

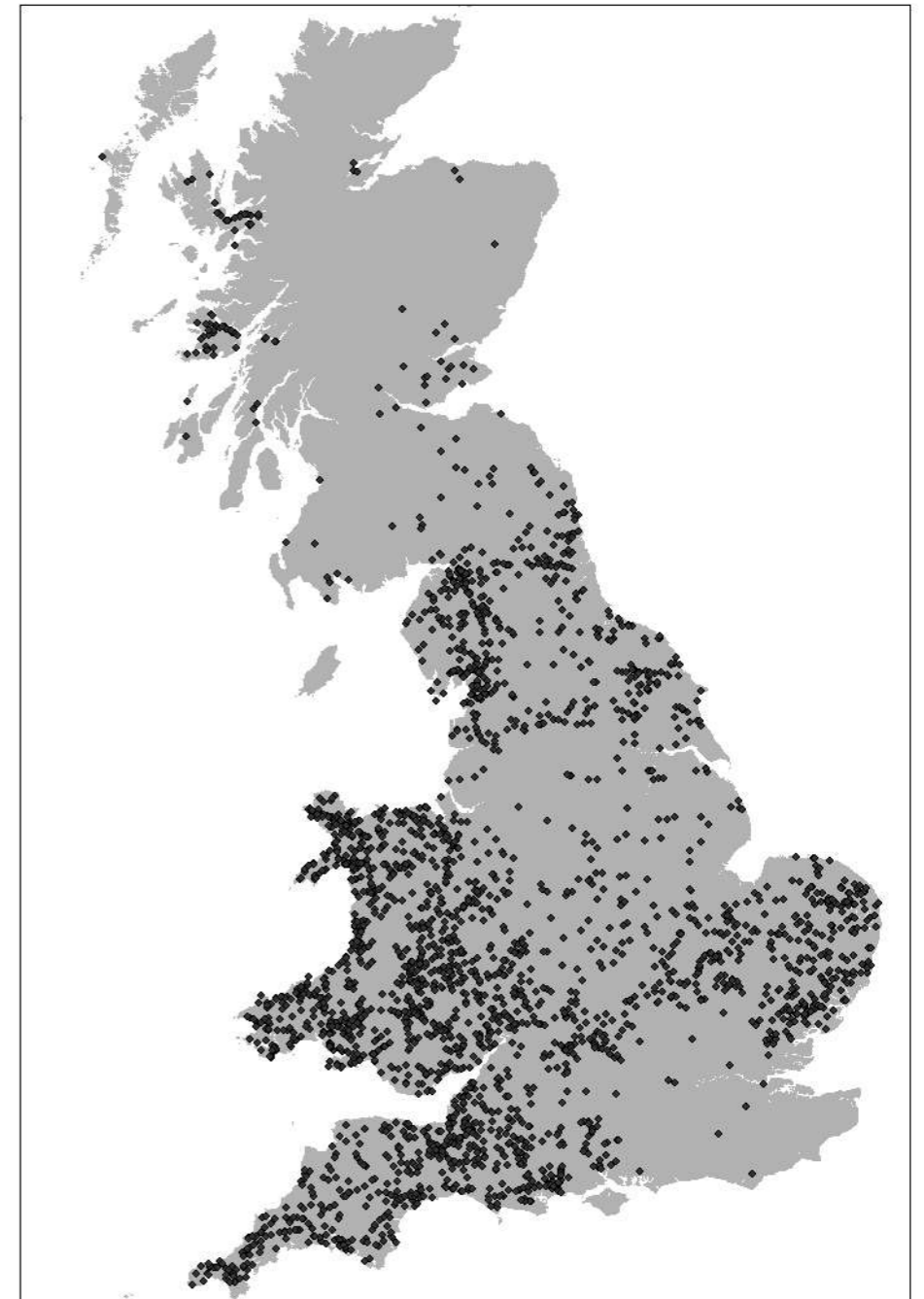
Cardiff University Otter Project



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 >3000 individuals



Procedure



CARDIFF UNIVERSITY
PRIFYSGOL CAERDYDD

OTTER POST MORTEM REPORT
Produced by Cardiff University, under contract to the Environment Agency.

Date found: 13 March 2008
UWC Ref: 1098
EA Ref: 01/04/2008

LOCATION
NGR: TF111119
Road: A1065
Catchment: North West Norfolk
County: Norfolk
EA Area and Region: Central - Anglian

POST MORTEM INFORMATION
Examined by: E Chadwick
Sex: Male
Age Class: Adult
Baculum length (males): 65 mm
Reprod Status (females):
Probable cause of death: Evidence of severe trauma consistent with RTA

Notes:
External observations: Adult male, testes descended. Head badly injured, skull crushed. Blood staining from mouth, nose and right ear. Lower left jaw broken between L5 and L6. Upper jaw broken on both sides. Palate broken, brain tissue missing from crushed palate. Teeth - all present, slight wear. Throat sloughy, no distinct patches, white moustache. Puncture to right side of snout. Possible fighting injury. Pads and claws - Skin on pads desiccated, hard and leathery. No damage to pads. Hind claws well worn, fore claws slightly worn. No abnormalities found.

Notes:
Internal observations: Large area of bruising to right side of spine. Spinal broken, free blood in abdomen. Spleen slightly damaged. Large laceration at knee.



FORM FOR ALL DEAD OTTERS

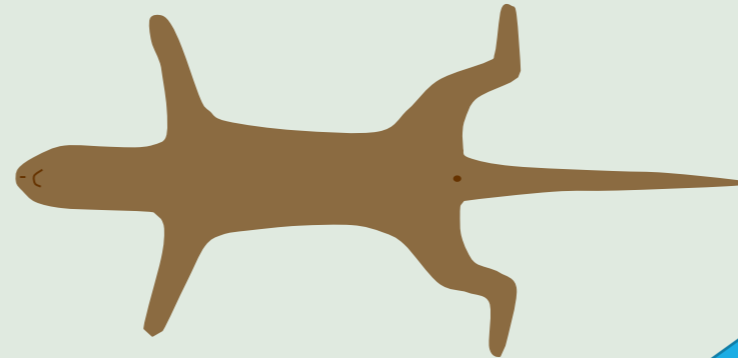
Officer to complete this section

Case No: NWN/00010

Date rec'd: 01.11.07

Where found (p/checkbox):

Home of finder, full name:



Reporting

Carcass collection

Post mortem

Archiving

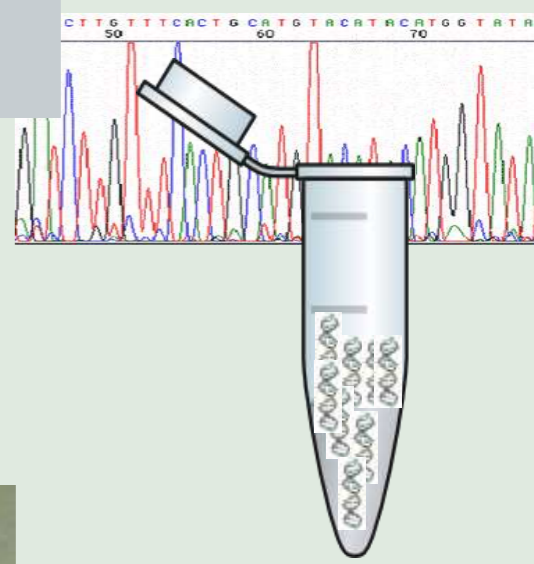
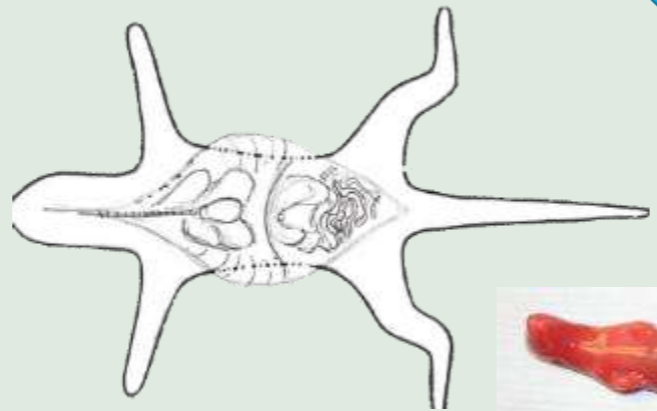
Research

Map of site (please use an OS map or GIS for accuracy). It's important that this section is completed, as it's vital to identify the location of the body. The location of roads, bridges, rivers, streams, pools, ponds, ditches, culverts, etc. The location of the body should be noted. The location of the body should be noted. The location of the body should be noted.

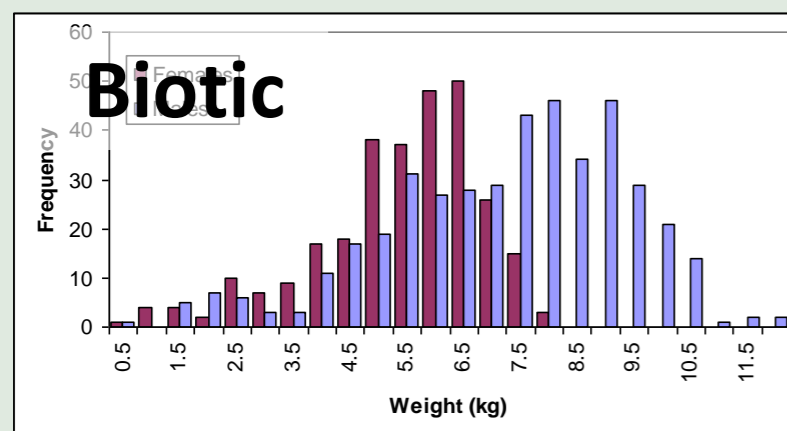
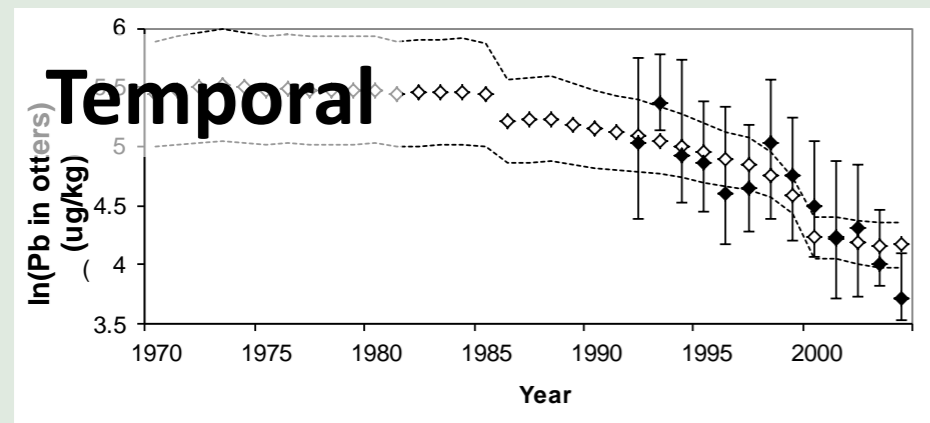
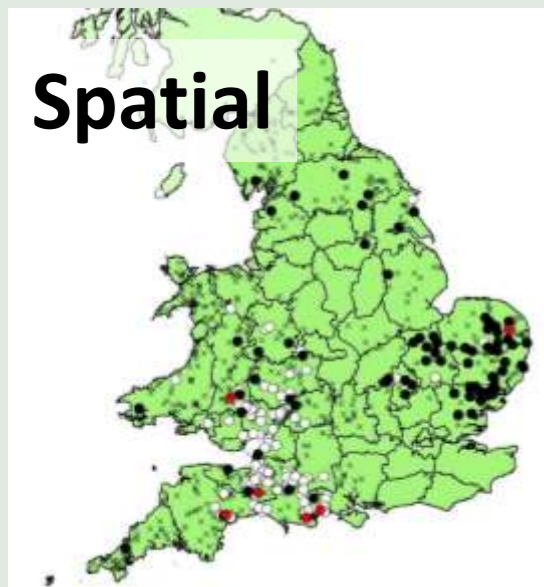
Notes on corpse, including:
• Condition of corpse (please tick):
• Any visible external damage?
• Any other comments?

Was the corpse sent for post mortem? Yes/No

Contractor Case Reference Number: If so, tick relevant contractor: UK Simpson: When both checked: X



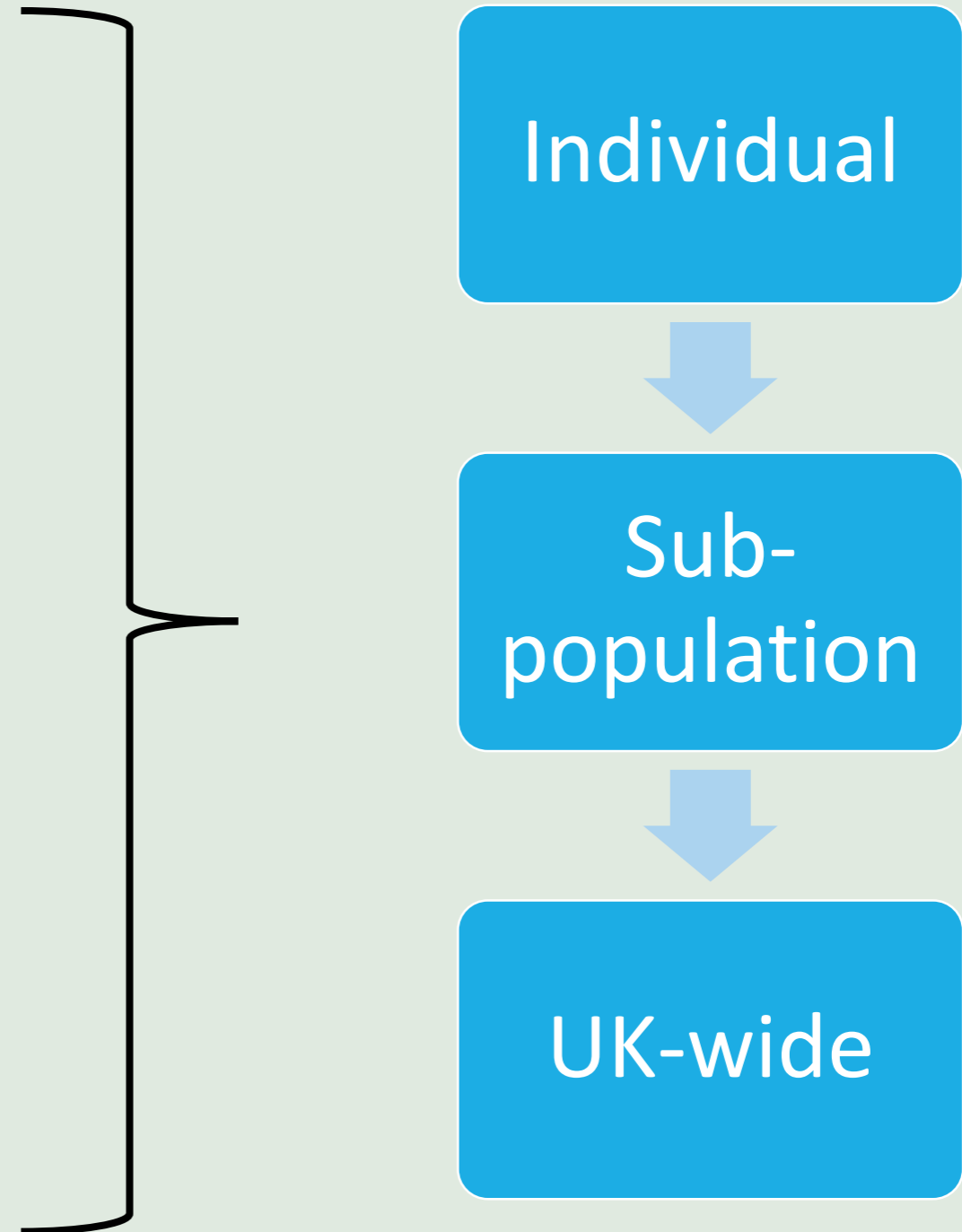
Research: Overarching themes




- 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



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 **Otter Project**
Research



About us ▾ Found an otter? ▾ Research ▾ Conservation and education ▾ Get involved News ▾ People ▾

Research

Research themes

Map

Post mortem examination

Publications ➤

Publications

Our researchers have produced a number of articles and monographs.

Selected publications

Sherrard-Smith, E. et al., 2016. [Distribution and molecular phylogeny of biliary trematodes \(Opisthorchiidae\) infecting native *Lutra lutra* and alien *Neovison vison* across Europe](#). *Parasitology International* 65 (2), pp.163-170. ([10.1016/j.parint.2015.11.007](#))

Kean, E. , Chadwick, E. A. and Muller, C. T. 2015. [Scent signals individual identity and country of origin in otters](#). *Mammalian Biology* 80 (2), pp.99-105. ([10.1016/j.mambio.2014.12.004](#))

Pountney, A. et al., 2015. [High liver content of polybrominated diphenyl ether \(PBDE\) in otters \(*Lutra lutra*\) from England and Wales](#). *Chemosphere* 118 , pp.81-86. ([10.1016/j.chemosphere.2014.06.051](#))

Sherrard-Smith, E. , Chadwick, E. A. and Cable, J. 2015. [The impact of introduced hosts on parasite transmission: opisthorchiid infections in American mink \(*Neovison vison*\)](#). *Biological Invasions* 17 (1), pp.115-122.



Publications archive

You can search Biosciences publications in Cardiff University's institutional repository.

[Search our publications](#)

Today's focus

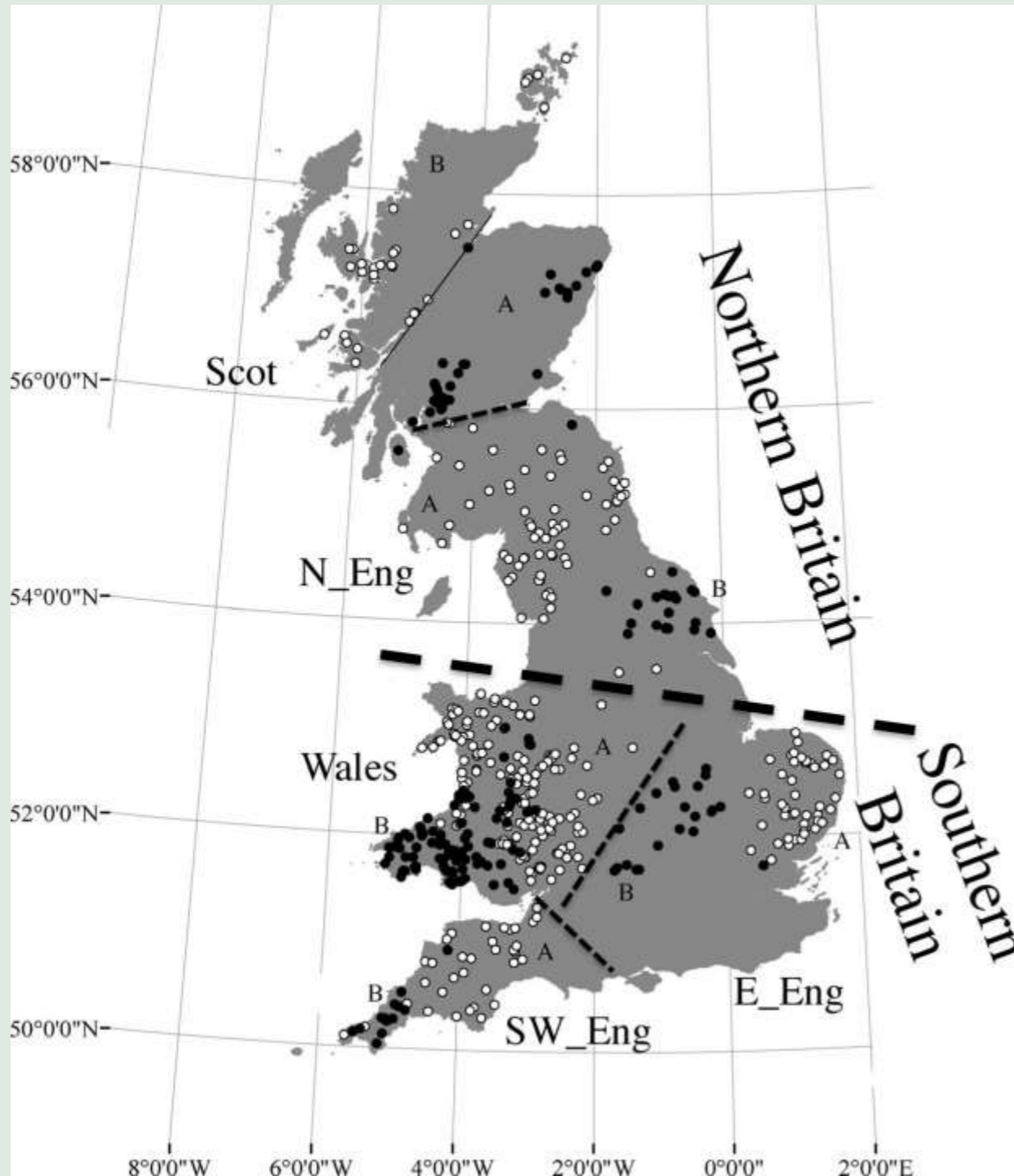
1. Why have populations increased?
2. Do we need to control populations?
3. Is fish stocking contributing to the increase?

Population dynamics

- Numbers have increased
- Carcasses received: Initially 10/yr, now up to 250/year
- Spraint surveys show increased distribution

- Why?

Genetic evidence



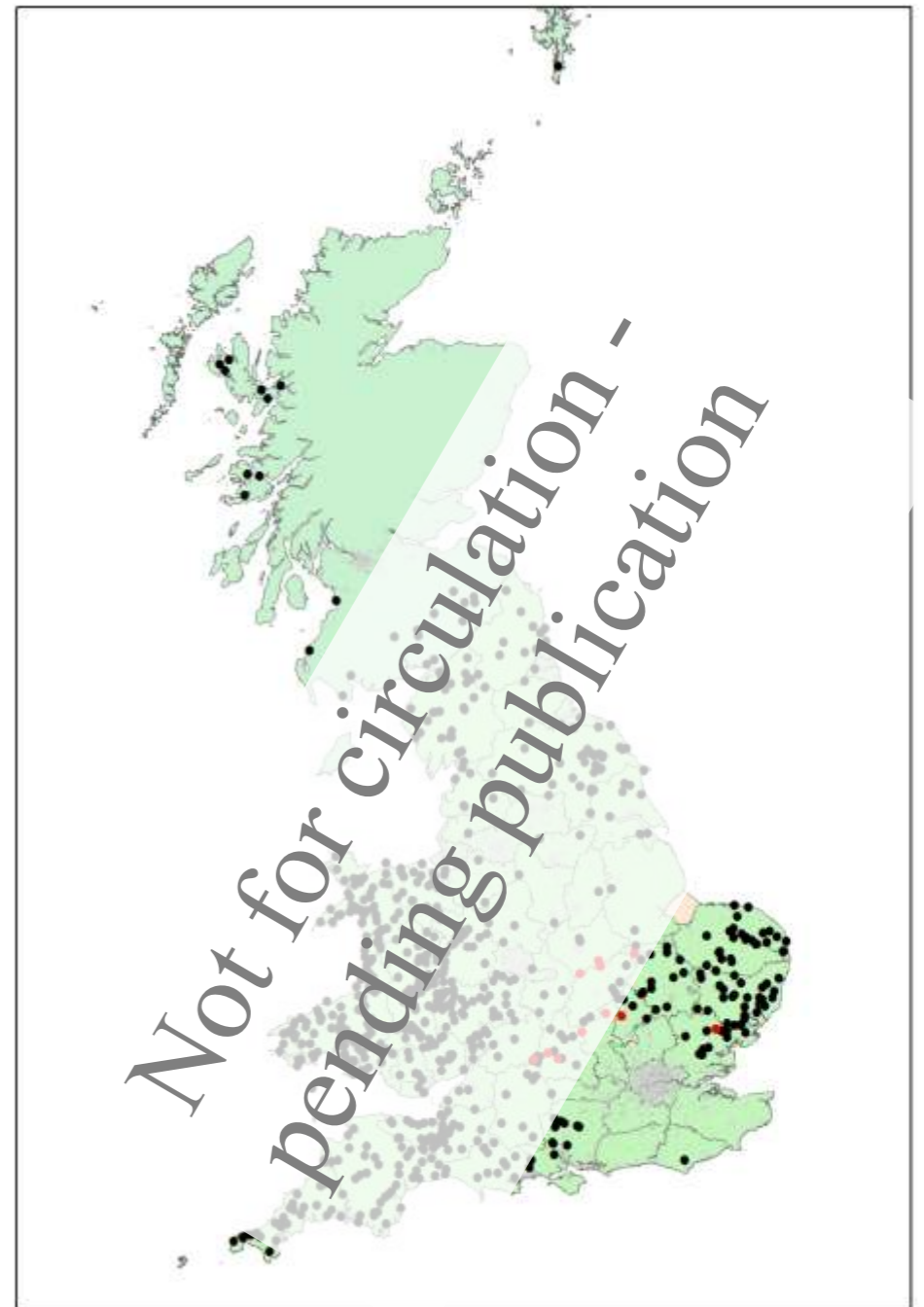
Method: DNA, from muscle tissue

- Highly structured population – suggests gradual recovery from distinct remnant populations

Genetic evidence

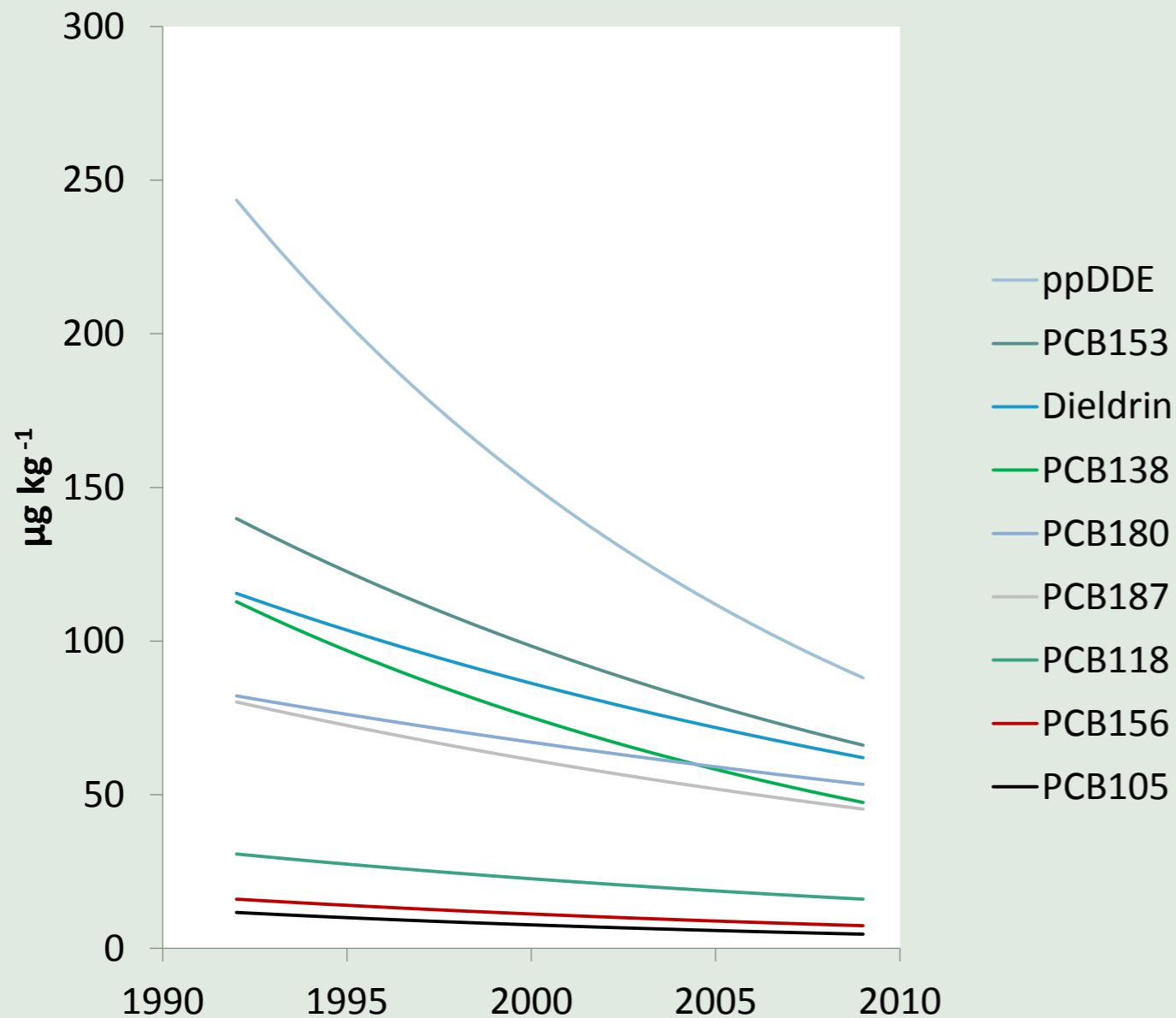
- Changes in genetic population structure across time
- DNA evidence (Hajkova et al 2006) previously suggested a distinct allele found in captive bred populations from Norfolk.
- This identifier (red dots) has NOT spread across the country

Nia Thomas
CUOP PhD
student



Hajkova et al 2006 J of Zoology.
doi:10.1111/j.1469-7998.2006.00259.x

Contaminant evidence



Kean & Chadwick 2012.

Method: Chemical analysis of liver tissue

- Clear decline in PBT chemicals (persistent, bioaccumulative, toxic)

Contaminant release has driven population recovery

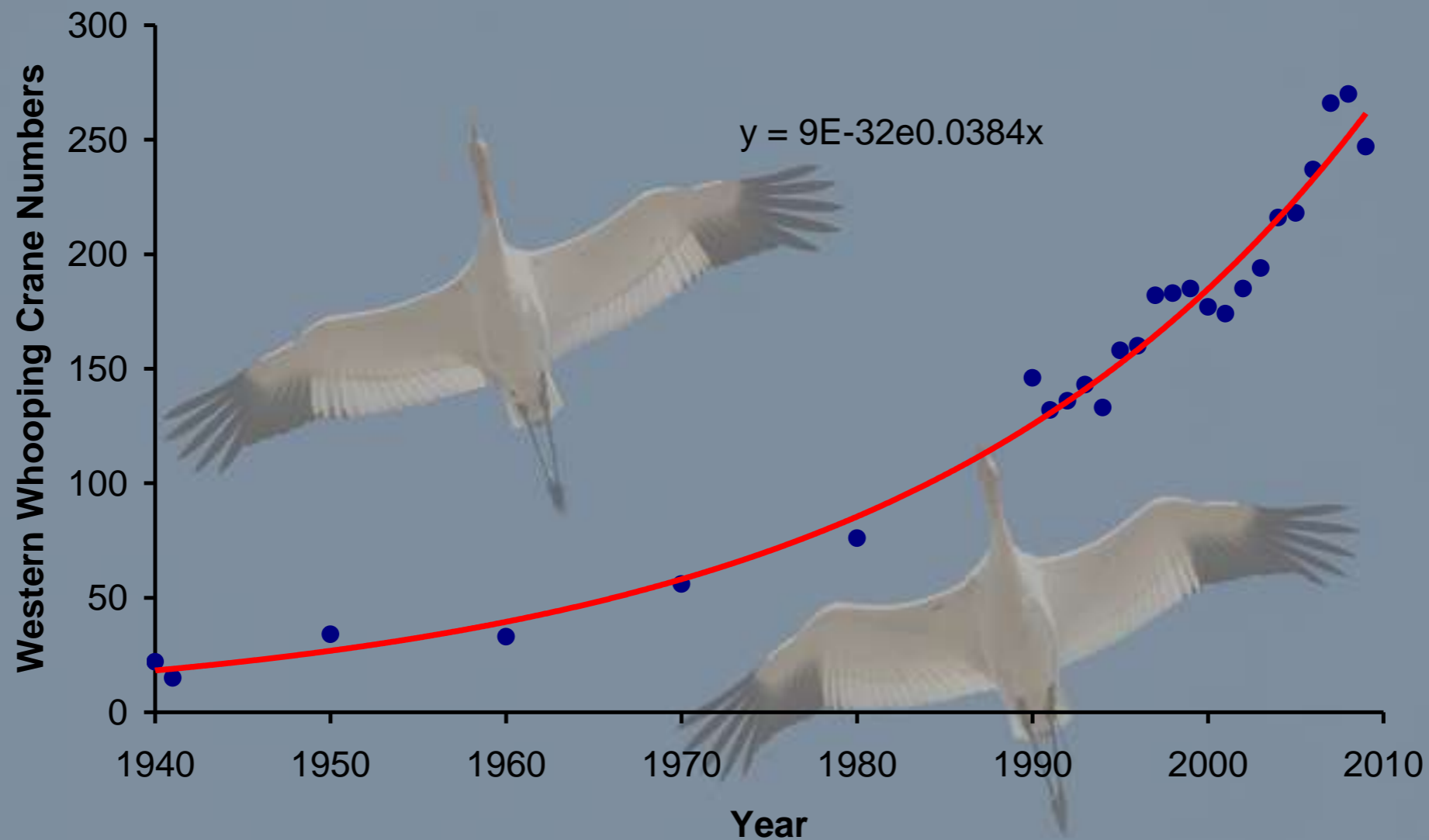
Should we implement controls?

What are natural controls on populations?

- Density dependent factors: e.g. competition drives changes in mortality and reproduction.
- Density *independent* factors: e.g. natural disasters – fire, flood – impact individuals regardless of density.
- Top down pressure: e.g. predators can control prey
- Bottom-up pressure: e.g. availability of food.
- Disease – also tends to be density dependent

Exponential growth?

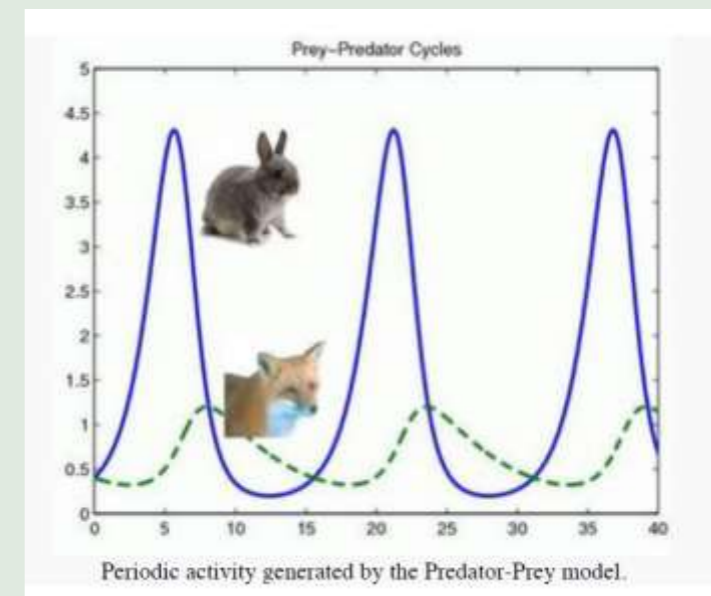
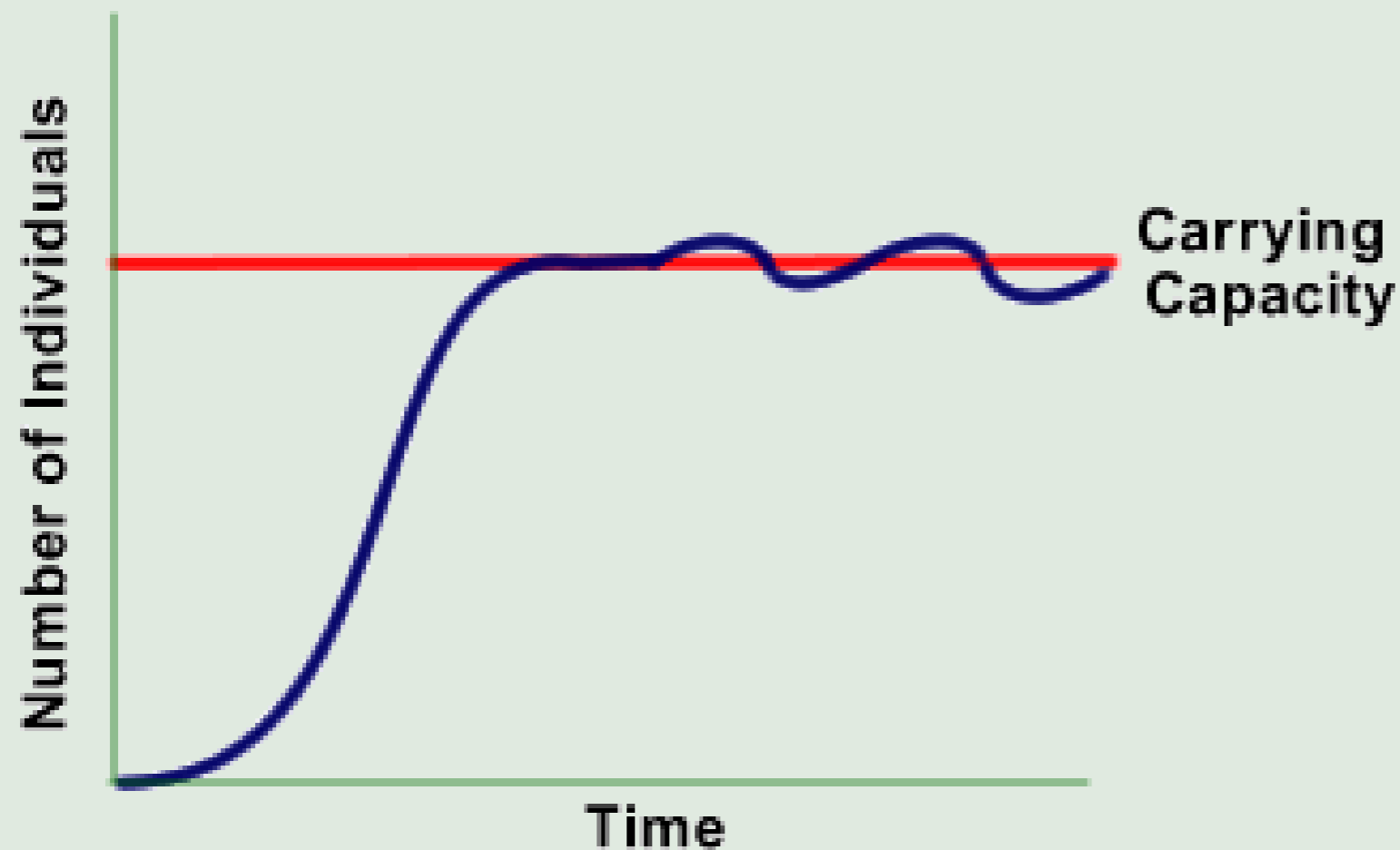
- Extremely rare in natural populations.
- Occurs sometimes in non-native invasive populations, and also during population recoveries



Data taken from www.learner.org/jnorth/tm/crane/Population.html

Carrying capacity

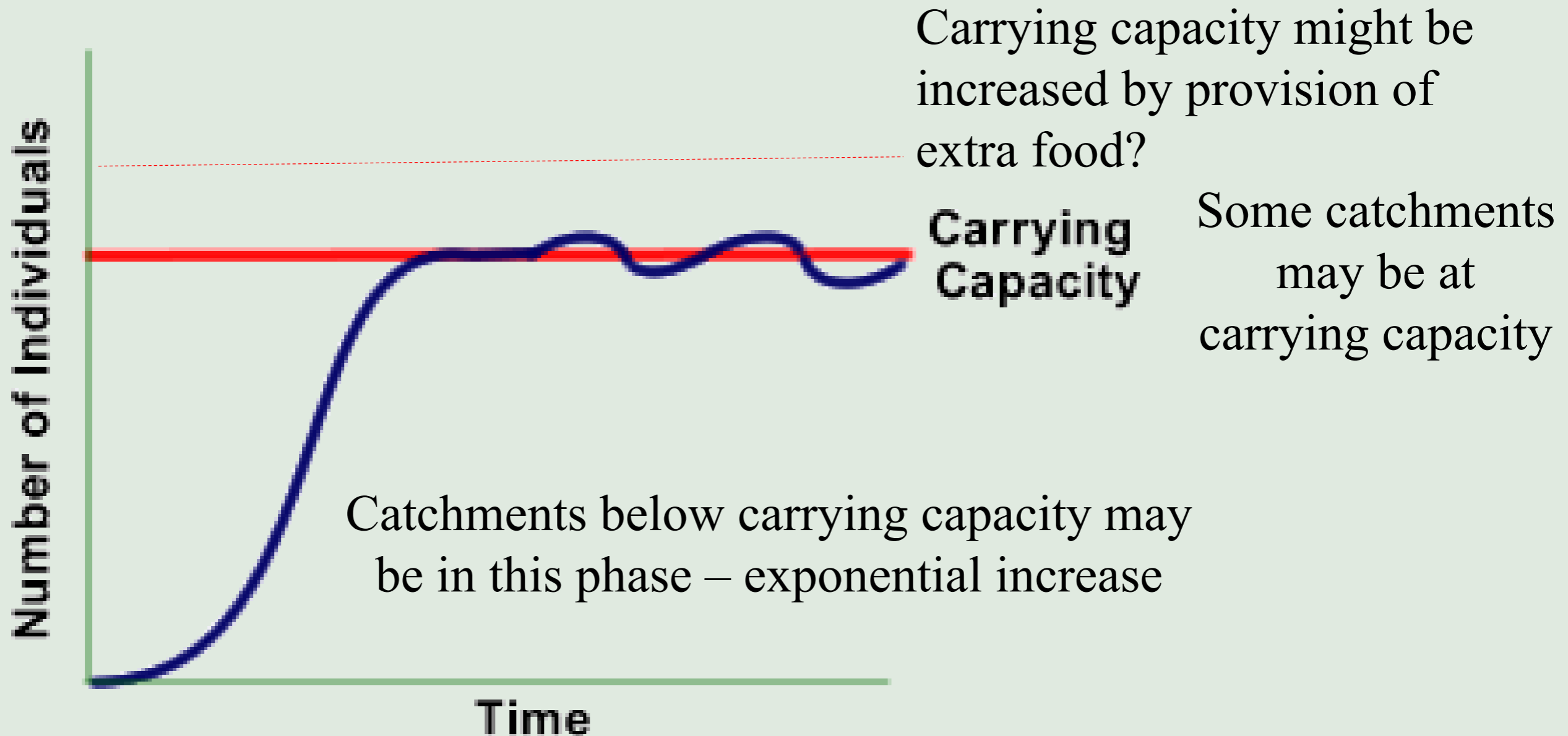
- May depend on food, refuge sites, ..
- Populations tend to fluctuate around carrying capacity – increased prey allows more predators, which drive down prey, which reduces predators... etc



<https://www.saylor.org/site/wp-content/uploads/2011/06/MA221-4.1.2.pdf>

Where are otters on the curve?

- It depends! Some catchments may be reaching carrying capacity, others are far below.



Are stocked fish elevating carrying capacity?

What do we know about otter diet?

- Traditional methods:

Hard parts analysis, typically from spraint

Application to stomach contents – link diet to the individual.



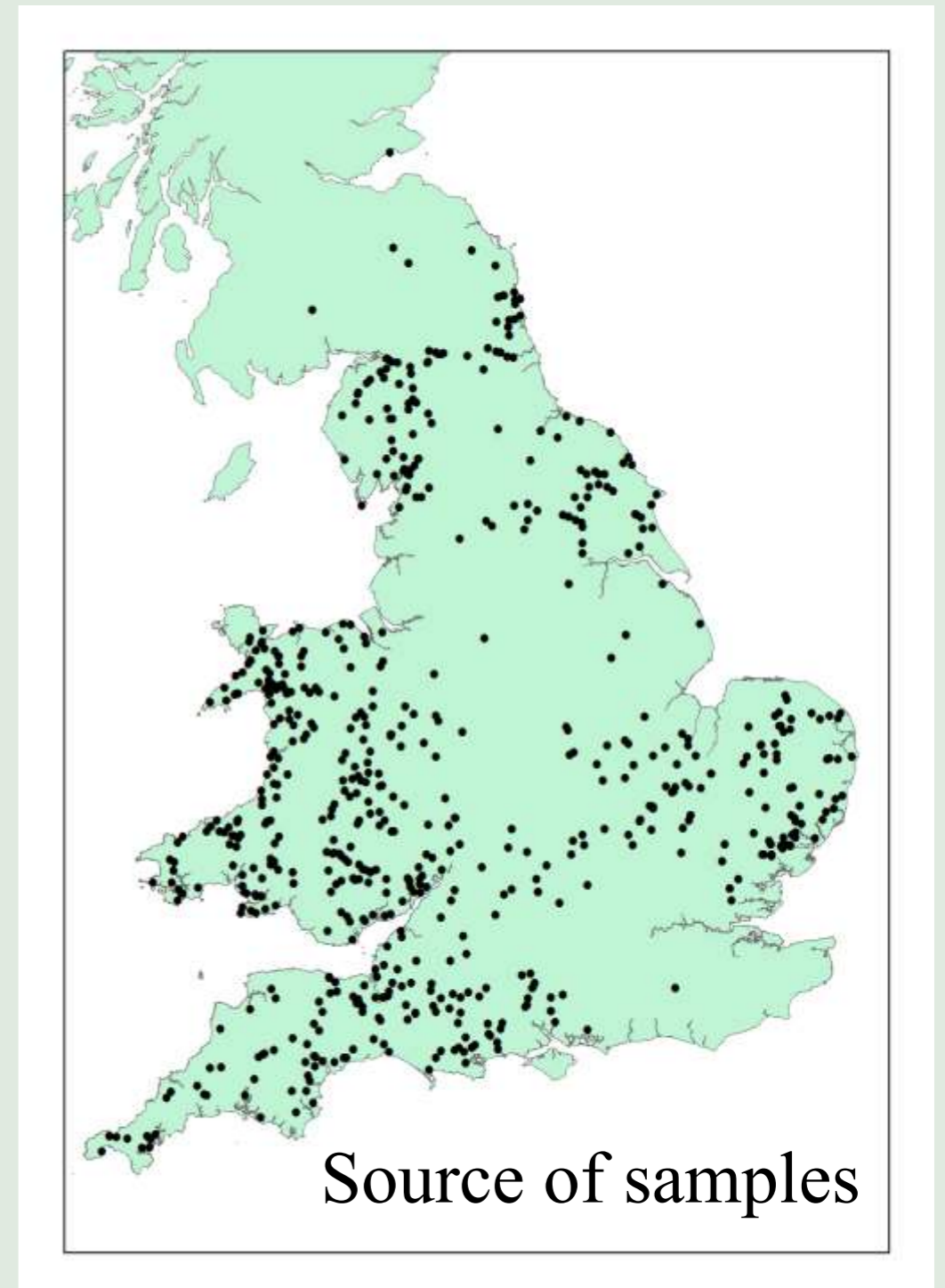
Stomach contents study, n=610 (1994-2010)

- 83% contained identifiable prey remains.

% of samples that contained... :

- 26% Bullhead
- 26% Cyprinid
- 25% Salmonid
- 20% Eel
- 13% Stickleback

Insect, bird, mammal, crustacean –
all ca.5%



Moorhouse Gann et al. Unpublished Otter
Project data

Limitations

- Cryptic prey e.g. Cyprinids

further IDd e.g. using jawbones: (of the 610)

Minnow (54), chub (12), roach (11), dace (4), carp (3), tench (2), barbel (2), common bream (2), rudd (1)

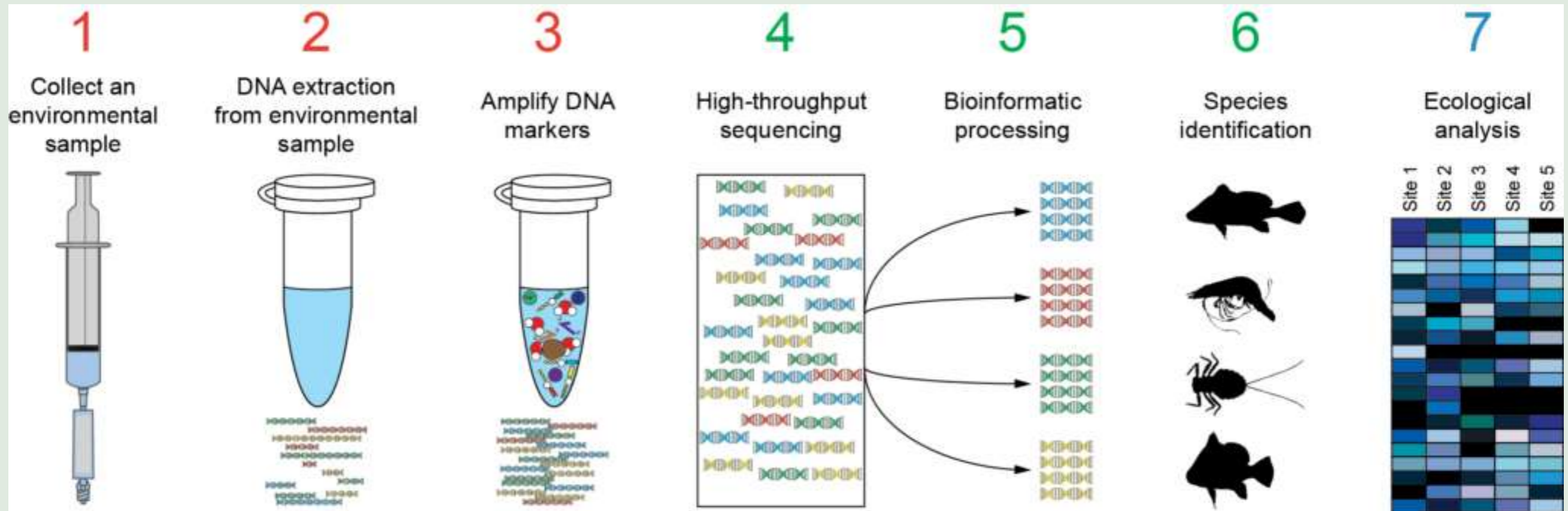
BUT:

- May not find a jaw bone
- Large fish – only flesh eaten? i.e. no hard parts
- Non-bony prey not picked up (e.g. lamprey?)

Is hard part analysis underestimating predation of certain species?

High throughput sequencing & metabarcoding

Lorna Drake
CUOP PhD
student



Otter faeces, n = 60 (2015-16)



- Trial period, n = 60 (white circles)
- Primer design and testing
- Initial results

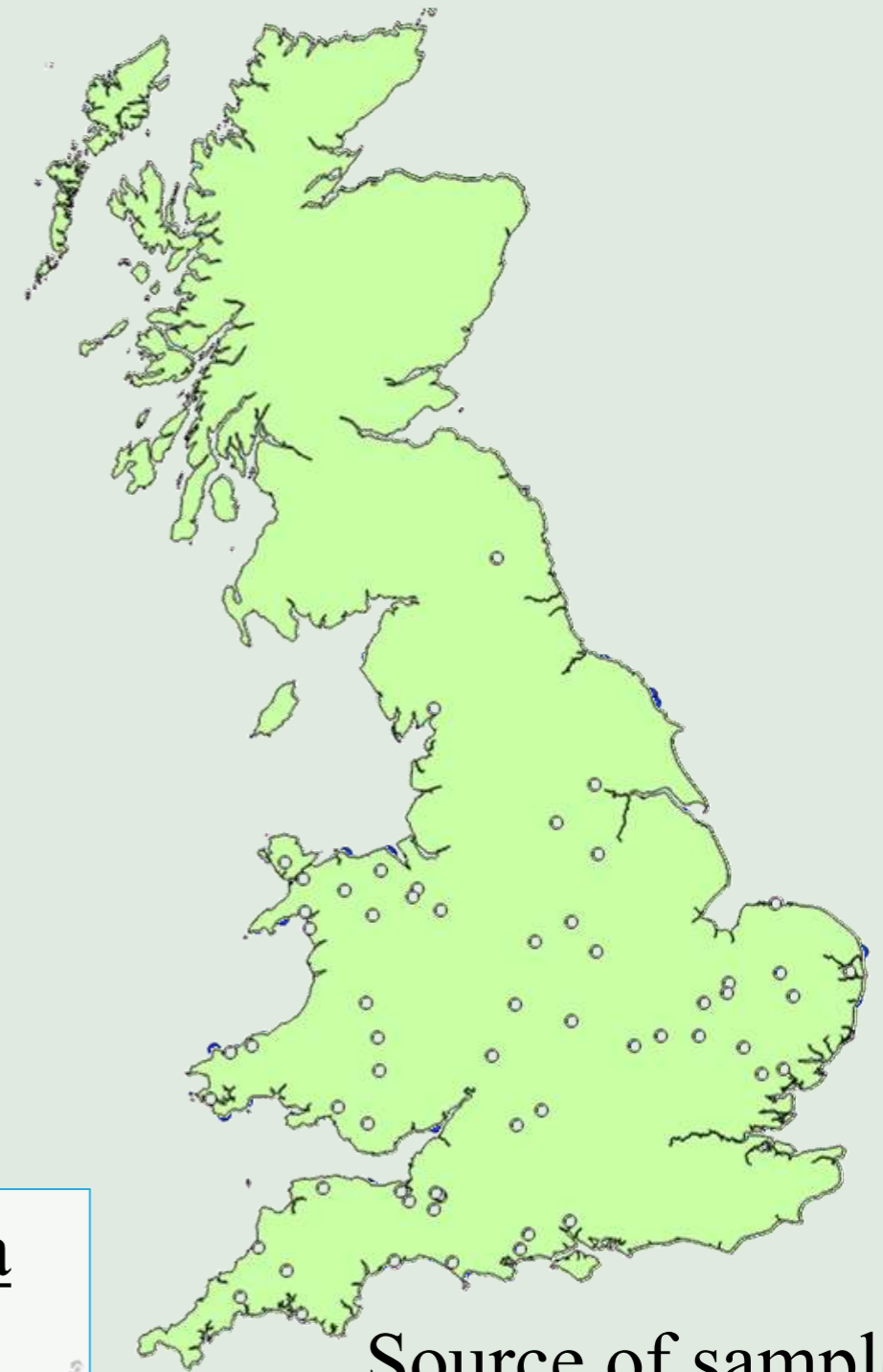
traditional

DNA

% of samples that contained... :

• 26%	Bullhead	23%
• 26%	Cyprinid	30%
• 25%	Salmonid	17%
• 20%	Eel	7%
• 13%	Stickleback	3%

Not for circulation. Preliminary data from trial. Some further method improvements to be made



Source of samples

Species specifics... of the 60 otters

- Cyprinids (30%), included:

One with crucian carp

(also minnow, roach, gudgeon, rudd, bream, tench)*

*Further work on DNA barcode library may add to this list

- Salmonids (17%), included:

One with rainbow trout

(also atlantic salmon, brown trout)

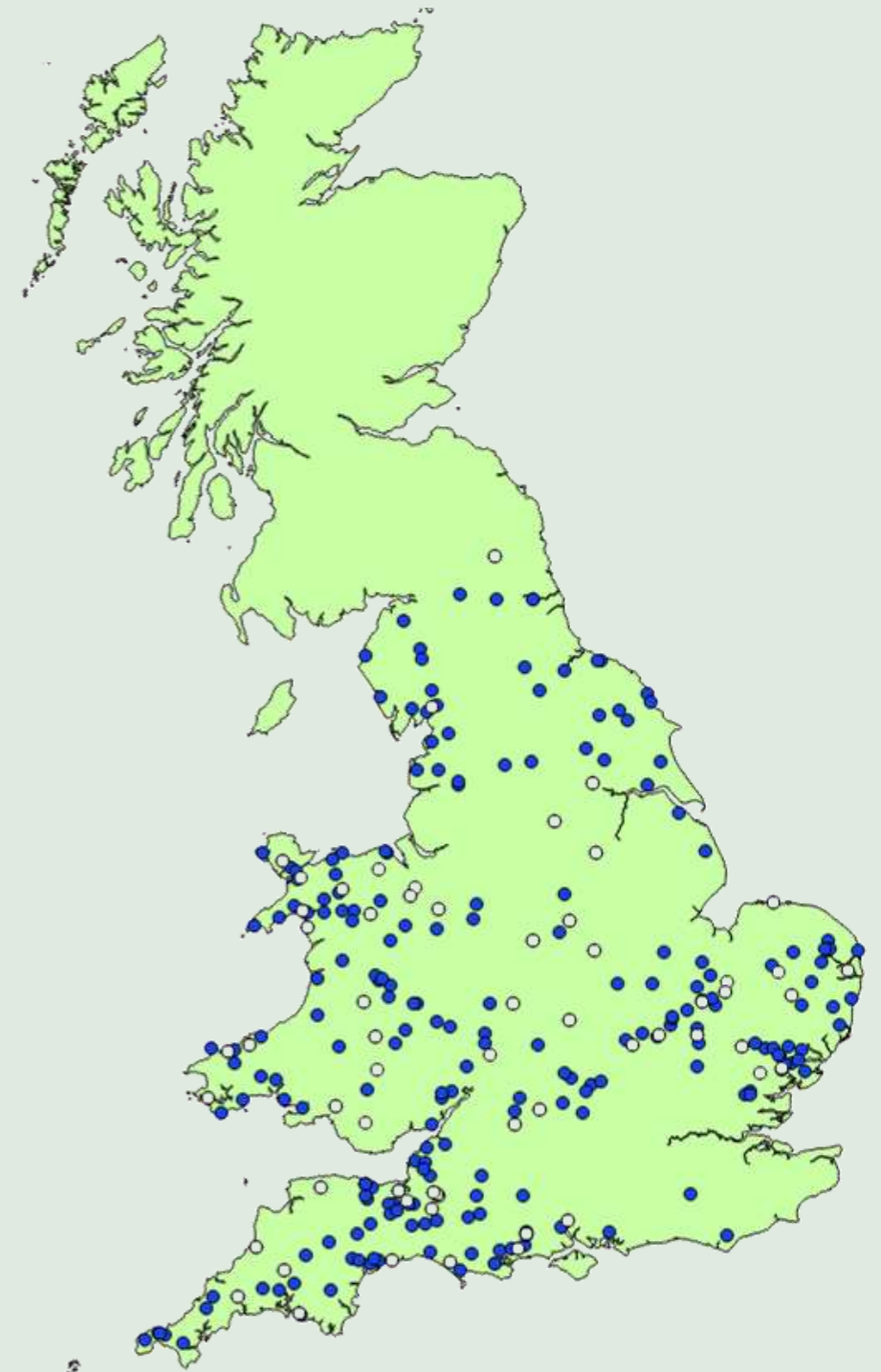
Next steps



- Full analysis, $n = 300$ (blue circles)
- Some further additions to the DNA barcode library required

Further analyses will look at

- Diet v sector of population (e.g. sex, age)
- Change over time (previous years)
- More species specific detail
- Generalist v. specialist individuals
- Direct comparison with hard parts from matched samples



Summary

- Captive breeding has not contributed massively to population expansion
- Rates of expansion not fully quantifiable; varies markedly between areas; controlled by carrying capacity.
- Work on diet is underway to help quantify the level of pressure on different fish species: key species such as carp do NOT appear to be heavily targeted

Wider implications

- Top of food chain - **indicator** of habitat quality, chemical pollutants, etc
- What's good for otters is good for fish..
- Charismatic – **flagship species**, useful for environmental education; also a valuable '**umbrella species**'

Acknowledgements:

The current team



PDRAs



PhD students



Masters / UG students



Funders & collaborators

Members of the public... and



Individual collaborators: M Bruford, J Cable, C Muller (Cardiff University), Andrew Kitchener (NMS) , G Scholey (EA), R Strachan (NRW), R Birtles (Salford), B Holt (ZSL), R Shore, Lee Walker (CEH), V Simpson (WVIC)