Research Networking Programme - EURAPMON

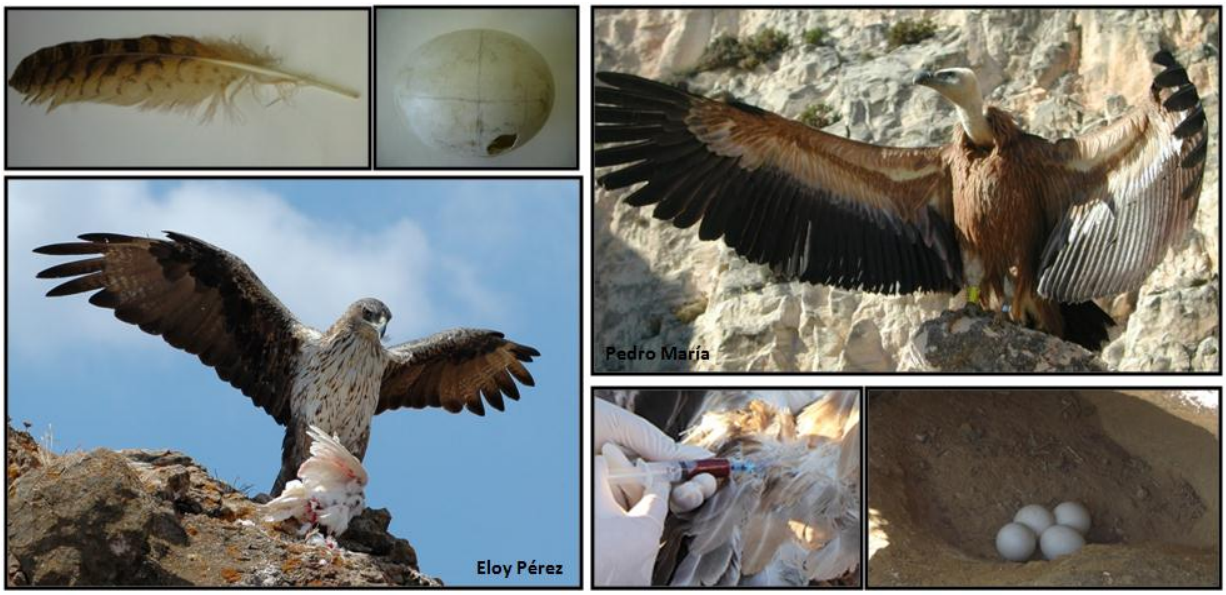
Research and monitoring *for* and *with* raptors in Europe

WORKSHOP

Setting best practices on raptor contaminant monitoring activities in Europe

Murcia, Friday 31st May to Sunday 2nd June 2013

FINAL REPORT TO ESF



SUMMARY

In order to achieve the aims of EURAPMON, and in agreement with the third immediate objective of EURAPMON, included as a part of the workpackage 5 (Best practice), it is necessary to spread best practices and build capacities in Europe for harmonised monitoring with raptors. A EURAPMON workshop focused on setting best practices on raptor contaminant monitoring activities in Europe (EURAPMON Work Package 5) was held in Murcia (Spain) from Friday 31st May to Sunday 2nd June 2013. The objectives of the Workshop were to prepare a draft manuscript on best practices for pollutant exposure monitoring of raptors, to prepare a sampling protocol, and to complete a database on contaminant monitoring with raptors in Europe. The workshop covered a 3-days program including short presentations on the different documents (manuscript, protocol and database), small sessions to discuss the drafting text, and working session to polish the documents.

This workshop was successful in meeting its objectives, bringing together a total of 10 participants and a ESF representative from 6 European countries. A draft manuscript was developed in order to combine and evaluate the new knowledge collected on activities undertaken by multiple organisations across Europe for monitoring either raptor populations and/or contaminant levels in raptors. This manuscript will provide data about what kind of matrices are collected from raptor species and where are they collected, and will evaluate the applicability of different matrix samples and which compound groups should be targeted in monitoring studies. Participants agreed to send the manuscript to the Journal “Reviews of Environmental Contamination and Toxicology”, and the structure and contents to include in the manuscript on “Best practice for contaminant exposure monitoring with raptors” were established. The sessions with researchers also allowed prepare a sampling protocol or guidelines about good and best practice, since different matrix samples need appropriate sampling methods, transport and storage conditions that should be warranted by the different schemes. This protocol is specially designed to be used by the personnel in biomonitoring for raptors. In addition, the collaboration with researchers in the field of biomonitoring for raptors and the link to the inventory of their activities has revealed potential of samples to be collected and used for pan-European monitoring, and hence, to fill the gaps in terms of sampling.

1. SCIENTIFIC CONTENT

1.1. INTRODUCTION AND OBJECTIVES

Raptors were among the first wildlife species known to be affected by anthropogenic pollutants such as persistent organic pollutants (POPs) and metals (García-Fernández et al. 2005; Mateo 2009; Ratcliffe 1970; Weech et al. 2003). Even though such legacy compounds have restricted usage or are banned in many countries, they are not readily degraded and their persistence results in continuing exposure of living organisms worldwide. There is also additional exposure to replacement products and other emerging pollutants that can, in addition to POPs and metals, cause adverse effects on the endocrine, immune, nervous and reproductive systems in both humans (Hatcher-Martin et al. 2012; Lutz et al. 1999; Yorifuji et al. 2008) and wildlife (Cortinovis et al. 2008; Fernie et al. 2005; Fernie et al. 2009; Frederick and Jayasena 2010; Mateo et al. 2003; Naidoo et al. 2009).

The vulnerability of raptors to environmental contaminants is in part due to their high trophic position, resulting in accumulation of high levels of contaminants that are bioaccumulative and have biomagnification capacitiy (Furness 1993). The early observations on the impacts of organochlorine compounds on raptors spawned increasing numbers of subsequent analytical studies using raptor tissues and eggs and recognition that raptors can be powerful sentinels of environmental contamination (Rattner 2009; Sergio et al. 2005). As a result, they have been widely used in biomonitoring studies in several countries with the aim of assessing concentrations of environmental pollutants and understanding the effects that contaminants may cause in raptor populations. In Europe, there are a number of national biomonitoring programmes that use raptors as sentinel species, and an inventory of all such schemes in Europe has recently been compiled by the EURAPMON network (Gómez-Ramírez et al. submitted). In order to achieve European-wide monitoring of environmental contamination using raptors as sentinels, harmonised coordination and sharing and dissemination of best practices between existing and emerging schemes is of utmost importance in order to enhance the reliability, comparability and interoperability of outcomes. It is also necessary to obtain samples from European countries where, to the best of our knowledge, no biomonitoring schemes exist. This may be possible by obtaining samples from studies conducted to monitor raptor populations. An inventory of all such studies is also being compiled (Derlink et al. in preparation) and provides information on the types of biological samples routinely collected in such population monitoring studies.

In order to achieve the aims of EURAPMON, and in agreement with the third immediate objective of EURAPMON, included as a part of the workpackage 5 (Best

practice), it is necessary to spread best practices and build capacities in Europe for harmonised monitoring with raptors. In this sense, the expected outcome from workpackage 5 is EURAPMON Outcome 3: “Best practice guidelines and protocols available on web (and possibly in print), including for: fieldwork, sampling, preparation, analyses, etc. building on existing best practice guidance”. Therefore, it is necessary to prepare a manuscript in order to combine and evaluate the new knowledge collected on activities undertaken by multiple organisations across Europe for monitoring either raptor populations and/or contaminant levels in raptors. Consequently, the manuscript will provide data about what kind of matrices are collected from raptor species and where are they collected, and will evaluate the applicability of different matrix samples, and which compound groups should be targeted in monitoring studies. In addition, a protocol or guidelines about good and best practice is needed since different matrix samples need appropriate sampling methods, transport and storage conditions that should be warranted by the different schemes.

A EURAPMON workshop focused on setting best practices on raptor contaminant monitoring activities in Europe (EURAPMON Work Package 5) was held in Murcia (Spain) from Friday 31st May to Sunday 2nd June 2013. The objectives of the Workshop were:

- To prepare a draft manuscript on best practices for pollutant exposure monitoring of raptors. Special attention was paid into the discussion about the structure of the manuscript and the journal where it should be sent, and the agreement about what information should be included in each section of the manuscript.

- To prepare a sampling protocol able to be adapted to different species, countries and user needs, especially designed to be used by the personnel in biomonitoring for raptors.

- To complete a database on contaminant monitoring with raptors in Europe, including information about studied species, geographical area, type and number of samples, concentrations of contaminants, aim of the studies and references.

1.2. MATERIAL AND METHODS

Prior to the workshop, published literature was reviewed and 3 draft documents were prepared during Dr. Silvia Espín stay in the Norwegian Institute for Air Research in Tromsø (Norway), under the supervision of Dr. Dorte Herzke and working through teleconferences with her other supervisors in United Kingdom (Prof. Richard Shore) and Spain (Prof. Antonio J García-Fernández and Dr. Emma Martínez-López). In this sense, a draft manuscript structure on “Best Practices for Pollutant Exposure Monitoring of Raptors” was written to use as base during the workshop, including basic information that should be addressed in the

different sections. In addition, a draft protocol on “Sampling and Contaminant Monitoring” and a database with information from published literature concerning pollutant monitoring in raptors were prepared to be used as preparatory material for the workshop. These documents were distributed to the participants before the workshop.

The workshop covered a 3-days program (see annex 1) including short presentations on the different documents (manuscript, protocol and database), small sessions to discuss the drafting text, and working session to polish the documents. According to the program (see annex 1), Prof. Antonio J. García-Fernández and Dr. Emma Martínez-López presented the inaugural session on Friday morning. Dr. Silvia Espín presented the different sections of the draft manuscript, the draft protocol and the database to the participants on Friday and Saturday morning. After each presentation, participants discussed about the structure and content and proposed new references that should be included. During Saturday afternoon and Sunday morning, working sessions were developed to add the information discussed previously and to polish and complete the draft manuscript and protocol. Finally, Prof. Antonio J. García-Fernández presented a closing session to the participants.

1.3. RESULTS AND DISCUSSION

1.3.1. Manuscript

The proposed title of the manuscript is “Best practice for contaminant exposure monitoring with raptors”. Participants agreed to send the manuscript to the Journal “Reviews of Environmental Contamination and Toxicology”. The manuscript is structured as follows:

1. Introduction and objective

In this section we introduce the reader into the matter. The section contains information about raptors as first wildlife species known to be affected by anthropogenic pollutants, providing some case studies as examples. The presence of different compounds in the ecosystems, how species and populations are exposed, and the adverse effects on health are also presented. In addition, information about raptors as good sentinels of environmental pollution and why raptors are use in biomonitoring studies is provided.

The aim of the manuscript is to combine and evaluate the new knowledge collected on activities undertaken across Europe for monitoring either raptor populations and/or contaminant levels in raptors (Gómez-Ramírez et al. submitted; Derlink et al. in preparation). We use that information to provide data about what kind of matrices are collected from raptor species and where are they collected. In this sense, it has to be kept in mind that each sample matrix may provide different information and not all the samples collected are

suitable for biomonitoring depending on the objective and the compound(s) to be targeted. Therefore, this paper evaluates the applicability of different matrix samples, proposing the ideal target tissues for a specific compound analysis, and which compound groups should be targeted in monitoring studies. For this purpose, this paper is also based on a review of the available literature on contaminant monitoring in raptors from Europe.

2. Choice of matrices

This section is based on the information of two different questionnaries on inventory of existing monitoring, one focused on the health of raptor populations themselves and other focused on what raptors can tell us about the environment (Gómez-Ramírez et al. submitted; Derlink et al. in preparation). In order to provide real data about what matrix samples are collected and where are they collected by different schemes around Europe by personnel form both monitoring areas, we have combined data of these two different questionnaires. A total of 281 different monitoring schemes from 35 countries have sent their questionnaires, and 33 countries collect samples of raptors in Europe. United Kingdom, Sweden and Italy are the countries with the highest number of schemes collecting samples of raptors in Europe. Of the countries that have sent their questionnaires, samples of raptors are not collected in Luxembourg and Serbia. In addition, to our knowledge, there is no sampling collection in other European countries such as Greece, Lithuania, Albania, Moldova, Macedonia and Montenegro, but questionnaires have not been received from these countries. The questionnaire results revealed that feathers and eggs are the most frequently collected samples by the different European schemes (35.6 and 32.4 % of schemes collect feathers and eggs, respectively), followed by food remains (28.8%), pellets (23.5%), internal tissues (22.1%), blood (19.2%), and finally preen oil (2.1%).

This section is subdivided in (i) invasive sampling (blood, plasma and serum, and feathers), (ii) non-invasive sampling (addled or deserted eggs and internal tissues), and (iii) other samples (regurgitated pellets, crop content, excrements, preen oil, and nails). Here we include information about how many schemes collect each kind of sample, which countries collect each kind of sample, and pros and cons about the use of each type of matrix. We also provide tables and maps to provide numbers and indicate where each kind of sample is collected.

3. Compounds to be analysed in each type of sample

This section is based on a literature review about monitoring of pollutants in raptors from Europe. A database with detailed information about the published literature reviewed will be included on the EURAPMON webpage (http://www.eurapmon.net), and a summary of

this database is presented in a table in the manuscript. We put special attention about which contaminants should be analysed. The section is subdivided into the different compound groups: persistent organic pollutants (POPs), poly- and perfluoroalkyl substances (PFASs), metals, pharmaceuticals and personal care products, and anticoagulant rodenticides. We provide information about which samples are most frequently used in monitoring studies, why these matrices are used taking into account the toxicokinetic of each compound group, and benefits and uncertainties on the use of the different matrices for each compound group. Here we also provide a table on recommendations about the matrices to be used to analyse the different compound groups for pan-European monitoring schemes.

4. Conclusions

Finally we include a chapter with missing information and gaps in monitoring studies, and recommendations and suggestions for the future.

1.3.2. Sampling Protocol

Different matrices need appropriate sampling methods, transport and storage conditions that should be warranted by the different schemes. Then, the aim of the sampling protocol is to provide a guide that may help to homogenize, share and disseminate best practices between existing and emerging schemes in order to enhance the reliability, comparability and interoperability of data.

This protocol starts with an introduction and general guidelines that should be considered during sampling. These guidelines include recommendations in order to avoid stress of the animals and external contamination of the samples. Then, a section about basic data that should be reported is presented, including date of sampling, studied area, species, identifications, age, gender, morphometric measurements, body condition index, samples and number of samples collected, productivity of the nest, information of the species and other observations. Then, the protocol is structured in different sections corresponding to the different matrices, i.e. blood, feathers, eggs and internal tissues. For each matrix, information about sampling, transport, pre-treatment of samples, storage, and characterization of samples is provided. In addition, several references, figures and tables are provided in the document to show how to take samples and how to measure some parameters.

This protocol will be freely available in the EURAPMON webpage (www.eurapmon.net) and it will be send to all EURAPMON members to be distributed among research groups and institutions in each country.

1.3.3. Database

A database with information on published literature on contaminant monitoring in raptors from Europe has been developed during the last years by the personnel of the research group “Toxicology and Forensic Veterinary Medicine” (E008-12) of the University of Murcia. The database includes information on year and sampling area, species studied, number of samples collected, tissues analysed, concentrations of organochlorine compounds and metals, aim of the study and references.

The list of references includes in the database (more than 150 references) has been provided to the workshop participants in order to check if there is missing information. Dr. Silvia Espín has received the new references suggested by participants in order to include them and improve the database. This database will be available in the EURAPMON webpage (www.eurapmon.net).

2. ASSESSMENT OF RESULTS AND IMPACT ON FUTURE DIRECTION OF THE FIELD

This workshop was successful in meeting its objectives, bringing together a total of 10 participants and a ESF representative from 6 European countries (Belgium, France, Germany, The Netherlands, Norway and Spain) (see annex 2). A draft manuscript was developed in order to combine and evaluate the new knowledge collected on activities undertaken by several organisations across Europe for monitoring either raptor populations and/or contaminant levels in raptors. This manuscript will provide data about what matrices are collected from raptor species and where are they collected, and will evaluate the applicability of different matrix samples and which compound groups should be targeted in monitoring studies. The sessions with researchers have allowed establish the structure and content that should be included in the manuscript on “Best practice for contaminant exposure monitoring with raptors”. During the workshop, a sampling protocol or guidelines about good and best practice was also prepared, since different matrix samples need appropriate sampling methods, transport and storage conditions that should be warranted by the different schemes. This protocol is specially designed to be used by the personnel in biomonitoring for raptors. In addition, the collaboration with researchers in the field of biomonitoring for raptors and the link to the inventory of their activities has revealed potential of samples to be collected and used for pan-European monitoring, and hence, to fill the gaps in terms of sampling.

After the workshop, Dr. Silvia Espín is doing a stay in the Centre for Ecology and Hydrology in Lancaster (United Kingdom), supervised by Prof. Richard F. Shore. During the

stay, Dr. Silvia Espín is working on delivering the outputs from the workshop. This involved shaping the paper and contents with Prof. Richard Shore and working through teleconferences with Dr. Dorte Herzke, Dr. Emma Martínez-López and Prof. Antonio J García-Fernández. The manuscript is still in progress but a first draft is currently being circulated between participants. We hope to submit the paper for publication later in 2013 to "Reviews of Environmental Contamination and Toxicology". Dr. Silvia Espín has already been in discussions with the editor of the journal to confirm that the topic of the paper is within scope. The protocol and database is currently being updated to be available in the EURAPMON webpage.

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ANNEX 1: PROGRAM

FRIDAY 31ST MAY 2013		
	Session/Topic	**Chair/Presenter**
9:30-11:00	Reception of participants-Registration	
11:00-11:30	*Coffee*	
11:30-12:30	Presentation of the Workshop	Prof. Antonio J. García-Fernández/ Dr. Emma Martínez-López
12:30-14:00	*Lunch*	
14:00-15:30	Presentation of INTRODUCTION and MATERIAL AND METHODS sections	Dr. Silvia Espín
15:30-16:00	*Coffee break*	
16:00-19:00	Presentation of RESULTS AND DISCUSSION section Part 1 and 2: What samples do we have? and What do we know about these samples?	Dr. Oliver Krone/ Dr. Silvia Espín
20:00	*Dinner*	

SATURDAY 1ST JUNE 2013		
	Session/Topic	**Chair/Presenter**
8:30-9:00	*Coffee*	
9:00-11:00	Presentation of RESULTS AND DISCUSSION section Part 3: Which contaminant groups can be analysed in each sample?	Prof. Antonio J. García-Fernández/ Dr. Silvia Espín
11:00-11:30	*Coffee break*	
11:30-13:00	Presentation of PROTOCOL and DATABASE	Dr. Bert van Hattum/ Dr. Silvia Espín
13:00-14:00	*Lunch*	
14:00-16:00	Working sessions	
16:00-16:30	*Coffee break*	
16:30-19:30	Working sessions	
20:00	*Dinner*	

SUNDAY 2ND JUNE 2013		
	Session/Topic	**Chair/Presenter**
8:30-9:00	*Coffee*	
9:00-10:00	Feedback from Working groups: What samples do we have? What do we know about these samples?	Dr. Veerle Jaspers/ Dr. Silvia Espín
10:00-11:00	Feedback from Working groups: Which contaminant groups can be analysed in each sample?	Dr. Silvia Espín
11:00-11:30	*Coffee break*	
11:30-12:30	Feedback from Working groups: Protocol and Database	Dr. Silvia Espín
12:30-13:15	Future activities	Prof. Antonio J. García-Fernández
13:15-13:30	Final remarks	
13:30-14:30	*Lunch*	

ANNEX 2: LIST OF PARTICIPANTS

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