



**Dr. Joan Real Ortí**  
Departament de Biologia Animal  
Universitat de Barcelona  
Av. Diagonal, 645  
08028 Barcelona  
Catalunya - SPAIN  
☎ : 34 - (93) 4035857  
☎ : 34 - (93) 4035740  
e-mail: jreal@ub.edu



## **REPORT OF THE SHORT VISIT GRANT OF EURAPMON-2013**

### **MAKING LONG-TERM MONITORING PROTOCOLS OF RAPTORS AS INDICATORS OF ENVIRONMENTAL CHANGES: A FIRST STEP TO LOCATE INITIATIVES FOR A NETWORK.**

Raptors have been recognized as good indicators of ecosystems as they are usually at the top of the trophic web community system. The response of raptors to environmental changes as the fluctuation of their main prey, not only results at population level but also at functional level, and this can be monitored directly within populations (census of individuals, survival, and fecundity) or indirectly (diet, contaminants,...).

In the recent decades great environmental changes occurred in European countries, even at global or local scale, therefore the monitoring of biodiversity is essential to obtain information of present impacts on it, but also to have early ecological signals of future changes. This kind of information permits not only to know how the global and local changes affect biodiversity but to develop adequate policies of sustainable management and conservation.

Europe has an important tradition of raptor monitoring usually at a large scale (region, countries) that furnish good information on global censuses and population trends of the different species involved. But not so much long-term studies have been developed at a local scale, using standardized monitoring protocols and in focal areas in which simultaneously biotic and abiotic factors are also monitored. Moreover, the areas where monitoring of raptors have developed usually have specifically protocols difficult to implement in other areas, ecosystems and species.

The global purpose of the author is to know different long-term initiatives of monitoring raptors related to specific ecological processes and conservation issues, to put in contact these researchers in order to create common monitoring protocols and develop common synergic initiatives and if the case specific common projects of monitoring. To do this the author last year visited initiatives of long-term biodiversity monitoring in Australia (University of Canberra and Mulligans Reserve, with Drs. Jerry Olsen, Brian Cooke and Adrian Manning), and Canada (Kluane Region by University of British Columbia with the studies carried out by Dr. Charles Krebs), to know global biodiversity long-term monitoring at a ecological community level.

So the second step that begun the last spring is to do contacts with European raptor researchers to know long term initiatives and protocols to develop in the future synergies and a network with them. In this sense after to know the Research Networking Programme EURAPMON in which one the main objectives is to establish consensus on Europe-wide priorities for monitoring with raptors, the author seamed that is a good

opportunity to add more effort and initiative to this program proposing applying for a short visit to begin to develop contacts with researchers making long-term raptor monitoring.

In these sense the first visit in Europe was carried out in the research team of Dr. Erkki Korpimäki (Department of Biology of University of Turku) that is one of the first long-term monitoring schemes of raptors developed in Europe.

So the short visit proposed in the grant of EURAPMON is not an immediate creation of long-term monitoring protocols but the knowledge of specific cases of long-term monitoring raptors, the particular ecological cases and species, the learning of specific methodologies and looking for common synergies with these research teams to create in the future common monitoring systems and different spatial scales and ecological scenarios.

For this the first stay was in Finland in the research team of Dr. Korpimaki, but in the near future it will be carried out in other places, ecosystems and researchers interested and for this is essential to involve the initiatives and participation of EURAPMON.

The purpose of the visit was i) to know the protocols of long-term monitoring of raptors and their prey in boreal and cropland ecosystems; ii) to see how these protocols are applied in the field; iii) to exchange information of both protocols of Mediterranean and boreal raptors, in different scales; and finally iv) to discuss future projects and applications of monitoring raptors as indicators of global change and to disentangle ecological hypothesis.

### **Context.**

The short visit had two temporal stages. The first stage was at the University of Turku and lasted 4 days. This stage consisted in knowing the basic projects at the Section of Ecology of the Department of Biology) and the second stage (10 days) was carried out in the region of Kauhava, the study area of Dr. Korpimaki.

In the first stage at the University of Turku, the researchers Drs. Julien Terraube and Alexandre Villiers explain me the principal nowadays research projects that were developed in the long-term monitoring and were specially focused mainly with Tengmalm Owl, Pigmy Owl, Kestrel, Ural Owl, Eagle Owl, Short-eared Owl, Long-eared Owl, Hen Harrier and Goshawk. This was very a key stage, because permits me to know the focus of the ecological communities involved and habitats (boreal forest and farmland), the involved species (see before), the ecological processes and the conservation problems. And also to enlarge the potential monitoring ideas to other species and habitats in Finland (as cliff nesting species).

The three basic projects that were carried out in the context of long-term monitoring scheme in Kaukava were:

-Land-use changes, trophic interactions and fitness components in top predators: implications for conservation planning in boreal forests. Species involved: Boreal Owl.

-Individual-Level approach to Animal Populations: Natural Variation and Responses to Human-Induced Changes in Forest and Agricultural Ecosystems

-Individual responses to small-scale habitat heterogeneity and implications for the emergence of maladaptive habitat preferences in farmland habitats. Species involved: Common Kestrel.

And moreover the regular monitoring involves other raptor species as: Pygmy Owl, Ural Owl, Eagle Owl, Goshawk, Common Buzzard, and depend of the years Hen Harrier, long-eared Owl and Short-eared Owl.

The second period was developed in the study area of Kauhava, the basic task was to know *in situ* the area, the species involved, the methodologies, the ecological and conservation context, to help with monitoring that permits learning techniques (as egg flooding to know the development of embryos), and to discuss how to develop long-term monitoring in different ecological scenarios, geographic areas and species, and how to use this long-term monitoring to develop and test novel ecological hypotheses.

This very constructive period was developed especially with Drs. Korpimäki and Chiara Morosinotto, Petra Sumasgutner and Rauno Varjonen.

The study area involves near 1000 square kilometres around the Kauhava city and is covered by fragments of boreal forest, cropland and peat bogs. In this area Dr. Korpimäki has more than 1.000 nest boxes corresponding to Boreal Owl, Pigmy Owls, Kestrel, Ural Owls and passerines.

In the case of Boreal Owl of near 300 nest boxes, only two were occupied this year, and one failed, and the other nest occupied has 4 nestlings. This is a very low vole year so only few pairs maintain their territory and breed. The maximum observed in a year were close to 170 pairs nesting. In the case of Pigmy owls, 5 nests were occupied, nestlings were blood sampled and weighed, and controlled with a data logger. In the case of Ural Owl no occupied boxes were found.

During this period we checked the occupied nest of Kestrels, close to 70 nest boxes occupied. During this period all the pairs were with eggs from 4 to 6, and two with recently hatched nestlings. Nests were checked and eggs were flooded to know the stadium of incubation to establish the possible date of hatching. Parasites of recently nestlings hatched were estimated. The experiment was to know different vital life parameters and ecology of Kestrel in two different 'habitats': a landscape with small fields surrounded by forests and another with large fields with less forested area.

During both periods, methodological protocols were exchanged and discussions were carried out with Dr. Erkki Korpimäki, Dr. Alexandre Villers, Dr. Julien Terraube; Dr. Chiara Morosinotto,. Discussion issues were related to compare monitoring protocols

and ecological and conservation issues. Related with ecological issues, some aspects of nomadism and the demographic implications were discussed and compared in the case of non-stable (boreal) and stable (Mediterranean) ecosystems. Aspects of fitness of birds related with the features of their habitats (best quality habitats) were also discussed also with some aspects of competence and intragremial predation. And finally the important changes in the ecosystems that were developed in recent years like timber exploitation, intensive farmland, and climate change were discussed as important approaches of monitoring.

### **Achievements.**

- i) **To know the protocols of long-term monitoring of raptors and their prey in boreal and cropland ecosystems and ii) to see how these protocols are applied in the field;**

In the area of Kauhava two main ecosystems exist, with different ecological and conservation scenarios.

The boreal forest, were the main species involved are the Boreal Owl and Pigmy Owl. These are used in different ecological and biological studies, and as indicators of the well conserved boreal forest, because these owls have important problems in actively cutter forests.

The parameters involved in the monitoring were:

- Global census.
- Nest box occupancy rate
- Breeding rate
- Hatching rate (clutch size is not used for not disturbance)
- Flight rate
- Diet
- Blood parasites

The global census was carried out using point stop of counting owls (see Korpimäki and Saarinen 2012), that consisted in detecting males hooting each season.

The other life parameters described were obtained in a regular checking of nest-boxes. Depend of the years a maximum of 500 nest boxes for Boreal Owl and fewer boxes to Pigmy Owl were monitored. They were distributed regularly in the Kauhava region, usually in pairs in the boreal fragments forests. Boreal Owls nest boxes were putted especially in Spruce trees from 5 to 7 meters hide and builder with wood. The boxes of Pigmy Owl were putted also in trees but between 1,5 and 2 meters hide and build using an empty trunk.

Diet was studied using pellets and prey delivered in the nest and in the case of Pigmy Owl using cumulating prey in autumn.

Blood parasites were studied with sampling blood via radial vein.

A new technique to study the presence and activity of Owls in the nest boxes was learned using chips and data loggers installed in the nests boxes. This easy technique permits to study for example the order of nestling fledging, their return to nest box and the activity of the parents.

The secondary monitored species as Ural Owl, Eagle Owl and Goshawks were monitored using standard monitoring techniques that permit to know their abundance, census and breeding parameters. And they are used as top predator's controls in boreal forests.

The farmland habitat, were like the forest the most important habitat in Kauhava. In this habitat the more frequent raptor is the Kestrel with high densities in good vole years. Moreover there also depending of the years Long-eared owls and Hen Harriers. The ecological and conservation studied and monitored issues in this habitat are: the extension of the farmland areas (small and fragmented or extensive), and the practices developed (traditional versus intensive). So the species focus is the Kestrel. Near 300 nest boxes were placed all of them in barns located in cereal fields, and located regularly usually in pairs. The main study areas are monitored, an area with fragmented crops (small crops) and an area with large crops, that usually corresponded the first with more traditional agriculture and the second with more intensive.

The parameters involved in the monitoring were:

- Global census.
- Nest box occupancy rate
- Breeding rate
- Clutch size
- Hatching rate
- Flight rate
- Diet
- External and Blood parasites

The global census is used looking for the presence of the pair in each nest box.

The other life parameters described were obtained in a regular checking of nest-boxes. A first visit is carried out to detect the occupancy and incubation, and a second visit to monitor the clutch size and usually another to detect the embryo age (using flooding technique) and that permits to predict the hatching date.

The nest boxes were made by wood and placed each one in the front of the barn that usually is in the middle of the crop. Diet is studied using pellet analysis. Parasites are studied checking the skin of the nestlings and internal parasites using blood sampling.

Secondarily Hen Harriers, long-eared Owls and short-eared owls are monitored, and also some relationships with curlew that are abundant in this area and probably benefited to the presence of Kestrels.

- iii) **To exchange information of both protocols of Mediterranean and boreal raptors, in different scales; and finally iv) to discuss future projects and applications of monitoring raptors as indicators of global change and to disentangle ecological hypothesis.**

**Two different important achievements were obtained.**

The first to learn monitoring systems in a very different ecosystem as the boreal forest, and with long experienced researchers and to discuss different aspects of monitoring techniques, in different scenarios. For example in some areas of Mediterranean countries some species like Kestrel or Tawny Owl, are difficult to use nest boxes, perhaps due to abundance of cliffs that produce a good places for breeding. So this aspect can be developed in the future to try to use the same species in both areas with the same methodology.

To built a first approach of monitoring involving two different geographical areas, with two different habitats: the Boreal Area (Finland) and the Mediterranean area (Catalonia).

To apply and develop protocols of monitoring raptors in boreal and Mediterranean ecosystems, we discussed different perspectives and problems emerged to develop a common protocol of monitoring raptors in boreal and Mediterranean ecosystems. The first is the different composition of species in their communities, the second the different environmental problems (not in all cases) and the third the different ecological processes that drive the communities.

The concrete areas that could be involved were: Kaukava region and other northern region in Finland and Prelittoral ranges of Barcelona and Tarragona, in Catalonia.

First approach:

**Forest areas.**

For the first issue in the case of forest communities we selected quite similar species and the ecological processes were focused in trophic chains:

*Strigiformes.*

Finland: Ural Owl, Boreal Owl and Pigmy Owl, and the trophic process (rodent monitoring as *Myomys* and *Microtus*).

Catalonia: Tawny Owl and the trophic process (*Apodemus sylvaticus* and *Myomys*). In some open-mountain areas Barn Owl and Long-eared owls could be also included

*Falconiformes:*

Finland: Goshawk, Sparrowhawk, and prey (tetraonidae, columbidae, passeriformes and squirrels). With the possibility of including Common Buzzard.

Catalonia: Goshawk, Sparrowhawk, and prey (rabbit, galliformes, columbidae, passeriformes and squirrels). Possibility of including Common Buzzard.

The monitoring parameters included in both areas: population census, density, vital rates (breeding success and if possible adult survival) and diet.

Ecological and human processes involved:

Finland: timber and forest management, landscape fragmentation, climate change, human activity (persecution).

Catalonia: land abandonment, leisure activities and persecution.

Time: yearly monitoring.

### **Mountain areas (and/or cliff nesting raptors).**

*Strigiformes.*

Finland: Eagle Owl. Trophic process: rodents versus other prey. Competence with Ural Owl and other nocturnal and diurnal raptors. Influence of land use (timber exploitation and intensive agriculture).

Catalonia: Eagle Owl but also Tawny Owl that breeds in cliffs. Trophic process: rabbit versus rodents and diversity of prey. Competence with Tawny Owl, and other diurnal raptors. Influence of land use (land abandonment).

*Falconiformes:*

Finland: Golden Eagle (in fact mainly nests in trees), peregrine falcon and kestrel. Trophic processes: tetraonidae, hares, carrion; birds, and small mammals). Persecution, timber exploitation,...Competence.

Catalonia: Golden Eagle, Bonelli's Eagle, Peregrine Falcon and Kestrel. Trophic processes: rabbit, galliformes and bird diversity. Human impact: power lines, land abandonment, leisure activities and interspecific competence.

The monitoring parameters included in both areas: population census, density, vital rates (breeding success and if possible adult survival) and diet.

Ecological and human processes involved:

Finland: timber exploitation, forest management, climate change, persecution.

Catalonia: land abandonment, leisure activities, power line impacts and urban development, and climate change.

Time: yearly monitoring.

### **Future projects and relation with EURAPMON**

This is an initial state that consists to localize raptor long-term monitoring initiatives in Europe that have the objective to monitor ecological and environmental changes in our ecosystems. The focus is not only to monitor raptors *per se* but to use them as indicators of local and global changes, and to develop research in an ecological sense.

The location of new initiatives, especially in different ecosystems (like deciduous woodlands of central Europe, and agricultural landscapes), will be very important in the future, and specially to focus on shared species or conservation concerns in the different geographical and ecological scenarios, and for this the participation of EURAPMON would be very important, even to spread this initiative to members of EURAPMON that they would be interested, and to promote long-term monitoring in an ecological sense.

So the first step is the location of the areas and researches, the second to discuss with them the existing monitoring systems and interests, the third to create an effective network and the fourth to develop a specific monitoring scheme with shared protocols and methodologies.

Reference.

Korpimäki, E. & Hakkarainen, H. 2012. The boreal Owl. Ecology, behaviour and conservation of a Forest-Dwelling predator. Cambridge University Press.







