

Case report and prey analysis of ground-nesting eagle owls (*Bubo bubo*) in Slovakia

Správa o rozboře potravy a zemnom hniezdení výra skalného (*Bubo bubo*) na Slovensku

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Abstract: In current ornithological literature, there is a general consensus that the eagle owl (*Bubo bubo*) is a breeder of rocky habitats in Slovakia, especially on cliffs and quarry walls, but little research to date has concentrated on cases of ground-nesting in the lowland areas of the country. This study provides an overview of the documented cases of eagle owls breeding in lowland forests, a relatively unusual method of breeding for this species. The authors also report a recent case of an eagle owl breeding on the ground in a floodplain forest at the small settlement of Sedín near the forest edge in the western part of the Danube Lowlands. The nest was located in a shallow basin at the base of a large white poplar (*Populus alba*) tree, just 3 m from an oxbow lake. The site was visited three times between 12 April and 12 May 2024, and three young birds were observed in the nest, all of which likely fledged successfully. Prey remains from the nest were analysed and the results are presented here together with those of five other eagle owl nests from the lowlands of Slovakia and the Czech Republic. In the nest near Sedín, the common hamster (*Cricetus cricetus*) was the predominant prey species, in contrast to a location near Vojčice in the East Slovak Lowlands in which the brown rat (*Rattus norvegicus*) predominated or nest sites in Southern Moravia and the Třeboňsko region of the Czech Republic where larger birds were the main prey.

Abstrakt: V ornitologickej literatúre je v podmienkach Slovenska zaužívaný názor, že výr skalný (*Bubo bubo*) je hniezdičom skalných biotopov - predovšetkým skalných stien a kameňolomov, ale takmer chýbajú údaje o hniezdení na zemi v nížinách. Autori popisujú doteraz evidované prípady z pohľadu Slovenska nezvyčajného hniezdenia výra skalného z literatúry, ktoré sa našli na stromoch a v lužných lesoch a podrobne popisujú aktuálny nález zemného hniezdenia výra v lužnom lese v západnej časti Podunajskej roviny. Hniezdo bolo umiestnené v starom mäkkom luhu, pri osade Sedín neďaleko okraja lesného porastu; na zemi v nevýraznej kotlinku pri päte veľkého bieleho topola (*Populus alba*), len 3 m od okraja vody – mŕtveho ramena. Hniezdo bolo medzi 12. aprílom a 12. májom 2024 navštívené trikrát. V hniezde boli 3 mláďatá, ktoré s veľkou pravdepodobnosťou úspešne vyleteli. Potrava výrov z tohto hniezda bola podrobená analýze, spoločne s 5 inými hniezdeniami výra v rovinatých častiach Slovenska a Českej republiky. Na lokalite Sedín na Podunajskej rovine bol početnejšie zastúpený chrček poľný (*Cricetus cricetus*), na lokalite Vojčice na Východoslovenskej rovine potkan hnedý (*Rattus norvegicus*), na južnej Morave a na Třeboňsku väčšie druhy vtákov.

Key words: eagle owl, nesting site, breeding habits, feeding ecology, Strigidae

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Introduction

In Slovakia, the eagle owl (*Bubo bubo*) typically breeds in rocky habitats such as active or disused quarries, or on cliffs and other smaller rocky formations. Other types of breeding site, such as ground nests in forested areas or steep rocky slopes which are overgrown by bushes, are relatively rare, but when there is a lack of their favoured rocky sites, eagle owls can breed also in

forests, either below the roots of fallen trees or among the roots of standing trees, as has been observed in, for example, the Orava Highlands, the Orava Magura range, the Skorušinské Mountains, the Vihorlat Mountains, the southern part of the Laborec Highlands and the Ondavská Highlands. The species does not breed deep in the forests, preferring instead wooded edges near open country (Danko & Karaska 2002).

The habitat of the eagle owl has been characterised as follows: “This species inhabits mainly rocky country with cliffs and ravines, caves, patches of woodland, scattered trees or groves, generally in undisturbed wilderness areas. It also uses open forest, taiga and other types of woodland, wooded steppe, river valleys with gorges, overgrown quarries and farmland with suitable rocky areas or cliffs. Occasionally it uses old tree nests of other species and rarely tree holes” (BirdLife International 2024, Hagemeyer & Blair 1997). Nonetheless, eagle owls have been almost exclusively associated with cliffs and boulders for many decades, undoubtedly because the overwhelming majority of studies published in English, Spanish, French or German are based on research carried out in rocky areas. The linguistic barrier which limits access to works published in, for example, Finnish and/or Russian, has prevented many people outside of the boreal range from associating the eagle owl with flat terrain, forests and clear-cuttings, although we should bear in mind that the distribution range of the species largely overlaps with boreal forest regions (Penteriniani & del Mar Delgado 2019). A similar share of habitats was also determined on the territory of the former Czechoslovakia: from 158 identified nests, 83 (52.6%) were located among rocks, 50 (31.6%) on a forested slope below a boulder or beside it; 12 (7.6%) among the underground roots of a fallen tree, 1 (0.6%) in the cavity of a tree stump, 4 (2.5%) among debris on a quarry slope, 2 (1.3%) in the walls of a castle ruin, 6 (3.9%) in raptor nests in varying heights in trees, and 1 (0.6%) in an old hunting lodge (Hudec et al. 1983). The frequent use of raptor nests in trees by eagle owls is well known in the Czech Republic (Bělka & Diviš 1989, Bělka & Crúz 1992).

Cases of eagle owls nesting in forests by eagle owls, either in ground nests in stumps or around roots and fallen trees or in former nests of raptors and storks in trees are also known in Belarus (Gričik 2004). An analysis of older breeding data from Sweden mentioned by Olsson (1979) noted that 80% of nests were found in rocky areas; the remaining 20% were located on the ground (Mikkola & Willis 1983). In the Czech Republic, an eagle owl was even found nesting in a red fox (*Vulpes vulpes*) den (Šťastný et al. 2006).

In Slovakia, the first case of an eagle owl breeding in a former raptor nest was found at Plavecké Podhradie in 1979 (Danko et al. 2002). Another example was found on 13.5.2004, when a female was observed with a chick in a former lesser-spotted eagle (*Aquila pomarina*) nest (Šotnár 2007). A possible breeding attempt in a lowland

floodplain forest was described by Noga (2005). A further case of nest-breeding was found in a narrow buffer zone of trees near the Senné fishponds at Blatná Polianka (Pačenovský et al. 2012), with eagle owls using a former white-tailed eagle (*Haliaeetus albicilla*) nest in 2011 and 2012; the site was used repeatedly until 2016 (Chrašč unpubl. in Danko et al. 2017) when the nest complete disintegrated. Data from the East Slovak Lowlands shows that eagle owls started to move to the lowlands from nearby hilly areas in around 2010 (Danko et al. 2017). A further case of breeding in an old raptor nest in a lowland floodplain forest by the Danube was described by Šotnár (2021).

Some examples of eagle owls breeding in non-rocky habitats, including ground-nesting and breeding in lowland floodplain forests and other lowland environments, from different parts of Europe but especially in Central Europe reported in literature from between 1980 and 2024 are listed and quantified in Table 1.

As early as the 1980s, the breeding of eagle owls close to human settlements was observed with growing frequency in Northern Europe, with the nocturnal activity of the owls enabling them to avoid human activities (Mikkola & Willis 1983). In recent decades, the species has also nested in small forest patches beside fields or near human settlements in Southern Bohemia (Kloubec et al. 2015). Of the 11 eagle owl breeding sites which were known to be active in Malá Fatra National Park throughout the 1980s, only 4 remained occupied in the period 2012–2017; this population decrease is likely explained by the loss of hunting grounds due to changes in land management followed by the afforestation of the surrounding open areas (Flajs 2017).

Between 2013 and 2017, Šnír et al. (2018) recorded 87 breeding attempts by 30 eagle owl pairs in Ponitrie region in the northern part of Nitrianska Pahorkatina and the margins of the Tribeč Mountains, the Strážov Mountains and Považský Inovec, an area of 1440 km²; 15 pairs in quarries, 5 in rocks, 3 in forests (1 in a tree and 1 on the ground) and 1 pair in a castle ruin. It has also been hypothesized that ground-breeding of eagle owls is probably more widespread but overlooked in areas without rocky habitats (Danko, Karaska in: Danko et al. 2002).

An extensive study of the diet of the eagle owl across much of its Palearctic distribution area was recently published by Obuch (2024). The study noted a long-term change in the overall survival strategy of the species in Slovakia (Obuch 2021). The majority of the eagle owl population now breeds on the edges of mountain valleys; in the past, they hunted small mammals and amphibians

Tab. 1. Known cases of ground-nesting of eagle owls and nesting in forested areas in some Central-European countries and Europe as a whole from 1980–2024.

Tab. 1. Známe prípady zemného hniezdenia a iných spôsobov hniezdenie v zalesnených oblastiach u výra skalného v strednej Európe aj v širšom okolí v rámci Európy v rokoch 1980-2024.

nest specification	country/region/site	No of cases	citation
ground-nesting	Sweden	20% of all cases	Olsson 1979
ground-nesting	former Czechoslovakia	12	Hudec et al. 1983
ground-nesting on a clay slope	Slovakia	1	Karaska 1995
ground-nesting on abandoned railway bridge	Slovakia	1	Karaska 1995
ground-nesting	Czech Republic	1	Červený & Obuch 1999
ground-nesting	Belarus	No of cases not specified	Gričik 2004
ground-nesting	Czech Republic	1	Šťastný et al. 2006
ground-nesting	Slovakia	1	Šnír et al. 2018
on a building - Bojnice castle tower	Slovakia	1	Danko et al. 2000
in former raptor nest	Plavecké Podhradie, Slovakia	1	Danko et al. 2002
in lowland forests	West Slovakia	1	Noga 2005
in heron and stork nests	Czech Republic	No of cases not specified	Šťastný et al. 2006
in a fox den	Czech Republic	1	Šťastný et al. 2006
in lesser-spotted eagle nest	Opatovce nad Nitrou, Prievidza district, Slovakia	1	Šotnár 2007
in a nestbox for sakers on an electricity “pylon; 1 pair bred in 2008-12 “	Budkovce, East Slovakia	5	Mihók & Lipták 2010
in ruins of a building	near Trebišov, East Slovakia	1	Hrtan 2010
in a nestbox for saker falcons in a tree, in a floodplain forest	South Moravia	2	Horal & Škorpíková 2011
in former white-tailed eagle tree-nest, in a floodplain forest	South Moravia	1	Horal & Škorpíková 2011
in former goshawk nest, in a floodplain forest	South Moravia	1	Horal & Škorpíková 2011
in former black stork nest, in a floodplain forest	Austria	1	Horal & Škorpíková 2011
in former raptor nest, in a floodplain forest	Austria	1	Horal & Škorpíková 2011
in former white-tailed eagle nest, 1 pair bred in 2011-16	Blatná Polianka, East Slovakia	6	Pačenovský et al. 2012, Danko et al. 2017
in old black stork nest, 3 pairs	between Pácin and Strážne villages, Hungary	3	Danko et al. 2017
in former common buzzard nest	between Pácin and Strážne villages, Hungary	1	Danko et al. 2017
in probable former white-tailed eagle nest	Danube Lowlands, Slovakia	1	Šotnár 2021

on pastureland located deep in the mountains, but they have recently adapted to hunting larger prey in more intensively farmed valleys (Obuch 2021).

Another case of ground-nesting by eagle owls was found in 2024 in a floodplain forest in the western part of the Danube Lowlands. The breeding record is described below.

Methods

The nest was observed during 3 daytime visits from a distance of 20 m using 12x50 binoculars. The timing of the checks was minimised in order to avoid disturbance. The area is known as the former breeding site of a pair of white-tailed eagles, and the eagle nest is located only 500 m from the ground nest of the eagle owl; white-tailed

eagles are known to have used the nest until 2020. The surrounding area of the extensive floodplain forest along the Malý Dunaj River is open agricultural land; part of the area is also used as a golf course from April until the autumn months.

The young birds were ringed, and prey remains and pellets were collected from the nest. The pellets were broken down in 5% NaOH and washed in water. After the bones had dried, the following material was identified: mammal jawbones, four types of bird bones (beaks, *humerus*, *metacarpus* and *tarsometatarsus*), frog hip bones (*os ilium*), insect heads and jaws. The abundance of specific species was determined as the minimum possible number based on the most commonly identified body parts (Minimum Number of Individuals, MNI). The results were compared using the methodology of marked difference from the mean (MDFM, Obuch 2001) and presented in the form of a contingency table with differences 1+ and 1-.

Results

The nest was found on 12 April 2024 near the edge of a floodplain forest close to the settlement of Sedín in the cadastral area Nové Osady, ca 6 km south of the village of Veľké Úľany in the western part of the Danube Lowlands. Inside the nest were 3 small, white nestlings of around 10–14 days old (Fig. 1). The ground nest of the eagle owl was located at the foot of a white poplar (*Populus alba*) tree on the bank of an oxbow lake, only 3 m from water (Fig. 2). The second visit to the nest was carried out on 14 April and the nest was observed from the opposite bank of the oxbow

lake. An adult female eagle owl was guarding its young chicks; she was lying on the nest and did not leave.

The third visit was performed on 12 May. The nest itself was only a small area dug into forest soil, directly below a tree, hidden from its surroundings by low bushes. By this time the young birds were about 6–7 weeks old and were found at a distance of 3 to 8 m from their nest. The female was observing them from the surrounding trees.

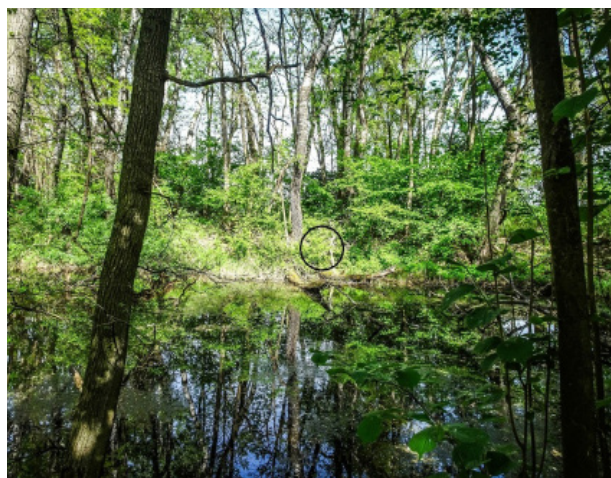


Fig. 2. Nest site of eagle owl (*Bubo bubo*) at the base of a white poplar tree (*Populus alba*), indicated with a circle (Photo: K. Šotnár).

Obr. 2. Hniezdo výra skalného (*Bubo bubo*) pri päte topoľa bieleho (*Populus alba*), miesto vyznačené kruhom (Foto: K. Šotnár).



Fig. 1. Eagle owl (*Bubo bubo*) nestlings, aged 10–14 days, with several prey items found in the nest during the first check (Photo: S. Pačenovský).

Obr. 1. Mláďatá výra skalného (*Bubo bubo*) vo veku 10 - 14 dní, so zvyškami potravy nájdenými počas prvej kontroly pri hniezde (Foto: S. Pačenovský).

Six samples of prey remains from eagle owl nest sites located in the lowlands of Slovakia and the Czech Republic were also analyzed (Table 2). The most abundant prey item at the Sedín site was the common hamster (*Cricetus cricetus*); at Vojčice in the East Slovak Lowlands the brown rat was predominant (*Rattus norvegicus*), while larger species of birds prevailed in Southern Moravia and the Třeboňsko region.

Discussion

Our observations confirmed earlier suggestions regarding the inconspicuous nature of eagle owls; their breeding activities can often escape attention, especially in areas without rocky formations or quarries. The distribution shift of eagle owls towards lowland areas of Slovakia with a lack of rocky areas is probably connected with a wider availability of larger prey, both in terms of mammals and birds. Traditional breeding sites on rocks are often

Tab. 2. Vzorky potravy výra skalného (*Bubo bubo*) z rovinatých častí Slovenska a Českej republiky
Tab. 2. Food samples of eagle owl (*Bubo bubo*) from the lowlands of Slovakia and the Czech Republic.

Species \ Sample No	1	2	3	4	5	6	Total	%
<i>Erinaceus roumanicus</i>		1		1	1		3	2.34
<i>Lepus europaeus</i>	3		1	4			8	6.25
<i>Mus cf. musculus</i>	1						1	0.78
<i>Apodemus flavicollis</i>	1						1	0.78
<i>Apodemus microps</i>	1						1	0.78
<i>Rattus norvegicus</i>	7	1	1+ 8	1			17	13.28
<i>Cricetus cricetus</i>	1+ 12	1	1	2	1		17	13.28
<i>Arvicola amphibius</i>			1		1	3	5	3.91
<i>Microtus arvalis</i>			2	3	1+ 10	1	16	12.50
<i>Microtus agrestis</i>						1	1	0.78
Mammalia	1+ 25	3	13	11	13	1- 5	70	54.69
<i>Anas platyrhynchos</i>		1		4	1	1	7	5.47
<i>Falco tinnunculus</i>					1		1	0.78
<i>Perdix perdix</i>				4	1		5	3.91
<i>Phasianus colchicus</i>				2			2	1.56
<i>Gallinula chloropus</i>			1	1			2	1.56
<i>Fulica atra</i>						1	1	0.78
<i>Chroicocephalus ridibundus</i>						1+ 10	10	7.81
<i>Columba livia domestica</i>					1		1	0.78
<i>Streptopelia decaocto</i>					1		1	0.78
<i>Streptopelia turtur</i>				1			1	0.78
<i>Bubo bubo</i>				1			1	0.78
<i>Asio otus</i>				1	2		3	2.34
<i>Strix aluco</i>				1	3		4	3.13
<i>Anthus trivialis</i>	1						1	0.78
<i>Phylloscopus trochilus</i>	1						1	0.78
<i>Turdus merula</i>				2		1	3	2.34
<i>Turdus philomelos</i>					1	1	2	1.56
<i>Passer domesticus</i>	1						1	0.78
<i>Oriolus oriolus</i>				1			1	0.78
<i>Garrulus glandarius</i>				1			1	0.78
<i>Corvus cornix + frugilegus</i>				1			1	0.78
Aves	1- 3	1	1- 1	1+ 20	11	14	50	39.06
<i>Pelophylax cf. esculentus</i>					1		1	0.78
Amphibia	0	0	0	0	1	0	1	0.78
Coleoptera sp.					1	5	6	4.69
<i>Gryllotalpa gryllotalpa</i>			1				1	0.78
Evertebrata	0	0	1	0	1	5	7	5.47
Total	28	4	15	31	26	24	128	100

Sample No: 1 - Sedín, 12.5.2024, ground nest, leg. K. Šotnár, 2 - Dolný Chotár, 3.6.2021, below nest tree, leg. K. Šotnár, 3 - Vojčice, 21.5.2010, on building, leg. E. Hrtan, SRJ 2010, 4 - Břeclav, Trnavá, 1.10.2019, leg. H. Matušík, 5 - Lanžhot, Zaječí jezero, 1.10.2019, leg. H. Matušík, 6 - Novořecká hráz, 26.7.1993, Červený & Obuch 1999.

Lokality: 1 - Sedín, 12.5.2024, hniezdo na zemi, leg. K. Šotnár, 2 - Dolný Chotár, 3.6.2021, pod.hniezdnym stromom, leg. K. Šotnár, 3 - Vojčice, 21.5.2010, v budove, leg. E.Hrtan, SRJ 2010, 4 - Břeclav, Trnavá, 1.10.2019, leg. H. Matušík, 5 - Lanžhot, Zaječí jezero, 1.10.2019, leg. H. Matušík, 6 - Novořecká hráz, 26.7.1993, Červený & Obuch 1999.

abandoned by eagle owls due to the growing disturbance posed by tourists and rock climbers (Obuch 2021), while traditional feeding habitats in mountains are also increasingly abandoned due to afforestation (Flajs 2017).

A growing number of eagle owl pairs are known to nest in forested lowland areas (Pačenovský et al. 2012, Danko et al. 2017, Šotnár 2021). Only small amounts of prey remains have been found at these lowland nest sites, a finding which suggests the short-term utilisation of these nests. At less suitable breeding sites a higher mortality rate among chicks was observed, and we therefore assume that eagle owls can find better food supplies with more optimal prey size in lowland regions, but that they also face a higher risk of the predation of young (Obuch 2024).

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