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Ornis Hungarica 2023. 31(2): 243–246.
DOI: 10.2478/orhu-2023-0034

Scavenging by young tortoises (*Testudo* sp.) could induce their predation by the Eurasian Eagle-Owl *(Bubo bubo)*

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Received: September 25, 2023 – Revised: October 14, 2023 – Accepted: October 26, 2023

Milchev, B. 2023. Scavenging by young tortoises (*Testudo* sp.) could induce their predation by the Eurasian Eagle-Owl *(Bubo bubo)*. – Ornis Hungarica 31(2): 243–246. DOI: 10.2478/orhu-2023-0034

Abstract Eating owl pellets by non-predator vertebrates is a rare and difficult-to-prove food chain relationship. In this paper, I reported the first record of a Spur-thighed Tortoise *(Testudo graeca)* eating a Eurasian Eagle-Owl *(Bubo bubo)* pellet with remains of a right Wood Pigeon *(Columba palumbus)* wing. Scavenging of food remains around owl nests by young tortoises may possibly explain the few cases of tortoise-eating Eurasian Eagle-Owls.

Keywords: diet, owl pellet, facultative scavenging, *Testudo graeca*

Összefoglalás A nem ragadozó gerincesek bagolyköpet fogyasztása egy ritka és nehezen bizonyítható kapcsolat a táplálékhálózatokban. Jelen munkában elsőként számolok be a mór teknős *(Testudo graeca)* bagolyköpet fogyasztásának egy esetéről, amikor a teknős uhu *(Bubo bubo)* köpetben található, örvös galamb *(Columba palumbus)* jobb szárnyának maradványát ette. A bagolyfészkek körüli táplálékmaradványok fiatal teknősök általi fogyasztása lehetséges magyarázatot nyújt az uhu teknős predációjának néhány ismert esetére.

Kulcsszavak: étrend, bagolyköpet, fakultatív dögevés, *Testudo graeca*

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The Eurasian Eagle-Owl *(Bubo bubo)* is usually a nocturnal ambush hunter in a wide variety of habitats preferring more open landscapes (Penteriani & Delgado 2019, Scherzinger & Mebs 2020). This largest owl predates opportunistically primarily mammals and birds with a preferred mass between 200 and 1,900 g (Glutz von Blotzheim & Bauer 1994). As a generalist, the Eurasian Eagle-Owl also includes many other vertebrates and larger invertebrates in its varied diet especially when the main local prey is scarce (Glutz von Blotzheim & Bauer 1994, Penteriani & Delgado 2019).

Tortoises (*Testudo* sp.) are one of its rarest prey in a sympatric distribution with this predator around the Mediterranean and in Asia Minor. Young tortoises with a not yet well ossified shell are accessible to the Eurasian Eagle-Owl *(Table 1)* (Tzankov & Milchev 2014). The robust shell of adult tortoises is reliable protection from this predator. The only adult tortoise in the diet of this owl (Bayle & Prior 2006) was most likely to be carrion (review Allen *et al*. 2019). The very low number of young tortoises in the hunting territory of the Eurasian Eagle-Owl could be an explanation for their rarity in the diet of this opportunistic predator: Spur-thighed (Common) Tortoise *(Testudo graeca)* is listed as vulnerable and

Table 1. Tortoises (*Testudo* sp.) in Eurasian Eagle-Owl *(Bubo bubo)* diets
1. táblázat Teknősök (*Testudo* sp.) az uhu *(Bubo bubo)* táplálékában

Tortoise number	Total prey number	% by prey number	Country	Reference
two young *Testudo* sp.	630	0.3	northeastern Greece	Papageorgiou *et al.* (1993)
one *Testudo* sp.	3,004	0.03	eastern Turkey	Obuch (1994)
an adult *Testudo* sp.	86	1.2	Lebanon	Bayle & Prior (2006)
an about 6–7 years old *Testudo graeca*	62,314	0.002	southeastern Bulgaria	Tzankov & Milchev (2014) Milchev & Georgiev (2019)
two young *Testudo graeca*	9,461	0.02	Israel	Hadad *et al.* (2022)

Hermann's Tortoise *(Testudo hermanni)* as near threatened, respectively (IUCN 2023). However, tortoises were not found, for example, in the Bulgarian owl's diet, even with their higher numbers in the 20th century (Tzankov & Milchev 2014), when tortoises were the main prey of the Golden Eagle *(Aquila chrysaetos)*, another opportunistic raptor in the area (Milchev 2022). The Eurasian Eagle-Owl appears to ignore young tortoises as potential prey, and some emergency situation underlies the rare cases of tortoise preying.

A young Spur-thighed Tortoise, 7–8 years old, was found with a piece of a Eurasian Eagle-Owl pellet in its' mouth of the rocky slope near the owl's nest in southeastern Bulgaria

Figure 1. A young Spur-thighed Tortoise *(Testudo graeca)* with a piece of a Eurasian Eagle-Owl *(Bubo bubo)* pellet in the mouth in SE Bulgaria
1. ábra Fiatal mór teknős *(Testudo graeca)*, szájában uhu *(Bubo bubo)* köpetének maradványával Dél-Bulgáriában

on 03.05.2023 *(Figure 1)*. The unswallowed piece included part of a right Wood Pigeon *(Columba palumbus)* wing: a distal ulna and radius and a proximal carpometacarpus. The tortoise could not break and swallow this hard and large group of bones. Nor could the tortoise gnaw through the strong tendons that connected the bones to the already swallowed part of the pellet. Separating the bones from the tendons to free the tortoise from its predicament did not induce vomiting.

Tortoises are mainly vegetarians, but animal food has been found in their diet: some invertebrates and carcasses of various vertebrates (Bertolero *et al*. 2011, Stojanov *et al*. 2011, Türkozan *et al*. 2023). Hermann's Tortoise ate pellets of Western Barn Owl *(Tyto alba)* and Yellow-legged Gull *(Larus michahellis)* (Bertolero 2015). Feeding on Eurasian Eagle-Owl pellet is new to the Spur-thighed Tortoise diet. But this case also shows a possibility to explaining the rare cases of fatality for young tortoises from conflict with this owl. Not only pellets, but also carcasses of prey are found around the Eurasian Eagle-Owl's nest during the breeding season (Glutz von Blotzheim & Bauer 1994, Penteriani & Delgado 2019). When the carcasses of prey are available for the tortoises to scavenge, this can provoke the attack of the owl guarding them. The only other prey of similar origin in Bulgarian Eurasian Eagle-Owl diets is probably the scolopendra (Arthropoda: *Scolopendra* sp.). Live scolopendras were found under prey items of this owl (author's observations), and 16 specimens (0.03%, n=62314 prey items) were reported in Eurasian Eagle-Owl pellets in SE Bulgaria (Milchev & Georgiev 2019).

The Eurasian Eagle-Owl and both tortoise species are endangered animals in the national red list (Golemanski 2015), and predation by this owl does not threaten the survival of the tortoise population. However, this study adds to the knowledge of facultative scavenging of non-predator species (Sebastián-González *et al*. 2023) and difficult-to-trace food chain relationships between threatened vertebrates.

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