**PROOF OF CONCEPT**

**SUMMARY FOR FRAMEWORK DOCUMENT**

The Proof of Concept pilot study (PoC) carried out within the COST Action “European Raptor Biomonitoring Facility” had the overall aim to test the key elements and processes of a distributed facility to deliver pan-European raptor biomonitoring. This proof of concept connected the three arenas, being comprehensive and multi-disciplinary regarding the elements and connecting processes included. The specific objectives of the PoC are comprised within the Capacity-building objectives of the ERBFacility COST Action, being: (1) to assess the feasibility of finding, collating, sharing, and analysing sample material from across Europe, understand the challenges involved in doing so, and suggesting solutions to the identified constraints (“proof of concept of the network/ERBFacility structures”) and (2) to assess the feasibility of generating maps of the spatial variation across Europe in exposure to selected contaminants using one or a small number of focal species (“proof of concept of the science”). Accordingly, the PoC works as an empirical test of the three frameworks developed within the ERBFacility: the European Raptor Biomonitoring Scheme (ERBioMS), the distributed European Raptor Specimen Bank (ERSpeB), and the European Raptor Sampling Programme (ERSamP).

The PoC considered four raptor species for a first step of analysing the availability of samples across European institutions (collections and research groups): Common Buzzard *Buteo buteo*, Common Kestrel *Falco tinnunculus*, Barn Owl *Tyto alba*, Tawny Owl *Strix aluco*. The subsequent steps, from sampling requesting to chemical analysis and data interpretation, was carried out using the Tawny Owl as focal species. The PoC used mercury (Hg), lead (Pb), and second-generation anticoagulant rodenticides (SGARs) as focal contaminants.

The PoC initially reviewed the existing published data about the focal contaminants in liver samples of the four focal species. This review included 14 studies reporting the levels of SGARs, XX reporting Pb and xx reporting Hg. DRAGANA’s STSM RESULTS. We used these results to establish a historical starting point to which we can compare the results obtained in the contaminant analysis carried out in the PoC.

The following step was to identify potential sample providers and analytical facilities across Europe. For this purpose, National Coordinators were selected, who had the task to indicate potential sample providers and analytical laboratories, provide their contacts and act as facilitators in national languages. A total of 31 National Coordinators were approached, and 315 sample providers were indicated for 34 countries. In terms of analytical facilities, 103 laboratories from 26 countries were indicated as having potential capacity to analyse metals and/or SGARs. All sample providers were contacted to obtain an inventory of potentially available samples of the 4 raptor species across Europe. A total of 3775 samples were indicated for 26 countries by 52 sample providers (1656 Common Buzzards, 713 Tawny owls, 630 Common Kestrels, 776 Barn Owls).

Then, focusing on the Tawny Owl, the available sample providers were asked to provide the samples for the PoC, regarding the period from 2010 to 2021 (n = 592). A total of 546 samples from 30 institutions in 20 countries were finally shipped to the 16 laboratories available for analysis. From the 453 samples analysed, there was a considerable variation in sample size among countries. The contamination values for Hg, Pb and SGARs were screened for variations between sexes, age classes, and causes of death.

The map displaying the Hg and Pb results indicated no clear spatial patterns, which may be related mostly with local sources of contamination. There was no association of Hg or Pb levels with agricultural versus woodland dominated 100x100 km squares.

The map displaying the SGARs results suggests the existence of some spatial patterns, with higher values in some countries. The levels of SGARs were higher in woodland-dominated 100x100 km squares.

Regarding the proof of concept of the network, we conclude that the pilot study demonstrated the feasibility of finding, collating, and sharing sample material from across Europe, given the widespread and large number of institutions of different nature (museums, wildlife rehabilitation centres, etc.), which ensures an **adequate spatial coverage**.

The PoC also suggested that a strong potential to have a **regular supply of samples along time**, considering the regular and long-term work carried out by the institutions involved (but also of other institutions identified that could not participate in the pilot study).

There is good indication that the samples can be accompanied by **relevant individual and contextual data**, which can provide a deeper insight on the potential causes of the spatial and temporal patterns in contamination.

The pilot study also contributed to identify many analytical laboratories that can participate in and run a pan-European biomonitoring scheme, representing a **potentially growing and widespread network of labs across Europe**.

The **main constraints** identified in the PoC are related to: (1) the need to maintain a regular involvement of different types of institutions in order to ensure a good spatial coverage and large sample size by region and country; (2) the potentially large dependence of shipping costs if the number of analytical labs involved is low; (3) the need to increase the available individual and population contextual data in order to account for some individual or local sources of variation in contamination levels (e.g., age, sex, diet composition); (4) the need to ensure strong and motivated national coordination that can ensure a good sample and data flow among the network, including feedback on the results.

Although the PoC was relatively limited in the number of samples and spatial coverage, the results clearly demonstrated the feasibility of generating maps that can show the spatial variation across Europe in exposure to selected contaminants.

The PoC also demonstrated that the Tawny Owl is a suitable focal species to monitor contamination at the pan-European scale. Other candidate species share many traits with the Tawny Owl, namely in terms of distribution and availability of samples, which suggests that several raptor species have the potential to be good biomonitor species.

