2012

Acrocephalus

letnik	33	številka	154/155	strani	141-336
volume	33	number	154/155	pages	141-336

Impresum / Impresum

Acrocephalus
glasilo Društva za opazovanje in proučevanje ptic Slovenije
Journal of DOPPS - BirdLife Slovenia

ISSN 0351-2851

Lastnik / Owned by:
Društvo za opazovanje in proučevanje ptic Slovenije (DOPPS - BirdLife Slovenia), p.p. 2990, SI–1001 Ljubljana, Slovenija

Oddaja rokopisov / Manuscript submision:
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Oblikovanje / Design: *Jasna Andrič*
Prelom / Typesetting: *Tadeja Smrtnik, Camera d.o.o.*
Tisk / Print: *Schwarz d.o.o.*
Naklada / Circulation: 1500 izvodov / copies

Izhajanje in naročnina: V letniku izidejo 4 številke. Letna naročnina za ustanove je 126,00 EUR, za posameznike 50,00 EUR.

Annual publications and membership subscription (abroad): One volume comprises 4 numbers. Annual subscription is 126,00 EUR for institutions and organisations, and 50,00 EUR for individuals.

Vaš kontakt za naročnino / Your contact for subscription:
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Poslovni račun: SI5602018-0018257011

International Girobank: Nova Ljubljanska banka
No. SI5602018-0018257011

Sofinancer / Co-financed by: *Javna agencija za knjigo Republike Slovenije / Slovenian Book Agency, European Science Foundation / Evropska znanstvena fundacija*

Revija je indeksirana / the journal is indexed in:
AGRICOLA, AQUATIC SCIENCES AND FISHERIES ABSTRACTS, BIOSIS PREVIEWS, BOSTAO SPA SERIALS, COBIB, DLIB.SI, ORNITHOLOGICAL WORLDWIDE LITERATURE, ORNITHOLOGISCHE SCHRIFTENSCHAU, RAPTOR INFORMATION SYSTEM, ZOOLOGICAL RECORDS

Published by: VERSITA

Partner: BirdLife International
Revijo je omogočil: Grand Hotel Union

Ilustracija na naslovnici / Front page:
planinski orel / Golden Eagle *Aquila chrysaetos,*
velika uharica / Eagle Owl *Bubo bubo*
risba / drawing: Jurij Mikuletič

Ilustracija v uvodniku / Editorial page:
kragulj / Goshawk *Accipiter gentilis*
risba / drawing: Jurij Mikuletič

Special issue on a preliminary inventory of monitoring *for* raptors in Europe

Posebna številka o preliminarnem pregledu monitoringa populacij ptic roparic v Evropi

The papers in this special issue of *Acrocephalus* derive from the workshop "**Inventory of existing raptor monitoring in Europe**" held in Murcia, Spain, in February 2012, under the auspices of EURAPMON (www.esf.org/eurapmon and www.eurapmon.net), a European Science Foundation (ESF) "Research Networking Programme" on Research and Monitoring *for* and *with* Raptors in Europe.

The aim of EURAPMON is to strengthen the contribution of research and monitoring *for* and *with* raptors in Europe to delivery of biodiversity, environmental and human health benefits, including maintenance and recovery of raptor populations and their habitats, and reduced chemicals threats to ecosystem and human health. By monitoring *for* raptors, we refer to monitoring that focuses on raptor populations and trends. By monitoring *with* raptors, on the other hand, we refer to monitoring which focuses on using raptors to monitor contaminants and other environmental pressures.

EURAPMON was launched in May 2010 and will run for 5 years. It builds on a workshop held in Sicily, Italy in October 2006, proceedings of which were published in a Special Issue of *Ambio* in 2008 (Ambio 37 (6) 2008; http://www.bioone.org/toc/ambi/37/6). EURAPMON participants are drawn from most ESF member countries and from key international organisations, including BirdLife International, MEROS and the Raptor Research Foundation. EURAPMON has access to a significant proportion of leading and emerging expertise and facilities for such work in Europe.

EURAPMON's objectives are: (1) to establish a sustainable and resource-efficient Europe-wide network for monitoring *for* and *with* raptors, linked to international networks, (2) to establish consensus on Europe-wide priorities for monitoring *for* and *with* raptors, based on a comprehensive inventory of existing monitoring and of needs of key users (policy makers, risk assessors, environmental managers), (3) to spread best practices and build capacities in Europe for harmonised monitoring *for* and *with* raptors, and (4) to build a web-based database, populated with interoperable data (not raw data) on European raptor populations and (contaminant and other) pressures on raptors in Europe, and to produce European- and EU-scale analytical outputs, which meet priority user needs.

The current publication is a key contribution towards preparing the inventory of existing raptor monitoring. The papers herein have been written by National Coordinators appointed by EURAPMON across Europe (most, but not all, countries have National Coordinators). The papers cover the following countries, organised by geographic region:

– Southern Europe: Portugal, Spain, Italy, Malta, Greece
– Central Europe: Poland, Slovak Republic, Austria, Hungary

– Northern Europe: Sweden, Norway, Finland, Estonia, Latvia
– Southeastern Europe: Bulgaria, Slovenia, Croatia, Bosnia and Herzegovina
– Western Europe: Ireland, Belgium, France, United Kingdom
– Eastern Europe (east to the Urals): Russia, Belarus, Georgia

Each paper provides an overview of the **main players**, the extent of **national coverage**, **species monitored, strengths and weaknesses**, **priorities and capacity-building**.

An overview paper pulls together the information provided in the individual country papers and draws out key findings in relation to the above questions.

The current issue of Acrocephalus provides a first and preliminary overview of the state of monitoring for raptors in Europe. We hope that it will give added stimulus to development of more comprehensive monitoring schemes in European countries and contribute to providing a baseline for development of common pan-European raptor monitoring network for the benefit of raptors and humans, towards delivering the EURAPMON's aim.

Acknowledgements

EURAPMON is funded by 15 European research academies, governments and non-governmental organisations through the European Science Foundation: Danish Council for Independent Research, Natural Sciences (FNU); Estonian Science Foundation; Academy of Finland Research Council for Biosciences and Environment; Hungarian Academy of Sciences (HAS); Hungarian Scientific Research Fund (OTKA); Ministry for the Environment, Land and Sea, Directorate General for Nature Protection, Italy; Comune di Castellammare del Golfo, Italy; National Research Fund, Luxembourg (FNR); Netherlands Organisation for Scientific Research (NOW); Research Council of Norway; Society for Wild Animals "Falcon", Poland; Foundation for Science and Technology (FCT), Portugal; National University Research Council (CNCSIS), Romania; Slovenian Research Agency (ARRS); Ministry of Science and Innovation (MICINN), Spain; Swedish Research Council (VR); Swedish Council for Environment, Agricultural Sciences & Spatial Planning (FORMAS); Centre for Ecology & Hydrology (CEH), UK. We thank Dr Dan Osborn for his constructive support in the early stages of EURAPMON. The proposal for EURAPMON was supported by a European Commission Marie Curie Fellowship to Dr Paola Movalli. We wish to thank Prof Antonio Garcia-Fernandez, Dr Emma Martinez-Lopez and their colleagues at the University of Murcia who were the local organisers of the workshop, the Autonomous Region of Murcia and the Spanish Ministry of Research for workshop co-funding, CEMACAM (the workshop venue), the EURAPMON National Coordinators and their raptor monitoring compatriots who contributed to this publication and all other workshop participants for their valuable contributions. We thank Dr Paola Campus and Marie-Laure Schneider of the European Science Foundation for their support. Special thanks also to Luka Božič, the Editor-in-Chief of Acrocephalus for his constructive collaboration.

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Prispevki v tej posebni izdaji *Acrocephalusa* so plod delavnice "**Pregled obstoječega monitoringa ptic roparic v Evropi**", ki je potekala februarja 2012 v Murciji (Španija) v organizaciji projekta EURAPMON (www.esf.org/eurapmon in www.eurapmon.net) Evropske znanstvene fundacije, ki se posveča raziskavam in monitoringu ptic roparic v Evropi.

Namen projekta EURAPMON je povečati prispevek raziskav in monitoringa ***za*** in ***s*** pticami roparicami v Evropi pri zagotavljanju biotske pestrosti ter koristi za okolje in zdravje ljudi, vključno z ohranjanjem in obnavljanjem populacij ptic roparic in njihovih habitatov ter ohranjanjem ekosistemov in varstvom človekovega zdravja zaradi uporabe kemikalij v naravi. Kadar govorimo o monitoringu ***za*** ptice roparice, imamo v mislih monitoring, ki se osredotoča na populacije in trende teh ptic, medtem ko monitoring ***s*** pticami roparicami pomeni prek monitoringa ptic roparic spremljati stanje v naravi zaradi onesnažil in drugih pritiskov na okolje.

Projekt EURAPMON je zaživel maja 2010 in bo trajal pet let. Njegovi zametki so nastali na delavnici, ki je oktobra 2006 potekala na Siciliji, in na osnovi razprav s te delavnice, ki so bile leta 2008 objavljene v posebni številki revije *Ambio* (Ambio 37 (6) 2008; http://www.bioone.org/toc/ambi/37/6). Pri projektu EURAPMON združujemo raziskovalce iz večine držav članic Evropske znanstvene fundacije in ključnih mednarodnih organizacij, vključno z organizacijama BirdLife International in MEROS in Raptor Research Foundation iz ZDA. EURAPMON ima odprto pot do pomembnega deleža strokovnega znanja in orodij za takšno delo v Evropi.

Cilji projekta EURAPMON so: (1) osnovati trajnostno vseevropsko omrežje z učinkovito uporabo virov za monitoring ***za*** in ***s*** pticami roparicami, povezano z mednarodnimi omrežji, (2) doseči soglasje o vseevropskih prioritetah za monitoring ***za*** in ***s*** pticami roparicami, temelječe na celostnem pregledu obstoječega monitoringa in potreb ključnih uporabnikov (oblikovalcev politike, ocenjevalcev tveganj, okoljskih upraviteljev), (3) razširjati primere najboljše prakse in ustvarjati kapacitete v Evropi za usklajen monitoring ***za*** in ***s*** pticami roparicami, in (4) zgraditi na spletu temelječo bazo podatkov z medsebojno povezljivimi podatki o evropskih populacijah ptic roparic in pritiskih nanje v Evropi (z onesnažili in podobno) ter pripraviti analize na evropski in EU-ravni, ki bodo zadovoljevale prednostne potrebe uporabnikov.

Pričujoča publikacija je ključni prispevek k pripravi celostnega pregleda obstoječega monitoringa ptic roparic. Članke so napisali nacionalni koordinatorji, imenovani v okviru projekta EURAPMON po vsej Evropi (nacionalne koordinatorje ima večina držav, ne pa vse). Razprave zadevajo naslednje države (po geografskih regijah):

– Južna Evropa: Portugalska, Španija, Italija, Malta, Grčija
– Srednja Evropa: Poljska, Slovaška, Avstrija, Madžarska
– Severna Evropa: Švedska, Norveška, Finska, Estonija, Latvija
– Jugovzhodna Evropa: Bolgarija, Slovenija, Hrvaška, Bosna in Hercegovina
– Zahodna Evropa: Irska, Belgija, Francija, Združeno kraljestvo
– Vzhodna Evropa (do Urala): Rusija, Belorusija, Gruzija

Vsak članek vsebuje pregled **glavnih protagonistov**, **obsega nacionalne pokritosti**, **vrst ptic roparic, vključenih v monitoring, prednosti in slabosti**, **prednostnih nalog in krepitev zmogljivosti**.

Pregledni članek združuje informacije, zbrane v člankih posameznih držav, in povzema ključne ugotovitve glede na gornja vprašanja.

Pričujoča številka Acrocephalusa prinaša prvi in predhodni pregled stanja populacijskega monitoringa ptic roparic v Evropi. Ob tem upamo, da bo prinesla dodatno spodbudo za razvoj bolj celostnih shem monitoringa v evropskih državah in prispevala k pripravi izhodišč za razvoj skupnega vseevropskega monitoringa ptic roparic tako v njihovo dobro kot dobro ljudi – k izpolnitvi ciljev, zastavljenih v okviru projekta EURAPMON.

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Acrocephalus 33 (154/155): 145–157, 2012
10.2478/v10100-012-0003-y

Overview of raptor monitoring activities in Europe

Pregled monitoringa ptic roparic v Evropi

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Despite the key role of raptors (including birds of prey Falconiformes and owls Strigiformes) in ecosystems and their sensitivity to environmental change, a well coordinated, Europe-wide monitoring of raptors is lacking. EURAPMON, a Research Networking Programme of the European Science Foundation, was launched with the aim of establishing a sustainable Europe-wide network for monitoring of raptors. An overview of current monitoring schemes for raptor populations in 28 European countries, as reported by EURAPMON National Coordinators at the workshop in Murcia (Spain) in 2012, showed existing monitoring schemes to be limited to a restricted number of species (mostly diurnal and rare raptor species). The most widely monitored species are the Golden Eagle *Aquila chrysaetos* amongst diurnal raptors and the Eagle Owl *Bubo bubo* amongst owls. Broad coverage of a species range across Europe is reached only for restricted-range species. The key driver for monitoring, which is mostly coordinated by NGOs, is conservation, and the main end users are governmental institutions. International collaboration in the field of monitoring of raptors is mainly regional and not yet pan-European in scale. The involvement of volunteers in raptor monitoring was perceived as the main strength of many schemes, but insufficient manpower and a focus on rare species were recognised as the main weaknesses across Europe as a whole. Among priorities identified for the future development of monitoring schemes are: improvements to national coordination; support to increase the number of volunteers; and assurances of stable funding. Further analysis of EURAPMON questionnaires will identify knowledge gaps, which will steer good practice guidance on survey methodologies; the need for the latter was identified as the main benefit that National Coordinators expect to gain from international networking.

Key words: Europe, raptor monitoring scheme, birds of prey, owls, monitoring inventory
Ključne besede: Evropa, monitoring ujed in sov, pregled shem monitoringa

1. Introduction

As top predators, raptors are key species in ecosystems, for which large positive relationships with overall biodiversity have been shown (Sergio *et al.* 2005). However, the benefits for conservation science of focussing on raptors can be two-fold (Movalli *et al.* 2008). First, as top predators they are vulnerable to ecosystem degradation and can respond rapidly to biodiversity loss lower down the food chain (Kovács *et al.* 2008). Second, due to contaminant biomagnification processes, they can act as valuable sentinels of environmental pollution (Helander *et al.* 2008). Both perspectives are crucial in assessment of the state of ecosystems, since biodiversity loss and contamination have significant environmental, social and economic impacts. Indeed, raptor monitoring can provide relevant information to inform assessment of the effectiveness of EU environmental policy and law aimed at nature conservation and at the prevention of environmental contamination (Duke 2008). Despite this, due to the need for specific survey protocols, raptors are usually poorly covered by more generic common bird censuses (Hardey *et al.* 2009). Monitoring schemes for raptors are not spread uniformly across Europe, apply diverse methods, and are conducted at quite different scales, from intensive academic research projects to broad-scale volunteer surveys (Kovács *et al.* 2008). There is a need to reinforce national and sub-national initiatives and improve coordination of raptor monitoring at pan-European scale. This applies both to monitoring largely focused on the health of raptor populations themselves (which we subsequently refer to as "monitoring *for* raptors") and to monitoring largely focused on what raptors can tell us about the environment ("monitoring *with* raptors"). These issues prompted the initiation of EURAPMON, a recently established Research Networking Programme of the European Science Foundation.

Traditionally, only birds of prey (order Falconiformes) were considered as raptors following Hartert's (1912) taxonomic division of order Accipitres. However, following modern discussions over the role of raptorial birds as top predators in ecosystems, and due to their similar predatory habits, owls (order Strigiformes) are often also considered as raptors (e.g. Burfield 2008, Saurola 2008). Thus, birds of prey and owls belong to the same ecological guild, i.e. a group of ecologically similar species exploiting the same environmental resources in a similar way as defined by Root (1967), within which strong competitive and even intraguild predation interactions are described (Carotheres & Jaksic 1984, Sergio *et al.* 2003, Vrezec & Tome 2004, Sergio & Hiraldo 2008). Some recent views on raptor assemblages define raptors even more broadly, including some passerine groups: shrikes (Laniidae), as indicated by publications in the *Journal of Raptor Research*; and even some corvids (Corvidae), i.e. Raven *Corvus corax* (Hardey *et al.* 2009). In this sense, ecologically based views are actually repeating old taxonomic considerations of raptors as the former order Accipitres, comprising birds of prey, owls and shrikes (Linnaeus 1758). For the purposes of the EURAPMON programme and this paper, however, only top predator species with an apex role in ecosystems are included, which require specific methodological approaches for monitoring: birds of prey (Falconiformes; diurnal raptors) and owls (Strigiformes; mainly nocturnal raptors).

The EURAPMON inventory of raptor population monitoring (monitoring *for* raptors) in Europe was initiated in 2012. The inventory will form the basis of future development of common monitoring approaches, including good practice guidance on survey methodologies and analysis of data. It will assist in setting priorities and is complementary to, and will be used in conjunction with, a similar inventory of *with* raptor monitoring schemes across Europe (Gómez-Ramírez *et al. submitted*) to foster cross-cooperation between these two monitoring communities. A network of National Coordinators has been established for the monitoring *for* raptors, who have the combined role of facilitating data provision for the inventory and promoting common pan-European raptor monitoring activities.

The *for* raptors monitoring inventory was launched at a workshop held in Murcia, Spain, 7–10 February 2012, organized by EURAPMON to bring together the National Coordinators for the first time to report on the monitoring schemes existing in their countries (EURAPMON 2013). This paper aims to provide an overview of the main insights arising from the National Coordinators' reports, providing a first up to date review of current monitoring activities *for* raptors across Europe. A further paper will synthesize the results of a subsequent questionnaire survey of those carrying out raptor monitoring across Europe and provide more detail on the particular biological parameters that are monitored, variation in survey methods across Europe and individual species coverage.

2. Material and methods

At the workshop held in Murcia in 2012, the appointed National Coordinators each provided a PowerPoint

presentation reviewing the current status of monitoring *for* raptors within their country (available at http://www.eurapmon.net), following this with papers summarising the current state of knowledge (published within this issue of *Acrocephalus*). The workshop participants were asked to answer a set of standard questions under five topics, covering a range of relevant monitoring issues:

(1) **Main players**
- Who are the main actors in monitoring for raptors in your country?
- Which are the main countries with which you collaborate, within your region, within Europe and/or globally?
- Who are the main users of the data obtained from this monitoring and for what purpose do they use the data?

(2) **National coverage**
- Is there any national co-ordination? By whom?
- Is there a national network for monitoring for raptors?
- How comprehensive or patchy, spatially, is monitoring across the country?

(3) **Key species and key issues**
- What are the key species addressed by monitoring for raptors in your country?
- What are the key issues (threats) addressed by monitoring for raptors in your country?
- For which, if any, of these species and issues might your country most benefit from international networking?

(4) **Strengths and weaknesses**
- What are the main strengths and weaknesses of monitoring for raptors in your country?
- What are the main gaps (species, regions, threats…) in monitoring for raptors in your country?
- Are there specific areas of weakness, or challenges, for which your country might benefit from international sharing of good/best practice?

(5) **Priorities, capacity-building**
- What are the priorities to strengthen monitoring for raptors in your country?
- What are the main capacity-building needs to strengthen for monitoring for raptors in your country?

The responses have been summarized and pooled into groups containing related answers. Some questions were not answered for all countries, so in the analysis we have excluded those countries in which National Coordinators have skipped certain questions. The scale of international collaboration was measured as distances between capital cities of collaborating countries. The scale was estimated by comparing actual collaboration distances with all possible distances between capital cities in Europe, assuming that the latter would reflect a pan-European collaboration scale. Non-parametric and χ^2 statistical tests have been used whenever needed for numerical evaluation of the data. The known presence of breeding raptor populations in European countries followed BirdLife International (2004), and only for poorly known countries have recent updates been taken into account, e.g. Bosnia and Herzegovina (Kotrošan & Hatibović 2012). In the paper we deal especially with monitoring of breeding populations and less with migration and wintering monitoring issues, which were less comprehensively covered with the current survey approach.

3. Results and discussion

Within this overview we have collected reports of raptor monitoring activity from 28 European countries (in alphabetical order; see also Figure 2): Austria, Belarus, Belgium, Bosnia & Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Ireland, Italy, Latvia, Malta, Norway, Poland, Portugal, Romania, Russia, Slovakia, Slovenia, Spain, Sweden and United Kingdom. Surveyed countries comprise 58% of all countries and 83% of the whole territory of Europe covered by EURAPMON (which includes Europe east to the Urals, Georgia, Armenia, Azerbaijan and Turkey).

3.1. Main players

In more than 90% of surveyed countries, monitoring *for* raptors is conducted by non-governmental organisations (NGOs), such as ornithological societies, BirdLife Partners and other associations (Figure 1 left). However, in 75% of countries, governmental (i.e. ministries, environmental agencies, protected areas administrations) and research institutions (i.e. universities, research institutes, museums) are also involved in running monitoring schemes. In some countries, further monitoring activities are the result of the enthusiasm of individuals, and monitoring is conducted only via private initiatives. The latter monitoring schemes are usually small-scale, but not necessarily short-term.

Large-scale, country-wide monitoring schemes usually incur higher costs, such that stable financing is necessary to conduct them in the long-term. For this reason, the needs of users of monitoring data are crucial

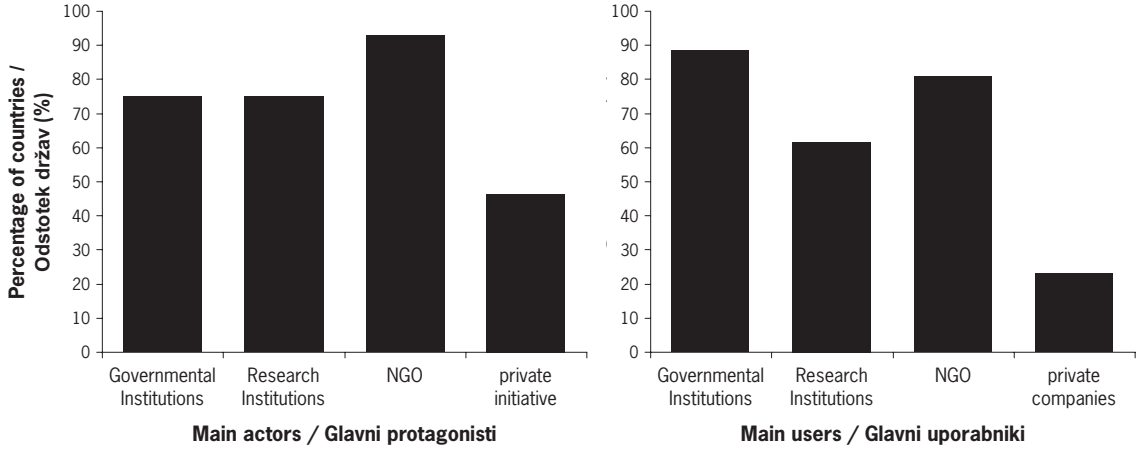

Figure 1: Main actors conducting monitoring *for* raptors in Europe (n = 28 countries) and main users of data of monitoring *for* raptors in Europe by the percentage of the surveyed countries (n = 26 countries). Each country can appear more than once in each graph.

Slika 1: Glavni protagonisti monitoringa populacij ptic roparic v Evropi (n = 28 držav) in glavni uporabniki podatkov monitoringa populacij ptic roparic v Evropi po odstotkih sodelujočih držav (n = 26 držav). Vsaka država je lahko upoštevana več kot enkrat v obeh grafikonih.

to consider when setting up monitoring schemes. In 88% of the surveyed European countries, the main identified users of monitoring data are governmental institutions (Figure 1 right), particularly for implementing their international monitoring obligations set by, for example, EU Directives (see an overview in Duke 2008). However, National Coordinators also reported large user needs for monitoring data within NGOs, particularly for assessing species' conservation status and other conservation issues (e.g. Burfield 2008). Research institutions are in general less involved with the analysis and management of monitoring data (Figure 1 right), and this was reported as one of the main weaknesses of monitoring schemes by many National Coordinators (see later). Due to obligations to assess the environmental and biodiversity impacts of development, many private companies are also involved in monitoring activities as both data users and monitoring funders (e.g. to carry out work to assess the impacts of wind farms, power lines etc.), although such monitoring activities are usually undertaken at a local scale only.

According to information obtained from National Coordinators, there is some existing network of international collaboration for the monitoring *for* raptors in Europe, with 102 different contacts reported (Figure 2). Our measure of the scale of this network (measured as distances between capital cities) has shown that this network represents more or less regional, but not pan-European, scale collaboration, with the majority of contacts restricted to neighbouring countries (Figure 3). The current network is significantly (Mann-Whitney U = 26,290, P < 0.0001) limited to short distance collaboration (median distance 680 km, n = 102 connections) compared to potential overall pan-European collaboration (median distance 1,314 km, n = 946 connections; see Figure 3). Long distance collaborations reported usually involved the monitoring of migrating raptors, with collaboration for monitoring of breeding populations less evident. Aside from EURAPMON, there are few existing collaborative initiatives aimed at moving towards pan-European monitoring *for* raptors: the MEROS programme and initiatives by BirdLife International and the European Bird Census Council (EBCC) are relevant in this respect (Kovács *et al.* 2008). Despite this, some countries reported intercontinental collaboration with South America, Africa and Asia, suggesting some global networking already exists for monitoring *for* raptors. These global connections were not targeted specifically within the current survey, and are thus probably underestimated in our results.

3.2. National Coverage

At least some national coordination of monitoring activity exists in 71% of surveyed countries. Most of the coordination is limited to one or a restricted number of species (43% of surveyed countries), while comprehensive coordination for monitoring

Figure 2: The current international collaboration network in Europe for monitoring *for* raptors, showing reported collaboration contacts between countries. Countries from which data were obtained are shaded grey.

Slika 2: Trenutno omrežje mednarodnega sodelovanja v Evropi v okviru monitoringa populacij ptic roparic s sporočanimi stiki sodelovanja med državami. Države, od katerih so bili pridobljeni podatki o monitoringu, so obarvane sivo.

of the whole raptor community or of the majority of raptor species within countries is less frequent (36% of surveyed countries). National coordination of monitoring schemes *for* raptors is mainly confined to NGOs (85% of the countries with reported national coordination). Only in a few countries is the national coordination conducted by research or governmental institutions (Figure 4), for example the comprehensive monitoring scheme (national *Raptor Grid*) in Finland, which is coordinated by the Finnish Museum of Natural History, University of Helsinki (Saurola 2008).

3.3. Key species

Monitoring activity exists for 50 (90%) of the 56 known breeding raptor species in Europe. Among the species monitored in most European countries are the Golden Eagle *Aquila chrysaetos*, White-tailed Eagle *Haliaeetus albicilla* and Peregrine Falcon *Falco peregrinus* (Table 1). Considering species range coverage, the whole European range is monitored for just two species: the Spanish Imperial Eagle *A. adalberti* and Steppe Eagle *A. nipalensis*, both of which are range-restricted in Europe to one or two countries only (BirdLife International 2004). The results suggest that for 62% of diurnal raptors, more than half of the species range is monitored in Europe,

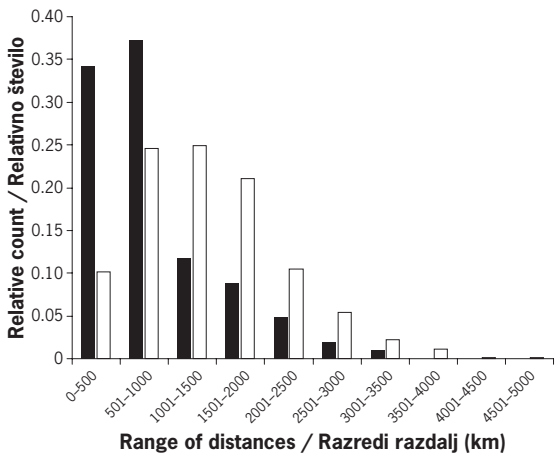

Figure 3: Range of international collaboration between European countries for monitoring *for* raptors, measured as distances between capital cities of collaborating countries. Dark columns show the actual collaboration detected, and light columns show the potential for collaboration if all possible connections between countries in Europe were made. The relative count is the proportion of the number of distances within actual or potential collaboration.

Slika 3: Razpon mednarodnega sodelovanja med evropskimi državami pri monitoringu populacij ptic roparic, izmerjen z razdaljami med glavnimi mesti sodelujočih držav. Temni stolpci prikazujejo dejansko sodelovanje, svetli stolpci pa potencialno sodelovanje, če se vzpostavijo vsi možni stiki med državami v Evropi. Relativno število je delež števila razdalj znotraj dejanskega ali potencialnega sodelovanja.

Table 1: Monitoring schemes for bird of prey species (Falconiformes) established in Europe (only species breeding in surveyed European countries are shown; according to BirdLife International (2004), Kotrošan & Hatibović (2012). The number of countries and estimated percentage of the species range in Europe covered by monitoring schemes as reported in the survey are shown (monitoring coverage of European range is calculated as the percentage of countries with a species population in which monitoring is conducted).

Tabela 1: Sheme monitoringa za ujede (Falconiformes), osnovane v Evropi (prikazane so samo vrste, ki gnezdijo v sodelujočih evropskih državah; po BirdLife International (2004), Kotrošan & Hatibović (2012). Tabela prikazuje število držav in ocenjene odstotke arealov vrst v Evropi, ki jih pokrivajo sheme monitoringa, kot je bilo sporočeno v popisih (obseg monitoringa v evropskem arealu je izračunan kot odstotek držav s populacijami vrst, v katerih je bil opravljen ali poteka monitoring).

Species / Vrsta	No. of countries / Št. držav	Monitoring coverage of European range / Obseg monitoringa v evropskem arealu (%)
Golden Eagle *Aquila chrysaetos*	18	75
White-tailed Eagle *Haliaeetus albicilla*	17	81
Peregrine Falcon *Falco peregrinus*	17	68
Montagu's Harrier *Circus pygargus*	12	50
Kestrel *Falco tinnunculus*	12	43
Osprey *Pandion haliaetus*	11	85
Red Kite *Milvus milvus*	11	61
Marsh Harrier *Circus aeruginosus*	10	40
Goshawk *Accipiter gentilis*	10	37
Buzzard *Buteo buteo*	10	37
Lesser Spotted Eagle *Aquila pomarina*	9	56
Saker Falcon *Falco cherrug*	8	73
Black Kite *Milvus migrans*	8	35
Honey Buzzard *Pernis apivorus*	8	31
Sparrowhawk *Accipiter nisus*	8	30
Egyptian Vulture *Neophron percnopterus*	7	87
Imperial Eagle *Aquila heliaca*	7	70
Red-footed Falcon *Falco vespertinus*	7	54
Hobby *Falco subbuteo*	7	27
Griffon Vulture *Gyps fulvus*	6	67
Lesser Kestrel *Falco naumanni*	6	54
Northern Harrier *Circus cyaneus*	6	33
Lammergeier *Gypaetus barbatus*	5	83
Greater Spotted Eagle *Aquila clanga*	5	71
Black Vulture *Aegypius monachus*	4	57
Bonelli's Eagle *Aquila fasciata*	4	57
Merlin *Falco columbarius*	4	50
Short-toed Eagle *Circaetus gallicus*	4	22
Eleonora's Falcon *Falco eleonorae*	3	75
Gyrfalcon *Falco rusticolus*	3	75
Spanish Imperial Eagle *Aquila adalberti*	2	100
Rough-legged Buzzard *Buteo lagopus*	2	50
Lanner Falcon *Falco biarmicus*	2	33
Booted Eagle *Aquila pennata*	2	13
Steppe Eagle *Aquila nipalensis*	1	100
Black-winged Kite *Elanus caeruleus*	1	33
Long-legged Buzzard *Buteo rufinus*	1	14
Pallid Harrier *Circus macrourus*	0	0
Levant Sparrowhawk *Accipiter brevipes*	0	0

particularly for threatened species. Species with lower monitoring coverage in Europe are mainly common and widespread species (e.g. Buzzard *Buteo buteo*, Honey Buzzard *Pernis apivorus*, Goshawk *Accipiter gentilis*, Sparrowhawk *A. nisus*) and species breeding predominantly in southern and eastern Europe (e.g. Long-legged Buzzard *B. rufinus*, Booted Eagle *A. pennata*, Short-toed Eagle *Circaetus gallicus*). However, from annually operated breeding bird surveys in 21 European countries, PECBMS (2009) was able to produce population trends at least for some common raptors at the pan-European scale, i.e. Sparrowhawk, Buzzard, Marsh Harrier *Circus aeruginosus*, and Kestrel *F. tinnunculus*. Two species breeding in surveyed countries, Pallid Harrier *C. macrourus* and Levant Sparrowhawk *A. brevipes*, are not covered by any reported monitoring scheme.

Less comprehensive monitoring of owl populations in Europe is suggested by the lower number of countries conducting owl monitoring as well as by the lower monitoring coverage of European ranges compared to diurnal raptors (median coverage of owls per species is 37%, median coverage of birds of prey per species is 54%; Tables 1 & 2). The most monitored owl species in Europe is the Eagle Owl *Bubo bubo*, but the highest monitoring coverage of breeding population in Europe is for the Great Grey Owl *Strix nebulosa*, which has a range restricted to only five European countries (BirdLife International 2004) and is monitored at least in four of these. Only for 23% of owl species is more than half of the species range reported as monitored in Europe, and other

Figure 4: Organisations involved in national coordination of monitoring activities *for* raptors in surveyed European countries (n = 20)

Slika 4: Organizacije, vključene v nacionalno koordinacijo monitoringa populacij ptic roparic v sodelujočih evropskih državah (n = 20)

Table 2: Owls (Strigiformes) for which monitoring schemes are established in Europe. The number of countries and estimated percentage of the species range in Europe covered by monitoring schemes are shown (monitoring coverage of the European range is calculated as the percentage of countries with a species population in which monitoring is conducted).

Tabela 2: Sove (Strigiformes) z obstoječimi shemami monitoringa v Evropi. Tabela prikazuje število držav in ocenjene odstotke arealov vrst v Evropi, ki jih pokrivajo sheme monitoringa (obseg monitoringa v evropskem arealu je izračunan kot odstotek držav s populacijami vrst, v katerih je bil opravljen ali poteka monitoring).

Species / Vrsta	No. of countries / Št. držav	Monitoring coverage of European range / Obseg monitoringa v evropskem arealu (%)
Eagle Owl *Bubo bubo*	15	58
Tawny Owl *Strix aluco*	10	40
Tengmalm's Owl *Aegolius funereus*	9	37
Long-eared Owl *Asio otus*	9	33
Ural Owl *Strix uralensis*	8	42
Barn Owl *Tyto alba*	7	29
Pygmy Owl *Glaucidium passerinum*	6	32
Little Owl *Athene noctua*	5	23
Short-eared Owl *Asio flammeus*	5	22
Great Grey Owl *Strix nebulosa*	4	80
Snowy Owl *Bubo scandiacus*	2	50
Hawk Owl *Surnia ulula*	2	40
Scops Owl *Otus scops*	2	12

Table 3: Preliminary overview of monitoring of raptor non-breeding populations in Europe, showing the number of surveyed countries which reported migration and/or wintering monitoring

Tabela 3: Predhodni pregled monitoringa populacij negnezdečih ptic roparic v Evropi s številom sodelujočih držav, ki so poročale o monitoringu selečih se in/ali prezimujočih vrst

Species / Vrsta	Monitoring	No. of countries / Št. držav
Honey Buzzard *Pernis apivorus*	Migration	5
Black Kite *Milvus migrans*	Migration	4
Marsh Harrier *Circus aeruginosus*	Migration	4
Short-toed Eagle *Circaetus gallicus*	Migration	3
Osprey *Pandion haliaetus*	Migration	3
Kestrel *Falco tinnunculus*	Migration	3
Red-footed Falcon *Falco vespertinus*	Migration	3
Griffon Vulture *Gyps fulvus*	Migration	2
Black Vulture *Aegypius monachus*	Migration	2
Pallid Harrier *Circus macrourus*	Migration	2
Montagu's Harrier *Circus pygargus*	Migration	2
Goshawk *Accipiter gentilis*	Migration	2
Buzzard *Buteo buteo*	Migration	2
Long-legged Buzzard *Buteo rufinus*	Migration	2
Lesser Kestrel *Falco naumanni*	Migration	2
Hobby *Falco subbuteo*	Migration	2
White-tailed Eagle *Haliaeetus albicilla*	Migration	1
Lammergeier *Gypaetus barbatus*	Migration	1
Egyptian Vulture *Neophron percnopterus*	Migration	1
Hen Harrier *Circus cyaneus*	Migration	1
Sparrowhawk *Accipiter nisus*	Migration	1
Levant Sparrowhawk *Accipiter brevipes*	Migration	1
Rough-legged Buzzard *Buteo lagopus*	Migration	1
Lesser Spotted Eagle *Aquila pomarina*	Migration	1
Greater Spotted Eagle *Aquila clanga*	Migration	1
Steppe Eagle *Aquila nipalensis*	Migration	1
Imperial Eagle *Aquila heliaca*	Migration	1
Golden Eagle *Aquila chrysaetos*	Migration	1
Booted Eagle *Aquila pennata*	Migration	1
Merlin *Falco columbarius*	Migration	1
Eleonora's Falcon *Falco eleonorae*	Migration	1
Saker Falcon *Falco cherrug*	Migration	1
Peregrine Falcon *Falco peregrinus*	Migration	1
Long-eared Owl *Asio otus*	Wintering	4
Black Kite *Milvus migrans*	Wintering	2
Montagu's Harrier *Circus pygargus*	Wintering	2
Red Kite *Milvus milvus*	Wintering	1
White-tailed Eagle *Haliaeetus albicilla*	Wintering	1
Hen Harrier *Circus cyaneus*	Wintering	1

species are monitored to a rather limited extent. The least monitored are Scops *Otus scops* and Short-eared Owl *Asio flammeus*, which are the only truly migratory owl species in Europe (Mikkola 1983).

Monitoring of non-breeding populations, i.e. monitoring of migration and wintering populations, was less well covered by the current survey. As expected, the most monitored species within migration monitoring schemes is the Honey Buzzard (Table 3), since this species is probably the most

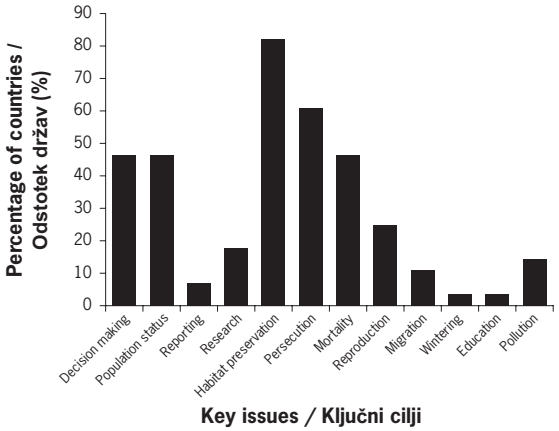

Figure 5: Frequency of key issues of raptor monitoring in Europe as reported by surveyed countries (n = 28)

Slika 5: Pogostost ključnih ciljev pri monitoringu ptic roparic v sodelujočih evropskih državah (n = 28)

numerous and widespread migrating raptor confined to bottlenecks during migration. The only owl species covered by non-breeding population monitoring is the Long-eared Owl *A. otus*, for which systematic counting at winter roosting sites is becoming more widespread in some European countries (e.g. Ružić *et al.* 2010).

3.4. Key issues

We have identified 12 key issues that have been addressed by National Coordinators *for* raptor monitoring schemes in Europe: (1) decision making (conservation and agricultural policy, Natura 2000 site monitoring, Red List/Red Data Book preparation, management plans), (2) defining species population status (including faunistic and atlas projects), (3) reporting (to local, national or EU authorities), (4) research, (5) habitat preservation (monitoring of threats and habitat loss), (6) persecution (hunting, illegal trade, poisoning), (7) mortality (electrocution, wind farms and other sources of increased mortality in raptors), (8) reproduction (monitoring breeding success), (9) migration, (10) wintering populations, (11) education (publicity and public relations), and (12) pollution (connected to *with* raptor monitoring issues). In the majority of raptor monitoring schemes, issues connected to conservation predominate, e.g. habitat preservation, persecution, mortality, population status, but also decision making policy (Figure 5). These issues are not surprising, since most of the users of monitoring data are governmental institutions and NGOs (Figure 1 right). In current monitoring schemes *for* raptors, issues related to research and monitoring *with* raptors (notably, contaminant monitoring) are rarely addressed. Enhancing contaminant monitoring in raptors could serve to draw greater attention to the value of monitoring raptors.

The National Coordinators were asked about the benefits that could accrue to them from international networking. Based on their responses, we have defined 10 main groups of such benefits: (1) international associations (e.g. BirdLife International, EBCC or raptor specific associations), (2) projects and funding, (3) manpower (to support monitoring schemes of international importance with volunteers from abroad), (4) conservation issues (international approach to solving main conservation problems, e.g. creating international pressure on local authorities), (5) threatened species (common approaches and knowledge exchange about monitoring and conservation of target species, e.g. Imperial Eagle, White-tailed Eagle, Saker Falcon *F. cherrug*, Gyrfalcon *F. rusticolus)*, (6) common trends (comparison of population trends), (7) research, (8) sharing best practice (common monitoring protocols, standardisation of methods, monitoring of threats), (9) migration (bottleneck counts, telemetry studies), and (10) pollution (connected to *with* raptor monitoring). Best practice and funding were the two most frequently cited benefits of European networking (Figure 6).

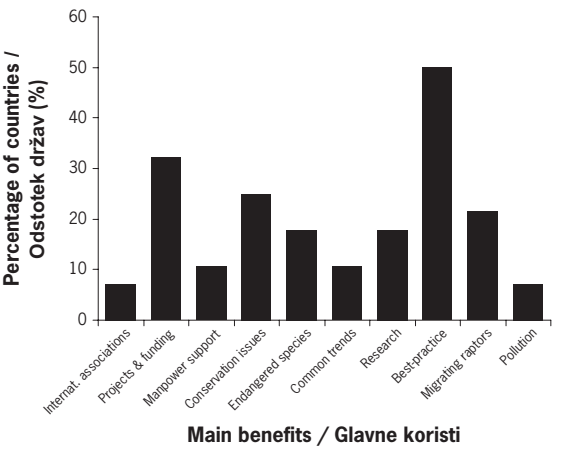

Figure 6: Frequency of main benefits of international networking in raptor monitoring in Europe as identified by surveyed countries (n = 28)

Slika 6: Pogostost glavnih koristi mednarodnega povezovanja pri monitoringu ptic roparic v Evropi, kot so bile ugotovljene v sodelujočih državah (n = 28)

3.5. Strengths and weaknesses of existing monitoring schemes

The reported strengths of existing monitoring schemes *for* raptors in Europe can be divided into 12 thematic groups: (1) long-term monitoring scheme (several schemes in Europe cover 20 or more years of annual counts), (2) endangered species (several monitoring schemes focus on rare and endangered species or species of conservation importance, e.g. qualifying species at Natura 2000 sites), (3) migration monitoring (some countries have well developed monitoring of migrating but not breeding raptors), (4) research (especially where research institutions are more involved in data collection, monitoring coordination or as data users), (5) conservation (where monitoring is contributing more to the conservation of the species alongside other concurrent conservation activities), (6) volunteers (availability and organisation of volunteers supporting monitoring activities is sufficient in some countries), (7) network (good organized network for raptor enthusiasts enabling also enough volunteers to get involved in monitoring activities), (8) good coverage (covering national range of monitored species or in the country more or less all occurring raptor species are monitored), (9) database (organised monitoring database at national scale), (10) monitoring protocols (developed and available monitoring protocols used by all professional and voluntary fieldworkers involved in programmes), (11) public interest (connected also to funding available for monitoring), and (12) funding (crucial for comprehensive and long-term monitoring scheme development). Two strengths of monitoring *for* raptors schemes were most frequently cited as important, volunteers and research (Figure 7 left).

The most frequently cited weakness/gap relates to missing coverage for certain species, common species and/or owls (Figure 7 right). We have identified in total 14 weaknesses/gaps based on the responses of National Coordinator (Figure 7 right): (1) no national coordination, (2) no data sharing (different monitoring schemes in the country are not connected and apparently the willingness to share existing data is low), (3) low funding (one of the main weaknesses, which prevents development of more comprehensive monitoring schemes), (4) only short-term and local schemes, (5) no conservation monitoring (usually only population monitoring is conducted, but no threats are monitored), (6) low research and data publishing (the reason addressed is general lack of interest in monitoring data by research institutions, while interest for data publishing by NGOs, which conduct most of the schemes, is usually low), (7) lack of volunteers, (8) fieldwork problems (in some countries fieldwork conditions can prevent more comprehensive monitoring scheme development, e.g. intensive hunting or mine fields), (9) no protocols (or no best practice, which is the major issue highlighted already as a major benefit of an international network), (10) missing species (especially common raptors and owls), (11) no monitoring of breeding success (more time consuming monitoring than pure counts of territories or individuals is not conducted

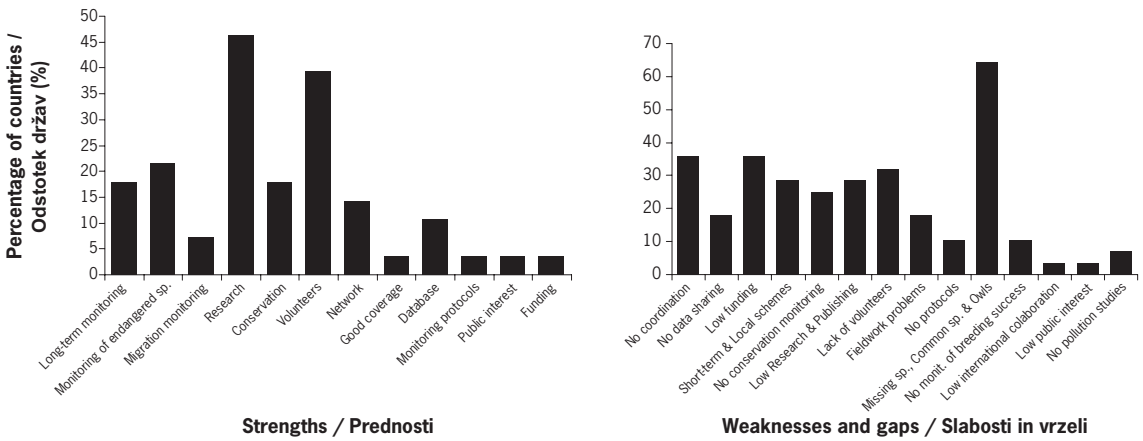

Figure 7: Frequency of the strengths (left graph) and weaknesses and gaps (right graph) of existing raptor monitoring schemes in Europe as suggested by surveyed countries (n = 28)

Slika 7: Pogostost prednosti (levi grafikon) ter slabosti in vrzeli (desni grafikon) v obstoječih shemah monitoringa ptic roparic v Evropi glede na poročila sodelujočih držav (n = 28)

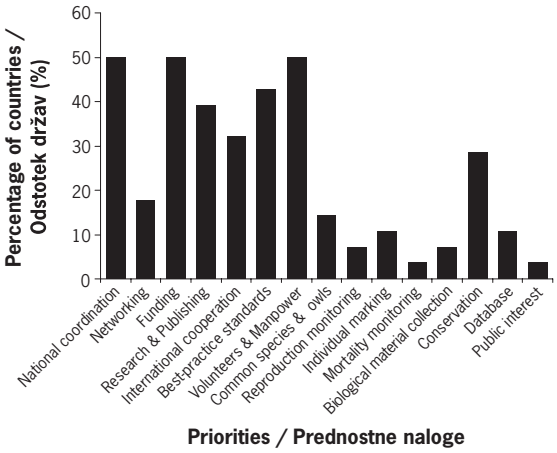

Figure 8: Overview of priorities and capacity building needs for monitoring *for* raptors as suggested by surveyed European countries (n = 28)

Slika 8: Pregled prednostnih nalog in potreb po povečanju kapacitet za monitoring populacij ptic roparic, kot jih sporočajo iz sodelujočih evropskih držav (n = 28)

due to limited financial or manpower sources), (12) low international collaboration (collaboration usually involves neighbouring countries having some common monitoring interest), (13) low public interest (apparent in many countries but not a main weakness), and (14) no monitoring *with* raptors scheme (usually involving a lack of trained experts or adequate laboratories).

3.6. Priorities and capacity building needs

Priorities and capacity building needs were addressed by separate questions but the responses by National Coordinators to these two questions were somewhat similar. For example, around half of respondents cited an increase in the number of volunteers as both a priority and a capacity-building need (Figure 8). Cited priorities and capacity-building needs included: (1) increasing volunteers and manpower for monitoring activities, (2) the development of national coordination and national schemes, (3) funding for long-term and comprehensive monitoring schemes, (4) best-practice standards development, possibly on an international level, (5) international collaboration, (6) enhancing research monitoring activities with possibly annual publishing of monitoring results, (7) increased attention to conservation issues (i.e. conservation strategy development and monitoring of main threats), (8) networking, (9) development of more comprehensive monitoring scheme by including common raptors and owls, (10) starting reproduction monitoring, (11) individual marking (i.e. raptor ringing and telemetry), (12) mortality monitoring, (13) collecting biological material (e.g. egg shells, feathers, carcasses) for monitoring *with* raptors purposes (14) national database development, and (15) increase in public awareness about raptors, their threats and population trends.

However, in general among the main priorities for future development of monitoring schemes, only a few countries actually suggested development of more comprehensive monitoring schemes through the inclusion of common raptors and owls (compare Figures 7 right and 8). Hence current priorities identified by individual countries appear to omit the most frequently suggested weakness of current schemes, a gap that a pan-European raptor monitoring network like EURAPMON should prioritize and facilitate inclusion of common diurnal raptors and owls into existing monitoring in Europe wherever possible.

4. Conclusions

This preliminary overview of *for* raptor monitoring in Europe gives a useful insight into the level of current monitoring activities, perceived gaps and needs identified by each country. This study will be followed up by a more comprehensive inventory using a systematic approach (based on a detailed questionnaire), which was launched on the EURAPMON website at the end of 2012, actively publicised by the EURAPMON network of National Coordinators, and aims to cover all European countries (to the Urals), including those on the far eastern border of Europe.

In summary, our current knowledge of existing monitoring *for* raptors in Europe from this study shows that:

- the main players conducting and coordinating raptor monitoring activities in Europe are NGOs, while the main end users and funders are governmental institutions;
- international collaboration for raptor monitoring in Europe is mainly regional (and largely nearest-neighbour driven) and not yet pan-European in extent;
- most monitoring schemes are confined to small numbers of species, usually species of conservation importance, and do not cover the whole raptor community within the country;
- the most widely monitored species are the Golden Eagle amongst diurnal raptors and the Eagle Owl

amongst owls, and in general good range coverage is reached only for restricted-range species;
– conservation is reported as the key driver for raptor monitoring schemes in Europe;
– the development and sharing of best-practice is the most beneficial aspect expected by National Coordinators from an international network;
– the greatest strengths of monitoring schemes *for* raptors in Europe are volunteers, which are in some countries still lacking, preventing those countries from conducting more comprehensive monitoring schemes;
– the main gaps in many European raptor monitoring schemes are the lack of coverage of commoner diurnal raptor and owl species;
– priorities reported for future development of national monitoring schemes *for* raptors in Europe are: improvements to national coordination, support to increase the number of volunteers available to participate and assurances of stable funding;
– current priorities identified by individual National Coordinators rarely include one of the main weakness identified in current monitoring schemes, specifically the lack of inclusion of common diurnal raptors and owls, and this should be one of the developments that a future pan-European network in the field of monitoring *for* raptors can facilitate.

Acknowledgements: The study was conducted with the support of the European Science Foundation (ESF) in the scope of the Research Networking Programme EURAPMON. Data on monitoring activities *for* raptors was collected at the workshop held in February 2012 in Murcia (Spain). The workshop was hosted by CEMACAM and funded by EURAPMON (ESF) and the Spanish Ministry of Research and Innovation. We would like to thank the local organisers of the workshop at the University of Murcia, especially Antonio Juan García Fernández, Emma Martínez López, Jose Francisco Calvo Sendin, Jose Enrique Martínez, Pilar Gómez Ramírez and Silvia Espin. The study would not have been possible to conduct without data provided by EURAPMON's National Coordinators, and we would like to thank them for their collaboration and support: Aleksandre Abuladze (Georgia), Alessandro Andreotti (Italy), Arianna Aradis (Italy), János Bagyura (Hungary), Dimitris E. Bakaloudis (Greece), Václav Beran (Czech Republic), Edward Bonavia (Malta), Szilard Daroczi (Romania), Andy Dobson (Great Britain), Valery Dombrovski (Belarus), Miroslav Dravecký (Slovakia), Vlatka Dumbović Mazal (Croatia), Vladimir Galushin (Russia), Anita Gamauf (Austria), Zuzana Guziová (Slovakia), Ena Hatibović (Bosnia & Herzegovina), Björn Helander (Sweden), Peter Hellström (Sweden), Márton Horváth (Hungary), Dražen Kotrošan (Bosnia & Herzegovina), Ubbo Mammen (Germany), Allan Mee (Ireland), Krešimir Mikulić (Croatia), Rein Nellis (Estonia), Torgeir Nygård (Norway), Luís Palma (Portugal), Jean-Yves Paquet (Belgium), Jānis Reihmanis (Latvia), José Antonio Sánchez Zapata (Spain), Janusz Sielicki (Poland), Svetoslav Spasov (Bulgaria), Jean-Paul Urcun (France), and Glenn Vermeersch (Belgium). For help in preparation of the map we would like to thank Andrej Kapla (National Institute of Biology, Slovenia). IB was supported partly by an NGO operating grant from the European Commission (DG Environment, under the LIFE+ programme) to Stichting BirdLife Europe.

5. Povzetek

Kljub temu da so ptice roparice, ujede Falconiformes in sove Strigiformes, prepoznane kot ključne vrste v ekosistemih in so zelo občutljive za okoljske spremembe, v Evropi še ni mednarodnega usklajenega monitoringa teh vrst. Zato so pri Evropski znanstveni fundaciji zagnali projekt EURAPMON, katerega cilj je vzpostavitev trajne panevropske raziskovalne mreže na področju monitoringa ujed in sov v Evropi. Pregled obstoječih shem monitoringa v 28 evropskih državah, ki so jih na EURAPMON-ovi delavnici v Murciji (Španija) leta 2012 predstavili nacionalni koordinatorji, je pokazal, da je v trenutne sheme monitoringov vključenih malo vrst (predvsem ujede in nekatere redke vrste). Največ shem monitoringa je vzpostavljenih za spremljanje populacije planinskega orla *Aquila chrysaetos* med ujedami in za veliko uharico *Bubo bubo* med sovami, dobra pokritost območja razširjenosti z monitoringom pa je dosežena le pri nekaterih ozko razširjenih vrstah. Ohranjanje ugodnega stanja populacij je glavni razlog za monitoring, ki ga večinoma opravljajo nevladne organizacije, končni uporabniki rezultatov monitoringa pa so večinoma vladne ustanove. Mednarodno sodelovanje na področju monitoringa ujed in sov je večinoma regionalno omejeno z malo panevropskimi povezavami. Kot pozitivne lastnosti obstoječih monitoringov so nacionalni koordinatorji označili vključevanje prostovoljcev; kot pomanjkljivosti pa pomanjkanje delovne sile (majhno število prostovoljcev) ter osredotočanje na redke vrste. Med prioritetami za razvoj shem monitoringa v prihodnosti so: izboljšanje nacionalne koordinacije, podpora za večje vključevanje prostovoljcev ter

zagotavljanje stabilnega financiranja. Prihodnja analiza EURAPMON-ovih vprašalnikov o obstoječih shemah monitoringa bo pokazala pomanjkljivosti v znanju in pripravila priporočila za metodologije. Tak prenos dobrih praks so nacionalni koordinatorji označili kot ključni rezultat mednarodnega sodelovanja.

6. References

BirdLife International (2004): Birds in Europe: population estimates, trends and conservation status. BirdLife Conservation Series No. 12. – BirdLife International, Cambridge.

Burfield, I. (2008): The Conservation Status and Trends of Raptors and Owls in Europe. – Ambio 37 (6): 401–407.

Carothers, J.H. & Jaksic, F.M. (1984): Time as a niche difference: the role of interspecific competition. – Oikos 42: 403–406.

Duke, G. (2008): The EU environmental policy context for monitoring *for* and *with* raptors in Europe. – Ambio 37 (6): 397–400.

EURAPMON (2012): Research and Monitoring for and with Raptors in Europe. Brochure. – European Science Foundation, Strasbourg Cedex. (available at http://www.eurapmon.net)

EURAPMON (2013): Workshop – inventory of existing raptor monitoring in Europe. Final Report to ESF. (available at http://www.eurapmon.net/sites/default/files/pdf-s/eurapmon_workshop_murcia_report_final.pdf)

Gómez-Ramírez, P., Shore, R.F., van den Brink, N.W., van Hattum, B., Bustnes, J.O., Duke, G., Fritsch, C., García-Fernández, A.J., Helander, B.O., Jaspers, V., Krone, O., Martínez-López, E., Mateo, R., Movalli, P. & Sonne, C. (*submitted*): The first inventory of existing raptor contaminant monitoring activities in Europe. – Environment International.

Hardey, J., Crick, H., Wernham, C., Riley, H., Etheridge, B. & Thompson, D. (2009): Raptors, a Field Guide for Surveys and Monitoring. Second Edition. – The Stationery Office, Edinburgh.

Hartert, E. (1921): Birds of Palearctic Fauna. Part II. – Verlag von R. Friedländer & Sohn, London.

Helander, B., Bignert, A. & Asplund, L. (2008): Using Raptors as Environmental Sentinels: Monitoring the White-tailed Sea Eagle *Haliaeetus albicilla* in Sweden. – Ambio 37 (6): 425–431.

Kotrošan, D. & Hatibović E. (2012): Raptors in Bosnia and Herzegovina – status and perspectives for monitoring development. – Acrocephalus 33 (154/155): 173–179.

Kovács, A., Mammen, U. & Wernham, C. (2008): European monitoring for Raptors and Owls: State of the Art and Future Needs. – Ambio 37 (6): 401–409.

Linnaeus, C. (1758): [Systema Naturae. Tomus I. Editio decima, reformata.] – Impensis Driect. Laurentii Salvii, Holmiae. (in Latin)

Mikkola H. (1983): Owls of Europe. – T & A D Poyser, London.

Movalli, P., Duke, G. & Osborn, D. (2008): Introduction to monitoring *for* and *with* raptors. – Ambio 37 (6): 395–396.

PECBMS (2009): The State of Europe's Common Birds 2008. – CSO/RSPB, Prague.

Root, R. (1967): The niche exploitation pattern of the blue-grey gnatcatcher. – Ecological Monographs 37 (3): 317–350.

Ružić, M., Radaković, M., Veselinović, D., Rudić, B., Kulić, S., Vučićević, I., Demajo, M., Nagulov, S., Golubović, A. & Miljković, N. (2010): [Long-eared Owl *Asio otus* winter roosts in Central Serbia 2006–2011: distribution, numbers and roost site preferences.] – Ciconia 19: 97–109. (in Serbian, English summary)

Saurola, P. (2008): Monitoring birds of prey in Finland: a summary of methods, trends and statistical power. – Ambio 37 (6): 413–419.

Sergio, F. & Hiraldo, F. (2008): Intraguild predation in raptor assemblages: a review. – Ibis 150, Suppl. 1: 132–145.

Sergio, F., Marchesi, L. & Pedrini, P. (2003): Spatial refugia and the coexistence of a diurnal raptor with its intraguild owl predator. – Journal of Animal Ecology 72 (2): 232–245.

Sergio, F., Newton, I. & Marchesi, L. (2005): Top predators and biodiversity. – Nature 436: 192.

Vrezec, A. & Tome, D. (2004): Altitudinal segregation between Ural Owl *Strix uralensis* and Tawny Owl *S. aluco*: evidence for competitive exclusion in raptorial birds. – Bird Study 51 (3): 264–269.

Arrived / Prispelo: 14. 6. 2013
Accepted / Sprejeto: 1. 7. 2013

Acrocephalus 33 (154/155): 159–166, 2012

A preliminary overview of raptor monitoring in Austria

Predhodni pregled monitoringa ptic roparic v Avstriji

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Austria has a rich raptor fauna with 34 documented species, 18–20 of them belonging to the breeding avifauna. The main players in monitoring activities are NGOs, Environmental Agencies and private initiatives. Monitoring areas are patchily distributed all over the country, but concentrated in the eastern part of the country. Main purposes for raptor monitoring are conservation issues like Red Lists, faunistic and atlas projects as well as scientific projects connected with universities and museums. Although no national network for monitoring raptors exists, data exchange operates well. Monitoring efficiency varies among the raptor species dependent on their size, rarity and habitat preferences. The best and detailed population estimates are available of medium-sized to large raptor key species living in open habitats. Knowledge about small species and forest living taxa is more limited. The key issues addressed by these monitoring programmes are to census the populations in order to identify population development and potential threats of population decline. Gaps exist of common and widespread taxa, relationships between breeding and wintering populations, information on non-breeders and, in general, long-term studies to recognize population dynamics. Such gaps on the regional level are found mainly in the Alpine region, which is difficult to explore due to topographic reasons and the low numbers of active ornithologists. Highly desirable is a national conservation law, as governments of the nine separate Austrian states are currently responsible for such topics, which makes conservation and science work considerably complex.

Key words: raptor monitoring, diurnal raptors, owls, Austria
Ključne besede: monitoring ptic roparic, ujede, sove, Avstrija

1. Introduction

Birds of prey monitoring under different aspects is one of the fundamental concerns in raptor conservation, given that threats concerning either birds or their habitats can be identified only with long-term population monitoring (Witmer 2005, Andersen 2007). In this way, adequate measures can be taken, which is one of the main reasons to embark on this kind of investigations.

Although Austria is a small country covering only 83,855 km^2, raptor monitoring is a more difficult task than expected. Specifically, as the country is largely mountainous (62%) due to its location in the Alps, some major gaps still exist. Only 32% of the country is situated below 500 m a.s.l. (Statistik Austria 2011). Therefore, harsh climatic conditions with long and high snow cover in large parts of the country make fieldwork often difficult.

Due to its geographic position in Central Europe and the polymorphic landscape (44% forest), Austria harbours a rich raptor fauna with 34 recorded species, 18–20 species among them as breeding species (Dvorak *et al.* 1993) (Table 1). As a result of short or long-term monitoring of several raptor species, more or less exact population numbers and development can be estimated. These figures are updated from time to time (Gamauf 1991, Mebs & Schmidt 2006).

The most common and widespread species are the Buzzard *Buteo buteo*, Sparrowhawk *Accipiter nisus* and Kestrel *Falco tinnunculus* (Gamauf 1991), while seven species are usually represented by less than

Table 1: Breeding raptor species and estimated populations in Austria. Species involved in monitoring activities over the last years are indicated.

Tabela 1: Gnezdeče vrste ptic roparic in ocenjene velikosti populacij v Avstriji. Vrste, v zadnjih nekaj letih vključene v monitoring, so označene s kljukico.

Species / Vrsta	No. of pairs / Št. parov	Monitoring activities/ Vključene v monitoring	Source / Vir
Honey Buzzard *Pernis apivorus*	1,500		1
Black Kite *Milvus migrans*	60–75	✓	1
Red Kite *Milvus milvus*	20	✓	1
White-tailed Eagle *Haliaeetus albicilla*	14-17	✓	2
Lammergeier *Gypaetus barbatus*	3–4	✓	3
Griffon Vulture *Gyps fulvus*	1		1
Marsh Harrier *Circus aeruginosus*	400		1
Hen Harrier *Circus cyaneus*	1–5	✓	5
Montagu's Harrier *Circus pygargus*	20–30	✓	4, 5
Goshawk *Accipiter gentilis*	2,300	✓	1
Sparrowhawk *Accipiter nisus*	8,000	✓	1
Buzzard *Buteo buteo*	12,000	✓	1
Imperial Eagle *Aquila heliaca*	11	✓	4
Golden Eagle *Aquila chrysaetos*	350	✓	1
Booted Eagle *Aquila pennata*	0–2		1
Kestrel *Falco tinnunculus*	7,000	✓	1
Red-footed Falcon *Falco vespertinus*	5–15	✓	6
Hobby *Falco subbuteo*	600–800		1
Saker Falcon *Falco cherrug*	25–30	✓	1, 4
Peregrine Falcon *Falco peregrinus*	220–325	✓	1

(1) A. Gamauf in Mebs & Schmidt (2006), (2) Probst (2012) / WWF Austria, (3) H. Frey & A. Schwarzenberger (*pers. comm.*), Bearded Vulture Introduction Project, (4) BirdLife Austria (*unpubl.*), (5) Sachslehner (2012 & *pers. comm.*), (6) H.-M. Berg (*pers. comm.*), NHM Vienna

20 pairs each: the Lammergeier *Gypaetus barbatus*, Griffon Vulture *Gyps fulvus*, Imperial Eagle *Aquila heliaca*, Montagu's Harrier *Circus pygargus*, Red Kite *Milvus milvus*, White-tailed Eagle *Haliaeetus albicilla* and the Red-footed Falcon *F. vespertinus*. Three species (Imperial Eagle, Saker Falcon *F. cherrug* and Red-footed Falcon) reach in eastern Austria their westernmost breeding limit. With a few exceptions, population development is positive or at least stable in most of the species.

2. Main players in monitoring for raptors

At the national level, the main players are NGOs (BirdLife Austria, WWF) and Environmental Agencies, which are often commissioned by the federal government and separate state governments. Private initiatives, however, are also accountable for short- or even long-term monitoring activities. In contrast, universities and museums are responsible for more complex and scientific issues, but raptor monitoring can always be included in such topics. Monitoring areas are patchily distributed all over the country, although concentrated mainly in its eastern half. Usually, these areas are regionally restricted by habitat or political borders (Zuna-Kratky & Kürthy 1999, Sumasgutner & Thoby 2011). For investigating sparsely populated large species (Lammergeier, Golden Eagle) in vast areas, however, collaborations within Alpine regions (Frey 1992, Winding & Lindner 2005) or between provinces are requisite.

Occasionally, collaboration within Austria among state governments, NGOs or individual researchers also takes place. Along the national border, especially with Slovakia (CORO-SKAT for Imperial and White-tailed Eagles and Saker Falcon; BirdLife Österreich 2013), collaboration at the international level is fulfilled. The aim of the project is to develop concepts which can be used for conservation measures in Natura 2000 areas and in the course of rural development. Monitoring of breeding populations of diurnal raptors, owls and storks form the base in both countries. The results will be integrated with data on habitat resources and habitat utilisation to

achieve concrete data on habitat needs of the species in question. In 2003–2005, in the course of the Interreg IIIA Project, the Golden Eagle population was recorded and monitored transnationally between Austria and Italy, embracing several important Natura 2000 areas (www.aquilalp.net; Winding & Lindner 2005).

For the long-term Lammergeier reintroduction programme, collaboration with several other countries has been implemented as well. Since the first release in 1986 in Salzburg (Figure 1), this project has developed into one of the most significant raptor conservation projects in Europe, although the project suffered certain losses now and then (Figure 2). Until now, 170 captive bred vultures have been released, and since 1997 this vulture species has been breeding again in the Alps (http://www.wild.uzh.ch/bg/frame.php?bi=0&bg=0&ya=0&la=e&th=proj&st=0&su=0; Izquierdo & Zink 2011).The journal *Bartgeier-News* reports regularly on the activities and project news.

Main data users of the monitoring projects are separate state governments, NGOs and scientific institutions (universities, museums). Main purposes for raptor monitoring are conservation issues (Red Lists; Berg 1997, Dvorak *et al.* 2010), faunistic and atlas projects (Wichmann *et al.* 2009) as well as scientific projects (e.g. McGrady & Pennersdorfer 2006, Sumasgutner *et al. in print*, *submitted* a & b).

Figure 1: Michael Knollseisen with a young Lammergeier *Gypaetus barbatus* before releasing as part of the reintroduction programme in the National Park Hohe Tauern (photo: National Park Hohe Tauern)

Slika 1: Michael Knollseisen z mladičem brkatega sera *Gypaetus barbatus* pred njegovo izpustitvijo v okviru programa ponovne naselitve te vrste v Narodnem parku Visoke ture (foto: Narodni park Visoke ture)

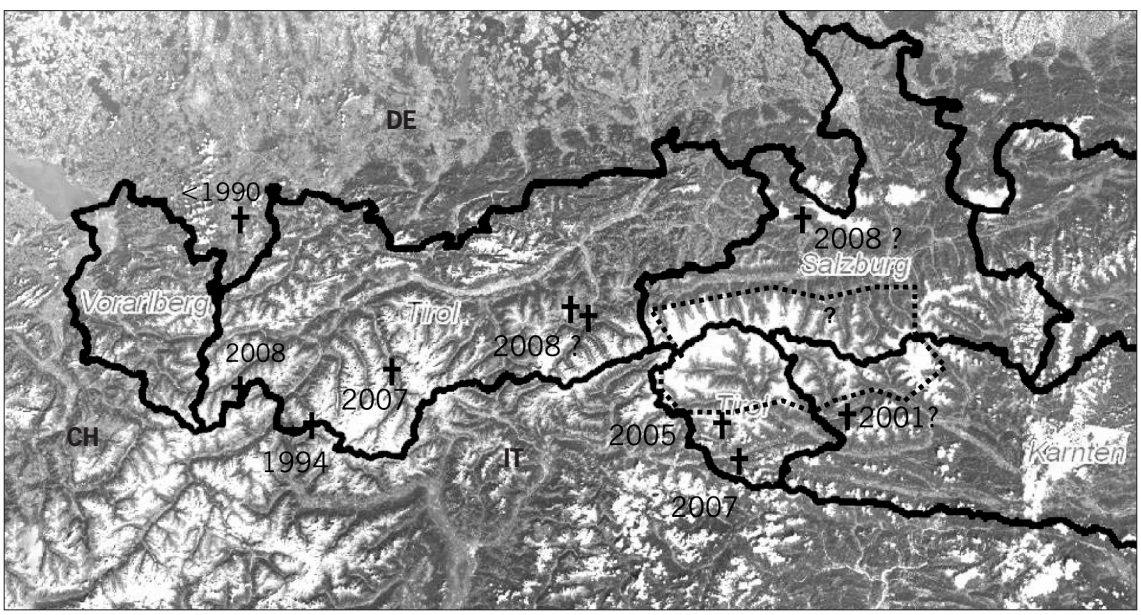

Figure 2: Documented Lammergeier *Gypaetus barbatus* losses in the Austrian Alps between 1996 and 2009. Crosses denote locations of lost individuals with exact or presumable years given, while dotted line delineates the boundary of National Park Hohe Tauern, where reintroduction programme has been carried out (by courtesy of M. Knollseisen).

Slika 2: Dokumentirane izgube brkatih serov *Gypaetus barbatus* v avstrijskih Alpah med letoma 1996 in 2009. Križci označujejo lokacije poginulih osebkov z navedenimi natančnimi oziroma domnevnimi letnicami, črtkana črta pa ponazarja mejo Narodnega parka Visoke Ture, kjer poteka program ponovne naselitve (z dovoljenjem M. Knollseisna).

3. National coverage

In Austria, neither national co-ordination nor official national network for raptor monitoring is available at the moment. Thus, there is no national network for monitoring for raptors. Nevertheless, until now four diurnal raptor and owl specific meetings have been organized, in which monitoring played a major part (proceedings were published in *Egretta* special issues 1992 and 1999; Gamauf & Berger 1996, Gamauf & Berg 2006). Knowledge about raptor populations across the country is limited to the last few decades and raptor monitoring was and is distributed only patchily in Austria. Projects follow very different time periods and are very diversely distributed in various landscapes. So population estimations are of different quality. Most of these monitoring programmes are financed by contract work to compile Red Lists and to investigate raptor density in protected areas. Thus census duration is often limited to three years, and is rarely extended over longer periods.

4. Key species and key issues

Monitoring efficiency varies among raptor species dependent on their size, rarity and habitat preferences. In general, the best and detailed population estimations are available of medium-sized to large raptor species living in open habitats. About small species and forest living taxa, knowledge is more limited. The key species addressed by monitoring for raptors are the Lammergeier, Golden Eagle, White-tailed Eagle, Imperial Eagle, Montagu's Harrier, Peregrine Falcon *F. peregrinus*, Saker Falcon and Red-footed Falcon.

The first monitoring project was focused on Lammergeier, starting in 1986 to reintroduce this species to the Alps and Austria, respectively (Frey & Walter 1989, Zink 2004). It is still in progress and has been expanded in the meanwhile to other Alpine countries. This project is supported by numerous national and international organisations, including WWF. The Golden Eagle is another comparatively well studied large species (Leditznig 1999, Steiner 1999b, Winding & Lindner 2005, Leditznig & Leditznig 2006, McGrady & Pennerstorfer 2006). WWF Austria initiated and funded a long-term survey of wintering and breeding population of the White-tailed Eagle (www.wwf.at/seeadler; Probst 2002 & 2009), which still continues. After the natural resettlement of the Imperial Eagle in Austria in 1999 (Ranner 2006), its populations are monitored year-round. Additionally, other aspects like distribution, dispersal study by satellite telemetry and feeding ecology are included (Berg *et al.* 2008, CORO-SKAT; Schmidt 2013) (Figure 3). Currently, a three-year transnational monitoring programme focused on conservation management is carried out together with Slovakia (BirdLife Austria, CORO-SKAT see above). Saker Falcon, Montagu's Harrier, Black Kite *Milvus migrans* and Red Kite *M. milvus* are also included in the project. For Saker Falcon and Montagu's Harrier, monitoring had started earlier (Berg 2000, Sachslehner 2004, 2006, 2011 & 2012, Sachslehner *et al. in print*). For the Peregrine Falcon, the country-wide monitoring data underline its wide distribution as well as its relative stable population size over a longer time period (Jiresch 1997, Leditznig & Leditznig 2006, Gamauf *et al.* 2009).

Figure 3: One of the Imperial Eagles *Aquila heliaca* satellite-tagged in Lower Austria in the course of the trans-border CORO-SKAT Project (photo: R. Katzinger)

Slika 3: Eden izmed kraljevih orlov *Aquila heliaca*, opremljenih z napravo za satelitsko spremljanje, v Spodnji Avstriji med potekom čezmejnega projekta CORO-SKAT (foto: R. Katzinger)

The more common species like Buzzard, Honey Buzzard *Pernis apivorus*, Sparrowhawk, Goshawk *Accipiter gentilis* and Kestrel are taken into consideration less frequently (Gamauf & Herb 1993, Zuna Kratky & Kürthy 1999, Steiner & Deschka 2006, Sumasgutner & Thoby 2011) and mostly for short-term periods only. Long-term surveys are available from a few areas only, like in Upper Austria (Steiner 1999a, Steiner & Deschka 2006) and Lower Austria (C. Friedl *pers. comm.*). Monitoring of common urban Kestrels in the city of Vienna was started in 2009 and still continues (Sumasgutner *et al. in print*) (Figure 4). All these examples concern the bird's breeding population.

Monitoring of wintering populations, on the other hand, has been carried out to a similar extent (Gamauf 1987, Samwald & Samwald 1993, Sackl & Samwald 1994, Bieringer & Laber 1999, Mülner 2000,

Laber & Zuna-Kratky 2005, Brader & Weissmair 2006, Dvorak & Wendelin 2008). Much work, however, remains to be done in the Alpine regions of the country, especially in western Austria.

Austria is a country with no distinctively pronounced migration routes. Migration is not funnelled in places where large raptor numbers could migrate (such as straits, promontories or some other sites in the Western Alps). Therefore, census of raptor migrants played only a minor role in the past. However, rather recently, monitoring of migrating diurnal raptors carried out at some more or less exposed points with prominent raptor emergence revealed good numbers of crossing migrants in parts of Carinthia (Laber 2006, Sachslehner 2006, Schmid & Probst 2006; Carinthian Migration Camp 2007–2011: www.birdlife.at/kaernten/raptorcamp/2010/index.html). Quite unknown remains the situation in other Austrian Alpine regions, where raptor migation is in fact known, but no systematic counts have been organised until now, like at Pfänder, Vorarlberg, Inn valley, Tyrol and northern edge of the Alps (Karner & Ranner in Sackl & Zechner 1995). The satellite-tagged raptors of different species have let us know that they do not cross here. Instead, they demonstrate broad-front migration.

The key issues addressed by these monitoring programmes are to census the populations in order to identify population development and potential threats of population decline. In Austria, especially in game-hunting areas and habitats densely populated by humans in the eastern part of the country, illegal persecution is a regionally serious problem. Not only common raptors like the Buzzards are killed by shooting, trapping and poisoning, but also rare species like eagles and large falcons. In Lower Austria, it is even legal to kill a certain number of Buzzards and Goshawks each year. Besides the nonsensical killing of raptors for sports and "control" reasons, the numbers killed cannot be controlled. The bill that allows killing of large numbers of these two species is endangering other raptor species as well, as shown by many examples in the meanwhile (Gamauf 2009). Additionally, the loss of fallow land and other open semi-natural habitats and changing land-use practices have brought species like harriers and Red-footed Falcon in serious troubles (Berg & Dvorak 2010, Sachslehner 2011).

International networking is beneficial particularly for those raptor species, which occur in eastern Austria along the border with the Czech Republic, Slovakia and Hungary (White-tailed Eagle, Imperial Eagle, Saker Falcon), as these countries are strongholds of these species and a main source for natural resettlement and population recruitment. The same is the case with the Lammergeier and Golden Eagle, which share their isolated occurrence in the Alps with other countries (Germany, Switzerland, Italy, France).

Figure 4: PhD student Petra Sumasgutner during fieldwork on her Kestrel *Falco tinnunculus*-project in the city of Vienna. Here she is taking morphometric measurements and comparing the colour of the soft body parts (cere, eye-ring, feet) with a standardised colour chart (photo: A. Gamauf).

Slika 4: Doktorska študentka Petra Sumasgutner med terenskim delom v okviru projekta preučevanja postovke *Falco tinnunculus* na Dunaju. Petra tu opravlja morfometrične meritve in primerja barve mehkih telesnih delov ptice (voščenice, očesnega obroča, nog) s standardizirano barvno karto (foto: A. Gamauf).

5. Strengths and weaknesses

The main strength of monitoring for raptors in Austria is the good data set of population development in rare species. But weaknesses, on the other hand, predominate. In comparison to some other countries (e.g. Germany, Mammen & Stubbe 2009; Finland, Saurola 2008), Austria has only a small number of amateur ornithologists involved in raptor monitoring. Recruitment of new volunteers is therefore needed. It is also necessary to raise interest in raptors in university students. Furthermore, certain gaps exist in other fields as well. Regarding raptor species, we often miss data on common and widespread taxa, relationships between breeding and wintering populations, information on non-breeders and, in general, long-term studies to recognize population dynamics. Gaps at the regional level are found mainly in the Alpine region, which is difficult to explore due to topographic reasons and the low numbers of active ornithologists. Threats coming from electrocution, wind farms and

persecution (illegal and legal) need to be thoroughly assessed at the national level as well.

6. Priorities and capacity-building

Priorities to strengthen monitoring for raptors in Austria are manifold. It would be desirable to motivate people to conduct raptor monitoring also outside the key areas, in mountainous regions as well as outside the breeding ranges and during the winter season. Furthermore, it would be important to accomplish a base to estimate realistic population sizes and to monitor long-term population developments. Additionally, more science-related topics should be investigated (e.g. feeding ecology, habitat use, migration, population genetics). Desirable, but difficult to achieve at the moment, is Austria's needs for uniform national conservation and hunting laws. Currently, nine state governments are responsible for these fields. As a federal republic, Austria is divided into nine states, which have some legislative authority distinct from the federal government, including nature conservation and hunting issues. These circumstances often impede conservation efforts and scientific work as well.

7. Povzetek

Avstrija se lahko pohvali z bogato favno ptic roparic 34 dokumentiranih vrst, med katerimi jih 18–20 tod tudi gnezdi. Glavni protagonisti pri dejavnostih, ki zadevajo monitoring ptic roparic, so nevladne organizacije, agencije za okolje in zasebni pobudniki. Območja monitoringa so razkropljena po vsej državi, vendar so skoncentrirana v vzhodnem delu Avstrije. Glavni namen monitoringa ptic roparic so naravovarstvena vprašanja, kot na primer Rdeči seznam vrst, favnistični projekti in atlasi ter tudi znanstveni projekti, povezani z univerzami in muzeji. Čeprav država nima nacionalnega omrežja za monitoring ptic roparic, pa dobro poteka izmenjava podatkov o teh pticah. Učinkovitost monitoringa se razlikuje glede na velikost in redkost vrst in njihovo izbiro habitata. Naboljše in najpodrobnejše populacijske ocene so na voljo o ključnih srednje velikih in velikih pticah roparicah, živečih v odprtih habitatih. Znanje o majhnih vrstah in vrstah, ki živijo v gozdovih, pa je bolj omejeno. Poglavitni cilj programov monitoringa so popisati populacije ptic roparic z namenom, da se ugotovijo trendi in dejavniki ogrožanja, ki utegnejo povzročiti upad populacij. Vrzeli obstajajo glede pogostih in splošno razširjenih taksonov, odnosov med gnezdečimi in prezimujočimi populacijami, informacij o negnezdilcih in, na splošno, glede dolgoročnih študij za ugotavljanje populacijske dinamike. Takšne vrzeli na regionalni ravni je najti predvsem v alpski regiji, ki jo je težko raziskovati zaradi topografskih vzrokov in majhnega števila aktivnih ornitologov. Zelo zaželen je nacionalni naravovarstveni zakon, saj so za te zadeve trenutno odgovorne le deželne vlade, kar zelo otežuje dejavnosti, povezane z naravovarstvom in znanstvenim delom.

8. References

Andersen, D.E. (2007): Survey techniques. pp. 89–100 In: Bird, D.M. & Bildstein, K.L. (eds.): Raptor Research and Management Techniques. – Hancock House, Surrey.

Berg, H.-M. (1997): [Red Lists of selected animal groups in Lower Austria. Birds (Aves).] – Amt der NÖ Landesregierung/Abt. Naturschutz, Wien. (in German)

Berg, H.-M. (2000): [Interim report on the mapping of the Saker Falcon (*Falco cherrug*) – Occurrence in Eastern Austria 1999.] – BirdLife Österreich, Wien. (in German)

Berg, H.-M. & Dvorak, M. (2010): [Monitoring of breeding populations of selected bird species listed in Annex I of the Birds Directive in the SPA "Parndorfer plate - Heideboden" in 2008–2010.] – BirdLife Österreich, Wien. (in German)

Berg, H.-M., Dvorak, M. & Wichmann, G. (2008): [Monitoring of selected bird species listed in Annex I of the Birds Directive in the SPA "Parndorfer Platte - Heideboden" in 2007 with special consideration of the Imperial Eagle (*Aquila heliaca*).] – BirdLife Österreich, Wien. (in German)

BirdLife Österreich (2013): Conservation of Raptors and Owls – Slovakia - Austria. – [http://www.birdlife.at/coro-skat], 29/4/2013.

Bieringer, G. & Laber, J. (1999): [First results of winter roadside counts of birds of prey in the pannonic part of Lower Austria.] – Egretta 42 (1/2): 30–39. (in German, English summary)

Brader, M. & Weissmair, W. (2006): [Interim report of winter raptor monitoring in the eastern part of the Traun-Enns-Platte, Upper Austria, from 2003/2004 to 2005/2006.] – Vogelkundliche Nachrichten aus Oberösterreich 14: 169–173. (in German, English summary)

Dvorak, M. & Wendelin, B. (2008): [Birds of prey populations on the Parndorfer Platte and the Heideboden (northern Burgenland) in the winters 2001/2002–2006/2007.] – Vogelkundliche Nachrichten aus Oberösterreich 19: 1–7. (in German)

Dvorak, M., Ranner, A. & Berg, H.-M. (1993): [Atlas of Austrian Breeding Birds.] – BMLFU, Wien. (in German)

Dvorak, M., Berg, H.-M. & Wendelin, B. (2010): [Ornithological surveys in European reserve "Waasen-Hansag" in the years 2009 and 2010.] – BirdLife Österreich, Wien. (in German)

Frey, H. (1992): [The reintroduction of the Bearded Vulture (*Gypaetus barbatus*) into the Alps.] – Egretta 35 (1): 85–95. (in German, English summary)

Frey, H. & Walter, W. (1989): The reintroduction of the Bearded Vulture *Gypaetus barbatus* into the Alps. pp 341–344 In: Meyburg, B-U. & Chancellor, R.D. (eds.): Raptors in the modern world. – WWGBP, Berlin.

Gamauf, A. (1987): [Three-year study on a winter raptor population in southern Burgenland.] – Egretta 30 (1): 24–37. (in German, English summary)

Gamauf, A. (1991): [Raptors in Austria: Inventory - Threats - Acts.] Monographien Bd. 29. –Umweltbundesamt, Wien. (in German)

Gamauf, A. (2009): [Hunting of Buzzard and Goshawk.] – Der Falke 56: 149–151. (in German)

Gamauf, A. & Herb, B. (1993): [Situation of firds of prey fauna in the proposed National Park Donau-Auen. Final Report.] – Betriebsgesellschaft Marchfeldkanal Nationalpark Donau-Auen, Wolkersdorf. (in German)

Gamauf, A. & Berger, V. (eds.) (1996): [Birds of prey and owls of Austria: Faunistics - Research - Protection.] – Abhandlungen der Zoologisch-Botanischen Gesellschaft, Wien, Sonderband 29. (in German)

Gamauf, A. & Berg, H.-M. (eds.) (2006): [Birds of prey and owls in Austria.] Proceedings of 4th international meeting on raptor and owl research in Austria 12–13 October 2001, Illmitz. – NHMW press, Wien. (in German, English summary)

Gamauf, A., Probst, R. & Steiner, H. (2009): The peregrine falcon (*Falco peregrinus*) in Austria: population development and ecological requirements. pp 99–116 In: Sielicki, J. & Mizera, T. (eds.): Peregrine falcon populations – status and perspectives in the 21st century. – Turul Publishing & Poznań University of Life Sciences Press, Warsaw - Poznań.

Jiresch, W.F.L. (1997): 10 Years of Investigations of Peregrine (*Falco peregrinus*) in Upper Austria. – Vogelkundliche Nachrichten aus Oberösterreich 5: 1–8. (in German, English summary)

Izquierdo, D. & Zink, R. (2011): International Bearded vulture Monitoring (IBM). Annual Report 2011. – Hohe Tauern National Park/Owl- and Raptor Centre Haringsee, c/o Research Institute of Wildlife Ecology & University of Veterinary Medicine Vienna.

Laber, J. (2006): [The autumn broad-front migration of raptors in Northern Lower Austria.] –Vogelkundliche Nachrichten aus Oberösterreich 17: 1–5. (in German)

Laber, J. & Zuna-Kratky, T. (2005): [Long-term counts of birds of prey during midwinter in the Laaer Becken (Lower Austria).] – Egretta 48 (1/2): 45–62. (in German, English summary)

Leditznig, W. (1999): [Distribution of the Golden Eagle (*Aquila chrysaetos*) in the Mostviertel, Lower Austria.] – Egretta 42 (1/2): 112–121. (in German, English summary)

Leditznig, C. & Leditznig, W. (2006): [Situation ob Black Stork (*Ciconia nigra*), Golden Eagle (*Aquila chrysaetos*), Peregrine (*Falco peregrinus*) and Eagle Owl (*Bubo bubo*) in the "Special Protected Area" (SPA) Ötscher Dürrenstein".] pp 143–165 In: Gamauf A. & Berg, H.-M. (eds.): Greifvögel und Eulen in Österreich. – NHMW press, Wien. (in German, English summary)

Mammen, U. & Stubbe, M. (2009): [Current trends in the population development of birds of prey and owl species in Germany.] – Populationsökologie Greifvogel- und Eulenarten 6: 9–25. (in German)

McGrady, M. & Pennerstorfer J. (2006): GIS-supported analysis of Golden Eagle (*Aquila chrysaetos*) habitats: characteristics of some eagle ranges in Austria. pp. 60–68 In: Gamauf, A. & Berg, H.-M. (eds.): Greifvögel und Eulen in Österreich. Proceedings of 4th international meeting on raptor and owl research in Austria 12–13 October 2001, Illmitz. – NHMW press, Wien.

Mebs, T. & Schmidt, D. (2006): [The raptors of Europe, North Africa and the Middle East.] – Kosmos Verlag, Stuttgart. (in German)

Mülner, B. (2000): [Population numbers, habitat preferences and perch use of wintering Common Buzzards (*Buteo buteo*) and Common Kestrels (*Falco tinnunculus*) in the upper Mur river valley (Styria).] – Egretta 43 (1): 20–36. (in German, English summary)

Probst, R. (2002): [Population development and conservation of the White-tailed Eagle (*Haliaeetus albicilla*) in Austria.] – Corax 19, Sonderheft 1: 92–95. (in German, English summary)

Probst, R. (2009): [The White-tailed Eagle (*Haliaeetus albicilla*) in Austria: The WWF Austria White-tailed Eagle project.] – Denisia 27: 29–50. (in German, English summary)

Probst, R. (2012): [White-tailed Eagle Project. Final Report 2012.] – WWF Österreich, Wien. (in German)

Ranner, A. (2006): [Current situation of the Imperial Eagle (*Aquila heliaca*) in Austria.] pp. 27–36 In: Gamauf, A. & Berg, H.-M. (eds.): Greifvögel und Eulen in Österreich. Proceedings of 4th international meeting on raptor and owl research in Austria 12–13 October 2001, Illmitz. – NHMW press, Wien. (in German, English summary)

Sachslehner, L. (2004): [Species conservation project Montagu's Harrier 2004.] – Amt NÖ Landesreg. (in German)

Sachslehner, L. (2006): Raptor migration above Vienna (Ottakring and Hernals) in spring and autumn 1992–2002. pp 99–112 In: Gamauf, A. & Berg, H.-M. (eds.): Greifvögel und Eulen in Österreich. Proceedings of 4th international meeting on raptor and owl research in Austria 12–13 October 2001, Illmitz. – NHMW press, Wien. (in German, English summary)

Sachslehner, L. (2011): [Species conservation project Montagu's Harrier 2011.] – BirdLife Österreich, Wien. (in German)

Sachslehner, L. (2012): [Species conservation project Montagu's Harrier (*Circus pygargus*) – Breeding population and protection in Lower Austria. Interim Report (2012 season).] – Stockerau. (in German)

Sachslehner, L., Lauermann, H., Gubi, F., Sachslehner, K., Schmalzer, A., Trauttmansdorff, J., Kugler J. & Walter, D. (*in print*): The breeding population of the Montagu's Harrier in the northeastern Waldviertel (Lower Austria), 2000–2011. – Egretta.

Sackl, P. & Samwald, O. (1994): [Grid counts to ascertain wintering populations of birds of prey and crows in selected valley areas of the Eastern Styrian hill country from 1989 to 1994.] – Vogelkundliche Nachrichten aus Ostösterreich 5: 120–124. (in German)

Sackl, P. & Zechner, L. (1995): [The migration of raptors

across the central Alps of Austria (Niedere Tauern, Styria) according to ground observations 1993–1994.] – Egretta 38 (1): 22–33. (in German, English summary)

Samwald, O. & Samwald, F. (1993): [Winter raptor populations in southern Burgenland 1983–1993.] – Vogelkundliche Nachrichten aus Ostösterreich 4: 52–55. (in German)

Saurola, P. (2008): Monitoring birds of prey in Finland: a summary of methods, trends and statistical power. – Ambio 37 (6): 413–419.

Schmid, R. & Probst, R. (2006): [Spring migration of raptors at Braunsberg (Lower Austia) in 2000 and 2001.] pp. 87–98 In: Gamauf, A. & Berg, H.-M. (eds.): Greifvögel und Eulen in Österreich. Proceedings of 4th international meeting on raptor and owl research in Austria 12–13 October 2001, Illmitz. – NHMW press, Wien. (German with English summary)

Schmidt, M. (2013): [No mercy for the Emperor? Imperial Eagle telemetry shows extent of illegal raptor persecution.] – Vogelschutz in Österreich 34: 20–21. (in German)

Statistik Austria (2011): [Statistical Yearbook 2011.] – Wien. (in German)

Steiner, H. (1999a): [The Buzzard (*Buteo buteo*) as an indicator of structure and land-use of rural areas: productivity in a heterogeneous habitat, effect of food and weather and comparisons with the Goshawk (*Accipiter gentilis*).] – Stapfia 62: 1–74. (in German)

Steiner, H. (1999b): [The Golden Eagle (*Aquila chrysaetos*) in Upper Austria.] – Egretta 42 (1/2): 122–139. (in German, English summary)

Steiner, H. & Deschka, C. (2006): [Long-term monitoring of birds of prey in Upper Austria between 1990–2003.] pp. 113–142 In: Gamauf, A. & Berg, H.-M. (eds.): Greifvögel und Eulen in Österreich. Proceedings of 4th international meeting on raptor and owl research in Austria 12–13 October 2001, Illmitz. – NHMW press, Wien. (German with English summary)

Sumasgutner, P. & Thoby, A. (2011): [Occurrence of birds of prey and Black Stork in the March-Auen – population changes, habitat selection and conservation strategies.] – Wissenschaftliche Mitteilungen Niederösterreichisches Landesmuseum 22: 99–128. (in German)

Sumasgutner, P., Gamauf, A. & Krenn, H. (*in print*): [Habitat use, breeding biology and feeding ecology of urban Kestrels (*Falco tinnunculus*) in Vienna.] – Populationsökologie von Greifvogel- und Eulenarten. (in German, English summary)

Sumasgutner, P., Krenn, H., Düesberg, J. & Gamauf, A. (*submitted* a). City slickers: conservation related conflicts in the nest-site selection of an urban raptor and the distribution of its avian prey.

Sumasgutner, P., Nemeth, E., Krenn, H. & Gamauf, A. (*submitted* b). The unexpected costs of city life: Are buildings ecological traps for urban raptors?

Wichmann, G., Dvorak, M., Teufelbauer, N. & Berg, H.-M. (2009): [The bird life of Vienna. Atlas of breeding birds.] – Verlag NMW, Wien. (in German, English summary)

Winding, N. & Lindner, R. (2005): [The Golden Eagle in the Eastern Alps – Establishing a trans-border monitoring programme for the Golden Eagle. INTERREG IIIa program Austria–Italy. Final report.]

Witmer, D.W. (2005): Wildlife population monitoring: Some practical considerations. – Wildlife Research 32: 259–263.

Zink, R. (1999): [Where have they gone? Monitoring of the Lammergeier (*Gypaetus barbatus*) in Austria.] – Egretta 42: 97–104. (in German, English summary)

Zuna-Kratky, T. & Kürthy, A. (1999): [Long-term study of birds of prey in the lower March-Thaya-valley along the Austrian–Slovakian border.] – Egretta 42 (1/2): 17–29. (in German, English summary)

Arrived / Prispelo: 27. 3. 2013
Accepted / Sprejeto: 1. 7. 2013

Acrocephalus 33 (154/155): 167–172, 2012

A preliminary overview of monitoring for raptors in Belarus

Predhodni pregled monitoringa populacij ptic roparic v Belorusiji

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In total, 29 diurnal raptor species and 13 owl species have been registered in Belarus. Of these, 20 and 10 species, respectively, are regular breeders in the country. Nine birds of prey and six owl species have been monitored during the past 40 years with variable degrees of intensity. Now, at the beginning of 2012, monitoring of seven diurnal raptor (Osprey *Pandion haliaetus*, Golden Eagle *Aquila chrysaetos*, Marsh Harrier *Circus aeruginosus*, Greater Spotted Eagle *A. clanga*, Lesser Spotted Eagle *A. pomarina*, White-tailed Eagle *Haliaetus albicilla*, Kestrel *Falco tinnunculus*) and four owl species (Tawny Owl *Strix aluco*, Tengmalm's Owl *Aegolius funereus*, Great Grey Owl *Strix nebulosa*, Pygmy Owl *Glaucidium passerinum*) is about to be continued at the same level. The population of the globally threatened Greater Spotted Eagle is in the process of most careful monitoring in comparison with other species. The main users of the data obtained through monitoring are the Ministry of Natural Resources and Environmental Protection of the Republic of Belarus, the Institute of Zoology (National Academy of Sciences), administration of the Strictly Protected Areas and NGO APB - BirdLife Belarus. Since 2006, monitoring of certain raptors has been included into a scheme of the National System of Environmental Monitoring in the Republic of Belarus. This national monitoring programme was fully funded during 5 years (2006–2010). Owing to the economic crisis and lack of sufficient financial support for research, this programme has eventually been reduced to monitoring of the Greater Spotted Eagle only. All other monitoring studies carried out in 2011 were only partial, as personal initiatives by some dedicated ornithologists on voluntary basis.

Key words: raptor monitoring, birds of prey, owls, Belarus
Ključne besede: monitoring ptic roparic, ujede, sove, Belorusija

1. Introduction

Belarus is the country in which fairly large populations of some rare and threatened European raptor species, i.e., Greater Spotted Eagle *Aquila clanga*, Lesser Spotted Eagle *A. pomarina*, Short-toed Eagle *Circaetus gallicus*, Hen Harrier *Circus cyaneus*, can still be found due to the presence of a large number of natural mires and swampy forest tracts. In total, 29 diurnal raptor species and 13 owl species have been registered in the country. Of these, 20 and 10 species, respectively, are regular breeders (Nikiforov *et al.* 1997).

Development and strengthening of monitoring studies will allow to respond efficiently to emerging threats in order to promptly prevent decline of raptor population or degradation of their habitats.

2. Main players

Bulk of the work on raptor monitoring was conducted by scientists from the National Academy of Sciences, university professors, staff members of national parks and several amateur ornithologists, members of NGO "Akhova ptushak Bat'kaushchini" (APB - BirdLife Belarus). In total, not more than 10 persons participated in birds of prey and owls monitoring in Belarus during each field season.

Main targets of birds of prey and owl monitoring

are as follows: (1) to obtain scientific data on the contemporary population status and numbers of birds of prey and owl species, (2) to make management decisions for environmental purposes, (3) to revise and update the Belarusian Red Data Book and Action Plans for protection of threatened birds of prey and owl species.

The main users of the data obtained from this monitoring are the Ministry of Natural Resources and Environmental Protection of the Republic of Belarus, the Institute of Zoology (National Academy of Sciences), administration of the Strictly Protected Areas and NGO APB - BirdLife Belarus.

3. National coverage

First targeted studies of birds of prey were carried out in the mid-20th century in Belovezhskaya Pushcha in western Belarus (Golodushko 1965). Then, from the beginning of the 1980s, most of such studies shifted to Poozer'e (northern Belarus) (Tishechkin & Ivanovski 1992, Ivanovsky & Tishechkin 1993, Ivanovski 2012). Since the mid-1990s, monitoring of forest birds of prey has been also carried out in one study plot in Minsk Region (central Belarus) (Vorob'ev & Mindlin 1994). Monitoring of Montagu's Harrier *C. pygargus* has been initiated in the Grodno region (western Belarus) during the same period (Vintchevski & Yasevitch 1998), the same as monitoring of Marsh Harrier *C. aeruginosus* populations in the Minsk region.

During 1995–1999, the project "Raptors of Belarus: Entering into New Century" has been carried out in Belarus with APB - BirdLife Belarus as the main beneficiary. Many new breeding sites of rare raptors were discovered in Belarus during the implementation of this project. In the majority of cases, researchers were not associated with permanent study plots and attempted to collect representative samples of data by finding a maximal number of nests. As a result, data such as regional lists of birds of prey species, breeding biology and reproductive indices were well known for most of raptor species by the end of the 20th century. At the same time, there was a lack of data on such important monitoring components as population numbers and densities of birds of prey within specific study plots (Tishechkin *et al.* 2000).

Monitoring of birds of prey species in the Chernobyl nuclear accident zone (south-eastern Belarus) begun in 1998 within the framework of the Institute of Zoology (National Academy of Sciences).

During 1999–2002, special counts of birds of prey were carried out within the APB - BirdLife Belarus project on Greater and Lesser Spotted Eagles status in Belarus, which was supported by the Royal Society for the Protection of Birds (RSPB). Although the counts covered the entire area of Belarus, they were concentrated in the southern part of the country. 92 plots were studied with a total area of about 9,000 km^2. Data collected during these studies have allowed us to estimate population numbers of most birds of prey species for the whole area of Belarus (Dombrovski & Ivanovski 2005a).

The owls are less studied in Belarus. By the end of the 20th century, Ural Owl *Strix uralensis*, Eagle Owl *Bubo bubo* and Great Grey Owl *S. nebulosa* were intensively but relatively short-term monitored within local areas in different parts of the country (Tishechkin & Gritschik 1994, Tishechkin *et al.* 1997, Tishechkin & Ivanovsky 1998 & 2003, Gritschik & Tishechkin 2002). At the beginning of the 21st century, regular monitoring of four owl species was initiated locally in south-western Belarus (Great Grey Owl) as well as in northern and central Belarus (Tengmalm's Owl *Aegolius funereus*, Pygmy Owl Glaucidium *passerinum* and Tawny Owl *S. aluco*) (Shamovich & Shamovich 2005, Abramchuk 2009). Nearly all these studies were carried out on private initiative of amateur or professional ornithologists belonging to different organisations.

Since 2006, raptor monitoring has been included into a scheme of the National System of Environmental Monitoring in the Republic of Belarus. A sector of Monitoring and Cadastre was established in the Belarusian National Academy of Sciences in 2006 in order to coordinate wildlife monitoring in our country. Within this project, model species were selected, study methods and approaches for different species selected and monitoring initiated. The Greater Spotted Eagle, Lesser Spotted Eagle, Golden Eagle *A. chrysaetos*, White-tailed Eagle *Haliaetus albicilla*, Buzzard *Buteo buteo* and Eagle Owl were defined as species to be monitored. The monitoring scheme includes assessment of numbers, breeding success and several environmental parameters (as for the Greater Spotted Eagles, for example, we also annually count small mammals and record groundwater levels within their breeding sites).

This national monitoring programme was fully funded during five years (2006–2010). Due to the economic crisis and lack of sufficient financial support for research, the programme was eventually reduced to monitoring of the Greater Spotted Eagle only (as a globally threatened species) at four permanent study plots in Pripyat Polesie (southern Belarus). All other monitoring studies carried out in 2011 were only partial, as personal initiatives by some dedicated ornithologists on voluntary basis.

Table 1: Status of raptor and owl monitoring in Belarus during past 40 years

Tabela 1: Status monitoringa ujed in sov v Belorusiji v zadnjih 40 letih

Species / Vrsta	No. of controlled pairs / Št. spremljanih parov	% national population/ nacionalne populacije	Locality of monitoring in Belarus / Lokacija monitoringa v Belorusiji	Researchers/ Raziskovalci	Duration of monitoring/ Trajanje monitoringa
White-tailed Eagle *Haliaeetus albicilla*	6	6	Chernobyl zone (south-east)	V. Yurko	2006–
Marsh Harrier *Circus aeruginosus*	10–50	0.4	Centre	A. Vintchevski	1990–
Montagu's Harrier *Circus pygargus*	13–36	0.6	West	D. Vintchevski	1993–2010
Buzzard *Buteo buteo*	55–105	0.4	Centre, South	V. Dombrovski	2006–2010
Lesser Spotted Eagle *Aquila pomarina*	9 20 11	1	Centre South North	G. Mindlin V. Dombrovski V. Ivanovski	1991– 2000– 2000–
Greater Spotted Eagle *Aquila clanga*	30–70	29	Centre, South	V. Dombrovski	1999–
Golden Eagle *Aquila chrysaetos*	4	89	North	V. Ivanovski	1982–
Osprey *Pandion haliaetus*	10–30	17	North	A. Tishechkin V. Ivanovski	1976–
Kestrel *Falco tinnunculus*	38–65	3	Urban population in two western towns	D. Vintchevski A. Minich A. Kivachuk D. Tabunov	2005–
Eagle Owl *Bubo bubo*	9–11	5	South	A. Tishechkin V. Gritchik G. Mindlin V. Vorob'ev	1991–1996
	13		South	V. Dombrovski	2006–2010
Pygmy Owl *Glaucidium passerinum*	7 20	2	Centre North	G. Mindlin D. Shamovich	2003– 2004–2009
Tawny Owl *Strix aluco*	10–23	0.3	Centre	D. Pisanenko G. Mindlin	1995–
	7		North	D. Shamovich	1999–2004
Ural Owl *Strix uralensis*	18–40	2	North	A. Tishechkin V. Ivanovski D. Shamovich	1986–2009
Great Grey Owl *Strix nebulosa*	5–7	6	South	A. Tishechkin V. Gritchik G. Mindlin V. Vorob'ev	1992–1996
	2–5		South-West	A. Abramchuk	2000–
Tengmalm's Owl *Aegolius funereus*	12	0.3	Centre	G. Mindlin	2000–

4. Key species and issues

Nine birds of prey and six owl species have been monitored in Belarus during the past 40 years with variable degrees of intensity (Table 1). Now, at the beginning of 2012, monitoring of seven diurnal raptor and four owl species is about to be continued at the same level. As the Table 1 shows, basically, we are dealing with several rare species included into the Red Data Book of the Republic of Belarus. Only two species (Marsh Harrier and Tawny Owl) are widely distributed and common locally. Such attention to

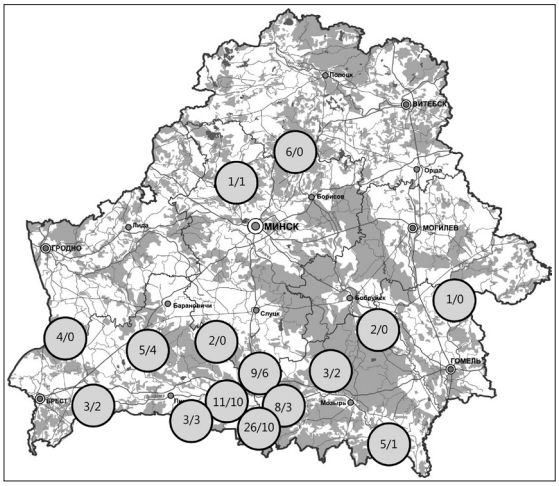

Figure 1: Actual distribution and number of known Greater Spotted Eagle *Aquila clanga* pairs (first number) and number of regularly monitored pairs of this species (second number) at separate monitoring plots in Belarus

Slika 1: Dejanska razširjenost in število znanih parov velikega klinkača *Aquila clanga* (prva številka) in število parov te vrste, deležnih rednega monitoringa (druga številka) na različnih ploskvah, določenih za monitoring vrste v Belorusiji

monitoring of rare species is associated with a priority of environmental conservation for ornithological research in Belarus.

From the global point of view, the most important Belarusian raptor to be monitored is the Greater Spotted Eagle. The key European population (150–200 breeding pairs) of this species inhabits southern Belarus (Dombrovski & Ivanovski 2005b). As can be seen from the Table 1 and Figure 1, the population of the Greater Spotted Eagle is undergoing most careful monitoring comparing to other species. This is thanks to the implementation of several projects by APB - BirdLife Belarus (funded in different years by the RSPB, British Ornithologists' Union, Club 300 Sweden, BirdLife International and Frankfurt Zoological Society), which were aimed at the identification and protection of the Greater Spotted Eagle nests.

Main negative factors impacting the raptor species' populations and breeding habitats in Belarus are as follows: direct destruction of natural habitats as a result of drainage, habitat degradation caused by disruptions in the hydrological regime, canalization of rivers, loss of biotopes suitable for nesting as a result of overexploitation of forests, environmentally unbalanced economic activities, arable farming on drained fen mires, allotment of summer house plots in river floodplains and on wetlands potentially suitable for rare birds of prey, poaching, disturbance in the breeding season, no management units in some of the protected areas, no protection status of some of the habitats, lack of awareness of the value of fen mires and wet alder forests for conservation of the globally important biodiversity among local people, loss of genetic purity of the Greater Spotted Eagle populations as a result of hybridization with Lesser Spotted Eagle (Dombrovski 2012).

Monitoring has never been carried out for nine birds of prey species from 18 regularly breeding ones in Belarus. Moreover, populations of two such species (Short-toed Eagle and Hen Harrier) represent significant numbers for our region. Four species from 10 breeding owl species have also never been covered by monitoring.

5. Strengths, weaknesses and future priorities

The lack of an integrated scheme for raptors is among the main weaknesses of birds of prey monitoring in Belarus. Almost all monitoring plots are located in several regions (southern and northern Belarus). There are no monitoring plots in eastern Belarus, while monitoring plots in central parts of the country are distinctly insufficient. For many species we can control only very small, non-representative parts of national populations (Table 1), or monitoring plots do not cover all typical habitats. There is practically no monitoring of threats for raptors in Belarus.

So, weaknesses of birds of prey monitoring in Belarus are as follows: (1) small numbers of professional and amateur ornithologists who would be ready and qualified to do this job, (2) low living standards of people do not allow us to carry out monitoring without a financial support even by volunteers, (3) insufficient amount of funding targeted to monitoring studies.

Ceasing of monitoring for several species is closely associated with either lack of financial support (Buzzard, Eagle Owl), or with changing of interests and/or research priorities of qualified ornithologists (Montagu's Harrier, Osprey *Pandion haliaetus*, Ural Owl).

The priorities for strengthening raptor monitoring in Belarus are as follows: (1) to establish a working group for monitoring birds of prey and owls in Belarus in order to exchange the experience and to coordinate the activities, (2) to involve new participants, (3) to search for funding the monitoring of key raptor species in key areas, (4) to initiate or re-establish monitoring for the Osprey, Ural Owl, Eagle Owl, Short-toed Eagle and Hen Harrier, (5) to expand the

network of monitoring plots for Lesser Spotted Eagle, White-tailed Eagle, Grey Great Owl and Pygmy Owl.

6. Povzetek

V Belorusiji je bilo doslej zabeleženih 29 vrst ujed in 13 vrst sov. Od teh jih 20 oziroma 10 tudi gnezdi. V zadnjih 40 letih je bilo devet vrst ujed in šest vrst sov deležnih različno intenzivnega monitoringa. V začetku leta 2012 se je na približno isti ravni nadaljeval monitoring sedmih vrst ujed (ribji orel *Pandion haliaetus*, planinski orel *Aquila chrysaetos*, rjavi lunj *Circus aeruginosus*, veliki klinkač *A. clanga*, mali klinkač *A. pomarina*, belorepec *Haliaeetus albicilla*, postovka *Falco tinnunculus*) in štirih vrst sov (lesna sova *Strix aluco*, koconogi čuk *Aegolius funereus*, bradata sova *Strix nebulosa*, mali skovik *Glaucidium passerinum*). Populacija globalno ogroženega velikega klinkača je v procesu najtemeljitejšega monitoringa v primerjavi z drugimi vrstami. Glavni uporabniki podatkov, pridobljenih z monitoringom, so Ministrstvo za naravne vire in varstvo okolja Republike Belorusije, Inštitut za zoologijo (nacionalna Akademija znanosti), administracija strogo zavarovanih območij in nevladna organizacija APB - BirdLife Belorusija. Od leta 2006 je monitoring nekaterih vrst vključen v shemo Nacionalnega sistema za okoljski monitoring Republike Belorusije. Ta nacionalni programme monitoringa je bil v celoti financiran v letih 2006–2010, zaradi gospodarske krize in pomanjkanja zadostne finančne pomoči pa je bil pozneje skrčen na monitoring zgolj velikega klinkača. Vse druge študije v okviru monitoringa v letu 2011 so bile le delne, in sicer kot osebne pobude nekaterih pticam roparicam posvečenih ornitologov na prostovoljni osnovi.

7. References

Abramchuk, A. (2009): [Great Grey Owl in Bialovezha forest.] pp. 128–131 In: Volkov, S.V., Sharikov, A.V. & Morozov V.V. (eds.): Owls of the Northern Eurasia: ecology, spatial and biotope distribution. – MPGU, Moscow. (in Russian, English summary)

Dombrovski V.C. (2012): [Action plans for the conservation of rare and endangered species of wild animals or wild plants: Greater Spotted Eagle *Aquila clanga*.] – Minsk. (in Russian)

Dombrovski, V. & Ivanovski, V. (2005a): New data on numbers and distribution of birds of prey breeding in Belarus. – Acta Zoologica Lituanica 15 (3): 218–227.

Dombrovski, V.C. & Ivanovski V.V. (2005b): [Number, distribution and breeding ecology of the Greater Spotted Eagle (*Aquila clanga*) in Belarus.] – Ornithologia 32: 57–70. (in Russian, English summary)

Golodushko, B.Z. (1965): [Birds of prey and their role in Belovezhskaya pushcha.] PhD thesis. – V. I. Lenin Belarusian State University Minsk. (in Russian)

Gritschik, W.W. & Tishechkin, A.K. (2002): [Eagle Owl (*Bubo bubo*) in Belarus: distribution and breeding biology.] – Subbuteo, Belarusian Ornithological Bulletin 5 (1): 3–19. (in Russian, English summary)

Ivanovski, V.V. (2012): [Birds of prey in Belorussian Poozerie.] – Vitebsk State University, Vitebsk. (in Russian, English summary)

Ivanovski, V.V. & Tishechkin, A.K. (1993): Monitoring of Lesser Spotted Eagle (*Aquila pomarina*) in Byelorussia. – Ring 15 (1/2): 267–273.

Nikiforov, M., Kozulin, A., Gritchik, V. & Tishechkin, A. (1997): [Birds of Belarus at the boundary of 21st century.] – N. A. Korolev, Minsk. (in Russian)

Shamovich, D.I. & Shamovich, I.Y. (2005): [Spatial and temporal differences in the association of forest owls in condition of different landscape types of northern Belarus.] pp. 121–135 In: Volkov, S.V., Sharikov, A.V. & Morozov V.V. (eds.): Owls of the Northern Eurasia: ecology, spatial and biotope distribution. – MPGU, Moscow. (in Russian, English summary)

Tishechkin, A.K. & Ivanovski, V.V. (1992): Status and breeding performance of the Osprey *Pandion haliaetus* in Nortern Byelorussia. – Ornis Fennica 69 (3): 149–154.

Tishechkin, A.K. & Gritschik, W.W. (1994): [Some preliminary results of the Eagle Owl research in Belarus.] pp. 12–21 In: Volkov, S.V., Sharikov, A.V. & Morozov V.V. (eds.): Owls of the Northern Eurasia: ecology, spatial and biotope distribution. – MPGU, Moscow. (in Russian, English summary)

Tishechkin, A.K. & Ivanovsky, V.V. (1998): [Ural Owl in the northern Belarus: nesting density and breeding biology.] – Berkut 7 (1/2): 55–63. (in Russian, English summary)

Tishechkin, A.K. & Ivanovsky, V.V. (2003): Breeding performance of the Ural Owl *Strix uralensis* in northern Belarus from 1986–1999. – Vogelwelt 124: 265–269.

Tishechkin, A.K., Gritschik, W.W., Vorob'ov, V.N. & Mindlin G.A. (1997): Breeding population of Great Gray Owl (*Strix nebulosa* Forster) in Belarus: summary of recent knowledge. pp. 449–455 In: Duncan, J.R., Johnson, D.H. & Nicholls, T.H. (eds.): Biology & Conservation of Owls of the Northern Hemisphere. 2nd International Symposium, 5–9 February 1997, Winnipeg, Manitoba, Canada. – General Technical Report NC-190. U.S. Department of Agriculture, Forest Service & North Central Forest Experiment Station, St. Paul, MN.

Tishechkin, A.K., Ivanovsky, V.V. & Vintchevski, A.E. (2000): Monitoring of breeding birds of prey in Belarus: methods and results. – Birds Census News 13 (1/2): 131–137.

Vintchevski, D.E. & Yasevitch, A.M. (1998): Monitoring breeding performance of Montagu's Harrier *Circus pygargus* in West Belarus, 1993–1997. pp. 78 In: Bird Numbers 1998. Abstract book of 14th International Conference of the European Bird Census Council (EBCC), 23–31 March 1998, Cottbus, Brandenburg, Germany.

Vorobiev, V.N. & Mindlin, G.A. (1994): [Experience

of assessment of population numbers, species diversity and breeding success of birds of prey.] pp. 281–283 In: Pikulik, M.M. (ed.): Problems Associated with the Study, Conservation and Utilization by Man of a Biologically Diverse Animal Fauna. Proceedings of 7th Zoological Conference, 27–29 September 1994, Minsk. – Navuka i Tekhnika, Minsk. (in Russian)

Arrived / Prispelo: 27. 3. 2013
Accepted / Sprejeto: 1. 7. 2013

Acrocephalus 33 (154/155): 173–179, 2012
10.2478/v10100-012-0004-x

Raptors in Bosnia and Herzegovina – their status and perspectives for monitoring development

Ptice roparice v Bosni in Hercegovini – njihov status in perspektive za razvoj monitoringa

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In the last 150 years, 49 raptor species belonging to the families Pandionidae, Accipitridae, Falconidae, Tytonidae, Strigidae and Laniidae have been recorded in Bosnia and Herzegovina. However, little is known about their populations. In comparison with historical data, their status has changed significantly, while nine species became extinct or probably extinct as breeders. In this paper, data on the present status of raptor populations is presented, as well as problems and the possibilities of developing species monitoring in Bosnia and Herzegovina. So far, no raptor monitoring has been established in the form of a long-term programme. The establishment of such programme is hampered by a number of reasons (lack of observers, lack of financial resources, lack of experience and knowledge, etc.). Monitoring of raptors in Bosnia and Herzegovina is needed to improve knowledge of the local populations as well as to protect these birds and their habitats. Also, this programme would be significant for the studies concerning the construction of various facilities (e.g. wind turbines). One of the important points of the development programme is to mobilize international cooperation and projects to solve current problems.

Key words: raptors, history, research, monitoring, Bosnia and Herzegovina
Ključne besede: ptice roparice, zgodovina, raziskave, monitoring, Bosna in Hercegovina

1. Introduction

Systematic studies of the avifauna of Bosnia and Herzegovina started in the second half of the 19th century. These studies revealed that Bosnia and Herzegovina was one of the most important European countries concerning different raptor populations. This is supported by the studies carried out by Otmar Reiser, one of the leading European ornithologists at that time (Rajzer 1889, Reiser 1939), who ascertained that Spain, Greece and Bosnia and Herzegovina were the only European countries where all four vulture species, Lammergeier *Gypaetus barbatus*, Griffon Vulture *Gyps fulvus*, Black Vulture *Aegypius monachus* and Egyptian Vulture *Neophron percnopterus*, were known to breed.

In the last 150 years, significant changes concerning major impacts on raptor populations in Bosnia and Herzegovina have taken place. Even though no long-term monitoring scheme is conducted in the country at the present time, the basic faunistic data collected in recent years on the distribution of observed raptor species show significant changes in the country's raptor populations. The most drastic example of these changes is the fact that none of the four vulture species currently breeds in Bosnia and Herzegovina (Kotrošan *et al.* 2009).

2. Overview of raptor species

Based on the last historical review of the avifauna in Bosnia and Herzegovina (Kotrošan & Drocić 2010/2011), 49 raptor species have been recorded (Table 1). Systematically, the species belong to three orders (Falconiformes, Strigiformes, Passeriformes) and six families (Pandionidae, Accipitridae, Falconidae,

Table 1: Review of raptor species in Bosnia and Herzegovina (B – breeder, B? – probable breeder, Ex – extinct breeder, Ex? – probably extinct breeder, N – regularly occurring non-breeder, V – vagrant, V? – probable vagrant)

Tabela 1: Pregled ptic roparic v Bosni in Hercegovini (B – gnezdilec, B? – verjetni gnezdilec, Ex – izumrli gnezdilec, Ex? – verjetno izumrl gnezdilec, N – redno pojavljajoči se negnezdilec, V – izjemen gost, V? – verjetni izjemen gost)

Species / Vrsta	Status	Distribution and estimate of population size/ Razširjenost in ocena velikosti populacije
Honey Buzzard *Pernis apivorus*	B	Regular breeder. Preliminary estimate: 1,000–1,500 breeding pairs (Kotrošan *et al.* 2012).
Black Kite *Milvus migrans*	B?, V	Formerly bred locally in the Posavina region (Delić 1999). In recent years, it has been rarely recorded, with single individuals considered vagrants (N. Drocić *pers. comm.*). Breeding at potential sites in the Sava River region not confirmed in recent years.
Red Kite *Milvus milvus*	Ex, V	Formerly bred locally in the Sava valley. Rarely recorded in recent years, with single individuals considered vagrants (N. Drocić *pers. comm.*).
White-tailed Eagle *Haliaeetus albicilla*	B	Regular breeder (e.g. in the Posavina region). Preliminary estimates indicate 5–10 breeding pairs (Kotrošan *et al.* 2012).
Lammergeier *Gypaetus barbatus*	Ex	On the basis of recorded young individuals, it was believed to be a breeder at the end of the 20th century (Marinković *et al.* 2007). In the last 10 years, no presence of this species in Bosnia and Herzegovina has been confirmed (Kotrošan *et al.* 2009).
Egyptian Vulture *Neophron percnopterus*	Ex	There are records of the species breeding in the late 20th century in Herzegovina. Last estimate for 1990 was three pairs (Marinković *et al.* 2007). It was allegedly seen in the early 21st century in Herzegovina, but recent surveys have failed to confirm the presence of this species (Kotrošan *et al.* 2009).
Griffon Vulture *Gyps fulvus*	Ex, N	Recent examples of its breeding recorded in the late 20th century (Kotrošan *et al.* 2009). In the last 10 years, less than 10 records of individual birds flying over the country have been made. At the moment, satellite tracking data show that individual birds fly in from Serbia and Croatia (Kulijer 2007, Bešo 2011/2012, S. Marinković & G. Sušić *pers. comm.*).
Black Vulture *Aegypius monachus*	Ex	Although not fully proven, it was assumed a breeder in Bosnia and Herzegovina on the basis of the registered young individuals. Extinct in the early 20th century (Kotrošan *et al.* 2009).
Short-toed Eagle *Circaetus gallicus*	B	Regular breeder. Preliminary estimates indicate 50–150 breeding pairs (Kotrošan *et al.* 2012).
Marsh Harrier *Circus aeruginosus*	B	Regular breeder. No estimations of its population size have been made so far.
Hen Harrier *Circus cyaneus*	N	Regularly recorded in winter and on migration, with no estimations of its winter population made so far.
Pallid Harrier *Circus macrourus*	V	Less than 20 observations in the last 10 years (N. Drocić, I. Dervović & D. Kulijer *pers. comm.*).
Montagu's Harrier *Circus pygargus*	B	Regular breeder. Preliminary estimates indicate 100–150 breeding pairs (Kotrošan *et al.* 2012).
Goshawk *Accipiter gentilis*	B	Regular breeder. Estimations of its population size have not been made.
Sparrowhawk *Accipiter nisus*	B	Regular breeder. Estimations of its population size have not been made.

Continuation of Table 1 / Nadaljevanje tabele 1

Species / Vrsta	Status	Distribution and estimate of population size/ Razširjenost in ocena velikosti populacije
Levant Sparrowhawk *Accipiter brevipes*	B?	It has bred locally only in Herzegovina, with the last estimate for the 1985–1992 period indicating max. 5 pairs (Grubač & Rašajski 2000). No confirmation as to its breeding in the last 10 years. If it does breed, its breeding is probably limited to a very small number of pairs.
Buzzard *Buteo buteo*	B	Regular breeder. Estimations of its population size have not been made. Generally, it is one of the most numerous raptors in the country.
Long-legged Buzzard *Buteo rufinus*	B	Regular breeder (e.g. karst poljes). Preliminary estimates indicate 20–40 breeding pairs (Kotrošan *et al.* 2012).
Rough-legged Buzzard *Buteo lagopus*	N	Regularly recorded during wintering and migration periods (e.g. Drocić 2005, Kotrošan *et al.* 2008). Estimations as to its winter population size have not been made.
Lesser Spotted Eagle *Aquila pomarina*	B	Regular breeder. In the last 10 years, it has been known to nest at Livanjsko polje, with some pairs probably breeding along the Sava River (Kotrošan 2008/2009). Preliminary estimates indicate less than 10 breeding pairs (Kotrošan *et. al* 2012).
Greater Spotted Eagle *Aquila clanga*	V	Rarely recorded, flies over a small number of sites (Obratil 1972). No new data.
Imperial Eagle *Aquila heliaca*	Ex	Once bred locally in the Sava valley. Went extinct during the 20th century. In the estimation for the 1985–1992 period marked as extinct (Ham & Puzović 2000). No new data.
Golden Eagle *Aquila chrysaetos*	B	Regular breeder. Preliminary estimates indicate less than 50 breeding pairs (Kotrošan *et. al* 2012).
Booted Eagle *Aquila pennata*	B?, V	There has been no confirmation of this species breeding in the last 20 years. Rarely registered in the last few years (e.g. Gašić & Ristić - Gašić 2010).
Bonelli's Eagle *Aquila fasciata*	Ex?	At the end of the 20th century bred at a single locality in Herzegovina (Kotrošan 2008/2009). In the last 20 years, no confirmation as to its breeding has been made. It probably became extinct.
Osprey *Pandion haliaetus*	Ex, N	Reliable data on nesting lacking, but it is assumed that a small number of this species bred here in the 20th century. Obratil & Matvejev (1989) marked it as extinct breeder. In the last 10 years, it has been regularly recorded, but no breeding has been proven so far.
Lesser Kestrel *Falco naumanni*	B	Regular breeder. Preliminary estimates indicate breeding of less than 10 pairs (Kotrošan *et al.* 2012).
Kestrel *Falco tinnunculus*	B	Regular breeder. Preliminary estimates refer to 3,000–4,000 breeding pairs (Kotrošan *et al.* 2012).
Red-footed Falcon *Falco vespertinus*	N	Mostly recorded on migration. Estimations of migrating numbers have not been made.
Merlin *Falco columbarius*	N	Mostly recorded on migration. Estimations of migrating numbers have not been made.
Hobby *Falco subbuteo*	B	Regular breeder. Estimations as to its population size have not been made, but there is probably a small number of pairs.

Continuation of Table 1 / Nadaljevanje tabele 1

Species / Vrsta	Status	Distribution and estimate of population size/ Razširjenost in ocena velikosti populacije
Lanner Falcon *Falco biarmicus*	B	Regular breeder locally in Herzegovina. Last estimation for 1993 was 12 breeding pairs (Marinković & Grubač 2000). Estimations of its population size have not been made, but there is probably a small number of pairs.
Saker Falcon *Falco cherrug*	Ex, V	Breeding was recorded locally in the Posavina area. No breeding data in the last 20 years. Satellite tracking data indicate that this species rarely flies over Bosnia and Herzegovina today (http://milvus.ro/en/tag/falco-cherrug).
Peregrine Falcon *Falco peregrinus*	B	Regular breeder, with no estimations of its population size made so far.
Barn Owl *Tyto alba*	B	Regular breeder. Preliminary estimates indicate 300–600 breeding pairs (Kotrošan *et. al* 2012).
Scops Owl *Otus scops*	B	Regular breeder. Preliminary estimates indicate 8,000–12,000 breeding pairs (Kotrošan *et al.* 2012).
Eagle Owl *Bubo bubo*	B	Regular breeder, with preliminary estimates indicating 400–500 breeding pairs (Kotrošan *et al.* 2012).
Hawk Owl *Surnia ulula*	V?	Only one record of this species known (Drocić 2010). This registration, however, has not been fully proven. If some of the new findings confirm this species occurring in Bosnia and Herzegovina, it will definitely be marked as vagrant.
Pygmy Owl *Glaucidium passerinum*	B	Regular breeder. Preliminary estimates indicate 50–100 breeding pairs (Kotrošan *et al.* 2012).
Little Owl *Athene noctua*	B	Regular breeder. Preliminary estimates indicate 2,000–3,500 breeding pairs (Kotrošan *et al.* 2012).
Tawny Owl *Strix aluco*	B	Regular breeder. Preliminary estimates indicate 15,000–20,000 breeding pairs (Kotrošan *et al.* 2012).
Ural Owl *Strix uralensis*	B	Regular breeder. Preliminary estimates indicate 200–400 breeding pairs (Kotrošan *et al.* 2012).
Long-eared Owl *Asio otus*	B	Regular breeder. Preliminary estimates indicate 5,000–10,000 breeding pairs (Kotrošan *et al.* 2012).
Short-eared Owl *Asio flammeus*	B	Regular breeder. Preliminary estimates indicate breeding of less than 10 pairs (Kotrošan *et al.* 2012).
Tengmalm's Owl *Aegolius funereus*	B	Regular breeder. Preliminary estimates indicate 100–300 breeding pairs (Kotrošan *et al.* 2012).
Red-backed Shrike *Lanius collurio*	B	Regular breeder. Preliminary estimates indicate 45,000–90,000 breeding pairs (Kotrošan *et al.* 2012).
Lesser Grey Shrike *Lanius minor*	B	Regular breeder. Preliminary estimates indicate 250–500 breeding pairs (Kotrošan *et al.* 2012).
Great Grey Shrike *Lanius excubitor*	N	Regularly recorded during wintering and migration periods. Estimations of its winter population size have not been made.
Woodchat Shrike *Lanius senator*	B	Regular breeder. Preliminary estimates indicate 100–300 breeding pairs (Kotrošan *et al.* 2012).

Tytonidae, Strigidae and Laniidae). 29 species breed here, three species are probable breeders (breeding not confirmed recently), while nine species are extinct or probably extinct breeders. The remaining species do not breed in Bosnia and Herzegovina and occur only as passage migrants or winter residents (Kotrošan 2008/2009). The information on Steppe Eagle *Aquila nipalensis* (Sage 1964) occurring in the country is not included in the list, given that the record of this species is highly controversial.

3. Current research and monitoring of raptors

After the last war (1992–1995), when all ornithological studies in Bosnia and Herzegovina were stopped, there was a tendency to refresh the research of local avifauna by following modern trends of research in ornithology. Of great significance was no doubt the founding of the Ornithological Society "Naše ptice" (Our Birds) in 2003, and the start of an informal network of birdwatchers in Bosnia and Herzegovina (Kotrošan & Papes 2007).

In 2000, systematic data collection for the preparation and development of long-term raptor monitoring began. After the war, no data on most raptor species were available to indicate the sizes of their populations. It was necessary, therefore, to collect the initial data to obtain recent estimates, in particular as there were significant changes as far as nesting of some species is concerned.

The first preliminary raptor data collection was made in the 2007–2009 period, when taking part in the "Balkan Vulture Action Plan" project (Kotrošan 2009, Kotrošan *et al.* 2009), aimed at developing a long-term strategy for the recovery of the four vulture species in the Balkan Peninsula in cooperation with numerous international and local partners. Given that the data from 1991 indicated 20 breeding Griffon Vulture pairs (Marinković & Grubač 2000), one of the project's aims was to determine the current status of the species in Bosnia and Herzegovina. Since the beginning of 1990, this species has been exposed to severe potential threats (poisoning, harassment during the war, etc.), so it was assumed that it completely disappeared as a breeder. The same goes with Egyptian Vulture now that certain accounts as to its breeding in Herzegovina have been heard. Data on a number of other raptors were also collected during the project (e.g. Sparrowhawk *Accipiter nisus* and Golden Eagle *A. chrysaetos*) in Herzegovina.

For some raptor species (e.g. Montagu's Harrier *Circus pygargus*, Hen Harrier *C. cyaneus*), data on their distribution and population sizes are collected during the studies conducted at karst poljes, especially at Livanjsko polje (Stumberger & Schneider-Jacoby 2010). The data were collected during the background studies necessary for the nomination of the site on the IBA list. On the basis of the data collected through other projects that started at a later date (e.g. "Monitoring of the bird population and vegetation communities at Livanjsko Polje" within the 2011–2012 KARST project, and the project "Identification and Promotion of Karst Poljes in Bosnia - Herzegovina as Wetlands of National and International Importance" implemented between 2012 and 2013), collecting of data continued on the number of populations of individual species (e.g. Great Grey Shrike *Lanius excubitor*, Lesser Grey Shrike *L. minor*). At the same time, other data concerning the impacts of poaching and other negative factors on their populations began to be collected as well.

Through the International Waterbird Census (IWC) programme, data on the wintering White-tailed Eagle *Haliaetus albicilla*, Marsh Harrier *C. aeruginosus*, Hen Harrier and Short-eared Owl *Asio flammeus* have been collected since 2012. Part of the collected data was published in the IWC report for Bosnia and Herzegovina (Topić & Kotrošan 2011/2012), while the data on areas not included in the report (e.g. karst poljes) have not been published as yet.

Considering the lack of historical data on owls (Obratil 1977), it is of prime importance to determine the selected species' distribution and population sizes. The only current monitoring scheme is conducted for the Long-eared Owl *A. otus* with winter roost sites census, which started in 2010 (Kotrošan *et al.* 2011a).

4. Issues and perspectives of monitoring in Bosnia and Herzegovina

Regarding the establishment of monitoring of raptors in Bosnia and Herzegovina, several issues are to be underlined: (1) lack of observers (currently there are only 5–10 suitable educated observers in the country), (2) lack of equipment (there is only basic equipment, such as telescopes, binoculars and GPS devices, available, but no night research equipment, as well as special vehicles necessary for the hardly accessible mountain areas, etc.), (3) low funding of field research (the State support for the projects is small and the possibilities of getting projects from the EU and other recourses are limited), (4) poor best-practice training in raptor monitoring, (5) safety during field studies (mine fields, political issues, conflicts with poachers).

Currently, monitoring of raptors in Bosnia and

Herzegovina is not established as regards long-term programmes. Research is mostly driven by short-term actions to establish status of individual species, but the above issues continue and hinder the development of a long-term programme. At this point, the only long-term monitoring has been established within the IWC and monitoring wintering Long-eared Owls. One of the possibilities of establishing long-term monitoring is to begin international cooperation and projects, needed to overcome current problems. Establishment of monitoring would have multifold meanings: to gain insight into the populations of certain species for the first time, and to use these data to define threat status of individual species and their placement on the national red list. On the other hand, the data would be extremely important for the needs of defining potential Natura 2000 sites (which is to start in 2013). Also, it would be important for the study concerning the construction of power plants, particularly 52 wind farms planned to be built in Bosnia and Herzegovina (Kotrošan *et al.* 2011b).

5. Povzetek

V zadnjih 150 letih je bilo v Bosni in Hercegovini zabeleženih 49 ptic roparic, pripadajočih družinam Pandionidae, Accipitridae, Falconidae, Tytonidae, Strigidae in Laniidae. Toda o populacijah teh vrst je še vedno malo znanega. V primerjavi z zgodovinskimi podatki se je močno spremenil njihov status, medtem ko je devet nekoč gnezdečih vrst že izumrlo ali verjetno izumrlo. V pričujočem prispevku so predstavljeni podatki o trenutnem statusu ptic roparic, a tudi problemi in možnosti, ki se pojavljajo med razvijanjem monitoringa v Bosni in Hercegovini. Tako še do danes ni bil vzpostavljen monitoring ptic roparic v obliki dolgoročnega programa, saj te poskuse ovira več dejavnikov (pomanjkanje popisovalcev, finančnih virov, izkušenj in znanja itd.). Sicer pa je monitoring ptic roparic nujno potreben, če želimo izboljšati znanje o lokalnih populacijah ter hkrati zavarovati te ptice in njihove habitate. Poleg tega bi bil ta program pomemben pri pripravi študij, potrebnih pri gradnji različnih objektov (npr. vetrnih turbin). Ena izmed pomembnih točk razvojnega programa je vzpostavitev mednarodnega sodelovanja in projektov za reševanje trenutno najbolj perečih problemov na tem področju.

6. References

Bešo, A. (2011/2012): [Watching a Griffon Vulture (*Gyps fulvus*) near Nevesinje.] – Bilten Mreže posmatrača ptica u Bosni i Hercegovini 7/8: 91. (in Bosnian, English summary)

Delić, V. (1999): [Our breeding birds, Raptors.] – Lovački list 24: 10–11. (in Bosnian)

Drocić, N. (2005): [Contribution to the knowledge of bird fauna of Central Bosnia]. – Bilten Mreže posmatrača ptica u Bosni i Hercegovini 1: 18–25. (in Bosnian, English summary)

Drocić, N. (2010): [Contribution to the addition list of birds in Bosnia and Herzegovina]. – Bilten Mreže posmatrača ptica u Bosni i Hercegovini 6: 53–59. (in Bosnian, English summary)

Gašić, B. & Ristić - Gašić, S. (2010): [New observation of the Booted Eagle *Aquila pennata* (J. F. Gmelin, 1788) in Bosnia and Herzegovina.] – Bilten Mreže posmatrača ptica u Bosni i Hercegovini 6: 50–52. (in Bosnian, English summary)

Grubač, B. & Rašajski, J.(2000): [Levant Sparrowhawk (*Accipiter brevipes*).] pp. 99–104 In: Puzović, S. (ed.): Atlas ptica grabljivica Srbije. – Zavod za zaštitu prirode Srbije, Beograd. (in Serbian, English summary)

Ham, I. & Puzović, S. (2000): [Imperial Eagle *Aquila heliaca*.] pp. 123–128 In: Puzović, S. (ed.): Atlas ptica grabljivica Srbije. – Zavod za zaštitu prirode Srbije, Beograd. (in Serbian, English summary)

Kotrošan, D. (2008/2009): [Updates and corrections to the Bird Checklist of Bosnia and Herzegovina for the species registered from 1888 to 2006.] – Bilten Mreže posmatrača ptica u Bosni i Hercegovini, 4/5: 72–86. (in Bosnian, English summary)

Kotrošan, D. (2009): [Balkan action plan for the protection of Vultures – A new attempt at restoring the population of Griffon Vulture in Herzegovina.] – Naše šume, 8 (16/17): 22–26. (in Bosnian and English)

Kotrošan, D. & Papes, M. (2007): [Bird checklist of Bosnia and Herzegovina registered from 1888 to 2006.] – Bilten Mreže posmatrača ptica u Bosni i Hercegovini 3: 9–38. (in Bosnian, English summary)

Kotrošan, D. & Drocić, N. (2010/2011): [The third supplemented and revised systematic overview of birds of Bosnia and Herzegovina.] pp. 304–309 In: Lelo, S. (ed.): Fauna Bosne i Hercegovine. Biosistematski pregledi 6/7. Izmijenjeno i dopunjeno interno izdanje Udruženja za inventarizaciju i zaštitu životinja. – Ilijaš, Kanton Sarajevo. (in Bosnian)

Kotrošan, D., Obratil, S. & Gašić, B. (2008): [First results of recent ornithological reserach of mountain Ozren in Central Bosnia.] pp. 125–142 In: Proceedings of the 1st Symposium of Biologists of Republic of Srpska, Banja Luka. (in Serbian and English)

Kotrošan, D., Marinković, S., Šimić, E. & Viada, C. (2009): [Handbook for education of birdwatchers in Bosnia and Herzegovina. Vultures I.] – Ornitološko društvo "Naše ptice", Sarajevo. (in Bosnian)

Kotrošan, D., Ružić, M., Radišić, D., Šimić, E., Sjeničić, J. & Dervović, I. (2011a): First results of the census of winter roost sites of the Long-eared Owl in Bosnia and Herzegovina. pp. 31 In: Abstract Book of International Conference on the Survey, Monitoring and Conservation of the Long-eared Owl *Asio otus,* 1–5 November 2011, Kikinda, Serbia.

Kotrošan, D., Trbojević, S. & Šimić, E. (2011b):

[Windfarms and birds.] – Ornitološko društvo „Naše ptice“, Sarajevo. (in Bosnian)

Kotrošan, D., Drocić, N., Trbojević, S., Šimić, E. & Dervović, I. (2012): [Program IBA, Important Birds Areas, in Bosnia and Herzegovina.] Internal publication for the project “Evaluation of IBA in FB&H.” – Ornitološko društvo “Naše ptice”, Sarajevo. (in Bosnian, English summary)

Kulijer, D. (2007): [Griffon Vulture (*Gyps fulvus*) registred on Čvrsnica.] – Bilten Mreže posmatrača ptica u Bosni i Hercegovini 3: 53. (in Bosnian, English summary)

Marinković, S. & Grubač, B. (2000): [Griffon Vulture (*Gyps fulvus*).] pp. 63–68 In: Puzović, S. (ed.): Atlas ptica grabljivica Srbije. – Zavod za zaštitu prirode Srbije, Beograd. (in Serbian, English summary)

Marinković, S., Orlandić, Lj., Micković, B. & Karadžić, B. (2007): [Census of vultures in Herzegovina.] – Vulture News 56: 14–28.

Obratil, S. (1972): [A review of research of ornithofauna of Bosnia and Herzegovina III (Falconiformes).] – Glasnik Zemaljskog muzeja Bosne i Hercegovine (PN) NS 10: 139–155. (in Bosnian)

Obratil, S. (1977): [A review of research of ornithofauna of Bosnia and Herzegovina VI (Columbiformes, Cuculiformes, Strigiformes, Caprimulgiformes, Apodiformes, Coraciformes, Piciformes).] – Glasnik Zemaljskog muzeja Bosne i Hercegovine (PN) NS 16: 203–223. (in Bosnian)

Obratil, S. & Matvejev, S. (1989): [The proposal “Red List” of endangered birds of SR Bosnia and Herzegovina.] – Naše starine 18/19: 227–235. (In Bosnian)

Rajzer, O. (1889): [Residence of four species of vultures in Bosnia and Herzegovina.] – Glasnik Zemaljskog muzeja 1 (1): 51–57. (in Bosnian)

Reiser, O. (1939): Materialien zu einer Ornis Balcanica. I. Bosnien und Herzegowina nebst Teilen von Serbien und Dalmatien. – Selbstverlag des Museums, Wien.

Sage, B.L. (1964): Notes on the Birds of the Lower Neretva valley. – Ardea 3/4: 202–218.

Stumberger, B. & Schneider-Jacoby, M. (2010): International importance of three Adriatic Flyway priority sites: Livanjsko polje, the Neretva Delta and Lake Skadar-Shkoder with Bojana-Buna Delta. pp. 53–59 In: Denac, D., Schneider-Jacoby, M. & Stumberger, B. (eds.): Adriatic flyway – closing the gap in bird conservation. – Euronatur, Radolfzell.

Topić, G. & Kotrošan, D. (2011/2012): [Results of the international waterbird census from Bosnia and Herzegovina in 2012.] – Bilten mreže posmatrača ptica u Bosni i Hercegovini 7/8: 56–74. (in Bosnian, English summary)

Arrived / Prispelo: 27. 3. 2013
Accepted / Sprejeto: 1. 7. 2013

Acrocephalus 33 (154/155): 181–189, 2012
10.2478/v10100-012-0005-9

An overview of monitoring *for* raptors in Bulgaria

Pregled monitoringa populacij ptic roparic v Bolgariji

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Since 1990, nature conservation NGOs are the main players in the running of nation-wide research and monitoring schemes for raptors in Bulgaria. Among them, the Bulgarian Society for the Protection of Birds (BSPB) and Green Balkans are most active, covering the most threatened diurnal raptors in the country. The key species covered by comprehensive monitoring schemes are the Imperial Eagle *Aquila heliaca*, White-tailed Eagle *Haliaeetus albicilla*, Egyptian Vulture *Neophron percnopterus*, Griffon Vulture *Gyps fulvus*, Black Vulture *Aegypius monachus*, Saker Falcon *Falco cherrug* and Red-footed Falcon *F. vespertinus*. Information on their distribution, numbers, breeding success, productivity, diet, movements etc. is gathered on annual basis. The Buzzard *Buteo buteo* and Kestrel *F. tinnunculus* are also regularly monitored at the national level by the Common Bird Monitoring scheme. Distribution of all raptor species has been studied for the purpose of the Atlas of Breeding Birds in Bulgaria. The contemporary satellite telemetry methods revealed important aspects of movements and threats to eagles and vultures from Bulgaria within the country and abroad. Main threats for the raptors in Bulgaria are related to habitat loss, unnatural mortality and disturbance. The main gaps in raptor monitoring in Bulgaria are related to the lack of coverage of most of the diurnal species and owls. There is a strong national and international cooperation in conjunction with the work concerning Imperial Eagle, Egyptian and Griffon Vultures. However, further enhancement of cooperation on other raptor species and issues such as lobbying for implementation of raptor-friendly agricultural practices and enhancement of various economic sectors are needed.

Key words: raptors, monitoring, BSPB, Bulgaria
Ključne besede: ptice roparice, monitoring, BSPB, Bolgarija

1. Introduction

So far, 37 diurnal birds of prey have been registered in Bulgaria, 23 of which breed here regularly (BUNARCO 2009). The interest in raptor species of birds has always inspired many scientists and conservationists in Bulgaria (Angelov 2009). For the 1950–2008 period, more than 120 publications dedicated to the research of raptor species can be found in Bulgarian literature (Mirkov 2009). Till the 1980s, most of the surveys had been done without planning actions for the establishment of a long term conservation strategy. The first targeted conservation activities were carried out in Eastern Rhodopes in the beginning of the 1980s, when supplementary feeding sites, maintained by BSPB, were established (Dobrev *et al.* 2013). This consequently resulted in the increase of Griffon Vultures' *Gyps fulvus* population in the Eastern Rhodopes (Iankov & Profirov 1991, Demerdzhiev *et al. in prep.*). Later on, at the beginning of the 1990s, the BSPB established a regular monitoring of all raptor species inhabiting the Eastern Rhodopes with the support of the Bulgarian–Swiss Biodiversity Conservation Programme (Hristov 2000). In recent years, the raptors research techniques and projects in Bulgaria have gone far beyond the faunistic and purely descriptive studies. New surveys and studies have been introduced, using modern methods such

as satellite tracking, ecological surveys, habitat selection research, etc. This involved a great deal of international cooperation, which eventually brought new knowledge and information on many aspects of the raptors' ecology and conservation requirements (BSPB 2010 & 2011, Demerdzhiev 2011, Dobrev *et al.* 2013, Demerdzhiev *et al. in prep.*).

2. Main players

The Executive Environment Agency (within the Ministry of Environment and Water) is the state authority responsible for biodiversity monitoring in Bulgaria. The Agency has recently established the National Biodiversity Monitoring System specified in the Biodiversity Act. However, there is limited capacity among state organizations to implement comprehensive monitoring schemes due to the small number of experienced fieldworkers and lack of suitable funding. At the moment, only National Parks directorates are providing some data on selected species, but these cover only the park's territories.
The Bulgarian Academy of Science used to play an important role in the autumn migration monitoring and studies (Michev & Simeonov 1981). In 1990, this activity was virtually taken over by NGOs and private consultancies dealing with Environmental Impact Assessments.

The Bulgarian Society for the Protection of Birds (BSPB), the BirdLife International's partner in Bulgaria, is the main organization implementing nation-wide raptor monitoring schemes and research. Its activities cover the most threatened priority species and some widespread birds of prey.

Three other nature conservation NGOs, the Green Balkans, Fund for Wild Flora and Fauna (FWFF) and Birds of Prey Protection Society (BPPS), are also implementing regional or local monitoring schemes, mostly focused on captive bred Griffon Vultures that have been introduced to areas away from their native population in the Eastern Rhodopes as part of restocking programme in Bulgaria (Green Balkans 2005, 2006, 2007 & 2010, Stoynov & Peshev 2011, 2012 & 2013).

The BSPB has developed active contacts and cooperation with several countries, mostly with BirdLife International local partners. The main foreign partners are RSPB, MME/BirdLife Hungary, Doğa Dernegi (BirdLife Partner Designate in Turkey), Hellenic Ornithological Society (BirdLife partner in Greece), WWF Greece, Macedonian Ecological Society (MES) and Protection and Preservation of Natural Environment in Albania (PPNEA). BSPB has established contacts and work actively with several African countries in the conservation of migrating raptors such as Egyptian Vulture and Imperial Eagle. (Arkumarev *et al.* 2012, Dobrev *et al* 2012).

Data collected as part of the monitoring schemes and research in various raptor species is used mainly by NGOs and private companies in environmental impact assessments of investment proposals within Natura 2000 sites or other areas with importance for birds of prey. State authorities have occasionally requested some data on distribution and number of some birds of prey, but the usage of the available information is scanty.

3. National coverage

The BSPB considers seven diurnal raptor species as priority species for monitoring and they are covered at the national level by comprehensive monitoring schemes (BSPB 2010 & 2011). There is also a *Common Bird Monitoring* scheme that operates at the national level, covering over 100 study plots across the country. It provides data for the two most common raptors, i.e. Buzzard *Buteo buteo* and Kestrel *Falco tinnunculus* (Spasov 2008, Hristov 2011).

Information on the rest of the breeding raptors is sporadic and localised. The monitoring of migrating birds is concentrated mainly in the eastern part of the county, along the Black Sea where the Via Pontica bird migration route is situated. It covers the majority of soaring birds, most of which are raptors (Profirov 1987, Michev *et al.* 2011). Autumn migration studies cover all raptors species passing over the migration watchpoints. For some regions, such as the Burgas area, there is a long-term set of data for migrating birds of prey (BSPB 2005).

The Atlas of Breeding Birds in Bulgaria covers all breeding or possibly breeding raptor species. It was published in 2008 and is foreseen to be updated every 10 years (Iankov 2007).

The wintering raptor populations have been studied for a couple of years, but only the lowland part (up to 600 m a.s.l.) of Bulgaria has been covered (Nikolov *et al.* 2006). All raptors are recorded during the *International Waterbird Census* (IWC) that takes place every year in January. This monitoring scheme has been implemented for more than 20 years and has good number of records on raptors wintering near all large wetlands and rivers (over 200; Kostadinova & Dereliev 2001).

There are regional studies of some owl species as well, but they are not covered by comprehensive monitoring activities (e.g. Shurulinkov & Stoyanov

2006, Shurulinkov *et al.* 2007).

Monitoring schemes implemented by BSPB are well coordinated. There is certain cooperation and exchange of information between the BSPB and other NGOs, but no coordination between all players at the national level has been established as yet. In order to facilitate the BSPBs network of researchers and fieldworkers scattered across the country, a new on-line GIS database has been established. It can be accessed only by staff members and expert fieldworkers, but there is a website for data gathering (www.BulgariaBirdQuest.org) that is publicly available. It is part of the "Worldbirds.org" project of BirdLife International. There are over 50 projects focused on research, monitoring and conservation of raptors in Bulgaria (Appendix 1).

4. Key species and key issues

4.1. Key species

The key species of raptors covered by comprehensive monitoring schemes are Imperial Eagle *Aquila heliaca*, White-tailed Eagle *Haliaeetus albicilla*, Egyptian Vulture *Neophron percnopterus*, Griffon Vulture, Black Vulture *Aegypius monachus*, Saker Falcon *Falco cherrug* and Red-footed Falcon *F. vespertinus*. Information on their distribution, numbers, breeding success, productivity, diet, movements etc. is gathered on annual basis. All these species have unfavourable conservation status at the national level, while some of them are also globally threatened.

The population of the Imperial Eagle indicates a slight increase in the last decade (Iankov 2007). New studies show that more than 30 pairs are breeding in the European part of Turkey and support the increase in the population of the species in Bulgaria up to 24 pairs in 2013 (19 were present in 2008; Demerdzhiev *et al.* 2011).

No occupied nests of the Saker Falcon were registered last years, but the number of observations is increasing, which gives a good perspective for the future return of the species as a breeder in Bulgaria. For the 2006–2010 period, Saker Falcons were registered in a maximum of nine territories with possible 1–2 breeding pairs, but without any direct evidence of any occupied nest (Iankov 2010).

One of the European's most threatened species, the Egyptian Vulture, has gone through a severe decline (more than 50%) during the last decade in Bulgaria, reaching only 29 pairs in 2012 despite all the efforts by BSPB (V. Dobrev *pers. comm.*). Facing many challenges, the species has reached its population minimum with less than 80 pairs in the Balkans (Velevski *et al. in prep.*).

The Griffon Vulture population is increasing rapidly with more than 100% population increase in the last 10 years. The apparent increase is a result of the improved carrying capacity of the environment and the hard efforts of several NGOs working in the Eastern Rhodopes as well (Demerdzhiev *et al. in prep.*). The first releases under the restocking programme for the species outside the Rhodopes were carried out in the last 5 years (Green Balkans 2010).

Despite the frequent observations of Black Vultures in Bulgaria, the only vital colony of the species in the Balkans breeds in Dadia Forest reserve in Greece. The improved carrying capacity of the environment in Bulgaria and the absence of many threats in the last few years are good prospects for future recolonization of the species in our country.

A good example of natural recolonization is the increased numbers in the White-tailed Eagles nesting in Bulgaria. The last decade has turned this almost forgotten species into a common visitor along all the biggest dams and rivers in Bulgaria, reaching more than 20 breeding pairs and still increasing.

The Red-footed Falcon is one of the species known as most sensitive to intensive farming. Abundant in the past, nowadays the species is almost extinct from the Bulgarian avifauna. The colonies discovered recently give a hope that the species will recover its numbers from the past, despite the many threats and the implementation of the EU Common Agriculture Policy (BSPB 2011).

Since 2008, BSPB implement satellite tracking programmes for Imperial Eagle (22 juveniles have been tagged so far), White-tailed Eagle (2 juv.) and Egyptian Vulture (6 juv.). Meanwhile, the Green Balkans has tagged Imperial Eagle (10 juv.; Zhelev *et al.* 2009, Gradev *et al.* 2011), Lesser Spotted Eagle *A. pomarina* (2 ind.), Long-legged Buzzard *B. rufinus* (1 ind.), Egyptian Vulture (1 ad., 1 subad. and 1 juv.; Gradev *et al.* 2012), Griffon Vulture (6 subad. and 14 juv.). Important information on the migration routes and wintering grounds of the Egyptian Vulture was gathered through the satellite telemetry. Chad and Sudan were proved as main wintering areas for the Bulgarian population.

4.2. Key issues (threats) addressed by monitoring for raptors in Bulgaria

Main threats for the raptors in Bulgaria are similar to those in other European countries and are related to habitat loss, unnatural mortality and disturbance. The

electrocution had previously been underestimated as a threat for raptors, but recent studies and satellite tracking of Imperial Eagles have proved that mortality, especially among juvenile birds, is significant (D. Demerdzhiev *pers. comm.*).

The poisoning has always been an issue, but the conflict between pigeon fanciers and the actively hunting raptors seems to be one of the main problems. Poisonous baits for Wolf *Canis lupus* and Golden Jackal *C. aureus* are the main threat to scavengers, while unintentional pesticide poisoning also has a negative impact on raptor populations.

In the last 10 year, habitat loss has been taking place at a greater speed than in the 1980s and 1990s. Direct payments within the framework of the European Union's RDP/CAP are the main driving force for the destruction of foraging habitats (grasslands) (Demerdzhiev *et al. in print*). Construction of wind farms and solar panels also lead to effective habitat loss, as well as to increased mortality among raptors due to collisions with turbine blades.

Disturbance and nest robbery is still a threat factor for the raptor populations in Bulgaria. Illegal taking of fledglings for falconry is one of the main limiting factors for some raptors such as the Saker Falcon, which is on the brink of extinction (Iankov *et al.* 2013). In recent years, it became clear that persecution is an issue, especially for rare birds of prey that are a highly desired trophy for local and foreign taxidermists. Game keepers are also taking part.

BSPB has established partnerships with several countries in conjunction with the work concerning the following species: Imperial Eagle (Hungary, Turkey, Macedonia, Sudan), Saker Falcon (Hungary, Slovakia, Romania), Egyptian Vulture (Turkey, Greece, Macedonia, Albania, Ethiopia, Sudan, Chad, Syria, Oman), Griffon Vulture (Greece, Macedonia, Serbia, Israel), Black Vulture (Greece), White-tiled Eagle (Romania, Germany), Red-footed Falcon (Hungary). Migrating species are of great importance to international cooperation and our efforts will be aimed at their protection in Bulgaria and the countries with the species' flyway, stopover sites and wintering grounds (Angelov *et al.* 2012).

5. Strengths and weaknesses

The main strengths of the monitoring schemes for raptors in Bulgaria are the good set of data for priority species, experienced fieldworkers and good knowledge regarding important areas for raptors.

Weaknesses are related to the lack of capacity to cover most of the common raptors and insufficient/irregular funding of the monitoring schemes. The fact that the gathered data are not used by authorities is also an important issue that has led to inadequate Environmental Impact Assessments and lack of protection of the raptors' habitats.

The main gaps in monitoring for raptors in Bulgaria are related to the lack of coverage of the majority of diurnal species that are not very common but at the same time not very rare, such as the Lesser Spotted Eagle, Short-toed Eagle *Circaetus gallicus*, Booted Eagle *A. pennata* and Peregrine Falcon *F. peregrinus*. The same issues hold true for owls as well. Some regions are not well known due to the smaller number of local fieldworkers, hence more resources are needed for their survey and monitoring.

International cooperation would be valuable in lobbying for the implementation of raptor-friendly agricultural practices. Exchange of information about best agricultural practices designed for the raptors' benefit would also be useful. Remote/GIS monitoring of priority habitats and sites (SPAs) through satellite imagery or other contemporary methods would support the evaluation and prioritisation of conservation efforts for raptors in Bulgaria.

6. Priorities, capacity-building

Different economic sectors certainly do influence raptor populations, but there are no quantitative data to prove/illustrate that impact. That is why establishment of monitoring schemes that measure the impact of wind farms, power lines, agricultural practices, infrastructural development etc. on raptor populations will be one of the BSPB's priorities for the coming years.

It is important to incorporate raptor monitoring standards into SPAs Management Plans. BSPB will provide the necessary support to the state authorities on this issue.

State funding for suitable operation of the National Biodiversity Monitoring System and birds of prey monitoring activities is crucial for adequate protection of species and their habitats.

Training of fieldworkers, especially national parks' staff members, regional environment and water inspectorates and NGO volunteers, is a constant task that needs special attention and efforts.

7. Povzetek

Glavni protagonisti pri vsedržavnem raziskovanju in monitoringu ptic roparic v Bolgariji so od leta 1990 predvsem naravovarstvene nevladne organizacije. Še

posebno dejavni med njimi sta Bolgarsko društvo za zaščito ptic (BSPB) in Zeleni Balkan, ki se posvečata najbolj ogroženim ujedam v državi. Ključne vrste, preučevane v okviru celostnega monitoringa, so kraljevi orel *Aquila heliaca*, belorepec *Haliaeetus albicilla*, egiptovski jastreb *Neophron percnopterus*, beloglavi jastreb *Gyps fulvus*, rjavi jastreb *Aegypius monachus*, sokol plenilec *Falco cherrug* in rdečenoga postovka *F. vespertinus*. Informacije o njihovi razširjenosti, številu, gnezditvenem uspehu, produktivnosti, prehrani in premikih se zbirajo na letni ravni. Tudi redni monitoring kanje *Buteo buteo* in postovke *F. tinnunculus* poteka na državni ravni, in sicer v okviru monitoringa pogostih vrst. Razširjenost vseh ptic roparic je bila preučevana za potrebe Atlasa bolgarskih gnezdilk. Sodobne metode satelitske telemetrije so razkrile pomembne vidike ogroženosti ter premikov orlov in jastrebov znotraj države in prek meja. Poglavitne grožnje za ptice roparice v Bolgariji so izguba habitata, nenaravna smrtnost in vznemirjanje. Glavne vrzeli v njihovem monitoringu so povezane z nezadostno pokritostjo večine ujed in sov. Sicer pa se razvija tesno mednarodno sodelovanje v povezavi z delom, posvečenim kraljevemu orlu ter egiptovskemu in beloglavemu jastrebu. Vsekakor pa je treba nujno pospešiti sodelovanje v zvezi z drugimi vrstami ptic roparic in lobiranje za roparicam prijazno kmetijstvo in izboljšavo nekaterih gospodarskih panog.

8. References

Akumarev, V., Myumyun, S. & Dyulgerova, S. (2012): Survey on the Egyptian Vulture population in Asia Minor, Turkey. Project Report. – Bulgarian Society for the Protection of Birds, Sofia.

BSPB (2005): Observation of autumn migration of soaring birds in Bulgaria in 2004 in terms of identification of bottleneck IBAs to be included in the European Ecological Network NATURA 2000. – Bulgarian Society for the Protection of Birds, Sofia. (available at http://bspb.org/article_files/127713194912.pdf.)

BSPB (2010): [Annual report for 2010.] – Bulgarian Society for the Protection of Birds, Sofia. (in Bulgarian) (available at http://bspb.org/article_files/130521434571.pdf)

BSPB (2011): [Annual report for 2011.] – Bulgarian Society for the Protection of Birds, Sofia. (in Bulgarian) (available at http://bspb.org/article_files/133845815923.pdf)

BUNARCO (2009): List of the Birds Recorded in Bulgaria. – Acta Zoologica Bulgarica 61 (1): 3–26.

Angelov, I. (2009): [Numbers, ecology, behaviour, threats and conservation measures for the Eastern imperial eagle (*Aquila heliaca*) in Sliven region.] BSc thesis. – Sofia university "St. Kl. Ohridski", Faculty of Biology, Sofia. (in Bulgarian)

Angelov, I., Hashim, I. & Oppel, S. (2012): Persistent electrocution mortality of Egyptian Vultures *Neophron percnopterus* over 28 years in East Africa. – Bird Conservation International 23 (1): 1–6.

Demerdzhiev, D. (2011): The eastern imperial eagle (*Aquila heliaca heliaca*, SAVIGNY, 1809) (ACCIPITRIDAE - AVES) in Bulgaria – distribution, biology, ecology, numbers and conservation measures. PhD abstract. – NNHM - BAS, Sofia.

Demerdzhiev, D., Stoychev, S., Terziev, N. & Angelov, I. (2011): Status of the Imperial Eagle (*Aquila heliaca*, Savigny, 1809) in the European part of Turkey. pp. 87–93 In: Proceedings of the 6th International Conference for Conservation of the Eastern Imperial Eagle (*Aquila heliaca*), 5–7 September 2008, Topolovgrad, Bulgaria. – Acta Zoologica Bulgarica, Suppl. 3.

Demerdzhiev, D., Dobrev, V. & Popgeorgiev, G. (*in print*): Can habitat change influence territory occupancy, breeding density, and breeding success of Long-legged Buzzard population in SPA "Besaparski hills". – Acta Zoologica.

Demerdzhiev, D., Hristov, H., Dobrev, D., Angelov, I. & Kurtev, M. (*in prep.*): Long-term population status, breeding parameters and limiting factors of the Griffon Vulture (*Gyps fulvus*) population in Eastern Rhodopes, Bulgaria.

Dobrev, V., Arkumarev, V., Bounas, T., Pappaioannou, H., Gerdzhikov, G., Dyulgerova, S., Saravia, V., Klimentova, I., & Nikolov, S. (2012): Preliminary survey on the Egyptian vulture breeding population in southern Albania. Project report. – Bulgarian Society for the Protection of Birds, Sofia.

Dobrev, D., Angelov, I. & Dobrev, V. (2013): Status and conservation of vultures in Bulgaria. Bulgarian society for the protection of birds/Birdlife Bulgaria (BSPB) activities. pp. 14–15 In: Andreevski, J. (ed.): Vulture Conservation in the Balkan Peninsula and Adjacent Regions. 10 Years of Research and Conservation. – Nacionalna i univerzitetska biblioteka "Sv. Kliment Ohridski", Skopje.

Green Balkans (2005): The Bearded Vulture – Let's recover the symbol of Bulgarian nature conservation. Balkan Vulture Action Plan (BVAP) project report. – Green Balkans, Plovdiv.

Green Balkans (2006): Activities for the Restoration of the Populations of the Black and Griffon Vultures as the First Step for the Reintroduction of the Bearded Vulture in Bulgaria. Balkan Vulture Action Plan (BVAP) project report. – Green Balkans, Plovdiv.

Green Balkans (2007): Activities for the Restoration of the Populations of the Black and Griffon Vultures as the First Step for the Reintroduction of the Bearded Vulture in Bulgaria. Balkan Vulture Action Plan (BVAP) project report. – Green Balkans, Plovdiv.

Green Balkans (2010): [Annual report for 2010.] – Green Balkans, Plovdiv. (in Bulgarian) (available at http://www.greenbalkans.org/article_files/131238069026.pdf)

Gradev, G., Matarranz, V., Dobreva, E., Popov, D., Ivanov, I., Klisurov, I., Kmetova, E. & Vasilakis, D. (2011): First Results of the Tracking of an Eastern Imperial Eagle (*Aquila heliaca*) Tagged with a GPS/GSM Transmitter in Bulgaria. pp. 15–20 In: Proceedings of the 6th International Conference for Conservation of the

Eastern Imperial Eagle (*Aquila heliaca*), 5–7 September 2008, Topolovgrad, Bulgaria. – Acta Zoologica Bulgarica, Suppl. 3.

Gradev, G., García, V., Ivanov, I., Zhelev, P. & Kmetova, E. (2012): Data from Egyptian vultures (*Neophron percnopterus*) tagged with GPS/GSM Transmitters in Bulgaria. – Acta Zoologica Bulgarica, Suppl. 4: 137–147.

Hristov, H. (2000): Supplementary and monitoring actions. Eastern Rhodopes project reports. Bulgarian–Swiss Biodiversity Conservation Programme – Bulgarian Society for the Protection of Birds, Sofia.

Hristov, I. (2011): State of common birds in Bulgaria 2005–2010. BSPB Conservation Series, Book 19. – Bulgarian Society for the Protection of Birds, Sofia.

Kostadinova, I. & Dereliev, S. (2001): Results from the Mid-winter Counts of Waterbirds in Bulgaria for the period 1997–2001. BSPB Conservation Series, Book 3. – Bulgarian Society for the Protection of Birds, Sofia.

Michev, T., Profirov, L., Nyagolov, K. & Dimitrov, M. (2011): The autumn migration of soaring birds at Bourgas Bay, Bulgaria. – British Birds 104 (1): 16–37.

Michev, T. & Simeonov, P. (1981): [Studies on the autumn migration of some waterfowl and birds of prey near Bourgas.] – Ecology, Sofia 8: 43–48. (in Bulgarian, English summary)

Mirkov, I. (2009): [Birds of Bulgaria and their researchers. Bibliography 1950–2008.] – Sofia. (in Bulgarian)

Nikolov, S., Spasov, S. & Kambourova, N. (2006): Density, number and habitat use of Common Buzzard (*Buteo buteo*) wintering in the lowlands of Bulgaria. – Buteo 15: 39–47.

Zhelev, P., Gradev, G., Ivanov, I., & Georgiev, D. (2009): [Data on the Trophic Spectrum of Young Imperial Eagles (*Aquila heliaca* Savigny, 1809) in South Bulgaria.] – Ecologia Balkanica 1: 51–58. (in Bulgarian, English Summary)

Profirov, L. (1987): [Study on the migration dynamics of order Falconifomes in the region of Atanasovsko lake near Bourgas.] pp. 47–50 In: Anniversary national conference in biology, Sofia. (in Bulgarian)

Iankov, P. (ed.) (2007): Atlas of Breeding Birds in Bulgaria. BSPB Conservation Series, Book 10. – Bulgarian Society for the Protection of Birds, Sofia.

Iankov, P. (2010): [Saker Falcon in Bulgaria.] – Falke 12: 500–505. (in German)

Iankov, P., Stoianov, G. & Ragiov, D. (2013): [Action plan for the Saker Falcon (*Falco cherrug* Gray, 1834) in Bulgaria.] – Ministry of Environment and Water, Sofia. (in Bulgarian)

Iankov, P. & Profirov, L. (1991): Contemporary state of griffon vulture (*Gyps fulvus* Hablizl) population in Bulgaria. – Ecology 24: 44–52.

Shurulinkov, P. & Stoyanov, G. (2006): Some new findings of Pigmy Owl *Glaucidium passerinum* and Tengmalm's Owl *Aegolius funereus* in western and southern Bulgaria. – Acrocephalus 27 (128/129): 65–68.

Shurulinkov, P., Ralev, A., Daskalova, G. & Chakarov, N. (2007): Distribution, numbers and habitat of Pigmy Owl *Glaucidium passerinum* in Rhodopes Mts (S Bulgaria). – Acrocephalus 28 (135): 159–163.

Stoynov, E. & Peshev, H. (2011): Re-introduction of Griffon Vulture (*Gyps fulvus*) in Kresna Gorge of Struma River, Bulgaria. Annual Report 2010. – Fund for Wild Flora and Fauna, Blagoevgrad.

Stoynov, E. & Peshev, H. (2012): Re-introduction of Griffon Vulture (*Gyps fulvus*) in Kresna Gorge of Struma River, Bulgaria. Annual Report 2011. – Fund for Wild Flora and Fauna, Blagoevgrad.

Stoynov, E. & Peshev, H. (2013): Re-introduction of Griffon Vulture (*Gyps fulvus*) in Kresna Gorge of Struma River, Bulgaria. Annual Report 2012. – Fund for Wild Flora and Fauna, Blagoevgrad.

Spasov, S. (2008): State of common birds in Bulgaria. BSPB Conservation Series, Book 13. – Bulgarian Society for the Protection of Birds, Sofia.

Velevski, M., Nikolov, S., Arkumarev, V., Dobrev, V., Topi, M., Hoxha, B., Tabur, E. & Oppel, S. (*in prep.*): Decrease of population size and range contraction of Egyptian Vulture in the Balkans.

Arrived / Prispelo: 27. 3. 2013
Accepted / Sprejeto: 1. 7. 2013

APPENDIX 1 / DODATEK 1

Most important projects dedicated to raptor conservation and monitoring in Bulgaria for the 1994–2013 period (the list is not exhaustive)

Najpomembnejši projekti, posvečeni varstvu in monitoringu ptic roparic v Bolgariji v obdobju 1994–2013 (seznam ni popoln)

Species / Vrsta	Project title / Naziv projekta	Implementing Organisation/ Izvajalec
White-tailed Eagle *Haliaeetus albicilla*	Let's together protect the White-tailed Eagle on the Islands of Belene	BSPB
	Together for Danube	BSPB
	Following the White-tailed Eagle	BSPB
Lammergeier *Gypaetus barbatus*	The Bearded Vulture – Let's recover the symbol of Bulgarian nature conservation	Green Balkans
	Establishing a national platform and strategy for the conservation and return of the Bearded Vulture – symbol of Bulgarian nature conservation	Green Balkans
Egyptian Vulture *Neophron percnopterus*	Urgent measures for the conservation of the Egyptian Vulture in Bulgaria	BSPB
	Urgent Conservation Measures for the Egyptian Vulture (*Neophron percnopterus*) in Bulgaria (phases III, IV and V)	BSPB
	Preparation for the implementation of large-scale conservation activities for the Egyptian Vulture (*Neophron percnopterus*): research of newly identified threatening factors, colour ringing, diet study and monitoring of the population in North Bulgaria	BSPB
	Conservation measures for the flagship bird species in the east of Bulgaria: the Egyptian Vulture	BSPB
	HOPE FOR THE EGYPTIAN VULTURE	BSPB
	Marking and follow-up tracking of the priority bird species: Egyptian Vulture, Black Stork and Eagle Owl	BSPB
	Return of the Neophron – Urgent measures to secure the survival of the Egyptian Vulture (*Neophron percnopterus*) in Bulgaria and Greece; LIFE10NAT/BG/000152	BSPB
	Capacity Building to Support the Conservation of Migratory Egyptian Vultures (*Neophron percnopterus*) from the Western Palearctic on their Wintering Grounds in Ethiopia, Sudan and Chad	BSPB
Griffon Vulture *Gyps fulvus*	VULTURES' RETURN – Recovery of the population of large vultures in Bulgaria; LIFE08 NAT/BG/278	Green Balkans
	Biodiversity Conservation in Stara Planina (Kotel Mountain Area)	FWFF
	Recovery through Reintroduction of the Griffon Vulture (*Gyps fulvus*) in Central Balkan National Park	BPPS
	Recovery of the Griffon Vulture as a nesting species in the Vrachanska Planina Mountain, Bulgaria	BPPS
	Recovery of the Griffon Vulture (*Gyps fulvus*) as a Breeding Species at Vrachanska Planina Mountain; Reintroduction - Following Steps - Measures	BPPS
	Recovery through reintroduction of the Griffon Vulture in Central Balkan National Park	BPPS

Continuation of Appendix 1 / Nadaljevanje dodatka 1

Species / Vrsta	Project title / Naziv projekta	Implementing Organisation/ Izvajalec
Black Vulture *Aegypius monachus*	Conservation of the Black Vulture	Green Balkans
	Conservation of Black Vulture in the Eastern Rhodopes	Green Balkans
Griffon Vulture *Gyps fulvus*	Activities for the Restoration of the Populations of the Black and Griffon Vultures as the First Step for the Reintroduction of the Bearded Vulture in Bulgaria	Green Balkans
Black Vulture *Aegypius monachus*	Conservation of the Large Vultures in the Eastern Rhodopes	BSPB
Egyptian Vulture *Neophron percnopterus*	Feeding of scavenging birds in the Eastern Rhodopes	BSPB
Griffon Vulture *Gyps fulvus*	Bulgarian–Swiss Biodiversity conservation programme in the Eastern Rhodopes (Phases I and II)	BSPB
Black Vulture *Aegypius monachus*		
vultures	Assessment of the potential to expand conservation of vultures in Bulgaria	BSPB
	Development of the Programme for Actions Against Poisons and Involving the State Institutions in Solving the Problem with the Use of Poison Baits in Nature	FWFF
	Antidote Campaign and creating preconditions for the recovery of vultures in SW Bulgaria as a "bridge" between the Rhodopian and Macedonian vulture communities	FWFF
	Anti-poisoning Campaign – Development of Compensatory Programme for Livestock Damages due to Predator Attacks in SW Bulgaria	FWFF
	Against Poison (Antidote) Activities of FWFF - Sofia	FWFF
Imperial Eagle *Aquila heliaca*	Investigation of the Imperial Eagle (*Aquila heliaca*) status in the "Eastern Rhodopes" and developing of recommendations for priority measures for species conservation	BSPB
	Survey on the Imperial Eagle (*Aquila heliaca*) in South Bulgaria and warding of sensitive nests	BSPB
	Mapping of nesting areas of the Imperial Eagle (*Aquila heliaca*) and measures for their preservation	BSPB
	Mapping of nesting sites of Imperial Eagle and measures for their conservation	Green Balkans
	Conservation of the Imperial Eagle in Bulgaria	Green Balkans
	Conservation of the Globally Threatened species – The Imperial Eagle	Green Balkans
	Conservation of the Imperial Eagle	Green Balkans
	Strandzha – Sakar – the realm of eagles	Reconstruction and Development Union & BSPB

Continuation of Appendix 1 / Nadaljevanje dodatka 1

Species / Vrsta	Project title / Naziv projekta	Implementing Organisation/ Izvajalec
Imperial Eagle *Aquila heliaca* Saker Falcon *Falco cherrug*	SAVE THE RAPTORS – Conservation of Imperial Eagle and Saker Falcon in key Natura 2000 Sites in Bulgaria; LIFE07NAT/BG/000068	BSPB
Imperial Eagle *Aquila heliaca* Lesser Kestrel *Falco naumanni* Black Vulture *Aegypius monachus*	Conservation activities for target species from the Birds Directive of the of EU – Lesser Kestrel, Imperial Eagle, Black Vulture in their important habitats in Bulgaria	Green Balkans
Lesser Kestrel *Falco naumanni*	Lesser Kestrel Recovery – Greater chance for Lesser Kestrel in Bulgaria; LIFE11 NAT/BG/360	Green Balkans
Red-footed Falcon *Falco vespertinus*	Saving the Red-footed Falcon from extinction in Bulgaria	BSPB
	Counteracting the Decline of the Breeding Red-footed Falcon (*Falco vespertinus*) Population in Bulgaria	BSPB
	Enhance the Nesting Habitats of Globally Threatened Species: Red-Footed Falcon	BSPB
	Together for the Red-Footed Falcon	BSPB
	Improving the nesting conditions for the Globally Threatened Red-footed Falcon (*Falco vespertinus*) in Bulgaria	BSPB
Saker Falcon *Falco cherrug*	Action plan for Saker (*Falco cherrug*) conservation in Bulgaria	BSPB
	Saving the Saker Falcon (*Falco cherrug*) in Bulgaria	BSPB
	Joint efforts in saving the Saker Falcon in Bulgaria	BSPB
	Falco cherrug B-H-R-S – Conservation of *Falco cherrug* in Northeastern Bulgaria, Hungary, Romania and Slovakia; LIFE09NAT/HU/000384	BSPB
birds of prey (all species)	Survey and conservation of birds of prey in East Balkan Mountains	BSPB

Acrocephalus 33 (154/155): 191–201, 2012
10.2478/v10100-012-0006-8

A preliminary overview of monitoring for raptors in Croatia

Predhodni pregled monitoringa populacij ptic roparic na Hrvaškem

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There are 40 regularly occurring raptor species in Croatia (diurnal raptors and owls), but only for two species (Griffon Vulture *Gyps fulvus* and Eleonora's Falcon *F. eleonorae)* long-term monitoring (more than 10 years) of significant parts (i.e. > 80%) of their national population has been implemented. For 23 species (58%), the coverage of monitoring is limited to several locations (often within borders of given protected area), involving small percentage of national population or/and has started recently. Therefore, they do not satisfy the main purpose of national monitoring programmes, i.e. to draw conclusions about the trend of the species' national population and to support the decision-making process about conservation measures to be applied. Besides the Institute of Ornithology and several ornithological NGOs, which are recognized as main actors for the implementation of raptors monitoring, the State Institute for Nature Protection (SINP) is setting up a framework for the nationwide bird monitoring complying with the legal provisions of the EU Birds Directive and the Natura 2000 network. The highest priority is to improve the coordination between state institutions, scientific and non-governmental organizations involved in raptor conservation with the final aim to develop a national raptor conservation strategy that sets priority target species and standardized monitoring systems.

Key words: diurnal raptors, owls, monitoring, Croatia
Ključne besede: ujede, sove, monitoring, Hrvaška

1. Introduction

The Croatian ornithofauna (399 species) comprises 46 bird species belonging to the orders of Falconiformes (9 species), Accipitriformes (27 species) and Strigiformes (10 species), of which 40 species are regularly occurring (Tutiš *et al. in print*).

For the purpose of this overview we define monitoring as a systematic, repeated, well-organized collecting of specific, parameterized field data on species aimed at getting data sets enabling to make conclusions about the trend of species population and supporting the decision-making processes about the conservation measures to be applied. Therefore, the set of monitoring parameters should describe not only the status of the object of monitoring (population size, breeding success) but also provide evidence on its trends, as well as pressures and impacts acting towards it.

2. Main players

The Croatian Ministry of Environmental and Nature Protection is the competent authority for nature protection, performing primarily administrative tasks in the field of nature protection. The State Institute for Nature Protection (SINP) is a governmental organization responsible to carry out expert tasks of nature protection such as organizing and implementing monitoring schemes and preparation of monitoring reports (Narodne novine 2005, 2008 & 2011). Results of monitoring programmes are essential for several SINP tasks: drafting the Croatian Red Data Book of Birds (Tutiš *et al. in print*), defining priorities for drafting Species Action Plans (Sušić 2010, Grlica 2011) and future Natura 2000 reporting.

Protected areas (PA) in Croatia are managed by

public institutions (PI). There are 19 PIs responsible for the management of national and nature parks. In addition, 20 PIs on the county level are responsible for the management of other protected areas categories. Several PIs (e.g. Lonjsko polje Nature Park and Paklenica National Park) have recognized raptor monitoring as a measure of efficiency of their management activities (Lukač & Hršak 2005, V. Hima *pers. comm.*).

The Institute of Ornithology – Croatian Academy of Science and Arts (IOO) in Zagreb is a national scientific institution dedicated to bird research and conservation. During last decade, the IOO has conducted researches and surveys on several diurnal raptor and owl populations and is also running the long-lasting continuous monitoring on Griffon Vultures *Gyps fulvus* in cooperation with the Eco-Center Caput Insulae – Beli (ECCIB).

However, recent raptor field research and survey is also done by ornithologist form several national nongovernmental organizations (NGO) and to some extent by PI employees. The most active NGOs are the Association BIOM (Udruga BIOM), Croatian Ornithological Society (COS, Hrvatsko ornitološko društvo), Croatian Society for Birds and Nature Protection (CSPBN, Hrvatsko društvo za zaštitu ptica i prirode), ECCIB and the Natural History Society "Drava" (NHSD, Prirodoslovno društvo Drava). Parts of the monitoring data are published in scientific journals (Mikuška 2009, Radović & Mikuška 2009a & 2009b).

Transboundary cooperation for raptor monitoring and protection is being realized on several levels. Formal collaboration for the protection of the White-tailed Eagle *Haliaeetus albicilla* was recently realized within the "DANUBEPARKS" project (http://danubeparks.org). The Action plan and the joint data base for Danube White-tailed Eagle populations are being prepared with the cooperation of Croatian, Hungarian, Romanian, Bulgarian, Serbian, Slovakian, Austrian and German PA managers and their White-tailed Eagle experts (Probst & Gaborik 2012). There is an informal cooperation of Croatian ornithologists with the Hungarian Ornithological and Nature Conservation Society (MME) for monitoring of the Saker Falcon *Falco cherrug*. Planning of transboundary protection for the Golden Eagle *Aquila chrysaetos* started with DOPPS - BirdLife Slovenia. There is a strong communication between Croatian researchers and conservationists with colleagues from other southeastern European countries, especially between NGOs (Bulgaria, Macedonia, Serbia, Montenegro and Bosnia and Herzegovina).

3. National coverage

SINP is responsible for the national coordination of monitoring and closely cooperates with main monitoring actors. However, there is no special national network for raptor monitoring in Croatia.

Diurnal raptor species that have small national populations and are breeding colonially on few locations are comprehensively monitored (Appendix 1). The species that have been monitored for a long period (more than 10 years) are the Griffon Vulture (Sušić & Radek 2010) and Eleonora's Falcon *F. eleonorae* (Šćetarić Legan & Piasevoli 2005). National population of the Saker Falcon has been monitored since 2007 (Grlica & Grlica 2011a), while the Lesser Kestrel *F. naumanni* has been monitored since the discovery of its breeding site in 2010 (Mikulić *et al.* 2012). An exception is the White-tailed Eagle that is comprehensively monitored even though being numerous and widespread in floodplains of continental Croatia. In two Nature Parks, Kopački rit and Lonjsko polje, monitoring of this species started in 1999 and 2003, respectively. Monitoring of all 13 breeding raptor species has been performed in Paklenica National Park since 1996 (Lukač 2011) (Appendix 1).

Wintering raptors (13 species) are being monitored in continental part of Croatia through simultaneous counts of individuals on several wetland sites, within *International Waterbird Census* (IWC) scheme (Wetlands International 2013, T. Mikuška *pers. comm.*). The Golden Eagle was patchily surveyed in several PAs, but in 2012 a comprehensive national monitoring of Golden Eagle has started (Mikulić *et. al.* 2012) (Appendix 1).

Several NGOs are monitoring some species due their own scientific interest or specific commitment. For example, members of the BIOM are monitoring Peregrine Falcon *F. peregrinus* in the continental part of Croatia and on the island of Mljet; COS monitors Peregrine Falcon on offshore islands and Eagle Owl *Bubo bubo* in the Neretva River valley. NHSD monitors the abundance indices of several raptor species on the Mura, Drava and Danube rivers (Grlica & Grlica 2011b) (Appendix 1). For owl species, a monitoring protocol for the Ural *Strix uralensis*, Tawny *S. aluco* and Tengmalm's Owl *Aegolius funereus* in two mountain PAs was prepared by the IOO, with surveys being implemented by PA employees (V. Tutiš *pers. comm.*). In addition, the IOO started Ural Owl monitoring in one proposed Natura 2000 mountain area (Gorski kotar) (V. Tutiš *pers. comm.*).

Generally, we can conclude that monitoring does

not exist for very rare species such as the Booted Eagle *A. pennata*, for which we are even lacking data on its distribution. Furthermore, comprehensive national monitoring does not exist for common species like the Buzzard *Buteo buteo*, Kestrel *F. tinnunculus*, Tawny Owl and Long-eared Owl *Asio otus*, while some local breeding populations are being long-term monitored only in Paklenica National Park (Lukač 2011) and patchily in eastern Croatia (Grlica & Grlica 2010 & 2011b).

4. Key species and key issues

Endangered raptor species should be recognized as key species considering the need for their conservation. 24 breeding raptors species are listed on the new Croatian Red List (Tutiš *et al. in print*) (Table 1) and their monitoring is recognized as one of the conservation measures. To date, populations of only seven threatened species have been monitored at the national level, while for other eight species monitoring has been implemented only on one or few sites covering small portion (less than 5%) of its national population (Table 1). Among the non-breeding raptor species, the passage population of Osprey *Pandion haliaetus* is classified as Near Threatened (NT), wintering population of Greater Spotted Eagle *A. clanga* as Critically Endangered (CR) and wintering population of Merlin *F. columbarius* Vulnerable (VU). Only wintering population of the Greater Spotted Eagle is monitored within IWC.

For the Griffon Vulture, a variety of threats are monitored like habitat degradation due to land abandonment, number of sheep in the breeding area and the disturbance of breeding pairs by tourist activities. For the White-tailed Eagle, a habitat analysis was executed including data on forest management and forest structures (Radović & Mikuska 2009a). Other kind of threats affecting raptor species are not quantified due to the lack of reliable data (i.e. poaching, poisoning, and succession of grasslands towards forests). There is no monitoring about the impacts of recently constructed wind farms on birds, as there was no legal obligation for the investors to conduct and finance such kind of Before-After Control-Impacts (BACI).

In general, Croatia would benefit from international projects for long distance migrants in order to identify the wintering grounds and migration routes of its raptor populations. For the Saker Falcon and Golden Eagle, transboundary cooperation would improve the level of monitoring of shared populations. The exchange of knowledge about the establishment

Table 1: Red List of breeding raptor species of Croatia (Tutiš *et al. in print*); bold – monitoring of significant part of population is in place, * – monitoring of small and localized populations, non-significant at the national level

Tabela 1: Rdeči seznam gnezdečih ptic roparic Hrvaške (Tutiš *et al. in print*); mastni tisk – monitoring vključuje pomemben del populacije, * – monitoring majhnih in lokaliziranih populacij, nepomembnih na nacionalnem nivoju

Critically Endangered (CR) / Kritično ogrožena vrsta	Endangered (EN) / Ogrožena vrsta	Vulnerable (VU) / Ranljiva vrsta	Near Threatened (NT) / Vrsta blizu ogroženosti
Levant Sparrowhawk *Accipiter brevipes*	Black Kite* *Milvus migrans**	**White-tailed Eagle *Haliaeetus albicilla***	Honey Buzzard* *Pernis apivorus**
Imperial Eagle *Aquila heliaca*	**Griffon Vulture *Gyps fulvus***	**Peregrine Falcon *Falco peregrinus***	Hobby* *Falco subbuteo**
Golden Eagle *Aquila chrysaetos*	Short-toed Eagle* *Circaetus gallicus**	Pygmy Owl *Glaucidium passerinum*	Barn Owl *Tyto alba*
Booted Eagle *Aquila pennata*	Marsh Harrier* *Circus aeruginosus**		Eagle Owl* *Bubo bubo**
Bonelli's Eagle *Aquila fasciata*	Montagu's Harrier* *Circus pygargus**		Little Owl *Athene noctua*
Lesser Kestrel *Falco naumanni*	Lesser Spotted Eagle *Aquila pomarina*		Ural Owl* *Strix uralensis**
Lanner Falcon *Falco biarmicus*	**Eleonora's Falcon *Falco eleonorae***		Tengmalm's Owl *Aegolius funereus*
Saker Falcon *Falco cherrug*			

of efficient volunteer networks would improve the weak volunteer network in Croatia. The transfer of established monitoring protocols from other countries could facilitate the monitoring of species that are not included in any kind of monitoring yet, but are key species like the Lesser Spotted Eagle *A. pomarina*.

5. Strengths and weaknesses

Although there is more than a century long continuum of ornithology in Croatia, it has been restricted to a small community of scientists and there has not been any development of amateur ornithological organizations until the mid-1980s. However, since Croatia's independence in 1991 and during the EU accession period, several ornithological NGOs have been founded and the community of amateur ornithologists is growing. Bird field guides and other ornithological literature in Croatian language were published. Since its establishment in 2003, the SINP has been developing a national monitoring system, including the drafting of monitoring protocols and building database system for monitoring data management.

Today, there is a network of ornithologists engaged in bird conservation that encompasses three sectors: (1) scientific, (2) public institutions managing protected areas, and (3) civil society organizations. PIs have their own conservation management structures and at least some basic capacities (employees, facilities, equipment). The existent nature conservation legal framework (adjusted to EU legal framework, i.e. Birds Directive) makes bird monitoring obligatory for the Republic of Croatia.

A formal national network for raptor monitoring, which would include all three above mentioned sectors, could prepare comprehensive strategy of raptor monitoring in Croatia, identify priorities (species, areas) and agree on monitoring system. Most PIs at the county level and PAs were recently established and they are lacking trained staff and experts that would work out conservation strategies or execute monitoring programmes. Funds for raptor monitoring are very restricted both on the county and state levels.

Most of the raptor species have never been mapped and basic information regarding nesting sites (position of long-term used eyries), home ranges and migration routes are lacking, what makes it more difficult to integrate amateurs and volunteers into monitoring schemes. Moreover, there is no tradition of volunteer work in Croatia and the current socio-economic situation does not favour actions that rely on *pro bono* work.

Parts of Croatia are inaccessible due to landmines and several hundreds of small island/islets cannot be mapped or monitored due to high transportation costs. A serious gap is the lack of data for migrating raptor birds. There are no identified bottlenecks in Croatia, despite indications that the Croatian coast could be an important flyway for the Red-footed Falcon *F. vespertinus* (Rucner 1998) and Honey Buzzards *Pernis apivorus* that cross the Adriatic Sea (Schneider-Jacoby 2001, Premuda *et al.* 2008).

The absence of exact data on distribution and migration routes for most raptor species contributes to poor environmental impact assessments, especially for wind farms that pose a serious threat to raptor species along the coast. In addition, it is nearly impossible to assess the Before-After Control-Impact (BACI) of existing wind farms. International sharing of good practice for solving all the above mentioned issues would improve raptor monitoring and conservation efforts in Croatia.

6. Priorities, capacity-building

The highest priority is to improve the coordination between all sectors and stakeholders involved in raptor conservation with the aim to work out a national raptor conservation strategy that agrees on priority target species and on monitoring systems with standardized protocols. In the second step, all PAs and PIs, including those at the county level, should be trained and involved in order to contribute with their resources to raptor monitoring. In addition, the present volunteer network needs to be expanded and improved. The establishment of species specific working groups would bring forward the monitoring system for raptors.

7. Povzetek

Čeprav se na Hrvaškem redno pojavlja 40 ptic roparic (ujede in sove), se dolgoročni monitoring (več kot 10 let) pomembnih delov (> 80 %) njihove nacionalne populacije izvaja le za dve vrsti (beloglavi jastreb *Gyps fulvus* and sredozemski sokol *F. eleonorae)*. Poleg tega je monitoring za 23 vrst (58 %) omejen na nekaj lokacij (pogosto znotraj meja danega zavarovanega območja) in pokriva le majhen odstotek nacionalne populacije in/ali se je začel nedavno. To pa seveda ni dovolj za doseganje glavnega cilja nacionalnih programov monitoringa, se pravi ugotavljanja trenda nacionalnih populacij ptic in podpiranja postopka odločanja glede nujno potrebnih naravovarstvenih ukrepov. Poleg Inštituta za ornitologijo in več ornitoloških nevladnih

organizacij, ki jih priznavajo kot glavne protagoniste za uresničevanje monitoringa ptic roparic, Državni zavod za varstvo narave pripravlja okvir za vsedržavni monitoring ptic v skladu s pravnimi določili EU Direktive o pticah in omrežja Natura 2000. Najvišja prioriteta je izboljšati sodelovanje med državnimi institucijami, znanstvenimi in nevladnimi organizacijami, ki so vključene v varovanje ptic roparic, s končnim ciljem razvijanja nacionalne strategije za ohranjanje teh ptic, ki določa prednostne ciljne vrste in standardizirane sisteme monitoringa.

8. References

Grlica, I.D. & Grlica, J. (2010): [Monitoring and protection of Saker Falcon. Project Report.] – Natural History Society Drava for Nature Protection Directorate of Croatian Ministry of Culture, Virovitica. (in Croatian)

Grlica, I.D. & Grlica, J. (2011a): [Expert analysis for drafting of Saker Falcon (*Falco cherrug*) Action Plan in Croatia in Period 2012–2016.] – Natural History Society Drava for State Institute for Nature Protection, Virovitica. (in Croatian)

Grlica, I.D. & Grlica, J. (2011b): [Monitoring of Sand Martins, Wetland Birds and Raptors on Drava River from Donja Dubrava Accumulation to Drava River mouth into Dunav River. Technical Report.] – Natural History Society Drava for State institute for Nature Protection, Virovitica. (in Croatian)

Leskovar, K., Radović, D., Krnjeta, D., Kršić, D. & Belić, R. (2011): [Monitoring of White-tailed Eagle (*Haliaeetus albicilla*) breeding pairs in Pokupsko Basin in 2004–2011. Technical Report.] – Croatian Ornithological Society for State Institue for Nature Protection, Zagreb. (in Croatian)

Lukač, G. (2011): [The birds atlas of the Paklenica National Park.] – Javna ustanova Nacionalni park Paklenica, Starigrad-Paklenica. (in Croatian)

Lukač, G. & Hršak, V (2005): Influence of visitor numbers on breeding birds in the Paklenica National Park, Croatia. – Ekológia (Bratislava) 24 (2): 186–199.

Lukač, G., Stipčević, M. & Haupt, R. (2003): Recent observations on the Griffon Vulture (*Gyps fulvus*) in the Paklenica National Park (Croatia). – Acrocephalus 24 (117): 51–59.

Mellone, U., López-López, P., Limiñana, R., Piasevoli, G. & Urios, V. (*in print)*: The trans-equatorial loop migration system of Eleonora's falcon: differences in migration patterns between age classes, regions and seasons. – Journal of Avian Biology doi 10.1111/j.1600-048X.2013.00139.x

Mikulić, K., Budinski, I. & Lucić, V. (2012a): [Monitoring of Golden Eagle. Technical Report.] – Association BIOM for for State Institute for Nature Protection, Zagreb. (in Croatian)

Mikulić, K., Lucić, V. & Budinski, I. (2012b): [Monitoring of Lesser Kestrel. Technical Report.] – Association BIOM for for State Institute for Nature Protection, Zagreb. (in Croatian)

Mikulić, K., Basrek, L., Lucić, V. & Budinski, I. (2012c): [Final Report of Monitoring of Forest Birds on Maceljska Gora, Kamena Gora i Čemernica and Peregrine Falcon in Hrvatsko Zagorje.] – Association BIOM for for State Institute for Nature Protection, Zagreb. (in Croatian)

Mikuska, T. (2009a): A review of recent knowledge on White-tailed Eagles in Croatia. – Denisia 27: 115–126.

Mikuska, T. (2009b): [Monitoring of White-tailed Eagle *Haliaeetus albicilla* population in Vukovar-Srijem County. Technical Report.] – Croatian Society for Protection of Birds and Nature, Osijek. (in Croatian)

Mikuska, T. (2010): [Monitoring of White-tailed Eagle *Haliaeetus albicilla* population in Vukovar-Srijem County. Technical Report.] – Croatian Society for Protection of Birds and Nature, Osijek. (in Croatian)

Mikuška, T. & Livak, P. (2010): [Monitoring of population status of the White-tailed Eagle, Ferruginous Duck, Otter and Beaver at Poljana fishpond.] – Croatian Society for Protection of Birds and Nature, Osijek. (in Croatian)

Mikuska, T., Šetina, M., Šetina, N., Andrić, V. & Hucaljuk, M. (2010): [Monitoring of White-tailed Eagle *Haliaeetus albicilla* population in Brod-Posavina County. Technical Report.] – Croatian Society for Protection of Birds and Nature, Osijek. (in Croatian)

Mikuska, T., Šetina, M., Šetina, N., Andrić, V., Hucaljuk, M. & Pavičić, M. (2012): [Monitoring of White-tailed Eagle *Haliaeetus albicilla* population in Brod-Posavina County. Technical Report.] – Croatian Society for Protection of Birds and Nature, Osijek. (in Croatian)

Narodne novine (2005): Nature Protection Act (NN 70/05).

Narodne novine (2008): Act on Amendments to the Nature Protection Act (NN 139/08).

Narodne novine (2011): Act on Amendments to the Nature Protection Act (NN 57/11).

Probst, R & Gaborik, A. (eds.) (2012): Action Plan for the conservation of the White-tailed Sea Eagle (*Haliaeetus albicilla*) along the Danube. Nature and Environment 163. – Council of Europe, Strasbourg.

Premuda, G., Gustin, M., Pandolfi, M., Sonet, L. & Cento, M. (2008): Spring raptor migration along the Adriatic coast (Italy): a comparative study over three sites. – Avocetta 32: 13–20.

Radović, D. (2010): [Monitoring of selected bird species and important bird areas in 2010 in Mediterranean and Alpine biogeographical region in Croatia. Technical Report.] – Croatian Ornithological Society for State Institute for Nature Protection, Zagreb. (in Croatian)

Radović, A. & Mikuska, T. (2009a): Population size, distribution and habitat selection of the white-tailed eagle *Haliaeetus albicilla* in the alluvial wetlands of Croatia. – Biologia (Bratislava) 64 (1): 156–164.

Radović, A. & Mikuska, T. (2009b): Testing the effect of persecution and permanent dispersion of sub-adult birds in long-term sustainability of white tailed eagles (*Haliaeetus albicilla* L.) population at different management options in Croatia. – Acta Zoologica Academiae Scientiarum Hungaricae 55 (4): 395–407.

Radović, D. & Ilić, B. (2011): [Monitoring of Eurasian Eagle-owl (*Bubo bubo*) breeding population in Neretva

River Valley in 2010–2011. Technical report.] – Croatian Ornithological Society for State Institute for Nature Protection, Zagreb. (in Croatian)

Radović, D. & Lolić, I. (2011a): [Monitoring of Wintering Birds in Reedbeds of Ornithological Reserve Vransko jezero in 2007–2011. Technical Report.] – Croatian Ornithological Society for State Institute for Nature Protection, Zagreb. (in Croatian)

Radović, D. & Lolić, I. (2011b): [Monitoring of Breeding Birds in Reedbeds of Ornithological Reserve Vransko jezero in 2009–2011. Technical Report.] – Croatian Ornithological Society for State Institute for Nature Protection, Zagreb. (in Croatian)

Radović, D. & Crnković, R. (2012): [Monitoring of Yelkouan Shearwater (*Puffinus yelkouan*), Cory's Shearwater (*Calonectris diomedea*), Audouin's Gull (*Larus audouiini*), Peregrine Falcon (*Falco peregrinus*) and Eleonora's Falcon (*Falco eleonorae*) in Lastovsko otočje Nature Park. Technical report.] – Croatian Ornithological Society for State Institute for Nature Protection, Zagreb. (in Croatian)

Rucner, D. (1998): [The birds of Croatian Adriatic coast.] – Hrvatski prirodoslovni muzej & Ministarstvo razvitka i obnove, Zagreb. (in Croatian)

Schneider-Jacoby, M. (2001): Lastovo – a new bottleneck site for the migratory Honey Buzzards *Pernis apivorus*?. – Acrocephalus 22 (108): 163–165.

Sušić, G. & Radek, V. (2010): [Action plan for Conservation of the Last Population of Griffon Vulture (*Gyps fulvus*) in Croatia. Draft.] – Eko-center Caput Insulae – Beli for Nature Protection Directorate of Croatian Ministry of Culture, Beli-Cres. (in Croatian)

Šćetarić Legan, V. & Piasevoli, G. (2005): The spread and population dynamic of Eleonora's Falcon (*Falco eleonorae* Gene 1839) on the Middle Dalmatian Islands (2000–2004). – Ekoloji 14 (56): 26–29.

Tutiš, V., Kralj, J., Radović, D., Ćiković, D. & Barišić, S. (*in print*): [Red Data Book of Birds of Croatia.] – Ministry of Environmental and Nature Protection & State Institute for Nature Protection, Zagreb. (in Croatian, English summary)

Wetlands International (2013): International Waterbird Census Overview 2012. African-Eurasian Region. – [http://www.wetlands.org/WatchRead/Currentpublications/tabid/56/mod/1570/articleType/ArticleView/articleId/3424/Default.aspx], 18/5/2013.

Arrived / Prispelo: 27. 3. 2013
Accepted / Sprejeto: 1. 7. 2013

APPENDIX 1 / DODATEK 1

An overview of raptor monitoring programmes in Croatia

Pregled programov monitoringa za ptice roparice na Hrvaškem

Duration – start year of the programme (all species are monitored on annual basis)
Geographical scale – national (N), regional (R), local (L)
Season – breeding (B), migration (M), wintering (W)
Population parameters – wintering population size (individuals) (WP), breeding population size (pairs) (BP), Abundance index (indices) (AI), breeding success (BS), nest monitoring (NM), causes of death (CD), dispersal monitoring (DM)
Monitoring methods – simultaneous counts of individuals on several sites within IWC scheme (IWC), territory mapping (TM), nest search (NS), counts of individuals (CI), counting of flying individuals from boat (CFI), nest surveillance (NSUR)

* Since 2000 extinct from Paklenica NP
** Initial stage of preparation
*** Mapping of hydrological changes in Drava River / water management works

Sources:
(1) Grlica & Grlica (2010), (2) Grlica & Grlica (2011a), (3) Grlica & Grlica (2011b), (4) Leskovar *et. al.* (2011), (5) Lukač (2011), (6) Lukač *et. al.* (2003), (7) Mellone *et al.* (*in press*), (8) Mikulić *et. al.* (2012a), (9) Mikulić *et. al.* (2012b), (10) Mikulić *et. al.* (2012c), (11) Mikuska (2009), (12) Mikuska (2010), (13) Mikuška & Livak (2010), (14) Mikuška *et. al.* (2010), (15) Mikuška *et. al.* (2012), (16) Radović (2010), (17) Radović & Ilić (2011), (18) Radović & Lolić (2011a & 2011b), (19) Radović & Crnković (2012), (20) Šćetarić Legan & Piasevolli (2005), (21) Sušić & Radek (2010), (22) T. Mikuška (*pers. comm.*), (23) V. Tutiš (*pers. comm.*)

Abbreviations:
BIOM – Association BIOM (Udruga BIOM); CSPBN – Croatian Society for the Protection of Birds and Nature (Hrvatsko društvo za zaštitu ptica i prirode); COS – Croatian Ornithological Society (Hrvatsko ornitološko društvo); NHSD – Natural History Society "Drava" (Prirodoslovno društvo Drava); IOO – Institute of Ornithology – Croatian Academy of Science and Arts; ECCIB – Eco-Center Caput Insulae – Beli; PI – Public Institution

Continuation of Appendix 1 / Nadaljevanje dodatka 1

Species/ Vrsta	Duration/ Trajanje	Geographical scale/ Geografski obseg	Researcher and Organisation/ Raziskovalec in organizacija	Season/ Obdobje	Population parameters/ Populacijski parametri	Environmental parameters/ Okoljski parametri	Monitoring methods/ Metode monitoringa	Individual marking/ Označevanje osebkov	Sources/ Viri
Honey Buzzard *Pernis apivorus*	1996	L (Paklenica NP)	G. Lukač / PI Paklenica NP	B	BP	no	TM	No	5
	2008	L (Mura, Drava and Danube Rivers)	I.D. Grlica / NHSD	B	AI	***	TM		3
Black Kite *Milvus migrans*	1999	R (Continental part of Croatia)	T. Mikuska / CSPBN	W	WP	no	IWC	no	22
	2008	L (Mura, Drava and Danube Rivers)	I.D. Grlica / NHSD	B, M	AI	***	TM		3
Red Kite *Milvus milvus*	2004	R (Baranya region)	T. Mikuska / CSPBN	W	WP	no	IWC	no	22
White-tailed Eagle *Haliaeetus albicilla*	1993	R (Continental part of Croatia)	T. Mikuska / CSPBN	W	WP	no	IWC	no	22
	1998	L (Kopački rit Nature park)	T. Mikuska / CSPBN; Kopački rit Management office	B	BP, BS	yes	NSUR	yes	22
	2003	L (Lonjsko polje Nature park)	Lonjsko polje Management office	B	BP, BS	yes	NSUR	no	22
	2009	L (Vukovar-Srijem County)	T. Mikuska / CSPBN; Vukovar-Srijem County management office	B	BP, BS	yes	NSUR	yes	11, 12
	2010	L (Brod-Posavina County)	T. Mikuska / CSPBN; Brod-Posavina County management office	B	BP, BS	yes	NSUR	yes	14, 15, 22
	2010	L (Požega-Slavonia County)	T. Mikuska / CSPBN; Požega-Slavonia County management office	B	BP, BS	yes	NSUR	no	13, 15
	2004	L (Pokupsko depression)	K. Leskovar, D. Radović/ COS	B	BP, BS	no	TM, NSUR	yes	4
	2005	L (Mura, Drava and Danube Rivers)	I.D. Grlica / NHSD	B	AI	no	TM	no	3

Continuation of Appendix 1 / Nadaljevanje dodatka 1

Species/ Vrsta	Duration/ Trajanje	Geographical scale/ Geografski obseg	Researcher and Organisation/ Raziskovalec in organizacija	Season/ Obdobje	Population parameters/ Populacijski parametri	Environmental parameters/ Okoljski parametri	Monitoring methods/ Metode monitoringa	Individual marking/ Označevanje osebkov	Sources/ Viri
Griffon Vulture *Gyps fulvus*	1996–99*	L (Paklenica NP)	G. Lukač / PI Paklenica NP	B	BP	nest height, orientation	TM, NS	no	5, 6
	1990	N	G. Sušić / IOO and ECCIB	B	BP, BS, CD, DM	yes	NS	metal-rings, colour-rings, wingtags, satellite tracking	21
Short-toed Eagle *Circaetus gallicus*	1996	L (Paklenica NP)	G. Lukač / PI Paklenica NP	B	BP	no	TM, NS	no	5
Marsh Harrier *Circus aeruginosus*	2007	L (Vransko jezero ornithological reserve)	I. Lolić / COS	B, W	WP, BP	no	TM	no	18
	1993	R (Continental part of Croatia)	T. Mikuska / CSPBN	W	WP	no	IWC	no	22
	2008	L (Mura, Drava and Danube Rivers)	I.D. Grlica / NHSD	B, M, W	AI	***	CI		3
Hen Harrier *Circus cyaneus*	1999	R (Continental part of Croatia)	T. Mikuska / CSPBN	W	WP	no	IWC	no	22
	2008	L (Mura, Drava and Danube Rivers)	I.D. Grlica / NHSD	M, W	AI	***	CI		3
Montagu's Harrier *Circus pygargus*	2005	L (Paklenica NP)	G. Lukač / PI Paklenica NP	B	BP	no	TM (courtship flyghts)	no	5
Goshawk *Accipiter gentilis*	1999	R (Continental part of Croatia)	T. Mikuska / CSPBN	W	WP	no	IWC	no	22
	1996	L (Paklenica NP)	G. Lukač / PI Paklenica NP	B	BP	no	TM	no	5
	2008	L (Mura, Drava and Danube Rivers)	I.D. Grlica / NHSD	B	AI	***	TM	no	3

Continuation of Appendix 1 / Nadaljevanje dodatka 1

Species/ Vrsta	Duration/ Trajanje	Geographical scale/ Geografski obseg	Researcher and Organisation/ Raziskovalec in organizacija	Season/ Obdobje	Population parameters/ Populacijski parametri	Environmental parameters/ Okoljski parametri	Monitoring methods/ Metode monitoringa	Individual marking/ Označevanje osebkov	Sources/ Viri
Sparrowhawk *Accipiter nisus*	1999	R (Continental part of Croatia)	T. Mikuska / CSPBN	W	WP	no	IWC	no	22
	1996	L (Paklenica NP)	G. Lukač / PI Paklenica NP	B	BP	no	TM, NS	no	5
	2008	L (Mura, Drava and Danube Rivers)	I.D. Grlica / NHSD	B	AI	***	TM		3
Buzzard *Buteo buteo*	1999	R (Continental part of Croatia)	T. Mikuska / CSPBN	W	WP	no	IWC	no	22
	2008	L (Mura, Drava and Danube Rivers)	I.D. Grlica / NHSD	B	AI	***	TM		3
	2007	L (Baranja and Srijem)	I.D. Grlica / NHSD	B	AI	no	NS (electricity pylons)		1
	1996	L (Paklenica NP)	G. Lukač / PI Paklenica NP	B	BP	no	TM	no	5
Rough-legged Buzzard *Buteo lagopus*	1999	R (Continental part of Croatia)	T. Mikuska / CSPBN	W	WP	no	IWC	no	22
Greater Spotted Eagle *Aquila clanga*	1999	R (Continental part of Croatia)	T. Mikuska / CSPBN	W	WP	no	IWC	no	22
Golden Eagle *Aquila chrysaetos*	1996	L (Paklenica NP)	G. Lukač / PI Paklenica NP	B	BP	no	TM, NS	no	5
	2012	N	K. Mikulić, V. Lucić, I. Budinski / BIOM	B	BP, BS	yes	TM, NS	no	8
Lesser Kestrel *Falco naumanni*	2010	N	K. Mikulić., V. Lucić, I. Budinski / BIOM	B, M	BP, NM	yes	CFI, NS	no	9
Kestrel *Falco tinnunculus*	1999	R (Continental part of Croatia)	T. Mikuska / CSPBN	W	WP	no	IWC	no	22
	1996	L (Paklenica NP)	G. Lukač / PI Paklenica NP	B	BP	no	TM, NS	no	5
	2008	L (Mura, Drava and Danube Rivers)	I.D. Grlica / NHSD	B, M, W	AI	***	TM		3
	2007	L (Baranja and Srijem)	I.D. Grlica / NHSD	B	AI	no	NS (electricity pylons)		1

Continuation of Appendix 1 / Nadaljevanje dodatka 1

Species/ Vrsta	Duration/ Trajanje	Geographical scale/ Geografski obseg	Researcher and Organisation/ Raziskovalec in organizacija	Season/ Obdobje	Population parameters/ Populacijski parametri	Environmental parameters/ Okoljski parametri	Monitoring methods/ Metode monitoringa	Individual marking/ Označevanje osebkov	Sources/ Viri
Merlin *Falco columbarius*	1999	R (Continental part of Croatia)	T. Mikuska / CSPBN	W	WP	no	IWC	no	22
Hobby *Falco subbuteo*	2007	L (Baranja and Srijem)	I.D. Grlica / NHSD	B	AI	no	NS (electricity pylons)		1
Eleonora's Falcon *Falco eleonorae*	1998	N	Gvido Piasevolli PI/NGO Falco & Dalmatian Nature PI; Vlatka Šćetarić / NGO Eleonora; Ivica Lolić, R.Crnković / COS; Nature Park Lastovsko otočje management office	B	BP, NM	yes	CFI, NS, nest camera system (since 2012) on one site	metal rings, satellite tracking	7, 16, 19, 20
Saker Falcon *Falco cherrug*	2007	N	I.D. Grlica / NHSD	B	BP, BS	no	NS (electricity pylons)	metal-rings	2
Peregrine Falcon *Falco peregrinus*	1999	R (Continental part of Croatia)	T. Mikuska / CSPBN	W	WP	no	IWC	no	22
	2009	R (NW Croatia - Zagorje and Žumberak)	K. Mikulić, I. Sever, T. Klanfar, V. Lucić / BIOM	B	BP, BS	no	NS	colour-rings	10
Scops Owl *Otus scops*	1996	L (Paklenica NP)	G. Lukač / PI Paklenica NP	B	BP	no	TM	no	5
Eagle Owl *Bubo bubo*	2010	L (Neretva River valley)	B. Ilić / COS	B	BP	no	TM	no	17
	1996	L (Paklenica NP)	G. Lukač / PI Paklenica NP	B	BP	no	TM	no	5
Ural Owl *Strix uralensis*	**	L (NP Sjeverni Velebit and NP Plitvička jezera	PI NP Sjeverni Velebit; PI NP Plitvička jezera; IOO	B	AI	no	TM (playback survey)	no	23
	2010	L (Central part of the Velika Kapela Mt - Gorski kotar)	V. Tutiš/ IOO	B	AI, BS	no	nest-box scheme (100 nb/150 km^2)	metal-rings	23

Acrocephalus 33 (154/155): 203–215, 2012
10.2478/v10100-012-0007-7

An overview of monitoring *for* raptors in Finland

Pregled monitoringa populacij ptic roparic na Finskem

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In Finland, population monitoring for both diurnal and nocturnal raptors has been almost entirely based on fieldwork carried out by voluntary raptor ringers. Responsible organisations include the Finnish Museum of Natural History, with economic support for administration from the Ministry of Environment, "Metsähallitus" (former National Board of Forestry) and WWF Finland. Since the early 1970s, numbers and productivity of four endangered species, the White-tailed Eagle *Haliaeetus albicilla*, Golden Eagle *Aquila chrysaetos*, Osprey *Pandion haliaetus* and Peregrine Falcon *Falco peregrinus* have been monitored by country-wide Comprehensive Surveys, with the aim of checking all known nest sites of these species every year. The Gyrfalcon *F. rusticolus* was included in this group in the late 1990s. Data for monitoring the populations of the other raptor species have been gathered by the Raptor Grid and Raptor Questionnaire projects. The Raptor Grid project produces annual population indices, which are calculated from the data collected from 10 × 10 km study plots (n = ca. 130/year) and quite well reflect the annual population fluctuations and long-term trends of seven common species of diurnal and six species of nocturnal raptors breeding in the southern part of Finland. For the rest of the species, which are either rare all over Finland or breed mostly in the north, outside the good coverage of the distribution of Raptor Grid study plots, conclusions on population changes are based on the total numbers of occupied territories and active nests reported annually by the Raptor Questionnaires.

Key words: monitoring for raptors, diurnal raptors, owls, Finnland
Ključne besede: monitoring populacij, ujede, sove, Finska

1. Introduction

Population monitoring is an absolute prerequisite and basis of conservation and sound management programmes. This means that regular surveys and well-planned long-term monitoring programmes should be included in official duties of every government of our continuously and rapidly changing world, and implies that all monitoring programmes should be funded by public resources. However, in our real world, in the competition of resources, short-sighted economic interests and human welfare instigate worries about the future of other animal and plant species and our entire environment. Thus, nature conservation in Finland, as in most other countries, has largely been based on activities of idealistic and responsible individuals and NGOs.

Monitoring of raptor populations is important firstly because the raptors have suffered more than many other groups from negative impacts caused by people (e.g. persecution, contaminants and habitat destruction; Newton 1979) and secondly, because they are at the top of their food chains, with changes in their numbers, productivity and survival reflecting changes in the environment of other species, including man (Sergio *et al.* 2006).

In Finland, the Finnish Nature Conservation Society organised the first Peregrine Falcon *Falco peregrinus* and Golden Eagle *Aquila chrysaetos* surveys as early as in the 1950s (see Saurola 1976). In the early 1970s, *Project Pandion*, systematic and nationwide monitoring of the Osprey *Pandion haliaetus* was initiated on the basis of voluntary work by bird ringers (Saurola 1980), and the WWF

Finland took the responsibility to monitor and save the vanishing population of the White-tailed Eagle *Haliaeetus albicilla* (Saurola 1976). Finally, in 1982, a new project to monitor "common" birds of prey based on voluntary fieldwork of ringers was launched (Saurola 1985a).

Description and evaluation of monitoring *for* diurnal and nocturnal birds of prey in Finland has been published recently and is not repeated here in detail (see Saurola 2006, 2008 & 2009). The main aim of this overview is to give answers to the questions raised by the EURAPMON to get a comparable view on the state-of-the-art of raptor monitoring in different parts of Europe. In addition, some selected examples of the updated results produced by different Finnish monitoring projects are given at the end of this contribution. Note: "raptor" includes here both diurnal and nocturnal birds of prey.

2. Questions raised by the EURAPMON

2.1. Main players

In Finland, the present main actors in monitoring *for* raptors are the Finnish Museum of Natural History, Ministry of Environment, "Metsähallitus" (former National Board of Forestry), WWF Finland and, the most important, raptor ringers. The Finnish Museum of Natural History is responsible for monitoring the Osprey population (started in 1971; Saurola 2011) and for two projects, the *Raptor Grid* (1982–) and *Raptor Questionnaire* (1986–) monitoring "common" raptors (Saurola 2006, Honkala *et al.* 2011). The Ministry of Environment has supported these projects by giving extra resources needed for the office work. Metsähallitus is responsible for monitoring the Golden Eagle (1971–; Ollila & Koskimies 2008, Ollila 2012), Peregrine Falcon (1974–; Ollila & Koskimies 2008) and Gyrfalcon *F. rusticolus* (1998–; Koskimies & Ollila 2009) since 1998; and WWF Finland is responsible for monitoring the White-tailed Eagle (1973–; Stjernberg *et al.* 2011).

Before obtaining a ringing licence, every Finnish bird ringer must have passed an exam, which proves that he is a high class field ornithologist and well aware of all aspects of bird protection (see Saurola *et al.* 2013). Thus, raptor ringers are an important voluntary resource with professional skills and are used for all fieldwork needed to monitor breeding raptors in Finland.

In addition to the monitoring projects carried out during the breeding season, migrating raptors have been counted systematically at the Hanko Bird Observatory located at the south-western corner of Finland's mainland (Lehikoinen *et al.* 2008).

Several international meetings have been arranged between Nordic researches working on the Golden Eagle, White-tailed Eagle, Peregrine Falcon and Gyrfalcon. Co-operation between Estonian, Latvian and Finnish raptor researchers has been close. Recently, a workshop was arranged to improve the co-operation between Russian and Finnish raptor researchers (see Koskimies & Lapshin 2006).

The main users of the results of raptor monitoring are Finnish government officials, European Commission, raptor researchers and conservation NGOs, i.e. all those in need of information on the population status and trends of Finnish raptors.

2.2. National coverage

In principle, all monitoring *for* raptors is co-ordinated nation-wide (Saurola 2008). *National network* is the network of raptor ringers, which means that the coverage of activities is, in practice, much better in the southern than northern parts of the country.

The goal of monitoring *for* the Osprey, White-tailed Eagle, Golden Eagle, Peregrine Falcon and Gyrfalcon populations is an annual *Comprehensive Survey* (Saurola 2008). In principle, all known territories all over the country are checked each year to obtain precise information on the annual breeding performance of these species.

Monitoring of the other, "common" raptor species, is patchy and concentrated to the southern half of the country. Voluntary ringers devoted to raptors have been encouraged to participate in the *Raptor Grid* monitoring project. This means that the ringers were asked (1) to join in teams, (2) to select a 10 × 10 km study plot based on the Finnish National Grid and (3) to try to locate active nests or at least occupied territories of raptors within their study plot by using the same searching effort from year to year (Saurola 1985a & 2006). In 2011, for example, 130 Raptor Grid 10 × 10 km study plots were surveyed (Honkala *et al.* 2012) (Figure 1). On the basis of these data from Raptor Grid it is possible to calculate relevant annual population indices and long-term trends for common raptors breeding in the southern half of Finland (Saurola 2008) (see also Figures 4 and 5).

In addition, information (1) on the total numbers of potential territories checked, (2) on the totals of active nests and occupied territories found and (3) on the breeding performance (clutch size and brood size) assessed by the ringers have been collected annually by using the *Raptor Questionnaire.* Because the data have been collected by the territories of local ornithological

societies, the population fluctuations in space and time can be detected (see Figure 6). The total number of breeding attempts of raptors is highly dependent on the phase of the vole cycle. In a top vole year 2009, 379 Raptor Questionnaires were filled by 256 individual raptor ringers or teams. Altogether, 47,767 potential nest sites of "common" diurnal and nocturnal raptors were inspected, 18,581 occupied territories detected as well as 12,259 breeding attempts verified and breeding performance reported (Honkala *et al.* 2010). In contrast, in a poor vole year 2010, when the number of potential nest sites checked was 43,514, only 9,068 occupied territories and 5,357 active nests were found and reported (Honkala *et al.* 2011). The Raptor Questionnaire is vital (1) in obtaining at least some information on population changes of species not covered by the Raptor Grid project and (2) in monitoring annual productivity of all raptor species.

2.3. Key species and key issues

Population status and trends of all raptor species breeding in Finland have been monitored during the last 30 years (Saurola 2008). If it is necessary to select some "key species", selection could be based e.g. on the specific IUCN category used in the national Red List.

The latest Finnish Red List of Birds included 14 species of raptors (Rassi *et al.* 2010). Of these, the Black Kite *Milvus migrans,* Greater Spotted Eagle *A. clanga*, and Snowy Owl *Bubo scandiacus* were classified as Critically Endangered (CR); Montagu's Harrier *Circus pygargus* and Gyrfalcon Endangered (EN); Honey Buzzard *Pernis apivorus,* White-tailed Eagle, Hen Harrier *C. cyaneus*, Buzzard *Buteo buteo*, Golden Eagle and Peregrine Falcon Vulnerable (VU); and Osprey, Eagle Owl *B. bubo* and Tengmalm´s Owl *Aegolius funereus* Near Threatened (NT).

All these 14 species could be defined as key species for monitoring *for* raptors, because these species need special protection and conservation measures. In addition, some of these species (e.g. the Osprey, White-tailed Eagle and Peregrine Falcon) can also be used as key indicators (sentinels) of the welfare of ecosystems in general (e.g. Helander *et al.* 2008, Henny *et al.* 2010).

At present, the most important "key issue" (threat) addressed by monitoring *for* raptors in Finland is land use, especially modern commercial forestry, which has reduced both the area of optimal habitat and availability of suitable nest sites needed by forest-dwelling species (Saurola 1997, 2008 & 2011, Saurola & Björklund 2011). Many other human related factors like direct persecution, environmental contaminants, traffic, power lines, wind turbines, fishing and disturbances during the breeding period may have an additional negative effect on the population trends of Finnish raptors (e.g. Saurola *et al.* 2013).

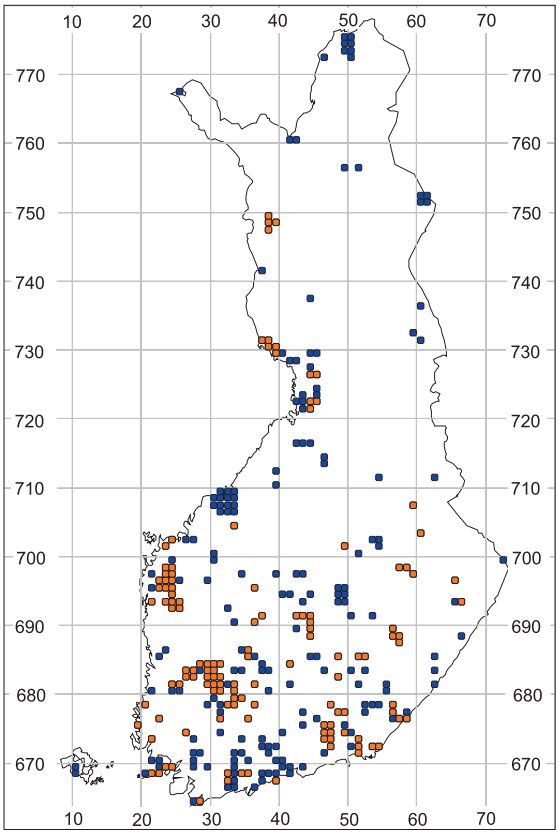

Figure 1: The locations of the 10 × 10 km study plots based on the Finnish National Grid. The plots studied at least once in 1982–2010 are depicted in blue, and the ones studied in 2011 in orange. The grid lines shown are 100 × 100 km (after Honkala *et al.* 2012).

Slika 1: Lokacije 10 × 10 km velikih popisnih ploskev, ki temeljijo na finski Nacionalni mreži. Ploskve, ki so bile v obdobju 1982–2010 preučevane najmanj enkrat, so obarvane modro, v letu 2011 preučevane ploskve pa oranžno. Prikazane mrežne črte so 100 × 100 km (po Honkala *et al.* 2012).

International networking gives the opportunity to compare the population trends detected in Finland with the corresponding trends in neighbouring countries and other parts of Europe.

2.4. Strengths and weaknesses

The main strength of monitoring *for* raptors in Finland is the availability of professional level manpower for fieldwork comprised by voluntary

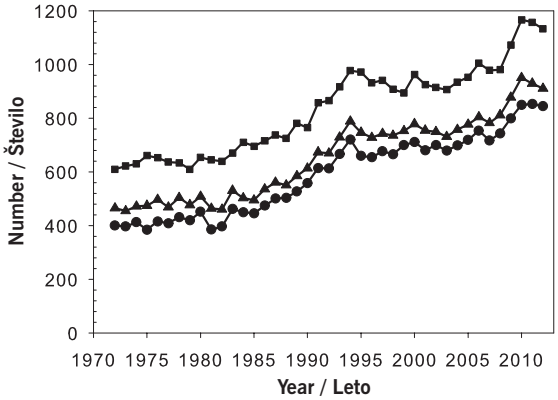

Figure 2: Annual numbers of occupied territories (squares), active nests (triangles) and successful nests (dots) of the Osprey *Pandion haliaetus* reported by the Finnish nationwide *Project Pandion* during the 1972–2012 period

Slika 2: Letna števila zasedenih teritorijev (kvadrati), aktivnih gnezd (trikotniki) in uspešnih gnezd (pike) ribjega orla *Pandion haliaetus*, zabeležena v okviru vsedržavnega *Projekta Pandion* v obdobju 1972–2012

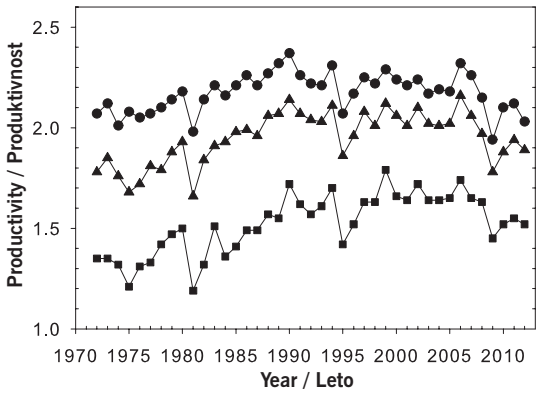

Figure 3: Average annual productivity of the Osprey *Pandion haliaetus* in 1972–2012; square – nestlings/occupied territory, triangle – nestlings/active nest, dot – nestlings/successful nest

Slika 3: Povprečna letna produktivnost ribjega orla *Pandion haliaetus* v obdobju 1972–2012; kvadrat – mladiči/zasedeni teritorij, trikotnik – mladiči/aktivno gnezdo, pika – mladiči/uspešno gnezdo

ringers and other trained amateur ornithologists interested in raptors. Very important strength of the Finnish raptor monitoring is the production of series of regular annual monitoring reports. The motivation of fieldworkers is maintained by these reports (in Finnish with English summaries and captions), which demonstrate the yearly fluctuations and long-term trends of different raptor species and the value of fieldwork carried out (e.g. Honkala *et al.* 2010, 2011 & 2012, Stjernberg *et al.* 2011, Saurola 2011 & 2012, Ollila 2012). Further, in addition to all ringing, recovery, recapture and resighting data, all monitoring data gathered by the Finnish Ringing Centre are stored in the Oracle Database Management System installed in the mainframe computer of the University of Helsinki and, thus, efficiently available, when needed for research and conservation (see Saurola *et al.* 2013).

The main weakness is the fact that the distribution of ringers is concentrated to the southern half of Finland. For this reason, the amount of data is not sufficient (1) to keep track of the status of the Critically Endangered Snowy Owl, and (2) for estimating reliable population trends of the "common" species breeding mainly in the northern half of the country like the Rough-legged Buzzard *B. lagopus*, Hen Harrier, Merlin *F. columbarius*, Hawk Owl *Surnia ulula*, Great Grey Owl *Strix nebulosa* and Short-eared Owl *Asio flammeus*. The Rough-legged Buzzard, Snowy Owl, Hawk Owl, Great Grey Owl and Short-eared Owl are at least partly nomadic species, which may change their breeding area thousands of kilometres depending on the fluctuations of their cyclic food, voles and lemmings. International co-operation is urgently needed to monitor population status and trends of these northern species, especially now, when the effects of global warming can only be speculated (Saurola 2009).

The other serious weakness is almost entire lack of reliable estimates of annual and long-term trends of survival of raptor species. To improve the situation, researchers and ringers have been encouraged to collect representative capture-recapture data needed to estimate survival of Finnish raptor species by using the new sophisticated statistical methods (see e.g. Saurola *et al.* 2003, Francis & Saurola 2008).

2.5. Priorities, capacity-building

At the moment, the highest priority to strengthen monitoring *for* both diurnal and nocturnal raptors in Finland should be given to the efforts to gather more relevant data from the northern half of the country. At least 20–30 new 10 × 10 km Raptor Grid study plots based on the National Grid and operating with standard effort from year-to-year should be urgently founded in the northern half of the country. Because this will not be possible only on the voluntary basis, extra national or/and international long-term funding is needed. Of course, more Raptor Grid study plots

would be welcome also in southern Finland, except that those study plots would have to be based on voluntary fieldwork.

3. Selected examples of results

3.1. Data collected

A rough idea of the amount of data on raptors collected annually in Finland is given in Tables 1 and 2. The tables show the highest numbers of (1) occupied territories and (2) active nests reported, and (3) nestlings ringed by Finnish ringers in the top year of the 1986–2012 period. The Greater Spotted Eagle, Montagu's Harrier, Pallid Harrier *C. macrourus* (first breeding record in 2011) and Black Kite are excluded from these tables, given that these species have always been very rare breeders in Finland, which is, in fact, situated outside the normal distribution area of these species.

3.2. Comprehensive Surveys

The Osprey has been selected here as an example of a species monitored by the Comprehensive Survey. The present estimate of the Finnish Osprey population is 1,300 pairs (Saurola 2011). In 2012, 2,046 potential nest sites of the Osprey were inspected; 1,133 occupied territories were detected, 911 of the nests were active, meaning that eggs were laid, and 845 successful with large young produced. The Finnish Osprey population remained at the same level through the 1970s, increased by 3% per year from 1982 to 1994 and has since remained relatively stable (Figure 2). The apparent increase during the very last years is at least partly due to the increased activity by ringers to construct artificial nests in the north-eastern part of the country. Also, the annual productivity increased steeply during the 1980s and has thereupon fluctuated at the same general level (Figure 3).

The positive trend can be attributed (1) to decreased persecution during migration and wintering (Saurola 1985b, Saurola *et al.* 2013), (2) to decreased impact of environmental toxicants (P. Saurola *unpubl.*) and (3) to construction of artificial nests to compensate for the losses of nest sites caused by the modern forestry procedures (Saurola 1997). Almost 50% of Finnish Ospreys breed in artificial nests constructed by voluntary ringers (Saurola 2011).

In the 1960s and 1970s, the Finnish populations of the White-tailed Eagle, Golden Eagle and Peregrine Falcon were on a very low level and even close to the verge of extinction (Saurola 1976). Careful monitoring through the decades indicates that the populations of all these three species have recovered well and are at the moment on 60-year record levels

Table 1: Diurnal raptors (Falconiformes): highest national totals per year during 1986–2012 of occupied territories and active nests with eggs laid at least, as reported by ringers, and nestlings ringed

Tabela 1. Ujede (Falconiformes): največja letna števila v obdobju 1986–2012 zasedenih teritorijev v državi in aktivnih gnezd vsaj z izleženimi jajci, o katerih so poročali obročkovalci, in število obročkanih mladičev

Species / Vrsta	No. of territories/ Št. teritorijev	No. of nests/ Št. gnezd	No. of nestlings ringed/ Št. obročkanih mladičev
Honey Buzzard *Pernis apivorus*	432	149	206
White-tailed Eagle *Haliaeetus albicilla*	386	304	267
Marsh Harrier *Circus aeruginosus*	402	209	418
Hen Harrier *Circus cyaneus*	294	47	123
Goshawk *Accipiter gentilis*	1,613	1,267	2,311
Sparrowhawk *Accipiter nisus*	753	462	1,248
Buzzard *Buteo buteo*	1,131	650	1,131
Rough-legged Buzzard *Buteo lagopus*	231	167	558
Golden Eagle *Aquila chrysaetos*	345	209	147
Osprey *Pandion haliaetus*	1,167	951	1,489
Kestrel *Falco tinnunculus*	3,496	3,189	12,645
Merlin *Falco columbarius*	100	57	110
Hobby *Falco subbuteo*	565	208	189
Gyrfalcon *Falco rusticolus*	32	22	26
Peregrine Falcon *Falco peregrinus*	194	173	359

Table 2: Nocturnal raptors (owls, Strigiformes): highest national totals per year during 1986–2012 of occupied territories and active nests reported by ringers, and nestlings ringed

Tabela 2. Nočne ptice roparice (sove Strigiformes): največja letna števila v obdobju 1986–2012 zasedenih teritorijev v državi in aktivnih gnezd, o katerih so poročali obročkovalci, in število obročkanih mladičev

Species / Vrsta	No. of territories/ Št. teritorijev	No. of nests/ Št. gnezd	No. of nestlings ringed/ Št. obročkanih mladičev
Eagle Owl *Bubo bubo*	1,106	537	854
Snowy Owl *Bubo scandiacus*	21	15	20
Hawk Owl *Surnia ulula*	182	120	399
Pygmy Owl *Glaucidium passerinum*	1,339	963	4,797
Tawny Owl *Strix aluco*	1,189	905	2,844
Ural Owl *Strix uralensis*	2,545	1,786	4,722
Great Grey Owl *Strix nebulosa*	145	103	200
Long-eared Owl *Asio otus*	1,486	1,135	554
Short-eared Owl *Asio flammeus*	581	298	532
Tengmalm's Owl *Aegolius funereus*	3,643	2,265	6,691

shown by the numbers in Table 1 (T. Stjernberg & T. Ollila *pers. comm.*). Very little is known about the Finnish Gyrfalcons before the start of this millennium; the population has probably fluctuated over the years around its present low level.

3.3. Raptor Grid

Annual population indices and long-term trends of six species of diurnal and six species of nocturnal raptors are shown in Figures 4 and 5.

Diurnal raptors

During the last three decades, the Honey Buzzard and Buzzard have been decreasing alarmingly steeply (Figure 4). The decreasing trend of the Goshawk *Accipiter gentilis* has not been as steep, but still statistically significant. Due to the modern commercial forestry, the amount of prime nesting habitat has continuously decreased and caused (1) increasing interspecific competition for high quality nesting sites between these forest-dwelling species and also (2) higher predation risk by the Goshawk on the nestlings of the other raptor species. Forestry has also caused a decrease of population densities in gallinaceous birds – important prey of the Goshawk (e.g. Sulkava 1964). Thus, the negative trends of these three medium-sized forest raptors are most probably connected with the effects of modern forestry (see Saurola 2008, Saurola & Björklund 2011).

In contrast to those typical forest-dwelling species mentioned above, the populations of three species breeding in more open habitats and independent of the effects of modern forestry have been increasing. The Kestrel *F. tinnunculus* and Marsh Harrier *C. aeruginosus* populations have increased steeply and the Hobby *F. subbuteo* moderately. The Kestrel has been recovering from the population crash in the 1960s and early 1970s. One of the important causes of the increase has been the effective nest box programme started by Erkki Korpimäki in the late 1970s (Valkama & Korpimäki 1999). According to the data from the Raptor Questionnaire, the number of artificial nests for small falcons (nearly all are nest boxes for Kestrels) has increased from 697 in 1986 to 7,003 in 2011. During the same period, the average productivity has increased because the nesting failures have decreased (see Figure 7).

The Marsh Harrier has extended its distribution towards the north during the last few decades, which have also been favourable for the Finnish population of the Hobby. No detailed studies on the causes of the success of these species are available.

Nocturnal raptors (Owls)

The Eagle Owl was increasing during the first decade of monitoring but, after that, has been on a continuous and very steep decrease (Figure 5). The increase phase can be attributed to (1) full protection since 1983, (2) increase of suitable open habitats (clear-cuts created by forestry) for nesting and hunting, and (3) year-round stable and rich food supply of Brown Rats *Rattus norvegicus* at the numerous poorly managed rubbish dumps. Since the mid-1990s, 90% of the local rubbish dumps have been closed. This dramatic change in food supply has surely been one of the

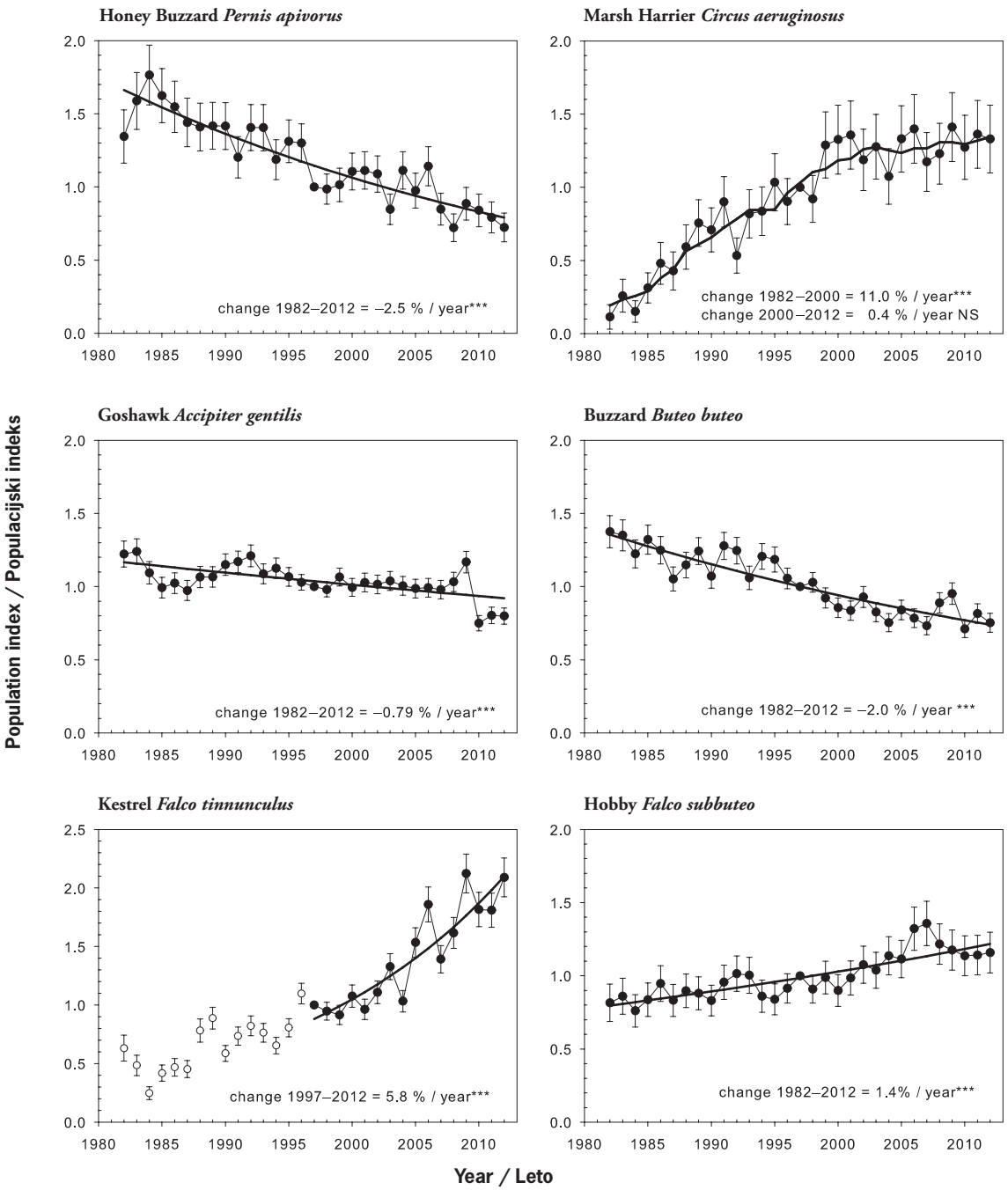

Figure 4: Annual population indices (dots) of six species of diurnal raptors, calculated from the numbers of occupied territories recorded on the *Raptor Grid* study plots during 1982–2012. Vertical bars indicate standard errors. Thick line = log-linear regression line, except in the panel of the Marsh Harrier = 7-point LOESS smoother (William 1978). Note: the indices of the Kestrel *Falco tinnunculus* from the 1982–1996 period are biased by the increasing number of nest boxes and not included in the estimation of population trend.

Slika 4: Letni populacijski indeksi (pike) šestih vrst uje, izračunani iz števila zasedenih teritorijev, zabeleženih v obdobju 1982–2012 na popisnih ploskvah *Mreža ptic roparic*. Stolpiči ponazarjajo standardne napake. Debela črta = log-linearna regresijska krivulja, razen pri rjavem lunju = 7-točkovni LOESS smoother (William 1978). Opomba: indeksi postovke *Falco tinnunculus* iz obdobja 1982–1996 so pristranski zaradi povečanega števila gnezdilnic in niso vključeni v oceno populacijskega trenda.

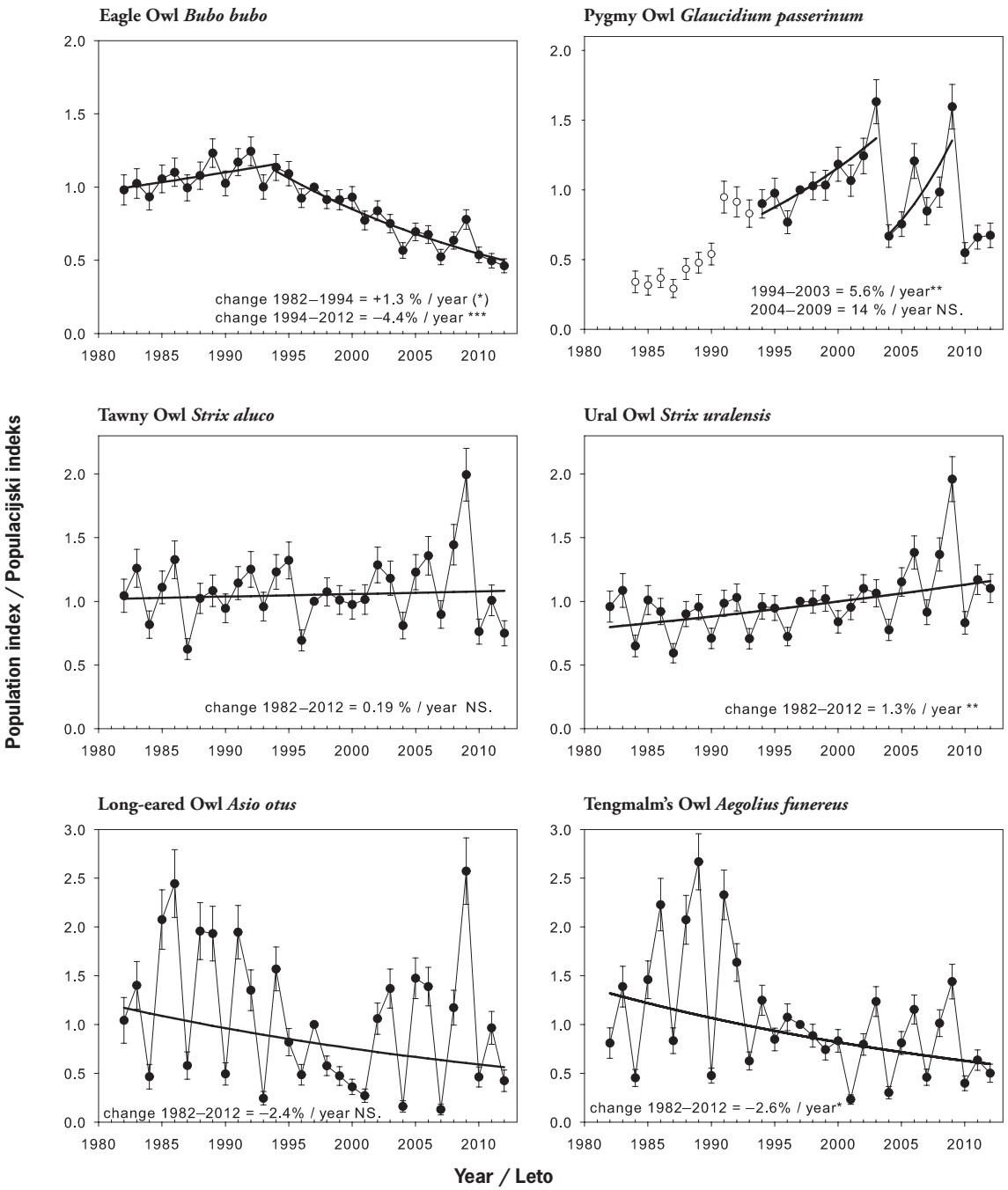

Figure 5: Annual population indices (dots) of six species of nocturnal raptors, calculated from the numbers of occupied territories recorded on the *Raptor Grid* study plots during 1982–2012. Vertical bars indicate standard errors. Thick line = log-linear regression line. Note: the indices of the Pygmy Owl *Glaucidium passerinum* from the 1984–1993 period are biased by the increasing number of nest boxes and not included in the estimation of population trends.

Slika 5: Letni populacijski indeksi (pike) šestih vrst sov, izračunani iz števila zasedenih teritorijev, zabeleženih v obdobju 1982–2012 na popisnih ploskvah *Mreža ptic roparic*. Stolpiči ponazarjajo standardne napake. Debela črta = log-linearna regresijska krivulja. Opomba: indeksi malega skovika *Glaucidium passerinum* iz obdobja 1984–1993 so pristranski zaradi povečanega števila gnezdilnic in niso vključeni v oceno populacijskih trendov.

most important factors causing the steep decline of the Finnish Eagle Owl population during the last two decades (Valkama & Saurola 2005, Saurola 2009).

The populations of the Tengmalm's Owl and Long-eared Owl *A. otus* have fluctuated widely according to their cyclic main prey, voles. In general, it is challenging to detect statistically significant long-term trends from widely scattered data set. In the Tengmalm's Owl, the decline is clear and significant, whereas in the Long-eared Owl, the trend is similar but not significant, mainly because of the record year 2009. The population decline of the Tengmalm's Owl has been attributed to the continuous degradation of forest habitat in Finland (for references, see Saurola 2009, Korpimäki & Hakkarainen 2012). No hypotheses have been proposed to explain the possible negative trend of the semi-nomadic Long-eared Owl population. Perhaps the "trend" happens to be an uncommon result of the nomadic life style of the species.

Of the two resident *Strix*-species, the population of the Ural Owl has been increasing, while the population of the Tawny Owl *S. aluco* has remained at the same level during the last decades. The welfare of both of these species and particularly of the Ural Owl is nowadays quite highly dependent on several thousands of nest boxes constructed by ringers. Some of the cavities made by the Black Woodpecker *Dryocopus martius* are large enough for the Tawny Owl. In contrast, most of the best natural nest sites of the Ural Owl, chimney-like old rotten stumps were some decades ago (not anymore) "cleaned" away by the foresters, and big old trees with large cavities had disappeared from Finnish forests long time ago. The Ural Owl is ready to breed in open stick nests constructed by the Goshawk and buzzards, but the breeding output seems to be much worse than in nest boxes.

Systematic monitoring of the breeding population and regular ringing activities at the bird observatories during the autumn have brought the pattern of the population changes of the Pygmy Owl *Glaucidium passerinum* to a new light (Saurola 2008 & 2009). The "increase" of the population during the first part of the monitoring period is heavily biased by the increase of the number of nest boxes constructed for the Pygmy Owls, because the detection probability of pairs breeding in nest boxes is higher than the ones breeding in woodpecker cavities. Since the mid-1990s, the data reflect the real changes in the population and indicate how the Pygmy Owl population has increased during favourable circumstances to a very high level and after that crashed owing to the strong autumn invasion in 2003 and 2009 detected at coastal bird observatories (e.g. Lehikoinen *et al.* 2011). The present data show that Pygmy Owls, which participated in the mass invasion, disappeared from the Finnish population. There are no data to show whether these owls started to breed elsewhere or did they simply die during the invasions, which seem to be an important part of the population regulation of the Pygmy Owl (Saurola 2008).

3.4. Raptor Questionnaire

Nests and territories

By the end of each breeding season, ringers have to report on the Raptor Questionnaire their data on breeding of all other raptor species except of the species monitored by the Comprehensive Surveys. Data from the Raptor Questionnaire are dependent on the variation of the activities of ringers and, if not corrected, may be in the worst case biased and even misleading. Keeping this potential source of error in mind, these data are "better-than-nothing", giving valuable additional information on numbers of nests and territories found in different parts of the country of all common species, also of the ones monitored by the Raptor Grid project, e.g. the Goshawk (Figure 6, but note that these data have not yet been corrected by taking the variation in ringers' activities into account).

For monitoring raptor species that are either rare or relatively common but breed in the northern or north-eastern parts of the country, the present distribution and number of Raptor Grid study plots are not representative enough for calculating annual indices (see Table 1 and 2). For these species, data from Raptor Questionnaire are the only piece of information on annual fluctuations and long-term trends (Figure 6).

The Hawk Owl is a true nomadic species: two nestlings ringed in Finland were encountered east of the Ural Mountains, almost 3,000 km to the east of their natal sites, and three others were found in southern Norway, 1,200–1,400 km southwest of their natal sites (Saurola 2002). Thus, the occurrence of Hawk Owls in Finland shown by the data from Raptor Questionnaire is as irregular as expected: during 1986–2012, the number of nests found per year has varied between 1 and 120!

According to the present knowledge, the Great Grey Owl is a semi-nomadic species: a part of the population is nomadic and the other part resident (Stefansson 1997, Saurola 2002). During 1986–2012, the annual total of active nests reported by the Raptor Questionnaire has varied a great deal, from 4 and 103 nests, but the population seems to have remained at the same general level. Contributions

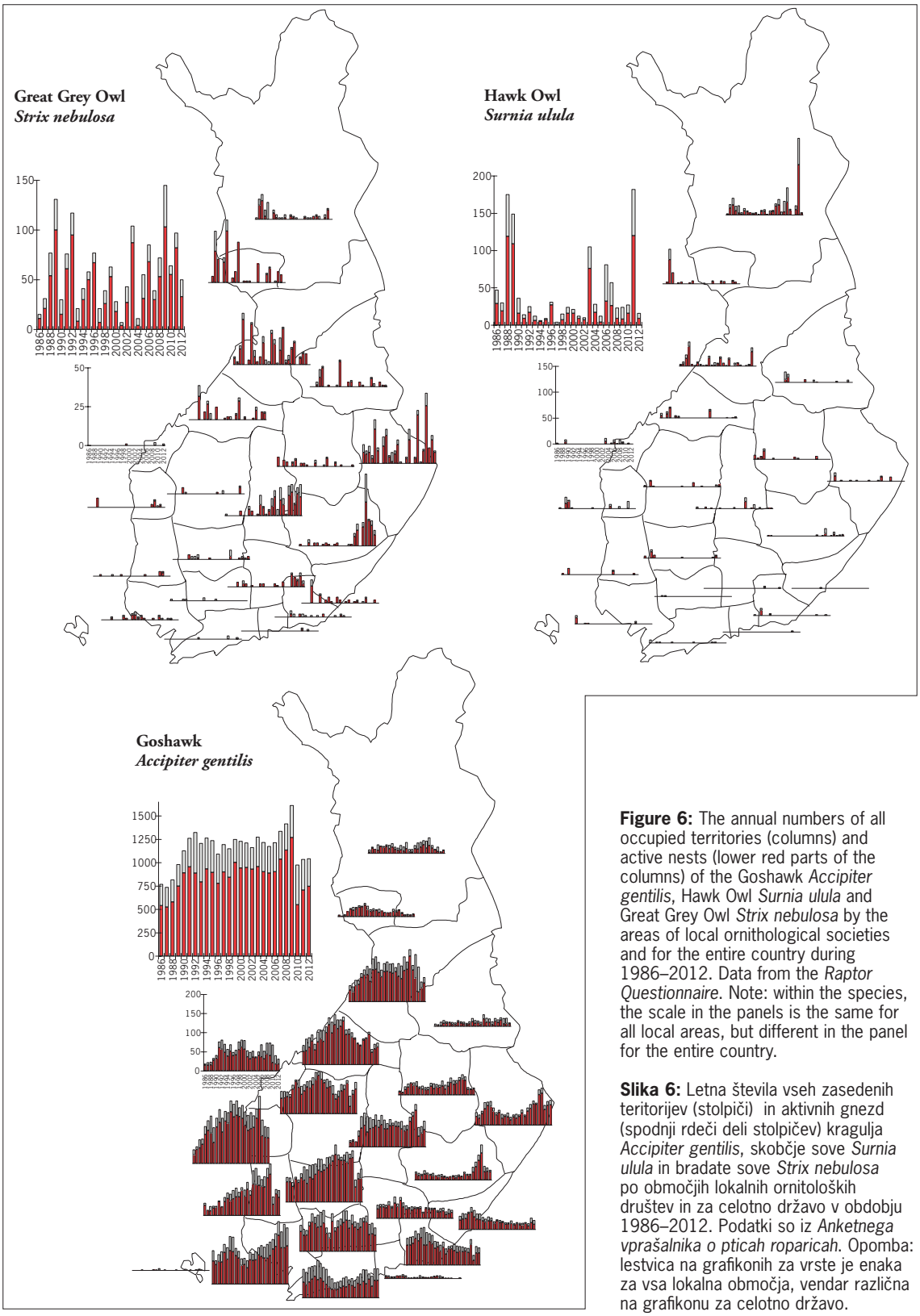

Figure 6: The annual numbers of all occupied territories (columns) and active nests (lower red parts of the columns) of the Goshawk *Accipiter gentilis*, Hawk Owl *Surnia ulula* and Great Grey Owl *Strix nebulosa* by the areas of local ornithological societies and for the entire country during 1986–2012. Data from the *Raptor Questionnaire*. Note: within the species, the scale in the panels is the same for all local areas, but different in the panel for the entire country.

Slika 6: Letna števila vseh zasedenih teritorijev (stolpiči) in aktivnih gnezd (spodnji rdeči deli stolpičev) kragulja *Accipiter gentilis*, skobčje sove *Surnia ulula* in bradate sove *Strix nebulosa* po območjih lokalnih ornitoloških društev in za celotno državo v obdobju 1986–2012. Podatki so iz *Anketnega vprašalnika o pticah roparicah*. Opomba: lestvica na grafikonih za vrste je enaka za vsa lokalna območja, vendar različna na grafikonu za celotno državo.

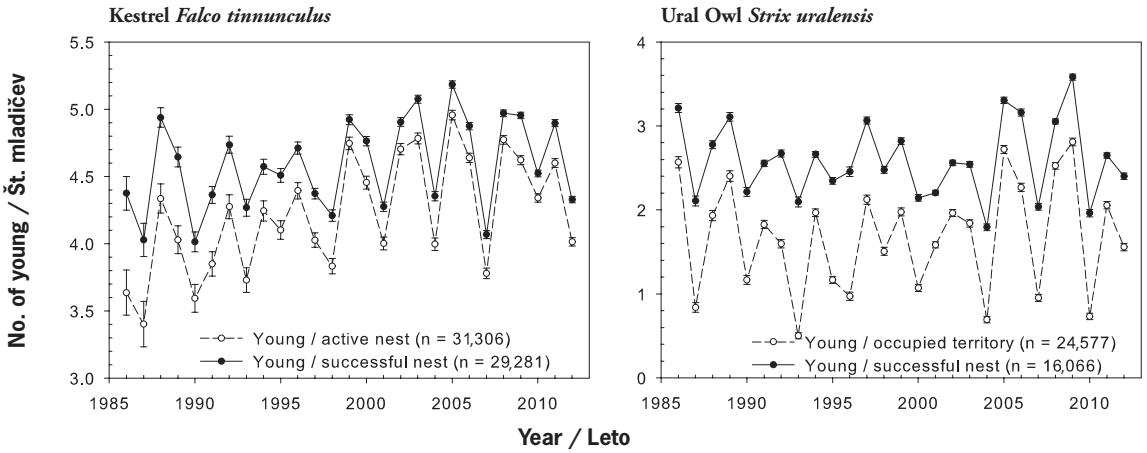

Figure 7: Average annual productivity of the Kestrel *Falco tinnunculus* and Ural Owl *Strix uralensis* during 1986–2012; filled circles – young/successful nest, open circles – young/active nest (Kestrel) or young/occupied territory (Ural Owl). Vertical bars indicate standard errors.

Slika 7: Povprečna letna produktivnost postovke *Falco tinnunculus* in kozače *Strix uralensis* v obdobju 1986–2012; polni krogci – mladiči/uspešno gnezdo, prazni krogci – mladiči/aktivno gnezdo (postovka) ali mladiči/zasedeni teritorij (kozača). Stolpiči ponazarjajo standardne napake.

from local areas to the national total have been very different from year to year, depending on the local fluctuations of vole populations and perhaps movements of the owls.

Productivity

In addition, the Raptor Questionnaire has produced important information for monitoring annual productivity of all raptor species, e.g. of the Kestrel and Ural Owl shown here as examples in Figure 7. The annual average productivity of the Kestrel seems to have increased during 1986–2012, although the annual fluctuations are large. This can probably be attributed to the increasing number of pairs breeding in nest boxes, where the risks of nesting failures caused by avian and mammalian predators are lower than in open stick nests. The average annual productivity of the Ural Owl varies also much from year to year according to the fluctuations of voles. Although the Ural Owl population has been slowly increasing, no long-term trend in productivity can be detected.

4. Concluding remarks

(1) Monitoring the three Critically Endangered and one Endangered raptor species is based on sporadic and random field observations made by amateur ornithologists around the country; only the Gyrfalcon has been systematically surveyed.
(2) The Finnish monitoring projects produce reliable data to assess the annual population size (or index), long-term population trend and productivity of almost all Vulnerable and Near Threatened raptor species; for the Hen Harrier, the distribution and number of Raptor Grid study plots should be much more representative.
(3) More resources and international co-operation are needed for reliable monitoring of species, which belong to the Finnish Red List category Least Concern (LC) and breed in northern Finland.
(4) More effort should be devoted to collect capture-recapture data for survival monitoring.

Acknowledgements: This article is based on voluntary fieldwork by enthusiastic and experienced Finnish raptor ringers. Juha Honkala, the administrator of the raptor monitoring data of the Finnish Ringing Centre, has depicted the Figures 1 and 6. Tuomo Ollila updated the information on the Golden Eagle, Peregrine Falcon and Gyrfalcon, and Torsten Stjernberg did the same for White-tailed Eagle data.

5. Povzetek

Monitoring populacij tako dnevnih kot nočnih ptic roparic na Finskem skoraj v celoti temelji na terenskem delu prostovoljnih obročkovalcev teh ptic. Nad monitoringom bdi Finski prirodoslovni muzej, gmotna sredstva za administrativno delo pa prispevajo

Ministrstvo za okolje, "Metsähallitus" (nekdanji Nacionalni odbor za gozdarstvo) in finski WWF. Od začetka 70. let 20. stoletja skrbijo za monitoring številčnosti in produktivnosti štirih ogroženih vrst – belorepca *Haliaeetus albicilla*, planinskega orla *Aquila chrysaetos*, ribjega orla *Pandion haliaetus* in sokola selca *Falco peregrinus* – v okviru popisov, ki potekajo po celotni državi, in sicer z namenom, da se vsako leto preverijo vsa znana gnezdišča teh ptic, med katere je bil v 90-ih letih vključen tudi arktični sokol *F. rusticolus*. Podatki o populacijah drugih vrstah ptic roparic se zbirajo v okviru projektov, imenovanih Mreža ptic roparic in Anketni vprašalnik o pticah roparicah. S prvim projektom se vsako leto pridobijo podatki o letnih populacijskih indeksih, ki so izračunani na osnovi opažanj na 10 × 10 km velikih popisnih ploskvah (n = ca. 130/leto) in dobro odsevajo letna populacijska nihanja ter dolgoročne trende sedmih pogostih dnevnih in šestih nočnih ptic roparic, ki gnezdijo v južnem delu Finske. Za druge vrste, ki so bodisi redke po vsej Finski bodisi gnezdijo predvsem na severu države, zunaj območja dobre pokritosti ozemlja s popisnimi ploskvami Mreže ptic roparic, ugotovitve o populacijskih spremembah slonijo na skupnem številu zasedenih teritorijev in aktivnih gnezd, o katerih vsako leto poročajo v okviru anketnega vprašalnika.

6. References

Francis, C.M. & Saurola, P. (2008): Estimating demographic parameters from complex data sets: a comparison of Bayesian hierarchical and maximum-likelihood methods for estimating survival probabilities of Tawny Owls, *Strix aluco* in Finland. pp. 619–640 In: Thomson, D.L., Cooch, E.G. & Conroy, M.J. (eds.): Modelling Demographic Processes in Marked Populations. Environmental and Ecological Statistics, Vol. 3. – Springer, New York.

Helander, B., Bignert, A. & Asplund, L. (2008): Using Raptors as Environmental Sentinels: Monitoring the White-tailed Sea Eagle *Haliaeetus albicilla* in Sweden. – Ambio 37 (6): 425–431.

Henny, C.J., Grove, J.L. Kaiser, J.L. & Johnson, B.L. (2010): North American Osprey populations and contaminants: historic and contemporary perspectives. – Journal of Toxicology and Environmental Health, Part B 13 (7/8): 579–603.

Honkala, J., Björklund, H. & Saurola, P. (2010): [Breeding and population trends of common raptors and owls in Finland in 2009.] – Linnut-vuosikirja 2009: 78–89. (in Finnish, English summary)

Honkala, J., Saurola, P. & Valkama, J. (2011): [Breeding and population trends of common raptors and owls in Finland in 2010.] – Linnut-vuosikirja 2010: 53–63. (in Finnish, English summary)

Honkala, J., Saurola, P. & Valkama, J. (2012): [Breeding and population trends of common raptors and owls in Finland in 2011.] – Linnut-vuosikirja 2011: 58–69. (in Finnish, English summary)

Korpimäki, E. & Hakkarainen, H. (2012): The Boreal Owl. Ecology, Behaviour and Conservation of a Forest-Dwelling Predator. – Cambridge University Press, New York.

Koskimies, P. & Lapshin, N.V. (eds.) (2006): Status of Raptor Populations in Eastern Fennoscandia. Proceedings of the Workshop, 8–10 November 2005, Kostomuksha, Karelia, Russia. – Karelian Research Centre of the Russian Academy of Science & Finnish-Russian Working Group on Nature Conservation, Petrozavodsk, Russia.

Koskimies, P. & Ollila, T. (2009): [The conservation status of the Gyrfalcon *Falco rusticolus* in Finland.] – Linnut-vuosikirja 2008: 7–13. (in Finnish, English summary)

Lehikoinen, A., Ekroos, J., Jaatinen, K., Lehikoinen, P., Lindén, A., Piha, M., Vattulainen, A. & Vähätalo, A. (2008): [Bird population trends based on the data of Hanko Bird Observatory (Finland) during 1979–2007.] – Tringa 35: 146–209. (in Finnish, English summary)

Lehikoinen, A., Hokkanen, T. & Lokki, H. (2011): Young and female-biased irruptions in Pygmy Owls *Glaucidium passerinum* in southern Finland. – Journal of Avian Biology 42 (6): 564–569.

Newton, I. (1979): Population ecology of raptors. – T & A D Poyser, Berkhamsted.

Ollila, T. (2012): Finnish Golden Eagles (*Aquila chrysaetos*) in 2011. – Linnut-vuosikirja 2011: 12–15. (in Finnish, English summary)

Ollila, T. & Koskimies, P. (2008): [The conservation status of the Golden Eagle and Peregrine Falcon in Finland.] – Linnut-vuosikirja 2007: 8–17. (in Finnish, English summary)

Rassi, P., Hyvärinen, E., Juslén, A. & Mannerkoski, I. (eds.) (2010): The 2010 Red List of Finnish Species. – Ympäristöministeriö & Suomen ympäristökeskus, Helsinki.

Saurola, P. (1976): Finnish raptor censuses. – Ornis Fennica 53 (4): 135–179.

Saurola, P. (1980): Finnish Project Pandion. – Acta Ornithologica 17 (13): 161–168.

Saurola, P. (1985a): The *Raptor Grid*: an attempt to monitor Finnish raptors and owls. – Vår Fågelvärd, Suppl. 11: 187–190.

Saurola, P. (1985b): Persecution of raptors in Europe assessed by Finnish and Swedish ring recovery data. – ICBP Technical Publications 5: 439–448.

Saurola, P. (1997): The Osprey (*Pandion haliaetus*) and modern forestry: a review of population trends and their causes in Europe. – Journal of Raptor Research 31 (2): 129–137.

Saurola, P. (2006): Monitoring "Common" Birds of Prey in Finland in 1982–2005. pp. 133–145 In: Koskimies, P. & Lapshin, N.V. (eds.): Status of Raptor Populations in Eastern Fennoscandia. Proceedings of the Workshop, 8–10 November 2005, Kostomuksha, Karelia, Russia. – Karelian Research Centre of the Russian Academy of Science & Finnish-Russian Working Group on Nature Conservation, Petrozavodsk, Russia.

Saurola, P (2008): Monitoring birds of prey in Finland: a summary of methods, trends, and statistical power. – Ambio 37 (6): 413–419.
Saurola, P. (2009): Bad news and good news: population changes of Finnish owls during 1982–2007. – Ardea 97 (4): 469–482.
Saurola, P. (2011): [Finnish Ospreys (*Pandion haliaetus*) 2010.] – Linnut-vuosikirja 2010: 29–35. (in Finnish, English summary)
Saurola, P. (2012): [Finnish Ospreys (*Pandion haliaetus*) 2011.] – Linnut-vuosikirja 2011: 16–23. (in Finnish, English summary)
Saurola, P & Björklund, H. (2011): Losers and winners among Finnish forest dwelling birds of prey. pp. 56–69 In: Zuberogoitia, I. & Martinez, J.E. (eds.): Ecology and conservation of European forest-dwelling raptors. – Departamento de Agricultura de la Diputación Foral de Bizkaia.
Saurola, P., Stjernberg, T., Högmander, J., Koivusaari, J., Ekblom, H. & Helander, B. (2003): Survival of juvenile and sub-adult Finnish White-tailed Sea Eagles in 1991–1999: a preliminary analysis based on resightings of colour-ringed individuals. pp. 155–167 In: Helander, B., Marquiss, M. & Bauerman, B. (eds.): Sea Eagle 2000. Proceedings from the international conference, 13–17 September 2000, Björkö, Sweden. – Swedish Ornithological Society, Stockholm.
Saurola, P., Valkama, J. & Velmala, W. (2013): [The Finnish Bird Ringing Atlas. Vol. I.] – Finnish Museum of Natural History & Ministry of Environment, Helsinki. (in Finnish, extensive English summary)
Sergio, F., Newton, I., Marchesi, L. & Pedrini, P. (2006): Ecologically justified charisma: preservation of top predators delivers biodiversity conservation. – Journal of Applied Ecology 43 (6): 1049–1055.
Stefansson, O. (1997): [Vagabond of the northern forest. Great Grey Owl (*Strix nebulosa lapponica*).] – Boden. (in Swedish, English summary)
Stjernberg, T., Koivusaari, J., Högmander, J., Nuuja, I. & Lokki, H. (2011): [Population size and nesting success of the White-tailed Sea Eagle (*Haliaetus albicilla*) in Finland 2009–2010.] – Linnut-vuosikirja 2010: 19–27. (in Finnish, English summary)
Sulkava, S. (1964): [To the feeding biology of the Goshawk, *Accipiter g. gentilis*.] – Aquilo Ser. Zoologica 3: 1–103. (in German)
Valkama, J. & Korpimäki, E. (1999): Nestbox characteristics, habitat quality and reproductive success of Eurasian Kestrels. – Bird Study 46 (1): 81–88.
Valkama, J. & Saurola, P. (2005): Mortality factors and population trends of the Eagle Owl *Bubo bubo* in Finland. – Ornithologischer Anzeiger 44 (2): 81–90.
William S. (1979): Robust Locally Weighted Regression and Smoothing Scatterplots. – Journal of the American Statistical Association 74 (368): 829–836.

Arrived / Prispelo: 27. 3. 2013
Accepted / Sprejeto: 1. 7. 2013

Acrocephalus 33 (154/155): 217–223, 2012

A preliminary overview of monitoring for raptors in France

Predhodni pregled monitoringa populacij ptic roparic v Franciji

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Metropolitan France boasts a high number and significant populations of breeding raptor species in Europe. Furthermore, it is located on major migration route for diurnal raptors. This wealth of raptors has certainly contributed to the creation of a wide network of volunteers tutored by NGOs. These, especially the "Ligue pour la Protection des Oiseaux" (LPO), the French partner of Birdlife International, play a key role in monitoring for raptors, including the most threatened species, both nationally with many specific networks and at regional or local level. This participatory involvement is certainly an asset for the development of monitoring programmes on a large scale. Unfortunately, no major raptor research has been carried out by academic experts in France, especially in the field of monitoring of the environment through raptors. Improving this situation by a closer dialogue between academic experts and fieldworkers and a better knowledge of common species are the main future challenges.

Key words: raptor monitoring, diurnal raptors, owls, France
Ključne besede: monitoring ptic roparic, ujede, sove, Francija

1. Introduction

France boasts rich raptor fauna, with 35 species of breeding raptors (26 diurnal with the recent re-addition of Lesser Spotted Eagle *Aquila pomarina* in 2004; Michelat 2007 and White-tailed Eagle *Haliaeetus albicilla* to the list in 2011; Le Roy 2012, and 9 nocturnal ones) (BirdLife International 2004) and a key geographical position in the Western European–West African Flyway for migrating diurnal raptors (Zalles & Bildstein 2000). Monitoring for raptors is well-developed with a large network of volunteers trained by numerous non-governmental organizations (NGOs).

Due to its geographical situation and diversity of landscapes and climate, France hosts the second (after Spain) largest number of breeding raptors species in western part of Europe. Moreover, some of the largest populations of particular species (e.g. Honey Buzzard *Pernis apivorus*, Black Kite *Milvus migrans*, Short-toad Eagle *Circaetus gallicus*, Montagu's Harrier *Circus pygargus* etc.) are found in France. This gives the country a major responsibility in conservation at the European level (BirdLife International 2004, Burfield 2008).

Large number of migrating raptors belonging to 25 species (including Honey Buzzard, Buzzard *Buteo buteo* and Black Kite as the most numerous) also cross the French territory to reach their winter quarters in Africa or on the Iberian peninsula, including non-breeding rare and endangered species such as Pallid Harrier *C. macrourus*, Eleonora's Falcon *Falco eleonorae* or Lesser Spotted Eagle. This gives the opportunity to develop a large network of watchpoints, where enthusiasts spend from a few hours to four or five months detecting, identifying and counting raptors among other species. The aim of continuous surveys is to acquire phenological and population indices related to changes in population size or climate change.

2. Main players

NGOs, especially the French partner of BirdLife International, "Ligue pour la Protection des Oiseaux" (LPO), but also other ornithological organizations at the regional level (more than 100 different ones) are

the main players for conducting the fieldwork. The National Forests Office (Office national des forêts, ONF) and The National Hunting and Wildlife Agency (Office National de la Chasse et de la Faune Sauvage, ONCFS), two governmental services, are also involved in raptor monitoring in the field. The National Centre for Scientific Research (Centre national de la recherche scientifique, CNRS) and the National Museum of Natural History in Paris (Muséum national d'histoire naturelle, MNHN) are the two main actors for data analyses.

International collaboration involves mainly Spain, Italy and Switzerland, depending on species or programmes, particularly those sponsored by LIFE or INTERREG European Union funds, like reintroduction programmes under LIFE Nature project "Reinforcement and conservation of Lesser Kestrel populations in Aude (FR) and Extrémadure (ES)" (LIFE05 NAT/F/000134 "Conservation et renforcement du Faucon crécerellette dans l'Aude (France) et l'Estrémadure (Espagne)", 2005–2009) or INTERREG "NECROPIR" project (conservation of scavengers in Pyrenees). For migration monitoring, the French network is taking an active part in the construction of the Euromigrans network (The Western Palearctic Bird Migratory Network).

Data are mainly used by organisations conducting the fieldwork themselves. When species concerning the National Action Plans are at stake, the work is ordered by the French government. The main goal of the monitoring activities is conservation of raptors species.

3. National coverage

At the French level, a large majority of monitoring activities is coordinated by the "Mission Rapaces" (The Raptors Study Group), an LPO's service, by means of a group of networks devoted to one species each or to a group of species (e.g. Réseau Milan royal for the Red Kite or Réseau Busards for harriers). Each network publishes a regular newsletter, with annual special issue of the *L'oiseau* magazine "Rapaces de France" giving an annual synthesis of the national monitoring of every breeding species. The status of rare species is also reviewed annually in the *Ornithos* journal.

The monitoring is carried out quite uniformly across the country with regional focuses on species depending on their distribution (e.g. Black-winged Kite *Elanus caeruleus* in Aquitaine). A national survey programme named *Observatoire Rapaces* (Raptor Observatory) began in 2002 (Thiollay & Bretagnolle 2004). It is based on a randomized 5 × 5 km square coverage. In each square, all breeding diurnal raptors are counted and classified as confirmed, probable or possible breeding pairs. A statistical analysis (ordinary kriging) predicts the spatial distribution and number of pairs at the national level.

The French programme of the Pan-European Common Bird Monitoring Scheme *Temporal Survey of Common Birds* (Le Suivi Temporel des Oiseaux Communs, STOC-EPS; http://vigienature.mnhn.fr/page/le-suivi-temporel-des-oiseaux-communs-stoc), coordinated by the "Centre de Recherches sur la Biologie des Populations d' Oiseaux" (CRBPO) also provides information on common raptors such as Kestrel *F. tinnunculus* or Sparrowhawk *Accipiter nisus* at the national scale. Main monitoring programmes for breeding raptors are listed in Appendix 1.

A network of 93 study sites (Figure 1) exists in France specifically for monitoring of migratory birds, including raptors, under the coordination of the "Mission Migration" (The Migration Study Group), which is an alliance of seven partners (LPO France, Le Clipon, Organbidexka Col Libre, Groupe Ornithologique Normand, Picardie Nature, Amis du Parc Naturel Régional de Corse, Centre Ornithologique Rhônes-Alpes) created to improve exchange of protocols, data and experiences through a shared web-based database (http://www.migraction.net). However, watchpoints differ significantly in terms of duration of counts, time period and regularity of counts, including some with continuous survey lasting more than 30 years (like the Organbidexka Pass in the Pyrenees) and others lasting only a couple of days.

4. Key species and key issues

All raptor species are monitored in France, although with different accuracy. The species of higher conservation concern (listed in the national Red List, Birds Directive, different conventions etc.) like Lammergeier *Gypaetus barbatus*, Egyptian Vulture *Neophron percnopterus*, Black Vulture *Aegypius monachus*, Red Kite *M. milvus*, Osprey *Pandion haliaetus*, Lesser Kestrel *F. naumanni*, Bonelli's Eagle *A. fasciata* and Little Owl *Athene noctua* benefit from the National Action Plans mainly managed by LPO. These plans are prepared by the French government. Their implementation is most often allotted to non-governmental organizations. The conservation programmes include as far as possible also an exhaustive monitoring of the birds' distribution, density, breeding success, causes of mortality, movements, etc. (http://rapaces.lpo.fr). Without a National Action

Plan, the Griffon Vulture *Gyps fulvus* benefits from the same quality of monitoring in reintroduction areas such as Gorges de la Jonte, Gorges du Verdon, Vercors or the Baronnies in south-eastern France. For all the other commoner species that are not covered by any National Action Plan, only distribution and density are monitored throughout the "Observatoire Rapaces" at the national level. STOC-EPS also provides valuable information on population changes.

Local or regional monitoring activities exist here and there. For owls, except Tengmalm's *Aegolius funereus* and Pygmy Owls *Glaucidium passerinum*, which are monitored at the national level, only local monitoring is carried out. Such example is the work carried out by the NGO "La Choue" in Bourgogne on Tawny Owl *Strix aluco*, Barn Owl *Tyto alba* and Long-eared Owl *Asio otus* (http://la.choue.free.fr/index.php?p=pages&title=publications).

Concerning the most endangered species (those covered by the National Action Plan) in France, only the Bonelli's Eagle (whose population has more or less stabilized during the recent years), and perhaps the Red Kite populations have been decreasing since the beginning of the 1990s. All others are increasing (LPO Mission Rapaces 2012; http://vigienature.mnhn.fr/page/resultats-par-especes). Monitoring of the common species started only recently, so it is impossible to draw any conclusions on their trends as yet.

Through monitoring programmes, the most important threats have been highlighted:

- Loss of habitat caused by changes in agricultural practises or increased urbanization is the major threat.
- Disturbance during breeding season, which affects the most sensitive species (e.g. Lammergeier).
- Poisoning as a deliberate act or as a consequence of use of rodenticides, which is also a significant cause of mortality for some species (e.g. Red Kite), combined with chronic lead poisoning due to the ingestion of lead ammunition spent by hunters.
- Poaching as an additional threat.
- Power lines and wind turbines through electrocution or collision, which could have a significant impact on some species (e.g. Bonelli's Eagle).

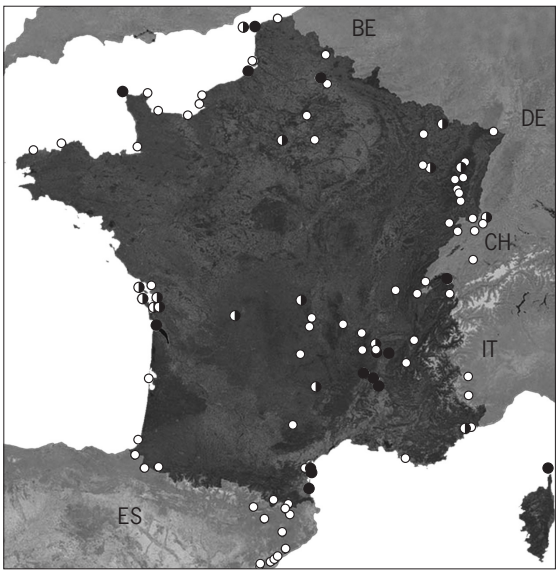

Figure 1: Locations of watchpoints in the French migration study network (after http://www.migraction.net; satellite image is courtesy of NASA/JPL-Caltech); black dots – spring survey, white dots – autumn survey, two-coloured dots – survey in both seasons

Slika 1: Lokacije opazovalnih točk v francoskem omrežju za preučevanje selitev ptic (http://www.migraction.net; satelitski posnetek z dovoljenjem NASA/JPL-Caltech); črne pike – spomladanski popis, bele pike – jesenski popis, dvobarvne pike – popis v obeh sezonah

5. Strengths, weaknesses and future priorities

The major strength of the monitoring for raptors in France is the fact that it rests on highly skilled volunteers trained by NGO's professionals. This enables an efficient and continuous transfer of skills through the network and promotes best practices. It also enables work on a large spatial scale. Another strength is the existence of a national coordination of the network allowing implementation of projects on a large time scale as well as a better attention of both local, regional or governmental authorities. And finally – which is perhaps even the most important – we can claim that volunteers, professionals from NGOs or official agencies are raptor enthusiasts.

Not surprising for the French network mainly based on NGOs, the unstable funding is the main weakness of the monitoring, as it often depends on fickle national public policies. Another weakness could be the relative lack of interest from French universities in monitoring for raptors, but also in raptors generally. It results in difficulty in finding students to work on data, as they are not able to be tutored academically.

If endangered or charismatic species are quite well monitored, more common ones (e.g. Hobby *F. subbuteo*, Kestrel, Sparrowhawk ...) as well as owls suffer the lack of knowledge. Particularly, effects of land-use change in general and agricultural practices, especially on raptors are not well monitored, as well as the impacts of biocides or poisons directly or through bioaccumulation. At even if volunteers for raptors

are numerous in France, they are not sufficiently numerous to cover all the fields of monitoring for raptors.

It seems that the priority of monitoring for raptors in France lies in intensifying the monitoring of "common" species and owls as well as of species using "commonplace" (e.g. unprotected areas or farmlands) habitats. It would permit linking of monitoring *for* raptors to the environmental monitoring *with* raptors. This would require – at least in France or perhaps more efficiently at the European level – a closer connection between raptor enthusiasts as data collectors and scientists as producers of indices.

6. Povzetek

Francija se lahko pohvali z velikim številom in evropsko pomembnimi populacijami gnezdečih ptic roparic. Poleg tega prek nje potekajo tudi selitvene poti ujed. Prav to bogastvo ptic roparic je prispevalo k oblikovanju široke mreže prostovoljcev, ki jih za to delo urijo različne nevladne organizacije. Med njimi je najbolj dejaven LPO, francoski partner organizacije Birdlife International, ki igra glavno vlogo pri monitoringu za ptice roparice, vključno z najbolj ogroženimi vrstami tako na nacionalni ravni z vrsto specifičnih omrežij kot tudi na regionalni ali lokalni ravni. Prav to sodelovanje udeležencev je veliko pripomoglo k razvoju programov monitoringa v najširšem obsegu. Žal pa ni bila nobena pomembnejša raziskava o pticah roparicah v Franciji opravljena na akademski ravni, še posebno na področju monitoringa okolja prek ptic roparic. Tako med največjimi izzivi v tej državi še vedno ostajata izboljšanje trenutnega stanja s tesnejšim dialogom med akademskimi izvedenci in terenskimi sodelavci in boljše poznavanje pogostih ptic roparic.

7. References

BirdLife International (2004): Birds in Europe: population estimates, trends and conservation status. BirdLife Conservation Series No. 12. – BirdLife International, Cambridge.

Burfield, I. J. (2008): The Conservation Status and Trends of Raptors and Owls in Europe. – Ambio 37 (6): 401–407.

Le Roy, C. (2012): [White-tailed Eagle. Monitoring report 2011.] – Rapaces de France 14: 45. (in French)

LPO Mission Rapaces (2012): [Monitoring report 2011.] – Rapaces de France 14. (in French)

Michelat, D. (2007): [Lesser Spotted Eagle. Monitoring report 2006.] – Rapaces de France 9: 16. (in French)

Thiollay, J.-M. & Bretagnolle, V. (2004): [Breeding raptors in France: distribution, numbers and conservation.] – Delachaux et Niestlé, Paris. (in French)

Zalles, J.I. & Bildstein, K.L. (eds.) (2000): Raptor watch. A global directory of raptor migration sites. BirdLife Conservation Series No. 9. – BirdLife International & Hawk Mountain Sanctuary, Cambridge.

Arrived / Prispelo: 27. 3. 2013
Accepted / Sprejeto: 1. 7. 2013

APPENDIX 1 / DODATEK 1

Main monitoring programmes on breeding raptors in France during the 21st century

Glavni programi monitoringa gnezdečih ptic roparic v Franciji v 21. stoletju

National network – working group established under the Raptors Study Group (LPO Mission Rapaces)
Raptor Observatory – national survey programme for raptors (Observatoire Rapaces)
STOC-EPS – Temporal Survey of Common Birds (Le Suivi Temporel des Oiseaux Communs)

(1) POCTEFA* – Sustainable biodiversity in the Pyrenees, the scavenging raptors, examples for the joint management; (2) LIFE Nature GYPAETE – International programme for the Bearded vulture in the Alps; (3) LIFE Nature – Large Pyrenean Fauna; (4) INTERREG – For Living Pyrenees; (5) LIFE Nature VAUTOUR – Recovery plan for the Egyptian Vulture in South-Eastern France; (6) LIFE Nature CONSAVICOR – Conservation of rare birds in Eastern Corbieres; (7) Life Nature TRANSFERT – Reinforcement and conservation of Lesser Kestrel populations in Aude (FR) and Extrémadure (ES)

* POCTEFA is the new name of INTERREG programme between France, Spain and Andorra

LPO – Ligue pour la Protection des Oiseaux (BirdLife partner in France); ONCFS – The National Hunting and Wildlife Agency (Office National de la Chasse et de la Faune Sauvage); GAN – Gestión Ambiental de Navarra; MEDDE – Ministry of Ecology, Sustainable Development and Energy (Ministère de l'Écologie, du Développement durable et de l'Énergie); GRIVE – Groupe de Recherche et d'Information sur les vertébrés; CEN-LR – Conservatoire d'espaces naturels du Languedoc-Roussillon

Continuation of Appendix 1 / Nadaljevanje dodatka 1

Species / Vrsta	National network/ Nacionalna mreža	National Action Plan/ Nacionalni akcijski načrt		Raptor Observatory	STOC-EPS	Reintroduction programme/ Program ponovne naselitve	EU programme/ Program Evropske unije		
		Duration/ Trajanje	Coordinator/ Koordinator				Project title/ Naziv projekta	Coordinator/ Koordinator	Duration/ Trajanje
Honey Buzzard *Pernis apivorus*	no	no		yes	yes				
Black-winged Kite *Elanus caeruleus*	no	no		yes	no				
Black Kite *Milvus migrans*	no	no		yes	yes				
Red Kite *Milvus milvus*	yes	2003–2007	LPO	yes	yes		1	GAN	2009–2014
White-tailed Eagle *Haliaeetus albicilla*	no	no, but local survey	LPO Champagne-Ardennes, ONCFS	no	no				
Lammergeier *Gypaetus barbatus*	yes	1997–2007, 2010–2020	LPO	yes	no	Alps	2	Asters	2003–2007
							3	MEDDE	1994–1998
							4	LPO	2003–2006
							1	GAN	2009–2014
Egyptian Vulture *Neophron percnopterus*	yes	2002–2007	LPO	yes	no		5	LPO	2003–2008
							4	LPO	2003–2006
							1	GAN	2009–2014
Griffon Vulture *Gyps fulvus*	yes	no		yes	no	Alps, Massif central	4	LPO	2009–2014
							1	GAN	2003–2006
Black Vulture *Aegypius monachus*	yes	2004–2008, 2011–2016	LPO	yes	no	Alps, Massif central			
Short-toed Eagle *Circaetus gallicus*	yes	no		yes	yes				
Marsh Harrier *Circus aeruginosus*	yes	no		yes	yes				
Hen Harrier *Circus cyaneus*	yes	no		yes	yes				
Montagu's Harrier *Circus pygargus*	yes	no		yes	yes				
Goshawk *Accipiter gentilis*	no	no		yes	no				
Sparrowhawk *Accipiter nisus*	no	no		yes	yes				
Buzzard *Buteo buteo*	no	no		yes	yes				

Continuation of Appendix 1 / Nadaljevanje dodatka 1

Species / Vrsta	National network/ Nacionalna mreža	National Action Plan/ Nacionalni akcijski načrt		Raptor Observatory	STOC-EPS	Reintroduction programme/ Program ponovne naselitve	EU programme/ Program Evropske unije		
		Duration/ Trajanje	Coordinator/ Koordinator				Project title/ Naziv projekta	Coordinator/ Koordinator	Duration/ Trajanje
Lesser Spotted Eagle *Aquila pomarina*	no	no, but local survey	LPO Franche-Comté	yes	no				
Golden Eagle *Aquila chrysaetos*	yes	no		yes	no				
Booted Eagle *Aquila pennata*	yes	no		yes	no				
Bonelli's Eagle *Aquila fasciata*	yes	1999–2003, 2005–2009	GRIVE, CEN-LR	yes	no		6	LPO	2005–2009
Osprey *Pandion haliaetus*	yes	2004–2007, 2008–2012	LPO	yes	no				
Lesser Kestrel *Falco naumanni*	yes	2002–2006, 2011–2015	LPO	yes	no	Aude	7	LPO	2005–2009
Kestrel *Falco tinnunculus*	no	no		yes	yes				
Red-footed Falcon *Falco vespertinus*	no	no		yes	no				
Hobby *Falco subbuteo*	no	no		yes	yes				
Peregrine Falcon *Falco peregrinus*	yes	no		yes	yes				
Barn Owl *Tyto alba*	yes	no		no	no				
Scops Owl *Otus scops*	no	no		no	no				
Eagle Owl *Bubo bubo*	yes	no		no	no				
Pygmy Owl *Glaucidium passerinum*	yes	no		no	no				
Little Owl *Athene noctua*	yes	2000–2010	LPO	no	yes				
Tawny Owl *Strix aluco*	no	no		no	no				
Long-eared *Owl Asio otus*	no	no		no	no				
Short-eared *Owl Asio flammeus*	no	no		no	no				
Tengmalm's *Owl Aegolius funereus*	yes	no		no	no				

Acrocephalus 33 (154/155): 225–231, 2012

A preliminary overview of monitoring for raptors in Great Britain*

Predhodni pregled monitoringa populacij ptic roparic v Veliki Britaniji

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This paper summarises monitoring of raptors (diurnal birds of prey and owls) in Great Britain. There is a long tradition of raptor monitoring in Great Britain, and all regularly breeding species receive at least a degree of survey coverage. Common raptors such as Buzzard *Buteo buteo* and Kestrel *Falco tinnunculus* are included in national all-species surveys co-ordinated by the British Trust for Ornithology (BTO), while rarer species are typically monitored in less extensive, more intensive studies conducted by specialist raptor fieldworkers. This work is supported (and often funded) by a large number of Non-Governmental Organisations (NGOs) and national government agencies. There is a need for greater co-ordination of local/regional study groups, which would facilitate the compilation of national-level population and productivity statistics, and also identify areas and/or species that require better survey coverage. There is potential for the better use of data collected by fieldworkers to provide evidence of human interference in breeding attempts.

Key words: birds of prey, owls, monitoring, survey, Great Britain
Ključne besede: ujede, sove, monitoring, popis, Velika Britanija

1. Introduction

Fifteen species of diurnal raptor and five owl species regularly breed in Great Britain (GB). Many were either very rare or effectively extinct at the beginning of the twentieth century (e.g. White-tailed Eagle *Haliaeetus albicilla*, Osprey *Pandion haliaetus*, Marsh Harrier *Circus aeruginosus*, Red Kite *Milvus milvus*), and have recovered in numbers either by natural processes and *in situ* conservation action (Osprey, Marsh Harrier), reintroduction (White-tailed Eagle) or a combination of the two (Red Kite) (Love 1983, Clarke 1995, Carter 2001, Dennis 2008). The Little Owl *Athene noctua* was introduced into southern England in 1842 and has since naturalised, spreading through most parts of England and Wales, and into southern Scotland (Greenoak 1997).

The Kestrel *Falco tinnunculus* was the most abundant raptor until the last couple of decades, when it was overtaken by the Buzzard *Buteo buteo* (Clements 2002). The Honey Buzzard *Pernis apivorus* and Montagu's Harrier *C. pygargus* are the least abundant breeding species (Baker *et al*. 2006). Several species occur only (or predominantly) in Scotland (Golden Eagle *Aquila chrysaetos*, White-tailed Eagle, Osprey, Hen Harrier *C. cyaneus*). Hen Harriers breed in small numbers (ca. 40 pairs) in Wales, and even smaller numbers in England, while Marsh Harriers and Hobbies *F. subbuteo* are found predominantly in England (Balmer *et al. in print*).

* Note that the United Kingdom is covered here in two separate entries: England, Scotland and Wales are covered by this paper on Great Britain, and Northern Ireland is covered in the paper for Ireland (i.e. together with the Republic of Ireland). However, some of this paper on GB also applies to parts of Ireland.

2. Main players

The main organisations involved in raptor monitoring fall into four main groups:

(1) Non-governmental organisations and charities with at least some professional staff – e.g. Royal Society for the Protection of Birds (RSPB); British Trust for Ornithology (BTO); Rare Breeding Birds Panel (RBBP); Hawk and Owl Trust (HOT).
(2) Volunteer-led organisations and individual volunteers – e.g. Scottish Raptor Study Groups (SRSGs); Northern England Raptor Forum (NERF); Welsh Rare Breeding Bird and Raptor Study Group (WRBBRSG); Welsh Kite Trust; Shropshire Raptor Study Group and Wiltshire Raptor Study Group.
(3) Statutory/government agencies – Natural England (NE); Scottish Natural Heritage (SNH); Natural Resources Wales (NRW); Joint Nature Conservation Committee (JNCC).
(4) Commercial consultancies.

In England and Wales, the majority of work is undertaken by NGOs and charities, with some funding provided by government agencies. An example of the latter is the SCARABBS (Statutory Conservation Agency/RSPB Annual Breeding Bird Scheme) series of periodic surveys for scarcer breeding birds, some of which are raptors. This is a rolling programme which has included in recent years: Barn Owl *Tyto alba* in 1995–1997 (Toms *et al.* 2001); Red Kite in 2000 (Wootton *et al.* 2002); Peregrine Falcon *F. peregrinus*, in 2002 (Banks *et al.* 2010); Golden Eagle in 2003 (Eaton *et al.* 2007); Marsh Harrier in 2005 (*unpubl.*); Merlin *F. columbarius* in 2008 (Ewing *et al.* 2011); and Hen Harrier in 2010 (Hayhow *et al. in press*).

In Scotland, raptor monitoring is co-ordinated under the *Scottish Raptor Monitoring Scheme* (SRMS), a partnership between SNH, JNCC, BTO, RBBP, RSPB, Scottish Ornithologists' Club (SOC), Forestry Commission Scotland (FCS) and the SRSGs, and funded by SNH (Wernham *et al*. 2008, Anon. 2002).

Across the whole of the UK, the *Breeding Bird Survey* (BBS) provides annual indices of change for certain common species, though few of these are raptors. This survey is organised by the BTO, and funded/supported by BTO, JNCC and RSPB. The BTO also runs the UK-wide *Nest Record Scheme* (NRS) and ringing scheme, which provide data on survival and productivity, though some parameter estimates may contain regional biases due to variation in sample sizes. Breeding records of rare birds (< 1,500 breeding pairs in the UK), which include several raptor species, are collated by the RBBP, a panel comprising representatives from the BTO, RSPB and JNCC, as well as a small number of independent individuals.

The data obtained through monitoring are used by (1) government agencies, for setting and assessing conservation targets, reviewing effectiveness of protected areas and development planning, (2) universities and other research organisations, for academic and applied conservation work, (3) NGOs, for applied conservation work and provision of advice to government, (4) consultancies, for development planning (e.g. Environmental Impact Assessments) and government contracts. Some individuals provide data to MEROS Monitoring of European Raptors and Owls; e.g. Mammen & Stubbe 2009, but this programme is probably not widely known in GB.

3. National coverage

Apart from BBS and the periodic SCARABBS surveys, there is little GB-scale co-ordination of monitoring. Annual, multi-species national co-ordination currently occurs only in Scotland, via the SRMS. Coverage in Scotland is variable by species; those best covered are Golden Eagle, Peregrine Falcon, Hen Harrier and Goshawk *Accipiter gentilis*, but even for these species the national coverage is patchy. Other species such as Buzzard, Merlin, Barn Owl and Tawny Owl *Strix aluco* are monitored extensively and intensively within discrete regional study areas (Etheridge *et al*. 2013).

The recently-formed WRBBRSG aims to fulfil the same role as the SRMS for Wales; there is no equivalent organisation covering the whole of England, but there is a number of smaller organisations that co-ordinate monitoring of certain species regionally, most prominently NERF, covering all diurnal raptor and owl species in the north of the country (Downing & NERF 2011).

Other groups focus on individual species, such as the Barn Owl Trust and the South West Peregrine Group, both of which operate in south-west England. White-tailed Eagles are monitored annually by the RSPB in the two areas of Scotland where they have been reintroduced, and the reintroduced populations of Red Kites in Scotland are also monitored by RSPB (Etheridge *et al*. 2013). Populations of kites in England and Wales are monitored but the proportion of pairs covered has steadily decreased as these populations grow (Welsh Kite Trust; http://www.gigrin.co.uk/red_kites_in_the_united_kingdom_breeding_pairs_1989-2007).

Other species are covered by occasional, regular surveys that attempt complete or near-complete coverage or have a rigorous sampling strategy (Honey Buzzard, Marsh Harrier, Hen Harrier, Golden Eagle, Peregrine Falcon, Merlin, Barn Owl), but such surveys typically occur at decade-long intervals. All Montagu's Harrier breeding attempts are probably effectively covered annually via reports to the RBBP (Holling *et al.* 2012), and there has recently been an effort by NE and RSPB to collate data on this species (A. Musgrove *pers. comm.*). The annual RBBP reports include a total for Goshawk based on fairly comprehensive samples (but this is likely to underestimate both numbers and geographic range; Holling *et al.* 2011 & 2012). Ospreys have been surveyed fairly comprehensively on an annual basis by the SRSGs and RSPB (Etheridge *et al.* 2013); they occur principally in Scotland, with one or two isolated breeding areas in England and Wales (Balmer *et al. in print*).

Common species (Kestrel, Buzzard, Sparrowhawk *A. nisus*) are covered by the BBS, providing indices of population change at the UK scale (and at national scales in some instances, depending on the number of survey squares; Baillie *et al.* 2013). RBBP has recently begun to collate county summaries of both Long-eared *Asio otus* and Short-eared Owls *A. flammeus* (Holling *et al.* 2012). See Appendix 1 for details of surveys.

4. Key species and key issues

All regularly breeding bird of prey and owl species receive at least a degree of monitoring in Britain during the breeding season (Appendix 1), and Hen Harriers are also monitored (with unknown proportional coverage) during the winter via the *Hen Harrier Winter Roost Survey* (Clarke & Watson 1990, Dobson *et al.* 2012).

The key threats experienced by raptors are species- and region-specific. In upland habitats (mainly Scotland and northern England) where land is managed for shooting of Red Grouse *Lagopus lagopus scotica*, illegal killing is a threat to a number of raptor species, but especially Hen Harriers, Golden Eagles, Peregrine Falcons and Red Kites (Etheridge *et al.* 1997, Whitfield *et al.* 2004, Smart *et al.* 2010, Amar *et al.* 2011). Management of lowland areas elsewhere in Britain for shooting of Pheasants *Phasianus colchicus* and partridge (*Alectoris rufa* and *Perdix perdix*) may also provide an incentive for illegal killing of a wide range of species (Allen & Feare 2003). Loss of habitat due to agricultural intensification affects populations of many species, but especially Barn Owl, Little Owl and Kestrel (Love *et al.* 2000, Baillie *et al.* 2013).

Monitoring of Golden Eagle, Hen Harrier and Peregrine Falcon in Scotland has contributed to Conservation Frameworks, which were commissioned by SNH, and aimed at assessing the conservation status of these species and identifying the main threats to population survival (Humphreys *et al.* 2007, Whitfield *et al.* 2008, Fielding *et al.* 2011). Monitoring of regional populations and productivity of Peregrine Falcons and Red Kites has identified areas where illegal killing limits population stability (Smart *et al.* 2010, Amar *et al.* 2011).

International networking would benefit the interpretation of monitoring data for migratory species such as the Hen Harrier, of which an unknown proportion of the GB wintering population may originate from Fennoscandian and/or Dutch breeding areas (Dobson *et al.* 2012), and the apparently nomadic Short-eared Owl, whose numbers in GB may fluctuate in response to factors operating elsewhere in Europe (Calladine *et al.* 2012).

5. Strengths and weaknesses

GB is fortunate to contain a large number of skilled volunteers, and there is a strong tradition of interest in (and monitoring of) birds, reflected in the existence of organisations such as the RSPB, BTO and raptor/upland bird study groups. Nonetheless, there are regions where survey coverage is poor or inconsistent between years, especially (but not exclusively) areas with low human population density. There is also a tendency towards secrecy among and between raptor fieldworkers – a legacy of a long history of illegal killing of raptors – which sometimes prohibits effective co-ordination of effort and sharing/collation of data. The SRMS has helped in building trust and a collective voice.

Monitoring – which is potentially fairly intrusive – is strictly regulated by the national government agencies, which issue annual licences for this purpose. This licence system does not, however, include a compulsory facility for reporting evidence of illegal human interference. The Partnership for Action against Wildlife crime (PAW) and the RSPB's persecution database – as well as the SRMS in Scotland – offer channels through which such activities may be reported.

The main geographical gaps are in the north-west of Scotland and in lowland England and Wales (for dedicated raptor monitoring; apart from north-west Scotland, these areas are generally well covered by some other bird surveys such as the BBS). In terms of species, the commoner species are generally less well monitored by dedicated raptor fieldworkers, but they

are covered to an extent in the BBS and other pan-avian surveys. The raptor monitoring movement in Britain was motivated by the historical rarity of species such as Golden Eagle, Hen Harrier and Peregrine Falcon, caused by illegal killing and (in the case of the Peregrine Falcon) the pesticide crisis of the 1960s and 1970s. There is therefore a traditional emphasis on upland areas managed for shooting, and on scarcer species.

6. Priorities, capacity-building

The main priority for GB raptor monitoring is to increase the national-level co-ordination of survey effort and the sharing of data, such that a strategic assessment of coverage and monitoring gaps can be carried out and addressed in future. In general terms, the SRMS model needs to be mirrored in England and Wales. The engagement of a new generation of raptor fieldworkers is also of paramount importance; the vast majority of monitoring in GB is undertaken by volunteers, and it is essential to maintain continuity of long-running surveys by recruiting new people.

There are a number of gaps in coverage of certain species already recognised at GB scale, which can be briefly summarised as: lack of comprehensive coverage of Red Kite in most English counties, especially in the Chiltern Hills area; lack of comprehensive coverage of Marsh Harrier in the core areas of East Anglia, Lincolnshire and Kent (though if the national SCARABBS survey is repeated this will be less critical); lack of comprehensive coverage of Hen Harrier, Golden Eagle, Merlin and Peregrine Falcon from most regions of Scotland (consistent, long-term study areas cover only a (sometimes non-representative) proportion of the national range for any species); data on Goshawk are based largely on monitored nests, and there is an unknown number of territorial birds present, which are not diligently counted, due to secrecy (data not submitted to recorders) or lack of descriptions in marginal areas, where recorders demand descriptions to support records; data for Ospreys in Scotland are often either withheld from SRMS/RBBP or submitted with insufficient site metadata; there is probably a relatively large, unrecorded population of Hobbies in the southern half of England, where population estimates may be based solely on counts of known nests, though the method of extrapolation of counts from intensively-studies areas (Clements 2001) has the potential to increase the accuracy of estimates; there are few regions of GB where Long-eared & Short-eared Owls are studied regularly in pre-defined areas.

The SRMS is currently formally reviewing the coverage of raptor monitoring across Scotland (Roos *et al. in print*; BTO Scotland & SRMS *unpubl.*). The SRMS is also developing an Entry-Level scheme wherein new members will be encouraged to survey grid squares that have been selected from a random (or, more likely, a stratified-random) sample, so that field data may be more rigorously translated into regional and/or national population trends. Finding a compromise between the scientific rigor of a survey design and its attractiveness to volunteers is a key challenge for survey co-ordinators.

7. Povzetek

Pričujoči prispevek je kratek oris dejavnosti, povezane z monitoringom ptic roparic (ujed in sov) v Veliki Britaniji. Redno spremljanje teh ptic ima na britanskem otočju dolgo tradicijo, tako da so v večji ali manjši meri popisane vse redno gnezdeče ptice roparice. Pogoste ptice roparice, kot sta kanja *Buteo buteo* in postovka *Falco tinnunculus*, so vključene v nacionalne popise vseh vrst, ki jih koordinira British Trust for Ornithology (BTO), medtem ko so redkejše vrste deležne pozornosti v manj obsežnih, a intenzivnejših študijah terenskih izvedencev. To delo podpira (tudi v finančnem smislu) tako več nevladnih organizacij kot nacionalnih vladnih agencij. Sicer pa avtorji prispevka ugotavljajo, da je potrebna večja koordinacija lokalnih/regionalnih študijskih skupin, s čimer bi se olajšalo zbiranje statističnih podatkov o populacijah in produktivnosti ptic roparic na državni ravni in tudi ugotavljanje območij in/ali vrst, ki terjajo temeljitejše popise. Sicer pa obstaja potencial za boljšo uporabo podatkov, zbranih na terenu, in s tem zagotavljanje dokazov o človekovih motnjah pri gnezdenju ptic roparic.

8. References

Allen, D.S. & Feare, C.J. (2003): Birds of prey and lowland gamebird management. pp. 427–442 In: Thompson, D.B.A., Redpath, S.M., Fielding, A.H., Marquiss, M. & Galbraith, C.A. (eds.): Birds of Prey in a Changing Environment. – The Stationery Office, Edinburgh.

Amar, A., Court, I.R., Davison, M., Downing, S., Grimshaw, T., Pickford, T. & Raw, D. (2011): Linking nest histories, remotely sensed land use data and wildlife crime records to explore the impact of grouse moor management on peregrine falcon populations. – Biological Conservation 145 (1): 86–94.

Anonymous (2002): Scottish Raptor Monitoring Scheme Agreement. – Scottish Natural Heritage.

Baillie, S.R., Marchant, J.H., Leech, D.I., Massimino, D., Eglington, S.M., Johnston, A., Noble, D.G., Barimore, C., Kew, A.J., Downie, I.S., Risely, K. & Robinson, R.A. (2013): Bird Trends 2012: trends in numbers, breeding

success and survival for UK breeding birds. BTO Research Report No. 644. – BTO, Thetford.

Baker, H., Stroud, D.A., Aebischer, N.J., Cranswick, P.A., Gregory, R.D., McSorley, C.A., Noble, D.G. & Rehfisch, M.M. (2006): Population estimates of birds in Great Britain and the United Kingdom. – British Birds 99 (1): 25–44.

Balmer, D.E., Gillings, S., Caffrey, B.J., Swann, R.L., Downie, I.S. & Fuller, R.J. (*in print*): Bird Atlas 2007–2011: The breeding and wintering birds of Britain and Ireland. – BTO Books, Thetford.

Banks, A.N., Crick, H.Q.P., Coombs, R., Benn, S., Ratcliffe, D.A., & Humphreys, E.M. (2010): The breeding status of Peregrine Falcons *Falco peregrinus* in the UK and Isle of Man in 2002. – Bird Study 57 (4): 421–436.

Calladine, J., du Feu, C. & du Feu, R. (2012): Changing migration patterns of the Short-eared Owl *Asio flammeus* in Europe: an analysis of ringing recoveries. – Journal of Ornithology 153 (3): 691–698.

Carter, I. (2001): The Red Kite. – Arlequin Press, Shrewsbury.

Clarke, R. (1995): The Marsh Harrier. – Hamlyn, London.

Clarke, R. & Watson, D. (1990): The Hen Harrier *Circus cyaneus* Winter Roost survey in Britain and Ireland. – Bird Study 37 (2): 84–100.

Clements, R. (2001): The Hobby in Britain: a new population estimate. – British Birds 94 (9): 402–408.

Clements, R. (2002): The Common Buzzard in Britain: A New Population Estimate. – British Birds 95 (8): 377–383.

Dennis, R. (2008): A Life of Ospreys. – Whittles Publishing, Dunbeath.

Dobson, A.D.M., Clarke, M., Kjellen, N. & Clarke, R. (2012): The size and migratory origins of the population of Hen Harriers *Circus cyaneus* wintering in England. – Bird Study 59 (2): 218–227.

Downing, S.E. & the Northern England Raptor Forum (2011): NERF Annual Review 2010. – NERF.

Eaton, M.A., Dillon, I.A., Stirling-Aird, P.K. & Whitfield, D.P. (2007): The status of the golden eagle *Aquila chrysaetos* in Britain in 2003. – Bird Study 54 (2): 212–220.

Etheridge, B., Riley, H., Wernham, C., Holling, M. & Stevenson, A. (2013): Scottish Raptor Monitoring Report 2011. – Scottish Ornithologists' Club, Aberlady, on behalf of the Scottish Raptor Monitoring Scheme.

Etheridge, B., Summers, R.W. & Green, R.E. (1997): The effects of illegal killing and destruction of nests by humans on the population dynamics of the hen harrier *Circus cyaneus* in Scotland. – Journal of Applied Ecology 34 (4): 1081–1105.

Ewing, S.R., Rebecca, G.W., Heavisides, A., Court, I.R., Lindley, P., Ruddock, M., Cohen, S. & Eaton, M.A. (2011): Breeding status of Merlins *Falco columbarius* in the UK in 2008. – Bird Study 58 (4): 379–389.

Fielding, A., Haworth, P., Whitfield, P., McLeod, D. & Riley, H. (2011): A Conservation Framework for Hen Harriers in the United Kingdom. JNCC Report 441. – Joint Nature Conservation Committee, Peterborough.

Gibbons, D.W., Reid, J.B. & Chapman, R.A. (1993): The New Atlas of Breeding Birds in Britain and Ireland: 1988–1991. – T & A D Poyser, London.

Greenoak, F. (1997): British Birds: Their Folklore, Names and Literature. – Christopher Helm, London.

Hayhow, D.B., Eaton, M.A., Bladwell, S., Etheridge, B., Ewing, S., Ruddock, M., Saunders, R., Sharpe, C., Sim, I.M.W. & Stevenson, A. (*in print*): The status of the Hen Harrier, *Circus cyaneus*, in the UK and Isle of Man in 2010. – Bird Study.

Holling, M. & the Rare Breeding Birds Panel (2011): Rare Breeding Birds in the United Kingdom in 2009. – British Birds 104 (9): 476–537.

Holling, M. & the Rare Breeding Birds Panel (2012): Rare Breeding Birds in the United Kingdom in 2010. – British Birds 105 (7): 352–416.

Humphreys, L., Wernham, C. & Crick, H. (2007): Raptor Species Conservation Frameworks: The Peregrine Conservation Framework Project Progress Report – Phase I. BTO Research Report No. 535. – BTO, Thetford.

Love, J.A. (1983): The Return of the Sea Eagle. – Cambridge University Press, Cambridge.

Love, R.A., Webbon, C., Glue, D.E. & Harris, S. (2000): Changes in the food of British Barn Owls (*Tyto alba*) between 1974 and 1997. – Mammal Review 30 (2): 107–129.

Mammen, U. & Stubbe, M. (2009): [Annual Report 2003 and 2004 for monitoring of birds of prey and owls in Europe.] – Jahresbericht zum Monitoring Greifvögel und Eulen Europas 16/17: 1–118. (in German)

Petty, S.J. (1996): History of the Northern Goshawk *Accipiter gentilis* in Britain. pp 95–102 In: Holmes, J.S. & Simons, J.R (eds.): The Introduction and Naturalisation of Birds. – HMSO, London.

Roos, S., Dobson, A., Noble, D., Haworth, P., Fielding, A., Carrington-Cotton, A., Etheridge, B. & Wernham, C. (*in print*): Raptors in Scotland – developing trends and indicators. – Scottish Natural Heritage Commissioned Report.

Smart, J., Amar, A., Sim, I.M.W., Etheridge, B., Cameron, D., Christie, G. &Wilson, J.D. (2010): Illegal killing slows population recovery of a re-introduced raptor of high conservation concern – The red kite *Milvus milvus*. – Biological Conservation 143 (5): 1278–1286.

Toms, M.P., Crick, H.Q.P. & Shawyer, C.R. (2001): The status of breeding barn owls *Tyto alba* in the United Kingdom 1995–97. – Bird Study 48 (1): 23–37.

Wernham, C.V., Etheridge, B., Holling, M., Riddle, G., Riley, H.T., Stirling-Aird, P.K., Stroud, D., Thompson, D.B.A. & Wilson, J.D. (2008): The Scottish Raptor Monitoring Scheme: objectives, achievements in the first four years, and plans for future development. – Ambio 37(6): 460–465.

Whitfield, D.P., Fielding, A.H., McLeod, D.R.A. & Haworth, P.F. (2004): Modelling the effects of persecution on the population dynamics of golden eagles in Scotland. – Biological Conservation 119 (3): 319–333.

Whitfield, D.P., Fielding, A.H, McLeod, D.R.A. & Haworth, P.F. (2008): A conservation framework for golden eagles: implications for their conservation and management in Scotland. – Scottish Natural Heritage Commissioned Report No. 193 (ROAME No. F05AC306).

Wotton, S.R., Carter, I., Cross, A.V., Etheridge, B., Snell, N., Duffy, K., Thorpe, R. & Gregory, R.D. (2002): Breeding status of the Red Kite *Milvus milvus* in Britain in 2000: The first co-ordinated Red Kite survey across Britain since the reintroduction programme began in 1989, yields 430 breeding pairs. – Bird Study 49 (3): 278–286.

Arrived / Prispelo: 27. 3. 2013
Accepted / Sprejeto: 1. 7. 2013

APPENDIX 1 / DODATEK 1

Status of populations and monitoring of raptors in Great Britain

Status populacij in monitoring ptic roparic v Veliki Britaniji

Species / Vrsta	Population size/ Velikost populacije (pairs / pari)	Latest national survey/ Zadnji nacionalni popis	Next national survey/ Naslednji nacionalni popis	Extent of annual national monitoring / Obseg letnega nacionalnega monitoringa	Parameters/ Parametri	Source/ Vir
Honey Buzzard *Pernis apivorus*	33–69	2000		Records submitted to RBBP	BP, Pr	NS
Red Kite *Milvus milvus*	1,043 (5-yr mean)	Annual		Professional monitoring of re-established populations	BP, Pr, S	1
White-tailed Eagle *Haliaeetus albicilla*	40 (5-yr mean)	Annual		Professional monitoring of re-established populations	BP, Pr, S	1
Marsh Harrier *Circus aeruginosus*	360	2005		Records submitted to RBBP**	BP, Pr	NS
Hen Harrier *Circus cyaneus*	687	2010* (and annual winter)		Partial co-ordinated coverage by RSGs	BP, Pr, S	NS
Montagu's Harrier *Circus pygargus*	15	Effectively annual via RBBP		Records submitted to RBBP	BP, Pr	1
Goshawk *Accipiter gentilis*	400	1988–91 BTO/ SOC/IWC Atlas	2007–11 BTO/ BWI/SOC Atlas	Partial co-ordinated coverage by RSGs***	BP, Pr	1, 2
Sparrowhawk *Accipiter nisus*	38,600	1988–91 BTO/ SOC/IWC Atlas	2007–11 BTO/ BWI/SOC Atlas	Coverage in BBS, and locally by some RSGs	BP, I, Pr	3
Buzzard *Buteo buteo*	31,100–44,000	1988–91 BTO/ SOC/IWC Atlas	2007–11 BTO/ BWI/SOC Atlas	Coverage in BBS, and locally by some RSGs	BP, I, Pr	3
Golden Eagle *Aquila chrysaetos*	442	2003		Considerable co-ordinated coverage by RSGs	BP, Pr	NS
Osprey *Pandion haliaetus*	180 (5-yr mean)	Effectively annual		Declining proportion covered by RSPB and RSGs as population increases	BP, Pr	1
Kestrel *Falco tinnunculus*	35,400	1988–91 BTO/ SOC/IWC Atlas	2007–11 BTO/ BWI/SOC Atlas	Coverage in BBS, and locally by some RSGs	BP, I, Pr	3

Continuation of Appendix 1 / Nadaljevanje dodatka 1

Species / Vrsta	Population size/ Velikost populacije (pairs / pari)	Latest national survey/ Zadnji nacionalni popis	Next national survey/ Naslednji nacionalni popis	Extent of annual national monitoring / Obseg letnega nacionalnega monitoringa	Parameters/ Parametri	Source/ Vir
Merlin *Falco columbarius*	1,128	2008		Partial co-ordinated coverage by RSGs	BP, Pr	NS
Hobby *Falco subbuteo*	2,200	1988–91 BTO/ SOC/IWC Atlas	2007–11 BTO/ BWI/SOC Atlas	Coverage in BBS, and records submitted to RBBP	BP, I, Pr	4
Peregrine Falcon *Falco peregrinus*	1,324	2002	2014?	Considerable co-ordinated coverage by RSGs	BP, Pr, S	NS
Barn Owl *Tyto alba*	3,000–5,000	1995–1997		Coverage in BBS, and locally by some RSGs	BP, I, Pr	NS
Little Owl *Athene noctua*	5,800–11,600	1988–91 BTO/ SOC/IWC Atlas	2007–11 BTO/ BWI/SOC Atlas	Coverage in BBS, and locally by some RSGs	BP, I, Pr	3
Tawny Owl *Strix aluco*	19,400	1988–91 BTO/ SOC/IWC Atlas	2007–11 BTO/ BWI/SOC Atlas	Coverage in BBS, and locally by some RSGs	BP, I, Pr	3
Long-eared Owl *Asio otus*	1,100–3,600	1988–91 BTO/ SOC/IWC Atlas	2007–11 BTO/ BWI/SOC Atlas	Local coverage by some RSGs	BP, Pr	5
Short-eared Owl *Asio flammeus*	1,000–3,500	1988–91 BTO/ SOC/IWC Atlas	2007–11 BTO/ BWI/SOC Atlas	Local coverage by some RSGs	BP, Pr	5

Sources:
(1) Holling & RBBP (2011); (2) Petty (1996); (3) Baker *et al.* (2006); (4) Clements (2001); (5) Gibbons *et al.* (1993)

* Not yet published. Population estimate refers to 2004 survey; declines were apparent between 2004 and 2010.
** Note: from these records 5-yr mean to 2009 is 404
*** Note: from records submitted to RBBP 5-yr mean to 2009 is 431

NS – National survey; BTO – British Trust for Ornithology; SOC – Scottish Ornithologists' Club; IWC – International Waterbirds Census; BWI – BirdWatch Ireland; RBBP – Rare Breeding Birds Panel; RSGs – Raptor Study Groups; BBS – BTO/JNCC/RSPB Breeding Bird Survey.

Parameters: BP – Breeding pairs; I – Individuals; Pr – Productivity; S – Survival. Parameters measured by at least some monitoring schemes.

Acrocephalus 33 (154/155): 233–237, 2012

An overview of monitoring for raptors in Hungary

Pregled monitoringa populacij ptic roparic na Madžarskem

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A total of 47 species of birds of prey and owls have occurred in Hungary since the beginning of ornithological data collection. The systematic monitoring of birds of prey in Hungary started in the late 1970s by MME/BirdLife Hungary. Since then a nation-wide monitoring network has developed, which presently includes more than 30 organisations and around 250–300 active members. The co-ordination of national monitoring of diurnal raptors and owls has been hosted by the Raptor Conservation Group and the Monitoring Centre of MME/BirdLife Hungary for decades, with a steady increase in the capacity and participation of state nature conservation bodies, especially national park directorates. Today, the population parameters of 12 birds of prey and two owl priority species are monitored annually in a nation-wide hierarchical monitoring network, while data about all other raptor species are regularly gathered regionally and locally. The coverage of the monitoring compared to the national range of threatened raptor species is usually between 60–80%, but in flagship species it often exceeds 80%. However, only broad estimations are available on the population size and trend of more widespread species, which forms one of the most important knowledge gaps regarding raptors in Hungary.

Key words*:* Hungary, birds of prey, owls, monitoring network, conservation, SWOT
Ključne besede*:* Madžarska, ujede, sove, monitorinško omrežje, varstvo, SWOT

1. Background

Since the beginning of ornithological data collection, 35 diurnal birds of prey and 12 owl species, including 21 and 10 breeding species respectively, have been recorded within the present political borders of Hungary (MME – Nomenclator Committee 2008).

The modern nation-wide raptor (birds of prey and owls) monitoring dates back to the mid-1970s, when a handful of interested people established the Raptor Conservation Committee (the later Raptor Conservation Group – RCG) in MME/BirdLife Hungary (Hungarian Ornithological and Nature Conservation Society) and embarked upon collecting and publishing sporadically available data mainly on rare raptor species in 1974 (Haraszthy & Bagyura 1993). The systematic data collection began in the late 1970s, when the main aims of the RCG were to fight against the persecution and illegal taking of birds of prey and to protect their nest sites. In later years, raptor monitoring data greatly contributed to the establishment of protected areas and to the conservation and management of key raptor sites and habitats as parts of the wider environment.

2. Main Players

2.1. Monitoring network

The Hungarian raptor monitoring network gradually broadened over the past decades and today it involves around 30 organisations (10 national park directorates and around 20 non-governmental organisations, museums and institutes of higher education) and 250–300 active members in a variety of raptor monitoring programmes countrywide.

As an initiative of MME/BirdLife Hungary, the Hungarian Raptor Conservation Council was established by 26 key organizations in 2010 to unite raptor monitoring and conservation efforts throughout Hungary (MME – Raptor Conservation Group 2012). The national monitoring network operates in a hierarchical system consisting of invited and overwhelmingly voluntary national co-ordinators, regional co-ordinators, local activists and employees of national park directorates. An annual informal assemble is organised for raptor monitoring activists in September for mainly team building purposes. A specialist meeting is organised annually in the first quarter of a year for giving updates on the previous year's conservation work and raptor population sizes to participants in raptor monitoring and conservation programmes.

Yearly concise reports on the monitoring and conservation of raptors species and short papers have been published in *Heliaca,* the annual of the RCG MME/BirdLife Hungary, since 2004 in Hungarian with English summaries (see for latest references in Table 1). Peer-reviewed raptor research papers are regularly published in *Aquila* (GRIN 2013), the annual of the former Hungarian Institute of Ornithology, recently edited and published with the financial help of the Ministry of Rural Development.

2.2. International co-operation

International co-operation in raptor monitoring of Hungary have been influenced mainly by the geographical distribution of key raptor species and key conservation issues. Some of the flagship raptor species form a single cross-border population in the Carpathian Basin. Thus, there has been a traditional strong cooperation with Slovak raptor specialists for decades for example in the conservation and monitoring of the Imperial Eagle *Aquila heliaca* and the Saker Falcon *Falco cherrug*. The co-operation has gradually been strengthened through joint projects with Austria, Bulgaria, Croatia, Romania and Serbia in the conservation of the White-tailed Eagle *Haliaeetus albicilla*, the Imperial Eagle, the Red-footed Falcon *F. vespertinus* and the Saker Falcon since the early 2000s.

Project level co-operations have also increased with a wide range of countries within Europe and outside (e.g. Azerbaijan, Georgia, Turkey, Macedonia – Imperial Eagle, Italy, Ukraine – Saker Falcon) since the early 2000s.

2.3. Main Users

The main users of the data obtained from raptor monitoring are the Ministry of Rural Development, National Park Directorates, environmental authorities and NGOs, primarily MME/BirdLife Hungary.

Data are used for decision making in Strategic Environmental Assessments (SEA) and Environmental Impact Assessments (EIA) by state conservation organisations and also for follow-up reporting to international conventions and to the European Commission under the Birds Directive (EC 2009) on the status of raptor species and on the general state of biodiversity.

Data collection in NGOs helps to follow and present the changes in raptor populations in the long term to the stakeholders and the general public. Since Hungarian people traditionally have a considerable cultural binding to raptors, presenting basic data about birds of prey and owl populations can significantly increase public awareness on environmental problems.

3. Key species

Key species addressed by co-ordinated national monitoring principally include threatened and rare diurnal raptors and owls (Table 1). Basic population data on these species are collected in a hierarchical system co-ordinated by a usually volunteer national co-ordinator. Data on some owl species are also collected by national co-ordinators, but these species are generally much less known than diurnal raptors.

4. Monitoring methods and national coverage

The method used for the monitoring of key species is predominantly annual total count of known territories of each species. The search for new territories and nest-sites takes place all year round based on data coming from point counts, synchronous and occasional observations in and outside the breeding season. In most key species, all known nests are checked more than once a year in order to localize occupied nest-sites, to record the brood size and the breeding success as well as to intervene if the brood is directly threatened by natural and human-related factors.

The total count of raptors is used during the winter raptor survey called *Eagle Synch*, when hundreds of observers record birds of prey simultaneously on the same winter date in a particular area within a coordinated effort.

Table 1: Population status and monitoring of diurnal birds of prey ad owls covered by co-ordinated national monitoring in Hungary

Tabela 1: Populacijski status in monitoring ujed in sov, ki se opravlja v okviru koordiniranega nacionalnega monitoringa na Madžarskem

Species / Vrsta	Population size/ Velikost populacije (pairs / pari)	Monitoring season / Obdobje monitoringa	Monitored population parameters / Spremljani populacijski parametri	Responsible organisation/ Odgovorna organizacija**	References / Viri
Black kite *Milvus migrans*	123 (observed)	Breeding season	D, BP, BS	MME, BNPD	Török *et al.* (2010)
Red kite *Milvus Milvus**	4 (2 observed)	Breeding season, winter count	D, BP, BS, NB	MME	Bank & Balázs (2010)
White-tailed Eagle *Haliaeetus albicilla**	250 (226 observed)	Breeding season, winter count	D, BP, BS, NB, CD, G, MD	MME, DDNPD	Horváth (2010)
Short-toed Eagle *Circaetus gallicus**	32 (observed)	Breeding season	D, BP, BS	MME, BNPD	Szitta *et al.* (2010)
Montagu's Harrier *Circus pygargus*	170–200 (estimated)	Breeding season	D, BP, BS	MME	MME NC (2008)
Long-legged Buzzard *Buteo rufinus**	15 (9 observed)	Breeding season, winter count	D, BP, BS, NB	HNPI	Tihanyi *et al.* (2010)
Lesser-spotted Eagle *Aquila pomarina**	30 (27 observed)	Breeding season	D, BP, BS	MME, BNPD	Pongrácz *et al.* (2010)
Imperial Eagle *Aquila heliaca**	135 (125 observed)	All year	D, BP, BS, NB, CD, G, MD	MME	Horváth *et al.* (2010)
Golden Eagle *Aquila chrysaetos**	5 (observed)	Breeding season, winter count	D, BP, BS, NB, CD	MME	Firmánszky *et al.* (2010)
Red-footed Falcon *Falco vespertinus**	774 (observed)	Breeding season, congregation sites	D, BP, BS, NB, CD, MD	MME	Solt *et al.* (2010)
Saker Falcon *Falco cherrug*	220 (172 observed)	All year	D, BP, BS, NB, CD, G, MD	MME, BNPD	Bagyura *et al.* (2010)
Peregrine Falcon *Falco peregrinus**	21 (observed)	Breeding season	D, BP, BS, NB, CD, MD	MME, PITE	Prommer *et al.* (2010)
Eagle Owl *Bubo bubo*	75 (60 observed)	Breeding season	D, BP, BS, NB, CD	MME	Petrovics (2010)
Long-eared Owl *Asio otus*	2,300–2,700 ind.	Winter roost (n = 92)	WP	HNPD	Monoki *et al.* (2010)

* Species in which the annual monitoring of population parameters supposedly covers more than 80% of the known national range

** BNPD – Bükk National Park Directorate; DDNPD – Duna - Dráva National Park Directorate; HNPD – Hortobágy National Park Directorate; MME – BirdLife Hungary; PITE – Pilis Nature Conservation Society

Parameters: D – distribution, BP – breeding population, WP – wintering population, BS – breeding success, NB – non-breeders, CD – causes of death, G – genetic variation, MD – migration and dispersal

Point counts and line transects are less often used but applied for example in the monitoring of the number of raptors in temporary settlement areas preferred by non-breeding individuals, or congregation sites.

The coverage of raptor monitoring differs from species to species. In key species (Table 1) the coverage of annual monitoring is in most cases between 60–80% of the known national breeding range. In flagship species, the annual monitoring of population parameters such as occupied territories, number of breeding pairs and breeding success can cover up to 80–95% of the estimated national populations.

As for more common species, such as the Buzzard *Buteo buteo* and Marsh Harrier *Circus aeruginosus*, the monitoring coverage and capacity are much lower and usually only scarce local studies have been available on their population parameters. The national breeding population sizes and population trends of such species are estimated by a randomised sampling design used in the Common Bird Census scheme (Szép & Gibbons 2000). Changes in numbers of wintering Hen Harriers *C. cyaneus*, Buzzards and Rough-legged buzzards *B. lagopus* are monitored in parallel with winter eagle surveys and relevant national data are collected by MME/BirdLife Hungary.

5. Assessment of the present state of raptor monitoring in Hungary

The *key monitoring issues* are closely associated with the monitoring of the general state of biodiversity and environmental parameters, such as the main specific and widespread threats to raptors including electrocution on electric poles, poisoning and illegal shooting, and habitat loss due to land use changes, agricultural and forestry intensification.

The *main strengths* of monitoring for raptors in Hungary are the experienced and enthusiastic nation-wide volunteer network consisted of numerous active field workers, professional full- and part-time raptor specialists at nature conservation organisations with effective international fundraising skills, and the hierarchical network of data collection.

The *main weaknesses* of monitoring for raptors in Hungary are probably the lack of strategic and project planning for monitoring in line with conservation and research needs; the limited international networking capacities due to inadequate knowledge of foreign languages; and that the monitoring results are rarely published in international peer-reviewed journals.

The main gap in species monitoring has been so far the lack of targeted national monitoring of common raptor population parameters especially in the Marsh Harrier, Buzzard and the Goshawk *Accipiter gentilis*. For filling this gap, a pilot monitoring scheme was introduced by MME/BirdLife Hungary in 2012 aiming at collecting raptor data annually in 2.5 × 2.5 km sample plots.

International networking could further increase the effectiveness of the Hungarian raptor monitoring through the development of standardised international monitoring schemes. Sharing international experience in the monitoring of the populations of common birds of prey species, and in advocacy efforts could contribute to their long-term conservation; and to the mitigation and elimination of the main human-induced threats to birds of prey (e.g. electrocution, poisoning and persecution). Developing negotiation skills with key stakeholders on the sustainable use of national resources, joint research planning and publication of available data would also improve the potential outputs of raptor monitoring and conservation efforts.

Sharing of good/best practice internationally would be beneficial to the Hungarian raptor monitoring activities in the planning of monitoring and related research in line with conservation needs; in collaboration and publication through joint projects; and in the more effective use of monitoring results in conservation policy and practice.

As *priorities* for future work, we can mention the development of a national raptor monitoring strategy that clearly defines the aims, objectives and potential applications of the results of raptor monitoring activities; the expansion of common raptor monitoring in terms of area and participants; and the strengthening of the national co-ordination of survey efforts in key conservation issues.

The main *capacity building needs* of the Hungarian raptor monitoring network are to establish an effective national planning, co-ordinating, data collecting, processing and interpreting unit and to recruit volunteers from younger generations.

After all it must be mentioned that with all gaps and weaknesses the monitoring of birds of prey and owls is traditionally one of the most successful and effective national bio-monitoring networks in Hungary thanks to the enthusiastic and devoted work of many volunteers and professionals.

Acknowledgements: A special thank you goes to the hundreds of volunteers who devoted their time and effort to raptor monitoring in Hungary in the past. The following individuals have played distinctive roles in the development of the Hungarian raptor monitoring

network: József Fidlóczky, Gábor Firmánszky, László Haraszthy, Béla Kalocsa, Péter Palatitz, Zoltán Petrovics, István Sándor, Tamás Szitta, Imre Tóth, Miklós Váczi and Levente Viszló. The authors thank EURAPMON and the European Science Foundation for their technical and financial support, which made the publication of this paper possible. We also thank the useful comments of Luka Božič (editor) and those of two anonymous referees.

6. Povzetek

Od začetka zbiranja podatkov o pticah na Madžarskem je bilo v tej državi zabeleženih 47 vrst ujed in sov. Sistematičnega monitoringa se je v poznih 70. letih lotil MME/BirdLife Madžarska. Od tedaj se je razvilo vsedržavno monitorinško omrežje, ki trenutno vključuje več kot 30 organizacij in med 250 in 300 aktivnih članov. Za koordinacijo nacionalnega monitoringa ujed in sov že desetletja skrbita Skupina za varstvo ptic roparic in Center za monitoring pri MME/BirdLife Madžarska ob nenehno naraščajočem sodelovanju državnih naravovarstvenih teles, še posebno direktoratov narodnih parkov. Danes so populacijski parametri 14 prioritetnih vrst (12 vrst ujed in 2 vrst sov) spremljani v vsedržavnem hierarhičnem monitorinškem omrežju, medtem ko se podatki o vseh drugih vrstah ptic roparic redno zbirajo regionalno in lokalno. Pokritost monitoringa je glede na madžarski areal ogroženih vrst navadno 60–80 %, medtem ko pri karizmatičnih vrstah pokritost pogosto presega 80 %. Kljub temu so na voljo le grobe ocene o velikosti in trendih populacij pogostejših vrst, kar pa je tudi ena največjih vrzeli v poznavanju ptic roparic na Madžarskem.

7. References

Bagyura, J., Fidlóczky, J., Szitta, T., Prommer, M., Tihanyi, G., Zalai, T., Balázs, I., Váczi, M., Viszló, L., Klébert, A., Haraszthy, L., Tóth, I., Török, H.A., Demeter, I., Serfőző, J., Pigniczki, Cs., Kazi, R. & Erdélyi, K. (2010): [Annual Report of the Saker Falcon Conservation Working Group.] – Heliaca 2010: 22–29. (in Hungarian, English summary)

Bank, L. & Balázs, I. (2010): [Red Kite Population Data.] – Heliaca 2010: 42–43. (in Hungarian, English summary)

European Commission (2009): Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds. (available at http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:020:0007:0025:EN:PDF)

Firmánszky, G. (2010): [Golden Eagle Population Data.] – Heliaca 2010: 48. (in Hungarian, English summary)

Global Raptor Information Network (2013): Search for papers in Aquila. – [http://grin.biblio.globalraptors.org/rmwp?dbOverride=1&fields=Periodical&func=doAdvSearch&dbId=GRIN&terms=Aquila], 5/6/2013.

Haraszthy, L. & Bagyura, J. (1993): Protection of birds of prey in Hungary in the last 100 years – Aquila 100: 105–121. (in Hungarian, English summary)

Horváth, Z. (2010): [Report of the White-tailed Eagle protection programme.] – Heliaca 2010: 36–39. (in Hungarian, English summary)

Horváth, M., Bagyura, J., Fatér, I., Firmánszky, G., Juhász, T., Kleszó, A., Szitta, T., Tóth, I. & Váczi, M. (2010): [Hungarian Imperial Eagle Working Group Annual Report.] – Heliaca 2010: 12–16. (in Hungarian, English summary)

MME – Nomenclator Committee (2008): Nomenclator avium Hungariae. An annotated list of the birds of Hungary. – MME/BirdLife Hungary, Budapest.

MME – Raptor Conservation Group (2012): [Hungarian Council for the protection of Birds of Prey.] – Heliaca 8: 133–134. (in Hungarian, English summary)

Monoki, Á., Sebe, K., Lisztes, A. & Kiss, Á. (2010): [Wintering Long-eared Owls in Hungary 2009/2010.] – Heliaca 2010: 56–60. (in Hungarian, English summary)

Petrovics, Z. (2010): [Eagle Owl Population Data.] – Heliaca 2010: 50–51. (in Hungarian, English summary)

Pongrácz, Á., Szegedi, Zs., Kováts, L., Szinai, P. & Bank, L. (2010): [Lesser-spotted eagle Population Data.] – Heliaca 2010: 46–47. (in Hungarian, English summary)

Prommer, M., Bagyura, J., Molnár, I.L., Szitta, T., Pongrácz, Á., Kazi, R., Viszló, L. & Csonka, P. (2010): [Peregrine Conservation Programme.] – Heliaca 2010: 30–31. (in Hungarian, English summary)

Solt, Sz., Palatitz, P., Fehérvári, P., Gergely, J., Ágoston, A. & Barna, K. (2010): [Red-footed Falcon Working Group Annual Report.] – Heliaca 2010: 17–21. (in Hungarian, English summary)

Szép, T. & Gibbons, D. (2000): Monitoring of common breeding birds in Hungary using a randomised sampling design. – The Ring 22 (2): 45–55.

Szitta, T., Béres, I., Csonka, P., Klébert, A., Molnár, I.L. & Nagy, L. (2010): [Short-toed Eagle Population Data.] – Heliaca 2010: 44. (in Hungarian, English summary)

Tihanyi, G., Tar, J., Vasas, A., Vincze, T., Czifrák, G. & Bagyura, J. (2010): [Long-legged Buzzard Population Data.] – Heliaca 2010: 45. (in Hungarian, English summary)

Török, H.A., Bank, L., Csonka, P., Horváth, Z., Hunyadvári, P., Kotymán, L., Kováts, L., Monoki, Á., Mórocz, A., Szegedi, Zs., Tihanyi, G. & Tóth, I. (2010): [Black Kite Population Data.] – Heliaca 2010: 40–41. (in Hungarian, English summary)

Arrived / Prispelo: 27. 3. 2013
Accepted / Sprejeto: 1. 7. 2013

Acrocephalus 33 (154/155): 239–245, 2012

An overview of monitoring *for* raptors in Ireland

Pregled monitoringa populacij ptic roparic na Irskem

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Ireland holds a low diversity of breeding raptors as a result of its location on the western edge of Europe but also due to historical persecution leading to the loss of at least seven species. Recolonisation by Buzzards *Buteo buteo* and the recent reintroduction of three species, Golden Eagle *Aquila chrysaetos*, White-tailed Eagle *Haliaeetus albicilla* and Red Kite *Milvus milvus*, has helped redress such losses. Monitoring for raptors is carried out by the statutory agencies, NGOs and two university research groups. Decadal and semi-decadal surveys are undertaken nationally in the Republic of Ireland and Northern Ireland for Peregrine Falcon *Falco peregrinus* and Hen Harriers *Circus cyaneus*, respectively. Long term monitoring projects have been established for some key species such as Barn Owl *Tyto alba*. However, some species receive little monitoring effort (e.g. Sparrowhawk *Accipiter nisus*, Merlin *F. columbarius*). A dedicated Raptor Monitoring Scheme to determine long-term population trends across a range of species is lacking and remains an urgent priority. Development of an Action Plan for raptors and/or single key species would further help identify priorities and raise awareness of the need of monitoring for raptors.

Key words: birds of prey, owls, monitoring, survey, Ireland
Ključne besede: ujede, sove, monitoring, popis, Irska

1. Introduction

Ireland holds perhaps the lowest diversity of raptor species in Europe (Table 1) in part as a result of its location as an island on the western edge of Europe but also due to the loss of several species as a result of centuries of human persecution and habitat loss (D'Arcy 1999). However, in the last few decades four species previously extinct have now either been re-established through reintroduction programmes (O'Toole *et al.* 2002) or have recolonised naturally (Norriss 1991), while two other species have bred intermittently and may re-establish themselves in the near future (Hillis 2008).

Perhaps due to different conservation priorities and the low diversity of breeding raptors, monitoring of raptors in Ireland has received much less attention than other bird groups (e.g., seabirds, wildfowl) until recently (see Table 1, Figure 1).

2. Main players

Statutory responsibility for raptor monitoring and conservation rests with the National Parks and Wildlife Service (NPWS) in the Republic of Ireland (RoI) and the Northern Ireland Environment Agency (NIEA) in Northern Ireland. Such responsibilities include the designation of Special Protection Areas (SPA) for Birds Directive Annex I raptors within the Natura 2000 network, the management of six National Parks in the RoI, some of which hold important raptor populations, and the enforcement of the Wildlife Act (1976, 2000) to protect raptor populations (see www.npws.ie).

Two NGOs have a specific remit to monitor raptor populations. The Irish Raptor Study Group (IRSG) is a voluntary organisation solely dedicated to monitor and improve the conservation status of raptors in the RoI (IRSG 2006). The Golden Eagle Trust

Table 1: Summary of monitoring programmes for raptors in Ireland (including Northern Ireland)

Tabela 1: Povzetek programov monitoringa ptic roparic na Irskem (vključno s Severno Irsko)

Species / Vrsta	Population Estimate/ Populacijska ocena	Project name/ Naziv projekta	Project type/ Vrsta projekta	Duration/ Trajanje	Organisation/ Organizacija
Red Kite *Milvus milvus*	25–30	Irish Red Kite reintroduction[1]	Reintroduction	2007–2011	GET, NPWS, RSPB
White-tailed Eagle *Haliaeetus albicilla*	10	Irish White-tailed Eagle reintroduction[2]	Reintroduction	2007–2011	GET, NPWS
Marsh Harrier *Circus aeruginosus*	0–2	No studies			IRSG
Hen Harrier *Circus cyaneus*	190–220	Planforbio[3]	Research		University College Cork
Goshawk *Accipiter gentilis*	0–5	No studies			D. Scott (*in litt.*)
Sparrowhawk *Accipiter nisus*	11,000	No studies			IRSG
Buzzard *Buteo buteo*	3,500–4,000	Buzzard Ecology & Biology Project[4]	PhD/ Monitoring	2010–	Queens University, IRSG
Golden Eagle *Aquila chrysaetos*	5–10	Irish Golden Eagle Reintroduction[5]	Reintroduction	2001–	GET, NPWS
Kestrel *Falco tinnunculus*	10,000	Kestrel Monitoring Project[6]	Monitoring/ Research		BWI
Merlin *Falco columbarius*	250+	Merlin pilot project[7]	Research	2010–	BWI, NPWS
Peregrine Falcon *Falco peregrinus*	450–500	Wicklow/NW Ireland pop. Study[8]	Survey/ Research	2011	D. Clarke/ NPWS/IRSG
Barn Owl *Tyto alba*	400–600	Barn Owl Research Project[9]	Research	2006–	BWI
Snowy Owl *Bubo scandiacus*	0–1	No studies			IRSG
Long-eared Owl *Asio otus*	3,500+	LEO Monitoring Project[10]	Survey/ Monitoring	2012–	BWI, NPWS
Short-eared Owl *Asio flammeus*	0–5	No studies			

[1] Co. Wicklow, Co. Down; [2] Co. Kerry; [3] Cos. Kerry, Cork, Limerick, Clare; [4] Co. Cork (IRSG), N. Ireland (Queens); [5] Co. Donegal; [6] SW Ireland; [7] Wicklow, Donegal, Connemara; [8] Co. Wicklow, NW Ireand; [9] SW Ireland; [10] Connemara, SW Ireland.

GET – Golden Eagle Trust; NPWS – National Parks and Wildlife Service; IRSG – Irish Raptor Study Group; BWI – BirdWatch Ireland

(GET) works to restore populations of threatened or previously extinct raptor species. The GET manages reintroduction programmes for Golden Eagles *Aquila chrysaetos*, White-tailed Eagles *Haliaeetus albicilla*, and Red Kites *Milvus milvus* in the RoI in collaboration with NPWS (O'Toole 2002, Mee 2009 & 2010). A third NGO, BirdWatch Ireland (BWI), the BirdLife International partner in the RoI, is dedicated to the conservation of Irish birds and has recently established a Raptor Conservation Project. BWI established a long term monitoring programme for Barn Owls *Tyto alba* in 2006 and has more recently initiated research and monitoring of Long-eared Owl *Asio otus*, Kestrel *Falco tinnunculus* and Merlin *F. columbarius* to determine

densities, trends, ecological requirements and factors affecting the conservation status of these populations (Lusby 2009, 2012a & 2012b, Lusby *et al.* 2010a, 2010b, 2011, 2012a & 2012b, Fernández-Bellon & Lusby 2011a & 2011b, O'Cleary *et al.* 2012). In Northern Ireland, the Royal Society for the Protection of Birds (RSPB) manages the reintroduction programme for Red Kites in County Down. The Northern Ireland Raptor Study Group (NIRSG) is the sister group of the IRSG, monitoring raptors in Northern Ireland, especially an intensive monitoring programme for Peregrine Falcons *F. peregrinus* (Wells 2007).

Two university research teams monitor raptor populations. The Planforbio research team at University College Cork has been working on the ecology of Hen Harrier *Circus cyaneus* nesting in commercial forestry plantations since 2008, work which has informed the State forestry body, Coillte, of forest management possibilities for harriers (Irwin *et al.* 2008, Wilson *et al.* 2009 & 2012). The Quercus programme at Queens University, Belfast, Northern Ireland, has instigated studies of harriers and Peregrine Falcon (Ruddock 2007 & 2008), as well as raptor monitoring workshops (www.qub.ac.uk/sites/Quercus). A study of the population dynamics of Buzzards *Buteo buteo* is also ongoing (Rooney 2013, Rooney & Montgomerie 2013).

Collaboration in monitoring for raptors is primarily with the UK including breeding and winter Atlas studies (all species including raptors), which are run simultaneously across Ireland and Britain (Sharrock 1976, Lack 1986, Gibbons *et al.* 1993). Single species studies of Peregrine Falcon (Crick & Ratcliffe 1995, Norriss 1995, Banks *et al.* 2003, Madden *et al.* 2009) and Hen Harrier (Sim *et al.* 2001, Norriss *et al.* 2002, Barton *et al.* 2006, Sim *et al.* 2007, Ruddock *et al.* 2010) have also been carried out in both regions in similar time periods. There is also close collaboration with Britain on ringing studies and activities as Irish ringers use rings supplied by the British Trust for Ornithology (BTO) and supply raptor information to BTO studies such as the Nest Record Scheme.

Raptor monitoring data submitted to statutory agencies are important in determining population status and trends and may form the basis for conservation action such as the SPA designation. Declining species may be added to the Red List of species of conservation concern and become priorities for conservation (Lynas *et al.* 2007). NGOs, such as the IRSG, NIRSG, GET and BWI, supply much of the data needed for setting conservation priorities. State agencies such as Coillte may use data on Hen Harrier to inform forest management.

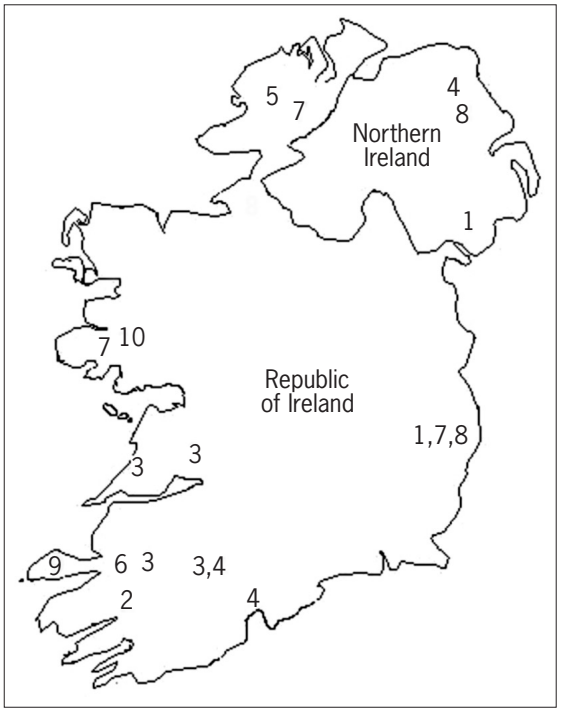

Figure 1: Monitoring programmes for raptors in Ireland. Numbers refer to project names in Table 1.

Slika 1: Programi monitoringa ptic roparic na Irskem. Številke ustrezajo nazivom projektov v Tabeli 1.

3. National coverage

Apart from Atlas studies (all species), coverage for single species raptor surveys has been coordinated by NPWS/NIEA, NGOs or private consultants working on behalf of the statutory agencies so that populations in all regions are assessed (e.g. Madden *et al.* 2009, Ruddock *et al.* 2010). NGOs have also coordinated their own national surveys to determine population status and trends (Lusby 2012b, Mee & Clarke *in prep.*). No national scheme exists for long-term monitoring of raptor population trends, although this has been proposed by the IRSG-NIRSG to the statutory agencies. At present, little or no funding appears to be available for this programme. The IRSG-NIRSG provide a framework for coordinating raptor monitoring but, except for dedicated national surveys, coverage is patchy and tends to focus on species of interest to individuals or those that can be relatively easily accessed without specialist skills such as tree-climbing, while some of the more widespread and apparently common raptors (e.g. Sparrowhawk

Accipiter nisus) are little monitored. Coverage also tends to be lowest in more remote, mountain areas.

4. Key species and key issues

The focus of monitoring for raptors to date has been national and regional studies of Annex I species, particularly Peregrine Falcon (Moore *et al.* 1992 & 1997, Wells 2007) and Hen Harrier (Scott 2000, O'Donoghue 2010) as well as local and regional studies of Merlin (Clarke & Scott 1994, McElheron 2005, Norriss *et al.* 2010, Fernández-Bellon & Lusby 2011a & 2011b). Other key species have been those recently listed on the Red (high) and Amber (medium) list of birds of conservation concern (Lynas *et al.* 2007) including the recently reintroduced Golden Eagle and Red Kite. Breeding populations of the reintroduced Golden Eagle (north-western Ireland) and Red Kite (County Wicklow) are comprehensively monitored by the GET using radio and satellite telemetry as well as public sighting of wing-tagged individuals (see www.goldeneagle.ie). White-tailed Eagles are similarly monitored, with first breeding in the wild expected in 2012/2013 (Mee 2009 & 2010).

Although historically habitat loss, principally loss of native forest cover and wetland drainage, has had an undoubted effect of Irish raptor populations, direct human persecution has in the past caused most population extinctions including the loss of breeding Osprey, Golden Eagle *Pandion haliaetus*, White-tailed Eagle, Red Kite, Goshawk *A. gentilis* and Buzzard (D'Arcy 1999). All but Osprey have now either been reintroduced or recolonised to varying extents (Norriss 1991, Hillis 2008, Mee 2010).

However, poisoning remains the greatest threat to re-establishing or maintaining populations. Between 2007 and early 2013, of 27 White-tailed Eagles recovered dead, 12 were confirmed poisoned in RoI and another seven suspected (GET *unpubl.*). At least three Golden Eagles and 16 Red Kites have also been poisoned during this period. Most if not all such poisoning appears to be accidental, foxes and crows being the intended target. However, several Buzzards and even Peregrine Falcons have also been deliberately poisoned. Most recently (Sept–Dec 2011), eight Red Kites were recovered dead, at least six apparently due to rodenticide (brodifacoum) poisoning (GET *unpubl.*) to which Barn Owls in Ireland are highly susceptible (J. Lusby *unpubl.*). Following a formal complaint to the EU (GET 2009), the use of poisons for the control of foxes has been banned in the RoI (Oct 2010). However, illegal use and misuse of substances remains a problem. A formal protocol for post-mortem handling, toxicological analysis and reporting was established in 2011 by NPWS in collaboration with the Department of Agriculture and the State Laboratory. Rodenticides also kill Kestrel and Buzzard, but population level threats are unknown. Other threats include road (Barn Owl) and rail (Red Kite) collisions, e.g. 214 road mortalities in 2006–2012 (J. Lusby *pers. comm.*). The recent expansion of wind farm developments, including some within SPAs, is also likely to pose a threat through displacement and/or collision (Scott & McHaffie 2008, Pearce-Higgins *et al.* 2009). In 2011, two White-tailed Eagles were recovered dead due to turbine collisions in south-western Ireland (GET *unpubl.*).

No currently breeding Irish raptors are truly migratory, although there is evidence that some Hen Harriers winter as far as Western Europe (B. O'Donoghue *in litt.*). Sharing information on dispersal patterns might improve the conservation status of this species. Issues facing raptors in Ireland such as poisoning and windfarm collisions would benefit from international networking to establish best practice for monitoring and assessing threats to populations.

5. Strengths and weaknesses

Ireland is a relatively small country with a smaller suite of breeding raptors than most other European countries. Therefore it should be in a position to devise and implement a comprehensive monitoring programme. Decadal and semi-decadal national surveys for key species such as Peregrine Falcon and Hen Harrier have worked well because the populations have been small enough, nesting sites reasonably well known, or populations have been discrete (e.g. Madden *et al.* 2009, Ruddock *et al.* 2010). However, such surveys are labour intensive and as some populations recover and expand (e.g. Peregrine Falcon) random selection of study areas will be essential. Other key species (e.g. Merlin) have never been surveyed on a national scale, while baseline data do not exist for some very rare breeders (e.g. Short-eared Owl *Asio flammeus*). Barn Owls have been increasingly monitored in recent years (Nagle 2007, O'Connell *et al.* 2007, Lusby 2009, 2012a & 2012b, Lusby *et al.* 2010a & 2010b), but little specific monitoring of breeding Long-eared or Short-eared Owl populations or their ecology has been undertaken (but see and Sleeman 1988, Smal 1989, Andrews 1992, Cooke *et al.* 1995).

Lack of a Raptor Monitoring Scheme (RMS) to

determine long-term population trends across a range of species, including some widespread but possibly declining species such as Kestrel, remain a major weakness. International best practice and information sharing on appropriate monitoring schemes would be useful in designing a RMS.

6. Priorities, capacity-building

Establishing an island-wide RMS is a high priority. However, lack of funding and the small pool of existing raptor fieldworkers will inhibit development of this scheme without full time personnel to drive the RMS.

Semi-decadal surveys for Hen Harriers should be continued. Merlin needs to be monitored at an appropriate level on at least a semi-decadal frequency. High priority reintroduced raptors should continue to be intensively monitored at least until all populations are well established. Rare and little known species should also be targeted to establish baseline data for conservation. Ultimately funding will be needed to drive much of this effort. Where key skills are lacking, training workshops will be useful in upskilling fieldworkers and generating support for monitoring programmes.

Group Action Plans have been devised for suites of species including raptors based on ecosystem to identify specific conservation requirements, targets and the actions needed to achieve such targets (e.g. BirdWatch Ireland 2010). Development of an Action Plan for raptors or single key species would further help identify priorities and raise awareness of the need of monitoring for raptors.

Further, the timely publication and dissemination of monitoring results is important not only for improving our knowledge of species and setting priorities but would also further capacity-building for raptors.

Acknowledgements: Thanks to the dedicated raptor fieldworkers who provided information on their monitoring and/or research projects including as yet unpublished data. Special thanks to Damian Clarke (NPWS), John Lusby (BWI), Tony Nagle (IRSG), and Eimear Rooney (Queens University). John Lusby made helpful comments on the manuscript.

7. Povzetek

Na Irskem je pestrost ptic roparic majhna, a ne zgolj zaradi geografske lege te države na zahodnem robu Evrope, marveč tudi zaradi zgodovinskega preganjanja teh ptic na otoku in posledično izumrtja najmanj sedmih vrst. Te izgube se je Irski posrečilo do neke mere nadomestiti z nedavno ponovno naselitvijo treh vrst, in sicer planinskega orla *Aquila chrysaetos*, belorepca *Haliaeetus albicilla* in rjavega škarnika *Milvus milvus*, medtem ko je kanja *Buteo buteo* pričela ponovno gnezditi sama. Za monitoring ptic roparic skrbijo različne javne agencije, nevladne organizacije in dve univerzitetni raziskovalni skupini. V Republiki Irski poteka, na primer, nacionalni popis sokola selca *Falco peregrinus* vsakih deset let, na Severnem Irskem pa popis pepelastega lunja *Circus cyaneus* vsakih pet let. Za nekatere ključne vrste, kakršna je pegasta sova *Tyto alba*, so bili izdelani projekti za njihov dolgoročni monitoring. Nekatere druge vrste, npr. skobec *Accipiter nisus* in mali sokol *F. columbarius*, pa so po drugi strani deležne komaj omembe vredne pozornosti. Najnujnejša prioriteta ostaja program temeljitega monitoringa ptic roparic, s katerim bi ugotavljali dolgoročne trende v arealih posameznih vrst. Razvoj akcijskega načrta za to skupino ptic in/ali posamezne ključne vrste pa bi nadalje pripomogel k ugotavljanju prioritet in spodbujal ozaveščenost o potrebi stalnega spremljanja ptic roparic.

8. References

Andrews, D.J. (1992): The diet of wintering Short-eared Owls on Strangford Lough, Co. Down. – Irish Birds 4: 549–554.

Banks, A.N., Coombes, R.H. & Crick, H.Q.P. (2003): The Peregrine Falcon breeding population in the UK and Isle of Man in 1992. BTO Research Report No. 333. – BTO, Thetford.

Barton, C., Pollock, C., Norriss, D.W., Nagle, T., Oliver, G.A. & Newton, S. (2006): The second national survey of breeding Hen Harriers *Circus cyaneus* in Ireland 2005. – Irish Birds 8: 1–20.

BirdWatch Ireland (2010): Action Plan for Upland Birds in Ireland 2011–2020. BirdWatch Ireland's Group Action Plans for Irish Birds. – BirdWatch Ireland, Kilcoole, Co. Wicklow.

Clarke, R. & Scott, D. (1994): Breeding season diet of the Merlin in County Antrim. – Irish Birds 5: 205–206.

Cooke, A., Nagle, A. & Fairley, J.S. (1995): The diet of Long-eared Owls within the range of the Bank Vole in Co. Cork. – Irish Birds 5: 305–307.

Crick, H.Q.P. & Ratcliffe, D.A. (1995): The Peregrine *Falco peregrinus* population of the United Kingdom in 1991. – Bird Study 42 (1): 1–19.

D'Arcy, G. (1999): Ireland's Lost Birds. – Four Courts Press, Dublin.

Gibbons, D.W., Reid, J.B. & Chapman, R.A. (1993): The New Atlas of Breeding Birds in Britain and Ireland 1988–1991. – T & A D Poyser, London.

Fernández-Bellon, D. & Lusby, J. (2011a): The effectiveness of playback as a method for monitoring

breeding Merlin *Falco columbarius* in Ireland. – Irish Birds 9: 155–158.

Fernández-Bellon, D. & Lusby, J. (2011b): The feeding ecology of Merlin *Falco columbarius* during the breeding season in Ireland, and an assessment of current diet analysis methods. – Irish Birds 9: 159–164.

Golden Eagle Trust Ltd. (2009): Ireland's failure to protect birds of prey. Unpublished report to the EU Commission Directorate General, November 2009.

Hillis, J.P. (2008): Rare Irish breeding birds, 2007. The Seventh Annual Report of the Irish Rare Breeding Birds Panel. – Irish Birds 8: 365–372.

Irish Raptor Study Group (2006): Birds of Prey and Owls in Ireland. – Dublin.

Irwin, S., Wilson, M., Kelly, T.C., O'Donoghue, B., O'Mahony, B., Oliver, G., Cullen, C., O'Donoghue, T. & O'Halloran, J. (2008): Aspects of the breeding biology of Hen Harriers *Circus cyaneus* in Ireland. – Irish Birds 8: 331–334.

Lack, P. (1986): The Atlas of Wintering Birds in Britain and Ireland. – British Trust for Ornithology & Irish Wildbird Conservancy, Calton.

Lusby, J. (2009): The impact of two introduced mammals on the Barn Owl (*Tyto alba*) population in Ireland. Poster presentation. Raptor Research Foundation Annual Conference, 29 September–4 October 2009, Pitlochry, Scotland.

Lusby, J. (2012a): Exposure of Barn Owls *Tyro alba* in Ireland to second generation anticoagulant rodenticides (2006–2011). Confidential report to the National Parks and Wildlife Service and the Department of Agriculture, Food and the Marine.

Lusby, J. (2012a): Barn Owl Monitoring Programme. Raptor Conservation Project, Final Report. – BirdWatch Ireland, Kilcoole.

Lusby, J., Watson, D. & Copland, A. (2010a): The ecology and conservation of the Barn Owl *Tyto alba* in County Cork; The Cork Barn Owl Research Project. Report prepared for Cork County Council.

Lusby, J., Watson, D. & O'Clery, M. (2010b): The ecology and conservation of the Barn Owl *Tyto alba* in County Kerry; The Kerry Barn Owl Research. Report to Kerry County Council.

Lusby, J., Fernández-Bellon, D., Norriss, D. & Lauder, A. (2011): Assessing the effectiveness of monitoring methods for Merlin *Falco columbarius* in Ireland: the Pilot Merlin Survey 2010. – Irish Birds 9: 143–154.

Lusby, J., Cregg, P. & O'Clery, M. (2012a): The West Offaly Raptor Conservation Project. Final Report to Offaly Local Development Company.

Lusby, J., McDonnell, B. and O'Clery, M. (2012b): The ecology and conservation of the Barn Owl *Tyto alba* in Duhallow; Duhallow Barn Owl Project. Final Report prepared for IRD Duhallow.

Lynas, P., Newton, S.F. & Robinson, J.A. (2007): The status of birds in Ireland: an analysis of conservation concern 2008–2013. – Irish Birds 8: 149–166.

Madden, B., Hunt, J. & Norriss, D. (2009): The 2002 survey of the peregrine *Falco peregrines* breeding population in the republic of Ireland. – Irish Birds 8: 543–548.

McElheron, A. (2005): Merlins of the Wicklow Mountains. – Currach Press, Dublin.

Mee, A. (2009): The Irish White-tailed Eagle reintroduction programme 2007–2008. Unpublished report to the Directorate of Nature Management, Trondheim, Norway.

Mee, A. (2010): Determining habitat use in a reintroduced population of White-tailed Sea Eagle in SW Ireland. Project ROO527. Unpublished report to The Heritage Council, Kilkenny, Ireland.

Mee, A. & Clarke, D. (*in prep.*): Population and range expansion in Ireland: the 2011–2012 national soaring survey.

Moore, N.P., Kelly, P.F. & Lang, F. (1992): Quarry-nesting by Peregrine Falcons in Ireland. – Irish Birds 4: 519–524.

Moore, N.P., Kelly, P.F. & Lang, F., Lynch, J.M. & Langton, S.D. (1997): The Peregrine *Falco peregrinus* in quarries: current status and factors influencing occupancy in the Republic of Ireland. – Bird Study 44 (2): 176–181.

Nagle, T. (2007): The loss of Barn Owl *Tyto alba* breeding and roost sites in Co. Cork: a contributory factor in the species decline. – Irish Birds 8: 314–315.

Norris, D.W. (1991): The status of the buzzard as a breeding species in the Republic of Ireland, 1977–1991. – Irish Birds 4: 291–198.

Norriss, D.W. (1995): The 1991 survey and weather impacts on the Peregrine *Falco peregrinus* breeding population in the Republic of Ireland. – Bird Study 42 (1): 20–30.

Norriss, D.W., Marsh, J., McMahon, D. & Oliver, G.A. (2002): A national survey of breeding Hen Harriers *Circus cyaneus* in Ireland 1998–2000. – Irish Birds 7: 1–12.

Norriss, D.W., Haran, B., Hennigan, A., McElheron, D.J., McLaughlin, D.J., Swan, V. & Walsh, A. (2010): Breeding biology of Merlins *Falco columbarious* in Ireland, 1986–1992. – Irish Birds 9: 23–30.

O'Clery, M., McDonnell, B. & Lusby, J. (2012): The Duhallow Raptor Conservation Project. Final Report to IRD Duhallow.

O'Connell, P., Cogan, R. & Dunne, J. (2007): The diet of the Barn Owl *Tyto alba* at two sites in Co. Galway. – Irish Birds 8: 91–96.

O'Donoghue, B. (2010): The hen harrier (*Circus cyaneus*) in Ireland; its ecology and conservation. PhD thesis. – University College Cork, Ireland.

O'Toole, L., Fielding, A.H. & Haworth, P.F. (2002): Reintroduction of the golden eagle into the Republic of Ireland. – Biological Conservation 103 (3): 303–312.

Pearce-Higgins, J.W., Stephen, L., Langston, R.H.W., Bainbridge, I.P. & Bullman, R. (2009): The distribution of breeding birds around upland wind farms. – Journal of Applied Ecology 46 (6): 1323–1331.

Rooney, E. (2013): Ecology and breeding biology of the Common Buzzard *Buteo buteo*, in Ireland. Unpublished thesis. – Queen's University, Belfast.

Rooney, E. & Montgomerie, W.I. (2013): Diet diversity of the Common Buzzard (*Buteo buteo*) in a vole-less environment. – Bird Study 60 (2): 147–155.

Ruddock, M. (2007): The importance of Peregrine diet

studies in resolving predator-prey conflicts. pp. 50 In: Sielicki, S. & Sielicki, J. (eds.): Abstracts of the Peregrine conference, 19–23 September 2007, Poland. – TURUL Robert Zmuda, Warszawa.

Ruddock, M. (2008): Housewives' planning: Population ecology, predation and prey selection in the peregrine falcon. Unpublished thesis. – Queen's University, Belfast.

Ruddock, M., Dunlop, B.J., O' Toole, L., Mee, A. & Nagle, T. (2011): Republic of Ireland Hen Harrier survey 2010. – Unpublished report by the Irish Raptor Study Group and the Golden Eagle Trust Ltd for the Department of Environment, Heritage and Local Government, Ireland.

Scott, D. (2000): Marking a decade of tree-nesting by Hen Harriers *Circus cyaneus* in Northern Ireland, 1991–2000. – Irish Birds 6: 586–589.

Scott, D. & McHaffie, P. (2008): Hen Harrier *Circus cyaneus* killed at windfarm site in County Antrim. – Irish Birds 8: 436–437.

Sharrock, J.T.R. (1976): The Atlas of Breeding Birds in Britain and Ireland. – T & A D Poyser, Berkhamsted, Herts.

Sim, I.M.W., Gibbons, D.W., Bainbridge, I.P. & Mattingley, W.A. (2001): Status of hen harrier *Circus cyaneus* in the UK and the Isle of Man in 1998. – Bird Study 48 (3): 341–353.

Sim, I.M.W., Dillon, I.A., Eaton, M.A., Etheridge, B., Lindley, P., Riley, H., Saunders, R., Sharpe, C. & Tickner, M. (2007): Status of the Hen Harrier *Circus cyaneus* in the UK and Isle of Man in 2004, and a comparison with the 1988/89 and 1998 surveys. – Bird Study 54 (2): 256–267.

Smal, C.M. (1989): Notes on the diet of Short-eared Owls in Ireland. – Irish Birds 4: 73–75.

Walsh, P.M. & Sleeman, D.P. (1988): Avian prey of a wintering Short-eared Owl population in south-west Ireland. – Irish Birds 3: 589–591.

Wells, J. (2007): The Northern Ireland Peregrine population 1977–2007. pp. 57 In: Sielicki, S. & Sielicki, J. (eds.): Abstracts of the Peregrine conference, 19–23 September 2007, Poland. – TURUL Robert Zmuda, Warszawa.

Wilson, M.W., Irwin, S., Norriss, D.W., Newton, S.F., Collins, K., Kelly, T.C. & O'Halloran, J. (2009): The importance of pre-thicket conifer plantations for nesting Hen Harriers *Circus cyaneus* in Ireland. – Ibis 151 (2): 332–343.

Wilson, M.W., O'Donoghue, B., O'Mahony, B., Cullen, C., O'Donoghue, T., Oliver, G., Ryan, B., Troake, P., Irwin, S., Kelly, T.C., Rotella, J.J. & O'Halloran, J. (2012): Mismatches between breeding success and habitat preferences in Hen Harriers *Circus cyaneus* breeding in forested landscapes. – Ibis 154 (3): 578–589.

Arrived / Prispelo: 27. 3. 2013
Accepted / Sprejeto: 1. 7. 2013

Acrocephalus 33 (154/155): 247–254, 2012

Monitoring of raptors in Norway

Monitoring ptic roparic na Norveškem

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All diurnal raptors and owls have been protected by law in Norway since 1968–1972. Since then, most species that had been heavily persecuted earlier (eagles and hawks), and those especially susceptible to environmental pollution (Peregrine Falcon *Falco peregrinus* and Osprey *Pandion haliaetus*) have increased in numbers. A national monitoring programme for the terrestrial environment in Norway, which also includes population monitoring of the Golden Eagle *Aquila chrysaetos* and Gyrfalcon *F. rusticolus*, was established in 1990. Monitoring of environmental pollutants in eggs of diurnal raptors and owls on a country-wide basis was started at the same time. A data series on pollutant levels in eggs of several species covers a time-span of up to 40 years for DDE and PCB, including shell thickness measurements. Only the Golden Eagle and Gyrfalcon are included in a comprehensive state-financed monitoring programme, while other species are locally financed and run by special interest groups and NGOs. The Golden Eagle is under pressure from farmers' and reindeer husbandry organizations, while the Goshawk *Accipiter gentilis* suffers from clear-cutting of old forests. High mortality of White-tailed Eagles *Haliaeetus albicilla* due to collisions with wind-turbines is a serious problem locally. The Osprey is on its way back to pre-DDT levels. In general, pesticide levels have dropped significantly during the last couple of decades, resulting in improved shell quality. The major constraints to comprehensive monitoring of diurnal raptors and owls in Norway are lack of funding and qualified personnel.

Key words: diurnal raptors, owls, monitoring, Norway
Ključne besede: ujede, sove, monitoring, Norveška

1. Introduction

In pre-World War II times, the classical attitude towards raptors in Norway was persecution by shooting, nest destructions and poisoning, encouraged by bounties. During the 1940s and 1950s, some pioneering work on raptor breeding numbers and reproductive rates in relation to fluctuations in their prey basis was performed, and a more realistic picture of their place in nature slowly gained foothold (Hagen 1952 & 1969). Still, no permanent monitoring schemes existed, while pesticides and persecution drove many species to the brink of extinction. Turning points came when all Norwegian diurnal raptors and owls were protected by law in 1968 (eagles) and 1972 (Barth 1971). Nevertheless, in 1975, when monitoring of Peregrine Falcon *Falco peregrinus* was initiated, only about eight pairs were known to breed in the whole country (Lindberg *et al.* 1988). At the same time, monitoring of Golden Eagle *Aquila chrysaetos* and White-tailed Eagle *Haliaeetus albicilla* was started by NGOs.

Initially, during the early 1990s, monitoring of flora and fauna in Norway focused on subalpine and alpine ecosystems to investigate impacts of long-range air pollution. Later, the objective was broadened to include effects of climate change and response to anthropogenic changes. Raptors positioned at the top of food-chains were included as sentinels of environmental pollution.

In recent years, predation on livestock by large carnivores and eagles has become a major issue. Therefore, there is an increasing pressure from the

farming and reindeer husbandry organizations, advocating culling and limiting of predators, including eagles. Also, there is an increasing conflict between forestry organizations and the conservation of forest-dwelling diurnal raptors and owls, especially those species depending on mature forest, such as the Goshawk *Accipiter gentilis*. At present, the development of wind farms along the coast poses a new threat, especially for the White-tailed Eagle, and electrocution by power lines has gained new attention owing to large declines of the Eagle Owl *Bubo bubo.*

2. National programmes

The *Monitoring Programme for Terrestrial Ecosystems* (TOV) is a national monitoring programme initiated and financed by the Directorate for Nature Management in 1990 (Løbersli 1989). The Norwegian Institute for Nature Research (NINA) coordinates a large part of the scientific investigations in the programme, including raptors. TOV generates knowledge of long-term changes in biota, and when possible relates this to the influence of: (1) acid rain (both sulphur and nitrogen), (2) long-range pollutants (metals and organic pollutants), (3) climate change, (4) land use, and (5) the interaction between several factors of influence. The programme focuses on commonly occurring habitats and species, mainly in forests and mountains, and is based on integrated monitoring of different species and other elements of the ecosystem in seven selected mountains and birch forest areas, plus a nationwide survey of selected parameters and vegetation monitoring in eleven spruce forest areas. Monitoring areas are distributed throughout the country from south to north in a way that reflects both climate variations and differences in the burden of long-range pollutants. All areas are located in places where they are not subjected to rapid changes in land use, mainly in protected areas. Raptor monitoring has only been performed in the southern part of the country up to present, but is currently being expanded (Figure 1). Only the Golden Eagle and Gyrfalcon *F. rusticolus* are encompassed within this programme.

The national monitoring programme *Rovdata* was established by the Directorate for Nature Management in 2000 to ensure that monitoring and surveillance of large predators was performed in the best possible way throughout the country, using the standardized methods. Data on breeding, predators' tracks and kills are processed, compiled and reported at the national level by an independent research body (NINA). During the first years, only the four large carnivores, the Lynx *Lynx l. lynx*, Wolverine *Gulo gulo*, Brown

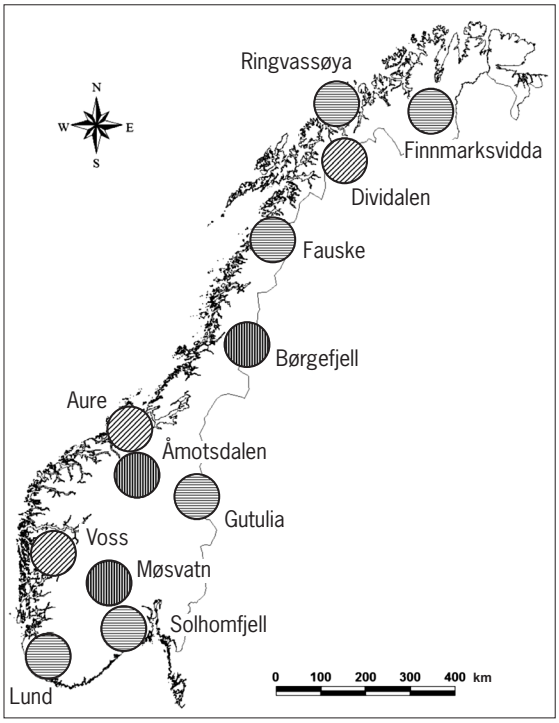

Figure 1: Existing (horizontal and vertical shading) and planned (slanted shading) areas for monitoring of Golden Eagle *Aquila chrysaetos* in Norway. In addition, Gyrfalcon *Falco rusticolus* is monitored in the vertically shaded areas. The areas have an approximate diameter of 100 km.

Slika 1: Obstoječa (horizontalno in vertikalno senčena) in načrtovana (poševno senčena) območja za monitoring planinskega orla *Aquila chrysaetos* na Norveškem. Poleg tega poteka v horizontalno senčenih območjih tudi monitoring arktičnega sokola *Falco rusticolus*. Premer vseh območij je približno 100 km.

Bear *Ursus arctos* and Wolf *Canis lupus*, were part of the scheme. From 2006 on, the Golden Eagle has been included. New modules for other large diurnal raptors and owls are presently being added.

The Species Databank (Artsdatabanken) of Norway, managed by the Norwegian Biodiversity Information Centre (NBIC), has a web-site open for on-line registration of bird observations, including diurnal raptors and owls, which over the years has accumulated a substantial amount of data regarding their occurrence and distribution. Some local interest groups (NGOs) also run their local monitoring projects.

3. National coverage

Today, only two raptor species are subjected to comprehensive, state financed population monitoring

Table 1: Known ongoing monitoring projects of diurnal raptors and owls in Norway

Tabela 1: Znani potekajoči projekti monitoringa ujed in sov na Norveškem

Species / Vrsta	Geographical area/ Geografsko območje	Responsible/ Odgovorna inštitucija	Red-list status in Norway/ Norveški Rdeči seznam
Honey Buzzard *Pernis apivorus*	locally in the south	Local interest groups	VU
White-tailed Eagle *Haliaeetus albicilla*	nationwide	NOF	LC
	Smøla Wind Farm area	NINA	LC
Goshawk *Accipiter gentilis*	some counties	Local governments and NGOs	NT
Golden Eagle *Aquila chrysaetos*	TOV areas	NINA	LC
	some counties	Local governments and NGOs	LC
Osprey *Pandion haliaetus*	some counties	Local governments and NGOs	NT
Kestrel *Falco tinnunculus*	Hedmark County	Agder Nature Museum and local enthusiasts (nest boxes)	LC
Merlin *Falco columbarius*	nationwide	TOV, for pollutants only, 5-year intervals	LC
Hobby *Falco subbuteo*	locally in the south	Local interest groups	VU
Gyrfalcon *Falco rusticolus*	TOV areas	NINA	NT
	Finnmark	Local interest groups	NT
Peregrine Falcon *Falco peregrinus*	some counties	Local governments and NGOs	LC
Eagle Owl *Bubo bubo*	nationwide, species of special concern	NOF, NGOs and district colleges	EN
Snowy Owl *Bubo scandiaca*	Finnmark County	NINA, Agder Nature Museum and NOF, research and monitoring	EN
Pygmy Owl *Glaucidium passerinum*	Troms County	NOF (nest boxes)	LC
Tawny Owl *Strix aluco*	Sør-Trøndelag County	Local interest groups (nest boxes)	LC
Ural Owl *Strix uralensis*	Hedmark County	Local interest groups (nest boxes)	VU
Tengmalm's Owl *Aegolius funereus*	Troms County	NOF (nest boxes)	LC

on a national basis in Norway; the Golden Eagle and Gyrfalcon (from 1990, ongoing, in selected areas under the TOV umbrella). For other species, such as the White-tailed Eagle, Peregrine Falcon, Goshawk and Osprey *Pandion haliaetus,* monitoring has been less systematic in time and space, but NGOs such as the Norwegian Ornithological Society (NOF) and other regional groups are active. The County Governors' offices in various counties finance regional monitoring projects for a range of species of diurnal raptors and owls, with NOF and local interest groups. The known monitoring activities of diurnal raptors and owls are listed in Table 1.

The Merlin *F. columbarius* has been monitored only for pesticides. A long data series is available in Norway for DDE, PCBs, HCB and HCH in eggs of bird of some prey (up to 40 years of monitoring), and from 1991 eggs have been analyzed for a wider range of pollutants, including brominated and fluorinated organic compounds (Herzke 2002 & 2005, Nygård & Polder 2012).

4. Key species and issues with overview of results

4.1. Key species

Golden Eagle

No long-term trend in the production of chicks has been shown in any of the six TOV areas. 10–15 territories are monitored in each area. The territory system of Golden Eagle is sufficiently stable from year to year to make the productivity monitoring

scheme suitable. Territory occupancy and chick production per territory in each area are recorded. It has been shown that the productivity of Golden Eagle is higher a year after the peak year of small rodents, when numbers of ptarmigans and other small game are high (Gjershaug 1996). Moulted feathers and addled eggs are collected for analysis of metals and organochlorine contaminants. In the future, feather DNA will be used to monitor adult turnover. There has probably been a population increase since the species was fully protected in 1968, but there are not enough historical data available to substantiate this assumption. The current population estimate is at 1,200–1,400 pairs. See Gjershaug *et al.* (2008) for details. Three monitoring areas in the north are to be added in the near future, two of them new, while the third (Finnmarksvidda) has been used since 2002 during a special research project (see Figure 1).

Gyrfalcon

Gyrfalcon populations are being monitored in three TOV areas in the southern half of Norway. One new monitoring area in Finnmark will probably be added in the near future (Figure 1). Breeding success and the number of large chicks are recorded. Line transects of Willow Ptarmigan *Lagopus lagopus* (the main prey of Gyrfalcon) provide data from same areas as explanatory variables for Gyrfalcon breeding performance. The annual proportion of territories with confirmed nesting attempts is related to population variation of its main prey species, the Rock Ptarmigan *L. muta* and the Willow Ptarmigan. The best predictor of Gyrfalcon reproductive success has been shown to be the production of Willow Ptarmigan chicks in year t–1 (Falkdalen *et al.* 2012). An estimate of 200–500 territorial pairs in Norway has been suggested (Myklebust 1996), but no comprehensive national census has been performed.

Peregrine Falcon

The species was on the brink of extinction in Fennoscandia in the mid-1970s (Lindberg *et al.* 1988), due to DDE effects on shell thinning (Nygård 1983). Local NGOs in the south and central parts of Norway have been monitoring its recovery and pollutant levels since that time.

White-tailed Eagle

Its population has been monitored in Norway since 1974 by the NOF as part of an international monitoring programme initiated by the WWF. Nesting success and production of chicks has been monitored nationwide since 1974 and is ongoing, and an extensive ringing scheme has been in place (Folkestad 2003). Since the White-tailed Eagle was fully protected in 1968, its population has increased from about 700–800 territorial pairs to a minimum of about 1,900–2,200 territorial pairs in population (Folkestad 2003), which probably amounted to about one third of the European population, and numbers have probably increased since. The increasing populations of Golden Eagle and White-tailed Eagle in Norway are most probably a result of protection, but lowered pollutant loads have also probably played a role. However, the quest for "green" energy has led to the allocation of large amounts of public subsidies into the development of wind-power in Norway, which may pose a long-term threat to White-tailed Eagle populations. At the 68-turbine wind-power plant at Smøla alone, 53 White-tailed Eagles have been found killed since 2005 (Bevanger *et al.* 2011 & *unpubl.*).

Eagle Owl

The Eagle Owl has decreased dramatically in Norway during the last few decades, mainly because of electrocution (Bevanger & Overskaug 1998). Therefore, it was red-listed as a species of special concern, and is presently subjected to nation-wide surveys, monitoring and research. A national census in 2008 revealed that less than 300 sites still had territory-holding Eagle Owls (Øien *et al.* 2009), and it has almost disappeared from large tracts of its former range, especially in the interior of the country. The national government is now financing mitigation measures to remedy the situation through a national action plan (Direktoratet for naturforvaltning 2009). A research and monitoring project, focusing on electrocution and mitigation measures, is ongoing. Mitigation by mounting perching devices on power-poles to prevent electrocution seems to be effective (Bevanger *et al.* 2013).

Other species

The Goshawk, once very numerous in the forested areas in Norway, has been severely reduced in numbers since the advent of large-scale forestry in Norway. From an estimated number of 10,000 pairs, its present population level is now probably less than 2,000 pairs (Grønlien 2004). Regarding Merlin and Osprey, banning and restrictions in use of poisonous organochlorines and mercury have been of vital significance to the recovery of their populations. The Merlin was heavily burdened by pollutants, but no good historic population data are available. However, the migration counts at the bird station Falsterbo on the southern tip of Sweden indicate a historic trend

similar to that of the Peregrine Falcon (Nygård 1999). The Osprey was long absent from large areas of its former range, but has now recovered greatly, and the present estimate is now ca. 500 pairs (own estimate based on enquiries).

4.2. Monitoring of persistent pollutants

The monitoring of pollutants in eggs of raptors is part of TOV, and samples of addled eggs and moulted feathers are collected for analysis when possible. For Merlin, we have been able to collect fresh eggs under special permission during sampling campaign every fifth year. Addled eggs and moulted feathers from other raptor species are collected *ad hoc* during ringing efforts and local monitoring activities. By incorporating available published and unpublished data, we are able to produce time trends for pollutants and shell thickness over 4–5 decades. Recently, data on organobromines and fluorocarbons have also become available (Herzke *et al.* 2005, Nygård & Polder 2012).

Eggshell thinning

Eggshells in most species have gradually increased in thickness since the ban on DDT became effective in 1972, but have in most species still not obtained values comparable with the pre-DDT era (before 1947) (Figure 2). Severe shell thinning has been observed in the Peregrine Falcon, Merlin, and Osprey, which coincides in time with very depressed populations of these species.

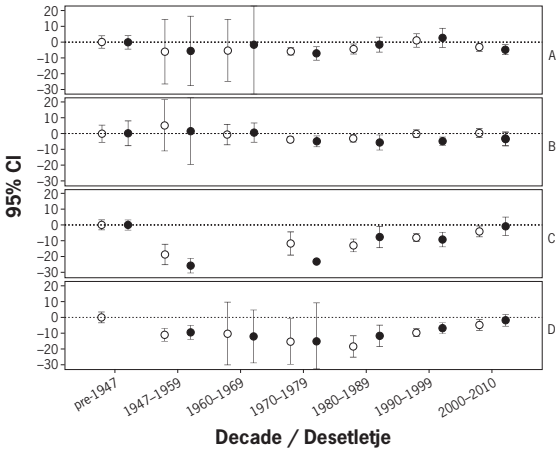

Figure 2: The change in eggshell thickness (white dots) and shell indices (black dots) in four raptor species (A – White-tailed Eagle *Haliaeetus albicilla*, B – Golden Eagle *Aquila chrysaetos*, C – Peregrine Falcon *Falco peregrinus*, D – Merlin *F. columbarius)* in Norway; average values per decade. Values before 1947 are considered base levels.

Slika 2: Sprememba v debelini jajčne lupine (bele pike) in indeksih lupin (črne pike) štirih ptic roparic (A – belorepec *Haliaeetus albicilla*, B – planinski orel *Aquila chrysaetos*, C – sokol selec *Falco peregrinus*, D – mali sokol *F. columbarius)* na Norveškem; povprečne vrednosti na desetletje. Vrednosti pred letom 1947 so obravnavane kot izhodiščne.

Contaminant levels

The results show in general that the levels of the "classic" pollutants such as DDTs and PCBs are decreasing in Norwegian diurnal raptors such as the White-tailed Eagle (Figure 3). Similar trends are documented for other species, as well as for pesticides such as dieldrin, HCH, and HCB. The trends of the "new pollutants" such as brominated flame retardants, i.e. polybrominated diphenyl ethers (PBDE), polybrominated biphenyls (PBB), and hexabromo-cyclo-dodecane (HCB) and perfluorinated compounds (PFCs) are still somewhat uncertain, because of the limited number of analyses, and the time series is short. We still know very little about the possible biological effects of these compounds, which are extensively used in fire-fighting foams, surface treatment of textiles, etc.

In general, the Golden Eagle is exposed to low levels of pollutants, due to its position at the apex of a short terrestrial food-chain. However, in a study of long-term reproductive performance in a coastal population, there was evidence of reduced productivity, which correlated with elevated pollutant levels in eggs. This was attributed to an influx of pollutants from coastal birds as prey, representing the longer marine food-chains with much higher pollutant levels than the terrestrial ones (Nygård & Gjershaug 2001). As for the Golden Eagle, the contaminant levels in Gyrfalcon eggs were in general low. The levels of pollutants in White-tailed Eagle eggs are now below the levels known to be detrimental to the species (Helander *et al.* 2002). The DDT-transformation product *p,p'*-DDE is still a prevalent pesticide in all predatory bird eggs, 40 years after the ban in western countries, and is the dominating pollutant in the migratory and bird-eating species such as Merlin and Sparrowhawk *A. nisus*. In other species, such as the White-tailed Eagle, PCBs today accounts for the major organochlorine burden, which is typical of marine environments.

5. Strengths and weaknesses

The strength of a monitoring programme is connected with the predictability and level of financing, and

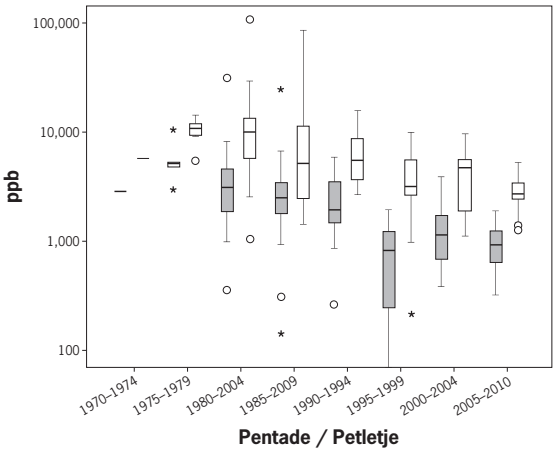

Figure 3: Box-and-whiskers chart (medians and quartiles) showing time trends of DDE (grey columns) and PCBs (fresh weight, white columns) in eggs of White-tailed Eagle *Haliaeetus albicilla* in Norway during 1970–2010

Figure 3: Grafikon z medianami in kvartili, ki prikazujejo časovne trende DDE (sivi stolpci) in PCB-jev (sveža teža, beli stolpci) v jajcih belorepca *Haliaeetus albicilla* na Norveškem v obdobju 1970–2010

also with the quality and strength of the responsible institution. Only the national projects financed by the Directorate for Nature Management are of such a type (TOV-projects, Golden Eagle, Gyrfalcon, pollutant monitoring and the Rovdata system). Some monitoring projects financed by the regional County governors have also been long-lasting and suitably financed. Weaknesses are often seen connected with projects run by NGOs and other interest groups, often being poorly financed over time and based on idealism. Such time-series can suffer greatly from poor descriptions and consistency of methods, poor and inconsistent data-storage, and change of personnel. Lack of harmonization of methods and cooperation between local groups may be a problem when trying to compile data over a larger geographical scale.

Norway is a large and thinly populated country, and there is a lack of competent personnel to carry out the necessary monitoring. Volunteers can be hard to find, so proper financing is needed. The Government only finances monitoring of species that have political and economic issues. More comprehensive monitoring of the Golden Eagle is required due to problems with illegal persecution and compensation issues. Better monitoring of the Goshawk is needed due to the threats posed by large-scale forestry, especially connected to the mature spruce forests of the lowlands. A sufficient overview of the status of the Eagle Owl is still needed, and so is proper implementation of mitigation measures. An assessment of cumulative future effects of wind farm developments on raptors is also lacking.

We have much to learn from our neighbouring countries, Sweden and Finland, regarding monitoring and management of Golden Eagle. They have a system of monetary compensation to the communities and reindeer husbandry units, which hold breeding Golden Eagles on their land. Compensation is given per occupied or breeding eagle territory. This requires comprehensive monitoring. In Norway, however, compensation is given per killed animal, mostly reindeer and sheep. The documentation process is problematic, and in practice the owners are given compensation as a certain percentage of their losses. The claims are therefore often grossly exaggerated (Gjershaug & Nygård 2003), thus giving the Golden Eagle a bad reputation.

6. Priorities, capacity-building

Other future threats come from habitat and climate change, urban spread, developments on the coast (wind-power developments, industry, tourism), in the mountains (tourism, roads, power lines, wind-power developments). The main goal must be to secure funding through long-lasting monitoring state-run projects, preferably with a research platform. Furthermore, one needs to educate state wildlife officers of proper species recognition and ecology. Also, there is a need to develop and strengthen co-operation between NGOs and state agencies. Education and information to the public and management authorities about the value of raptors as environmental sentinels is important, and so is the dissemination of results by publishing and making them available on the web.

The use of addled raptor eggs has proven a nondestructive and efficient way to perform environmental monitoring on a broad scale. It is important that the national monitoring scheme for pollutants in raptors is continued, especially in light of the high levels of new contaminants, where the trends, sources and pathways are not yet well understood. A national repository for biological samples, aimed at long-term monitoring of pollutants in the Norwegian environment, is under implementation under The Environmental Specimen Bank (ESB Norway), and will archive eggs and tissue samples for future analyses (http://www.miljoprovebanken.no).

7. Povzetek

Na Norveškem so vse ujede in sove zavarovane z zakonom, sprejetim v letih 1968 in 1972. Od takrat se je število večine vrst, ki so bile predtem neusmiljeno preganjane (ujede), in vrst, ki so bile še posebno občutljive za okoljsko onesnaževanje (sokol selec *Falco peregrinus* in ribji orel *Pandion haliaetus*), povečalo. Leta 1990 je bil na Norveškem osnovan nacionalni program monitoringa kopenskega okolja, v katerega je vključen tudi monitoring populacij planinskega orla *Aquila chrysaetos* in arktičnega sokola *F. rusticolus.* Hkrati pa je po vsej državi začel potekati tudi monitoring onesnažil v jajcih ujed in sov. Niz podatkov o ravni onesnažil v jajcih več vrst ptic roparic zadeva obdobje 40 let za DDE (dikloro-difenil-dikloroetilen) in PCB-je (poliklorirani bifenili) kot tudi meritve debeline jajčnih lupin. Sicer pa sta v celostni program monitoringa, ki ga financira država, vključena samo planinski orel in arktični sokol, medtem ko druge vrste lokalno financirajo in preučujejo posebne zainteresirane skupine in nevladne organizacije. Planinski orel je pod močnim pritiskom kmetov in organizacij, ki se ukvarjajo z rejo severnih jelenov, medtem ko na kragulja *Accipiter gentilis* negativno vpliva golosečnja starih gozdov. Velik lokalni problem je visoka smrtnost belorepca *Haliaeetus albicilla* zaradi trkov z vetrnimi turbinami. Populacija ribjega orla se vrača na raven iz obdobja pred uporabo DDT-ja (dikloro-difenil-trikloretan). V zadnjih dveh ali treh letih se je raven pesticidov na splošno močno znižala, kar se navsezadnje kaže v boljši kakovosti jajčnih lupin. Največja ovira za celosten monitoring ujed in sov na Norveškem je pomanjkanje finančnih sredstev in ustreznega osebja.

8. References

Barth, E.K. (1971): [Birds of prey and Eagle Owl finally protected.] – Sterna 10: 153–158. (in Norwegian)

Bevanger, K. & Overskaug, K. (1998): Utility structures as a mortality factor for raptors and owls in Norway. pp. 381–392 In: Chancellor, R.D., Meyburg, B.-U. & Ferrero, J.J. (eds.): Holarctic birds of prey. – ADENEX, Merida & World Working Group on Birds of Prey, Berlin.

Bevanger, K., Berntsen, F., Clausen, S., Dahl, E.L., Flagstad, Ø., Follestad, A., Halley, D., Hanssen, F., Johnsen, L., Kvaløy, P., Hoel, P.L., May, R., Nygård, T., Pedersen, H.C., Reitan, O., Røskaft, E., Steinheim, Y., Stokke, B. & Vang, R. (2011): Pre- and post-construction studies of conflicts between birds and wind turbines in coastal Norway (BirdWind). Report on findings 2007–2010. NINA Report 620. – Norwegian Institute for Nature Research, Trondheim.

Bevanger, K., Bartzke, G., Brøseth, H., Dahl, E.L., Gjershaug, J.O., Hanssen, F., Jacobsen, K.-O., Kleven, O., Kvaløy, P., May, R., Meås, R., Nygård, T., Refsnæs, S., Stokke, S. & Thomassen, J. (2013): Optimal design and routing of power lines; ecological, technical and economic perspectives (OPTIPOL). NINA Report 904. – Norwegian Institute for Nature Research, Trondheim.

Direktoratet for naturforvaltning (2009): [Management plan for Eagle Owl.] DN Rapport 2009. – Direktoratet for naturforvaltning, Trondheim. (in Norwegian)

Falkdalen, U., Hörnell-Willebrand, M., Nygård, T., Bergström, T., Lind, G., Nordin, A. & Warensjö, B. (2012): Relations between Willow Ptarmigan density and Gyrfalcon breeding performance in Jämtland, Sweden. pp. 171–176 In: Watson, R.T., Cade, T.J., Fuller, M., Hunt, G. & Potapov, E. (eds.): Gyrfalcon and Ptarmigan in a changing world. Vol. II. Proceedings of the Conference, 1–3 February 2011, Boise, Idaho. – The Peregrine Fund, Boise.

Folkestad, A.O. (2003): Status of the white-tailed sea eagle in Norway. pp. 51–55 In: Helander, B., Marquiss, M. & Bowerman, W.W. (eds.): Sea Eagle 2000: proceedings from an International Conference, 13–17 September 2000, Björkö, Sweden, – Swedish society for nature consevation, Stockholm.

Gjershaug, J.O. (1996): Breeding success and productivity of the golden eagle *Aquila chrysaetos* in central Norway, 1970–1990. pp. 475–482 In: Meyburg, B.-U. & Chancellor, R.D. (eds.): Eagle Studies. – World Working Group on Birds of Prey, Berlin..

Gjershaug, J.O. & Nygård, T. (2003): [Golden eagle in Norway: Population size, predator role and management.] – NINA Fagrapport 58: 1–25. (in Norwegian)

Gjershaug, J.O., Kalas, J.A., Nygard, T., Herzke, D. & Folkestad, A.O. (2008): Monitoring of raptors and their contamination levels in Norway. – Ambio 37 (6): 420–424.

Grønlien, H. (2004): [The goshawk in Norway. Population status and trends throughout the last 150 years.] NOF rapportserie 5-2004. – Norsk Ornitologisk Forening, Trondheim. (in Norwegian)

Hagen, Y. (1952): [Birds of prey and game management.] – Universitetsforlaget, Oslo. (in Norwegian)

Hagen, Y. (1969): [Norwegian studies on the reproduction of birds of prey and owls in relation to micro-rodent population fluctuations.] – Fauna 22: 73–126. (in Norwegian)

Helander, B., Olsson, A., Bignert, A., Asplund, L. & Litzén, K. (2002): The role of DDE, PCB, coplanar PCB and eggshell parameters for reproduction in the White-tailed Sea Eagle (*Haliaeetus albicilla*) in Sweden. – Ambio 31 (5): 386–403.

Herzke, D., Kallenborn, R. & Nygård, T. (2002): Organochlorines in egg samples from Norwegian birds of prey: Congener-, isomer- and enantiomer specific considerations. – Science of the Total Environment 291 (1/2/3): 59–71.

Herzke, D., Berger, U., Kallenborn, R., Nygård, T. & Vetter, W. (2005): Brominated flame retardants and

other organobromines in Norwegian predatory bird eggs. – Chemosphere 61 (3): 441–449.
Lindberg, P., Schei, P. & Wikman, M. (1988): The Peregrine Falcon in Fennoscandia. pp. 159–172 In: Cade, T.J., Enderson, J.H., Thelander, C.G. & White, C.M. (eds.): Peregrine Falcon populations. Their management and recovery. – The Peregrine Fund, Boise.
Løbersli, E.M. (ed.) (1989): [Terrestrial monitoring in Norway.] DN Rapport. – Direktoratet for naturforvaltning, Trondheim. (in Norwegian)
Myklebust, M. (1996): [Threatened bird species in Norway.] NOF Rapport 5-1996. – Norsk Ornitologisk Forening, Klæbu. (in Norwegian)
Nygård, T. (1983): Pesticide residues and shell thinning in eggs of peregrines in Norway. – Ornis Scandinavica 14 (2): 161–166.
Nygård, T. (1999): Long-term trends in pollutant levels and shell thickness in eggs of merlin in Norway, in relation to its migration pattern and numbers. – Ecotoxicology 8 (1): 23–31.
Nygård, T. & Gjershaug, J.O. (2001): The effects of low levels of pollutants on the reproduction of golden eagles in western Norway. – Ecotoxicology 10 (5): 285–290.
Nygård, T. & Polder, A. (2012): [Pollutants in raptor eggs in Norway. Current state and time-trends.] NINA Rapport 834. – Norwegian Institute for Nature Research, Trondheim. (in Norwegian, English summary)
Øien, I.J., Steen, O.F., Jacobsen, K.-O. & Oddane, B. (2009): [The Eagle Owl in Norway. Results from a national census in 2008.] – Vår Fuglefauna 32: 150–156. (in Norwegian)

Arrived / Prispelo: 27. 3. 2013
Accepted / Sprejeto: 1. 7. 2013

Acrocephalus 33 (154/155): 255–260, 2012

A preliminary national overview of monitoring *for* raptors in Poland

Predhodni nacionalni pregled monitoringa populacij ptic roparic na Poljskem

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The State Bird Monitoring programme in Poland covers most breeding species of birds of prey and owls. As part of the bigger State Environment Monitoring System, it is engaged in 16 different projects, aimed at individual species or groups of species, including raptors. State Bird Monitoring is conducted by three organisations, the Eagle Conservation Committee (KOO), Polish Society for the Protection of Birds (OTOP) and Owls Protection Society, coordinated by the Institute and Museum of Zoology of the Polish Academy of Sciences on request by the General Inspectorate of Environmental Protection (GIOŚ). Two monitoring models are used, one based on sampling of populations (of widespread and common species), while the other covers a complete (or near complete) census of rare species. The data are publicly available in Polish. Apart from the State Bird Monitoring, there are numerous professional organisations, NGO's and individuals engaged in conservation and study of birds of prey, although none of them within the framework of a true monitoring system. Apart from the protection guaranteed by Polish law, nests of rarest species, including birds of prey, are protected by special protection zones excluded from forest management. Currently, there are ca. 2,900 zones covering ca. 1,500 km^2 in total.

Keywords: Poland, state monitoring, birds of prey, owls, population studies, protection zones
Ključne besede: Poljska, državni monitoring, ujede, sove, populacijske raziskave, zaščitne cone

1. Law protection of raptors in Poland

Nineteen species of birds of prey and nine owl species regularly nest in Poland. In addition, a single case of the Saker Falcon *Falco cherrug* nesting in the country has been confirmed (Tomiałojć & Stawarczyk 2003, BirdLife International 2004). Currently, all species are protected by Polish law. Until 1975, Goshawks *Accipiter gentilis*, Sparrowhawks *A. nisus* and Marsh Harriers *Circus aeruginosus* were allowed to be killed.

In 1984, new law was introduced – with innovative, highly effective method of protecting nests and broods through the establishment of "protection zones". Thus, strict protection areas have been established around nests, which are closed to the public and allow no forestry activities to be carried out in them. Every forest area containing nest-site is protected within a radius of 200 m (i.e. about 12.5 ha) throughout the year (no admittance, no other activities). In addition, the radius is extended to 500 m (ca. 78.5 ha) during the breeding season, forbidding people both to enter the zone and to conduct any forestry activities. Thus, the pressure from people (foresters, hunters, tourists, birdwatchers) is reduced to such an extent that the birds are not disturbed and can rear their offspring successfully.

The protection zones around the nests concern the following species: Osprey *Pandion haliaetus*, White-tailed Eagle *Haliaeetus albicilla*, Golden Eagle *Aquila chrysaetos*, Greater Spotted Eagle *A. clanga*, Lesser Spotted Eagle *A. pomarina*, Short-toed Eagle *Circaetus gallicus*, Booted Eagle *A. pennata*, Red Kite *Milvus milvus*, Black Kite *M. migrans*, Peregrine Falcon *F. peregrinus*, Saker Falcon, Eagle Owl *Bubo bubo* and,

since 2011, Pygmy Owl *Glaucidium passerinum* and Tengmalm's Owl *Aegolius funereus* (only within 50 m around their nests). The law has been slightly changed recently, reducing the radius of the zone to 100 m (ca. 3.1 ha) year-round for three species (Lesser Spotted Eagle, Black and Red Kite); in the breeding season, the protection zone radius has remained unchanged.

Currently, there are ca. 2,900 protection zones covering ca. 1,500 km^2 in total. It is worth emphasizing that the total size of established protection zones is greater than the forest area of all 23 National Parks in Poland. It is estimated that ca. 60% of all nests of targeted birds of prey are already situated in protection zones (Mizera 2006).

2. Main players in monitoring activities

The coordinating unit of the State Bird Monitoring programme in Poland is the Institute and Museum of Zoology of the Polish Academy of Sciences, which is also responsible for ornithological ringing programme in Poland. Many universities and institutes employ ornithologists, some of them to work on birds of prey projects. Also, there are several ornithological and environmental NGOs in Poland, which are active in the area of population studies and monitoring of birds of prey. The organizations particularly interested in this work are the Eagle Conservation Committee (Komitet Ochrony Orłów – KOO; www.koo.org.pl), Falcon Society (Stowarzyszenie na Rzecz Dzikich Zwierząt Sokół; www.peregrinus.pl), Polish Society for the Protection of Birds (OTOP, Polish Birdlife partner; http://www.otop.org.pl), Owls Protection Society (Stowarzyszenie Ochrony Sów; http://sowy.sos.pl) and PTOP (Polskie Towarzystwo Ochrony Ptaków; http://www.ptop.org.pl), as well as many regional organisations, some of which specialise in certain bird species.

Among the NGOs involved in the protection of birds of prey, the KOO is probably the most influential one. With ca. 500 members and volunteers, it was established in 1981 and is the oldest NGO in Poland. Searching for nests, setting borders of the occupied protection zones are activities entrusted to foresters and/or members of the KOO. Every year, 1,000–2,000 nests are censused by both professionals and amateurs, with 20 most active members of KOO controlling about 1,000 nests annually. Each nest is controlled twice a season, which allows determining the numbers of breeding pairs, breeding success and the number of nestlings reared. The results of these inventories are published in special reports in Newsletter of the Eagle Conservation Committee (Biuletyn Komitet Ochrony Orłów). 18 reports were published in the 1982–2012 period (http://www.koo.org.pl/promocja-i-edukacja/biuletyn-koo).

The State Bird Monitoring is financed by the Chief Inspectorate for Environmental Protection (GIOŚ), which is also the main data user. The key findings are published in a database and summarised in reports, all of which are publicly available on the webpage in Polish language, where basic information on individual programmes is also provided (http://monitoringptakow.gios.gov.pl). An English version of the website is now in preparation and will be ready in the course of 2013.

3. National coverage, key species

3.1. State monitoring programme

The State Bird Monitoring programme in Poland is engaged in 16 different projects concerning breeding species, with each project having its own network and coordinator as well as its own scheme. Monitoring schemes for birds of prey are conducted by the KOO, for owls by the Owls Protection Society, and monitoring of common breeding birds by the OTOP. More common and widespread species are monitored on a basis of sampling plots that are controlled a few times a year, while rare species are monitored through a country-wide census of all or most known breeding territories (Table 1). All monitoring schemes focus on population data – numbers, range and, for some species, reproduction rate as well. Presented here is the situation as existing in 2011.

A nationwide programme to monitor 11 widespread species of birds of prey was launched in 2007 under the *Monitoring of Birds of Prey* (MPD) scheme. Therein, birds of prey are counted on forty 10 × 10 km sampling plots (Figure 1). These plots were selected during stratified random sampling, to ensure that field effort was maximized in areas with most birds. In addition, this approach allows estimating the population sizes of raptors in the whole country (Cenian 2009, Neubauer *et al.* 2011). In short, four surveys per year are performed on each sampling plot, and due to the different breeding phenology of birds these take place between 20 March and 20 July. At each plot, nine fixed observation points were selected. Data on observations, interpretations and ways of recording are maximally standardized. At each point, all the birds are counted for 30 min (for more methodological details, see http://monitoringptakow.gios.gov.pl).

The commonest species is the Buzzard *Buteo buteo*

Table 1: Overview of main monitoring projects for birds of prey and owls in Poland

Tabela 1: Pregled najpomembnejših projektov monitoringa ujed in sov na Poljskem

Project title/ Naziv projekta	Financed by/ Plačnik	Area / Območje	Raptor species included/ Vključene ptice roparice	Duration (start year) / Trajanje projekta (začetno leto)	Beneficiary/ Koristnik sredstev
Monitoring of Birds of Prey (MPD)	State Inspection of Environment (GIOŚ)	40–42 sampling plots (10 × 10 km)	*P. apivorus* *M. migrans* *M. milvus* *H. albicilla* *C. aeruginosus* *C. pygargus* *A. gentilis* *B. buteo* *A. pomarina* *F. tinnunculus* *F. subbuteo*	2007–	Eagle Conservation Committee (KOO)
Bird Monitoring Scheme: Osprey (MRY)	State Inspection of Environment (GIOŚ)	Entire territory of Poland	*P. haliaetus*	2007–	Eagle Conservation Committee (KOO)
Bird Monitoring Scheme: Golden Eagle (MOP)	State Inspection of Environment (GIOŚ)	Entire territory of Poland	*A. chrysaetos*	2007–	Eagle Conservation Committee (KOO)
Bird Monitoring Scheme: Greater Spotted Eagle (MOG)	State Inspection of Environment (GIOŚ)	Entire territory of Poland	*A. clanga*	2007–	Eagle Conservation Committee (KOO)
Common Breeding Bird Monitoring (MPPL)	State Inspection of Environment (GIOŚ)	500–645 sampling plots (1 × 1 km)	*A. gentilis* *A. nisus* *B. buteo*	2000–	OTOP (Polish Birdlife partner)
Monitoring of Flagship Birds (MFGP)	State Inspection of Environment (GIOŚ)	40–48 sampling plots (10 × 10 km)	*C. aeruginosus*	2007–	OTOP (Polish Birdlife partner)
Monitoring of Breeding Forest Owls (MLSL)	State Inspection of Environment (GIOŚ)	35–39 sampling plots (10 × 10 km)	*B. bubo* *G. passerinum* *S. aluco* *S. uralensis* *A. otus* *A. funereus*	2010–	Owls Protection Society
Peregrine Falcon Monitoring	Falcon Society	Entire territory of Poland	*F. peregrinus*	1998–	Falcon Society
Migratory birds at Baltic Sea	Fund for Environmental Protection and Water Management in Gdansk	Vistula Spit (Baltic Sea)	all migratory species	2007–	Drapolicz – Association of Migratory Birds Observers

Figure 1: Distribution of sampling plots of the *Monitoring of Birds of Prey* (MPD) scheme in Poland – the same model, based on sampling plots is used in Common Breeding Bird Monitoring (MPPL), Monitoring of Flagship Birds (MFGP) and Monitoring of Breeding Forest Owls (MLSL); after Neubauer *et al.* (2011)

Slika 1: Razporeditev vzorčnih ploskev v okviru projekta *Monitoring ujed* (MPD) na Poljskem – enak model, temelječ na vzorčnih ploskvah, se uporablja v okviru projektov Monitoring pogostih vrst ptic (MPPL), Monitoring karizmatičnih ptic (MFGP) in Monitoring gnezdečih gozdnih sov (MLSL); po Neubauer *et al.* (2011)

– recorded on 39 out of 40 plots. The size of breeding population is estimated at 52,000–63,000 pairs. The least frequently recorded species is the Black Kite, registered at nine plots only; this low frequency causes population estimate to have low precision (450–1,300 pairs). Significantly higher numbers compared to some recently published estimates (Tomiałojć & Stawarczyk 2003, BirdLife International 2004) concern the White-tailed (1,250–1,700 pairs) and Lesser Spotted Eagles (2,300–3,300 pairs) (Neubauer *et al.* 2011).

The three rare species have their own monitoring schemes – Osprey (MRY), Greater Spotted Eagle (MOG) and Golden Eagle (MOP). These species are censused within their entire range with all known breeding territories controlled annually (Figure 2).

The Greater Spotted Eagle's population seems to be stable at 22–23 pairs (including mixed pairs with Lesser Spotted Eagle; Maciorowski & Mizera 2010). The recent situation as far as the Osprey is concerned is critical: in 2009, only 24–29 nesting pairs were found (Neubauer *et al.* 2011) in contrast to 53 pairs and estimated population of 70–75 pairs in the 1990s and 2000 (Adamski *et al.* 1999, BirdLife International 2004, Mizera 2009) as shown on Figure 3.

A special project aimed at few easily identifiable species is the *Monitoring of Flagship Birds* (MFGP), which includes only one bird of prey species, the Marsh Harrier.

The last project dealing with birds of prey is the nationwide *Common Breeding Bird Monitoring* (MPPL; http://www.mppl.pl). Here, on the sampling plots of 1 × 1 km in size, all recorded bird species are counted. Such work was performed on 562 plots throughout the country in 2009 (random stratified sampling approach was used to ensure the representativeness of results). Field work has been carried out since 2000; each season, two surveys are performed along fixed two 1 km long routes. The project involved 290 volunteer ornithologists in the years 2008–2009 (Neubauer *et al.* 2011). Regarding birds of prey, the Common Breeding Bird Monitoring results include population indices and trends of several species, e.g. Goshawk, Sparrowhawk, Buzzard, Kestrel, Marsh Harrier, etc. (Chylarecki & Jawińska 2007, Neubauer *et al.* 2011).

In 2010, the project *Monitoring of Breeding Forest Owls* (MLSL) that covers six species was launched. Included here are: Tawny Owl *Strix aluco*, Ural Owl *S. uralensis*, Long-eared Owl *Asio otus*, Tengmalm's Owl, Pygmy Owl and Eagle Owl. Currently, there are 35–37 sampling plots, each 10 × 10 km in size. The most widespread and most numerous species are the Tawny Owl, Tengmalm's Owl and Pygmy Owl.

3.2. Other programmes

Many ornithologists and regional or local organizations conduct various state-independent population studies of raptors.

Monitoring of Peregrine Falcon population has not been included in the national scheme as yet, but has been conducted by the Falcon Society since first confirmed breeding of this species in Poland in 1998 (Sielicki & Sielicki 2009).

Worth mentioning are the activities carried out by Drapolicz – Association of Migratory Birds Observers that include the ongoing autumn counts of migratory birds of prey (among other birds), which started in 2007, and the study of migration dynamics of owls, mainly the Long-eared and Short-eared *A. flammeus* Owls (initiated in 2011) at Vistula Spit in the Baltic Sea (Bela *et al.* 2012; http://www.drapolicz.org.pl/index.php?lang=en).

Some of these projects cover only small areas and are not conducted on regular basis due to dependence

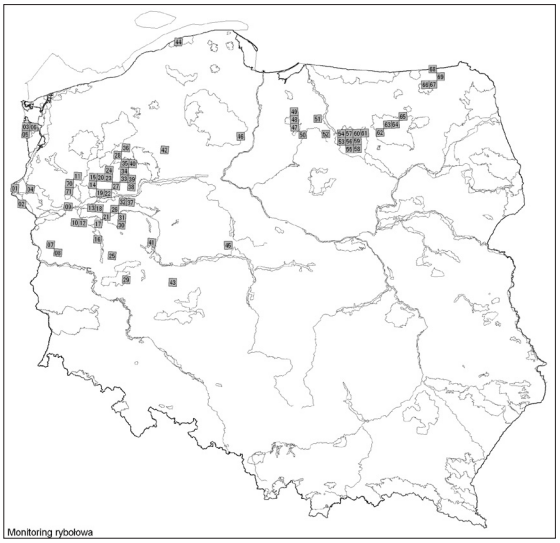

Figure 2: Distribution of sampling plots for monitoring of Osprey *Pandion haliaetus* (MRY) in Poland – the same model based on census study plots aimed to cover the species' entire range is used for Golden Eagle *Aquila chrysaetos* (MOP) and Greater Spotted Eagle *A. clanga* (MOG); after Neubauer *et al.* (2011)

Slika 2: Razporeditev vzorčnih ploskev za monitoring ribjega orla *Pandion haliaetus* (MRY) na Poljskem – enak model, ki temelji na preučevanju celotnega areala vrste s štetjem na določenih ploskvah, se uporablja za planinskega orla *Aquila chrysaetos* (MOP) in velikega klinkača *A. clanga* (MOG); po Neubauer *et al.* (2011)

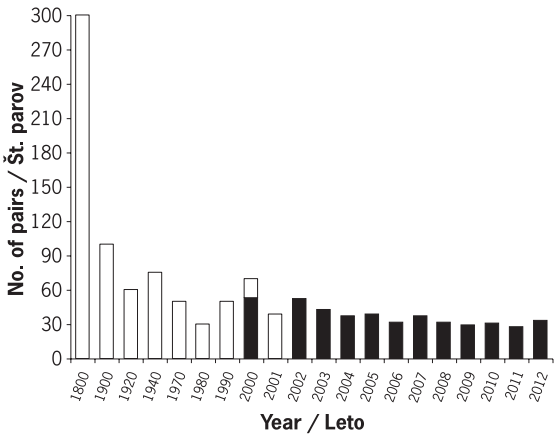

Figure 3: Population development of Osprey *Pandion haliaetus* in Poland in 1800–2012; after Mizera & Szymkiewicz (1996) and Mizera (2009), supplemented (white columns – estimate, black columns – census data)

Slika 3: Razvoj populacije ribjega orla *Pandion haliaetus* na Poljskem v obdobju 1800–2012; po Mizera & Szymkiewicz (1996) in Mizera (2009), dopolnjeno (beli stolpci – ocena, črni stolpci – podatki, pridobljeni s štetjem)

on availability of observers and their professionalism (especially as far as migrant counts at the sea are concerned). Also, some caution is needed in the interpretation of their results.

4. Strengths and weaknesses

The current monitoring system is rather comprehensive and is still developing. The network of 400–500 researchers has officially been included into the project plus few more hundreds of volunteers. The instructions as how to conduct fieldwork for each programme are available on the website of each monitoring programmes. Two guides presenting the methodology for monitoring species or their groups (Chylarecki *et al.* 2009 for breeding birds) are available in Polish. These materials are easily adapted for other countries, if there is such a need. Some species currently not included (especially Peregrine Falcon) should be added to the State Bird Monitoring in the following years.

The quality of birds of prey monitoring depends on the availability of specialists and volunteers interested in taking part. Networking, international exchange programmes, books and instructions should help. Polish monitoring scheme is very well organised and effective and could be used as model for other countries. Only well-designed monitoring programmes will produce robust results, which can then represent a base for generalizations (trends, population sizes) across wider areas. Monitoring of birds of prey needs to consider the variable breeding biology of species and specificity of areas where performed.

5. Povzetek

Državni monitoring ptic na Poljskem vključuje večino gnezdečih vrst ujed in sov. Kot del večjega Državnega sistema za monitoring okolja se posveča šestnajstim različnim projektom, namenjenim preučevanju posameznih vrst ali skupinam vrst, vključno s pticami roparicami. Za monitoring ptic so zadolžene tri organizacije, in sicer Komite za varstvo orlov (KOO), Poljsko društvo za varstvo ptic (OTOP) in Društvo za zaščito sov, katerih delo koordinira Inštitut za zoologijo in muzej Poljske akademije znanosti na zahtevo Generalnega inšpektorata za varstvo okolja. V rabi sta dva modela monitoringa: prvi sloni na vzorčenju populacij (splošno razširjenih in pogostih vrst), drugi pa na popolnem (ali skoraj popolnem) štetju redkih vrst. Podatki so na voljo javnosti v poljskem jeziku. Poleg Državnega monitoringa ptic se z varstvom

in preučevanjem ptic ukvarjajo še mnoge poklicne organizacije, nevladne agencije in posamezniki, pa čeprav ne v okviru pravega sistema monitoringa. Poleg zaščite, ki jo zagotavlja poljski zakon, so gnezda najredkejših vrst, vključno s pticami roparicami, zavarovana s posebnimi zaščitnimi conami, izvzetimi iz gozdnogospodarskih območij. Trenutno obstaja 2.900 takšnih con, ki skupaj pokrivajo 1,500 km^2 ozemlja.

6. References

Adamski, A., Lontkowski, J., Maciorowski, G., Mizera, T., Rodziewicz, M., Stawarczyk, T. & Wacławek, K. (1999): [Distribution and numbers of rare birds of prey in Poland at the end of the 20th century.] – Notatki Ornitologiczne 40 (1/2): 1–22. (in Polish)

Bela, G., Janczyszyn, A. & Kośmicki, A. (2012): [Migration of Falconiformes, Columbiformes and Corvidae on the Vistula Spit in autumn 2009.] – Ptaki Pomorza 3: 135–138. (in Polish, English summary)

BirdLife International (2004): Birds in Europe: population estimates, trends and conservation status. BirdLife Conservation Series No. 12. – BirdLife International, Cambridge.

Cenian, Z. (2009): [National monitoring of birds of prey – evaluation methodology of the population and distribution in large sample areas.] – Studia i materiały Centrum Edukacji Przyrodniczo-Leśnej 11, 3 (22): 10–21. (in Polish, English summary)

Chylarecki, P. & Jawińska, D. (2007): [Monitoring of common breeding birds. Report for 2005–2006.] – OTOP, Warszawa. (in Polish, English summary)

Chylarecki, P., Sikora, A. & Cenian, Z. (2009): [Monitoring of breeding birds. Methodological manual for protected species from the Birds Directive.] – GIOŚ, Warszawa. (in Polish)

Maciorowski, G. & Mizera, T. (2010): [Research and conservation of Greater Spotted Eagle *Aquila clanga* in Poland – Project LIFE+.] – Studia i materiały Centrum Edukacji Przyrodniczo-Leśnej 12, 2 (25): 181–190. (in Polish, English summary)

Mizera, T. (2006): [Twenty years of the zonal protection in Poland.] – Studia i Materiały Centrum Edukacji Przyrodniczo-Leśnej 8, 2 (12): 29–53. (in Polish, English summary)

Mizera, T. (2009): [The Osprey, *Pandion haliaetus*, situation in Poland at the start of the 21st century.] – Studia i materiały Centrum Edukacji Przyrodniczo-Leśnej 11, 3 (12): 45–55. (in Polish, English summary)

Mizera, T. & Szymkiewicz, M. (1996): The present status of the Osprey *Pandion haliaetus* in Poland. pp. 23–33 In: Meyburg, B.U. & Chancellor, R.D. (eds.): Eagle Studies. – WWGBP, Berlin.

Neubauer, G., Sikora, A., Chodkiewicz, T., Cenian, Z., Chylarecki, P., Architа, B., Betleja, J., Rohde, Z., Wieloch, M., Woźniak, B., Zieliński, P. & Zielińska, M. (2011): [Monitoring of Polish breeding birds in 2008–2009.] – Biuletyn Monitoringu Przyrody 8 (1): 1–40. (in Polish, English summary)

Sielicki, S. & Sielicki, J. (2009): Restoration of Peregrine Falcon in Poland 1989–2007. pp. 699–722 In: Sielicki, J. & Mizera, T. (eds.): Peregrine Falcon Populations – status and perspectives in the 21st Century. – Turul Publishing & Poznań University of Life Sciences Press, Warsaw - Poznań.

Tomiałojć, L. & Stawarczyk, T. (2003): [The avifauna of Poland. Distribution, numbers and trends.] – PTTP "pro Natura", Wrocław. (in Polish, English summary)

Arrived / Prispelo: 27. 3. 2013
Accepted / Sprejeto: 1. 7. 2013

Acrocephalus 33 (154/155): 261–269, 2012

A preliminary overview of monitoring for raptors in the Slovak Republic

Predhodni pregled monitoringa populacij ptic roparic na Slovaškem

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In Slovakia, 33 diurnal and 12 nocturnal raptor species have been recorded so far. Of these, 18 diurnal raptor species and 10 owl species also breed in the country. Raptor monitoring has a long tradition in Slovakia; however, owl monitoring takes place mostly only at the local or regional level. For some species, specifically Imperial Eagle *Aquila heliaca*, Saker Falcon *Falco cherrug*, Golden Eagle *A. chrysaetos*, Red-footed Falcon *F. vespertinus* and Red Kite *Milvus milvus*, the entire breeding populations have been monitored in the long term. The most comprehensive raptor monitoring has been covered by the Raptor Protection of Slovakia (RPS), the NGO specialized exclusively in raptors through its network of working groups for particular species. The Slovak Ornithological Society (SOS/BirdLife Slovakia) is mostly involved in monitoring of common raptors and wintering population of the White-tailed Eagle *Haliaeetus albicilla*. Monitoring is mostly implemented with the ultimate objective of conserving the targeted species. Therefore, the most endangered raptor species at the international and national levels are the key monitored species. On-line databases became popular for storing monitoring data; recently, Aves-Symfony database operated by SOS, RPS and the Institute of Zoology has been developed. Well established network of professionals and volunteers present the major strength of monitoring for raptors in Slovakia. Unfortunately, not all raptor species are adequately covered by monitoring. Access to monitoring data is constrained by unwillingness of some experts to share data in common databases. Another problem is lack of capabilities to evaluate data at the scientific level. Modern monitoring methods, such as remote monitoring with radio or satellite tracking, are applied only rarely due to financial constraints. Monitoring activities do not sufficiently influence decision making.

Key words: raptors, birds of prey, owls, monitoring, Slovakia
Ključne besede: ptice roparice, ujede, sove, monitoring, Slovaška

1. Introduction

So far, 33 diurnal raptor species have been recorded in Slovakia, 18 of which are regular breeders. Only eight species, i.e. the Red Kite *Milvus milvus*, White-tailed Eagle *Haliaeetus albicilla,* Goshawk *Accipiter gentilis,* Sparrowhawk *A. nisus,* Buzzard *Buteo buteo,* Imperial Eagle *Aquila heliaca,* Golden Eagle *A. chrysaetos* and Kestrel *Falco tinnunculus*, are breeding residents. Most of the observed raptors are migrants, either visiting Slovakia from spring to autumn to breed, or to winter or just occurring on migration. The group of vagrant visitors includes the Egyptian Vulture *Neophron percnopterus,* Black Vulture *Aegypius monachus,* Griffon Vulture *Gyps fulvus* and Steppe Eagle *A. nipalensis.* In 2012, two new diurnal raptor species were observed in Slovakia for the first time – the Black-winged Kite *Elanus caeruleus* (Václav 2012) and Levant Sparrowhawk *A. brevipes* (Danko & Hrtan 2012). While the Buzzard and Kestrel are

Table 1: Status and population size of diurnal raptors in Slovakia

Tabela 1: Status in velikost populacij ujed na Slovaškem

Species / Vrsta	No. of breeding pairs/ Št. gnezdečih parov	Source / Vir
Honey Buzzard *Pernis apivorus*	900–1,300	Karaska & Danko (2002a)
Black-winged Kite *Elanus caeruleus*	Non-breeding	Václav (2012)
Black Kite *Milvus migrans*	40–60	Chavko & Siryová (2002)
Red Kite *Milvus milvus*	8–10	Maderič (2012)
White-tailed Eagle *Haliaeetus albicilla*	9	Chavko (2012a)
Egyptian Vulture *Neophron percnopterus*	Non-breeding	Danko (2002a)
Griffon Vulture *Gyps fulvus*	Non-breeding	Danko & Kropil (2002)
Black Vulture *Aegypius monachus*	Non-breeding	Danko (2002b)
Short-toed Eagle *Circaetus gallicus*	20–25	Danko (2002c)
Marsh Harrier *Circus aeruginosus*	400–500	Karaska *et al.* (2002)
Hen Harrier *Circus cyaneus*	Non-breeding	Danko (2002d)
Pallid Harrier *Circus macrourus*	Non-breeding	Danko (2002e)
Montagu's Harrier *Circus pygargus*	10–18	Noga (2011)
Goshawk *Accipiter gentilis*	1,600–1,800	Karaska & Chavko (2002a)
Sparrowhawk *Accipiter nisus*	1,500–2,000	Karaska (2002)
Levant Sparrowhawk *Accipiter brevipes*	Non-breeding	Danko & Hrtan (2012)
Buzzard *Buteo buteo*	5,000–7,000	Kropil (2002a)
Long-legged Buzzard *Buteo rufinus*	Non-breeding	Danko (2002f)
Rough-legged Buzzard *Buteo lagopus*	Non-breeding	Kropil & Danko (2002)
Lesser Spotted Eagle *Aquila pomarina*	800–900	Karaska & Danko (2002b)
Greater Spotted Eagle *Aquila clanga*	Non-breeding	Danko (2002g)
Steppe Eagle *Aquila nipalensis*	Non-breeding	Danko (2002h)
Imperial Eagle *Aquila heliaca*	41–44	Chavko & Danko (2012)
Golden Eagle *Aquila chrysaetos*	90–95	Kropil (2002b)
Booted Eagle *Aquila pennata*	0–6	Danko (2002i)
Osprey *Pandion haliaetus*	Non-breeding	Karaska & Chavko (2002b)
Lesser Kestrel *Falco naumanni*	Non-breeding	Danko (2002j)
Kestrel *Falco tinnunculus*	4,000–6,000	Darolová & Kropil (2002)
Red-footed Falcon *Falco vespertinus*	3	Chavko (2012d)
Merlin *Falco columbarius*	Non-breeding	Karaska & Chavko (2002c)
Hobby *Falco subbuteo*	600–800	Karaska & Danko (2002c)
Saker Falcon *Falco cherrug*	41–43	Chavko (2012b)
Peregrine Falcon *Falco peregrinus*	150–180	Chavko (2012c)

the most numerous raptors in Slovakia, the Short-toed Eagle *Circaetus gallicus,* Red Kite and White-tailed Eagle are considered rare breeders with only a few pairs in the country (BirdLife International 2004). Table 1 includes an overview of diurnal raptors recorded in Slovakia.

As far as nocturnal raptors – owls are concerned, 12 species have been recorded in Slovakia, 10 of which are breeders (BirdLife International 2004). While the Long-eared Owl *Asio otus* and Tawny Owl *Strix aluco* are the most frequently occurring species, the Snowy Owl *Bubo scandiacus* and Hawk Owl *Surnia ulula* are rare visitors. Table 2 includes an overview of nocturnal raptors in Slovakia.

Raptor monitoring has a long tradition in Slovakia (see Uhrin *et al.* 2008, 2009, 2010, 2011 & 2012). In the past, there was no mechanism or systematic effort made to concentrate monitoring data, and neither was there any information on ongoing monitoring programmes readily available. Horizontal inventory of existing databases within the country and verification/ evaluation of existing data started some ten years ago with Slovakia's preparation to access the EU and related need to mobilize data for the purpose

Table 2: Status and population size of owls in Slovakia

Tabela 2: Status in velikost populacij sov na Slovaškem

Species / Vrsta	No. of breeding pairs/ Št. gnezdečih parov	Source / Vir
Barn Owl *Tyto alba*	400–600	Sárossy (2002)
Scops Owl *Otus scops*	40–80	Danko & Sárossy (2002)
Eagle Owl *Bubo bubo*	300–400	Danko & Karaska (2002)
Snowy Owl *Bubo scandiacus*	Non-breeding	Danko *et al.* (2002)
Hawk Owl *Surnia ulula*	Non-breeding	Saniga (2002)
Pygmy Owl *Glaucidium passerinum*	1,000–1,500	Pačenovský (2002a)
Little Owl *Athene noctua*	800–1,000	Pačenovský (2002b)
Tawny Owl *Strix aluco*	2,500–3,000	Pačenovský & Obuch (2002)
Ural Owl *Strix uralensis*	1,400–2,500	Krištín *et al.* (2007)
Long-eared Owl *Asio otus*	2,500–4,000	Kropil (2002c)
Short-eared Owl *Asio flammeus*	0–50	Danko & Chavko (2002)
Tengmalm's Owl *Aegolius funereus*	400–600	Pačenovský (2002c)

of identifying and designating its Special Protection Areas (SPAs), including those for raptors. Generally, monitoring of diurnal raptors has been developed in more comprehensive manner compared to owl monitoring.

2. Main players in raptors monitoring

Currently, the main actors in monitoring for raptors in Slovakia can be classified into three categories:

Government bodies and agencies
Ministry of the Environment (MoE) holds general responsibility for the Integrated Environment Monitoring System in Slovakia (includes 12 subsystems/themes, one being "Biota") and for the preparation of the State of the Environment Reports (http://www1.enviroportal.sk/spravy-zp/en).

The State Nature Conservancy of the Slovak Republic (SNC SR) is a government agency generally responsible for the long- and medium-term monitoring of the Biota and holds responsibility for "Biota" monitoring subsystem. It is also specifically responsible for gathering detailed data for the purpose of Birds and Habitats Directives, including data for assessing conservation status of raptor species of conservation concern and for reporting purposes. Data are gathered by the SNC technical staff as well as by contracted individual experts, or more rarely by contracted institutions.

In 2005, the SNC published a manual for the preparation of management plans including criteria and indicators for assessing conservation status of habitats and species of European importance (Polák & Saxa 2005). In this manual, criteria and indicators along with simple monitoring methodology are described for 13 diurnal and five nocturnal raptors. Monitoring data are stored in the "Information system on Taxa and Habitats" database, the access to which, however, is restricted to the public. Besides, two online databases for the SNC are under development. The raptor monitoring by SNC is financed by the state budget and, recently, also through projects mostly co-financed by the European Union. It is mostly concentrated on designating protected areas, particularly the Special Protection Areas in accordance with the EU Birds Directive.

Academic institutions (universities, Slovak Academy of Sciences, museums) are involved in monitoring on project basis. Mostly, they have no long-term raptor monitoring programmes. Few exceptions include the Faculty of Natural Sciences of Comenius University in Bratislava, which has been dedicated for several years to monitoring of the wintering White-tailed Eagles along the Danube River (Bohuš 2011), studying the diet composition of owls (Obuch & Karaska 2010, Obuch 2011) as well as population dynamics and diet of the Buzzard (Šotnár & Topercer 2009a & 2009b), and the Orava Museum with long-term regional monitoring scheme for the Lesser Spotted Eagle *A. pomarina.*

NGOs
Most important players from the NGO community in Slovakia with adopted raptor monitoring schemes

are the Raptor Protection of Slovakia and the Slovak Ornithological Society/ BirdLife Slovakia.

The Raptor Protection of Slovakia (RPS) is the only institution in the Slovak Republic exclusively specializing in raptor monitoring (both *for* raptors and *with* raptors) and conservation. The RPS (in the 1975–2004 period known as Group for Research of Birds of Prey and Owls) regularly and comprehensively monitors raptor species, both diurnal and nocturnal, and collects data on their breeding performance and threats. It holds records on raptors since the 1970s regularly published in annual reports (Danko 1976, 1977a, 1977b, 1978, 1979, 1980, 1981, 1982, 1983, 1984, 1985, 1987, 1988, 1989, 1990, 1991, 1992, 1994a, 1994b, Danko *et al.* 1995a, 1995b & 2000). Results of monitoring in the past were published mostly in the journal *Buteo* (1986–2007). Monitoring is carried out by its members, both volunteers and professionals. From the late 1990s, monitoring of raptors was funded mostly on project basis (e.g. LIFE Nature & Biodiversity, CORO-SKAT, INTERREG etc.). The backbone for monitoring is the well functioning system of working groups for particular species.

The Slovak Ornithological Society/BirdLife Slovakia (SOS/BirdLife Slovakia) carries out long-term monitoring of certain raptor species within the framework of international monitoring programmes. Monitoring of common raptors is part of the *Pan-European Common Bird Monitoring Scheme* (PECBM), in which SOS/BirdLife Slovakia has been participating in cooperation with the Technical University in Zvolen since 2005 (Slabeyová *et al.* 2009a). No other organisation in Slovakia holds such comprehensive data on common raptors and their trends (http://vtaky.sk/stranka/97-Scitanie-beznych-druhov.html). Besides, monitoring of the wintering White-tailed Eagles is part of the *Winter Waterbird Census* in Slovakia that has been implemented in Slovakia since 1991. Through this census, Short-eared Owl *A. flammeus* has been occasionally recorded as well (Slabeyová *et al.* 2008, 2009b & 2011). In the monitoring of other raptors, SOS/BirdLife Slovakia has been involved only on occasional basis, through projects. In cooperation with the RPS and SAS Institute of Zoology, it operates partly publicly accessible on-line database at Aves-Symfony (http://aves.vtaky.sk), where data on raptors are also registered, although many of them remain confidential and are not publicly accessible.

Monitoring data gathered by the RPS and SOS/BirdLife Slovakia are annually processed, with reports containing more general information on breeding populations and breeding success provided to the MoE and SNC. General information on species is also provided to other institutions on *ad hoc* basis when negotiating implementation of specific conservation measures, for instance, with energy distribution companies, foresters, etc. Accordingly, monitoring data are above all used for conservation purposes, mainly for assessing status and trend of raptor species, formulation of conservation measures, and formulation of management and policy documents, public awareness and education.

3. National coverage

Raptor monitoring is generally taking place in the whole territory of Slovakia. However, there is no "formal" (i.e. run by state authorities) raptor-specific national monitoring network. Most comprehensive coverage of raptor monitoring is implemented by the RPS through working groups system.

The following species are covered by the RPS working groups: Imperial Eagle, Golden Eagle, Lesser Spotted Eagle, White-tailed Eagle, Red Kite, Montagu's Harrier *Circus pygargus*, Saker Falcon *Falco cherrug*, Peregrine Falcon *F. peregrinus*, Red-footed Falcon *F. vespertinus*, Eagle Owl *Bubo bubo*, Scops Owl *Otus scops*, Pygmy Owl *Glaucidium passerinum*, Long-eared Owl and Little Owl *Athene noctua*. Groups dealing with Imperial Eagle, Golden Eagle, Red Kite, Saker Falcon and Red-footed Falcon are covering the entire breeding population in Slovakia in the long-term. As far as owls are concerned, the Long-eared Owl and Little Owl are best covered by monitoring. Particularly active is the working group for the latter species, although it embarked on its activities only recently. Records for the Long-eared Owl are available from 1993 onwards, gathered during winter censuses.

This system has been functioning for years, mostly on voluntary basis, and is able to generate at least basic data even in the absence of external funds. The RPS also implements *ad hoc* or local monitoring of other raptors, not specifically covered by working groups, but not on systematic basis. Short reports by working groups are available annually in the "Dravce a sovy" (Raptors and Owls) journal, published by RPS (since 2005). Scientific articles on birds of prey and owls are published in the specialized journal *Slovak Raptor Journal* (from 2007).

The SNC and SOS/BirdLife Slovakia also operate at the national level. However, the intensity and coverage of their raptor monitoring schemes depend on specific circumstances, such as methodology employed, availability of funding and, last but not least, on capacity. For instance, in common birds

census run by SOS/BirdLife Slovakia, the point count sampling method has been employed for recording all birds, including raptors. More intensive raptor monitoring run recently by the SNC is concentrated in protected areas, particularly in SPAs. It is a part of the larger EU funded project and is focused, among other, on gathering data on distribution and abundance of key raptor species that are protected through the SPA network in Slovakia.

4. Key species and key issues

Monitoring is mostly implemented with ultimate objective of conservation of the species concerned. Therefore, the most endangered raptor species are key species addressed by monitoring for raptors in Slovakia and involve: the globally threatened Imperial Eagle and Saker Falcon (VU and EN categories, IUCN 2013), nationally rare breeders like Short-toed Eagle, Red Kite, Black Kite, Red-footed Falcon, White-tailed Eagle and Montagu's Harrier, and particularly endangered species in Slovak Republic like Golden Eagle, Lesser Spotted Eagle and Peregrine Falcon.

Monitoring of these species is generally focused on censuses, searching for the presence of species within known home ranges, searching for newly occupied territories, detection of active nests, evaluation of breeding success and determining reasons for breeding failures. Such "basic" monitoring is frequently complemented with studies of ecology, biology, ethology and genetics of the species, monitoring threatening factors and their influence on the targeted species' conservation status (e.g. Chavko *et al.* 2007, Dravecký *et al.* 2008a & 2008b, Vili *et al.* 2009, Chavko 2010, Pačenovský & Šotnár 2010, Dobrý 2011).

The main threats to raptors in Slovakia include: electrocution, bird crime (illegal activities, poisoning, illegal shooting etc.), disturbance and logging in breeding territories, loss and degradation of natural breeding and feeding habitats.

5. Strengths and weaknesses

Doubtless, the major strength of monitoring for raptors in Slovakia is the well established network of skilled, experienced and highly committed professionals and volunteers, organized particularly within a framework of RPS, but also within the SOS/BirdLife Slovakia and SNC. This, along with quite a long record of data for some raptor species, creates a good basis for future raptor monitoring. Furthermore, the efforts to streamline monitoring and evaluation through officially established criteria and indicators for assessing conservation status are definitely going the right way. Web databases, such as the Aves-Symfony or databases operated by the SNC, provide for collection of data and, subject to agreement with data owners, can be utilized for conservation purposes.

As to weaknesses, not all raptor species are adequately covered by monitoring. Moreover, not all monitoring data are entered in databases. Some experts are reluctant to share data because of a fear of their abuse. Monitoring results generally suffer from the lack of capabilities to evaluate data at the scientific level, not only for RPS and SOS/BirdLife Slovakia, but also for the SNC. Missing statistical evaluation of long-term data sometimes causes problems with using these data in international evaluations and nature conservation at the EU level, e.g. for infringement procedures. Modern approaches, like remote monitoring with radio or satellite tracking, are applied only rarely due to financial constraints. Last but not least, it is necessary to mention that the "follow up mechanism" has not been sufficiently developed, i.e. monitoring activities do not sufficiently influence decision making processes.

6. Priorities, capacity-building

Monitoring of raptors in the Slovak Republic must be continuously promoted as an instrument for adaptive policy development and nature management, decision making and learning. Stimulated interest in monitoring and evaluation from decision making sphere might positively influence further development of raptor monitoring schemes. Monitoring data, however, must be complex, timely, reliable, correctly evaluated and readily available.

With the objective to gain a complete picture of raptor populations and their dynamics at the national level, efforts should be made to achieve monitoring coverage of all raptors. Tailor-made monitoring schemes, including simple criteria and indicators for assessing conservation status, should be designed for those species that are not included in regular monitoring, yet in consideration of their conservation status and population size. Statistical literacy of raptor experts, i.e. the capacity to design, analyse and interpret statistical data that can support decision makers and their partners from public and private sectors, must be enhanced.

Developing procedures and systems for the exchange or sharing of information and statistical data on raptors both at the national and international levels is also important. This can contribute to more efficient utilisation of monitoring data and avoid

duplicated monitoring efforts by different experts or entities.

Personal capacities need to be extended for raptor monitoring; particularly important is to stimulate young professionals' interest in raptors. This needs to be complemented with promotion of using modern remote monitoring methods. It is also important to strengthen public/voluntary capacities to participate in raptor monitoring though organising monitoring courses or by other tools, for instance by developing simple raptor monitoring manual promoting collection and on-line reporting of "minimum standard data". In conclusion, it should be noted that each capacity strengthening effort should involve all key players in raptor monitoring at the national level.

7. Povzetek

Na Slovaškem je bilo doslej zabeleženih 33 vrst ujed in 12 vrst sov, med katerimi 18 vrst ujed in 10 sovjih vrst tudi gnezdi. Monitoring ptic roparic ima na Slovaškem sicer dolgo tradicijo, vendar monitoring sov v glavnem poteka le na lokalni in regionalni ravni. Nekatere vrste, in sicer kraljevi orel *Aquila heliaca*, sokol plenilec *Falco cherrug*, planinski orel *A. chrysaetos*, rdečenoga postovka *F. vespertinus* in rjavi škarnik *Milvus milvus*, so deležne dolgoročnega monitoringa njihovih celotnih populacij. Za najbolj celosten monitoring ptic roparic skrbi nevladna organizacija "Zaščita slovaških ptic roparic" (RPS), ki se prek svojega omrežja delovnih skupin posveča izključno tem pticam. Slovaško ornitološko društvo (SOS/BirdLife Slovaška) pa se po drugi strani ukvarja predvsem z monitoringom pogostih ptic roparic in s prezimujočo populacijo belorepca *Haliaeetus albicilla*. Sicer pa je končni cilj vseh monitoringov ohraniti ciljne vrste – ključne vrste so najbolj ogrožene ptice roparice tako na mednarodni kot državni ravni. Za shranjevanje podatkov monitoringa so postale zelo priljubljene spletne baze podatkov; nedavno je bila razvita tako imenovana Aves-Simfony, baza podatkov, ki jo upravljajo SOS, RPS in Inštitut za zoologijo. Največja prednost pri monitoringu ptic roparic na Slovaškem je zagotovo že dobro uveljavljeno omrežje strokovnjakov in prostovoljcev. Žal pa niso ustrezno spremljane vse vrste ptic roparic. Dostop do podatkov, pridobljenih z monitoringom, je omejen zaradi nepripravljenosti nekaterih izvedencev, da bi podatke v skupnih bazah delili z drugimi. Drug problem pa je nezadostna sposobnost vrednotenja podatkov na znanstveni ravni. Sodobne metode, kot na primer monitoring z radijskim in satelitskim sledenjem, se zaradi finančnih omejitev uporabljajo le poredkoma. Poleg tega pa dejavnosti monitoringa nimajo dovolj velikega vpliva na sprejemanje odločitev, ki posredno ali neposredno zadevajo ptice roparice.

8. References

BirdLife International (2004): Birds in Europe: population estimates, trends and conservation status. BirdLife Conservation Series No. 12. – BirdLife International, Cambridge.

Bohuš, M. (2011): [Census of wintering White-tailed Sea Eagles in Slovak section of the Danube river in winters 2008/2009–2010/2011.] – Tichodroma 23: 53–56. (in Slovak, English summary)

Chavko, J. (2010): Trend and conservation of saker falcon (*Falco cherrug*) population in western Slovakia between 1976 and 2010. – Slovak Raptor Journal 4: 1–22.

Chavko, J. (2012a): [White-tailed eagle (*Haliaeetus albicilla*).] – Dravce a sovy 8 (1): 7. (in Slovak)

Chavko, J. (2012b): [Saker falcon (*Falco cherrug*).] – Dravce a sovy 8 (1): 8. (in Slovak)

Chavko, J. (2012c): [Peregrine falcon (*Falco peregrinus*).] – Dravce a sovy 8 (1): 9. (in Slovak)

Chavko, J. (2012d): [Red-footed falcon (*Falco vespertinus*).] – Dravce a sovy 8 (1): 10. (in Slovak)

Chavko, J. & Siryová, S. (2002): [The Black Kite (*Milvus migrans*).] pp. 168–170 In: Danko, Š., Darolová, A. & Krištín, A. (eds.): [Birds distribution in Slovakia.] – Veda, Bratislava. (in Slovak, English summary)

Chavko, J. & Danko, Š. (2012): [Eastern imperial eagle (*Aquila heliaca*).] – Dravce a sovy 8 (1): 6. (in Slovak)

Chavko, J., Danko, Š., Obuch, J. & Mihók, J. (2007): The Food of the Imperial Eagle (*Aquila heliaca*) in Slovakia. – Slovak Raptor Journal 1: 1–18.

Danko, Š. (1976): [Report on activity of Group for Research of Birds of Prey and Owls in 1975.] Unpublished document 8. – Depon. in Group for Research of Raptors and Owls, Michalovce. (in Slovak)

Danko, Š. (1977a): [Report on activity of Group for Rsearch and Protection of Birds of Prey and Owls in Czechoslovakia in 1975 and 1976.] pp. 93–104 In: Randík, A. (ed): Falconiana I. Proceedings from seminar "Current state of distribution and protection of raptors in Czechoslovakia", 24–25 September 1976, Nitra. – Ústav experimentálnej fytopatológie a entomológie SAV, Sekcia ochrany fauny Slovenskej zoologickej spoločnosti SAV & Sekcia ochrany vtáctva Československej ornitologickej spoločnosti, Bratislava. (in Slovak, German summary)

Danko, Š. (1977b): [Report on activity of Group for Research of Birds of Prey and Owls in Czechoslovakia in 1975.] Unpublished document 9. – Depon. in Group for Research of Raptors and Owls, Michalovce. (in Slovak)

Danko, Š. (1978): [Report on activity of Group for Research of Birds of Prey and Owls in Czechoslovakia in 1977.] Unpublished document 10. – Depon. in Group for Research of Raptors and Owls, Michalovce. (in Slovak)

Danko, Š. (1979): [Report on activity in 1978.] Unpublished document 12. – Depon. in Group for Research of Raptors and Owls, Michalovce. (in Slovak)

Danko, Š. (1980): [Report on activity in 1979.] Unpublished document 11. – Depon. in Group for Research of Raptors and Owls, Michalovce. (in Slovak)

Danko, Š. (1987): [Report on the Activity of the Group for Research and Protection of Birds of Prey and Owls in Czechoslovakia in 1985.] – Skupina pro výzkum dravých ptáků a sov, Zprávy 6: 1–25. (in Slovak)

Danko, Š. (1988): [Report on the Activity of the Group for Research and Protection of Birds of Prey and Owls in Czechoslovakia in 1986.] – Buteo 1: 3–31. (in Slovak, English summary)

Danko, Š. (1989): [Report on the Activity of the Group for Research and Protection of Birds of Prey and Owls in Czechoslovakia in 1987.] – Buteo 2: 1–36. (in Slovak, English summary)

Danko, Š. (1990): [Report on the Activity of the Group for Research and Protection of Birds of Prey and Owls in Czechoslovakia in 1988.] – Buteo 3: 1–34. (in Slovak, English summary)

Danko, Š. (1991): [Report on the Activity of the Group for Research and Protection of Birds of Prey and Owls in Czechoslovakia in 1989.] – Buteo 4: 1–28. (in Slovak, English summary)

Danko, Š. (1992): [Report on the Activity of the Group for Research and Protection of Birds of Prey and Owls in Czechoslovakia in 1990.] – Buteo 5: 1–30. (in Slovak, English summary)

Danko, Š. (1994a): [Report on the Activity of the Group for Research and Protection of Birds of Prey and Owls in Czechoslovakia in 1991.] – Buteo 6: 90–120. (in Slovak, English summary)

Danko, Š. (1994b): [Report on the Activity of the Group for Research and Protection of Birds of Prey and Owls in Czechoslovakia in 1992.] – Buteo 6: 121–151. (in Slovak, English summary)

Danko, Š. (2002a): [The Egyptian Vulture (*Neophron percnopterus*).] pp. 174–175 In: Danko, Š., Darolová, A. & Krištín, A. (eds.): [Birds distribution in Slovakia.] – Veda, Bratislava. (in Slovak, English summary)

Danko, Š. (2002b): [The Black Vulture (*Aegypius monachus*).] pp. 176 In: Danko, Š., Darolová, A. & Krištín, A. (eds.): [Birds distribution in Slovakia.] – Veda, Bratislava. (in Slovak, English summary)

Danko, Š. (2002c): [The Short-toed Eagle (*Circaetus gallicus*).] pp. 177–178 In: Danko, Š., Darolová, A. & Krištín, A. (eds.): [Birds distribution in Slovakia.] – Veda, Bratislava. (in Slovak, English summary)

Danko, Š. (2002d): [The Hen Harrier (*Circus cyaneus*).] pp. 180–182 In: Danko, Š., Darolová, A. & Krištín, A. (eds.): [Birds distribution in Slovakia.] – Veda, Bratislava. (in Slovak, English summary)

Danko, Š. (2002e): [The Pallid Harrier (*Circus macrourus*).] pp. 182 In: Danko, Š., Darolová, A. & Krištín, A. (eds.): [Birds distribution in Slovakia.] – Veda, Bratislava. (in Slovak, English summary)

Danko, Š. (2002f): [The Long-legged Buzzard (*Buteo rufinus*).] pp. 191–193 In: Danko, Š., Darolová, A. & Krištín, A. (eds.): [Birds distribution in Slovakia.] – Veda, Bratislava. (in Slovak, English summary)

Danko, Š. (2002g): [The Spotted Eagle (*Aquila clanga*).] pp. 197–198. In: Danko, Š., Darolová, A. & Krištín, A. (eds.): [Birds distribution in Slovakia.] – Veda, Bratislava. (in Slovak, English summary)

Danko, Š. (2002h): [The Steppe Eagle (*Aquila nipalensis*).] pp. 198 In: Danko, Š., Darolová, A. & Krištín, A. (eds.): [Birds distribution in Slovakia.] – Veda, Bratislava. (in Slovak, English summary)

Danko, Š. (2002i): [The Booted Eagle (*Hieraaetus pennatus*).] pp. 202–204 In: Danko, Š., Darolová, A. & Krištín, A. (eds.): [Birds distribution in Slovakia.] – Veda, Bratislava. (in Slovak, English summary)

Danko, Š. (2002j): [The lesser kestrel (*Falco naumanni*).] pp. 206 In: Danko, Š., Darolová, A. & Krištín, A. (eds.): [Birds distribution in Slovakia.] – Veda, Bratislava. (in Slovak, English summary)

Danko, Š., s.a. (1981): [Report on the Activity of the Group for Research of Birds of Prey and Owls in Czechoslovakia in 1980.] – Skupina pro výzkum dravých ptáků a sov, Zprávy 1/80: 3–12. (in Slovak)

Danko, Š., s.a. (1982): [Report on the Activity of the Group for Research and Protection of Birds of Prey and Owls in Czechoslovakia in 1981]. – Skupina pro výzkum dravých ptáků a sov, Zprávy 2/81: 1–13. (in Slovak)

Danko, Š., s.a. (1983): [Report on the Activity of the Group for Research and Protection of Birds of Prey and Owls in Czechoslovakia in 1982.] – Skupina pro výzkum dravých ptáků a sov, Zprávy 3/82: 1–13. (in Slovak, English summary)

Danko, Š., s.a. (1984): [Report on the Activity of the Group for Research and Protection of Birds of Prey and Owls in Czechoslovakia in 1983.] – Skupina pro výzkum dravých ptáků a sov, Zprávy 4/83: 1–15. (in Slovak, English summary)

Danko, Š., s.a. (1985): [Report on the Activity of the Group for Research and Protection of Birds of Prey and Owls in Czechoslovakia in 1984.] – Skupina pro výzkum dravých ptáků a sov, Zprávy 5/84: 1–20. (in Slovak, English summary)

Danko, Š. & Kropil, R. (2002): [The Griffon Vulture (*Gyps fulvus*).] pp. 175–176 In: Danko, Š., Darolová, A. & Krištín, A. (eds.): [Birds distribution in Slovakia.] – Veda, Bratislava. (in Slovak, English summary)

Danko, Š. & Sárossy, M. (2002): [The scops owl (*Otus scops*).] pp. 358–360 In: Danko, Š., Darolová, A. & Krištín, A. (eds.): [Birds distribution in Slovakia.] – Veda, Bratislava. (in Slovak, English summary)

Danko, Š. & Karaska, D. (2002): [The eagle owl (*Bubo bubo*).] pp. 360–362 In: Danko, Š., Darolová, A. & Krištín, A. (eds.): [Birds distribution in Slovakia.] – Veda, Bratislava. (in Slovak, English summary)

Danko, Š. & Chavko, J. (2002): [The short-eared owl (*Asio flammeus*).] pp. 376–378 In: Danko, Š., Darolová, A. & Krištín, A. (eds.): [Birds distribution in Slovakia.] – Veda, Bratislava. (in Slovak, English summary)

Danko, Š. & Hrtan, E. (2012): The first observation of the Levant sparrowhawk *Accipiter brevipes* (Severtzov, 1850) in Slovakia. – Slovak Raptor Journal 6: 31–36.

Danko, Š., Chavko, J. & Karaska, D. (1995a): [Report on the Activity of the Group on Protection of Birds of Prey and Owls in the Slovak republic in 1993.] – Buteo 7: 109–121. (in Slovak, English summary)

Danko, Š., Chavko, J. & Karaska, D. (1995b): [Report on

the Activity of the Group on Protection of Birds of Prey and Owls in the Slovak republic in 1994]. – Buteo 7: 132–148. (in Slovak, English summary)

Danko, Š., Karaska, D. & Chavko, J. (2000): [Report on the activity of the Group on Protection of Birds of Prey and Owls of the Slovak Society for Ornithology in 1995]. – Tichodroma 13: 227–250. (in Slovak, English summary)

Danko, Š., Karaska, D. & Kropil, R. (2002): [The snowy owl (*Nyctaea scandiaca*).] pp. 363 In: Danko, Š., Darolová, A. & Krištín, A. (eds.): [Birds distribution in Slovakia.] – Veda, Bratislava. (in Slovak, English summary)

Darolová, A. & Kropil, R. (2002): [The common kestrel (*Falco tinnunculus*).] pp. 207–209 In: Danko, Š., Darolová, A. & Krištín, A. (eds.): [Birds distribution in Slovakia.] – Veda, Bratislava. (in Slovak, English summary)

Dobrý, M. (2011): The abundance of the little owl (*Athene noctua*) in Podunajská rovina lowland in 2009 and 2010. – Slovak Raptor Journal 5: 121–126.

Dravecký, M., Danko, Š., Obuch, J., Kicko, J., Maderič, B., Karaska, D., Vrána, J., Šreibr, O., Šotnár, K., Vrlík, P. & Bohačík, L. (2008a): Diet of the Lesser Spotted Eagle (*Aquila pomarina*) in Slovakia. – Slovak Raptor Journal 2: 1–18.

Dravecký, M., Maderič, B., Šotnár, K., Danko, Š., Harvančík, S., Kicko, J., Karaska, D., Vrlík, P., Vrána, J., Balla, M., Boucný, D. & Kišac, P. (2008b): Lesser Spotted Eagle (*Aquila pomarina*) colour ringing programme and its first results in the period 2000–2008 in Slovakia. – Slovak Raptor Journal 2: 27–36.

IUCN (2013): The IUCN Red List of Threatened Species. Version 2012.2. – [http://www.iucnredlist.org/], 28/5/2013.

Karaska, D. (2002): [The Sparrowhawk (*Accipiter nisus*).] pp. 187–189 In: Danko, Š., Darolová, A. & Krištín, A. (eds.): [Birds distribution in Slovakia.] – Veda, Bratislava. (in Slovak, English summary)

Karaska, D. & Chavko, J. (2002a): [The Goshawk (*Accipiter gentilis*).] pp. 185–187 In: Danko, Š., Darolová, A. & Krištín, A. (eds.): [Birds distribution in Slovakia.] – Veda, Bratislava. (in Slovak, English summary)

Karaska, D. & Chavko, J. (2002b): [The Osprey *Pandion haliaetus*).] pp. 204–205 In: Danko, Š., Darolová, A. & Krištín, A. (eds.): [Birds distribution in Slovakia.] – Veda, Bratislava. (in Slovak, English summary)

Karaska, D. & Chavko, J. (2002c): [The merlin (*Falco columbarius*).] pp. 211–212 In: Danko, Š., Darolová, A. & Krištín, A. (eds.): [Birds distribution in Slovakia.] – Veda, Bratislava. (in Slovak, English summary)

Karaska, D. & Danko, Š. (2002a): [The Honey Buzzard (*Pernis apivorus*).] pp. 166–167 In: Danko, Š., Darolová, A. & Krištín, A. (eds.): [Birds distribution in Slovakia.] – Veda, Bratislava. (in Slovak, English summary)

Karaska, D. & Danko, Š. (2002b): [The Lesser Spotted Eagle (*Aquila pomarina*).] pp. 195–197 In: Danko, Š., Darolová, A. & Krištín, A. (eds.): [Birds distribution in Slovakia.] – Veda, Bratislava. (in Slovak, English summary)

Karaska, D. & Danko, Š. (2002c): [The Eurasian hobby (*Falco subbuteo*).] pp. 213–214 In: Danko, Š., Darolová, A. & Krištín, A. (eds.): [Birds distribution in Slovakia.] – Veda, Bratislava. (in Slovak, English summary)

Karaska, D., Trnka, A. & Danko, Š. (2002): [The Marsh Harrier (*Circus aeruginosus*).] pp. 178–180 In: Danko, Š., Darolová, A. & Krištín, A. (eds.): [Birds distribution in Slovakia.] – Veda, Bratislava. (in Slovak, English summary)

Krištín, A., Mihók, J., Danko, Š., Karaska, D., Pačenovský, S., Saniga, M., Boďová, M., Balázs, C., Šotnár, K., Korňan, J. & Olekšák, M. (2007): Distribution, abundance and conservation of the Ural owl *Strix uralensis* in Slovakia. pp. 8–15 In: Müller, J., Scherzinger, W. & Moning, C. (eds): European Ural owl workshop, Bavarian Forest National Park. Tagungsbericht, Heft 8. – National Park Bayerischer Wald, Grafenau.

Kropil, R. (2002a): [The Common Buzzard (*Buteo buteo*).] pp. 189–191 In: Danko, Š., Darolová, A. & Krištín, A. (eds.): [Birds distribution in Slovakia.] – Veda, Bratislava. (in Slovak, English summary)

Kropil, R. (2002b): [The Golden Eagle (*Aquila chrysaetos*).] pp. 201–202 In: Danko, Š., Darolová, A. & Krištín, A. (eds.): [Birds distribution in Slovakia.] – Veda, Bratislava. (in Slovak, English summary)

Kropil, R. (2002c): [The long-eared owl (*Asio otus*).] pp. 374–376 In: Danko, Š., Darolová, A. & Krištín, A. (eds.): [Birds distribution in Slovakia.] – Veda, Bratislava. (in Slovak, English summary)

Kropil, R. & Danko, Š. (2002): [The Rough-legged Buzzard (*Buteo lagopus*).] pp. 193–195 In: Danko, Š., Darolová, A. & Krištín, A. (eds.): [Birds distribution in Slovakia.] – Veda, Bratislava. (in Slovak, English summary)

Maderič, B. (2012): [Red kite (*Milvus milvus*).] – Dravce a sovy 8 (1): 11. (in Slovak)

Noga, M. (2011): [Montagu's harrier (*Circus pygargus*).] – Dravce a sovy 7 (1): 13. (in Slovak)

Obuch, J. (2012): Spatial and temporal diversity of the diet of the tawny owl (*Strix aluco*). – Slovak Raptor Journal 5 (1): 1–120.

Obuch, J. & Karaska, D. (2011): The Eurasian eagle-owl (*Bubo bubo*) diet in the Orava Region (N Slovakia). – Slovak Raptor Journal 4 (1): 83–98.

Pačenovský, S. (2002a): [The pygmy owl (*Glaucidium passerinum*).] pp. 364–367 In: Danko, Š., Darolová, A. & Krištín, A. (eds.): [Birds distribution in Slovakia.] – Veda, Bratislava. (in Slovak, English summary)

Pačenovský, S. (2002b): [The little owl (*Athene noctua*).] pp. 367–369 In: Danko, Š., Darolová, A. & Krištín, A. (eds.): [Birds distribution in Slovakia.] – Veda, Bratislava. (in Slovak, English summary)

Pačenovský, S. (2002c): [The Tengmalm´s owl (*Aegolius funereus*).] pp. 379–381 In: Danko, Š., Darolová, A. & Krištín, A. (eds.): [Birds distribution in Slovakia.] – Veda, Bratislava. (in Slovak, English summary)

Pačenovský, S. & Obuch, J. (2002): [The tawny owl (*Strix aluco*).] pp. 369–371 In: Danko, Š., Darolová, A. & Krištín, A. (eds.): [Birds distribution in Slovakia.] – Veda, Bratislava. (in Slovak, English summary)

Pačenovský, S. & Šotnár, K. (2010): Notes on the

reproduction, breeding biology and ethology of the Eurasian pygmy owl (*Glaucidium passerinum*) in Slovakia. – Slovak Raptor Journal 4: 49–81.

Polák P. & Saxa, A. (eds.) 2005: [Favourable Conservation Status of Habitats and Species of European Importance.] – State Nature Conservancy of the Slovak Republic, Banská Bystrica. (in Slovak)

Saniga, M. (2002): [The hawk owl (*Surnia ulula*).] pp. 364 In: Danko, Š., Darolová, A. & Krištín, A. (eds.): [Birds distribution in Slovakia.] – Veda, Bratislava. (in Slovak, English summary)

Sárossy, M. (2002): [The barn owl (*Tyto alba*).] pp. 356–358 In: Danko, Š., Darolová, A. & Krištín, A. (eds.): [Birds distribution in Slovakia.] – Veda, Bratislava. (in Slovak, English summary)

Slabeyová, K., Ridzoň, J., Darolová, A., Karaska, D. & Topercer, J. (2008): Report on winter waterbird census in Slovakia in the season 2004/05. – SOS/BirdLife Slovensko, Bratislava. (in Slovak, English summary)

Slabeyová, K., Ridzoň, J. & Kropil, R. (2009a): Trends in common birds abundance in Slovakia during 2005–2009. – Tichodroma 21: 1–13. (in Slovak, English summary)

Slabeyová, K., Ridzoň, J., Topercer, J., Darolová, A. & Karaska, D. (2009b): Report on winter waterbird census in Slovakia in the season 2005/06. – SOS/BirdLife Slovensko, Bratislava. (in Slovak, English summary)

Slabeyová, K., Ridzoň, J., Karaska, D., Topercer, J. & Darolová, A. (2011): Report on winter waterbird census in Slovakia in the season 2009/2010. – SOS/BirdLife Slovensko, Bratislava. (in Slovak, English summary)

Šotnár, K. & Topercer, J. (2009a): Estimating density, population size and dynamics of Common Buzzard (*Buteo buteo*) in a West Carpathian region by a new method. – Slovak Raptor Journal 3: 1–12.

Šotnár, K. & Topercer, J. (2009b): Feeding ecology of a nesting population of the Common Buzzard (*Buteo buteo*) in the Upper Nitra region, Central Slovakia. – Slovak Raptor Journal 3: 13–20.

Uhrin, M., Danko, Š. & Latková, H. (2008): Bibliography on birds of prey and owls in Slovakia. Part 1. Order Accipitriformes, genera *Aquila*, *Hieraaetus* & *Haliaeetus*. – Slovak Raptor Journal 2: 119–142.

Uhrin, M., Danko, Š. & Latková, H. (2009): Bibliography on birds of prey and owls in Slovakia. Part 2. Order Accipitriformes, genera *Pernis*, *Milvus*, *Neophron*, *Gyps*, *Aegypius*, *Circaetus*, *Circus*, *Accipiter*, *Buteo* & *Pandion*. – Slovak Raptor Journal 3: 73–88.

Uhrin, M., Danko, Š. & Latková, H. (2010): Bibliography on birds of prey and owls in Slovakia. Part 3. Order Falconiformes, genus *Falco*. – Slovak Raptor Journal 4: 115–131.

Uhrin, M., Danko, Š. & Latková, H. (2011): Bibliography on birds of prey and owls in Slovakia. Part 4. Order Strigiformes, genera *Tyto, Otus, Bubo, Strix, Surnia, Glaucidium, Athene, Aegolius* & *Asio*. – Slovak Raptor Journal 5: 137–163.

Uhrin, M., Danko, Š. & Latková, H. (2012): Bibliography on birds of prey and owls in Slovakia. Part 5. General references and supplements to previous parts. – Slovak Raptor Journal 6: 45–77.

Václav, R. (2012): First observation of the black-winged kite *Elanus caeruleus* in Slovakia. – Slovak Raptor Journal 6: 27–30.

Vili, N., Chavko, J., Szabó, K., Kovács, S., Hornung, E., Kalmár, L. & Horváth, M. (2009): Genetic structure of the Imperial Eagle (*Aquila heliaca*) population in Slovakia. – Slovak Raptor Journal 3: 21–28.

Arrived / Prispelo: 27. 3. 2013
Accepted / Sprejeto: 1. 7. 2013

Acrocephalus 33 (154/155): 271–276, 2012
10.2478/v10100-012-0008-6

A preliminary overview of raptor monitoring in Slovenia – an overview of methodologies, current monitoring status and future perspectives

Predhodni pregled monitoringa ptic roparic v Sloveniji – pregled metodologij, trenutnega stanja monitoringa in perspektive

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Among 48 raptor species (birds of prey, owls, shrikes) recorded recently in Slovenia, some long-term monitoring activities are being conducted for more than half of them, mainly for conservation and research purposes. However, national coverage is achieved only in 15% of the species, whereas other monitoring programmes are more or less local. Two monitoring approaches are considered, the species specific approach and assemblage approach. Current ongoing monitoring programmes for raptors in Slovenia lack monitoring of breeding success, which is now confined to only a few owl species. Use of nestboxes should therefore be considered more broadly in the future for some species at least.

Key words: Slovenia, raptor monitoring, monitoring methodology, birds of prey, owls, shrikes
Ključne besede: Slovenija, monitoring ptic roparic, metodologija monitoringa, ujede, sove, srakoperji

1. Introduction

Despite a relatively long ornithological research tradition (Scopoli 1769) and certain conservation efforts for many raptor species in Slovenia (Beuk 1920), the actual bird monitoring programmes and studies were embarked upon fairly recently, specifically in the 1980s. The aims of these monitoring programmes were quite different taking into account specific scientific (Tome 2009) or conservation based issues (Polak *et al.* 2004). They were designed either as broad international actions (Božič 2005) or as a way of bird popularization by monitoring of charismatic bird species (Denac, D. 2010). Therefore long-term data on bird or specifically raptor populations in Slovenia are of quite different quality and quantity based on species specific or assemblage-oriented surveys such as Farmland Bird Index counts (Kmecl & Figelj 2012). In terms of raptors, only few long-term monitoring results from Slovenia have been published (e.g. Denac 2003, Rubinić 2009, Tome 2009, Vrezec *et al.* 2009), leaving most of the collected data unanalysed and unpublished.

The main aim of this study was therefore to inventory data collections in Slovenia appropriate for raptor monitoring purposes. I have taken into account the published and unpublished long-term data on population size (breeding and non-breeding) and breeding success, including survey methods overview, and identified strong and weak points of current monitoring programmes with future perspectives and needs. In the present preliminary overview of raptor monitoring in Slovenia, I have followed broader ecological definition of raptors including birds of prey, owls and shrikes.

2. Methods

For the purpose of this overview, an updated list of raptors recorded in Slovenia in the past 50 years was prepared. For each species the inventory of continuous or consecutive surveillances and especially long-term

Table 1: Overview of raptor monitoring in Slovenia (the number of species listed)

Tabela 1: Pregled monitoringa ptic roparic v Sloveniji (z navedenim številom vrst)

	Falconiformes	Strigiformes	Laniidae	Total / Skupaj
No. of species	34	11	4	49
Breeders	15	9	3	27
Vagrants	10	1	0	11
Monitoring of breeding population	7	6	2	15
Monitoring of breeding success	2	5	1	8
Raptor migration monitoring	13	0	1	14
Monitoring of wintering population	1	0	1	2

monitoring programmes was reviewed, taking into account the published data, unpublished reports, existing data bases or survey protocols.

3. Results and discussion

In the past 50 years, 49 raptor species have been recorded in Slovenia. Breeding has been confirmed for 27 of them (five species became recently extinct or breed irregularly or in very low numbers), at least 22 species are regular migrants, and at least five species form regular wintering populations (Sovinc 1994, Geister 1995, Bordjan & Božič 2009, Hanžel & Šere 2011) (Table 1). From further analysis, 11 vagrant species have been excluded. For 71% of non-vagrant species, some long-term monitoring activities exist.

3.1. Monitoring schemes, data users

Monitoring of breeding populations was carried out for 58% of the breeders, but the actual breeding success was ascertained only for 27% of them. In raptor migration monitoring, 37% of the species were considered, and only 5% in wintering population monitoring (Table 1). However, the spatial coverage and time series differ greatly among species.

The largest data set was obtained from regular ringing of migrating passerines (coordinated by the Slovenian Museum of Natural History) for the Red-backed Shrike *Lanius collurio,* which started as early as in 1927, but systematically continued at a permanent bird ringing station in 1987 (Božič 2009, Šere 2009). Other monitoring programmes are much shorter and confined mainly to the last 20 years. They were mostly conducted by DOPPS - BirdLife Slovenia, Sečovlje Salina Nature Park and the National Institute of Biology for research, conservation and management purposes.

Data users and monitoring programmes' supporters are mainly governmental institutions from the field of nature conservation (Ministry of Agriculture and Environment, Institute of the Republic of Slovenia for Nature Conservation) and scientific research (Slovenian Research Agency, Ministry of Culture). Quite some monitoring efforts rely also on purely voluntary work.

National coverage was achieved only in seven species (18%), mostly as breeding population monitoring. For 20 species (53%), the monitoring programmes were local (one or two sites). The latter were mainly migration monitoring programmes at specific sites, including monitoring of several migrating raptor species.

3.2. Monitoring methodology, key species and key monitoring issues

Two monitoring approaches are considered in the scope of long-term data collection for raptors, species specific approach and assemblage approach.

In the latter, raptors are target species of raptor migration monitoring, which is conducted at migration bottlenecks or other important migration sites, e.g. open wetlands, in Slovenia. Raptor migration monitoring has been conducted since 2005 on eight sites in Slovenia, but only on one more or less regularly within the scope of Natura 2000 network monitoring programme (Denac *et al.* 2010). This monitoring was conducted in spring and autumn and every raptor species was recorded, with Honey Buzzard *Pernis apivorus*, Griffon Vulture *Gyps fulvus* and Kestrel *Falco tinnunculus* as the most abundant raptors, the last two species as residents and not true migrants (Denac, K. 2010).

Raptor migration is followed also within regular bird ringing programme coordinated by the Slovenian Museum of Natural History, but these data have not yet been fully evaluated for the monitoring purposes.

Migration of raptors, mostly birds of prey, is

followed seasonally and annually also in the scope of waterbird counts at larger wetlands in Slovenia. This has been regularly conducted since 2002 (since 1983 at only one site) on at least five sites, in which migrating as well as breeding and wintering raptor populations are considered, with Marsh Harrier *Circus aeruginosus*, Buzzard *Buteo buteo*, Red-footed Falcon *F. vespertinus*, Kestrel and Osprey *Pandion haliaetus* as the most abundant species (Bordjan & Božič 2009, Škornik 2009, Bordjan 2012). For the White-tailed Eagle *Haliaeetus albicilla*, the usefulness of large scale and non-targeted data from *International Waterbird Census* (IWC) counts has been shown. In Slovenia, the IWC has been continuously conducted on almost all water bodies since 1997 (Štumberger 1997). Despite winter counts, this survey appeared to be very useful for estimating breeding population trends of the White-tailed Eagle (Vrezec *et al.* 2009). An increase in winter population (estimated with TRIM software) corresponded very well to the increase of new nests found.

Breeding population of some species is followed in consecutive periods, although not annually, for example for the Red-backed Shrike, where local population is surveyed approximately every five years (Denac 2003). Since 2007, breeding populations of some common raptors, e.g. Kestrel and Red-backed Shrike, have been followed by annual bird surveys conducted on 102 plots over the country as part of the *Farmland Bird Index* programme, conducted by DOPPS - BirdLife Slovenia (Kmecl & Figelj 2012).

Collection of biological material (carcasses, eggs, feathers etc.) that might be an important source for *with* raptor monitoring, i.e. monitoring of contaminants in raptor tissues, is conducted by the Slovenian Museum of Natural History, but with no specific collection programme for raptors so far.

The species specific monitoring programmes are focused mainly on breeders (Table 2), with the exception of the Great Grey Shrike *L. excubitor* for which regular surveys of its winter numbers have been conducted since 2000, currently on two larger open areas in Slovenia at least, using the area count method (Bombek 2001). Some endangered raptor species have been included in the national monitoring scheme of qualification species of the Natura 2000 network: Lesser Spotted Eagle *Aquila pomarina*, Peregrine Falcon *F. peregrinus*, Scops Owl *Otus scops*, Eagle Owl *Bubo bubo*, Ural Owl *Strix uralensis* and Lesser Grey Shrike *L. minor* (Rubinić 2009, Denac *et al.* 2010). However, the species specific monitoring programmes are focused mostly on territorial pair counts or chick presence in the nest at most, but rarely on other breeding and ecological parameters (Table 2). These were part of more detailed but local studies of feeding and breeding ecology in raptors (i.e. Long-eared Owl *Asio otus*, Tome 2003 & 2009) or research nestbox programme (i.e. Tawny *S. aluco* and Ural Owl, Vrezec 2007 & *unpubl.*).

Many monitoring programmes in Slovenia are part of a broad international cooperation, especially with BirdLife International. Migration monitoring was designed in cooperation with Austrian and Italian researchers (Mihelič & Genero 2005, Probst 2010), whereas species specific monitoring of owls was developed in close cooperation with Finnish, Croatian, Italian, Austrian and some other researchers (e.g. Vrezec & Tutiš 2003). Currently, there is a bilateral project with Bosnia and Herzegovina going on, aimed at joint study of some owl species.

3.3. Strengths and weaknesses of current monitoring programmes, future perspectives

Monitoring programmes should be cost-effective (McDonald-Madden *et al.* 2010) to ensure long-term surveillance according to limited financial and human resources on one hand and its information efficiency on the other, which includes large scale and complex survey approach. Since raptors are charismatic and usually well known species, it is important to search for possibilities at least for their population monitoring in current ongoing monitoring programmes, e.g. population monitoring of the White-tailed Eagle in Slovenia (Vrezec *et al.* 2009). In Slovenia, however, nearly a half of raptor species are currently not covered by any monitoring programme or only migrating population is monitored, while their breeding populations have not been taken into consideration.

In Slovenia, monitoring of raptors' breeding success is currently confined to just few owl species (Table 2). The use of nestboxes is still underrepresented in raptor monitoring and research (Lambrechts *et al.* 2012) and should be more broadly used. In general, the conservation needs for nestboxes in order to supplement nest sites for hole nesting raptors are low due to still well preserved forest stands in Slovenia, which provide enough natural possibilities for breeding. Currently, nestboxes are used for Kestrel, Barn Owl *Tyto alba*, Scops Owl, Tawny Owl, Ural Owl, Tengmalm's owl *Aegolius funereus* and Little Owl *Athene noctua*, although mostly at the local level with low quantity and different success. However, the perspective of nestbox application in monitoring programmes is to recruit volunteers to maintain

Table 2: Overview of species specific monitoring programmes for raptors in Slovenia

Tabela 2: Pregled programov vrstno specifičnega monitoringa za ptice roparice v Sloveniji

Species / Vrsta	Time series/ Obdobje	Spatial coverage/ Prostorska pokritost	Methods/ Metode	Other parameters monitored/ Drugi spremljani parametri	Sources/ Viri
Lesser Spotted Eagle *Aquila pomarina*	since 2004	Local	Annual inspections of known breeding sites	No	Rubinić (2009)
Golden Eagle *Aquila chrysaetos*	since 2008	National	Annual inspections of known breeding sites	Chick presence	T. Mihelič (*pers. comm.*)
Peregrine Falcon *Falco peregrinus*	since 2004	Local	Annual inspections of known breeding sites	Chick presence	Rubinić (2009)
Scops Owl *Otus scops*	since 1998	National	Point counts of territories (playback)	Clutch and brood size (nestboxes)	Denac K. (2003)
Eagle Owl *Bubo bubo*	since 1992	National	Annual inspections of known breeding sites	Chick presence	Mihelič (2011)
Tawny Owl *Strix aluco*	since 1998	Local	Point counts of territories (playback)	Clutch and brood size, female ringing (nestboxes), diet, prey abundance	Vrezec (2003)
Ural Owl *Strix uralensis*	since 1997	National	Point counts of territories (playback)	Clutch and brood size, female ringing (nestboxes), diet, prey abundance	Vrezec (2007)
Long-eared Owl *Asio otus*	1982–2001	Local	Nest inspections	Clutch and brood size, diet, prey abundance	Tome (2003, 2009)
Tengmalm's Owl *Aegolius funereus*	since 1997	Local	Point counts of territories (playback)	No	Vrezec (2003)
Red-backed Shrike *Lanius collurio*	since 1992	Local	Area count	Habitat	Denac D. (2003)
Lesser Grey Shrike *Lanius minor*	since 1999	Local	Area count	Brood size	Hudoklin (2008), Denac *et al.* (2010)
Great Grey Shrike *Lanius excubitor**	since 2000	Local	Area count	No	Bombek (2001)

* wintering population / prezimujoča populacija

different kinds of nestboxes for raptors. Based on Finnish raptor monitoring programme (Saurola 2008), this provides good population as well as breeding success monitoring.

In order to explain monitoring results, some key environmental parameters should be included in the monitoring programmes, which are considered in Slovenia only marginally for research needs (e.g. Tome 2009). Especially, there is a need for monitoring of threats, which have been studied in Slovenia only preliminary, e.g. roadkill (Rubinič & Vrezec 2001) and electrocution (Rubinić 2009), but not followed by a long-term scheme and connected to population monitoring programmes.

The future perspectives of monitoring for raptors in Slovenia, largely stimulated by EURAPMON, are: (1) to collect current scattered data and to produce reliable national trends where possible, (2) to develop efficient field methods (survey, breeding success), (3) to start with nestboxes programme at the national level (volunteer-based), (4) to include ringing activity and advanced telemetry studies into raptor monitoring, (5) to include mortality monitoring or monitoring of threats, and (6) to start with systematic biological material collection of raptors for the purposes of monitoring *with* raptors. These issues should be largely enhanced by international cooperation at the point of general monitoring scheme establishment.

Acknowledgements: To accomplish this overview, several colleagues offered me great help in obtaining additional information on unpublished but ongoing monitoring programmes for raptors in Slovenia: Dominik Bombek, Dejan Bordjan, Katarina Denac, Dare Fekonja, Dr Primož Kmecelj, Dr Urša Koce, Tomaž Mihelič and Dr Davorin Tome.

4. Povzetek

Dolgoročni monitoring trenutno poteka za dobro polovico od 48 ptic roparic (ujed, sov, srakoperjev), zabeleženih v zadnjem obdobju v Sloveniji, predvsem za potrebe varstva in raziskovanja teh ptic. Vendar pa je na nacionalni ravni pokritih le 15 % vrst, medtem ko drugi programi monitoringa potekajo bolj ali manj na lokalno. V rabi sta dva pristopa monitoringa, in sicer vrstno specifični pristop in pristop na ravni združb. Sedanji programi monitoringa za ptice roparice v Sloveniji pa ne zajemajo monitoringa njihovega gnezditvenega uspeha, ki je trenutno omejen le na sove. V prihodnosti bi za nadaljnji razvoj monitoronga ptic roparic v Sloveniji morali razmisliti predvsem o: (1) zbiranju obstoječih a razpršenih podatkov, s katerimi bi lahko izračunali zanesljive populacijske trende vsaj za nekatere vrste, (2) razvoju učinkovitih terenskih metod (popisi, ugotavljanje gnezditvenega uspeha), (3) začetku programa z uporabo gnezdilnic na nacionalnem nivoju (s širšim vključevanjem prostovoljcev), (4) vključitvi obročkovalske aktivnosti in uporabe naprednih telemetrijskih tehnik v monitoring ptic roparic, (5) vključitvi monitoringa smrtnosti in dejavnikov ogrožanja v sheme monitoringa in (6) začetku sistematičnega zbiranja biološkega materiala ptic roparic za namene monitoringa onesnažil in strupov. Ti cilji morajo biti tesno povezani z mednarodnim sodelovanjem za postavitev nacionalne sheme monitoringa za ptice roparice v Sloveniji.

5. References

Beuk, S. (1920): Spomenica. – Glasnik Muzejskega društva za Slovenijo 1 (1–4): 69–75. (in Slovene)

Bombek, D. (2001): [Survey of the Great Grey Shrike *Lanius excubitor* at Dravsko and Ptujsko polje in December 2000.] – Acrocephalus 22 (104/105): 41–43. (in Slovene, English summary).

Bordjan, D. (2012): [Waterbirds and raptors of Cerknica polje (southern Slovenia) in 2007 and 2008, with an overview of interesting observations till the end of 2010.] – Acrocephalus 33 (152/153): 25–104. (in Slovene, English summary)

Bordjan, D. & Božič, L. (2009): [Waterbirds and raptors occurring in the area of Medvedce reservoir (Dravsko polje, NE Slovenia) during the 2002–2008 period.] – Acrocephalus 30 (141/142/143): 55–163. (in Slovene, English summary)

Božič, L. (2005): [Results of the International Waterbird Census (IWC) in January 2004 and 2005 in Slovenia.] – Acrocephalus 26 (126): 123–137. (in Slovene, English summary)

Božič, I.A. (2009): [Results of bird ringing in Slovenia: 1926–1982.] – Scopolia, Suppl. 4: 23–110. (in Slovene, English summary)

Denac, D. (2003): Population decline and land-use changes in hunting habitat of the Red-backed Shrike *Lanius collurio* at Šturmovci (NE Slovenia). – Acrocephalus 24 (118): 97–102.

Denac, D. (2010): Population dynamics of the White stork *Ciconia ciconia* in Slovenia between 1999 and 2010. – Acrocephalus 31 (145/146): 101–114.

Denac, K. (2003): Population dynamics of Scops Owl *Otus scops* at Ljubljansko barje (central Slovenia). – Acrocephalus 24 (119): 127–133.

Denac, K. (2010): Census of migrating raptors at Breginjski Stol (NW Slovenia) – the first confirmed bottleneck site in Slovenia. – Acrocephalus 31 (145/146): 77–92.

Denac, K., Božič, L., Rubinić, B., Denac, D., Mihelič, T., Kmecl, P. & Bordjan, D. (2010): [Population monitoring of selected bird species. Technical report.] – DOPPS - BirdLife Slovenia, Ljubljana. (in Slovene)

Kmecl, P. & Figelj, J. (2012): [Monitoring of common bird species for estimation of Slovenian Farmland Bird Index. Report for 2012.] – DOPPS, Ljubljana. (in Slovene) (available at http://www.natura2000.gov.si/index.php?id=211)

Geister, I. (1995): [The Ornithological Atlas of Slovenia.] – DZS, Ljubljana. (in Slovene, English summary)

Hanžel, J. & Šere, D. (2011): [The list of birds of Slovenia with an overview of rare species.] – Acrocephalus 32 (150/151): 143–203. (in Slovene, English summary)

Hudoklin, A. (2008): [Ecological demands of the Lesser Grey Shrike *Lanius minor* in its breeding habitat at Šentjernejsko polje (SE Slovenia).] – Acrocephalus 29: 23–31. (in Slovene, English summary)

Lambrechts, M.M., Wiebe, K.L., Sunde, P., Solonen, T., Sergio, F., Roulin, A., Møller, A.P., Lopez, B.C., Fargallo, J.A., Exo, K.M., Dell'Omo, G., Costantini, D., Charter, M., Butler, M.W., Bortolotti, G.R., Arlettaz, R. & Korpimäki, E. (2012): Nest box design for the study of diurnal raptors and owls is still an overlooked point in ecological, evolutionary and conservation studies: a review. – Journal of Ornithology 153 (1): 23–34.

Mcdonald-Madden, E., Baxter, P.W.J., Fuller, R.A., Martin, T.G., Game, E.T., Montambault, J. & Possingham, H.P. (2010): Monitoring does not always count. – Trends in Ecology and Evolution 25: 547–550.

Mihelič, T. (2011): [Eagle Owl *Bubo bubo*.] pp. 25–33 In: Denac, K., Mihelič, T., Denac, D., Božič, L., Kmecl, P. & Bordjan, D. (eds.): Population monitoring of selected bird species. Census of breeders in spring 2011 and summary of surveys in the 2010–2011 period. Final report. – DOPPS - BirdLife Slovenia, Ljubljana. (in Slovene)

Mihelič, T. & Genero, F. (2005): Occurrence of Griffon Vulture *Gyps fulvus* in Slovenia in the period from 1980 to 2005. – Acrocephalus 26 (125): 73–79.

Polak, S., Kebe, L. & Koren, B. (2004): [Thirteen years of the Corn Crake *Crex crex* census at Lake Cerknica (Slovenia).] – Acrocephalus 25 (121): 61–72. (in Slovene, English summary)

Probst, R. (2010): Important sites for migrating raptors in the Eastern Alps. – Acrocephalus 31 (145/146): 73–75.

Rubinić, B. (ed.) (2009): [Birds in Slovenia in the year 2008.] – DOPPS - BirdLife Slovenia, Ljubljana. (in Slovene)

Rubinič, B. & Vrezec, A. (2001): [A contribution to the knowledge of bird mortality on Slovene roads.] – Acrocephalus 22 (109): 219–223. (in Slovene, English summary)

Saurola, P. (2008): Monitoring Birds of Prey in Finland: A Summary of Methods, Trends, and Statistical Power. – Ambio 37 (6): 413–419.

Scopoli, I.A. (1769): [Annus I. historico-naturalis. Descriptiones Avium.] – Sumtib. Christ. Gottlob Hilscheri, Lipsiae. (in Latin)

Sovinc, A. (1994): [The Atlas of Wintering Birds of Slovenia.] – Tehniška založba Slovenije, Ljubljana. (in Slovene)

Šere, D. (2009): [A short report on birds ringed in Slovenia, 1983–2008.] – Scopolia, Suppl. 4: 23–110. (in Slovene, English summary)

Škornik, I. (2009): [A Faunistic-Ecological Contribution to the Knowledge of Birds in the Sečovlje Salina.] – Soline pridelava soli, Seča. (in Slovene, English summary)

Štumberger, B. (1997): [Results of the mid-winter waterfowl census in January 1997 in Slovenia.] – Acrocephalus 18 (80/81): 29–39. (in Slovene, English summary)

Tome, D. (2003): Functional response of the Long-eared Owl *(Asio otus)* to changing prey numbers: a 20-year study. – Ornis Fennica 80 (2): 63–70.

Tome, D. (2009): Changes in the diet of long-eared owl *Asio otus*: seasonal patterns of dependence on vole abundance. – Ardeola 56 (1): 49–56.

Vrezec, A. (2003): Breeding density and altitudinal distribution of the Ural, Tawny, and Boreal Owls in North Dinaric Alps (central Slovenia). – Journal of Raptor Research 37 (1): 55–62.

Vrezec, A. (2007): The Ural Owl (*Strix uralensis macroura*) – Status and overview of studies in Slovenia. pp. 16–31 In: Müller, J., Scherzinger, W. & Moning, C. (eds.): European Ural Owl workshop. – Nationalparkverwaltung Bayerischer Wald, Grafenau.

Vrezec, A., Bordjan, D., Perušek, M. & Hudoklin, A. (2009): Population and ecology of the White-tailed Eagle (*Haliaeetus albicilla*) and its conservation status in Slovenia. – Denisia 27: 103–114.

Vrezec, A. & Tutiš, V. (2003): Characteristics of North Dinaric Ural Owl (*Strix uralensis macroura*) population. pp. 75 In: Schwerdtfeger, O. & Schwerdtfeger, J. (eds.): Ecology and Conservation of European Owls. International Symposium Dornbirn 2003. – Dornbirn.

Arrived / Prispelo: 27. 3. 2013
Accepted / Sprejeto: 1. 7. 2013

Acrocephalus 33 (154/155): 277–282, 2012

A preliminary overview of monitoring for raptors in Sweden

Predhodni pregled monitoringa populacij ptic roparic na Švedskem

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Swedish diurnal raptor and owl monitoring is to a large extent based on species specific projects with long-standing traditions, migration counts at specific migration hot-spots, and a nation-wide bird survey. The best-known and long-lived projects are the Peregrine Falcon *Falco peregrinus* and White-tailed Eagle *Haliaeetus albicilla* projects, which continue to make important contributions to the knowledge about effects of environmental pollutants in wild birds. For many diurnal birds of prey, trend estimation is based on the long time series (1973–) of migration counts at Falsterbo in southernmost Sweden, whereas possibilities to detect population trends in most owl species are still relatively low. New protocols, however, are being developed to better incorporate night active-birds such as owls in the Swedish Bird Survey. Much raptor monitoring data is being collected by volunteers. Sweden has several valuable networks for bird monitoring in general, although special efforts could be directed towards better coordination and publication of the on-going raptor work within a common framework. Potential threats (e.g. forestry, wind power development, train collisions, declining prey populations, pollutants) and their effects on raptor populations should preferably also be included in monitoring protocols to a higher extent than at present.

Key words: diurnal raptors, owls, monitoring, Sweden, Falsterbo, Swedish Bird Survey, Swedish Society for Nature Conservation, environmental pollutants
Ključne besede: ujede, sove, monitoring, Švedska, Falsterbo, Švedski popis ptic, Švedsko društvo za varstvo narave, okoljska onesnažila

1. The raptor fauna of Sweden

The Swedish raptor fauna consists of 18 regularly breeding species of diurnal raptors (Falconiformes) and 11 species of owls (Strigiformes). 18 additional raptor species (the term raptors includes both diurnal raptors and owls in this paper) have been recorded in Sweden, but do not breed in the country. The most common birds of prey are Sparrowhawk *Accipiter nisus*, Buzzard *Buteo buteo* and Goshawk *A. gentilis*, whereas the commonest owl species are Tengmalm's Owl *Aegolius funereus*, Pygmy Owl *Glaucidium passerinum* and Tawny Owl *Strix aluco* (Ottosson *et al.* 2012; see Table 1 for population estimates).

2. Main players

Monitoring for raptors in Sweden is conducted by several actors, ranging from government agencies to volunteer-based interest groups. Environmental monitoring on a national level is coordinated by the Swedish Environmental Protection Agency (SEPA) and is used to assess the status of the environment, more specifically 16 environmental quality objectives. The national monitoring is divided into 10 programme areas, with three sub-programmes containing raptor monitoring. The White-tailed Eagle *Haliaeetus albicilla* population along the Baltic Sea coast is included in the sub-programme *Marine top*

predators in the "coasts and seas" programme area. The two other sub-programmes that include raptors are *Falsterbo bird migration counts* and the *Swedish Bird Survey*, both in the "landscape" programme area. The Swedish Red List is compiled by the Swedish Species Information Centre (ArtDatabanken) and serves as the basis for specific action plans that involve monitoring funded by SEPA.

The Swedish Society for Nature Conservation (SSNC) has played an important role by initiating long-term projects for White-tailed Eagle (Helander 1975 & 1983) and Peregrine Falcon *Falco peregrinus* (Lindberg 1975). The Swedish Ornithological Society (SOF) regularly organizes nation-wide surveys of selected species. Some organizations have a species-specific focus, such as "Kungsörn Sverige" (Golden Eagle Sweden; Birkö 2011). Kungsörn Sverige is a new national interest group that coordinates the regional (county-wide) Golden Eagle monitoring groups, and communicates with organizations and administrators. In addition, a symposium is held yearly with contributions from the Nordic countries. Highly coordinated and structured initiatives such as Kungsörn Sverige are valuable for effective management and conservation, and might be a good example to follow.

Volunteers make important contributions to raptor monitoring in various ways, e.g. by reporting observations to the Species Gateway (http://www.artportalen.se), a web-based reporting system operated by the Swedish Species Information Centre. It should be acknowledged that virtually all large-scale monitoring programmes for raptors in Sweden involve important contributions made by a large number of volunteers. Further, about 160 people in Sweden have ringing licenses covering raptors (see Table 1).

3. National coverage

Sweden lacks a national network for raptor monitoring. Therefore, monitoring for raptors is shared between the national monitoring programme, action plans and species-specific projects. Traditionally, monitoring in Sweden has focused on rare species and there is therefore less information available from breeding areas on more common species.

The Swedish Bird Survey, national representative of the Pan-European Common Bird Monitoring Scheme, coordinated by Department of Ecology at Lund University, is a volunteer-based system with standard routes that cover most of Sweden. Data collected by the Swedish Bird Survey is used e.g. to calculate EU Bird Indices, with results published in yearly monitoring reports (e.g. Lindström & Green 2013) and scientific papers (e.g. Jiguet *et al.* 2013, Lindström *et al.* 2013). The number of observed raptors on the standard routes is low, so assessment of raptor population trends is complemented by migration counts from Falsterbo bird observatory. The migratory bird counts at Falsterbo started in the 1940s, and have been carried out with standardized methodology since 1973 (Kjellén & Roos 2000).

Overall, quantitative information on population trends and status is much better for diurnal raptors than for owls. For 18 regularly breeding diurnal raptor species, data quality is generally good if all available sources are taken into account (Ottvall *et al.* 2009). But for several owl species, virtually no data are available for trend estimation.

4. Key species and key issues

Key projects that survey the majority of the geographical distribution with national coordination by SEPA and the county administration boards concern White-tailed Eagle (Helander *et al.* 2003), Golden Eagle *Aquila chrysaetos* (Birkö 2011), and Peregrine Falcon (Lindberg 2009). Montagu's Harrier *Circus pygargus* (Rodebrand 1996), Osprey *Pandion haliaetus* (e.g. Odsjö & Sondell 2001) and Gyrfalcon *F. rusticolus* (Falkdalen *et al.* 2011) are monitored within the framework of one or several projects in either restricted areas or without national coordination. The first four mentioned species currently have an action plan, where conservation actions and monitoring are important components (Helander 2009, Hjernquist 2011, Lindberg 2011, Rodebrand 2011). An action plan is not a legal document and only serves as a recommendation for conservation and monitoring administrators. As per 2013, all action plans including raptors (except for Montagu's Harrier) have been down-prioritized by SEPA, and the county administrations therefore have limited possibilities to work with the existing raptor action plans.

Much attention has been paid to effects of environmental pollutants on reproduction and population recovery in White-tailed Eagle (Helander *et al.* 2002 & 2008) and Peregrine Falcon (Lindberg 1983 & 2009). The time series of White-tailed Eagle brood size and proportion of successful breeding attempts are the only bird series in Sweden's Official Statistics (Naturvårdsverket 2013), which demonstrates the importance of this species as an environmental sentinel. Among owls, substantial

Table 1: List of raptor species breeding in Sweden; eight bird of prey and five owl species are listed in the Swedish national red list. Population estimates (point estimates with range) are from Ottosson *et al.* (2012). The numbers of active ringers and ringed nestlings are also compiled for each species in the 2000–2010 period (for White-tailed Eagle *Haliaeetus albicilla* and Peregrine Falcon *Falco peregrinus*, the ringing license is issued to the project leader, but ca. 10 ringers contribute as helpers).

Tabela 1: Seznam ptic roparic gnezdečih na Švedskem; osem vrst ujed in pet sovjih vrst je uvrščenih v švedski Rdeči seznam. Ocene njihovih populacij (točkovne ocene z intervali) so prikazane po Ottosson *et al.* (2012). Za obdobje 2000–2010 je zbrano tudi število aktivnih obročkovalcev in obročkanih mladičev (za belorepca *Haliaeetus albicilla* in sokola selca *Falco peregrinus* je bilo dovoljenje za obročkanje izdano vodji projekta, kakih 10 obročkovalcev je bilo pomočnikov).

Species / Vrsta	Red List category/ Kategorija v Rdečem seznamu	Action plan/ Akcijski načrt	Estimated no. of breeding pairs/ Ocenjeno št. gnezdečih parov	Active ringers/ Št. aktivnih obročkovalcev 2000–2010	No. of ringed nestlings / Št. obročkanih mladičev 2000–2010
Honey Buzzard *Pernis apivorus*	VU		6,625 (5,180–8,070)	19	155
Black Kite *Milvus migrans*			10 (3–20)		
Red Kite *Milvus milvus*			2,054 (1,933–2,181)	4	173
White-tailed Eagle *Haliaeetus albicilla*	NT	2009–2013	533 (533–600)	1–10	3,191
Marsh Harrier *Circus aeruginosus*			1,498 (1,317–1,676)	34	1,003
Hen Harrier *Circus cyaneus*	NT		859 (690–1,025)	1	4
Montagu's Harrier *Circus pygargus*	EN	2011–2015	59 (45–74)	6	39
Goshawk *Accipiter gentilis*			7,600 (4,500–10,700)	36	1,281
Sparrowhawk *Accipiter nisus*			43,700 (21,750–65,800)	20	1,022
Buzzard *Buteo buteo*			31,100 (17,160–45,060)	43	1,827
Rough-legged Buzzard *Buteo lagopus*	NT		3,000 (1,700–5,200)	17	187
Golden Eagle *Aquila chrysaetos*	NT	2011–2015	682 (585–805)	27	1,191
Osprey *Pandion haliaetus*			4,060 (3,380–4,700)	40	3,522
Kestrel *Falco tinnunculus*			6,431 (4,495–8,367)	74	26,939
Merlin *Falco columbarius*			6,180 (4,567–7,893)	7	101
Hobby *Falco subbuteo*			2,335 (1,695–2,975)	13	71
Gyrfalcon *Falco rusticolus*	VU	In prep?	114 (80–136)	7	278
Peregrine Falcon *Falco peregrinus*	VU	2011–2014	282 (232–332)	1–10	1,928
Barn Owl *Tyto alba*	CR		10 (5–17)	2	28
Eagle Owl *Bubo bubo*	NT		474 (393–557)	53	1,350
Snowy Owl *Bubo scandiacus*	CR		0 (0–0)	0	0
Hawk Owl *Surnia ulula*			2,273 (1,125–13,510)	9	88
Pygmy Owl *Glaucidium passerinum*			19,340 (9,640–29,550)	23	880
Tawny Owl *Strix aluco*			17,750 (14,950–20,670)	84	10,422
Ural Owl *Strix uralensis*			2,680 (2,025–3,415)	24	3,385
Great Grey Owl *Strix nebulosa*	NT		402 (201–603)	16	759
Long-eared Owl *Asio otus*			8,625 (2,605–14,565)	26	128
Short-eared Owl *Asio flammeus*	NT		1,655 (755–4,702)	9	20
Tengmalm's Owl *Aegolius funereus*			32,125 (16,760–91,470)	42	2,305

effort has been devoted to restocking of the Eagle Owl *Bubo bubo* population with captive breeding.

The key threats currently addressed and discussed by monitoring in Sweden (not in any particular order of importance) are effects of pollutants, lead poisoning, forestry practices, wind power, wild bird crime, electrocution and power line collisions, vehicle collisions, human disturbance and changes in prey abundance (e.g. Helander *et al.* 2009a & 2009b, Ottvall *et al.* 2009, Rydell *et al.* 2011). Many of these topics are of such general importance that any networking activity within EURAPMON would benefit Swedish perspectives. Recently, location of wind farms has been viewed as a major problem in Sweden, and we currently lack sufficient planning for raptors (and other birds) in relation to location of

wind farms. Nest site protection is also a high-priority issue.

5. Strengths and weaknesses

Two obvious strengths among Swedish raptor monitoring are the Peregrine Falcon and White-tailed Eagle projects that were initiated by the SSNC in the early 1970s, and remain unparalleled in Swedish nature conservation both in terms of longevity and success. Both projects are network projects with a large number of participants, primarily operating on a volunteer basis. The existing networks are indeed necessary to maintain the status and quality of these projects.

Further, the migration counts at Falsterbo are the longest available time-series for several species (Kjellén & Roos 2000, Kjellén 2012). Although annual numbers and proportion of migrants that funnel over the Falsterbo area vary between species, population changes can be assessed for ca. 14 raptor species. In addition to population trends, migration phenology and reproductive output is studied. However, the geographical origin of migrating birds is not known and the counts reflect a mixture of birds from different breeding sites and countries, thereby limiting the usefulness of migration counts for active management.

The Swedish Bird Survey has extensive spatial coverage, but the number of observations of raptors per route and year is low (e.g. Lindström & Green 2013), which results in low statistical power for trend analyses. However, the recent addition of night routes (Green 2010) will be an important tool for monitoring of common owl species (Pygmy Owl, Tawny Owl, Ural Owl *S. uralensis*, Long-eared Owl *Asio otus* and Tengmalm's owl).

There are thus some considerable gaps in Swedish raptor monitoring (Ottvall *et al.* 2009). The number of ornithologists decreases towards north, which coincides with an increase in habitat heterogeneity. Therefore, data on common raptors in northern Sweden is only locally available. On a national level, little is known regarding population trends in owls (Ottvall *et al.* 2009), which partly can be explained by the scattered distribution and cyclic breeding pattern of e.g. Snowy Owl *B. scandiacus*, Short-eared Owl *A. flammeus*, Hawk Owl *Surnia ulula* and Great Grey Owl *S. nebulosa*. But there is little information available on population trends also for well-known species with a southerly distribution (Tawny Owl), and for forest species (Ural owl and Tengmalm's owl). For migratory raptors, there is a lack of information on carry-over effects from wintering habitats and stop-over sites on e.g. body condition. The EURAPMON network could be important for mapping winter distribution and abundance of short-distance migrants, as well as collaborative efforts on long-distance migration.

A large proportion of bird monitoring in Sweden is based on surveillance monitoring, which provides weak inference about species that breed in low densities (Nichols & Williams 2006), such as most raptors. The current monitoring system should preferably be combined with a more scientific and hypothesis-driven approach towards explaining changes in population numbers. For instance, many diurnal raptor and owl populations are limited by food abundance and/or nest sites, and it should be possible to design and combine the existing (e.g. small mammal monitoring) survey protocols that link populations to these limiting factors.

Sweden will benefit from an increased collaborative effort within EURAPMON, both *for* and *with* raptors. Since Sweden lacks a comprehensive network for raptor monitoring, we could benefit from best-practice sharing on how to set up a large-scale monitoring system (see e.g. Saurola 2008, Wernham *et al.* 2008), where it is made clear to policy makers why raptor monitoring is a high-priority topic, and in the next step prioritize areas for monitoring. Increased understanding of pathways of environmental pollutants (e.g. brominated flame retardants, DDE, PCB) will further strengthen the use of raptors as environmental sentinels (Lindberg *et al.* 2004, Helander *et al.* 2008). Efforts to co-ordinate raptor surveys in northern Fennoscandia are essential for new information on several owl species, Golden Eagle, Gyrfalcon and Rough-legged Buzzard *B. lagopus*. A coordinated monitoring of Ospreys, a species for which Sweden has a high responsibility, would be valuable. There are several independent Osprey projects that could benefit from co-operation and international sharing with Finland in particular (Saurola 1997). Further, reporting of data, results and trends could be improved, as a large quantity of monitoring work (done e.g. by local projects and ringers) is rarely published in print.

6. Priorities, capacity-building

There are several immediate possibilities for capacity-building in Sweden. Expertise based on work with rare species could be applied to more common species. A relatively small group of ornithologists are active as ringers, and it should be possible to coordinate

ringing activities within a broader framework. Ringers collect information on clutch and brood size, breeding phenology, sex ratio and dispersal – valuable data that can be used to study demography and effects of climate change on bird populations. There is a lack of demographic data, particularly survival, for many species. Based on ringing reports since 2000 (Table 1), it is evident that nestbox-breeders receive the most attention (Kestrel *F. tinnunculus*, Pygmy Owl, Tawny Owl, Ural Owl, Tengmalm's Owl). Special attention within EURAPMON should be paid to standardize methods and measurements (body measures and moult patterns).

Sweden should also improve its reporting on raptors. The Species Gateway is used to some extent for this, but it is evident that many observations and nests are not reported at all. The Species Gateway could be improved in some aspects with respect to raptor surveys (although it is not well suited for more vulnerable species such as the eagles and large falcons), and discussions with other countries within EURAPMON on how to secure, report and publish data are of high value.

Co-ordination of several action programmes and more effective monitoring should be prioritized. Monitoring of some raptors could also be coordinated with the national monitoring programme for small mammals (Hörnfeldt 2013). Volunteers and interest groups have always been important for monitoring, and the contribution made by volunteers should not be underestimated. However, there is a need for recruitment of new volunteers, and discussions should be made within EURAPMON on how to raise interest in raptors among e.g. university students.

Acknowledgements: Thomas Wenninger, The Swedish Bird Ringing Centre (RC), extracted the ringing records from RC databases.

7. Povzetek

Švedski monitoring ujed in sov poteka večinoma v okviru projektov, ki se dolga leta že tradicionalno posvečajo določenim vrstam, štetju selivk na pomembnih selitvenih točkah in popisovanju ptic na nacionalni ravni. Najbolj poznana projekta z najdaljšo zgodovino na Švedskem zadevata sokola selca *Falco peregrinus* in belorepca *Haliaeetus albicilla*, ki še vedno pomembno prispevata k poznavanju učinkov okoljskih onesnažil na prostoživeče ptice. Ocenjevanje trendov mnogih ujed temelji na dolgoletnem (od leta 1973) štetju selivk pri Falsterboju na skrajnem jugu Švedske, medtem ko so možnosti za ugotavljanje populacijskih trendov pri večini sovjih vrst razmeroma majhne. Sicer pa so prav zdaj v pripravi načrti za boljše vključevanje nočno aktivnih ptic, kot so sove, v okvir švedskega popisovanja ptic. Za mnoge podatke, pridobljene na osnovi monitoringa, se je treba zahvaliti prostovoljcem. Švedska ima več dragocenih omrežij za splošni monitoring, vendar pa bi bilo treba vložiti več naporov v boljšo koordinacijo in objavljanje zdaj potekajočega dela na področju ptic roparic v skupnem okviru. Sploh pa bi se morali v načrtih za monitoring v veliko večji meri kot danes posvečati tudi potencialnim grožnjam (npr. gozdarstvo, razvoj vetrne energije, trki z vlaki, vse manj plena za te ptice, onesnažila) in njihovim vplivom na populacije ptic roparic.

8. References

Birkö, T. (2011): [The Golden Eagle in Sweden during ten years.] pp. 30–39 In: Bentz, P.-G. & Wirdheim, A. (eds): The Bird Year 2010. – Swedish Ornithological Society, Stockholm. (in Swedish)

Falkdalen, U., Hörnell-Willebrand, M., Nygård, T., Bergström, T., Lind, G., Nordin, A. & Warensjö, B. (2011): Relations between willow ptarmigan (*Lagopus lagopus*) density and gyrfalcon (*Falco rusticolus*) breeding performance in Sweden. pp. 171–176 In: Watson, R.T., Cade, T.J., Fuller, M., Hunt, G. & Potapov, E. (eds.): Gyrfalcon and Ptarmigan in a changing world. Vol. II. Proceedings of the Conference, 1–3 February 2011, Boise, Idaho. – The Peregrine Fund, Boise.

Green, M. (2010): [Night routes programme – short report for 2010.] – Naturvårdsverket/SEPA, Stockholm. (in Swedish)

Helander, B. (1975): [The White-tailed Eagle in Sweden.] – Swedish Society for Nature Conservation, Stockholm & Bohuslänningen AB, Uddevalla. (in Swedish, English summary)

Helander, B. (1983): Reproduction of the White-tailed Sea Eagle *Haliaeetus albicilla* (L.) in Sweden, in relation to food and residue levels of organochlorine and mercury compounds in the eggs. PhD thesis. – Department of Zoology, Stockholm University.

Helander, B. (2009): [Action plan for white-tailed eagle 2009–2013 (*Haliaeetus albicilla*).] – Naturvårdsverket/SEPA, Stockholm. (in Swedish, English summary) (available at http://www.naturvardsverket.se/Documents/publikationer/978-91-620-5938-5.pdf)

Helander, B., Olsson, A., Bignert, A., Asplund, L. & Litzén, K. (2002): The role of DDE, PCB, coplanar PCB and eggshell parameters for reproduction in the White-tailed Sea Eagle (*Haliaeetus albicilla*) in Sweden. – Ambio 31 (5): 386–403.

Helander, B., Marquiss, M. & Bowerman, W. (eds.) (2003): SEA EAGLE 2000. Proceedings from the international conference, 13–17 September 2000, Björkö, Sweden. – Swedish Ornithological Society, Stockholm.

Helander, B., Bignert, A. & Asplund, L. (2008): Using

raptors as environmental sentinels: monitoring the white-tailed sea eagle *Haliaeetus albicilla* in Sweden. – Ambio 37 (6): 425–431.

Helander, B., Axelsson, J., Borg, H., Holm, K. & Bignert, A. (2009a): Ingestion of lead from ammunition and lead concentrations in white-tailed sea eagles (*Haliaeetus albicilla*) in Sweden. – Science of the Total Environment 407 (21): 5555–5563.

Helander, B., Räikkönen, J. & Bignert, A. (2009b): [Analysis of collisions with eagles along State Rail 2000–2007.] – Swedish Museum of Natural History, Stockholm. (in Swedish, English summary)

Hjernquist, M. (2011): [Action plan for golden eagle 2011–2015 (*Aquila chrysaetos*).] – Naturvårdsverket/ SEPA, Stockholm. (in Swedish, English summary) (available at http://www.naturvardsverket.se/Documents/ publikationer6400/978-91-620-6430-3.pdf)

Hörnfeldt, B. (2013): [National Monitoring of Small Mammals.] (in Swedish) – [http://www.slu.se/sv/ fakulteter/s/om-fakulteten/institutioner/institutionen-for-vilt-fisk-och-miljo/personal/lista/birger-hornfeldt/ miljoovervakning-av-smagnagare], 19/6/2013.

Jiguet, F., Barbet-Massin, M., Devictor, V., Jonzén, N. & Lindström, Å. (2013): Current population trends mirror forecasted changes in climatic suitability for Swedish breeding birds. – Bird Study 60 (1): 60–66.

Kjellén, N. (2012): Migration counts at Falsterbo. – [http:// www.falsterbofagelstation.se/index_e.html], 19/6/2013.

Kjellén, N. & Roos, G. (2000): Population trends in Swedish raptors demonstrated by migration counts at Falsterbo, Sweden 1942–1997. – Bird Study 47 (2): 195–211.

Lindberg, P. (1975): [The peregrine falcon in Sweden.] – Swedish Society for Nature Conservation & Tryckeribolaget Svea, Stockholm. (in Swedish, English summary)

Lindberg, P. (1983): Relations between the diet of Fennoscandian peregrines *Falco peregrinus* and organochlorines and mercury in their eggs and feathers, with a comparison to the gyrfalcon *Falco rusticolus*. PhD thesis. – University of Göteborg.

Lindberg, P. (2009): The fall and the rise of the Swedish Peregrine population. pp. 137–144 In: Sielicki, J. & Mizera, T. (eds.): Peregrine Falcon Populations – status and perspectives in the 21st Century. – Turul Publishing & Poznań University of Life Sciences Press, Warsaw - Poznań.

Lindberg, P. (2011): [Action plan for peregrine falcon 2011–2014 (*Falco peregrinus*).] – Naturvårdsverket/ SEPA, Stockholm. (in Swedish, English summary) (available at http://www.naturvardsverket.se/Documents/ publikationer6400/978-91-620-6426-6.pdf)

Lindberg, P., Sellström, U., Häggberg, L. & De Wit, C. (2004): Higher brominated diphenyl ethers and hexabromocyclododecane found in eggs of peregrine falcons (*Falco peregrinus*) breeding in Sweden. – Environmental Science & Technology 38 (1): 93–96.

Lindström, Å. & Green, M. (2013): [Monitoring population changes of birds in Sweden. Annual report for 2012.] – Ekologiska institutionen, Lunds universitet, Lund. (in Swedish, English summary) (available at http:// www.zoo.ekol.lu.se/birdmonitoring/Publikationer.htm)

Lindström, Å. & Green, M. Paulson, G., Smith, H.G. & Devictor, V. (2013): Rapid changes in bird community composition at multiple spatial scales in response to recent climate change. – Ecography 36 (3): 313–322.

Naturvårdsverket (2013): Environmental Statistics A-Ö. – [http://www.naturvardsverket.se/Sa-mar-miljon/ Statistik-A-O], 19/6/2013. (search for "Havsörn", White-tailed Eagle in Swedish)

Nichols, J.D. & Williams, B.K. (2006): Monitoring for conservation. – Trends in Ecology & Evolution 21 (12): 668–673.

Odsjö, T. & Sondell, J. (2001): Population status and breeding success of osprey *Pandion haliaetus* in Sweden, 1971–1998. – Vogelwelt 122: 155–166.

Ottosson, U., Ottvall, R., Elmberg, J., Green, M., Gustafsson, R., Haas, F., Holmqvist, N., Lindström, Å., Nilsson, L., Svensson, M., Svensson, S. & Tjernberg, M. (2012): [Birds in Sweden – Numbers and distribution.] – Swedish Ornithological Society, Halmstad. (in Swedish, English summary)

Ottvall, R., Edenius, L., Elmberg, J., Engström, H., Green, M., Holmqvist, N., Lindström, Å., Tjernberg, M. & Pärt, T. (2009): Population trends for Swedish breeding birds. – Ornis Svecica 19 (3): 117–192.

Rodebrand, S. (1996): [The Montagu 's Harrier *Circus pygargus* in Öland, and Sweden.] – Calidris 25: 99–116. (in Swedish, English summary)

Rodebrand, S. (2011): [Action plan for Montagu's harrier 2011–2015 (*Circus pygargus*).] – Naturvårdsverket/ SEPA, Stockholm. (in Swedish, English summary) (available at http://www.naturvardsverket.se/Documents/ publikationer6400/978-91-620-6465-5.pdf)

Rydell, J., Engström, H., Hedenström, A., Kyed Larsen, J., Pettersson, J. & Green, M. (2011): [Effects of wind power on birds and bats. A synthesis report.] – Naturvårdsverket/SEPA, Stockholm. (in Swedish)

Saurola, P. (1997): The osprey (*Pandion haliaetus*) and modern forestry: a review of population trends and their causes in Europe. – Journal of Raptor Research 31 (2): 129–137.

Saurola, P. (2008): Monitoring birds of prey in Finland: a summary of methods, trends, and statistical power. – Ambio 37 (6): 413–419.

Wernham, C.V., Etheridge, B., Holling, M., Riddle, G., Riley, H.T., Stirling-Aird, P.K., Stroud, D., Thompson, D.B.A. & Wilson, J.D. (2008): The Scottish Raptor Monitoring Scheme: objectives, achievements in the first four years, and plans for future development. – Ambio 37(6): 460–465.

Arrived / Prispelo: 27. 3. 2013
Accepted / Sprejeto: 1. 7. 2013

Acrocephalus 33 (154/155): 283–284, 2012

A preliminary overview of monitoring for raptors in Belgium

Predhodni pregled monitoringa populacij ptic roparic v Belgiji

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Belgium is divided in three highly autonomous regions: Flanders in the north, Wallonia in the south and Brussels in the centre. Each region has its own regional government and, therefore, its own nature administration. Because of this situation, large-scale bird monitoring projects and atlas work have been implemented at the regional level resulting in different methodology, scale and timing. However, scientists responsible for the coordination of these projects meet on a regular basis and it is statistically possible to merge the data and produce national status assessments, trends and indices.

Although small, Belgium hosts 20 breeding raptor species, many of which, however, in small numbers (Vermeersch *et al.* 2004 & 2007, Weiserbs & Jacob 2007, Jacob *et al.* 2010).

Main players

Large scale bird monitoring projects and atlas work in Wallonia and Brussels are coordinated by Aves-Natagora (BirdLife partner in Wallonia) in collaboration with the regional nature administration "Département d'Étude des Milieux Naturels et Agricoles" (DEMNA) in Wallonia and Brussels Institute for the Environment (BIM) in Brussels. Similar work is conducted in Flanders where Research Institute for Nature and Forest (INBO), a scientific institute of the Flemish government coordinates the projects in collaboration with Natuurpunt, a non-governmental organisation, and Flemish BirdLife partner that provides the essential volunteer-network. Data on these large-scale projects are easily accessible and are merged to produce national reports (e.g. for cyclic reports under the Birds Directive 2009/147/EC).

Apart from these organisations, independent working groups are active in all three regions, focusing mainly on one or two species per group. Harriers, kites, owls and Peregrine Falcons *Falco peregrinus* are monitored on a voluntary basis within the framework of these groups. The resulting data are less accessible and more patchily distributed. Many of the independent working groups monitor breeding success of the study species and many young birds are ringed at the nest. These ringing data are collected at the national level by the Royal Belgian Institute for Natural Sciences (KBIN).

Main data users

The three regional nature administrations are the main users of the collected ornithological data. They are mainly used for the development of several indicators and for nature directives reports. Nature associations form another group of data users. They are able to quickly inform a large number of people since they coordinate the volunteers and thanks to the rapidly growing number of their members. Data can sometimes be used for risk-assessment: impact of planned windmills, large infrastructure building plans and other potential problems.

Coordination

Although we have no national coordinating scientific institute, Aves, INBO and BIM work closely together to compile the cyclic Birds Directive reports as well as trends and indices for the European Bird Census Council (EBCC) and BirdLife International.

Key species and issues

Apart from the large scale monitoring and atlas projects, which cover a wide array of species, most independent working groups focus on owls, harriers, kites and Peregrine Falcons. In Wallonia, Eagle Owl *Bubo Bubo* and Tengmalm's Owl *Aegolius funereus* breeding numbers are closely monitored. In both Wallonia and Flanders, Barn Owl *Tyto alba* and Little Owl *Athene noctua* receive much attention. Barn Owl is probably the best studied bird species in Flanders with long-term data on its breeding success and survival. Wallonia has a separate programme for Red Kites *Milvus milvus*, but coverage is restricted to the core area of its breeding range. Breeding numbers of Marsh *Circus aeruginosus*, Montagu's *C. pygargus* and Hen Harriers *C. cyaneus* are monitored on a yearly basis in Wallonia.

The relationship between the presence of these species and the implementation of agri-environmental schemes has received growing attention in both Flanders and Wallonia. In Flanders, the nature conservancy is interested in presence/absence data of

Marsh Harriers in relation to ground water levels in reedbeds. INBO has recently started a new research project focusing on movements, habitat choice and breeding success of Marsh Harriers in fragmented landscapes (Anselin *et al.* 2011). An important issue is the illegal trade of Eagle Owl and Peregrine Falcon resulting in increasing time investment in site protection. Finally, the location of new wind farms has received considerable attention recently (Everaert 2011), especially in relation to the breeding grounds of the endangered Red Kite.

Strengths and weaknesses

Being one of the most densely populated and highly accessible countries in Europe, the large scale monitoring schemes in Belgium are characterised by a very good coverage (sample size) and a high number of skilled volunteers. The development of databases and online data-collection has received a lot of attention so that data can rapidly be used in various reports and risk-assessments.

Obvious weaknesses are the non-existing integration of independent working groups at a national or even a regional level and the integration of the ringing data in the monitoring schemes. A growing problem is the fact that our young highly skilled and most active birdwatchers hardly show any interest in actively contributing to the monitoring schemes, resulting in an ageing pool of volunteers.

Despite of the different monitoring schemes, we have no good data for a few diurnal or nocturnal raptor species like Long-eared Owl *Asio otus*, Honey Buzzard *Pernis apivorus*, Goshawk *Accipiter nisus* and Hobby *F. subbuteo*. We would highly welcome input from workshop-participants to provide a useful standard protocol for monitoring raptors at a regional scale.

Belgian priorities

To summarize, Belgium should coordinate the different independent working groups at a regional and national levels and invest in monitoring of "difficult" species based on standard protocols. Moreover, we should integrate national ringing data in large-scale monitoring schemes and provide standard protocols for ringers. Last but not least, appointing a national coordinator is of vital importance to achieve these priorities.

References & supporting bibliography

Anselin, A., Castelijns, H. & De Bruyn, L. (2011): Movements, Habitat Choice And Breeding Success Of The Marsh Harrier (*Circus aeruginosus*) In Fragmented Landscapes. Poster presentation. 8th Conference of the European Ornithologists' Union, 27–30 August 2011, Riga, Latvia.

De Bruyn, L., Anselin, A., Bauwens, D., Colazzo, S., Devos, K., Maes, D., Vermeersch, G. & Kuijken, E. (2003): Red lists in Flanders: scale effects and trend estimation pp. 111–120 In: Longh, de H.H. (ed.): The harmonisation of red lists for threatened species in Europe – The Netherlands Commission for International Nature Protection, Leiden.

Everaert, J. (2011): Site selection for new wind farms in Flanders (Belgium): new dynamic decision-instrument for birds and bats. pp. 86 In: May, R. & Bevanger, K. (eds.): Proceedings of the Conference on Wind energy and Wildlife impacts, 2–6 May 2011, Trondheim, Norway. – NINA Report 693. – [http://www.nina.no/archive/nina/PppBasePdf/rapport/2011/693.pdf]

Jacob, J.-P., Dehem, C., Burnel, A., Dambiermont, J.L., Fasol, M., Kinet, T., Van Der Elst, D. & Paquet, J.Y. (eds.) (2010): [Breeding Bird Atlas of Wallonia 2001–2007.] Série Faune Flore Habitats no. 5. – Aves et la Région Wallonne, Gembloux. (In French, English summary)

Paquet, J.-Y., Jacob, J.-P., Kinet, T. & Vansteenwegen, C. (2010): [Common bird population trends in Wallonia, 1990–2009.] – Aves 47: 1–19. (In French, English summary)

Vermeersch, G. & Anselin, A. (2009): [Breeding bird in Flanders in 2006–2007: recent status and trends of rare, colonial and exotic bird species and species of the Flemish Red List and/or European Birds Directive.] – Mededelingen van het Instituut voor Natuur- en Bosonderzoek, 2009 (3). Instituut voor Natuur- en Bosonderzoek, Brussels. (In Dutch, English summary)

Vermeersch, G., Anselin, A., Devos, K., Herremans, M., Stevens, J., Gabriëls, J. & Van Der Krieken, B. (2004): [Atlas of Flemish Breeding Birds 2000–2002.] Mededelingen van het Instituut voor Natuurbehoud 23. – Brussels. (In Dutch, English summary)

Vermeersch, G., Anselin, A., Onkelinx, T. & Bauwens, D. (2007): Monitoring common breeding birds in Flanders: a new step towards an integrated system. – Bird Census News: 20 (1): 30–35.

Vermeersch, G., Anselin, A. & Devos, K. (2007): [Status and trends of diurnal raptor species in Flanders.] – Natuur.oriolus: 73: 41–44. (In Dutch, English summary)

Weiserbs, A. & Jacob, J.-P. (2007): [Breeding birds of Brussels 2000–2004: distribution, numbers, development.] – Aves, Liège. (In French)

Arrived / Prispelo: 27. 3. 2013
Accepted / Sprejeto: 1. 7. 2013

Acrocephalus 33 (154/155): 285–287, 2012

A preliminary overview of monitoring for raptors in Estonia

Predhodni pregled monitoringa populacij ptic roparic v Estoniji

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Estonia is situated on the eastern coast of the Baltic Sea. It has a long coastline and more than 1,500 islands and islets. The ground is mostly flat, rich in lakes and rivers. Forests cover over 40% and mires ca. 22% of the Estonian territory (Leibak *et al.* 1994). Altogether, 41 raptor species have been registered in Estonia (21 species of Accipitriformes, 8 species of Falconiformes and 12 species of Strigiformes) of which 21 species have large breeding populations or breed regularly in few pairs (Elts *et al.* 2009).

Main players

The Estonian raptor-monitoring programme is carried out by members of the NGO Estonian Ornithological Society (EOS, http://www.eoy.ee/en) raptor monitoring group, NGO Eagle Club (http://www.kotkas.ee/eagle-club) and some employees of the Environmental Board. The coordinator of raptor monitoring at study plots is Dr Ülo Väli from the Estonian University of Life Sciences, while monitoring of eagles alone is coordinated by members of the Eagle Club (four coordinators for five breeding species). The EOS raptor monitoring group works mainly at permanent study plots, whereas Eagle Club members carry out their eagle monitoring programme across the entire country. During the last 10 years, about 30 active fieldworkers have been implementing the raptor-monitoring programme in Estonia.

Several institutions under the governance of the Ministry of the Environment use raptor-monitoring results. The Estonian Environment Information Centre (EEIC) aims at collecting, processing and generalizing data on the Estonian nature and the factors influencing it. The Information Centre provides reliable environmental information for the decision-makers in Estonia, for the public both in Estonia and abroad, and for various organizations. The Environmental Board works to preserve the diversity of nature, to protect natural habitats and to ensure favourable conditions for different species (e.g. by funding and coordinating national monitoring programmes and managing the creation and implementation of species action plans).

The results of monitoring are also used by ornithologists from the EOS and the Eagle Club for estimating the raptors' population sizes and calculating trends (e.g. Lõhmus *et al.* 1998, Elts *et al.* 2003, Elts *et al.* 2009), as well as for promoting the conservation of raptors in Estonia (e.g. Väli 2003, Männik 2006).

Estonia co-operates with Latvia through the European Regional Development Fund project "ESTLAT Eagles cross borders". The partners of Estonia in the LIFE project "Arrangement of Spotted Eagles and Black Stork conservation in Estonia (EAGLELIFE)", which was implemented in the 2004–2009 period, were Belarus, Latvia and Lithuania. Estonia participates in pan-European colour-ringing programmes for the White-tailed Eagle *Haliaeetus albicilla*, Lesser Spotted Eagle *Aquila pomarina*, Golden Eagle *A. chrysaetos* and Osprey *Pandion haliaetus*. Estonian academic raptor researchers also have close contacts with researchers from Finland, Sweden, Spain, etc.

National coverage

The Estonian raptor monitoring scheme includes two main parts. First, all 21 raptor species breeding in Estonia are monitored annually at permanent study plots (the minimum size of a plot is 50 km^2), which are located in different counties over the country. There were 16 such plots in 2012, with a total area of 1,595 km^2 (Figure 1). The number of species, the number and locations of occupied territories as well as nest-sites and information on their productivity are gathered from these particular plots (see Lõhmus 1999 & 2004).

Second, scarce raptors that occur at permanent study plots in few pairs, e.g. eagles and Eagle Owl *Bubo bubo*, are monitored all over the country. For this purpose, 25–90% of the known nest-sites of these species are visited and locations of known territories and nest-sites mapped every year. In addition to the nation-wide monitoring, the most numerous eagle species, i.e. the Lesser Spotted Eagle, is also studied at special monitoring plots, with a total area of 3,205 km^2 in 2012. These plots provide representative information on breeding densities and productivity of this species for estimating the size and trend of the Estonian population (Väli *et al.* 2011).

Additional information on Estonian raptors is gathered through several other projects and national

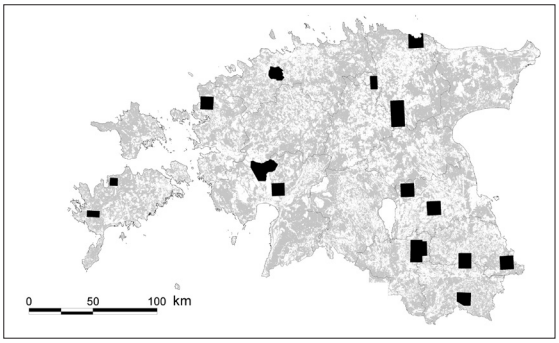

Figure 1: All raptors breeding in Estonia are monitored annually at permanent study plots (black areas, studied in 2012)

Slika 1: Vse ptice roparice, ki gnezdijo v Estoniji, so deležne letnega monitoringa na stalnih popisnih ploskvah (črno obarvane površine, vrste preučevane leta 2012)

monitoring programmes carried out by EOS: (1) *Common Breeding Bird Monitoring* programme (part of the Pan-European Scheme) shows long-term changes in the number of Buzzard *Buteo buteo*; (2) Estonian Breeding Bird Atlas (fieldwork was carried out from 2003 to 2009) gives an overview about distribution of raptor species breeding in Estonia; (3) EOS project "Bird of the Year" has produced interesting results about Goshawk *Accipiter gentilis* (Nellis 2006) and Tawny Owl *Strix aluco* (see EOS homepage) and (4) wintering bird count and wintering raptor count give information on the wintering populations of the Buzzard, Rough-legged Buzzard *B. lagopus* and Hen Harrier *Circus cyaneus*.

The Estonian Rarities Committee collects and independently verifies the records of rare raptors observed in Estonia (among other species). The activities carried out by NGO "Estbirding" are targeted to rare species – all interesting observations are collected and published on the web page of this NGO. The members of Estbirding have made overviews about the Red-footed Falcon *Falco vespertinus* influx in 2005 and Hawk Owl *Surnia ulula* wintering in Estonia.

There is an open online database for birdwatchers and naturalists as a part of a web interface for all the taxa found in Estonia (eBiodiversity; http://elurikkus.ut.ee). Information on the raptors' regional occurrence, wintering, phenology and breeding success is available in this database. The Estonian Red List of Threatened Species is also available in this interface.

Migration counts are being made at Kabli Bird Station (ringing and migration counts since 1969) and Sõrve Bird Observatory (established by Finnish non-profit NGO Estonian Birding Society in 1999).

Key species

All 21 regularly breeding raptor species in Estonia are monitored at study plots, while the most threatened (White-tailed Eagle, Greater Spotted Eagle *A. slanga*, Golden Eagle, Osprey and Eagle Owl) or the more abundant species with a long-term negative population trend (Goshawk) are monitored all over the country. These species, along with the Lesser Spotted Eagle, can be considered the key species addressed by the monitoring for raptors in Estonia.

The main purpose of the monitoring and protection activities so far has been to protect populations through the conservation of suitable nesting sites of these species. National action plans have been compiled for these species and all monitoring and protection activities are carried out according to these plans (e.g. Väli 2003, Männik 2006, Nellis 2006).

Strengths and weaknesses

The main strengths of monitoring for raptors in Estonia are a long dataset, experienced enthusiastic birdwatchers, the organizations within the framework of which they work, existence of the national raptor monitoring programme, and academic researchers dedicated to raptors.

Raptors have been studied at a few plots already in the late 1950s and early 1960s in Estonia (Randla 1976, Lõhmus 1999, Tuule *et al.* 2011), but the monitoring has been making marked progress only since 1989 (Lõhmus 1999). The monitoring of the numbers of eagles was embarked upon at the beginning of 20th century, while monitoring of their productivity started in the 1980s (Randla 1976). Raptor monitoring at permanent study plots and monitoring of eagles became part of the national monitoring programme in 1994 (Lõhmus 1999).

The Estonian University of Life Sciences and University of Tartu provide a basis for academic raptor research in Estonia. The research interest covers different areas of raptor population ecology and conservation, such as population dynamics (e.g. Tuule *et al.* 2011, Väli *et al.* 2011), habitat selection (e.g. Lõhmus 2001, Lõhmus 2003b, Väli *et al.* 2004), telemetry studies (e.g. Väli & Sellis 2007, Sellis *et al.* 2007), population genetics and hybridization (e.g. Lõhmus & Väli 2001, Väli *et al.* 2010 & 2011), impacts of forestry on raptors (e.g. Lõhmus 2003b, 2005 & 2006, Rosenvald & Lõhmus 2003), etc.

There is, however, a shortage of information on the productivity of some species breeding in low densities (Lõhmus 1999 & 2004) and raptor populations living in Important Bird Areas (IBAs). These areas probably need periodic inventories, as there are no study plots

for monitoring raptors in most of them. The Ministry of Environment is now working, in co-operation with the EOS, to fill this gap of knowledge.

Priorities, capacity-building

In Estonia, there is an urgent need to increase efforts at study plots, to recruit more observers and/or change to more cost-effective methods for assembling adequate information on low-density species. There is also a need to increase regional co-operation for monitoring low-density raptors (specially migrating species), as populations of these species should be considered and monitored as one at least at the regional level. Development of co-operation and research at the national and European scales (especially on topics like wind farms impact, effects of pollutants, electrocution, etc.) should be the main priority of monitoring for raptors in Estonia.

References

Elts, J., Kuresoo, A., Leibak, E., Leito, A., Lilleleht, L., Luigujõe, L., Lõhmus, A., Mägi, E., & Ots, M. (2003): [Status and numbers of Estonian birds, 1998–2002.] – Hirundo 16 (2): 58–83. (in Estonian, English summary)

Elts, J., Kuresoo, A., Leibak, E., Leito, A., Leivits, A., Lilleleht, V., Luigujõe, L., Mägi, E., Nellis, R. & Ots, M. (2009): [Status and numbers of Estonian birds, 2003–2008.] – Hirundo 22 (1): 3–32. (in Estonian, English summary)

Leibak, E., Lilleleht, V. & Veromann, H. (eds.) (1994): Birds of Estonia. Status, Distribution and Numbers. – Estonian Academy Publishers, Tallinn.

Lõhmus, A. (1999): [Monitoring of raptors and owls in Estonia, 1994–1998.] – Hirundo 12 (1): 19–35. (in Estonian, English summary)

Lõhmus, A. (2001): Habitat selection in a recovering Osprey *Pandion haliaetus* population. – Ibis 143 (4): 651–657.

Lõhmus, A. (2003a): Do Ural owls (*Strix uralensis*) suffer from the lack of nest sites in managed forests? – Biological Conservation 110 (1): 1–9.

Lõhmus, A. (2003b): Are certain habitats better every year? A review and a case study on birds of prey. – Ecography 26 (5): 545–552.

Lõhmus, A. (2004): [Monitoring raptors and owls in Estonia, 1999–2003: decline of the Goshawk and the Clockwork of vole-cycles.] – Hirundo 17 (1): 3–18. (in Estonian, English summary)

Lohmus, A. (2005): Are timber harvesting and conservation of nest sites of forest-dwelling raptors always mutually exclusive? – Animal Conservation 8 (4): 443–450.

Lõhmus, A. (2006): Nest-tree and nest-stand characteristics of forest-dwelling raptors in east-central Estonia: implications for forest management and conservation. – Proceedings of the Estonian Academy of Sciences, Biology & Ecology 55 (1): 31–50.

Lõhmus, A., Kuresoo, A., Leibak, E., Leito, A., Lilleleht, V., Kose, M., Leivuts, A., Luigujõe, L. & Sellis, U. (1998): [Status and numbers of Estonian birds.] – Hirundo 11 (2): 63–83. (in Estonian, English summary)

Lõhmus, A. & Väli, Ü. (2001): Interbreeding of the Greater *Aquila clanga* and Lesser Spotted Eagle *A. pomarina*. – Acta Ornithoecologica 4 (2/3/4): 377–384.

Männik, R. (2006): Osprey and its conservation in Estonia. – Hirundo, Suppl. 10: 1–58.

Nellis, R. (2006): The Eagle Owl and its conservation in Estonia. – Hirundo, Suppl. 9: 1–64.

Nellis, R. (2006): Goshawk – bird of the year 2005. – Hirundo 19 (2): 81–93.

Randla, T. (1976): [Raptors of Estonia.] – Valgus, Tallinn. (in Estonian)

Rosenvald, R. & Lohmus, A. (2003): Nesting of the black stork (*Ciconia nigra*) and white-tailed eagle (*Haliaeetus albicilla*) in relation to forest management. – Forest Ecology and Management 185 (3): 217–223.

Sellis, U., Männik, R. & Väli, Ü. (2007): [Maria on migration: a satellite-telemetrical study on spring and autumn migration of an Estonian osprey (*Pandion haliaetus*)]. – Hirundo 20 (1): 1–13. (in Estonian, English summary)

Tuule, E., Tuule, A. & Lõhmus, A. (2007): [Nesting ecology of birds of prey and owls near Saue, 1959–2006.] – Hirundo 20 (1): 14–36. (in Estonian, English summary)

Tuule, E., Tuule, A. & Lõhmus, A. (2011): Fifty-year dynamics in a temperate raptor assemblage. – Estonian Journal of Ecology 60 (2): 132–142.

Väli, Ü. (2003): The Lesser Spotted Eagle and its conservation in Estonia. – Hirundo Suppl. 6: 1–64.

Väli, Ü., Treinys, R. & Lõhmus, A. (2004): Geographical variation in macrohabitat use and preferences of the Lesser Spotted Eagle *Aquila pomarina*. – Ibis 146 (4): 661–671.

Väli, Ü. & Sellis, U. (2007): Occurrence of satellite-tracked Greater Spotted Eagles *Aquila clanga* from Estonia in the Sava River valley. – Ciconia 16: 94–95.

Väli, Ü., Dombrovski, V., Treinys, R., Bergmanis, U., Daroczi, S.J., Dravecky, M., Ivanovski, V., Lontkowski, J., Maciorowski, G., Meyburg, B.-U., Mizera, T., Zeitz, R. & Ellegren, H. (2010): Widespread hybridization between the Greater Spotted Eagle *Aquila clanga* and the Lesser Spotted Eagle *A. pomarina* (Aves: Accipitriformes) in Europe. – Biological Journal of the Linnean Society 100 (3): 725–736.

Väli, Ü., Männik, R., Nellis, R., Sein, G. & Tuvi, J. (2011): [Monitoring Estonian eagles: examples of following status and abundance of rare species.] pp 92–106 In: Kull, T. Liira, J. & Sammul, M. (eds.): Yearbook of the Estonian Naturalists' Society 86. – Estonian Naturalists' Society, Tartu. (in Estonian, English summary)

Arrived / Prispelo: 27. 3. 2013
Accepted / Sprejeto: 1. 7. 2013

Acrocephalus 33 (154/155): 289–292, 2012

A preliminary overview of raptor monitoring in Georgia

Predhodni pregled monitoringa ptic roparic v Gruziji

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Monitoring of birds of prey started in Georgia in 1975 (Flint & Galushin 1981). The basic aim of the project was to obtain data on numbers and population trends needed for conservation. 40 raptor species have been recorded in the country; 34 of them are regular, while six are vagrants.

Breeding raptors

Breeding has been confirmed for 26 species; another 4 species are occasional breeders.

Numbers of breeding pairs are the following: Honey Buzzard *Pernis apivorus* (200–450), Black Kite *Milvus migrans* (500), White-tailed Eagle *Haliaeetus albicilla* (2–3), Lammergeier *Gypaetus barbatus* (20–22), Egyptian Vulture *Neophron percnopterus* (110), Griffon Vulture *Gyps fulvus* (40–45), Black Vulture *Aegypius monachus* (15), Short-toed Eagle *Circaetus gallicus* (25), Marsh Harrier *Circus aeruginosus* (110–130), Montagu's Harrier *C. pygargus* (15–20), Goshawk *Accipiter gentilis* (240), Sparrowhawk *A. nisus* (750–800), Levant Sparrowhawk *A. brevipes* (45–60), Buzzard *Buteo buteo* (1,250–1,500), Long-legged Buzzard *B. rufinus* (55–60), Lesser Spotted Eagle *Aquila pomarina* (60–75), Imperial Eagle *A. heliaca* (35–40), Golden Eagle *A. chrysaetos* (up to 35), Bonelli's Eagle *A. fasciata* (1–3), Booted Eagle *A. pennata* (70–100), Kestrel *Falco tinnunculus* (1,600–2,100), Red-footed Falcon *F. vespertinus* (occasional breeder), Hobby *F. subbuteo* (230–250), Lanner Falcon *F. biarmicus* (1–2), Saker Falcon *F. cherrug* (occasional breeder) and Peregrine Falcon *F. peregrinus* (40) (Abuladze 2013).

During the study period (i.e. 1975–2012), monitoring revealed that nine species increased, seven remained stable and five declined, with unclear trends for the other five species. Two species which were regular breeders, no longer breed regularly: Osprey *Pandion haliaetus* in the 1950s and Lesser Kestrel *F. naumanni* in the 1990s (Abuladze 1996, 2008 & 2013).

Passage of raptors

Georgia is of special importance for migrating raptors owing to its location between Europe and Asia, located on their path from breeding grounds in Scandinavia, European Russia, the Urals and West Siberia to the Mediterranean, Middle Eastern and African wintering grounds. Monitoring of migrating raptors started in 1976. Counts were carried out in migration corridors in the 1976–1992, 1997–2002 and 2005–2006 periods in spring and autumn from constant stations during 52–67 days in autumn (704–782 hrs, 8–14 hrs/day) and 22–31 days in spring (219–335 hrs, 7–14 hrs/day) (Abuladze *et al.* 2011a).

34 species are typical transit migrants. Among these, 28 species are regular migrants (Honey Buzzard, Black Kite, White-tailed Eagle, Egyptian Vulture, Short-toed Eagle, Marsh Harrier, Hen Harrier *C. cyaneus*, Pallid Harrier *C. macrourus*, Montagu's Harrier, Goshawk, Sparrowhawk, Levant Sparrowhawk, Buzzard, Long-legged Buzzard, Rough-legged Buzzard *B. lagopus*, Lesser Spotted Eagle, Greater Spotted Eagle *A. clanga*, Imperial Eagle, Steppe Eagle *A. nipalensis*, Booted Eagle, Osprey, Lesser Kestrel, Kestrel, Red-footed Falcon, Merlin *F. columbarius*, Hobby, Saker Falcon and Peregrine Falcon), while six species – Crested Honey Buzzard *P. ptilorhynchus*, Red Kite *Milvus milvus*, Shikra *Accipiter badius*, Bonelli's Eagle, Lanner Falcon and Eleonora's Falcon *F. eleonorae* are occasional passage visitors. Lammergeier and Golden Eagle are residents with local altitudinal movements; Griffon Vulture and Black Vulture (Gavashelishvili *et al.* 2012) are nomadic species with wide movements outside the breeding seasons (Verhelst *et al.* 2011).

Data on species composition, numbers, diurnal activity, flight direction, flight altitude, correlation with weather conditions, stop-over sites, behaviour and threats were collected. Autumn passage is particularly intensive, with three well-distinguished waves. The most important flyways and bottlenecks are: the Eastern Black Sea Flyway with the "Batumi Bottleneck" (850,000 ind. of 34 species), "Mtkvari Valley Flyway" (250,000+ ind., 26 species), "Alazani Flyway" (200,000+ ind., 24 species) and "Javakheti Flyway" (200,000+ ind., 25 species) (Figure 1). The most important and well-known among them is the Eastern Black Sea Flyway with the Batumi Bottleneck. During the last decade, up to 2 million raptors of 34 species in autumn and up to 700,000 raptors of 32 species in spring have been estimated to migrate across Georgia. Especially numerous are Honey Buzzard (250,000–700,000 ind. in autumn), Buzzards *B. b. vulpinus, B. b. buteo* (200,000–600,000) and Black Kite (80,000–170,000) (Verhelst *et al.* 2011, Abuladze *et. al.* 2011a, Abuladze 2013).

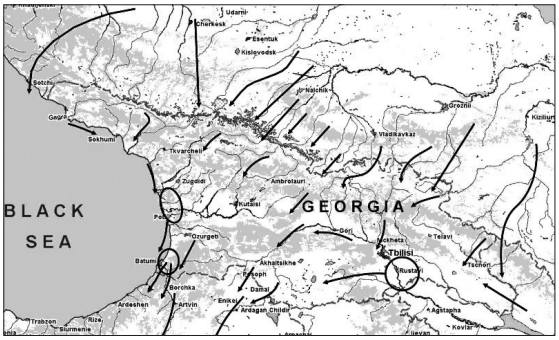

Figure 1: The most important flyways and bottlenecks during the raptors' autumn passage in Georgia. The arrows on the map indicate known flight directions across the country, while the encircled areas are stop-over sites along the most important flyways.

Slika 1: Najpomembnejše selitvene poti in ozka grla med jesensko selitvijo ujed v Gruziji. Puščice na zemljevidu prikazujejo znane smeri preletov čez državo, obkrožena območja pa so počivališča vzdolž najpomembnejših selitvenih poti.

Raptors in winter

Georgia is also important for the wintering raptors, which are represented by 23 species: 18 occur regularly, three irregularly and two occasionally. Counts of wintering raptors were carried out in the 1977–1991, 1997–1999 periods and in 2004 and 2006. Coverage of wintering areas was 45% in 1977–1982, 75–85% in 1983–1991, 40% in 1997–1999, and about 30% in 2004 and 2006. Total numbers of wintering raptors greatly fluctuated, i.e. from 4,400 individuals in hard, cold, snowy winters to 14,700 individuals in mild, warm, snowless winters. Numbers were directly correlated with the meteorological situation in surrounding regions, especially in the foothills and steppes of the North Caucasus. Raptors are distributed in wintering habitats unevenly and prefer areas with abundant food resources and favourable hunting conditions. Preferred wintering habitats are located in areas with warm and snowless winters. Kolkheti Lowland in the western part of the country should be considered as the most important wintering area, holding up to 70% of all wintering raptors. The narrow strip of the Black Sea coastlands holds up to 10–15%, and other parts of the country 15–30% of all wintering raptors. Vertical limits of wintering habitats are 0–1,000 m a.s.l., usually up to 600 m a.s.l. Solitary birds have been recorded higher up in warm winters – up to 1,700 m a.s.l. At times, wintering conditions are more favourable in anthropogenic landscapes than in natural habitats (due to more stable food resources and less severe weather impacts). Raptors are usually concentrated in mosaic biotopes, including small forests, which are used as shelters against bad weather and as night roosts. Black Kite is by far the most numerous wintering raptor (3,000–12,000 ind.) (Abuladze 2013, Abuladze *et al.* 2002 & 2011b).

Main players

The main actors in monitoring for raptors in Georgia are:

(1) Governmental organisations – the Ministry of Environment Protection of Georgia carries out the bio-monitoring programme with funding from SVS/BirdLife Switzerland; raptors are part of this programme. 12 specialists from different regions participate in this project.

(2) Research organisations – there are only two centres in Georgia, researchers of which carry out monitoring of raptor populations. The Institute of Zoology of the Ilia State University (formerly of the Academy of Sciences of Georgia) has carried out the long-term monitoring on breeding, migratory and wintering populations since the 1970s. In recent years, the Institute of Ecology has been monitoring some species using modern methods, like tracking with satellite-received radio-transmitters (Gavashelishvili *et al.* 2006 & 2012).

(3) Solitary researchers monitor raptor populations at the local level in some regions (Edisherashvili 1999).

(4) Several NGOs (Bird Conservation Union of Georgia, "Bude", Georgian Centre for the Conservation of Wildlife, PSOVI) also carry out small-scale monitoring activities at the regional level or on certain species of raptors; they also carry out applied research on the impact of technical constructions on raptor populations.

Special attention must be paid to the activities by members of the international project *Batumi Raptor Count* (http://www.batumiraptorcount.org). Since 2008, each autumn participants of this project have monitored migrating raptors at the Black Sea coast in SW Georgia, in one of the most important bottlenecks in the Western Palearctic (Verhelst *et al.* 2011).

Contacts have been established with all neighbouring countries of the region (but there are currently no contacts with Russia due to political reasons). Until 1992, projects were carried out within the framework of former USSR programmes (Flint & Galushin 1981). Since then, contacts have been established with researchers from Azerbaijan, Armenia and Turkey, but at a fairly small scale and

concentrating on some issues (specific raptor species or trans-boundary projects). Besides, small scale projects with some European countries are mostly carried out through individual contacts or private initiatives. There are representatives of international organisations in Georgia, such as WWF, IUCN and BirdLife International, which carry out the various programmes of these organisations, with Georgia participating in them.

In Georgia, the main users of data collected during raptor monitoring are governmental organizations, ministries and departments, research institutes, universities, mass-media, national parks, nature reserves, and some international organizations.

National coverage

Comprehensive monitoring of raptors in Georgia was carried out during the 1970s and 1980s, but in the 1990s there were no such possibilities due to financial, political and social challenges to monitoring the whole territory of Georgia. However, in recent years the extent of monitoring has grown. Wintering and migratory species are monitored well, but breeding species are not covered comprehensively. At the present time, there is unfortunately no national coordination or network for monitoring raptors.

Threats

The main threats to raptors in Georgia, causing declines in some raptor species, are illegal shooting, falconers' activities, and the transformation and destruction of breeding and feeding habitats. Economic activities such as the construction of railways, roads, oil and gas pipelines, ports, airports, alpine resorts and creation of reservoirs endanger the raptors' habitats. The impact of newly constructed power transmission lines may also be negative. The main threat to migratory raptors is illegal shooting. The practice of trapping hawks and large falcons for falconry purposes also presents one of the major raptor conservation problems in Georgia (Maanen *et al.* 2001, Abuladze *et al.* 2011c, Jansen 2011).

Weaknesses and challenges

At present, the main problems relate to monitoring of breeding populations, since there is no governmental funding, a lack of monitoring specialists and no national monitoring scheme adapted to modern conditions. Another gap is the lack of owl monitoring. For the regions Abkhazia and South Ossetia, we lack any data for the last 20 years due to the political instability of the areas. However, taking into account the diversity of raptors, the rich species composition, the especially high numbers of migrants, and regular presence of several otherwise rare or accidental species in Europe there is plenty to interest researchers and motivate more monitoring.

Among the specific areas of weakness, or challenges, for which Georgia might benefit from international sharing of good/best practice, we should mention the funding schemes, training opportunities, new methods and technologies adapted for small countries like Georgia. The lack of professional researchers involved in monitoring of diurnal and nocturnal raptor populations, training of young researchers, engagement in international programmes together with funding, introduction of inexpensive methods of monitoring of raptors should be considered as the main capacity-building needs to strengthen monitoring for raptors in Georgia.

References

Abuladze, A. (1996): Lesser Spotted Eagle *Aquila pomarina* in Georgia. pp. 349–355 In: Meyburg, B.U & Chancellor, R.D. (eds.): Eagle studies. – World Working Group on Birds of Prey, Berlin, London & Paris.

Abuladze, A. (2008): [Changes in the species composition and numbers of the birds of prey in Georgia in 1975–2007.] pp. 162–166 In: Galushin, V.M., Melnikov, V.N., Chudnenko, D.E. & Sharikov, A.V. (eds.): Research and Conservation of the Raptors in Northern Eurasia. Materials of the 5th Conference on Raptors of Northern Eurasia, 4–7 February 2008, Ivanovo, Bulgaria. – Ivanovo State University. (in Russian)

Abuladze, A. (2013): Birds of Prey of Georgia. Materials towards a Fauna of Georgia, Issue VI. – Institute of Zoology, Ilia State University & Publishing house "Lasha Khvichia", Tbilisi.

Abuladze, A., Eligulashvili, B. & Shergalin, J. (2002): Wintering of raptors in Georgia. pp. 141 In: Yosef, R., Miller, M.L. & Pepler, D. (eds.): Raptors in the New Millenium. Proceedings of the World Conference on Birds of Prey & Owls "RAPTORS 2000", 2–8 April 2000, Eilat, Israel. – Israel International Birding & Research Center in Eilat, Israel.

Abuladze, A., Kandaurov, A. & Eligulashvili, B. (2011a): Seasonal migrations of Birds of Prey across Georgia: results of the long-term studies. pp. 3–4 In: Materials of the International Conference "The Birds of Prey and Owls of Caucasus", 26–29 October 2011, Tbilisi, Abastumani, Georgia.

Abuladze, A., Kandaurov, A., Edisherashvili, G. & Eligulashvili, B. (2011b): Wintering of raptors in Georgia: results of long-term monitoring. pp 4–5 In: Materials of the International Conference "The Birds of Prey and Owls of Caucasus", 26–29 October 2011, Tbilisi, Abastumani, Georgia.

Abuladze, A., Kandaurov, A., Bukhnikashvili, A., Natradze, I., Kokhia, M., Bekoshvili, D., Gorgadze,

O., Edisherashvili, G., Goderidze, A., Gertsvolf, A., Eligulashvili, B., Kashta, Ye., Shekiladze, Sh., Mtatsmindeli, A., Rostiashvili, G., Beruchashvili, G. & Abuladze, G. (2011c): The analysis of recorded causes of death of adult birds of prey and owls in Georgia in 1973–2011. pp. 5–7 In: Materials of the International Conference "The Birds of Prey and Owls of Caucasus", 26–29 October 2011, Tbilisi, Abastumani, Georgia.

Edisherashvili, G. (1999): [The modern status of the raptors of Shida Qarthli Region.] pp. 242–246 In: Proceedings of Tskhinvali State Pedagogical Institute. (in Russian)

Flint, V.E. & Galushin, V.M. (1981): Strategy of raptor conservation in the USSR. – Journal of Raptor Research 15 (1): 1–3.

Gavashelishvili, A., McGrady, M.J., & Javakhishvili, Z. (2006): Planning the conservation of the breeding population of cinereous vultures (*Aegypius monachus*) in the Republic of Georgia. – Oryx 40 (1): 76–83.

Gavashelishvili, A., McGrady, M., Ghasabian, M. & Bildstein, K.L. (2012): Movements and habitat use by immature Cinereous Vultures (*Aegypius monachus*) from the Caucasus. – Bird Study 59 (4): 442–462.

Jansen, J. (2011): The Protocol for long-term raptor migration monitoring along Eastern Black Sea flyway in Batumi, Georgia. pp. 20–21 In: Materials of the International Conference "The Birds of Prey and Owls of Caucasus", 26–29 October 2011, Tbilisi, Abastumani, Georgia.

Maanen, Van E., Goradze, I., Gavashelishvili, A. & Goradze, R. (2001): Trapping and hunting of migratory raptors in western Georgia. – Bird Conservation International 11 (2): 77–92.

Verhelst, B., Jansen, J. & Vansteelant, W. (2011): South West Georgia: an important bottleneck for raptor migration during autumn. – Ardea 99 (2): 137–146.

Arrived / Prispelo: 27. 3. 2013
Accepted / Sprejeto: 1. 7. 2013

Acrocephalus 33 (154/155): 293–295, 2012

A preliminary overview of monitoring for raptors in Greece

Predhodni pregled monitoringa populacij ptic roparic v Grčiji

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One of the fundamental concerns in raptors' conservation is the monitoring of their populations (Andersen 2007). A long-term monitoring of raptor populations can help to identify early threats either concerning the birds or their habitats, and thereby is a useful tool for establishing adequate conservation measures (Witmer 2005). In most ornithological advanced countries, monitoring programmes have started during the last few decades.

On the other hand, although many scientists and ornithologists have appeared in Greece during the last two decades, there is no comprehensive scheme for monitoring the populations of birds of prey as yet. Greece, due to its position among three continents and due to its variable climate, which in turn affects the vegetation and habitats, supports diverse raptor communities. From a total of 442 birds that occurred in the country, 38 (8.6%) species are diurnal raptors of which 24 (63.2%) breed here (Handrinos 2009). In addition, eight out of nine owls breed in the country. Both in the mainland and on the islands, 4 vultures, 6 eagles, 3 buzzards, 3 hawks, 1 kite, 1 harrier and 6 falcons breed as well. However, except for the Black Vulture *Aegypius monachus* in Dadia forest in north-eastern Greece and for the Griffon Vulture *Gyps fulvus* and the Lammergeier *Gypaetus barbatus* in Crete, there is no other long-term national monitoring programme in progress in the country.

The aim of this study was to present briefly an overview of monitoring for raptors in Greece.

Main players

The main actors in monitoring raptors' population and distribution in Greece are the Universities, mainly the Aristotle University of Thessaloniki in northern Greece, the University of Patras in Peloponnesus, and the Natural History Museum of Crete University in southern Greece. Furthermore, non-governmental organizations (NGOs) are activated in monitoring programmes, mainly under LIFE projects, and in a few cases the Forestry Service has collaborated in these projects. Recently, the authorities of the 27 National Parks are also responsible in monitoring all biotic (including raptors) and abiotic features within their areas.

Unfortunately, only in a few occasions foreign ornithologists have collaborated in monitoring programmes. These ornithologists originated from Spain, Austria, Germany, England and Belgium, and most of these scientists were volunteers working during the data collection.

The data collected from those projects were used by the ornithologists either for publications in scientific journals or for formulating conservation recommendations to the Greek government.

National coverage

Information concerning raptor population across the country is limited for a few regions and only for specific periods of time. The first monitoring programme started during the end of the 1980s in Dadia forest (north-eastern Greece), concentrating on the Black Vulture population recovery after the establishment of the first feeding station (Vlachos *et al.* 1999). Today, the authority of the National Park with the help of the WWF Greece is continuing the monitoring programme (Poirazidis 2003, Poirazidis *et al.* 2011). Another monitoring project for the Griffon vulture and the Lammergeier in Crete has been run by the Natural History Museum of Crete University since the mid-1990s (ongoing; Xirouchakis & Nikolakakis 2002). The Eleonora's Falcon *Falco eleonorae* monitoring project was carried in Dionysades island complex in Crete by Dr D. Ristow and Prof M. Wink (Heidelberg University) from 1965 to 2001 (e.g. Ristow *et al.* 1989). In addition, two monitoring projects were carried out in the country (for the Lesser Kestrel *F. naumanni* during 2001–2002, and for the Eleonora's Falcon during 2005–2006); both were realized in a short period of time. However, there is no national integrated monitoring programme for raptors in Greece.

Monitoring of migrating raptors was established at several sites (e.g. Antikythira Island, Mount Olympus, etc.) in the last few years with the help of Italian ornithologists (Lucia *et al.* 2011, Panuccio *et al.* 2012).

After the first meeting of ornithologists that took place in Aegina Island in 2002, a web-based network has been established in order to exchange information among scientists, concerning mainly the vultures' population, distribution, and threats.

Key species and key issues

In general, the key species addressed by monitoring in Greece are the four vultures, specifically the Black Vulture, the Griffon Vulture the Lammergeier and the Egyptian Vulture *Neophron percnopterus*, although two falcon species, the Eleonora's Falcon and the Lesser Kestrel, were also considered (Dimalexis *et al.* 2008, Vlachos *et al.* 2004, respectively). Especially for the Lesser Kestrel, a number of colonies have been systematically monitored since 1998, including the reproductive success and process, radio-telemetry, feeding ecology, habitat use and foraging ecology. A further ringing programme for juvenile Lesser Kestrels was initiated in 2009.

The key issues that were addressed by the monitoring programmes were to census the populations, identify the reasons for their population decline, establish conservation measures, and recommend their protection and recovery to the government.

Strengths and weaknesses

The main weaknesses of monitoring for raptors in Greece are (1) the cost of this action, (2) the large partitioning of the country, and (3) the low level of public awareness for birds. Greece covers ca. 132,000 km^2 and consists of thousands of small and large islands covering 25,000 km^2 (18.9%). Thus, this makes a national monitoring scheme for raptors difficult and costly. However, there are strengths in the monitoring of some raptors, such as the recovery of the Black Vulture population in Dadia forest, and the improvement of the breeding colonies of the Lesser Kestrel in Thessaly.

Although the data concerning most of raptors in Greece are patchy, information on their distribution and population is limited and has not been obtained from a systematic monitoring programme (Meyburg & Meyburg 1987, Handrinos & Akriotis 1997). Furthermore, except from a few sporadic observations there are no data for some species such as the Sparrowhawk *Accipiter nisus*, the Levant Sparrowhawk *A. brevipes*, the Peregrine Falcon *F. peregrinus*, and the Hobby *F. subbuteo*.

Therefore, the knowledge from international experts would be beneficial for the implementation of a realistic monitoring programme across the country.

Priorities, capacity-building

A fundamental priority to strengthen monitoring for raptors in Greece is the development of an atlas for birds of prey, which will describe accurately their status, distribution and population estimates. Species-specific long-term data are also important for the continuation of threatened and/or charismatic raptors, such as Black Vulture, Egyptian Vulture, Lammergeier, Lesser Kestrel and Eleonora's Falcon. Furthermore, we need to shift from short-term and local projects to an integrative long-term monitoring programme under the auspices of the Institutes.

Although there are some ornithologists and scientists across the country, the main capacity-building needs are to strengthen a realistic monitoring programme are personnel, and a satisfactory budget to address the specificities throughout Greece.

References

Andersen, D.E. (2007): Survey techniques. pp. 89–100 In: Bird, D.M. & Bildstein. K.L. (eds.): Raptor Research and Management Techniques. – Hancock House, Surrey.

Dimalexis, A., Xirouchakis, S., Portolou, D., Latsoudis, P., Karris, G., Fric, J., Georgiakakis, P., Barboutis, C., Bourdakis, S., Ivovič, M., Kominos, T. & Kakalis, E. (2008): The status of Eleonora's Falcon (*Falco eleonorae*) in Greece. – Journal of Ornithology 149 (1): 23–30.

Handrinos, G. (2009): Birds. pp. 213–354 In: Legakis, A. & Maragou, P. (eds.): [The Red Book of Endangered Animals in Greece.] – Hellenic Zoological Society, Athens. (in Greek)

Handrinos, G. & Akriotis, T. (1997): The Birds of Greece. – Christopher Helm, London.

Lucia, G., Agostini, N., Panuccio, M., Mellone, U., Chiatante, G., Tarini, D. & Evangelidis, A. (2011): Raptor migration at Antikythira, in southern Greece. – British Birds 104 (5): 266–270.

Meyburg, B.-U. & Meyburg, C. (1987): Present status of diurnal birds of prey (Falconiformes) in various countries bordering the Mediterranean. – Ricerche Biologia Selvaggina 12, Suppl.: 147–152.

Panuccio, M., Agostini, N. & Barboutis, C. (2012): Raptor migration in Greece: a review. pp. 16–17 In: Proceedings of the 2nd Italian Conference on raptors, October 2012, Treviso.

Poirazidis, K. (2003): [Dadia-Lefkimi-Soufli forest reserve, diurnal raptor assemblages. Status report of raptor species populations.] – WWF Greece, Athens. (in Greek)

Poirazidis, K., Schindler, S., Kakalis, E., Ruiz, C., Bakaloudis, D.E., Scandolara, C., Eastham, C., Hristov, H. & Catsakorakis, G. (2011): Population estimates for the diverse raptor assemblage of Dadia National Park, Greece. – Ardeola 58 (1): 3–17.

Ristow, D., Scharlau, W. & Wink, M. (1989): Population structure and mortality of Eleonora's Falcon (*Falco eleonorae*). pp. 321–326 In: Meyburg, B.-U. & Chancellor, R.D. (eds.): Raptors in the modern world. – World Working Group on Birds of Prey, Berlin.

Vlachos, C.G., Bakaloudis, D.E. & Holloway, G.J. (1999): Population trends of Black Vulture *Aegypius monachus* in Dadia Forest, north-eastern Greece following the establishment of a feeding station. – Bird Conservation International 9 (2): 113–118.

Vlachos, C.G., Bakaloudis, D.E. & Chatzinikos, E. (2004): Status of the Lesser Kestrel *Falco naumanni* in Thessaly, Central Greece. pp. 731–736 In: Chancellor, R.D. & Meyburg, B.-U. (eds.): Raptors worldwide: proceedings of the 6th World Conference on Birds of Prey and Owls, 18–23 May 2003, Budapest, Hungary. – World Working Group on Birds of Prey and Owls, Berlin & MME/BirdLife Hungary, Budapest.

Witmer, G.W. (2005): Wildlife population monitoring: some practical considerations. – Wildlife Research 32 (3): 259–263.

Xirouchakis, S. & Nikolakakis, M. (2002): Conservation implications of the temporal and spatial distribution of the Bearded Vulture *Gypaetus barbatus* in Crete. – Bird Conservation International 12 (3): 211–222.

Arrived / Prispelo: 27. 3. 2013
Accepted / Sprejeto: 1. 7. 2013

A preliminary overview of monitoring for raptors in Italy

Predhodni pregled monitoringa populacij ptic roparic v Italiji

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Owing to its great latitudinal extension and environmental heterogeneity, Italy hosts a relatively large number of birds of prey. Considering both diurnal and nocturnal species, 47 taxa are known to occur regularly in the country, 31 of which breed here, while two have gone extinct as breeders (Table 1). Furthermore, twice a year Italy is reached by a large number of migrants on their way between Europe and Africa. Big concentrations of migrating raptors occur in some important bottlenecks (e.g. Marettimo Island, Messina Strait, Monte Conero Promontory, Monte Beigua).

Table 1: Number of raptor species occurring in Italy

Tabela 1: Število vrst ptic roparic, ki se pojavljajo v Italiji

Family/ Družina	No. of all species/ Št. vseh vrst	No. of breeding species / Št. gnezdečih vrst
Accipitridae	27	15
Falconidae	10	7
Strigidae	10	9

On a national scale, reviews on the status of raptors were published in 1992 (Brichetti *et al.* 1992) and 2003 (Brichetti & Fracasso 1993) for diurnal species and in 2006 (Brichetti & Fracasso 2006) for owls. Among the species nesting in Italy, 17 are classified as Species of European Conservation Concern – SPECs (BirdLife International 2004), three are included in the IUCN Red List (IUCN 2012), while four are Critically Endangered (CR) according to the Red List of the Italian Breeding Birds (Peronace *et al.* 2011). To promote the conservation of some of the most endangered species, the Italian Ministry for the Environment issued the national action plans for the Lanner Falcon *Falco biarmicus feldeggii*, the Eleonora's Falcon *F. eleonorae* and the Egyptian Vulture *Neophron percnopterus* (Andreotti & Leonardi 2007 & 2009, Spina & Leonardi 2007). A regional action plan has been drafted for the conservation of the Griffon Vulture *Gyps fulvus* in Sardinia (Schenk *et al.* 2008). Monitoring is currently carried out by different actors and with different aims, especially to evaluate trends of common species and species of conservation concern.

Main players

In Italy, many actors are promoting programmes for raptor monitoring:
- State Forestry Corp (CFS),
- Departments of several Universities (e.g. Milano, Palermo, Pavia, Urbino),
- Institute for the Environmental Protection and Research – ISPRA,
- National Parks (e.g. Aspromonte National Park; Stelvio National Park) and other protected areas instituted by national or regional laws,
- Natural History Museums (e.g. Tridentine Museum of Natural Sciences),
- NGOs (ALTURA – Associazione Tutela Uccelli Rapaci e loro Ambienti; Legambiente; LIPU – Lega Italiana Protezione Uccelli, BirdLife International partner in Italy; MEDRAPTORS – Mediterranean Raptor Migration Network; Ornis Italica; WWF),
- Regional Administrations.

Co-operation has been promoted with foreign ornithologists to study vulture populations and raptor wintering and migration. Switzerland, Austria and France are partners in the "International Bearded Vulture Monitoring" (IBM) project to follow the birds' movements across country borderlines. A tight collaboration with Slovenian and Croatian ornithologists is currently in progress within the framework of the Griffon Vulture monitoring programmes in the eastern Alps. Since 2011, Italy has been involved in the European census of the wintering Red Kite *Milvus milvus*, a project coordinated by LPO (Ligue pour la Protection des Oiseaux), France. Moreover, collaboration has been established with Spanish researchers to study the migration of the Short-toed Eagle *Circaetus gallicus* through satellite tracking technology (University of Alicante) and the Black Kite *M. migrans* (Doñana Biological Station and CSIC).

The Italian Ministry for the Environment requires monitoring data in order to report on the status of protected species according to the Birds Directive, as well as to designate and manage Special Protection Areas (SPAs) and Important Bird Areas (IBAs).

Other frequent users of the data obtained from raptor monitoring are: (1) Co-ordinators of reintroduction/restocking programmes to evaluate the status of the new established populations and to formulate management decisions; (2) National Parks to manage land use (e.g. presence of Goshawk *Accipiter gentilis* and forest management plans) and to stipulate conservation actions; (3) Developers and advisors of the Environmental Impact Assessment (EIA) procedures: Regional Offices to assess the impact of local projects (wind farms, regional motorways etc.) and the Commission for National Impact Assessment of the Ministry for the Environment to assess the impact of major projects (e.g. bridge over the Messina Strait, motorways).

National coverage

Italy still lacks national coordination for raptor monitoring. Some efforts have been made to promote co-operation among groups working on the same species, to standardize monitoring protocols and to assess the size of the breeding populations (e.g. Allavena *et al*. 2006, Magrini *et al.* 2007). A national coordination for the Lanner Falcon was established in the 2003–2004 breeding seasons to acquire relevant information for the Italian action plan (Andreotti & Leonardi 2007, Andreotti *et al*. 2008). In the Alps, a network for vulture monitoring was promoted in 2008 by the Lombardy Region, Stelvio National Park and Alpi Marittime Natural Park (RIMANI project). Aims of this network are to follow and study dynamic population of re-introduced individuals of Lammergeier *Gypaetus barbatus* and to observe and record other vulture species which are slowly colonizing the Alps (Griffon Vulture, Black Vulture *Aegypius monachus*) or occasionally occurring (Egyptian Vulture). There is informal national coordination for monitoring the raptor migration (Migrans project), supported by a group of people depending on different organisations (NGOs, Parks).

The spatial coverage of monitoring depends on the species themselves. For some of them (e.g. Golden Eagle *Aquila chrysaetos*, Peregrine Falcon *F. peregrinus*, Griffon Vulture), comprehensive monitoring is being implemented all over the country. In some areas, monitoring projects have been carried out intensively for many years (e.g. Fasce *et al*. 2011). In other parts of the country, the knowledge of raptor populations is still scarce (e.g. Calabria). The monitoring is generally done at the local or regional levels and it is quite patchy across Italy. In some regions, atlases of breeding raptors have been recently published following standardised methods (Aradis *et al*. 2012).

Counts of migrating birds of prey have been carried out mostly in the last two decades both during post- and pre-breeding migration periods in several bottlenecks (mountain passes, promontories, small islands and straits) to describe flyways and movements strategies (e.g. Panuccio 2011). Some of this research work has been the result of joint efforts based on simultaneous observations at different watchpoints (e.g. Agostini 2002, Agostini *et al.* 2002). In recent years, satellite telemetry has been used to carry out detailed studies on migration (e.g. Mellone *et al*. 2011).

Key species and key issues

Monitoring activities are carried out in different periods of the year, addressing different target species. In the breeding period, the species like Golden Eagle, Bonelli's Eagle *A. fasciata*, Peregrine Falcon, Lanner Falcon, Lesser Kestrel *F. naumanni*, Eleonora's Falcon, Egyptian Vulture, Griffon Vulture and Lammergeier receive fairly solid coverage across their entire breeding range. Red Kite, Marsh Harrier *Circus aeruginosus*, Montagu's Harrier *Circus pygargus,* Eagle Owl *Bubo bubo* and Tengmalm's Owl *Aegolius funereus* are monitored only on a local scale, while Buzzard *Buteo buteo* and Kestrel *F. tinnunculus* are monitored within the framework of the national common bird census project to evaluate the breeding population trends (*Progetto Mito*; Rete Rurale Nazionale & LIPU 2012).

In the non-breeding period, Red and Black Kites are counted at night roosts (partial monitoring), while Marsh Harrier is included in *International Waterbird Census* (IWC) (Baccetti *et al*. 2002). Among the most numerous species in the migration periods are Black Kite, Marsh Harrier, Short-toed Eagle and Honey Buzzard *Pernis apivoris*.

Monitoring is usually aimed at censusing populations or, as far as Endangered and Critically Endangered species are concerned, to assess their status (e.g. Egyptian Vulture, Sara *et al.* 2009). However, data on threats to raptors are also gathered. The main threats monitored by different projects are habitat loss, disturbance, illegal hunting, egg collecting and stealing of young falcons from their nests, poisoning, collisions with aerial structures (wires, power lines, wind farms), both in the breeding areas and in bottlenecks where migrants funnel. The effects of collisions with power lines were studied in details, and guidelines to mitigate

the impact have been written (Rubolini *et al.* 2005, Pirovano & Cocchi 2008).

An international networking might help to improve our knowledge on new coming threats whose effects are not yet fully understood (e.g. wind farms). Furthermore, it might allow a better understanding of flyways especially relevant for the protection of stopover key sites.

Strengths and weaknesses

The main strength of the monitoring programmes carried out in Italy is the high motivation and enthusiasm of several ornithologists working in the field, in most cases on a voluntary basis. The qualitative level of field observers is generally high.

The weaknesses are the lack of a national coordination and the low level of communication among a part of ornithologists, who are scarcely inclined to co-operate and share their own data with others for several reasons (e.g. fear to expose nests to robbery, jealousy, distrust). Lack of economic resources from various institutions is also a major limiting factor.

Studies and monitoring of owl populations are quite scarce. Some diurnal species are not adequately monitored, in particular tree-nesting raptors (such as the Goshawk, whose population is probably underestimated in remote areas due to the harsh census conditions). Some of the less covered areas are in southern Italy (Calabria, Campania and Sardinia), in spite of their richness in species of relevant conservation importance; this lack of data is partially related to the low number of active ornithologists and ringers there.

About threats, the role of pesticides, rodenticides, pollutants, chemical contaminants and collisions with wind farms is not adequately investigated and the relevance of their impacts on population trends is not well known.

European monitoring network could facilitate commencement of national programmes, at least for some species of diurnal raptors currently monitored by local ornithological groups. Furthermore, international standardised protocols could improve the efficiency of monitoring in Italy, both to evaluate population sizes and trends and to assess the impact of some threats (e.g. electrocution, windfarms). Special attention should be paid to define guidelines for Before-After Control-Impacts monitoring within the framework of project evaluation and impact assessment.

Priorities, capacity-building

The highest priority to strengthen monitoring in Italy is to create a National Coordination aimed at organizing a network of regional focal points and to draw standardized species-specific protocols. Ideally, the coordination for each species or species groups should be provided by public institutions such as the Italian Ministry for the Environment, universities, museums or ISPRA to ensure adequate resources in terms of economy and/or staff, temporal continuity, correct use of the data and to train regional focal points to guarantee a strict connection between local observers and the national network.

Povzetek

V Italiji manjkajo celostni popisi in monitoringi populacij ptic roparic na nacionalni ravni. Da bi lahko uresničili mednarodne projekte, ki zadevajo brkatega sera *Gypaetus barbatus*, beloglavega jastreba *Gyps fulvus*, kačarja *Circaetus gallicus,* črnega *Milvus migrans* in rjavega škarnika *M. milvus,* je bilo vzpostavljeno sodelovanje z nekaterimi tujimi državami (Švica, Avstrija, Francija, Španija). S strani različnih nevladnih organizacij je bilo zastavljenih nekaj regionalnih in lokalnih projektov monitoringa več vrst in dogovorjena neformalna nacionalna koordinacija za monitoring selečih se ujed. Namen monitoringa je navadno ugotoviti velikost populacij, pridobljene podatke pa različni deležniki uporabljajo v glavnem za poročanje statusa vrst, zavarovanih v skladu Direktivo o pticah EU, načrtovanje zavarovanih območij, upravljanje s prostorom, načrtovanje naravovarstvenih akcij in ocenjevanje vplivov nacionalnih in lokalnih projektov.

References

Agostini, N. (2002): [The migration of birds of prey in Italy.] pp. 157–182 In: Brichetti, P. & Gariboldi, A. (eds.): Manuale di Ornitologia. Vol. 3. – Edagricole - Il Sole 24 Ore, Bologna. (in Italian)

Agostini, N., Baghino, L., Coleiro, C., Corbi, F., & Premuda, G. (2002): Circuitous autumn migration in the Short-toed Eagle (*Circaetus gallicus*). – Journal of Raptor Research 36 (2): 111–114.

Allavena, S., Andreotti, A., Angelini, J. & Scotti, M. (2006): Proceedings of the Congress "Status and conservation of the Red Kite (*Milvus milvus*) and the Black Kite (*Milvus migrans*) in Italy and southern Europe", 11–12 March 2006, Serra San Quirico, Italy. – Parco Naturale della Gola della Rossa e di Frasassi, Comunità Montana dell'Esino Frasassi & Altura. (in Italian)

Andreotti, A. & Leonardi, G. (2007): [National Action Plan for the Lanner Falcon (*Falco biarmicus feldeggii*).] Quaderni di Conservazione della Natura 24. – Ministero

dell'Ambiente e della Tutela del Territorio e del Mare & Istituto nazionale per la fauna selvatica. (in Italian, English summary)

Andreotti, A. & Leonardi, G. (2009): [National Action Plan for Egyptian Vulture (*Neophron percnopterus*).] Quaderni di Conservazione della Natura 30 – Ministero dell'Ambiente e della Tutela del Territorio e del Mare & ISPRA. (in Italian, English summary)

Andreotti, A., Leonardi, G., Sarà, M., Brunelli, M., De Lisio, L., De Sanctis, A., Magrini, M., Nardi, R., Perna, P. & Sigismondi, A. (2008): Landscape-scale Spatial Distribution of the Lanner Falcon (*Falco biarmicus feldeggii*) breeding population in Italy. – Ambio 37 (6): 440–444.

Aradis, A., Sarrocco, S. & Brunelli, M. (eds.) (2012): [Analysis of the status and distribution breeding birds of prey in Lazio.] Quaderni Natura e Biodiversità 2/2012. – ISPRA & ARP, Lazio. (in Italian, English summary)

Baccetti, N., Dall'antonia, P., Magagnoli, P., Melege, L., Serra, L., Soldatini, C. & Zenatello, M. (2002): [Results of the censuses of wintering waterbirds in Italy: distribution, population estimates and trends in 1991–2000.] – Biol. Cons. Fauna: 111: 1–240. (in Italian, English summary)

BirdLife International (2004): Birds in Europe: Population estimates, trends and conservation status. BirdLife Conservation Series No. 12. – BirdLife International, Cambridge.

Brichetti, P. & Fracasso, G. (2003): [Ornitologia Italiana.] Vol. 1. Gaviidae–Falconidae. – Perdisa Editore, Bologna. (in Italian)

Brichetti, P. & Fracasso, G. (2006): [Ornitologia Italiana.] Vol. 3. Stercorariidae–Caprimulgidae. – Perdisa Editore, Bologna. (in Italian)

Brichetti, P., De Franceschi, P. & Baccetti, N. (eds.) (1992): [Fauna of Italy.] Vol. 29. Aves, Part I. – Calderini, Bologna. (in Italian).

Fasce, P., Fasce, L., Villers, A., Bergese, F. & Bretagnolle, V. (2011): Long-term breeding demography and density dependence in an increasing population of Golden Eagles *Aquila chrysaetos*. – Ibis 153 (3): 581–591.

IUCN (2012): The IUCN Red List of Threatened Species. Version 2012.2. – [www.iucnredlist.org], 27/5/2013.

Magrini, M., Perna, P. & Scotti, M. (2007): Proceedings of the Congress "Golden Eagle, Lanner and Peregrine in peninsular Italy: status of knowledge and conservation problems", 26–28 March 2004, Serra San Quirico, Italy. – Parco Naturale della Gola della Rossa e di Frasassi. (in Italian)

Mellone, U., Limiñana, R., Mallìa, E. & Urios, V. (2011): Extremely detoured migration in an inexperienced bird: interplay of transport costs and social interactions. – Journal of Avian Biology 42 (5): 468–472.

Panuccio, M. (2011): Wind Effects on Visible Raptor Migration in Spring at the Strait of Messina, Southern Italy. – Journal of Raptor Research 45 (1): 88–92.

Peronace, V., Cecere, J.G., Gustin, M. & Rondinini, C. (2012): [2011 Red List of breeding birds in Italy.] – Avocetta, 36: 11–58. (in Italian)

Pirovano, A. & Cocchi, R. (2008): [Guidelines for mitigating the impact of power lines on birds.] – ISPRA. (in Italian)

Rete Rurale Nazionale & LIPU (2013): [Common birds in Italy. Updating population trends in 2012.] – [http://www.reterurale.it/farmlandbirdindex] (in Italian, English summary)

Rubolini, D., Gustin, M., Bogliani, G. & Garavaglia, R. (2005): Birds and powerlines in Italy: an assessment. – Bird Conservation International 15 (2): 131–145.

Sara, M., Greci, S. & Di Vittorio, M. (2009): Status of Egyptian Vulture (*Neophron percnopterus*) in Sicily. – Journal of Raptor Research 43 (1): 66–69.

Schenk, h., Aresu, M. & Naitana, S. (2008): [Proposal for an Action Plan for the Griffon Vulture (*Gyps fulvus*) in Sardinia.] – Legambiente Sardegna, Cagliari. (in Italian)

Spina, F. & Leonardi, G. (2007): [National Action Plan for the Eleonora's falcon (*Falco eleonorae*).] – Quaderni di Conservazione della Natura 26. – Ministero dell'Ambiente e della Tutela del Territorio e del Mare & & Istituto nazionale per la fauna selvatica. (in Italian, English summary)

Arrived / Prispelo: 27. 3. 2013
Accepted / Sprejeto: 1. 7. 2013

Acrocephalus 33 (154/155): 301–304, 2012

A preliminary overview of monitoring for raptors in Latvia

Predhodni pregled monitoringa populacij ptic roparic v Latviji

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Latvia is situated in Northern Europe and belongs to the Boreal biogeographical region (EC 2005). Most of the country is composed of fertile lowland plains and moderate hills. Forests account for 56% of the total land area. Mires occupy 9.9% of Latvia's territory. Of these, 42% are raised bogs.

Raptor assemblages (both diurnal and nocturnal) are comprised of species characteristic of Northern Europe. Species composition of breeding raptors is similar (forms one cluster) to that in the neighbouring Estonia and Fennoscandian countries – Finland, Sweden and Norway (López-López *et al.* 2008).

Including all historical records and rare vagrants, Latvia's list of raptors includes 28 diurnal raptor species and 13 owl species. Out of these, at least 17 diurnal birds of prey and at least 7 owl species can be counted as regularly breeding species (BirdLife International 2004, Latvijas putni 2013).

Main players

The Latvian Ornithological Society (LOB, BirdLife Partner) was a co-ordinating organisation for most bird monitoring schemes, including those for raptors, when these schemes were state-supported. In 2010 and 2011, there were no state-supported programmes implemented since no funding was granted. Some monitoring schemes were based only on the enthusiasm of individual experts, their ability to raise funds and/or their willingness to work voluntarily. Thus, individual experts can be considered as the main actors in monitoring for raptors, regardless of their institutional affiliation.

Several project-based monitoring and research activities were/are co-ordinated by the Latvian Fund for Nature (Latvijas Dabas fonds). Monitoring of bird migration is carried out by the Laboratory of Ornithology, Institute of Biology, University of Latvia. Since 2012, the joint stock company "Latvijas valsts meži" (Latvia's State Forests) supports monitoring for the Lesser Spotted Eagle *Aquila pomarina* and Golden Eagle *A. chrysaetos*.

Regional co-operation includes regular meetings of diurnal raptor experts from the neighbouring Baltic States and Belarus. Meetings have been taking place since 2005 and act as basis for discussing the broad spectrum of raptor-related topics at the regional scale, such as monitoring and research, conservation, development of common project ideas, etc. These meetings have resulted in several joint publications (e.g. Väli *et al.* 2010). Latvian raptor scientists have cooperated with colleagues from Germany (Scheller *et al.* 2001, Helbig *et al.* 2005, Meyburg *et al.* 2011). This collaboration concentrated mostly on the Lesser Spotted Eagle. More diurnal raptor and owl species have been included during the co-operation within MEROS programme (Mammen 2003, Kovács *et al.* 2008). Since 1984, raptor specialists have been co-operating with the Swedish Museum of Natural History within colour-ringing scheme of the White-tailed Eagle *Haliaeetus albicilla*. The Latvian Fund for Nature is currently implementing the project "Eagles cross borders", during which research and monitoring of the White-tailed Eagle and Osprey *Pandion haliaetus* is carried out in Latvia and Estonia.

Data obtained during different monitoring schemes (in which raptors are included to some extent) are used by NGO's – LOB and Latvian Fund for Nature, for species conservation purposes. Information is used by experts from these NGO's also during the preparation of site management plans for Natura 2000 sites. Raptor species listed in Annex I of the EU Birds Directive are monitored within the Monitoring of Natura 2000 sites scheme. Data from all monitoring schemes are used by the Ministry of Environment and Rural Development for reporting to the European Commission – e.g. for Article 12 report (Birds Directive).

National coverage

For state-supported monitoring schemes, the Nature Conservation Agency was the responsible supervising public authority, with LOB co-ordinating their implementation. As state institutions showed no interest in monitoring data in 2010 and 2011, most schemes were stopped or implemented by individual experts at a minor scale. Exceptions are the *Latvian Breeding Bird Monitoring scheme* (LBBM – data submitted to the Pan-European Common Bird Monitoring Scheme) and comprehensive surveys for several species. LBBM managed to obtain some funding and is still running, co-ordinated by LOB. The Latvian Fund for Nature is a coordinating body for the White-tailed Eagle monitoring, while LOB is

coordinating Osprey monitoring in Latvia.

In Latvia, there is no unified, countrywide and standardized monitoring scheme targeted exclusively on all raptor species, i.e. there is no special programme designed to include all raptor (diurnal and nocturnal) species and to obtain reliable data for the whole country. Raptor data are split among several national and regional schemes, each having their own methodology and data recording standards. As there is no special programme for raptor monitoring in Latvia, the available data come from several schemes and are of variable degree of patchiness.

There are several species for which comprehensive surveys do exist. Those having such a scheme are mainly rare and charismatic species, such as the White-tailed Eagle (Ķuze *et al.* 2010), Golden Eagle, Osprey (Kalvāns 2011) and Eagle Owl *Bubo bubo* (Lipsbergs 2011). There are experts who work with these species and attempt to monitor most known active nests.

The LBBM scheme generates national trends for four common diurnal raptor species – Buzzard *Buteo buteo*, Sparrowhawk *Accipiter nisus*, Marsh Harrier *Circus aeruginosus* and Goshawk *A. gentilis* (Auniņš 2010). This is the most reliable scheme in terms of sampling design, however, the number of raptors (even common ones) recorded is rather insufficient, since the confidence intervals of obtained trends remain very high.

There is survey-plot-based research in the Lesser Spotted Eagle (Bergmanis 2009) and five most common breeding owl species – Tengmalm's Owl *Aegolius funereus*, Long-eared Owl *Asio otus*, Short-eared Owl *A. flammeus*, Tawny Owl *Strix aluco* and Ural Owl *S. uralensis* (Avotiņš 2009). The results obtained during these studies are valuable as long-term and in-depth research; however, distribution of survey-plots is distinctly patchy. Therefore, the number of survey-plots is insufficient to obtain reliable population trends for the whole country for such a widespread species. There was an attempt to expand the number of owl survey-plots to improve coverage at the national scale. Monitoring for Natura 2000 sites includes species listed in Annex I of the Birds Directive. This scheme is designed to survey only protected areas and does not take into account birds or habitats outside these sites. Therefore, spatial bias cannot be avoided in design of this scheme.

Key species and key issues

Summing up, at least some kind of monitoring exists or has existed in recent years for eight species of diurnal raptors and six owl species.

Monitoring of bird migration is carried out by the Institute of Biology, University of Latvia. Standardized migration counts are conducted at Pape ornithological station (south-western Latvia). Diurnal species for which the data obtained are sufficient to draw conclusions about the migration process include two most common species – the Buzzard and Sparrowhawk (Keišs & Pētersons 2009). Nocturnal migration is monitored at Pape ornithological station as well. The Long-eared Owl is an owl species with the highest number of captured/ringed birds.

Kolkasrags (Slītere National Park, north-western Latvia) is the migration site where important bird congregations occur during the spring migration. The site is on the list of Important Bird Areas (IBAs) that are currently known to be important congregatory raptor sites in Africa and Eurasia, under the CMS Agreement on the Conservation of Migratory Birds of Prey. The high concentration of migratory birds demonstrates that the Kolkasrags is a vital site, where birds are funnelled in a narrow corridor. Thus, the geographical location of Kolkasrags at the northernmost point of the Kurzeme peninsula gives a unique opportunity for conducting flyway population counts to monitor raptor populations from large northeastern European areas (Reihmanis 2010). Monitoring of migratory birds (including diurnal raptors) has been conducted there for several years (Kazubiernis 2007). At Kolkasrags, monitoring (by means of mist-net trapping) of migratory owls has been conducted since 2011. Migratory owls are best represented by the Long-eared Owl (Grandāns 2013). Other common breeding owl species also are listed as target species in this research.

Forestry practice is most often mentioned as threat, both by destroying habitats and causing disturbance. Agricultural land abandonment and land use change are identified as threats to species like the declining Lesser Spotted Eagle (Meyburg *et al.* 2004).

The whole monitoring system and all species could benefit from international networking. We are seeking to establish long-term monitoring scheme for raptors to determine population trends for the country's breeding raptors. We are interested in designing monitoring scheme compatible with other countries, based on common standardized methods and being linked to the international monitoring system.

Strengths and weaknesses

The main strengths of raptor monitoring in Latvia are highly motivated experts, accumulated experiences and the existing well-established research programmes. Weaknesses include shortage of volunteers with necessary skills, which leads to insufficient

coverage across the country and species, and lack of coordination for raptor monitoring. The existing monitoring schemes provide insufficient data on countrywide trends of widely dispersed species e.g. Lesser Spotted Eagle, Honey Buzzard *Pernis apivorus*, Buzzard, Sparrowhawk, Marsh Harrier and Goshawk. Information on the effects of environmental pollutants on raptor populations are almost entirely missing in Latvia. Only some preliminary research has been carried out on this topic, such as the study of DDT effect on breeding Black Stork *Ciconia nigra* (Strazds & Grinblate 2009).

Cost effective country-wide monitoring of both common and those with conservation concern status raptor species is the issue we are interested in terms of best practice obtained in other countries. International sharing of best practice could be used to promote understanding of sampling design principles.

Priorities, capacity-building

Priorities to strengthen monitoring for raptors in Latvia are to increase the number of motivated and trained surveyors to obtain representative countrywide coverage and population trends for many breeding species. To work on these trends, unified, countrywide and standardized monitoring schemes need to be launched. However, fundraising for such raptor monitoring schemes is still a challenge in Latvia.

Thus, to strengthen monitoring for raptors, the main capacity-building needs are (1) securing long-term continuity of funding, (2) development and launching of unified monitoring that focuses on most raptor populations and its trends, and (3) attracting more surveyors.

References

Auniņš, A. (2010): [Monitoring of diurnal birds.] Report to LVĢMA. – Latvian Ornithological Society, Riga. (in Latvian)

Avotiņš A. (2009): [Woodland (nocturnal) birds.] pp. 18–32 In: Ķerus, V. (ed.): [Monitoring of Biodiversity in year 2009, section Monitoring of Birds.] Report to LVĢMA. – Latvian Ornithological Society, Riga. (in Latvian)

Bergmanis, U. (2009): [Lesser Spotted Eagle.] pp. 35–43 In: Ķerus, V. (ed.): [Monitoring of Biodiversity in year 2009, section Monitoring of Birds.] Report to LVĢMA. – Latvian Ornithological Society, Riga. (in Latvian)

BirdLife International (2004): Birds in Europe: population estimates, trends and conservation status. BirdLife Conservation Series No. 12. – BirdLife International, Cambridge.

European Commission (2005): Commission Decision of 13 January 2005 adopting, pursuant to Council Directive 92/43/EEC, the list of sites of Community importance for the Boreal biogeographical region (2005/101/EC). – OJ L 40, 11.2.2005: 1–181. (available at http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2005:040:0001:0181:EN:PDF)

Grandāns, G. (2013): Spring migration of Long-eared Owl *Asio otus* at Kolka, Latvia in 2011. pp. 5 In: Oļehnovičs D. (ed.): Proceedings of the 54th International Scientific Conference of Daugavpils University, 18–20 April 2012, Daugavpils, Latvia. – Daugavpils Universitātes Akadēmiskais apgāds „Saule".

Helbig, A.J., Seibold, I., Kocum, A., Liebers, D., Irwin, J., Bergmanis, U., Meyburg, B.-U., Scheller, W., Stubbe, M. & Bensch, S. (2005): Genetic differences and hybridization between greater and lesser spotted eagles (Accipitriformes: *A. clanga, A. pomarina*). – Journal of Ornithology 146 (3): 226–234.

Kalvāns, A. (2011): Changes in distribution and numbers of the Osprey (*Pandion haliaetus*) in Latvia. pp. 177 In: Fusani, L., Coppack, T. & Strazds, M. (eds.): Programme and Abstracts of the 8th Conference of the European Ornithologists' Union, 27–30 August 2011, Riga, Latvia. – Latvian Ornithological Society, Riga.

Kazubiernis, J. (2007): [The monitoring of migratory birds and bats in year 2006.] Report to LVĢMA. – Institute of Biology, University of Latvia, Riga. (in Latvian)

Keišs, O. & Pētersons, G. (2009): [The final report on monitoring of migratory birds and bats in year 2008.] Report to LVĢMA. – Institute of Biology, University of Latvia, Riga. (in Latvian).

Kovács, A, Mammen, U.C. & Wernham, C.V. (2008): European monitoring for raptors and owls: state of the art and future needs. – Ambio 37 (6): 408–412.

Ķuze, J., Lipsbergs, J. & Bergmanis, U. (2010): [Recent news on research and nest protection of White-tailed Eagle in Latvia.] – Putni dabā 2010 (1/2): 10–19. (in Latvian)

Latvijas putni (2013): [http://www.putni.lv], 15/5/2013.

Lipsbergs, J. (2011): [What is going on with Eagle Owl *Bubo bubo* in Latvia?] – Putni dabā 2011 (1): 6–19. (in Latvian)

López-López, P., Benavent-Corai, J. & García-Ripollés, C. (2008): Geographical assemblages of European raptors and owls. – Acta Oecologica 34 (2): 252–257.

Mammen, U. (2003): No Chance of European Monitoring of Raptors and Owls? – Ornis Hungarica 12/13: 1–2.

Meyburg, B.-U., Scheller, W. & Bergmanis, U. (2004): Home range size, Habitat utilisation, Hunting and Time budgets of Lesser Spotted Eagles *Aquila pomarina* with regard to Disturbance and Landscape Fragmentation. pp. 615–635 In: Chancellor, R.D. & Meyburg, B.-U. (eds.): Raptors Worldwide. – WWGBP/MME, Budapest.

Meyburg, B.-U., Bergmanis, U., Langgemach, T., Graszynski, K., Hinz, A., Börner, I., Sömmer, P. & Meyburg, C. (2011): Experience with the hacking method for support of the Lesser Spotted Eagle (*Aquila pomarina*) population in Germany. pp. 61 In: Fusani, L., Coppack, T. & Strazds, M. (eds.): Programme and Abstracts of the 8th Conference of the European Ornithologists' Union, 27–30 August 2011, Riga,

Latvia. – Latvian Ornithological Society, Riga.
Reihmanis, J. (2010): The effect of topography on spatial pattern and directional preference of selected diurnal non-passerine species during spring migration: visual study at bottleneck site of European Union importance – Slitere Nature Reserve, Latvia. In: 2nd Conference on Bird Migration and Global Change: movement ecology and conservation strategies, 17–20 March 2010, Strait of Gibraltar, Algeciras, Spain.
Scheller, W., Bergmanis, U., Meyburg, B.-U., Furkert, B., Knack, A. & Röper, S. (2001): [Home range size, habitat utilisation and time budgets of Lesser Spotted Eagles (*Aquila pomarina*).] –Acta ornithoecologica 4 (2/3/4): 75–236. (in German)
Strazds, M. & Grinblate, S. (2009): Preliminary report about the impact of DDT and other pesticides on breeding success of Black Stork in Latvia. pp. 83 In: Keller, V. & O'Halloran, J. (eds.): Abstracts of the 7th Conference of the European Ornithologists' Union, 21–26 August 2009, Zurich, Switzerland. – Swiss Ornithological Institute, Sempach.
Väli, Ü., Dombrovski, V., Treinys, R., Bergmanis, U., Daróczi, S.J., Dravecky, M., Ivanovski, V., Lontkowski, J., Maciorowski, G., Meyburg, B.-U., Mizera, T., Zeitz, R. & Ellegren, H. (2010): Widespread hybridization between the Greater Spotted Eagle *Aquila clanga* and the Lesser Spotted Eagle *Aquila pomarina* (Aves: Accipitriformes) in Europe. – Biological Journal of the Linnean Society 100 (3): 725–736.

Arrived / Prispelo: 27. 3. 2013
Accepted / Sprejeto: 1. 7. 2013

Acrocephalus 33 (154/155): 305–307, 2012

A preliminary overview of monitoring for raptors in Malta

Predhodni pregled monitoringa populacij ptic roparic na Malti

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A total of 31 species of raptors have been recorded in Malta, nine of which are vagrants (Maltese Rarities Committee *unpubl.*). Most raptors are seen on spring (mainly from mid March to mid May) and on autumn (mainly in September and October) migration (Sammut & Bonavia 2004). Only two species of raptors have ever bred in Malta – the Kestrel *Falco tinnunculus* and the Peregrine Falcon *F. peregrinus* (Sultana *et al.* 2011). Both, however, are rare and irregular.

Main players

BirdLife Malta is the only organisation in Malta that monitors raptors. Founded in 1962 as Malta Ornithological Society (MOS), local birders have been monitoring raptors voluntarily since then. Since the mid-1990s, monitoring of migrating raptors was undertaken more systematically by a handful of birders both in the spring (mid-March to mid-May) and autumn (mid-August to end October). In the past few years, BirdLife Malta organised raptor camps both in the spring and autumn and a large number of international birders and activists take part to monitor raptor migration and illegal raptor hunting.

BirdLife Malta is a partner of BirdLife International. Throughout Raptor Camp we exchange data through e-mails with "Lega Italiana Protezione Uccelli" (LIPU, the Italian BirdLife Partner), which monitors raptors across the Straits of Messina. Raptor camps are sponsored by the following BirdLife Partners: Swedish Ornithological Society (SOF), "Vogelbescherming Nederland", and Nature And Biodiversity Conservation Union (NABU, Germany) and therefore we collaborate closely with these organisations, too. Throughout the camps BirdLife Malta also collaborates closely with the Committee Against Bird Slaughter (CABS), which also organises bird protection camps twice a year in Malta.

All raptor data are currently inputted by individual birders in the web-based "Worldbirds Malta" database run by BirdLife Malta and used to compile systematic lists published in *Il-Merill* (e.g. Bonavia *et al.* 2010), the only scientific ornithological journal in Malta, published by BirdLife Malta.

National coverage

The author has been appointed as the national raptor coordinator by BirdLife Malta. There is no formal national network for monitoring raptors currently in Malta, as there are only a few birders on the Islands.

Due to a lack of human and financial resources in Malta, monitoring is carried out only voluntarily by a few birders and thus only on individuals' initiatives. The author has monitored daily the best site for raptor migration in the autumn (Buskett) since the mid-1990s. Contrary to the autumn, raptors migrate on a broad front in spring, and therefore a large number of raptors are not recorded. Due to the small number of birders present in Malta there is a tendency that all birders end up at the same location and usually monitor raptors only in the afternoon. Thus, a large number of raptors migrating over Malta both in the spring and autumn are not being recorded.

Key species

Key migrant raptor species include Honey Buzzard *Pernis apivorus* (mid Apr–May and Sep–Oct), Black Kite *Milvus migrans* (Mar–Apr and Aug–Sep), Marsh Harrier *Circus aeruginosus* (Mar–May and end Aug–Oct), Pallid Harrier *C. macrourus* (Mar–Apr and Sep–Oct), Montagu's Harrier *C. pygargus* (Apr and end Aug–Sep), Osprey *Pandion haliaetus* (Mar–May and end Aug–Oct), Lesser Kestrel *F. naumanni* (Mar–Apr and Sep–Oct), Kestrel (Mar–Apr and mid Sep–early Nov), Red-Footed Falcon *F. vespertinus* (mid Apr–May), Hobby *F. subbuteo* (Apr–May and Sep–Oct), and Eleonora's Falcon *F. eleonorae* (Apr–Oct).

The major site monitored in Malta is Buskett (Figure 1), where a large number of raptors congregate in autumn. Buskett comprises a small wooded area and a valley, surrounded by hills, in the western part of Malta. At 220 m a.s.l. it provides a fine view over the northern and eastern half of the island. It is one of the few wooded areas in the islands and thus attractive to raptors, combining an area of relatively high land (ideal for the formation of thermals) with a sheltered and reasonably safe roosting place. Between 2,000 and 4,000 raptors are seen annually from Buskett in the autumn, the majority being Honey Buzzards, Marsh Harriers, Kestrels and Hobbies (Sammut & Bonavia 2004).

From 2008 onwards, 1–2 pairs of Kestrels started breeding in Gozo (Sultana *et al.* 2011) and possibly a pair of Peregrine Falcons along the Southwestern cliffs

Figure 1: Raptor camp participants together with local birdwatchers counting birds of prey migrating over Buskett, Malta

Slika 1: Ornitologi in udeleženci tabora za monitoring ptic roparic med štetjem ujed, selečih se prek Busketta na Malti

of Malta in the last two years. A few Kestrels winter in the Maltese Islands, mainly in Gozo (Sultana & Gauci 1982).

Key issues and threats

The most critical issue facing raptor conservation in Malta is illegal hunting. The problem is not only a local issue, but has international ramifications as well, as it has a serious impact on the migratory raptors of Europe. Species listed on the global IUCN Red List such as Pallid Harrier are killed regularly and Ospreys carrying rings from Scandinavian countries are frequently shot down. Even in the case of species, which are not threatened at a global or European level, such as the Honey Buzzard or Marsh Harrier, if birds migrating over Malta are coming from specific countries where the species is at a critically low level, then the death of even a few of these birds could cause their extirpation from that country (Raine 2011).

In Malta, there are currently around 10,000 hunters. With such a small landmass, Malta has one of the highest numbers of hunters in Europe with a density of 50 hunters per km square (Raine 2011). Illegal poachers shoot at raptors as these are relatively easy targets especially when trying to roost.

Although both the local law and the EU Birds Directive prohibit the shooting of raptors in Malta, law enforcement is poor. The Administrative Law Enforcement (ALE), the police unit responsible for dealing with wildlife crime, is under-staffed and under-resourced. This is caused primarily by a lack of priority given to the issue by the Maltese Government. All this means that illegal hunters are unlikely to be caught committing their crimes. Even when apprehended, hunters often get laid off with light sentences or even simply warnings or probationary sentences (Raine 2011). The low number of raptors that breed and winter here are a direct result of illegal hunting together with minimal protection of habitats in Malta. There are very few reserves and there is a lot of disturbance in most areas thus making it difficult for raptors to breed or winter here. While the level of illegal hunting has been reduced in the past few years, thanks to BirdLife Malta and raptor camp volunteers, illegal hunting on the island is still at a level which shocks and horrifies visitors from overseas (Raine 2011). Out of the 337 shooting incidents in 2010, 47.7% were targeted at raptors involving 12 species. BirdLife Malta receives an average of 40 injured raptors annually in recent years.

International networking is necessary especially to curb the illegal hunting. Pressure is needed from other European countries to end this illegal raptor hunting once and for all. As seen, illegal hunting in Malta can have a significant impact on international conservation projects. Even after joining the European Union in 2004, Malta has continued to allow hunting in spring, despite the fact that it is not permitted under the Birds directive. Human and financial resources are needed to monitor the migration of raptors both in the spring and autumn and also to monitor illegal hunting. Raptor camps are the ideal platform for this and if these were to be extended to a longer period and a larger number of participants were to attend we will safeguard a larger number of raptors. A proper Wildlife Crime unit in Malta and a rehabilitation centre to treat injured raptors are also urgently required.

Strengths and weaknesses

The main strength of monitoring for raptors in Malta lies in the fact that although there are only a handful of birders in Malta they are well qualified in identifying and spotting raptors. There are also several dedicated and motivated people (both local and foreign) to safeguard European raptors and volunteer to support raptor camps. Furthermore, all raptor data are easily accessible.

On the other hand, the main weaknesses include lack of financial resources for monitoring raptors, which means that everything is done on a voluntary basis. Additionally, there are limited human resources (no more than 15 active birders) and, finally, rampant illegal hunting of raptors is practised, causing a lot of disturbance when raptors are monitored.

There are a number of gaps in monitoring for raptors in Malta. These include the difficulty in

estimating the actual raptor numbers that migrate over Malta. Monitoring is carried out only in a few areas and mainly in afternoons due to work commitments by local birders. In spring, sites are monitored depending on weather conditions, thus no systematic monitoring is done at any particular site for the entire spring season. In autumn, only one site (Buskett) is well covered. Other sites need to be monitored for the whole period. No regular observations are made in the sister island of Gozo. There is, therefore, a gap in the actual numbers of raptors that migrate over the Maltese Islands. An additional gap is that illegal hunting is monitored well only during raptor camps thanks to the international participants. They are present for only a short period (two weeks in spring and two weeks in autumn) and can cover just a few places. Thus there is a gap in the actual number of raptors being shot down.

The main challenges include human and financial resources. There are only a few birders in Malta, who can monitor only a small fraction of the islands, and everything is voluntary as there is no financial help. Monitoring is done by individuals' own free will and therefore time allotted for raptor monitoring is quite restricted. Law enforcement is not helping in reducing illegal raptor hunting.

Priorities, capacity-building

There are several priorities to strengthen monitoring for raptors in Malta. These include having a better picture of the actual amounts of raptors that migrate over the Maltese Islands during both spring and autumn migration. More foreign birders are needed to help few local birders to monitor key sites. Additional documentation of illegal hunting is required to improve illegal raptor hunting in the near future. Participation at Raptor camps has to be increased and more help is needed to organize longer-lasting camps (both financially and in terms of human resources). Finally, ecotourism should be promoted so that tourists start visiting Malta as a raptor watching destination.

The following are the main capacity-building needs:

– implementation of an interpretation centre at Buskett,
– establishment of new nature reserves offering protection for raptor species,
– start-up of a raptor rehabilitation centre to treat injured raptors,
– more human resources required,
– more financial resources required,
– more pressure from EU governments to the EU to curb illegal hunting and spring hunting in Malta,
– more raptor enthusiasts participating at raptor camps.

Povzetek

Malteško otočje leži na pomembni selitveni poti mnogih ptic roparic. Selitev teh ptic na otočju redno spremljajo že od leta 1962, ko je bila ustanovljena organizacija BirdLife Malta. Žal pa zaradi pomanjkanja človeških in finančnih virov, a tudi redkih zavarovanih območij na otočju sistematični monitoring poteka le na eni lokaciji (Buskett), in še to zgolj v jesenskem času. Avtor članka tu opravlja dnevni monitoring že od sredine 90-ih. V zadnjih nekaj letih BirdLife Malta redno organizira tako spomladanske kot jesenske tabore za monitoring selitve ptic roparic pa tudi nezakonitih lovskih dejavnosti, pri čemer ji pomagajo tuji prostovoljni aktivisti in ornitologi. Ptice roparice seveda ne privlačijo le opazovalcev ptic, marveč tudi divje lovce, kar pomeni, da je na različnih malteških lokacijah žal še vedno ustreljenih veliko teh ptic. Vsi podatki o pticah roparicah se vnašajo v bazo podatkov, ki je osnova za pripravo letnih sistematičnih seznamov, ki so nato objavljeni v znanstveni ornitološki reviji organizacije BirdLife Malta. V tem kratkem prispevku njen avtor poleg monitoringa ptic roparic našteva vrsto prednosti in slabosti pa tudi potreb po krepitvi zmogljivosti, nujnih za izboljšanje monitoringa na Malti.

References

Bonavia, E., Borg, J.J., Coleiro, C., Raine, A. & Sultana, J. (2010): Systematic List 2000–2005. – Il-Merill 32: 55–109.

Raine, A. (2011): A Photographic Guide to the Birds of Malta. – Langford Press, Peterborough.

Sammut, M. & Bonavia, E. (2004): Autumn raptor migration over Buskett, Malta. – British Birds 97 (7): 318–322.

Sultana, J. & Gauci, C. (1982): A new Guide to the Birds of Malta. – The Ornithological Society, Malta

Sultana, J., Borg, J.J., Gauci, C & Falzon, V. (2011): The Breeding Birds of Malta. – Birdlife Malta, Malta.

Arrived / Prispelo: 27. 3. 2013
Accepted / Sprejeto: 1. 7. 2013

Acrocephalus 33 (154/155): 309–313, 2012

A preliminary overview of monitoring for raptors in Portugal

Predhodni pregled monitoringa populacij ptic roparic na Portugalskem

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Portugal has a diverse assemblage of diurnal raptor and owl species, made up of the majority of species that occur in the Iberian Peninsula. 22 diurnal raptors and six owl species are accounted for as regular breeders, with a few others wintering or occurring as migrants or vagrants. Some of the breeding species are especially noteworthy, such as the Spanish Imperial Eagle *Aquila adalberti*, which is currently building up its numbers as a breeding bird after ca. 30 years of extinction as a breeder in Portugal, and the Bonelli's Eagle *A. fasciata*, whose fast growing tree-nesting population already sums about 100 pairs in the south of the country. Most of the raptors populations are currently recovering after a period of general decline during the 20th century. Only one species went extinct recently as a breeder, the Osprey *Pandion haliaetus*, but is now being reintroduced.

Main players

There are four main types of actors performing raptor and owl monitoring:

(1) people working for environmental agencies and Natural Parks (involved in the management of protected areas and endangered species);
(2) people working for private companies (carrying out EIA – environmental impact assessment studies, especially of wind farms, power lines and dams);
(3) members of environmental NGOs (involved in EIA and conservation projects);
(4) academic researchers.

As for the latter, monitoring has been part of some long-term scientific projects, namely of the Bonelli's Eagle tree-nesting population in the south of the country, and of shorter academic studies (BSc, MSc and PhD theses) covering several species such as the Eagle Owl *Bubo bubo*, the Bonelli's Eagle, the Egyptian Vulture *Neophron percnopterus* or the Lesser Kestrel *Falco naumanni* among others. These studies have been carried out within universities and research centres, e.g. the Universities of the Algarve, Évora, Lisbon, Trás-os-Montes e Alto Douro and Porto, and the CIBIO (Research Centre in Biodiversity and Genetic Resources). Additionally, tree-nesting Bonelli's Eagles were also widely monitored during the 4.5 years of a LIFE Nature project (2008–2011), coordinated by NGO "Centro de Estudos da Avifauna Ibérica".

Some collaboration has been established with Spain, concerning both state entities and NGOs, on the monitoring of cliff-nesting species (vultures, large eagles and Eagle Owls) in border areas, and of some endangered priority species (Spanish Imperial Eagle, Bonelli's Eagle and Black Vulture *Aegypius monachus*). Bonelli's Eagle research has been the subject of substantial scientific collaboration between Portugal, Spain and France, covering ecological, demographic and genetic issues. In turn, the Noctua-Portugal Programme, a monitoring scheme of owls and nightjars, coordinated by GTAN-SPEA (working group on nocturnal birds of the Portuguese Society for the Study of Birds), follows the same methodology of Noctua-Spain, allowing data to be analysed altogether for the Iberian Peninsula. Out of Europe, collaboration existed in the recent past with Cape Verde on the monitoring of the country's Osprey population.

Main users of the data obtained from monitoring are officials of the Institute for Nature Conservation and Biodiversity (including protected areas) and other environmental agencies for e.g. protected areas management, emergency conservation measures, evaluation of infrastructure projects and issue of permits (construction, hunting, recreation). Also NGOs (e.g. Quercus, LPN – Liga para a Protecção da Natureza, CEAI – Centro de Estudos da Avifauna Ibérica, ATN – Associação Transumância e Natureza) have used monitoring data for intervention in conservation emergencies and for the planning and development of conservation projects, as well as private environmental companies (e.g. STRIX, Bio3, Mãe d'Água, Oriolus, Profico Ambiente) for the EIA and monitoring of infrastructure and development projects.

Big companies, e.g. of the energy and industrial paper pulp sectors, which need up-to-date data on the distribution and breeding condition of species of higher conservation rank to incorporate impact preventive and mitigation measures on their production and management schemes are also regular users of monitoring data.

Research institutes (e.g. CCMAR – Centre of Marine Sciences, CIBIO) Universities (e.g. Algarve, Évora, Trás-os Montes e Alto Douro) and scientific societies (SPEA) also use monitoring in academic, research and conservation projects. For example, under the scope of long-term multidisciplinary research on tree-nesting Bonelli's Eagles, monitoring of the population was comprehensively and continuously carried out from 1991 to 2010. Only from 2011 onwards has it been patchily carried out. Also, both within the scope of research and conservation initiatives, Lesser Kestrel is another species that has been the object of regular monitoring since 1994.

National coverage

Traditionally, monitoring has been mostly restricted to areas with the richest cliff-nesting raptor communities or with top endangered species (e.g. Black Vulture, Egyptian Vulture, Spanish Imperial Eagle, Bonelli's Eagle, Lesser Kestrel). This has occurred mainly in areas of the north-east and central east along the Spanish border, and in the south-west uplands as well as in the open lowlands of the south-east. However, there is no formal national coordination or national network for raptor monitoring in Portugal.

Common raptor and owl species have been monitored in a few academic and research studies, and in some EIA studies. In this kind of studies, the Eagle Owl has been one of the most often surveyed species. Additionally, the *Common Bird Census* carried out by SPEA since 2004, although not specifically aimed at raptors and owls despite being a countrywide survey, has obtained some information on common raptor species like Black-winged Kite *Elanus caeruleus*, Black Kite *Milvus migrans*, Buzzard *Buteo buteo*, Booted Eagle *A. pennata*, Kestrel *F. tinnunculus* and Little Owl *Athene noctua*.

Currently, the only countrywide survey is the above mentioned owl monitoring scheme of GTAN-SPEA, which started in 2010. Another SPEA working group (especially dealing with the monitoring and conservation of Bonelli's Eagle in highly urbanised habitats) has recently expanded fieldwork to include common forest diurnal raptor species counts in suburban areas. SPEA has also regularly monitored Buzzards in the Azores and Madeira archipelagos, as well as Barn Owl *Tyto alba* in Madeira in partnership with Madeira National Park.

In recent years, monitoring has been carried out by some private environmental companies within the impact assessment of wind farms, infrastructures and development projects throughout mountainous areas of the western part of the country. A long-term study of autumn raptor migration in Sagres area (south-western corner of the country) has been undertaken almost annually since 1990, at first organized by the local Natural Park staff, then by SPEA (1996–2001) and from 2005 onwards by STRIX, a private environmental company, linked with impact monitoring of local wind farms.

In summary, despite diurnal raptor and owl monitoring has been often though patchily carried out, Portugal lacks a long-term comprehensive and countrywide monitoring programme encompassing all of the country's raptor and owl species.

Key species and key issues

The key species addressed by monitoring for raptors in Portugal are primarily endangered species (Black Vulture, Egyptian Vulture, Spanish Imperial Eagle, Bonelli's Eagle, Lesser Kestrel), and secondly the rarer cliff-nesting species (besides Egyptian Vulture and Bonelli's Eagle, these include Griffon Vulture *Gyps fulvus*, Golden Eagle *A. chrysaetos*, Peregrine Falcon *Falco peregrinus* and Eagle Owl). Additionally, owls in general have been the aim of an increasing monitoring effort in Portugal during the last five years.

Threats addressed by monitoring are the potential impact of man-made structures (wind farms, power lines, dams, roads) in mortality, habitat loss and breeding impairment. Commonly, this monitoring has been carried out by technicians working for small private companies dedicated to EIA. In turn, the impacts of agriculture, forestry and hunting on nesting habitat degradation and breeding disturbance have been key issues addressed by monitoring within scientific studies or conservation projects (e.g. LIFE Nature projects) that target a few species, namely the Bonelli's Eagle.

International networking could be beneficial to the countrywide long-term monitoring of priority species, especially of those tree-nesting species with wide and sparse distributions (e.g. Spanish Imperial Eagle, tree-nesting Bonelli's Eagle), that despite being very important for conservation purposes is logistically difficult and expensive. Carrying out regular and coordinated Iberian censuses of these and other endangered species such as Egyptian and Black Vultures would also be an important measure. International collaboration would be most relevant in exchanging information and expertise with Spain, concerning all species. Additionally, international networking might help raising funds and get manpower support.

Strengths and weaknesses

The main strength of monitoring in Portugal is the

young biologists working for private companies or NGOs, who are fairly well trained (although in small numbers) for raptor monitoring. However, those working in private companies are mostly constrained to environmental assessment work and have few opportunities to participate in research or conservation monitoring. However, the number of available skilled observers could rise with some training effort. The main weakness is the lack of funding for wide range and especially long-term monitoring, and the lack of strategic planning and coordination. The lack of well-established monitoring methodologies is also noteworthy. Strong and coherent coordination and leadership could be relevant in establishing a comprehensive raptor monitoring scheme in Portugal.

Some major gaps in monitoring can be identified, among them the follow-up of the recovery of Spanish Imperial Eagle that although carried out since 2003 still does not cover the whole potential habitat and is ill-coordinated despite its conservation relevance and urgency. The population monitoring of the common raptor and owl species, as well as of less common and less known forest species (e.g. Short-toed Eagle *Circaetus gallicus*, Honey Buzzard *Pernis apivorus*, Booted Eagle, Long-eared Owl *Asio otus*, Scops Owl *Otus scops*) is another major gap throughout the country. However, even the better monitored species can suffer the consequences of the current economic crisis in the country.

Almost the entire western half of northern and central Portugal, a highly populated area, is almost unknown regarding the raptor community. Yet, some on-going regional studies have recently revealed fairly high densities of some species, including of previously under-detected ones such as Goshawk *Accipiter gentilis.*

The most ill-studied wide range threats are those linked with the increasing large scale forest degradation throughout the country; in the north and the centre, the extensive tree cover deterioration caused by frequent and recurrent wildfires; in the south, the high mortality rates observed throughout the extensive areas of oak parkland and forest (especially of Cork Oak *Quercus suber*) putatively driven by climatic change coupled with unsound understorey management, and the increasing mortality caused by an introduced Pinewood Nematode *Bursaphelenchus xylophilus* on Maritime Pine *Pinus pinaster* stands. Other threats presumably such as electrocution, collision with power lines, loss of habitat by wind farms, persecution, and poisoning seem of moderate global impact at present but are, nevertheless, worth of reference. Furthermore, a general drawback is upstream of the threats, the great lack of scientific background knowledge of the population dynamics, ecological requirements and resource availability for most raptors and owls in the country.

Among the weaknesses and challenges for which Portugal might benefit from international sharing of best practice we can point out raptor conservation measures within forestry and game management.

Priorities, capacity-building

Fund raising, uniform methodology, strategic planning and national coordination are priority issues to strengthen monitoring for raptors in the country. Enhanced initiative, expertise and fund-raising ability could also help improving monitoring capacity in Portugal.

The main capacity building needs identified in raptor monitoring in Portugal are the training of technicians and nature wardens of environmental agencies and protected areas and field assistants on monitoring methods and techniques, as well as a well-established model for coordination of monitoring efforts, i.e. governmental *vs.* academic *vs.* non-governmental.

Acknowledgements: I am indebted to Alexandre Leitão, Alice Gama, Andreia Dias, Bárbara Fráguas, Carlos Pacheco, Jorge Vicente, Nuno Onofre, Pedro Rocha, Rita Ferreira and Rui Lourenço for their most useful contribution. Acknowledgements are also due to Rui Lourenço, Luka Božič (editor) and an anonymous referee for their critical revision of the manuscript.

Supporting bibliography

Aguiar, A., Lopes, A.L., Pimenta, M. & Luís, A. (2010): Owls (Strigiformes) in Parque Nacional Peneda-Gerês (PNPG), Portugal. – Nova Acta Científica Compostelana (Bioloxía) 19: 83–92.

Beest, van F., Bremer, van den L., Boer, de W.F., Heitkönig, I.M.A. & Monteiro, A.E. (2008): Population dynamics and spatial distribution of griffon vultures (*Gyps fulvus*) in Portugal. – Bird Conservation International 18 (2): 102–117.

Beja, P. & Palma, L. (2008): Limitations of methods to test density-dependent fecundity hypothesis. – Journal of Animal Ecology 77 (2): 335–340.

Canário, F., Leitão, A.H. & Tomé, R. (2012): Predation Attempts by Short-eared and Long-eared Owls on Migrating Songbirds Attracted to Artificial Lights. – Journal of Raptor Research 46 (2): 232–234.

Capelo, M., Onofre, N., Rego, F., Monzón, A., Faria, P. & Cortez, P. (2008): [Modelling the Presence of Birds of Prey in Maritime Pine Stands in Central and North of Portugal.] – Silva Lusitana 16 (1): 45–62. (in Portuguese,

English summary)

Cardia, P., Fráguas, B., Pais, M., Guillemaud, T., Palma, L., Cancela, M.L., Ferrand, N. & Wink, M. (2000): Preliminary genetic analysis of some Western Palearctic populations of Bonelli's Eagle, *Hieraaetus fasciatus.* pp. 845–851 In: Chancellor, R.D. & Meyburg, B.-U. (eds.): Raptors at Risk. Proceedings of the 5th World Conference on Birds of Prey and Owls, 4–11 August 1998, Midrand, Johannesburg, South Africa – World Working Group on Birds of Prey and Owls, London.

Catry, I., Alcazar, R., Franco, A.M.A. & Sutherland, W.J. (2009): Identifying the effectiveness and constraints of conservation interventions: A case study of the endangered lesser kestrel. – Biological Conservation 142 (11): 2782–2791.

Catry, I., Dias, M.P., Catry, T., Afanasyev, V., Fox, J., Franco, A.M.A. & Sutherland, W.J. (2011): Individual variation in migratory movements and winter behaviour of Iberian Lesser Kestrels *Falco naumanni* revealed by geolocators. – Ibis 153 (1): 154–164.

Catry, I., Franco, A.M.A. & Sutherland, W.J. (2011): Adapting conservation efforts to face climate change: Modifying nest-site provisioning for lesser kestrels. – Biological Conservation 144 (3): 1111–1119.

Catry, I., Franco, A.M.A. & Sutherland, W.J. (2012): Landscape and weather determinants of prey availability: implications for the Lesser Kestrel *Falco naumanni*. – Ibis 154 (1): 111–123.

Catry, I., Amano, T., Franco, A.M.A. & Sutherland, W.J. (2012): Influence of spatial and temporal dynamics of agricultural practices on the lesser kestrel. – Journal of Applied Ecology 49 (1): 99–108.

Catry, I., Franco, A.M.A., Rocha, P., Alcazar, R., Reis, S., Cordeiro, A., Ventim, R., Teodósio, J. & Moreira, F. (2013): Foraging habitat quality constrains effectiveness of artificial nest-site provisioning in reversing population declines in a colonial cavity nester. –PLoS ONE 8 (3): e58320. doi:10.1371/journal.pone.0058320

CTA-PEAR (2009): [Emergency Plan for three rupicolous birds of the National Park Douro Internacional. Final report.] – ALDEIA. (available online at www.aldeia.org) (in Portuguese)

Equipa Atlas (2008): [Atlas of breeding birds in Portugal (1999–2005).] – Instituto da Conservação da Natureza e da Biodiversidade, Sociedade Portuguesa para o Estudo das Aves, Parque Natural da Madeira & Secretaria Regional do Ambiente e do Mar. – Assírio & Alvim, Lisboa. (in Portuguese, English summary)

Figueira, R., Tavares, P.C., Palma, L., Beja, P. & Sérgio, C. (2009): Application of indicator kriging to the complementary use of bioindicators at three trophic levels. – Environmental Pollution 157 (1): 2689–2696.

Figueiredo, D. (coord.) 2005: [Monitoring of natural heritage of Pedrogão reservoir.] Unpublished report. – University of Évora. (available online at www.edia.pt) (in Portuguese)

Franco, A.M.A., Palmeirim, J.M. & Sutherland, W.J. (2007): A method for comparing effectiveness of research techniques in conservation and applied ecology. – Biological Conservation 134 (1): 96–105.

Grilo, C., Sousa, J., Ascensão, F., Matos, H., Leitão, I., Pinheiro, P., Costa, M., Bernardo, J., Reto, D., Lourenço, R., Santos-Reis, M. & Revilla, E. (2012): Individual spatial responses towards roads: implications for mortality risk. – PLoS ONE 7 (9): e43811. doi:10.1371/journal.pone.0043811

GTAN-SPEA (2012): [Programme Report NOCTUA Portugal (2009/10–2011/12).] Unpublished report. – Sociedade Portuguesa para o Estudo das Aves, Lisboa. (available online at spea.pt) (in Portuguese)

Hernández-Matías, A., Real, J., Moleón, M., Palma, L., Sánchez-Zapata, J.A., Pradel, R., Carrete, M., Gil-Sánchez, J.M., Beja, P., Balbontín, J., Vincent-Martin, N., Ravayrol, A., Benítez, J.R., Arroyo, B., Fernández, C., Ferreiro, E. & García, J. (2013): From local monitoring to a broad-scale viability assessment: a case study for the Bonelli's Eagle in western Europe. – Ecological Monographs 83 (2): 239–261.

Lourenço, R. (2006): The food habits of Eurasian eagle-owls in Southern Portugal. – Journal of Raptor Research 40 (4): 297–300.

Lourenço, R.F., Basto, M.P., Cangarato, R., Coelho, S., Álvaro, M.C., Oliveira, V. & Pais, M.C. (2002): The owl (Order Strigiformes) assemblage in the North-eastern Algarve. – Airo 12: 25–33.

Lourenço, R., Abelho, B., Cangarato, R., Pedroso, R., Santos, E., Pais, M.C. & Figueiredo, D. (2006): [Results of using car transects for census of diurnal raptors in southern Portugal.] 5th SPEA Ornithological Congress, 23 – 26 March 2006, Oeiras, Portugal. (in Portuguese)

Martins, S., Freitas, R., Palma, L. & Beja, P. (2011): Diet of breeding ospreys in the Cape Verde archipelago, Northwestern Africa. – Journal of Raptor Research 45 (3): 244–251.

Meirinho, A., Leal, A., Marques, A.T., Fagundes, A.I., Sampaio, H., Costa, J. & Leitão, D. (2013): [The state of the common birds in Portugal 2011: Common Birds Census project report.] Unpublished report. – Sociedade Portuguesa para o Estudo das Aves, Lisboa. (in Portuguese) (available online at spea.pt)

Mira, S., Arnaud-Haond, S., Palma, L., Cancela, M.L. & Beja, P. (*in press*): Large-scale population genetic structure in Bonelli's Eagle *Aquila fasciata*. – Ibis 155 (3): 485–498.

Moleón, M., Sánchez-Zapata, J.A., Real, J., García-Charton, J.A., Gil-Sánchez, J.M., Palma, L., Bautista, J. & Bayle, P. (2009): Large scale spatio-temporal shifts in the diet of a predator mediated by an emerging infectious disease of its main prey. – Journal of Biogeography 36 (8): 1502–1515.

Moleón, M., Sebastián-González, E., Sánchez-Zapata, J.A., Real, J., Mathias, M.P., Gil-Sánchez, J.M., Bautista, J., Palma, L., Bayle, P., Guimarães, Jr. P.R. & Beja, P. (2012): Changes in intrapopulation resource use patterns of an endangered raptor in response to a disease-mediated crash in prey abundance. – Journal of Animal Ecology 81 (6): 1154–1160.

Monteiro, A., Pacheco, C. & Santos, N. (2009): [Population trends, distribution, and conservation concerns of vultures in Portugal.] pp. 200–213 In: Donázar, J.A., Margalida, A. & Campión, D. (eds.):

Vultures, feeding stations and sanitary legislation: a conflict and its consequences from the perspective of conservation biology. Munibe, Suppl. 29. – Aranzadi, Donostia - San Sebastián. (in Spanish)

Onofre, N., Capelo, M., Faria, P., Teixeira, F., Cortez, P., Blanco, H., Condeço, V., Cruz, C., Pinheiro, A., Rosa, G., Claro, J., Venade, D., Almeida, J., Pais, M., Safara, J., Cangarato, R., Peça, C. & Pereira, D. (1999): [Abundance estimates of diurnal raptors in agricultural and forest habitats in Portugal.] pp. 177–179 In: Beja, P., Catry, P. & Moreira, F. (eds.): Actas do II Congresso de Ornitologia da Sociedade Portuguesa para o Estudo das Aves. – SPEA, Faro. (in Portuguese)

Palma, L. (1985): The present situation of birds of prey in Portugal. pp. 3–14 In: Newton, I. & Chancellor, R.D. (eds.): Conservation Studies on Raptors. ICBP Technical Publication No. 5. – ICBP, Cambridge.

Palma, L. & Beja, P. (1994): Autumm migration of raptors through Sagres (SW Portugal). pp. 179–185 In: Meyburg, B.-U., & Chancellor, R.D. (eds.): Raptor Conservation Today: proceedings of the 4th World Conference on Birds of Prey and Owls, 10–17 May 1992, Berlin, Germany. – WWWGBP, Berlin & Pica Press, London.

Palma, L., Pais, M.C. & Fráguas, B. (1996): Status and distribution of Bonelli's Eagle (*Hieraaetus fasciatus*) in Portugal. Unpublished. 2ndInternational Conference on Raptors, 2–5 October 1996, Urbino, Italia.

Palma, L., Onofre, N. & Pombal, E. (1999): Revised distribution and status of diurnal birds of prey in Portugal. – Avocetta 23 (2): 3–18.

Palma, L., Mira, S., Cardia, P. & Beja, P. (2001): Sexing Bonelli's eagle nestlings: morphometrics versus molecular techniques. – Journal of Raptor Research 35 (3): 187–193.

Palma, L., Ferreira, J., Cangarato, R., Pinto, P.V. (2004): Current status of the Osprey in the Cape Verde Islands. – Journal of Raptor Research 38 (2): 141–147.

Palma, L., Beja, P., Onofre, N., Pais, M.C., Lourenço, R., Coelho, S. & Janeiro, C. (2004): [PMO 5.3. Monitoring of raptors in the area of Alqueva backwater.] – CEAI, Centro de Estudos de Avifauna Ibérica, Évora. (available online at www.edia.pt) (in Portuguese)

Palma, L., Beja, P., Tavares, P.C. & Monteiro, L.R. (2005): Spatial variation of mercury levels in nesting Bonelli's eagles from Southwest Portugal: effects of diet composition and prey contamination. – Environmental Pollution 134 (3): 549–557.

Palma, L., Beja, P., Pais, M. & Cancela da Fonseca, L. (2006): Why do raptors take domestic prey? The case of Bonelli's eagles and pigeons. – Journal of Applied Ecology 43 (6): 1075–1086.

Palma, L., Dias, A., Cangarato, R., Ferreira, R. & Carrapato, C. (2009): [Distribution and population status of *Aquila fasciata* south of the Tagus and Extremadura.] 6th SPEA Ornithological Congress & 4th Iberian Ornithological Congress, 5–8 December 2009, Elvas, Portugal. (in Portuguese)

Palma, L., Dias, A., Cangarato, R., Carrapato, C., Ferreira, R., Pais, M.C. & Beja, P. (2009): An Exception to the Rule: The Fast Growing Tree-nesting Bonelli's Eagle (*Aquila fasciata*) Population of Southern Portugal. Annual conference of Raptor Research Foundation, 29 September–4 October 2009, Pitlochry, Scotland.

Pires, N.M. (2008): The use of radar as a tool for studying bird migration and its role in environmental impact assessment – a pilot study in Portugal. MSc thesis. – Faculty of Sciences, University of Lisbon.

Silva, C.C., Lourenço, R., Godinho, S., Gomes, E., Sabino-Marques, H., Medinas, D., Neves, V., Silva, C., Rabaça, J.E. & Mira, A. (2012): Major roads have a negative impact on the Tawny Owl *Strix aluco* and the Little Owl *Athene noctua* populations. – Acta Ornithologica 47 (1): 47–54.

Sousa, J., Reto, D., Filipe, J., Leitão, I., Grilo, C., Ascensão, F., Lourenço, R., Marques, A., Ferreira, D. & Santos-Reis, M. (2010): How Do Major Roads Affect Barn Owls? Distribution, Space Use, Food Source and Mortality. pp. 407–417 In: Wagner, P.J., Nelson, D. & Murray, E. (eds.): Adapting to change: proceedings of the 2009 International Conference on Ecology and Transportation, 13–17 September 2009, Duluth, Minnesota. – Center for Transportation and the Environment & North Carolina State University, Raleigh. (available at http://www.icoet.net/ICOET_2009/09proceedings.asp)

Tomé R, Costa H, Leitão D (1998): [The autumn migration of soaring birds in the Sagres region – results of the 1994.] – SPEA, Lisboa. (in Portuguese)

Tomé, R., Catry, P., Bloise, C. & Korpimäki, E. (2008): Breeding density and success, and diet composition of little owls *Athene noctua* in steppe-like habitats in Portugal. – Ornis Fennica 85: 22–32.

Arrived / Prispelo: 27. 3. 2013
Accepted / Sprejeto: 1. 7. 2013

An overview of the most significant recent (1990–2012) raptor monitoring studies in European Russia

Pregled najpomembnejših nedavnih (1990–2012) dejavnosti v okviru monitoringa ptic roparic v evropskem delu Rusije

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The avifauna of European Russia includes 47 breeding raptor species: 13 species of owls and 34 species of birds of prey (BirdLife International 2004). Population status and trends of the latter at the end of 20th century are shown in Appendix 1.

Raptor studies in European Russia

Raptor research, including long-term monitoring of their regional populations, does not evenly cover the entire European Russia. In the last two decades, regular studies covering all raptor species have been implemented in the following areas: Darwin Nature Reserve and its vicinities (1), north of Moscow (2), the Upper Don River (3) and the Northern Caucasus (4). Some irregular surveys and research covering only certain species have been carried out in the Murman (5) and Yamal (6) peninsulas, the Urals (7), Kaliningrad (8) and Smolensk (9) regions, the Middle Oka River (10), Kaluzhskie Zaseki Nature Reserve (11), the Volga River (12, 13, 15), the Central Chernozem (Black Soil) region (14), the Lower Don River (16), the North-Western Caucasus (17) and the Orenburg region (18).

Within Darwin Nature Reserve (120 km^2) near Rybinsk Reservoir at the Upper Volga (1) it was ascertained that 65 years after the reserve was established the number of rare raptors like the Osprey *Pandion haliaetus* and White-tailed Eagle *Haliaeetus albicilla* increased gradually (up to 38–40 and 27–30 pairs, respectively), while populations of common species like the Buzzard *Buteo buteo*, Black Kite *Mivus migrans*, Kestrel *Falco tinnunculus* and harriers decreased owing to the total afforestation of their open hunting places (Kuznetsov & Babushkin 2006, Babushkin 2010).

A model study and monitoring of the Kestrel, Long-eared Owl *Asio otus* and Short-eared Owl *A. flammeus* are being implemented within the area of 48 km^2 some 100 km north of Moscow (2) annually from 1996 onwards. A number of owls sharply fluctuated from 0 to 41 (LeO) or even 0 to 63 (SeO) breeding pairs quite synchronously with the population dynamics of their major prey, specifically Common Voles *Microtus arvalis* (Volkov *et al.* 2009, Galushin & Sharikov 2011). The findings clearly indicate that myophagous predators are capable of wide annual movements in search of breeding places with high density of their favourite prey not only through open tundra and steppe as shown before (Galushin 1974), but within forest-agricultural landscape as well (Kostin *et al.* 1990, Kostin 2012).

Long-term monitoring of raptors breeding within 50 km^2 (including 3.2 km^2 of forest fragments) of the Plushchan area along the west bank of the Upper Don River (3) has been carried out from 1992 onwards (Galushin *et al.* 2000, Zakharova 2003, Solovkov *et al.* 2009). The numbers of Goshawks *Accipiter gentilis* have increased (from 1 to 3 pairs); Buzzards (5–9 pairs), Sparrowhawks *A. nisus* (1–2 pairs) and Montagu's Harriers *Circus pygargus* (2–4 pairs) have been relatively stable, Black Kites have decreased in numbers (from 4 to 1 pair), one pair of Booted Eagle *Aquila pennata* and Honey Buzzard *Pernis apivorus* nested irregularly, while the Hobby *F. subbuteo* and

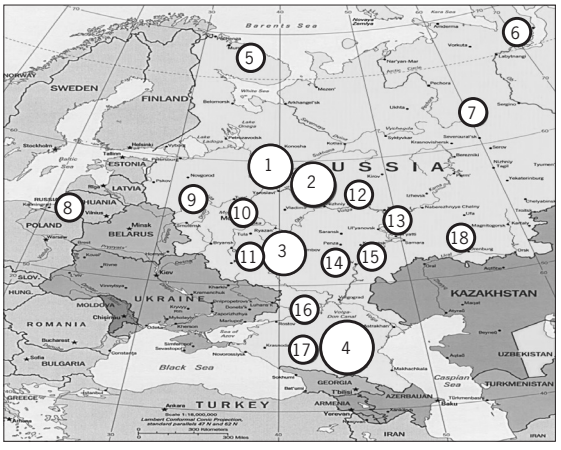

Figure 1: Map of recent raptor monitoring sites in European Russia (numbers correspond to those given beside the site names in the text)

Slika 1: Zemljevid novejših lokacij za monitoring ptic roparic v evropskem delu Rusije (številke lokacij so enake številkam ob imenih lokacij v besedilu)

Kestrel disappeared after 1999 resulting in predation by martens on their nest providers, i.e. Hooded Crows *Corvus cornix* and Magpies *Pica pica*.

The Northern-Caucasus Plains (4) (180,000 km^2) are inhabited by 28 raptor species, i.e. 21 Falconiformes and 7 Strigiformes. Eight of them have decreasing populations: Honey Buzzard, Black Kite, Long-legged Buzzard *B. rufinus*, Steppe Eagle *A. nipalensis*, Imperial Eagle *A. heliaca*, Peregrine Falcon *F. peregrinus*, Eagle Owl *Bubo bubo* and Short-eared Owl. Evident increasing populations are indicated for the following four species: Tawny Owl *Strix aluco*, Barn Owl *Tyto alba*, Goshawk and Sparrowhawk. Other 16 species have either stable or slightly increasing populations (Ilyukh & Khokhlov 2010).

Major results of raptor research and monitoring are published in books (Karyakin 1998 & 2008, Rakhimov & Pavlov 1999, Ilyukh & Khokhlov 2010, Korepov & Borodin 2013) and in over 200 papers in conference proceedings and other paper collections, as well as in scientific journals *Ornithologia* (Moscow, Chief Editor V.M. Gavrilov), *Zoological Journal* (Moscow, Chief Editor Ju.I. Chernov), *Strepet* (Rostov on Don, Chief Editor V.P. Belik), published in Russian with English summaries, and bilingual (Russian and English) *Raptors Conservation* (Nizhniy Novgorod, Chief Editor I.V. Karyakin). They have also been discussed at the 4th (Penza, 2003), 5th (Ivanovo, 2008), and 6th (Krivoy Rog, Ukraine, 2012) conferences organized by the Working Group on Birds of Prey and Owls of North Eurasia and at other ornithological workshops and meetings.

Questions raised by EURAPMON

The data collected by raptor monitoring are practically used for their protection mostly by the federal and regional conservation organisations and societies first of all for the preparation and revision of Red Data Books at various levels, which comprise an important basis for the national and regional conservation legislation.

Raptor specialists in Russia are in permanent contacts with our colleagues from EURAPMON as well as from Ukraine, Belarus, Georgia, Latvia, Kazakhstan, Turkmenistan, Finland, Poland, Germany, UK, Spain, Israel, Bulgaria, Serbia and many other countries.

Co-ordination of the raptor research, monitoring and conservation is the major activity carried out by the Working Group on Birds of Prey and Owls of Northern Eurasia, which has been led from the very beginning of 1983 by Vladimir Galushin. The membership of this working group consists of about 100 persons, with over 20 specialists coordinating local activities for raptor research and monitoring in various regions. As already mentioned, raptor monitoring in Russia does not cover the entire country in its European part evenly, but is fragmented through separate regions.

Local monitoring efforts usually concern all raptor species. At times, however, regional administrations mainly support monitoring of particular rare species for the preparation or revision of local Red Data Books. In such cases, major threats and conservation measures are the key issues. The most endangered raptors in Russia are large falcons, specifically the Saker Falcon *F. cherrug* and Gyrfalcon *F. rusticulus*, mostly due to illegal taking and falconry trade. Any international help in their study and, most of all, protection could be very valuable indeed.

The major problem of raptor monitoring in Russia is a huge size of the country – European part of it is almost equal to Western and Central Europe combined. So, it is impossible to cover it by the existing professional ornithologists, while our birdwatchers are still few and less experienced at the same time. Therefore, participation of professionals and volunteers from other countries would be highly beneficial.

Acknowledgements: We are thankful to well-known ornithologists like Pertti Saurola (Finland), Bernd-U. Meyburg (Germany), Janusz Sielicki (Poland), Maxim Gavrilyuk, Jury Milobog and Vitaly Vetrov (Ukraine), Vladimir Ivanovski and Valery Dombrovski (Belarus), Alexander Abuladze (Georgia), Evgeny Shergalin (Estonia, UK) and many others for the valuable exchange of experience. We hope this kind of joint efforts will continue to the benefit of raptors and raptorology. The author is also grateful to the referee and Luka Božič (editor) for useful corrections and amendments to the text.

Povzetek

Monitoring 47 gnezdečih ptic roparic (13 sov in 34 ujed) poteka na kakih 20 lokacijah v evropskem delu Rusije. Najpomembnejši in najrednejši monitoring opravljajo v (1) Darwinovem naravnem rezervatu (120 km^2) v bližini zadrževalnika Ribinsk na Gornji Volgi, (2) v severnem delu moskovske oblasti, (3) ob Gornjem Donu z majhnimi gozdnimi zaplatami med kultiviranimi polji, in (4) v Severnem Kavkazu (180.000 km^2), ki ga poseljuje 28 ptic roparic (21 vrst ujed in 7 vrst sov). Najpomembnejši rezultati, doseženi z raziskavami in monitoringom ptic roparic so bili v

zadnjih 15 letih objavljeni v petih posebnih knjigah, v več kot 200 znanstvenih člankih, predstavljenih na treh različnih konferencah, posvečenih pticam roparicam (2003, 2008 in 2012), in na mnogih drugih srečanjih. Raziskave, monitoring in varstvo ptic roparic koordinira Delovna skupina za ujede in sove severne Evrazije, ki je bila ustanovljena leta 1983.

References

Babushkin, M.V. (2010): [Raptors of forest-lake areas at the Upper Volga river.] PhD thesis. – Moscow Pedagogical State University, Moscow. (in Russian)

BirdLife International (2004): Birds in Europe: population estimates, trends and conservation status. BirdLife Conservation Series No. 12. – BirdLife International, Cambridge.

Galushin, V.M. (1974): Synchronous fluctuations in populations of some raptors and their prey. – Ibis 116 (2): 127–134.

Galushin, V.M. (2002): Small Falcons in European Russia: recent population status and trends. pp. 201 In: Yosef, R., Miller, M.L. & Pepler, D. (eds.): Raptors in the New Millenium. Proceedings of the World Conference on Birds of Prey & Owls "RAPTORS 2000", 2–8 April 2000, Eilat, Israel. – Israel International Birding & Research Center in Eilat, Israel.

Galushin, V.M. (2005): [Adaptive strategies of raptors.] DS thesis. – Moscow Pedagogical State University, Moscow. (in Russian)

Galushin, VM. (2007): [Adaptive strategies and communications of birds of prey.] pp. 326–338 In: Matrosov V.L. (ed.): Scientific proceedings of Moscow Pedagogical State University. Physics, Mathematics and Natural Sciences. (in Russian)

Galushin, V.M. & Sharikov, A.V. (2011): Review of recent surveys of the Long-eared Owl populations in European Russia. pp. 25 In: Abstract Book of International Conference on the Survey, Monitoring and Conservation of the Long-eared Owl *Asio otus,* 1–5 November 2011, Kikinda, Serbia.

Galushin, V.M., Zakharova-Kubareva, N.Ju. & Romanov, M.S. (2000): [Nesting and behaviour of raptors in forest microfragments at the Upper Don river.] pp. 13–28 In: Sarychev, V.S. (ed.): Nature of the Upper Don river. Vol. 2. – Lipetsk. (in Russian)

Ilyukh, M.P. & Khokhlov, A.N. (2010): [Raptors of transformed ecosystems in Northern Caucasus.] – North-Caucasus Technical University Press, Stavropol. (in Russian)

Karyakin, I.V. (1998): [Raptors of the Ural region: *Falconiformes* and *Strigiformes.*] – Centre for field studies of Ural animals, Perm. (in Russian)

Karyakin, I.V. & Pazhenkov, A.S. (2008): [Raptors of the Samara region.] – Samara Ministry of natural resources and nature conservation, Samara. (in Russian)

Korepov M.V., Borodin, O.V. (2013): [Imperial Eagle as a flag species of the Ulyanovsk region.] – Ulyanovsk. (in Russian)

Kostin A.B. (2012): [Territorial distribution, population dynamics and ecology of the Buzzard in the southern part of the Kaluga region.] pp. 61–73 In: Gavrilyuk, M.N. (ed.): Birds of Prey in the Dynamic Environment of the 3rd Millenium: Status and Prospects. Proceedings of the 6th International Conference on Birds of Prey and Owls of North Eurasia, 27–30 September 2012, Krivoy Rog, Ukraine. – Pub. Chernjavskyj D.A., Kryvyi Rih. (in Russian)

Kostin, A.B., Kostina I.L. & Vlasov, A.A. (1990): [Relationship between the Buzzard distribution, reproduction and local abundance of small mammals in the Central-Chernozem nature reserve.] pp. 260–261 In: Collection of papers: Nature reserves in the USSR – their present state and future. Part. III. – Zoological studies, Novgorod. (in Russian)

Kuznetsov, A.V. & Babushkin, M.V. (2006): The White-tailed Sea Eagle (*Haliaeetus albicilla*) and the Osprey (*Pandion haliaetus*) in the Vologda lake district and southeastern Onega area. pp. 80–90 In: Koskimies, P. & Lapshin, N.V. (eds.): Status of Raptor Populations in Eastern Fennoscandia. Proceedings of the Workshop, 8–10 November 2005, Kostomuksha, Karelia, Russia. – Karelian Research Centre of the Russian Academy of Science & Finnish-Russian Working Group on Nature Conservation, Petrozavodsk, Russia.

Rakhimov, I.I. & Pavlov, Ju.I. (1999): [Raptors of Tatarstan.] – Tatpoligraph editorial house, Kazan. (in Russian)

Red Data Book of Russian Federation (2001): [Animals.] Danilov-Danilian, V.I. (ed.) – Astrel Publishing House, Moscow. (in Russian)

Solovkov, D.A., Galushin, V.M., Romanov, M.S., & Zakharova-Kubareva, N.Ju. (2009): [Rare raptors along the Plushchan river and its vicinities.] pp.101–103 In: Aleksandrov, V.N. & Sarychev, V.S. (eds.): Rare species of the Lipetsk region. – Lipetsk. (in Russian)

Volkov, S.V., Sharikiv, A.V., Basova, V.B. & Grinchenko, O.S. (2009): [Influence of small mammals abundance upon yearly habitat selection and population dynamics of the Long-eared Owl (*Asio otus*) and Short-eared Owl (*A. flammeus*).] – Zoological Journal 88: 1248–1257. (in Russian, English summary)

Zakharova, N.Ju. (2003): [Dynamics of raptor populations in the Plushchan forest at the Upper Don river.] pp. 192–193 In: Galushin V.M. (ed.): Proceedings of the 4th Conference on Raptors of Northern Eurasia, 1–3 February, 2003, Penza, Russia. – Rostov State Pedagogical University, Rostov, Russia. (in Russian)

Arrived / Prispelo: 27. 3. 2013
Accepted / Sprejeto: 1. 7. 2013

APPENDIX 1 / DODATEK 1

Birds of prey populations and their trends in European Russia in the 1975–2000 period (Galushin 2002, 2005 & 2007, BirdLife International 2004): (–) small decline, (– –) moderate decline), (– – –) large decline, (F) fluctuating, (S) stable, (+) small increase, (+ +) moderate increase, (+ + +) large increase, (?) – trend unknown

Populacije ujed in njihovi trendi v evropskem delu Rusije v obdobju 1975–2000 (Galushin 2002, 2005 & 2007, BirdLife International 2004): (–) majhen upad, (– –) zmeren upad), (– – –) velik upad, (F) nihajoč, (S) stabilen, (+) majhen porast, (+ +) zmeren porast, (+ + +) velik porast, (?) – trend neznan

* Combination of various signs for individual species indicates variations of its status and trends in different regions in the vast territory of European Russia

Species / Vrsta	Population trend/ Populacijski trend 1975–2000*	No. of breeding pairs at the end of 20th century / Št. gnezdečih parov ob koncu 20. stoletja
A. Population decreasing		
A1. Rare species included into Red Data Book of Russian Federation (2001) or proposed to be included in its next edition		
Pallid Harrier *Circus macrourus*	F, –	300–1,100
Greater Spotted Eagle *Aquila clanga*	– –	600–800
Steppe Eagle *Aquila nipalensis*	– –	5,000–20,000
Red-footed Falcon *Falco vespertinus*	S, –	20,000–30,000
Saker Falcon *Falco cherrug*	– – –	10–20
A2. Common species		
Black Kite *Milvus migrans*	– –	30,000–50,000
Griffon Vulture *Gyps fulvus*	–	200–400
Hen Harrier *Circus cyaneus*	S, F	20,000–40,000
Kestrel *Falco tinnunculus*	F, –	40,000–60,000
B. Populations relatively stable		
B3. Rare species		
Red Kite *Milvus milvus*	S, +	5–10
Lammergeier *Gypaetus barbatus*	S, –	50–100
Egyptian Vulture *Neophron percnopterus*	S, –	70–120
Black Vulture *Aegypius monachus*	S, –	30–70
Long-legged Buzzard *Buteo rufinus*	S, –	1,000–2,000
Golden Eagle *Aquila chrysaetos*	S	500–1,000
Booted Eagle *Aquila pennata*	S, +	600–1,500
Osprey *Pandion haliaetus*	S, +	2,000–4,000
Gyrfalcon *Falco rusticolus*	F, –	100–200
B4. Common species		
Honey Buzzard *Pernis apivorus*	S, F	60,000–80,000
Sparrowhawk *Accipiter nisus*	S, +	160,000–180,000
Buzzard *Buteo buteo*	S, +	200,000–500,000
Rough-legged Buzzard *Buteo lagopus*	S, F	30,000–60,000
Merlin *Falco columbarius*	S	20,000–30,000
Hobby *Falco subbuteo*	S, –	30,000–60,000
C. Population increasing		
C5. Rare species		
White-tailed Eagle *Haliaeetus albicilla*	+ +	1,000–2,000
Short-toed Eagle *Circaetus gallicus*	S, +	500–1,000
Levant Sparrowhawk *Accipiter brevipes*	S, +, –	2,000–3,000
Lesser Spotted Eagle *Aquila pomarina*	S, +	300–500
Imperial Eagle *Aquila heliaca*	S, +	800–1,200
Lesser Kestrel *Falco naumanni*	S, +	400–600
Peregrine Falcon *Falco peregrinus*	S, +	1,000–1,200
C6. Common species		
Marsh Harrier *Circus aeruginosus*	+	40,000–60,000
Montagu's Harrier *Circus pygargus*	F, +	25,000–35,000
Goshawk *Accipiter gentilis*	+ +	90,000–110,000
Total / Skupaj		781,465–1,335,820

Acrocephalus 33 (154/155): 321–323, 2012

Overview of raptor monitoring in Spain

Pregled monitoringa ptic roparic v Španiji

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Raptor study and conservation has received an important public attention in Spain since the beginning of the 1970s. The rich communities of raptors and owls and the TV programmes directed by Felix Rodríguez de la Fuente might be in part responsible of such an unusual interest in raptors and owls that in a few years changed their official status of pests that should be eliminated to that of species of high conservation concern. Since, direct persecution is no longer a major factor driving raptor declines and socioeconomic changes have promoted a shift in the ways of impacting wildlife (Martínez-Abrain *et al.* 2009). Actually raptors are key species in biodiversity conservation in Spain and many of Natura 2000 network sites are devoted to raptor preservation.

Here we present a short review of the main players involved in monitoring and conservation, the key species and issues and the strengths and weaknesses related with raptors in Spain.

Main players

Raptor monitoring in Spain involves many different players, including research and management and conservation institutions. Since the 1970s, a large number of ecologists, naturalists and ornithologists have been devoted to raptor study and conservation.

There are at least 20 research groups that focus on raptor ecology and conservation, including species-habitat relationships, population dynamics, PVAs, trophic ecology, migration, ecotoxicology … These research groups include CSIC (Consejo Superior de Investigaciones Científicas), particularly Doñana Biological Station (Estación Biológica Doñana) and several universities (Barcelona, Madrid, Murcia, Miguel Hernández, Alicante, Granada among others).

There are also national strategies of population monitoring coordinated by the Ministry of Agriculture, Food and Environment, SEO/BirdLife and the Autonomous Governments. These programmes also include national strategies for biodiversity conservation focussed on particular endangered species or technical groups coordinated by the Ministry. Besides, different NGOs and Foundations also play an important role in raptor monitoring and conservation, including specific programmes for endangered species (e.g. Lammergeier and Black Vulture, Grupo Ornitológico Balear, Fundación Gypaetus), particular habitats (e.g. Wetlands, Fundación Global Nature, Asociación de Naturalistas del Sureste) and migration (e.g. Straits of Gibraltar; Fundación Migres, Colectivo Ornitológico Cigüeña Negra).

Interactions with other countries include, in particular, neighbouring France and Portugal, but there are also different research interactions with other countries in Europe and worldwide although without a regular coordination schedule.

National coverage

As stated above, the national co-ordination is usually conducted by the Ministry of Agriculture, Food and Environment and SEO/BirdLife with the collaboration of the Autonomous Governments, local NGOs and research groups. This includes nationwide population censuses conducted regularly for the most endangered species (http://www.seo.org/2012/07/02/monografias-seuimiento-de-aves). These national censuses are often based upon a combination of volunteer and professional work. There are also regular programmes for owls (NOCTUA) and common birds monitoring (SACRE) at the national level that relies almost exclusively on volunteers coordinated by SEO/BirdLife (see for example; http://www.seo.org/2012/05/07/resultados-de-los-programas-de-seguimiento-de-avifauna).

Key species and key issues

The key species addressed by monitoring include:

(1) Avian scavengers; Spain holds the largest populations of Griffon Vulture *Gyps fulvus* (94%), Black Vulture *Aegypius monachus* (98%), Egyptian Vulture *Neophron percnopterus* (97%) and Lammergeier *Gypaetus barbatus* (63%) of Europe (Margalida *et al.* 2010).

(2) Mediterranean raptors; Spain is also the main European stronghold for many Mediterranean raptors, particularly the Spanish Imperial Eagle *Aquila adalberti*, Bonelli´s Eagle *A. fasciata*, Lesser Kestrel *Falco naumanni* and Little Owl *Athene noctua* among others (López-López *et al.* 2011, Hernández-Matías *et al.* 2013).

The key issues include the following:

(1) Most of the species listed above depend on extensive agricultural and cattle grazing landscapes. Changes mediated by European regulations (i.e. common agricultural practices or animal by-product regulations) might directly influence their populations through changes in habitat quality and shortage of food resources (Tella *et al.* 1998, Donázar *et al.* 2009).

(2) Some old problems such as illegal poisoning and persecution and electrocution keep being an important issue affecting population trends and viability for different species (Carrete *et al.* 2007, López-López *et al.* 2011, Pérez-García *et al.* 2011).

(3) New problems such as wind farm impacts, public recreational use, or lead poisoning are arising and might be major drivers of population decline for some species (García-Fernández *et al.* 2005, Carrete *et al.* 2009 & 2011).

Strengths and weaknesses

In my opinion, the main strength is the interest of the general public on raptor conservation and the large research effort. Spain leads in the surface of Important Bird Areas (IBAs) selected for raptor conservation and also leads in raptor research in Europe (1st) and 2nd in the world ranking, just after USA (Thomson Reuters 2013).

There are no large gaps, except for low monitoring effort on common species and some interregional differences in data quality. The main problem derives from the little communication between researchers and managers that affect implementation of monitoring and conservation "know-how" (Knight *et al.* 2008). In this sense, Spain might clearly benefit from international sharing of good/best practice.

Priorities, capacity-building

Under the economic crisis scenario, biodiversity will be put at risk if research and conservation programmes are paralyzed (Margalida 2012). As a result, the priority should be to maintain cost-effective monitoring and conservation programmes. This would need a review of current knowledge on raptor ecology and conservation to evaluate research priorities, cost-effective and cost-benefit analysis of raptor monitoring and conservation programmes and coordination proposals and the analysis of the research-implementation gaps.

Povzetek

Španija se lahko pohvali z bogato združbo ujed in sov, hkrati pa je tudi poglavitno evropsko oporišče za obligatne mrhovinarje, kot so beloglavi jastreb *Gyps fulvus*, rjavi jastreb *Aegypius monachus*, brkati ser *Gypaetus barbatus* in egiptovski jastreb *Neophron percnopterus*, za velike teritorialne orle, kot so španski kraljevi orel *Aquila adalberti*, planinski orel *A. chrysaetos* in kragulji orel *Aquila fasciata*, in za male ujede in sove, kot sta južna postovka *Falco naumanni* in čuk *Athene noctua*, ki so vsi tesno povezani z agroekosistemi z nizko intenzivnostjo kmetovanja. Hkrati v Španiji obstajajo mnoge javne in zasebne inštitucije in posamezniki, ki so vsaj do neke mere posvečajo preučevanju in varovanju ujed in sov po vsej državi. Monitoring in varovanje teh ptic sta že po tradiciji koordinirana na nacionalni ravni, kar omogoča posodabljanje ocen populacij najbolj ogroženih vrst. Kljub kakovostnim raziskavam in zanimanju javnosti za varstvo ptic roparic pa so monitoring in znanstveni programi močno prizadeti zaradi močno zmanjšanih proračunskih sredstev, kar utegne imeti pomembne dolgoročne posledice.

References

Carrete, M., Grande, J.M., Tella, J.L., Sánchez-Zapata, J.A., Donázar, J.A., Díaz-Delgado, R. & Romo, A. (2007): Habitat, human pressure, and social behaviour: Partialling out factors affecting large-scale territory extinction in an endangered vulture. – Biological Conservation 136 (1): 143–154.

Carrete, M., Sánchez-Zapata, J.A., Benítez, J.R., Lobón, M. & Donázar, J.A. (2009): Large scale risk-assessment of wind-farms on population viability of a globally endangered long-lived raptor. – Biological Conservation 142 (12): 2954–2961.

Carrete, M., Sánchez-Zapata, J.A., Benítez, J.R., Lobón, M., Montoya, F. & Donázar, J.A. (2012): Mortality at wind-farms is positively correlated to large-scale distribution and aggregation in griffon vultures. – Biological Conservation 145 (1): 102–108.

Donázar, J.A., Margalida, A., Carrete, M. & Sánchez-Zapata, J.A. (2009): Too sanitary for vultures. – Science 326 (5953): 664.

García-Fernández, A.J., Martínez-López, E., Romero, D., María-Mojica, P., Godino, A. & Jiménez, P. (2005): High levels of blood lead in Griffon Vultures (*Gyps fulvus*) from Cazorla Natural Park (southern Spain). – Environmental Toxicology 20 (4): 459–463.

Hernández-Matías, A., Real, J., Moleón, M., Palma, L., Sánchez-Zapata, J.A., Pradel, R., Carrete, M., Gil-Sánchez, J.M., Beja, P., Balbontín, J., Vincent-Martin, N., Ravayrol, A., Benítez, J.R., Arroyo, B., Fernández, C., Ferreiro, E. & García, J. (2013): From local monitoring to a broad-scale viability assessment:

a case study for the endangered Bonelli's eagle *Aquila fasciata* in Western Europe. – Ecological Monographs 83 (2): 239–261.

Knight, T., Cowling, R.M., Rouget, M., Balmford, A., Lombard, A.T. & Campbell, B.M. (2008): Knowing But Not Doing: Selecting Priority Conservation Areas and the Research-Implementation Gap. – Conservation Biology 22 (3): 610–617.

López-López, P., Ferrer, M., Madero, A., Casado, E., & McGrady, M. (2011): Solving Man-Induced Large-Scale Conservation Problems: The Spanish Imperial Eagle and Power Lines. – PloS *ONE* 6 (3): e17196. doi:10.1371/journal.pone.0017196

Margalida, A. (2012): Baits, budget cuts: a deadly mix. – Science 338 (6104): 192.

Margalida, A., Donázar, J.A., Carrete, M. & Sánchez-Zapata, J.A. (2010): Sanitary versus environmental policies: fitting together two pieces of the puzzle of European vulture conservation. – Journal of Applied Ecology 47 (4): 931–935.

Margalida, A., Carrete, M., Sánchez-Zapata, J.A., Donázar., J.A. (2012): Good news for European vultures. – Science 335 (6066): 284.

Martínez-Abraín, A., Crespo, J., Jiménez, J., Gómez, J.A. & Oro, D. (2009): Is the historical war against wildlife over in Southern Europe? – Animal Conservation 12 (3): 204–208.

Pérez-García, J.M., Botella, F., Sánchez-Zapata, J.A. & Moleón, M. (2011): Conserving outside protected areas: edge effects and avian electrocutions in the periphery of Special Protected Areas. – Bird Conservation International 21 (3): 296–302.

Tella, J.L., Forero, M.G., Hiraldo, F. & Donázar, J.A. (1998): Conflicts between Lesser kestrel conservation and European Agricultural Policies as identified by habitat use analysis. – Conservation Biology 12 (3): 593–604.

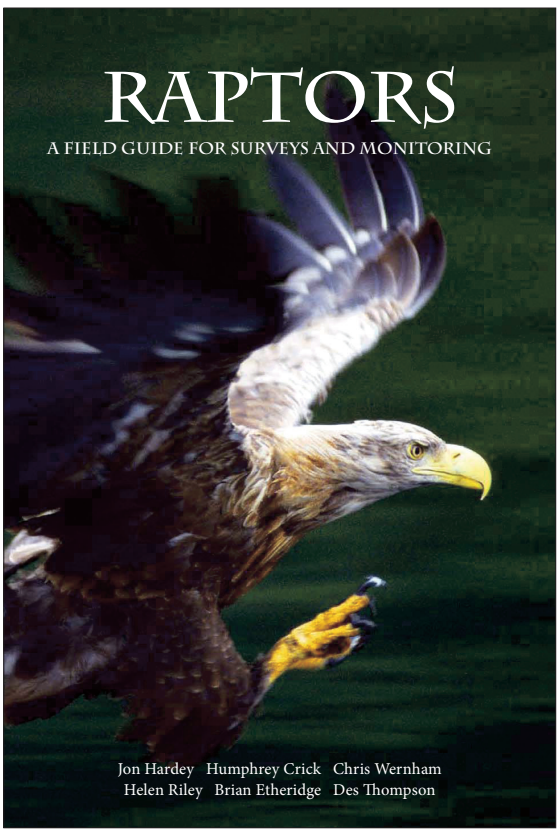
Thomson Reuters (2013): Isi Web of Sciences. –
[http://ip-science.thomsonreuters.com/es/productos/wok/], 5/2/2013.

Arrived / Prispelo: 27. 3. 2013
Accepted / Sprejeto: 1. 7. 2013

Nove knjige

New books

Hardey, J., Crick, H., Wernham, C., Riley, H., Etheridge, B. & Thompson, D. (2009): Raptors, a Field Guide for Surveys and Monitoring. Second Edition. – The Stationery Office, Scottish Natural Heritage, Edinburgh. pp. 370. ISBN 978-011 4973452



Because of their elusive life, low densities and low detectability by commonly used ornithological methods, raptors are usually excluded from general bird surveys and monitoring schemes. There is even no common methodological approach that would be generally applicable to the study of all raptor species, since they greatly differ by their way of life, diurnal activity and behaviour. This is reflected in numerous research methods for surveying raptors as well as in the fact that raptors appeared to be quite understudied or not studied at all in many countries simply due only to the lack of suitable methodological protocols. It is therefore not surprising that many National Coordinators for raptor monitoring in the scope of EURAPMON claimed research techniques as the main benefit, which can be delivered by international networking.

The first and crucial step towards development of common and standardized raptor monitoring protocols was made by British, mainly Scottish raptor experts by preparing a field guide for surveys and monitoring of raptor populations. Although the field guide is dealing only with species occurring in Britain and Ireland, many of considered raptors are actually widely distributed in Europe, what makes the field guide of a broader pan-European or even global interest.

This manual for raptor monitoring has quite extensive introductory part (Part 1), which should be relevant to all raptor monitoring schemes across the globe. In the introductory part, the authors give an overview of raptor monitoring in the UK as an example, solve important distinctions between terms of survey, surveillance and monitoring, which are still not fully understood within the ornithological community, give an overview of topics dealing within comprehensive raptor monitoring scheme (e.g. population estimates, breeding and non-breeding birds), identify key breeding parameters important for raptor monitoring, deal with problems of identification at different levels (including sex, age, prey remains, pellets, etc.) and breeding behaviour aspects including vocalizations, give an overview of different additional techniques important in raptor studies (e.g. individual marking techniques, nomograms, nestboxes) and offer some useful good practice guidelines for the fieldwork with raptors.

The core part of the book is dealing with methodological guidelines and protocols for 22 raptor species regularly occurring in Great Britain and Ireland, including 15 birds of prey, six owls and the Raven *Corvus corax*, and only briefly five irregularly occurring raptors (4 birds of prey and 1 owl). Each species account is structured with the species introduction, description of species ecology (e.g. habitat, home range, nests, breeding biology), and an overview of survey techniques in the breeding and non-breeding seasons. Part 3 is devoted to the feathers and the last Part 4 to the development of raptor chicks. In both parts, extensive photographic materials are provided, which can help fieldworkers as a useful identification guide.

For people studying raptors, this book is indispensable as it was written by Ian Newton in the foreword, and since this is a fundamental step

towards raptor monitoring methods standardization across Europe, the book PDF is fully available at EURAPMON website (http://www.eurapmon.net/sites/default/files/raptors_2nd_ed_001_intro_sections.pdf) thanks to the authors and publisher. We can only wish that this field guide, which is highly valuable for raptor researchers, will be upgraded in the near future with all European raptors and will serve as a key reference for setting raptor monitoring schemes in Europe in a standardized, comprehensive and pan-European way.

Al Vrezec

Slovak Raptor Journal. – Published by: Raptor Protection of Slovakia (RPS). ISSN: 337-3463

As top predators and usually as species of special conservation concern, raptors are frequent research objects to which a special raptor research community is devoted. Raptor researchers are commonly organized in specific raptor research societies, leading also to special raptor related journals. The Raptor Research Foundation from North America, for example, is publishing the most renowned raptor focused journal *The Journal of Raptor Research.*

However, the raptor research community is also strong in Europe and is becoming more and more united, but not yet covered with a common scientific journal. One of the possibilities is the *Slovak Raptor Journal*, a new European raptor focused journal covering birds of prey and owls launched in 2007 by the Raptor Protection of Slovakia society. The journal is published annually, with all papers published in English with Slovak abstracts. All papers are also available through De Gruyter Online (Versita) at http://www.degruyter.com/view/j/srj. The journal is aimed to be international and is fully opened to all topics related to birds of prey and owls. Papers in all six currently published issues are focused mainly on raptor studies in Slovakia and in eastern Europe, although some published studies are also dedicated to raptor studies in Siberia as well as to some large-scale review studies such as an overview of colour ringing and satellite telemetry tracking of the Lesser Spotted Eagle *Aquila pomarina*, Greater Spotted Eagle *A. clanga* and hybrids. Some issues have been more focused on certain raptor species compiling several papers on, for example, the Lesser Spotted Eagle or Imperial Eagle *A. heliaca* biology and ecology.

There were several attempts to unite the specific and very diverse raptor research community in Europe and to launch European scientific journal for raptor research, which would cover all different aspects of raptor studies in Europe, including monitoring issues. The Slovak Raptor Journal is currently the most perspective journal to reach this goal.

Al Vrezec

Kazalo letnika 33 (2012), št. 152–155: str. 1–336

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Kratki prispevki / Short Communications

Nove knjige / New books

Najave in obvestila / Announcements

Kazalo znanstvenih imen ptic / Index of scientific names of birds

Seznam recenzentov letnika 33 (2012)

The list of manuscript reviewers of Volume 33 (2012)

Spisek recenzentov, ki so pregledovali prispevke v reviji Acrocephalus za letnik 33, 2012. Njihov delež pri nastajanju revije je bil velik in ključen pri objavljanju kvalitetnih prispevkov. Urednik se zato vsem iskreno zahvaljuje za opravljene recenzije v minulem letu. Imena recenzentov so urejena po abecednem vrstnem redu brez akademskih naslovov, a z oznakami držav:

The list of manuscript reviewers for the journal Acrocephalus in Volume 33, 2012. Their contribution was great and essential in preparing high quality papers published in Volume 33. The Editor would like to thank them for their work in the past year. Names of reviewers are presented in alphabetical order without academic titles but with abbreviations of their countries:

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