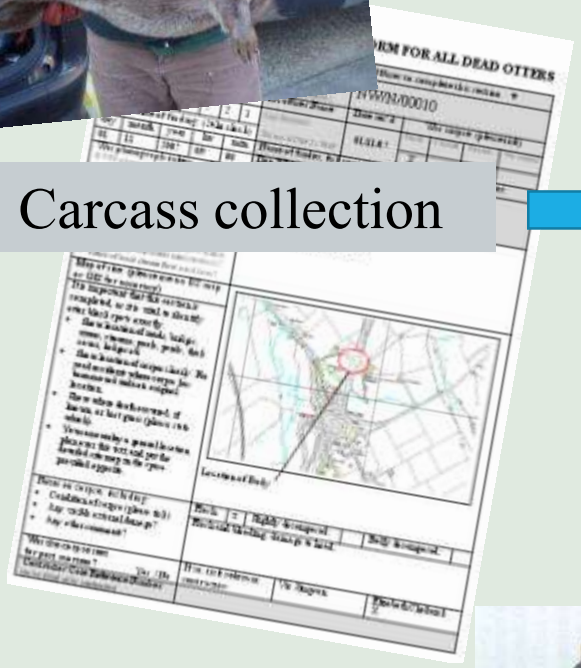
Carcass collection

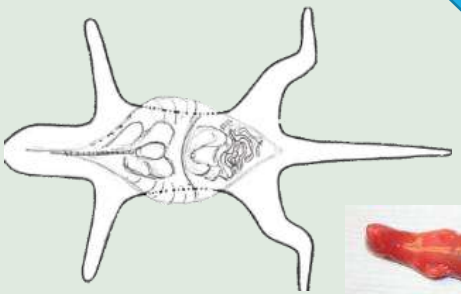
Post mortem

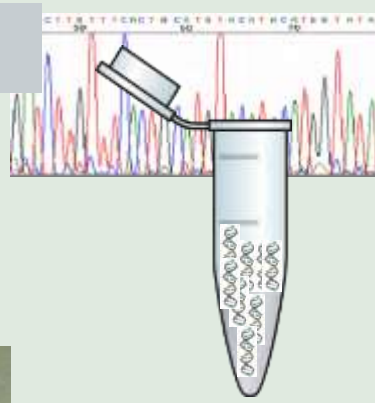
Reporting

Archiving

Research





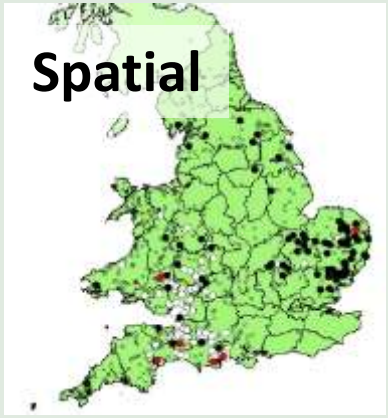


The archive

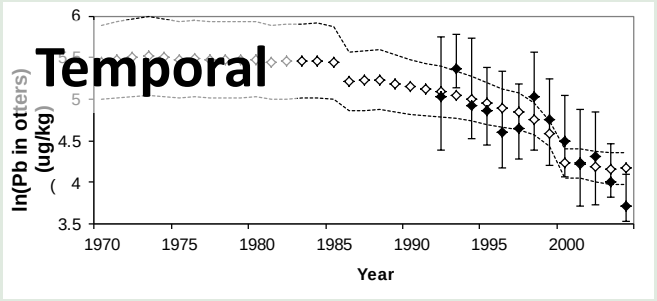
Archived samples – we can retrospectively analyse as:

- New questions arise e.g. AMR
- New methods are developed e.g. genomics
- New funding becomes available…

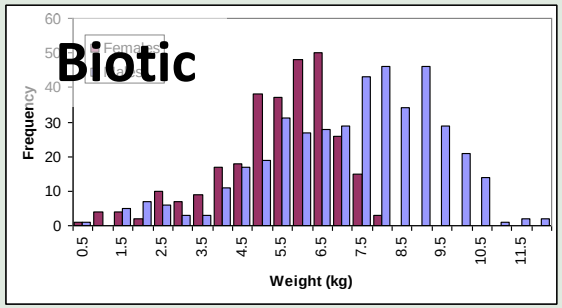
Research: Overarching questions



- Patterns across the UK – do they reflect the natural landscape, anthropogenic drivers, or other factors?



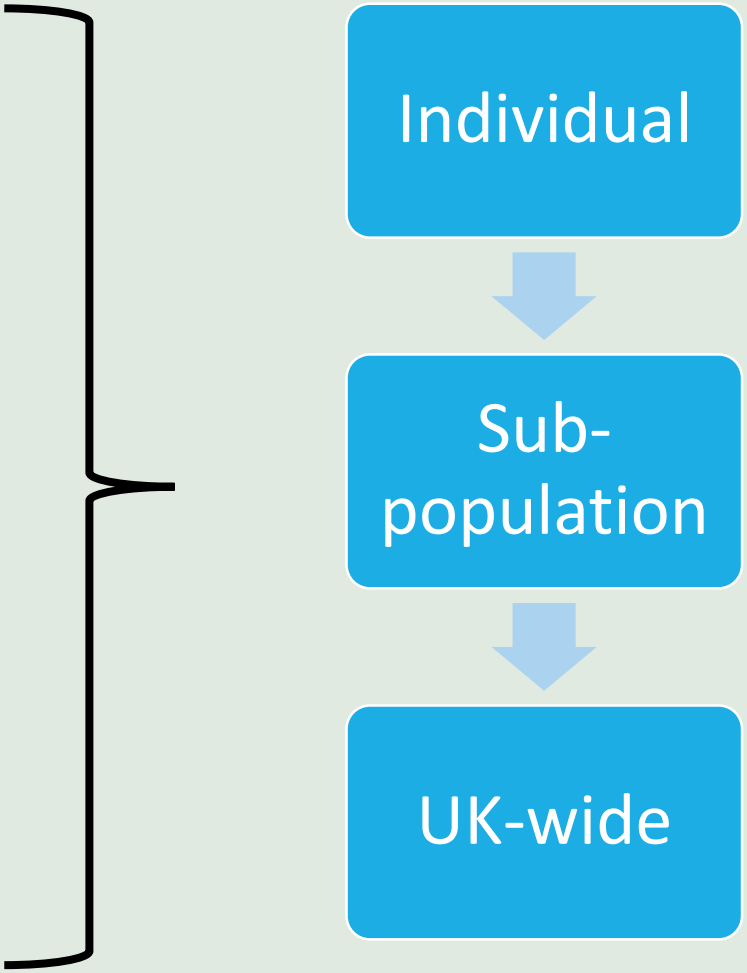
- Change over time (25 yr time series), seasonal variation



- Differences between groups e.g. by age, sex, reproductive status

Research: Range of disciplines and scales

- Basic biology
- Contaminants
- Genetics
- Chemical communication
- Parasitology
- Diet
- Health



Relevant aspects for biomonitoring

Biological monitoring – chemical residues

- Top of the freshwater foodchain in UK
- Opportunistic predator, largely fish-based diet
- Non-migratory (home range few to tens km)
- Life-span <8 years; sampled otters mostly 1-3.

Biological effect monitoring – 'health'

- Diverse PM data
- Body condition
- Relative organ / gland weights
- Reproductive indicators
- Cysts, parasite load, … etc

Presence of flame retardants

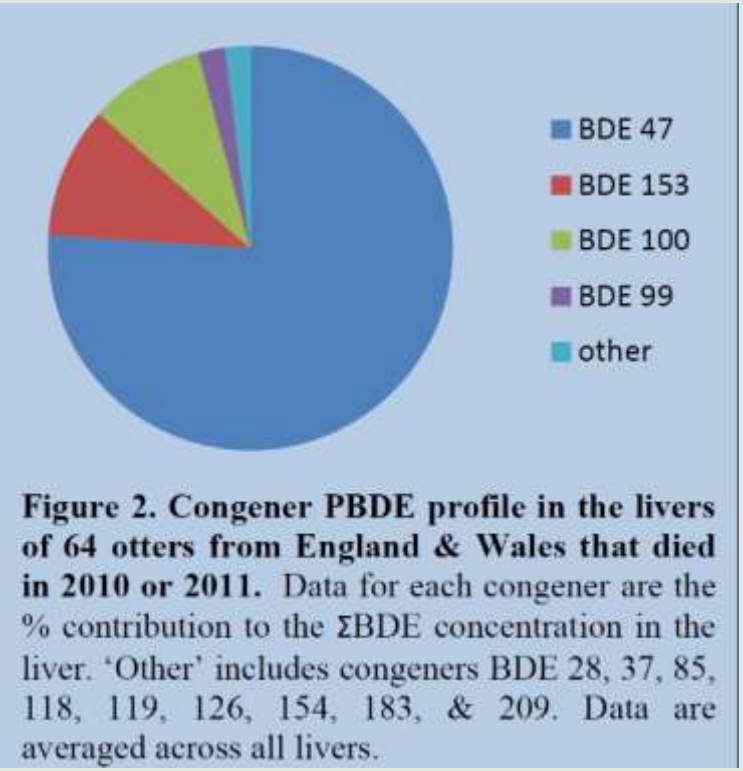


Figure 2. Congener PBDE profile in the livers of 64 otters from England & Wales that died in 2010 or 2011. Data for each congener are the % contribution to the ΣBDE concentration in the liver. 'Other' includes congeners BDE 28, 37, 85, 118, 119, 126, 154, 183, & 209. Data are averaged across all livers.

Walker et al. (2013) PBMS report

Pountney et al. 2014, Chemosphere; n = 129,1995-2006

Walker et al. 2013, PBMS report; n = 64, 2010-2011

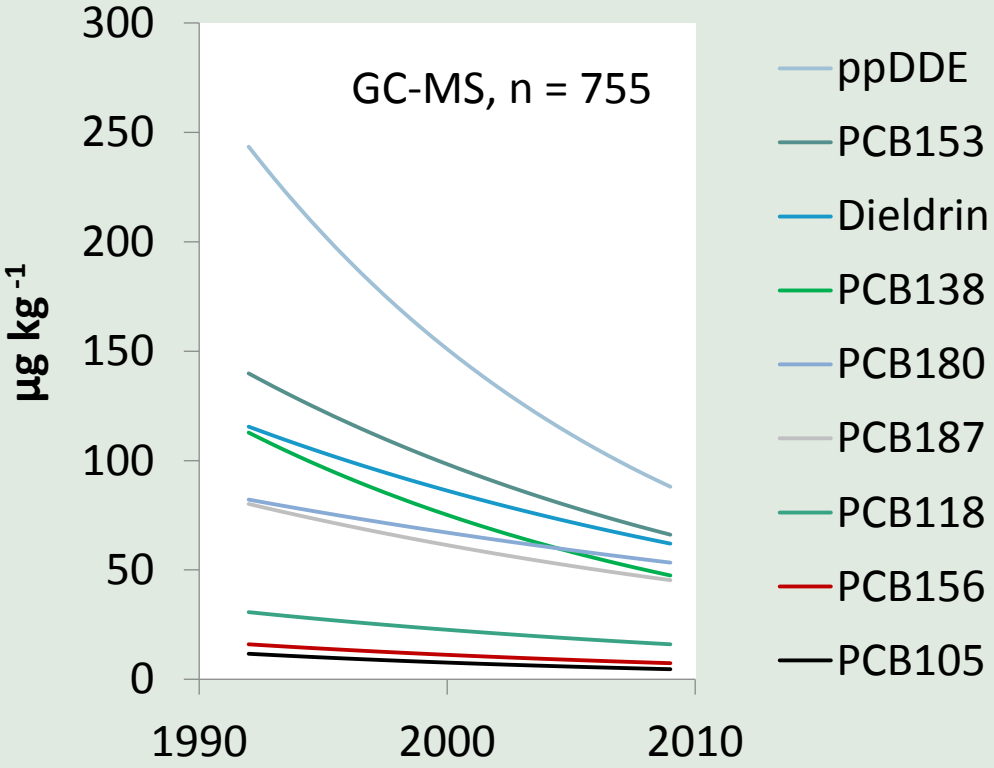
- PBDEs present in all livers analysed
- Conc. ranged between 12 and 70,000 ng/g lipid weight, median

Newer (replacement) fire retardants in few samples (Walker et al 2013) including:

- Hexabromocyclododecane (HBCD) (4/30, 2010)
- 2-Dechlorane (DC2) (3/64)
- Hexabromobenzene (6BrBz) 2/64

Temporal trends in legacy contaminants

- Proved that legislative action to ban (e.g. POPs) contaminants has been successful in some cases
- Why are declines not apparent for some contaminants?



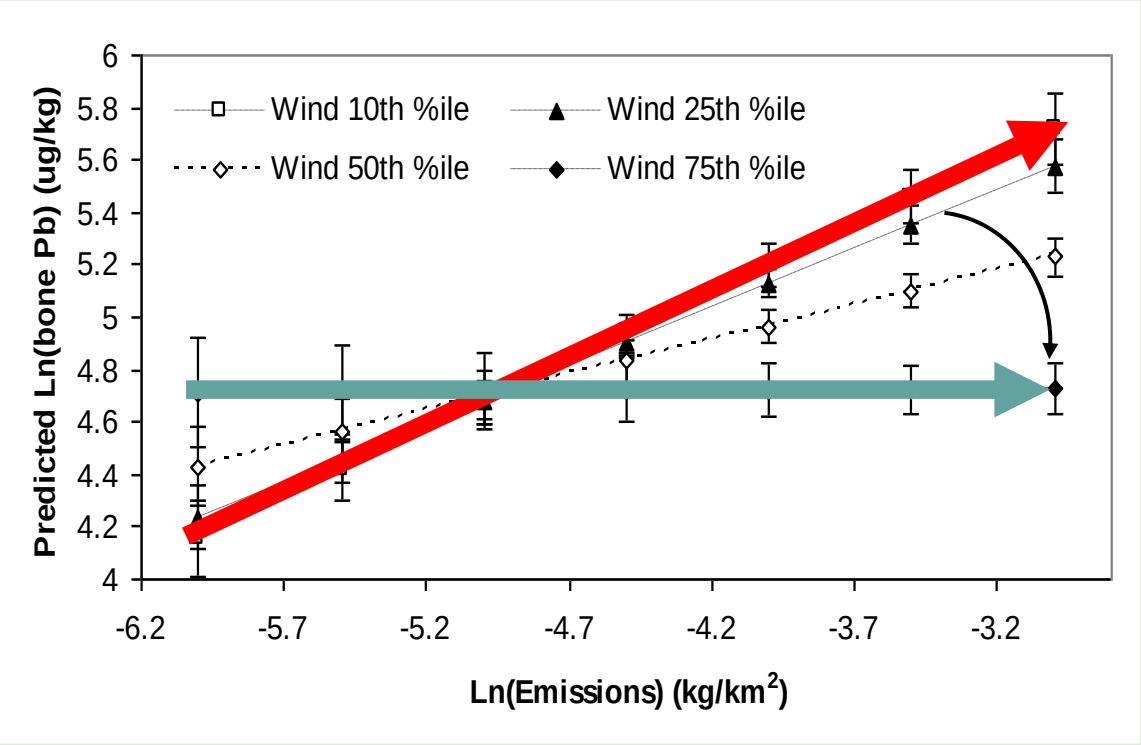
Significant declines with time in:
- Dieldrin
- ppDDE
- and 7 PCB's

Not clear
- ppTDE
- HCBenz
- PCB128
- PCB170

Kean & Chadwick 2012. Report to EA

Spatial trends in lead (Pb) concentration

Otters are an effective fine-scale indicator – interactions between sources, weather, and water chemistry, predict spatial variation



where it's still, there is a **clear relationship** between local emissions, and Pb in otter bone

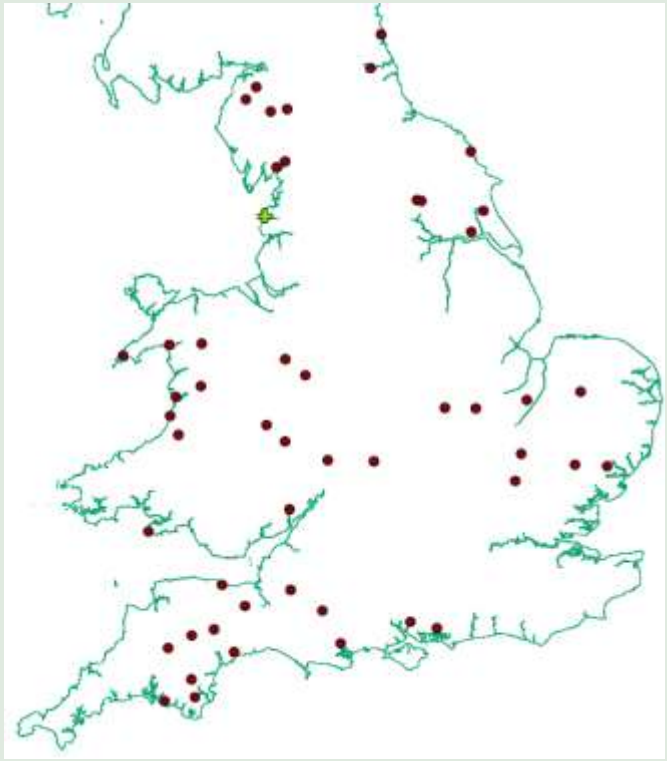
but where it's really windy, there is **no relationship** between local emissions and Pb in otter bone

Chadwick et al 2011. Environmental Science & Technology. 45 (5) 1911-16

Perfluorinated compounds

- Samples 2007-09 (prior to voluntary reduction of PFOA by 2010 / withdrawal by 2015; after withdrawal of PFOS in 2002).
- Screened for 10 perfluoroalkyl carboxylic acids (PFCAs), 4 perfluroalkyl sulfonic acids (PFSAs) and perfluorooctane sulfonaminde (PFOSA).

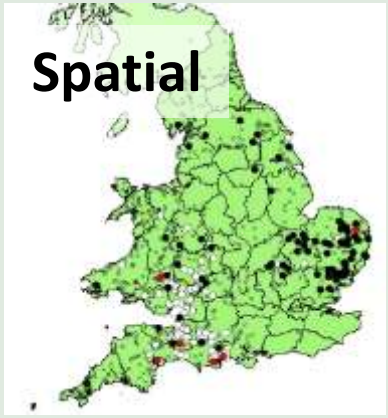
Detection rates high across most compountds



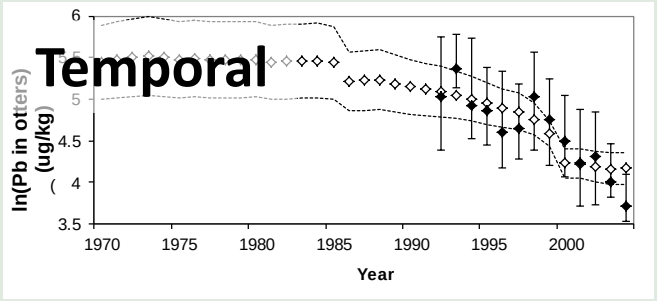
Method: LC-MS, n=50

Cefas

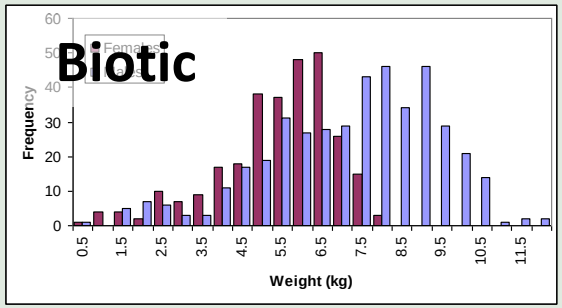
What next?



Greater sampling density needed to accurately model spatial drivers e.g. include wind direction e.g. for PFCs



Legacy contaminants not analysed since 2007. PFCs – baseline established, what now?



Current work exploring dietary variation using molecular methods – helps inform contaminant exposure. Genomics – understanding health.

Conclusions

Incredible resource!

- especially useful for bioaccumulative contaminants
- So far research into PCBs, OCs, heavy metals, flame retardants, PFCs, plastics
- integration of information – concentration data, biotic data, ecological understanding, health endpoints

Communication?

- Information perhaps underutilised e.g. by agencies & policy makers? How can we communicate better?
- Otter as flagship – great for communication with the public

Acknowledgements

Members of the otter team at Cardiff

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Cyfoeth Naturiol Cymru Natural Resources Wales

Public Health England

Animal & Plant Health Agency

Llywodraeth Cymru Welsh Government

NERC Science of the Environment

kess

Environment Agency

IOSF International Otter Survival Fund

SEPA Scottish Environment Protection Agency / Buidheann Dion Àrainneachd na h-Alba

The Wildlife Trusts

npower An RWE company

CHEMTrust Protecting humans and wildlife from harmful chemicals

CEH Centre for Ecology & Hydrology Natural Environment Research Council

Contact / follow us

www.cardiff.ac.uk/otter-project

@otterprojectuk

@Otter_Project

Otters@Cardiff.ac.uk (the team)
ChadwickEA@Cardiff.ac.uk (me)

02920 874046 (the team)
02920 874948 (me)