



European Raptor Biomonitoring Facility

The Life APEX project - experiences so far with sourcing of samples for Common Buzzard

Oliver Krone

Leibniz-Institut für Zoo und
Wildtierforschung
Berlin



Life APEX 09/2018-08/2022



Project information

- The AIM of LIFE APEX is to improve systematic use of **chemical monitoring data** from **apex predators and prey** for protecting human health and the environment
- The project will make a better and more cost-effective use of chemical monitoring data from the large, valuable but underused resources of archived environmental samples across Europe's:



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- LIFE APEX will make use of novel analytical methods that allow for screening of several thousands of chemicals substances
- This data will be further on used for prioritization of frequently occurring pollutants and their mixtures

Investigated analytes

- | | |
|--|--|
| • Personal care products | • Surfactants |
| • Steroids & hormones | • Mercury |
| • Pharmaceuticals (>450) <ul style="list-style-type: none">○ Antibiotics (>50) | • Biocides <ul style="list-style-type: none">○ Quaternary ammonium compounds |
| • Illicit drugs and new psychoactive substances (>500) | • PAHs, PFAS, OCPs, PCBs, PBDEs Polychlorinated naphthalenes, Fatty acid methyl esters |
| • Industrial Chemicals (>100) | • Chlorinated alkanes |
| • Pesticides (>900) | • novel organophosphorus flame retardants, Decolorane Plus |
| • Sweeteners | • And many more... |

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What kind of samples are analyzed?

Predators (liver):

- Marine mammalian predators (e.g. harbour seal or taxa of the same trophic level)



- Terrestrial raptors (e.g. common buzzard or taxa of the same trophic level)



- Limnic mammalian predators (e.g. Lutrinae)



Prey (muscle):

- Freshwater fish (e.g. Bream/roach/perch)



- Marine fish (e.g. eelpout or herring)

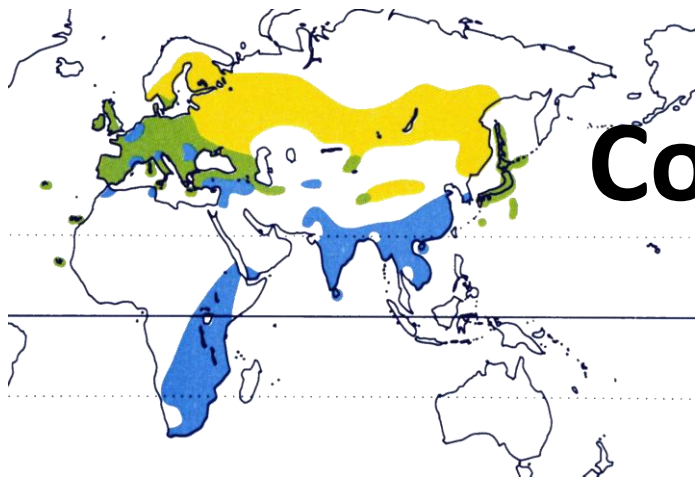


Sampling countries:

- Sweden
- United Kingdom
- The Netherlands
- Germany



➤ Samples from 5 regions within each country!



Common buzzard

Buteo buteo

morphe: variabel dark brown to white, fine banded tail (8-12 bands), dark feather patch at hand, brown iris

size: ♂ 700-800g wsp: 110-130cm
♀ 880-1000g

habitat: forest edges, open country

density: 20 BP/100km²

resident, visitant, migratory

nutritional needs: 120g/d (6-8 mice)

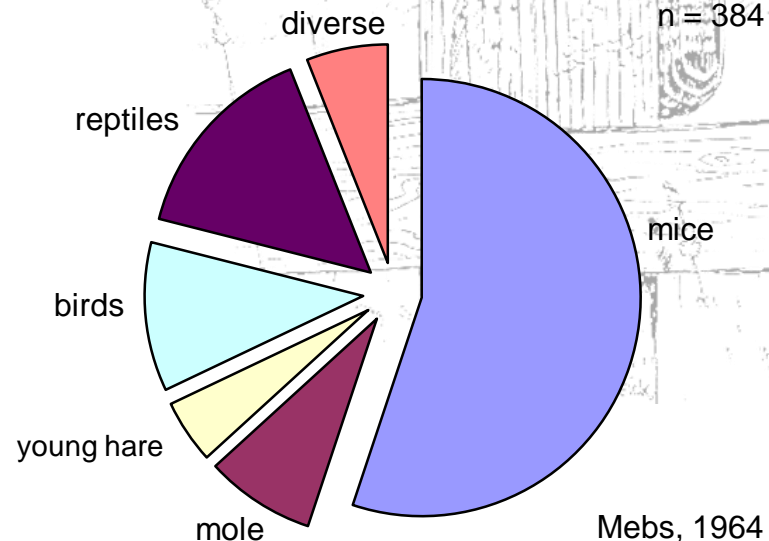
population: most common bop;

50.-70.000 BP/Germany

distribution: Eurasia (11SSP)



n = 384



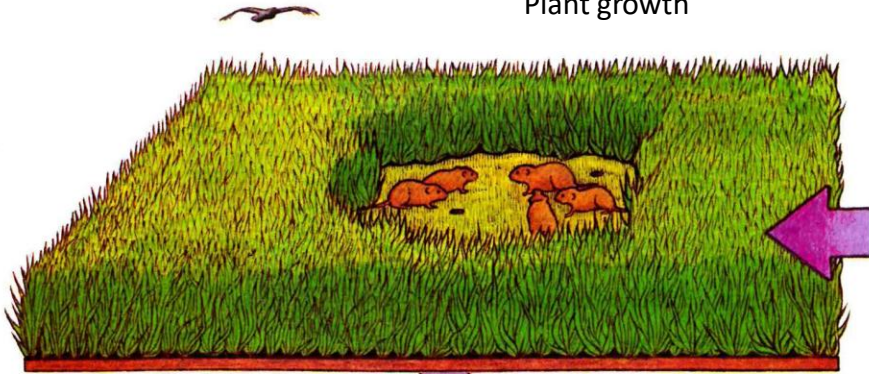
Mebs, 1964



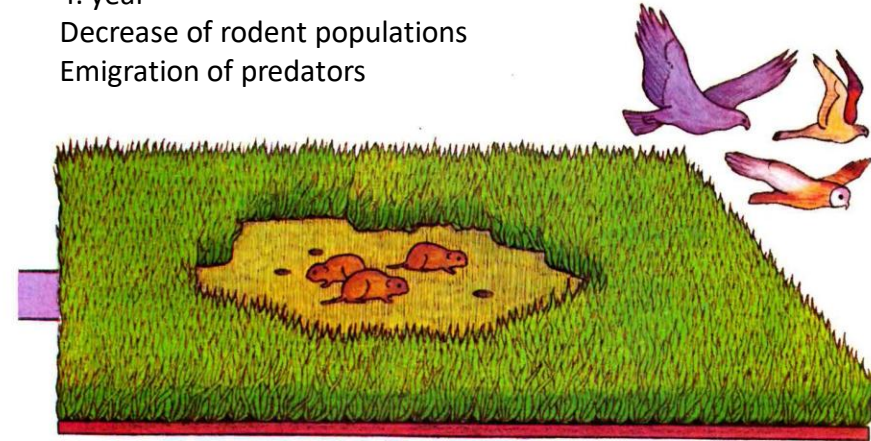


Regulatory circuit: Raptor - Prey

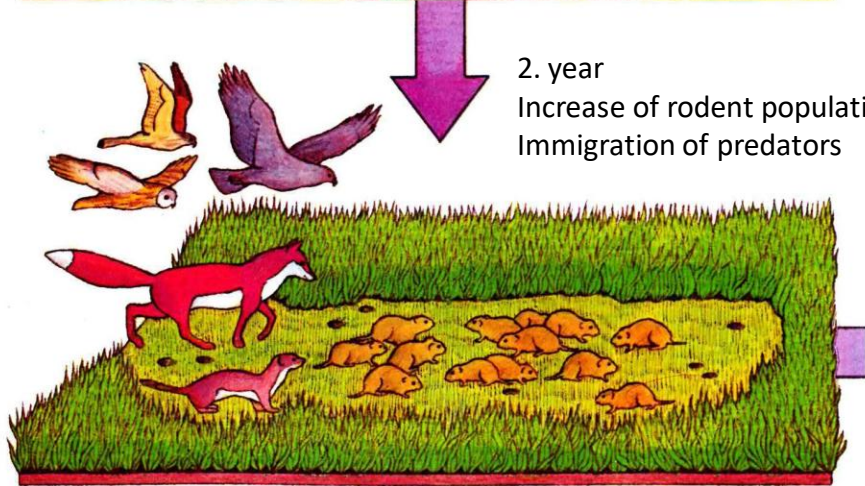
1. year
Favourable weather
Plant growth



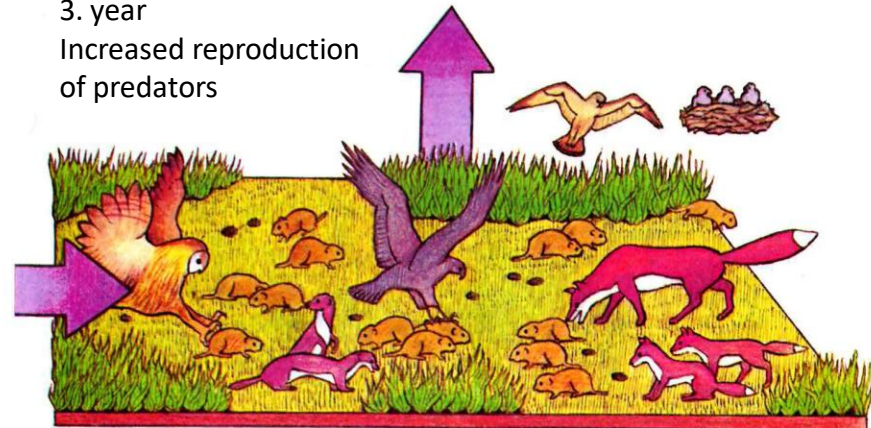
4. year
Decrease of rodent populations
Emigration of predators



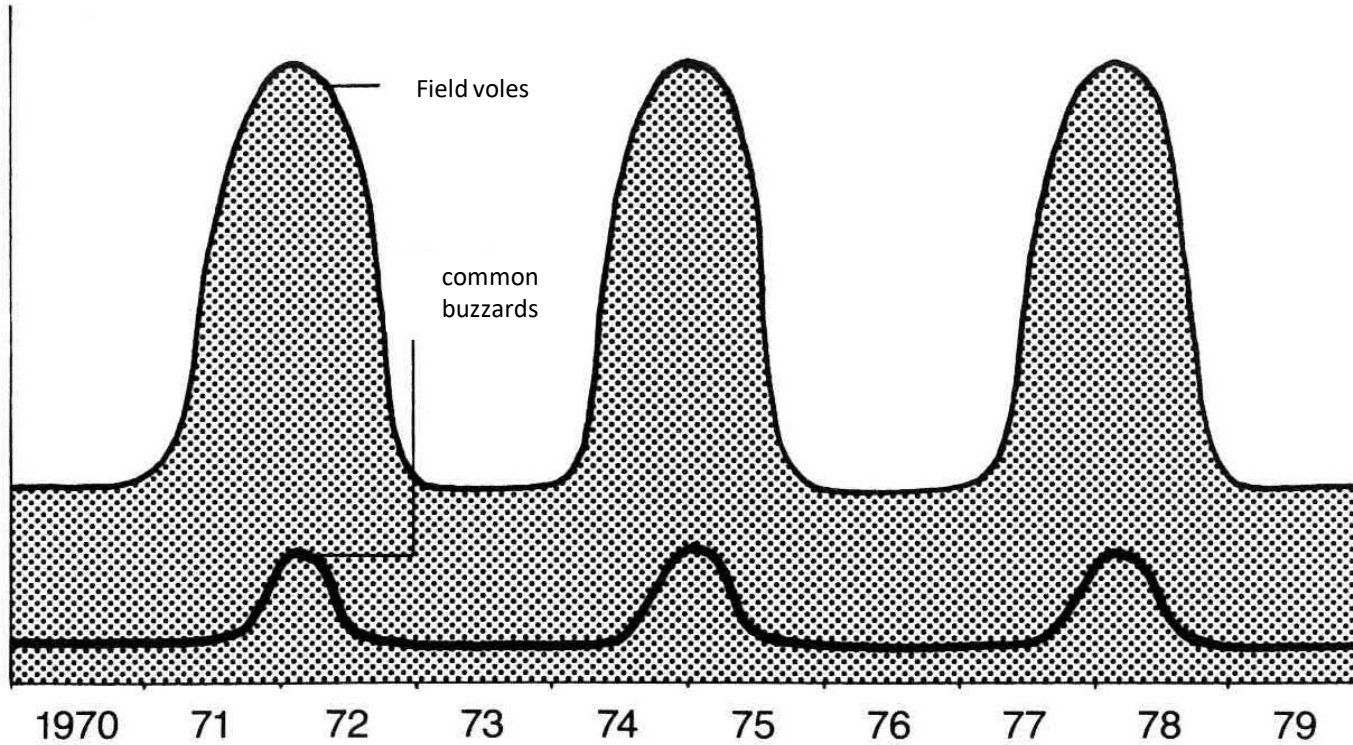
2. year
Increase of rodent populations
Immigration of predators



3. year
Increased reproduction
of predators



Regulatory mechanism



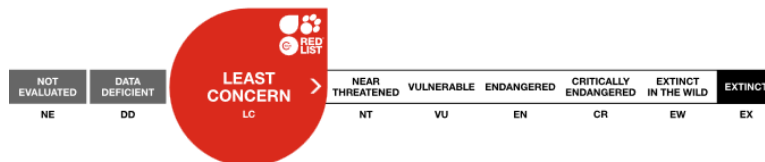
Population size driven by the availability of potential prey

Population numbers of Common Buzzards in Europe

Current population trend
Stable

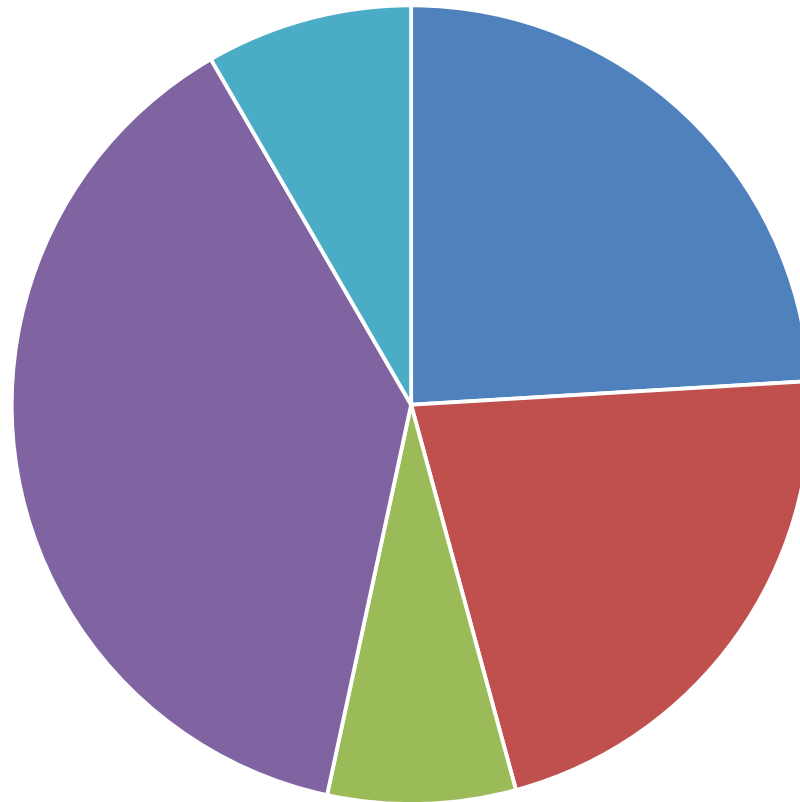
Number of mature individuals
1,630,000-2,770,000

The European population is estimated at 814,000-1,390,000 pairs, which equates to 1,630,000-2,770,000 mature individuals (BirdLife International 2015). Europe forms approximately 75% of the global range, so a very preliminary estimate of the global population size is 2,170,000-3,690,000 mature individuals, although further validation of this estimate is needed. It is placed in the band 2,100,000-3,700,000 mature individuals.



BirdLife International 2017. *Buteo buteo* (amended version of 2016 assessment). *The IUCN Red List of Threatened Species 2017*: e.T61695117A119279994. <http://dx.doi.org/10.2305/IUCN.UK.2017-3.RLTS.T61695117A119279994.en>. Downloaded on 11 September 2019.

Common Buzzard Populations in Europe



■ Middel Europe
■ East Europe

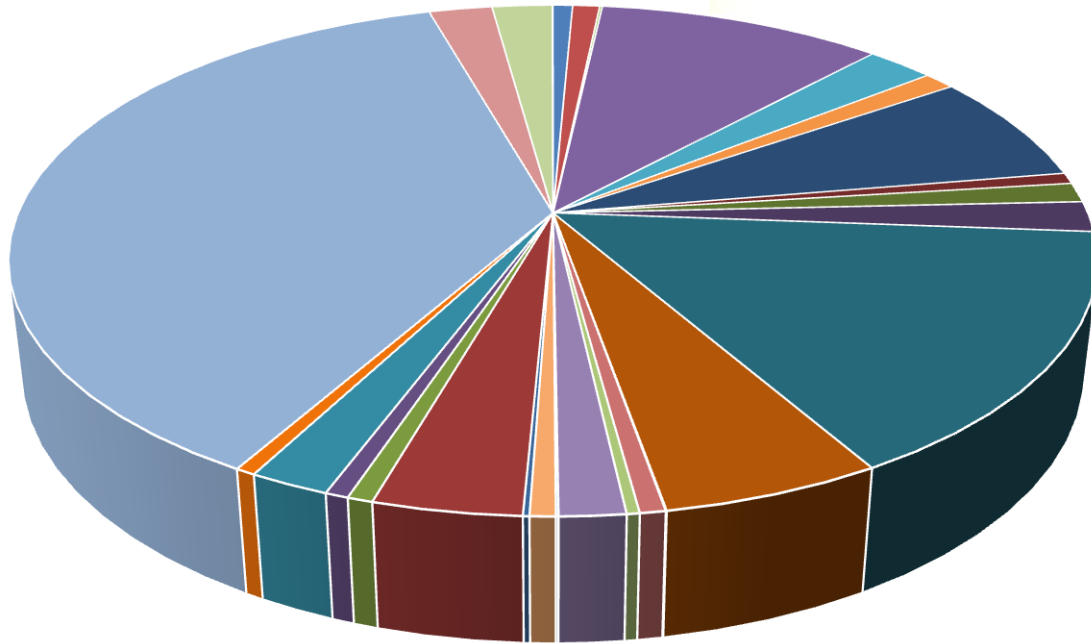
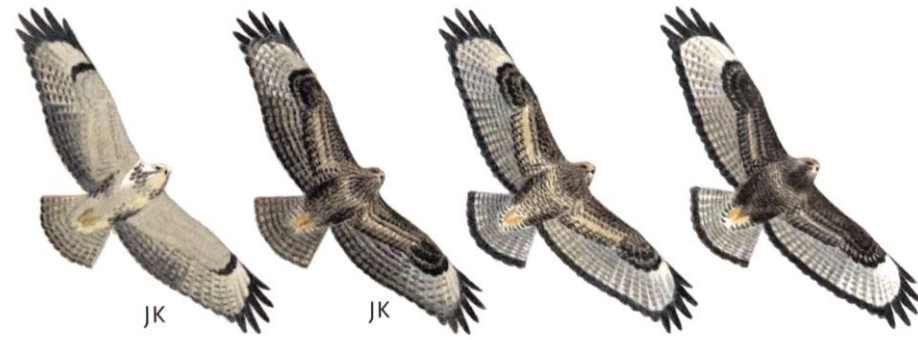
■ West- and South Europe
■ South Europe

■ North- and Northeast Europe

1.022.474



Common Buzzard populations in European countries



- | | | | | |
|-----------|------------------|-------------|------------------|-----------------|
| ■ Belgium | ■ Neatherlands | ■ Luxemburg | ■ Germany | ■ Switzerland |
| ■ Austria | ■ Poland | ■ Slovakia | ■ Czech Republic | ■ Hungary |
| ■ France | ■ UK | ■ Ireland | ■ Italy | ■ Portugal |
| ■ Spain | ■ Canary Islands | ■ Denmark | ■ Norway | ■ Sweden |
| ■ Finland | ■ Estonia | ■ Latvia | ■ Lithuania | ■ Europ. Russia |
| ■ Belarus | ■ Ukraine | ■ Moldavia | | |

The Common Buzzard as wildlife sentinel

Advantages

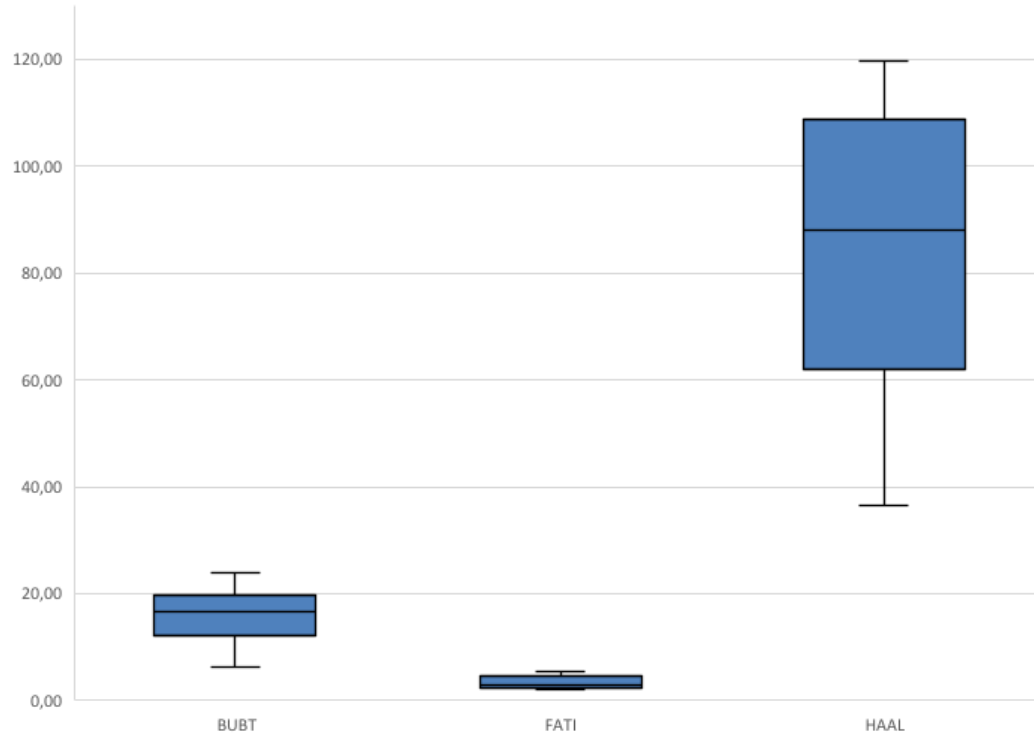
- Distributed throughout Europe
- Breeding around agricultural setting, forest patches and urban habitats
- Active foraging and facultative scavenging
- Carcasses are frequently found
- Sufficient liver weight for analytical requirements

Disadvantages

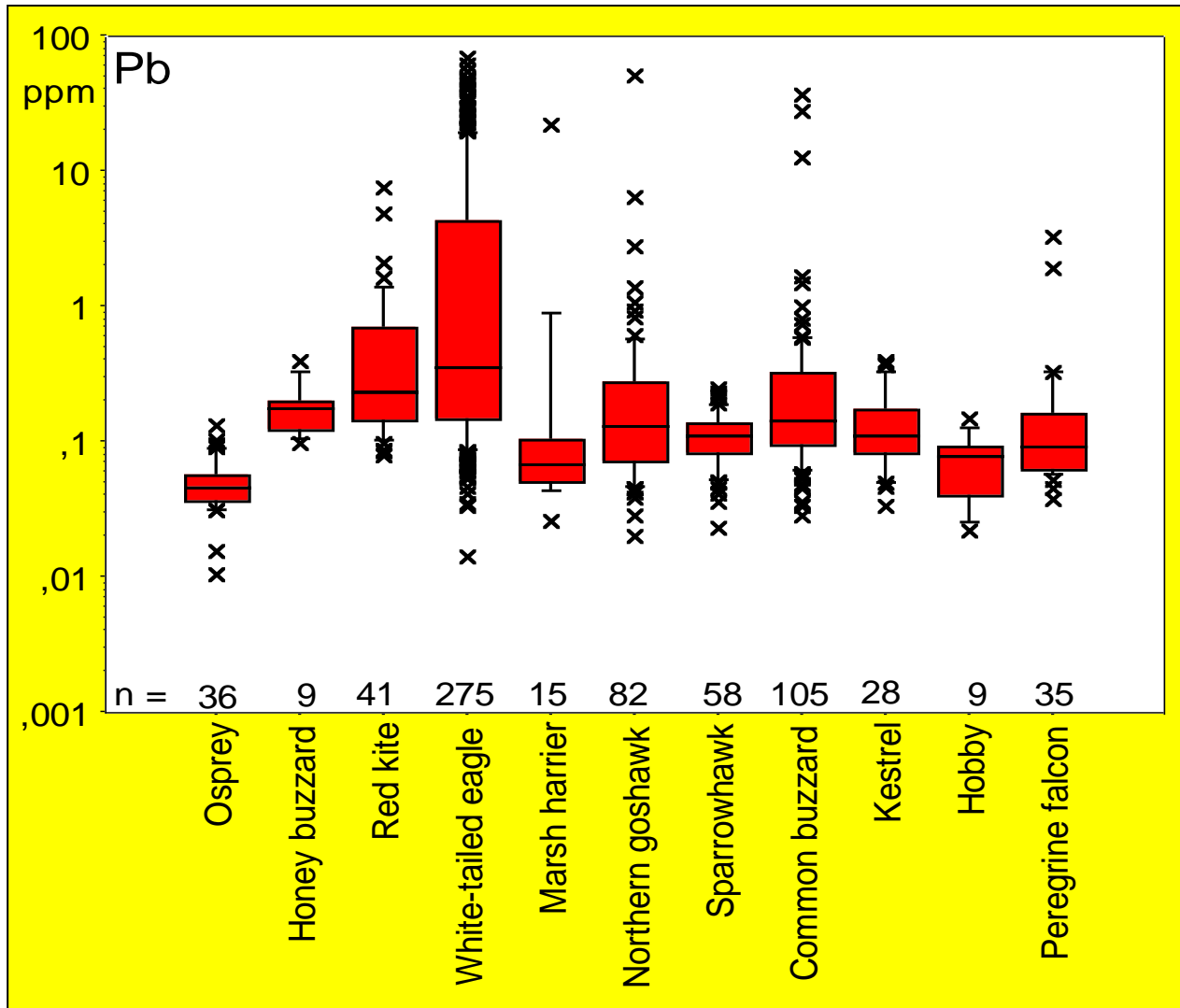
- Dietary plasticity
 - composition of rodents, insects and carrion varies among populations
- Partial migratory
 - restricts sampling to breeding season for some regions



Liver weights of raptors



Liver lead values in birds of prey



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Sample requirements

LIVER SAMPLES (PREDATORS)

- 28.8 g (minimum) or 52.2 g ww (optimum) as pool sample from at least 5 individuals. Individual samples were collected from the same region

FILET SAMPLES (PREY)

- 141 g (minimum) or 261 g ww (optimum) as pool sample from at least 5 individuals. Individual samples were collected from the same region

➤ **A POOLED LIVER SAMPLE FROM 5 INDIVIDUALS REPRESENTS ONE LIFE APEX SAMPLE**

Pooling:

- Same sample region as basic requirement (sample region is dependent on species distribution and not further defined within LIFE APEX)
- Same age class (preferentially adults)
- Same sex (in case of predator samples)

Sample collection LIFE APEX



SAMPLE ANALYSIS TIER 1 (+++ONGOING+++)

| | | |
|---|--|--|
| <p>United Kingdom</p> <p>Predator (liver)</p> <ul style="list-style-type: none"> • Harbour porpoise (5/5) • Common buzzard (5/5) • Eurasian otter (5/5) <p>Prey (filet):</p> <ul style="list-style-type: none"> • Roach (5/5) • Eelpout/marine fish (0/5) | <p>Germany</p> <p>Predator (liver)</p> <ul style="list-style-type: none"> • Harbour seal (4/5) • Common buzzard (5/5) • Eurasian otter (5/5) <p>Prey (filet):</p> <ul style="list-style-type: none"> • Bream (5/5) • Eelpout (3/5) | |
| <p>The Netherlands</p> <p>Predator (liver)</p> <ul style="list-style-type: none"> • Harbour seal (2/5) • Common buzzard (2/5) • Eurasian otter (5/5) <p>Prey (filet):</p> <ul style="list-style-type: none"> • Bream (1/5) • Eelpout/marine fish (0/5) | <p>Nordic region (Sweden)</p> <p>Predator (liver)</p> <ul style="list-style-type: none"> • Harbour seal (4), Grey seal (1) • Common Buzzard (0/5) • Eurasian otter (5/5) <p>Prey (filet):</p> <ul style="list-style-type: none"> • Bream/roach/perch (0/5) • Herring (3/5) | |

→ 65 Samples have been lyophilised and distributed

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First results from LIFE APEX



Tier 1 samples: Common buzzard *Buteo buteo* (n=12), otter *Lutra lutra* (n=20), harbour seal *Phoca vitulina* (n=10), grey seal *Halichoerus grypus* (n=1), harbour porpoise *Phocoena phocoena* (n=5), common bream *Abramis brama* (n=6), common roach *Rutilus rutilus* (n=5), European eelpout *Zoarces viviparus* (n=3), herring *Clupea harengus* (n=3), European herring gull *Larus argentatus* eggs (n=2) from: UK, Netherlands, Germany, Sweden

Substances detected: hundreds of legacy and emerging contaminants and their biotransformation products including:

- plant protection products
- surfactants
- pharmaceuticals
- industrial chemicals
- PCBs
- PAHs
- OCPs
- antipsychotic and antidepressant drugs

