

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. eleonora*) 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, GRLIĆ 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 from 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. leonorae* (ŠČETARIĆ 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 (GRLIČA & GRLIČA 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 (TUŠIŠ *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 (Tušiš *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: Rdeći seznam gnezdećih ptic roparic Hrvaške (Tušiš *et al. in print*); mastni tisk – monitoring uključuje 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 <i>Accipiter brevipes</i>	Black Kite* <i>Milvus migrans*</i>	White-tailed Eagle <i>Haliaeetus albicilla</i>	Honey Buzzard* <i>Pernis apivorus*</i>
Imperial Eagle <i>Aquila heliaca</i>	Griffon Vulture <i>Gyps fulvus</i>	Peregrine Falcon <i>Falco peregrinus</i>	Hobby* <i>Falco subbuteo*</i>
Golden Eagle <i>Aquila chrysaetos</i>	Short-toed Eagle* <i>Circus gallicus*</i>	Pygmy Owl <i>Glaucidium passerinum</i>	Barn Owl <i>Tyto alba</i>
Booted Eagle <i>Aquila pennata</i>	Marsh Harrier* <i>Circus aeruginosus*</i>		Eagle Owl* <i>Bubo bubo*</i>
Bonelli's Eagle <i>Aquila fasciata</i>	Montagu's Harrier* <i>Circus pygargus*</i>		Little Owl <i>Athene noctua</i>
Lesser Kestrel <i>Falco naumanni</i>	Lesser Spotted Eagle <i>Aquila pomarina</i>		Ural Owl* <i>Strix uralensis*</i>
Lanner Falcon <i>Falco biarmicus</i>	Eleonora's Falcon <i>Falco eleonorae</i>		Tengmalm's Owl <i>Aegolius funereus</i>
Saker Falcon <i>Falco cherrug</i>			

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 vsedrjavni 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.

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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 Hrvatskem

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) MIKUŠKA (2009), (12) MIKUŠKA (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) ŠČETARIĆ 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

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 <i>Pernis apivorus</i>	1996 2008	L (Paklenica NP) L (Mura, Drava and Danube Rivers)	G. Lukač / PI Paklenica NP I.D. Grlica / NHSD	B B	BP AI	no ***	TM TM	No	5 3
Black Kite <i>Milvus migrans</i>	1999 2008	R (Continental part of Croatia) L (Mura, Drava and Danube Rivers)	T. Mikuska / CSPBN I.D. Grlica / NHSD	W B, M	WP AI	no ***	IWC TM	no	22 3
Red Kite <i>Milvus milvus</i>	2004	R (Baranya region)	T. Mikuska / CSPBN	W	WP	no	IWC	no	22
White-tailed Eagle <i>Haliaeetus albicilla</i>	1993 1998	R (Continental part of Croatia) L (Kopački rit Nature park)	T. Mikuska / CSPBN T. Mikuska / CSPBN; Kopački rit Management office	W B	WP BP, BS	no yes	IWC NSUR	no yes	22 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 <i>Gyps fulvus</i>	1996–99* 1990	L (Paklenica NP) N	G. Lukač / PI Paklenica NP G. Sušić / IOO and ECCIB	B B	BP BP, BS, CD, DM	nest height, orientation yes	TM, NS NS	no metal-rings, colour-rings, wingtags, satellite tracking	5, 6 21
Short-toed Eagle <i>Circus gallicus</i>	1996	L (Paklenica NP)	G. Lukač / PI Paklenica NP	B	BP	no	TM, NS	no	5
Marsh Harrier <i>Circus aeruginosus</i>	2007 1993 2008	L (Vransko jezero ornithological reserve) R (Continental part of Croatia) L (Mura, Drava and Danube Rivers)	I. Lolić / COS T. Mikuska / CSPBN I.D. Grlica / NHSD	B, W W B, M, W	WP; BP WP AI	no no ***	TM IWC CI	no no no	18 22 3
Hen Harrier <i>Circus cyaneus</i>	1999 2008	R (Continental part of Croatia) L (Mura, Drava and Danube Rivers)	T. Mikuska / CSPBN I.D. Grlica / NHSD	W M, W	WP AI	no ***	IWC CI	no no	22 3
Montagu's Harrier <i>Circus pygargus</i>	2005	L (Paklenica NP)	G. Lukač / PI Paklenica NP	B	BP	no	TM (courtship flights)	no	5
Goshawk <i>Accipiter gentilis</i>	1999 1996 2008	R (Continental part of Croatia) L (Paklenica NP) L (Mura, Drava and Danube Rivers)	T. Mikuska / CSPBN G. Lukač / PI Paklenica NP I.D. Grlica / NHSD	W B B	WP BP AI	no no ***	IWC TM TM	no no no	22 5 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 osebikov	Sources/ Viri
Sparrowhawk <i>Accipiter nisus</i>	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 <i>Buteo buteo</i>	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 <i>Buteo lagopus</i>	1999	R (Continental part of Croatia)	T. Mikuska / CSPBN	W	WP	no	IWC	no	22
Greater Spotted Eagle <i>Aquila clanga</i>	1999	R (Continental part of Croatia)	T. Mikuska / CSPBN	W	WP	no	IWC	no	22
Golden Eagle <i>Aquila chrysaetos</i>	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 <i>Falco naumanni</i>	2010	N	K. Mikulić, V. Lucić, I. Budinski / BIOM	B, M	BP, NM	yes	CFI, NS	no	9
Kestrel <i>Falco tinnunculus</i>	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 <i>Falco columbarius</i>	1999	R (Continental part of Croatia)	T. Mikuska / CSPBN	W	WP	no	IWC	no	22
Hobby <i>Falco subbuteo</i>	2007	L (Baranja and Srijem)	I.D. Grlica / NHSD	B	AI	no	NS (electricity pylons)		1
Eleonora's Falcon <i>Falco eleonorae</i>	1998	N	Gvido Piashevli PI/NGO Falco & Dalmatian Nature PI; Vlatka Ščetarić / 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 <i>Falco cherrug</i>	2007	N	I.D. Grlica / NHSD	B	BP, BS	no	NS (electricity pylons)	metal-rings	2
Peregrine Falcon <i>Falco peregrinus</i>	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 <i>Otus scops</i>	1996	L (Paklenica NP)	G. Lukač / PI Paklenica NP	B	BP	no	TM	no	5
Eagle Owl <i>Bubo bubo</i>	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 <i>Strix uralensis</i>	**	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. Turtiš / IOO	B	AI, BS	no	nest-box scheme (100 nb/150 km ²)	metal-rings	23