LIFE17 ENV/SK/000355 - Systematic use of contaminant data from apex predators and their prey in chemicals management

LIFE APEX

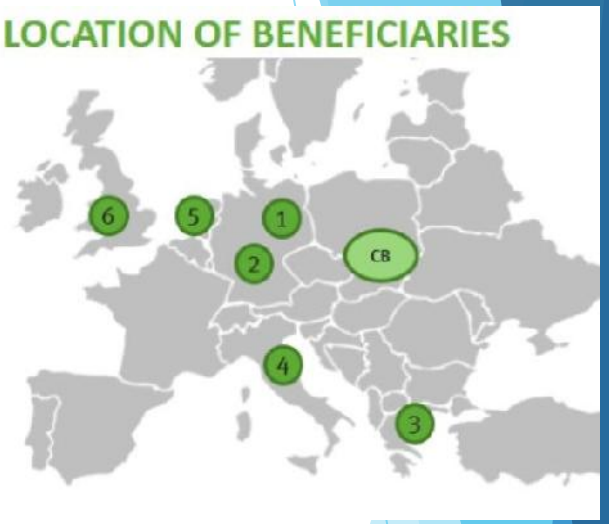
https://lifeapex.eu/

LIFE APEX and the contribution of natural science collections to pan-European contaminant monitoring in apex predators

JAROSLAV SLOBODNIK, ENVIRONMENTAL INSTITUTE, SLOVAKIA

ERBF, WG3 - THE ROLE OF COLLECTIONS FOR CONTAMINANT MONITORING IN RAPTORS ACROSS EUROPE – STATE OF PLAY AND NEXT STEPS, 11 FEBRUARY 2021

LIFE APEX



PROJECT LOCATION:

Germany, Greece, Italy, Netherlands, Slovakia, United Kingdom

BUDGET INFO:

Total amount: 3,353,413 Euro

60 % EC Co-funding: 2,012,047 Euro

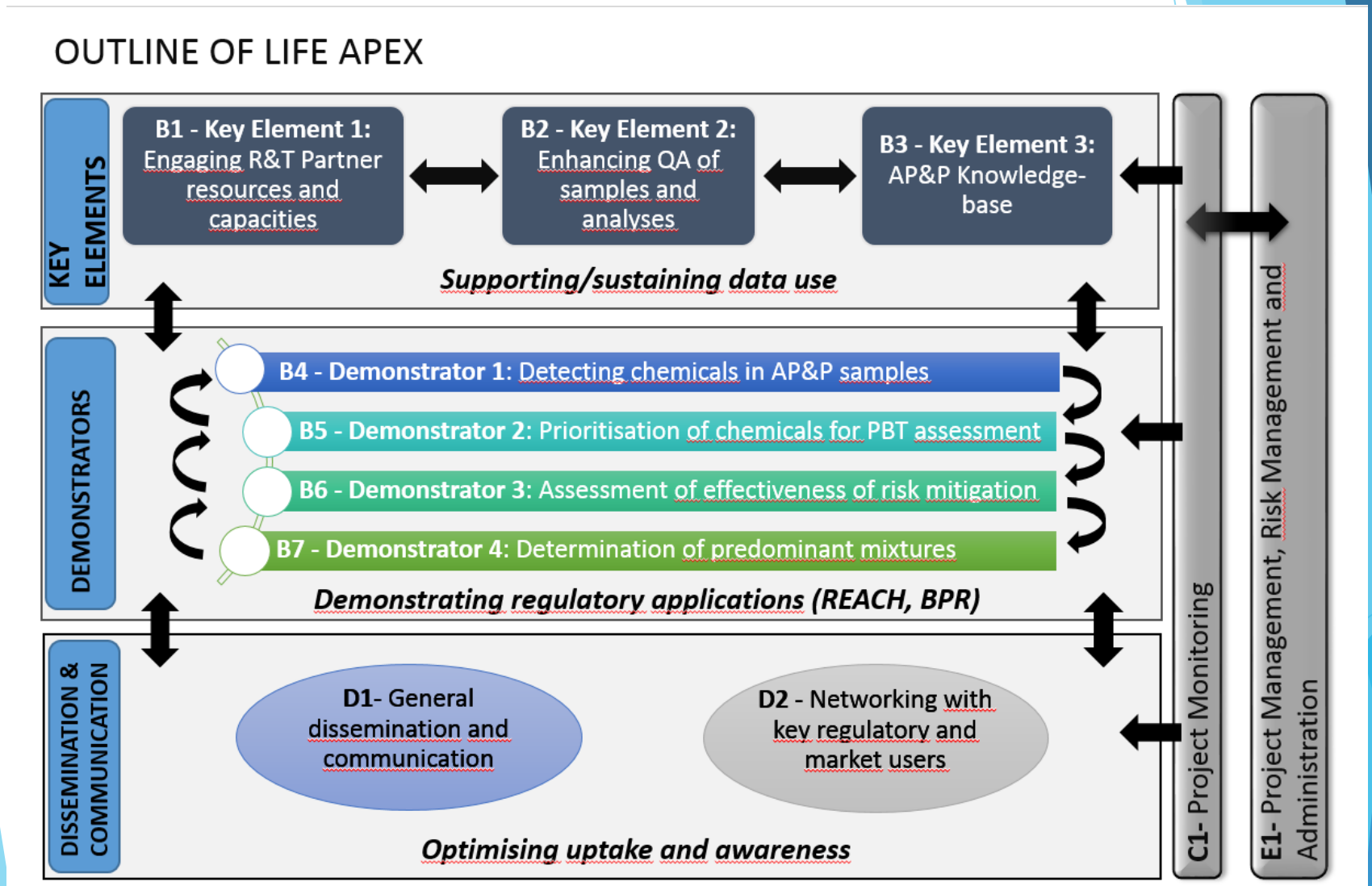
DURATION: Start: 01/09/2018 - End: 31/08/2022

PROJECT'S IMPLEMENTORS:

Coordinating Beneficiary: Environmental Institute (SK)

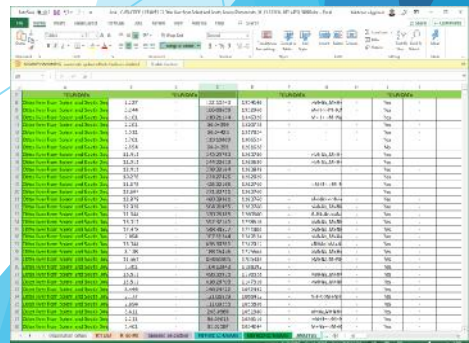
Associated Beneficiaries: CEH (UK), Fh-IME (DE), Naturalis (NL), UBA (DE), UNIFI (IT), UoA (GR)

KEY ELEMENTS & DEMONSTRATORS



Guidance documents, protocols

General guidance on how to ship the samples within the LIFE APEX Project



- How to store the samples
- How to ship the samples
- How to process them
- SOPs for analyses
- Data and metadata reporting templates

LIFE APEX
Presence of chemical contaminants

- AP&P analysed by NORMAN non-target screening workflow
- **Tier 1 – Does it work?**
  - Samples from ESBs and NHMs in DE, NL, SE, UK (12/67)
- **Tier 2 – Can we look back at the pollution pattern?**
  - ESBs and research collections from 2000 – 2019 (19/65)
- **Tier 3 – What do we see around Europe?**
  - Samples of top predators from all European Sea Regions (20/60)
- **LIFE APEX Database System - FAIR**

Emerging substances in AP&P

LIFE APEX Tier 1 samples (67) – Results of target analyses (116 substances) and wide-scope target screening (2,316 substances) of chemical contaminants in top predators and their prey (in µg/Kg w.w. unless otherwise stated)

Shown only concentrations above LOD

Select contaminants

- 1,2,3,4,7,8-HxCDF (pg/Kg w.w.)
- 1,2,3,6,7,8-HxCDF (pg/Kg w.w.)
- 1,2,3,7,8,9-HxCDF (pg/Kg w.w.)
- 2,3,4,6,7,8-HxCDF (pg/Kg w.w.)
- 1,2,3,4,6,7,8-HpCDF (pg/Kg w.w.)
- OCDF (pg/Kg w.w.)
- Total - PCDD/F/dlPCB (TEQ) (pg/Kg w.w.)

Industrial Chemicals - Phosphates

- Triisobutyl phosphate (TIBP) (µg/Kg w.w.)
- Tris(2-chloroethyl) phosphate (TCEP) (µg/Kg w.w.)
- Tris(2-chloroisopropyl)phosphate (TCPP) (µg/Kg w.w.)
- Tris(1,3-dichloro-2-propyl) phosphate (TDCIPP) (µg/Kg w.w.)
- Triphenyl phosphate (TPHP) (µg/Kg w.w.)
- 2-Ethylhexyl diphenyl phosphate (EHDP) (µg/Kg w.w.)
- Tris(2-ethylhexyl) phosphate (TEHP) (µg/Kg w.w.)
- Tributyl phosphate (TBP) (µg/Kg w.w.)

Industrial chemicals - Polybrominated diphenyl ethers

- 2,4,4-Tribromodiphenyl ether (BDE-28) (µg/Kg w.w.)
- 2,24,4-Tetrabromodiphenyl ether (BDE-47) (µg/Kg w.w.)
- 2,3,4,4-Tetrabromodiphenyl ether (BDE-66) (µg/Kg w.w.)
- 2,2,4,4,6-Pentabromodiphenyl ether (BDE-100) (µg/Kg w.w.)

Chart type: pie

Top predators

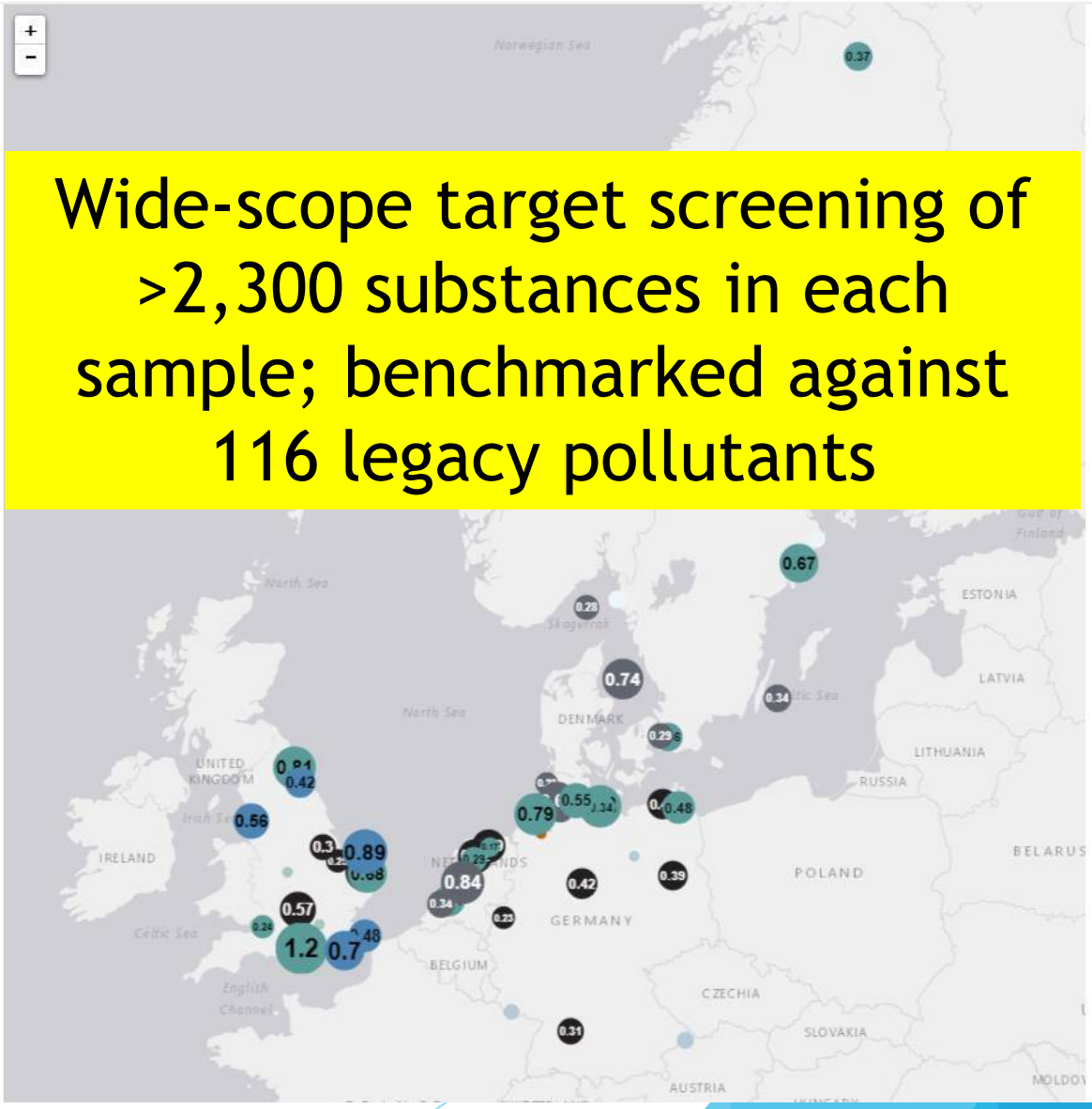
Prey

Muscle

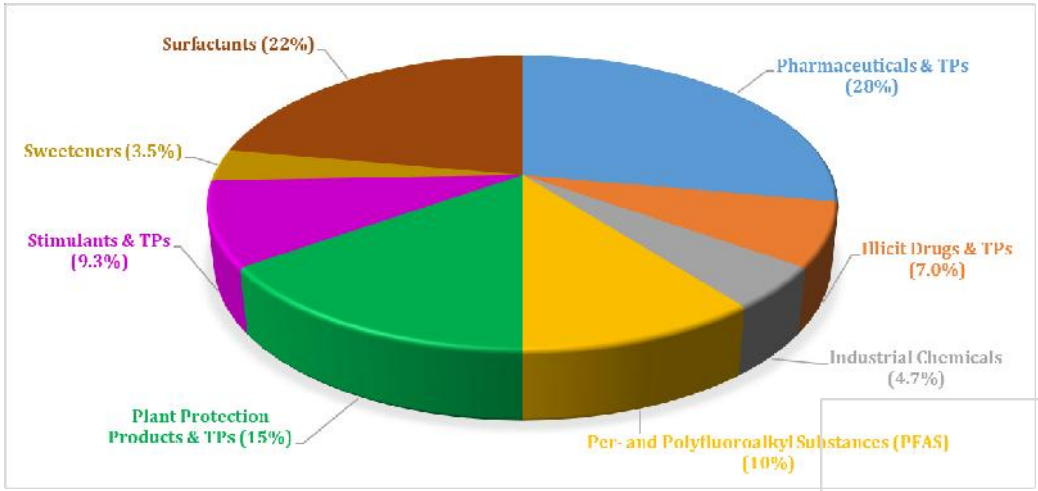
Liver

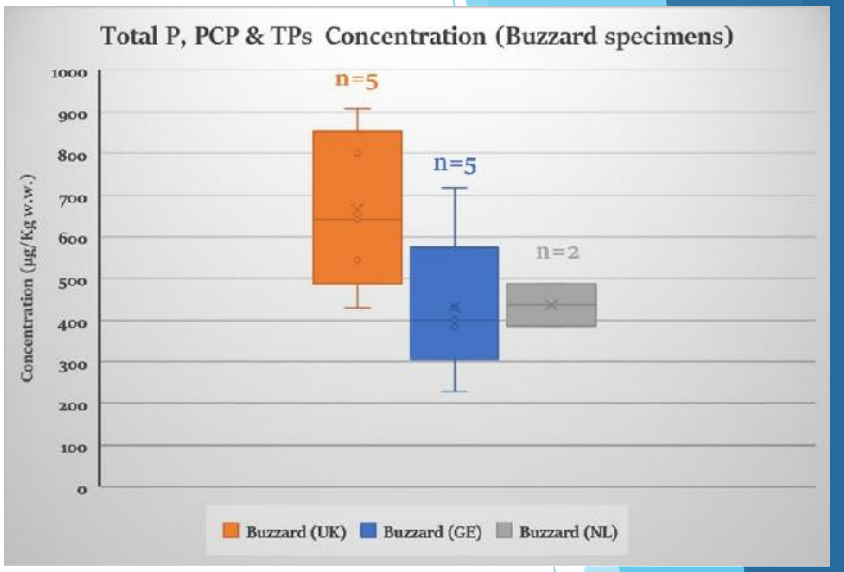
Egg

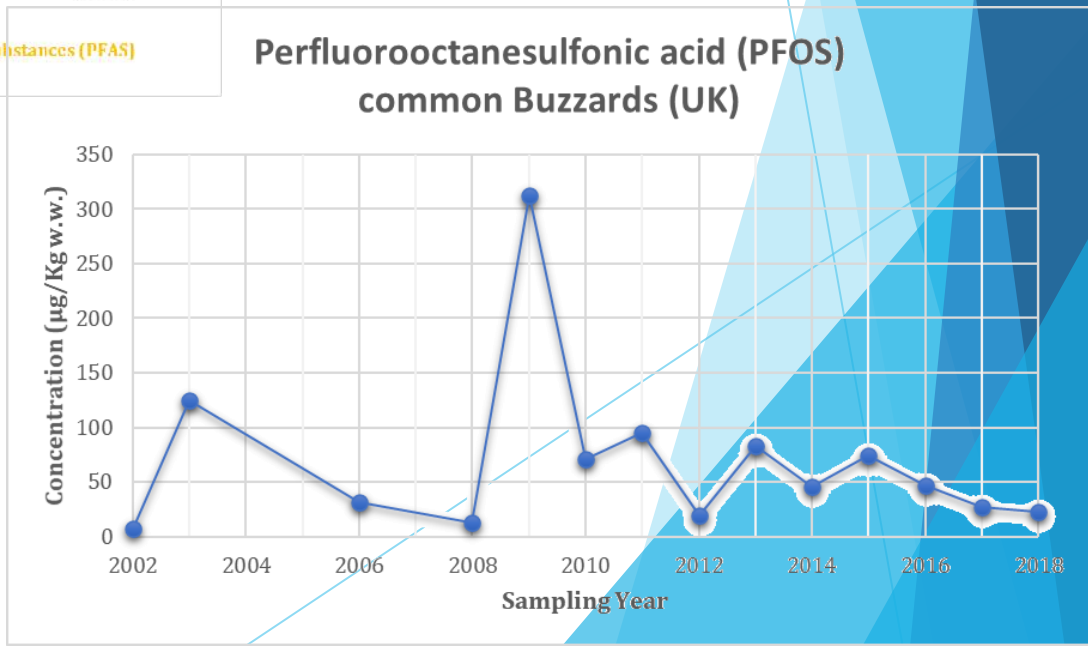
Wide-scope target screening of >2,300 substances in each sample; benchmarked against 116 legacy pollutants



What do we see?







LIFE APEX Database System - https://www.norman-network.com/apex/

- Substance Database
  - 106,545 substances
- Sample Catalogue
- Chemical Occurrence Data
  - Data: **Total 719,518/ APEX 458,873/ Raptors 96,679**
  - Substances: **2,937**
- Digital Sample Freezing Platform – retrospective screening

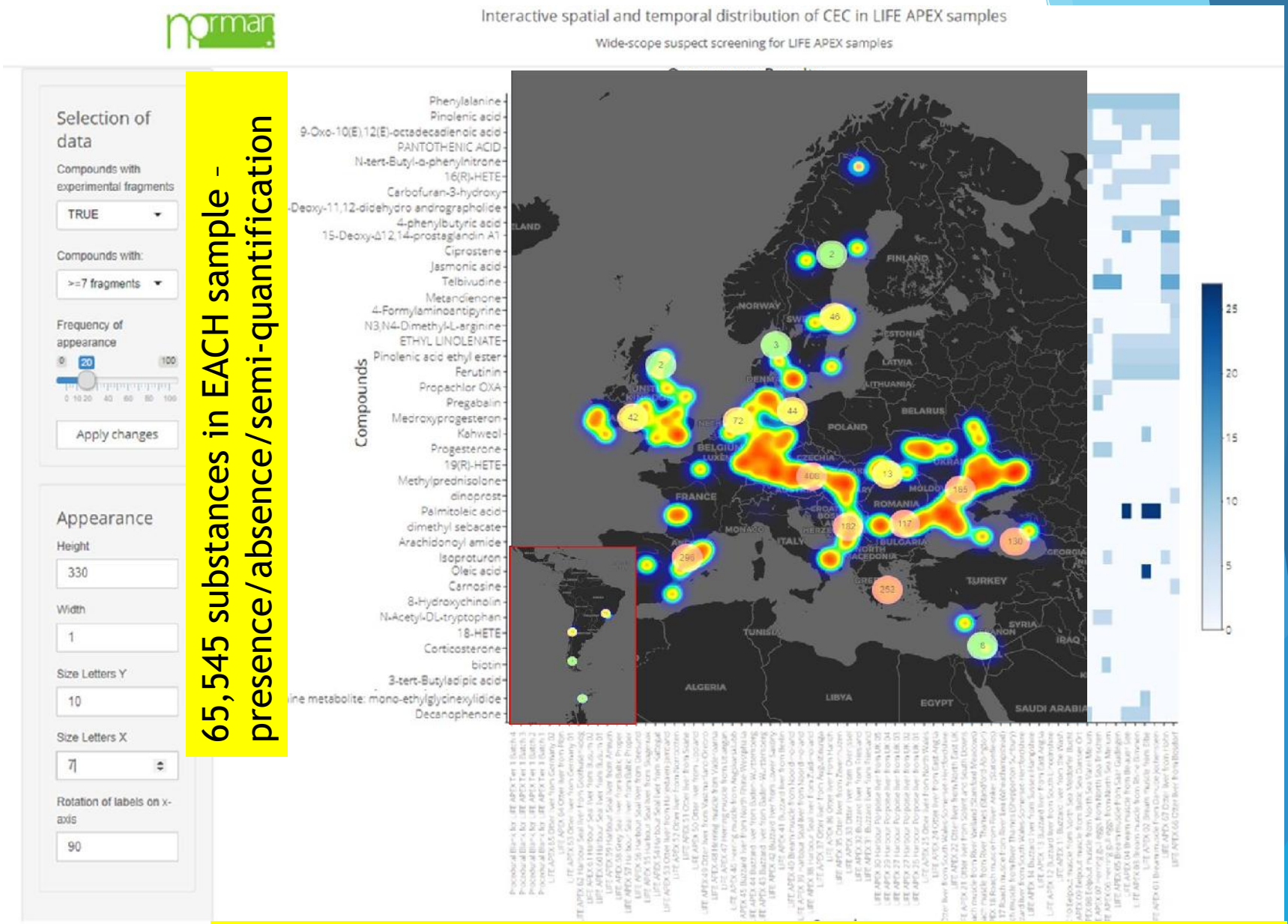
LIFE APEX DS ⇒ NORMAN DS ⇒ EC IPCHEM

Title	Veterinary examination and tissue archive for birds of prey found dead within Germany
Country of origin	Germany
Species Common name	Common buzzard
Species Latin name	Buteo buteo
Habitat type	Terrestrial
Sample type	Various
Access restrictions	On a case by case basis
Health and safety (H&S) issues	Biological hazard
Start date	1999
End date	ongoing
Lineage	Passive and targeted collection
Physical state	Frozen (-20oC)
Storage container	Bag: plastic
Number of samples	**<1,000**
ISO19115 INSPIRE Topic category	Biota
ISO19115 INSPIRE Topic category	Environment
SOP used for sample collection?	No
SOP used for archiving?	Yes
Contact name	Dr. Oliver Krone/Alexander Badry
Contact email address	krone@izw-berlin.de; badry@izw-berlin.de
Archive location - address line 1	Alfred Kowalke Str. 17
Archive location - address line 2	
Archive location - address line 3	
Archive location - address line 4	
Archive location - village/town/city	Berlin
Archive location - county	Berlin
Archive location - postcode	10315
Archive location - country	Germany
Keywords	birds of prey, liver samples, cause of death, veterinary examination, parasitology, toxicology
Website url	http://www.izw-berlin.de/welcome.html
Additional Resources	

EXAMPLE
Sample code:
APEX1-Bb(Lp)-GB(6)-2017
Provider's code:
20549 (19694/19410/19409)

Sex, age, weight, tissue, cause of death etc. stored in the Data Collection Templates linked to the analytical results

Retrospective suspect screening in digitally-stored samples (NORMAN DSFP)



65,545 substances in EACH sample – presence/absence/semi-quantification

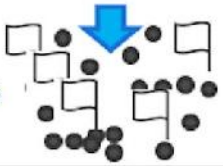
At present >1,800 environmental samples >117 million data

CHEMICAL ANALYSIS & PRIORITIZATION SCHEME

All chemicals present in biota

B4: **Analyze** biota samples for occurrence of chemicals using NTS & target screening (Tier 1-3)

300 TOP APEX PBT candidates

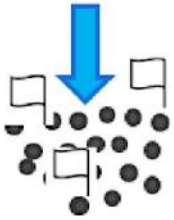


B5.1 **Prioritisation** of target substances by frequency of appearance
B5.2 **Prioritisation** of NTS substances by the mass spectral 'fingerprint' and retention time

Lists with

1) TOP 100 APEX target
2) TOP 100 APEX NTS unambiguously identified,
3) TOP 100 APEX NTS tentatively identified substances

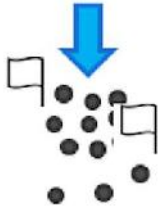
300 TOP APEX chemicals ranked by PBT potential



B5.3 **PBT assessment and ranking of TOP APEX chemicals** according to NORMAN Prioritisation Framework and then by manual screening. Identify worst case PBTs/vPvBs for further PBT assessment. Conduct substance evaluation with respect to P& B potential with 2 PBT/vPvB candidates.

List of 300 PBT/vPvB candidates present in biota ranked by FoA, exposure & manually screened for P, B and T

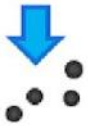
300 TOP APEX chemicals ranked by PBT potential & exposure



B5.4 **Exposure assessment** and ranking of TOP APEX chemicals and ranking by Exposure Index

Guideline on use of target/NTS for (1) identification & prioritisation of PBT/vPvB candidates and (2) for P and B assessment.

Worst case PBT/vPvB candidates present in biota



Provide lists to assessors with recommendation if further assessment is needed for ranked PBT/ vPvB candidates, close collaboration with ECHA, NCA, PBT EG for application, replication and transfer of approach.

Enhance exchange between regulators & monitoring community

Prioritisation based on automated calculation of Risk + Hazard + Exposure scores

- Model predicted values/scores (0-1)
  - **RISK**: Exceedance of ecotoxicity threshold values – today 64,448 substances in NORMAN Ecotoxicology database; https://www.norman-network.com/nds/ecotox/
  - **HAZARD**: Persistence (P), bioaccumulation (B), toxicity (T) properties - >106,000 substances; UBA DE; JANUS QSAR tool; https://www.vegahub.eu/portfolio-item/janus/
  - **EXPOSURE**: KEMI Hazard Score – use information and annual tonnage from regulatory databases (e.g. the REACH registry); 94,270 substances https://www.norman-network.com/nds/susdat/
- Experimental values
  - Literature, accessible ecotox databases
  - EU MS; **Cooperation with OSPAR, HELCOM, BSC**

In support of regulatory uptake - need for

ONE SUBSTANCE, ONE ASSESSMENT

- European infrastructure for hosting harmonised quality controlled data
  - List of available samples
  - List of substances - **unique identifiers**
  - Target monitoring data from ESBs, NHMs, research collections
  - Non-target/Suspect screening - IT IS NOT A RESEARCH ANYMORE!
  - Ecotoxicity threshold values – adapted to raptors
- European Early Warning System for chemicals - Top predators an important part!

NEWSLETTER LIFE APEX

ISSUE NO. 5 | DECEMBER 2020

YouTube https://youtu.be/7y3zDawHDCk

LifeAPEX - Project video

Telegram

- +++New Life Apex project video is available on Youtube+++
- Novel analytical techniques for PFAS were developed
- Results for Tier 2 time-trend analysis (2000-2018) are available
- Detection of novel compounds that have not been reported in Tier 1
- Many PFAS show declining trends in otters from the UK and harbour seals from Germany
- Similar trends were observed for mercury in bream (Germany).
  - However, levels were above the environmental quality standard (20 µg/kg wet weight)
- BDEs were declining in otters (UK) and bream (Germany) as well
- 64 Buzzard samples were shipped to the University of Florence for assessing the impact and effectiveness of risk management measures for legacy pollutants at national and European scale
- Sample selection across Europe (Tier 3) has been finalized
  - Wide spatial coverage of available samples

The Life APEX-Team wishes you Merry Christmas and a Happy New Year!

TOPIC 01

- Presentation of novel analytical techniques
- Tier 2 time-trend results

TOPIC 02

- Demonstrator 3 (Common Buzzard)

TOPIC 03

- Virtual project meeting in June, 2020
- Sample selection for Tier 3
- Networking activities

See also - **https://www.youtube.com/watch?v=7y3zDawHDCk&feature=youtu.be**