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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.

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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.

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