



New Data on the Mammal Diet of the Barn Owl *Tyto alba* (Scopoli, 1769) (Strigiformes: Tytonidae) in the Southern Region of Albania

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Abstract: During 2018-2019, the mammal diet of the barn owl (*Tyto alba*) in the southern region of Albania was studied. A considerable number of barn owl pellets has been collected, of which 1200 specimens of terrestrial small mammals (TSM) have been identified as belonging to 13 species (four insectivore and nine rodent species). Although the diet composition differed spatially from one station to another, the prey species preferred by the barn owl, both as frequency and biomass, were *Microtus thomasi*, *Mus macedonicus*, *Crociodura suaveolens* and *Apodemus sylvaticus*. In the southernmost region of Albania (Aliko), where the highest number TSM species was recorded, a drastic decline of *M. thomasi* was noted, accompanied with a significant shift in the barn owl prey preference. The study is a continuation of the previous studies undertaken in the same region since 2004 and provides new data on the dietary habits of the barn owl as well as on the distribution and population dynamics of TSM.

Key words: barn owl, diet, terrestrial small mammals, dynamics

Introduction

The barn owl *Tyto alba* (Scopoli, 1769) feeds mainly on small mammals. In the Mediterranean region, a combination of suitable climatic conditions and long-term human presence has favoured the establishment of this species, supporting relatively high population densities (OBUCH & BENDA 2009). Barn owl occurs in diverse habitats: from open and extensively cultivated farmlands with a mosaic of grassland and fields to highly urbanised areas (suburbs) and rocky mountains (CRAMP 1985). The relatively small individual territory of the barn owl and low degree of digestion of skeletal elements of prey make it an ideal species to be used in studying the distribution and age structure of populations of small vertebrates (RUPRECHT 1979). In addition,

the analysis of owl pellets has advantages since it reveals rare mammal species, which are difficult to be sampled with traditional capture methods, or species that cannot be identified by using small mammal traps (TETA et al. 2010). Over the last two decades, the diet of the barn owl has raised the interest of Albanian and foreign mammalogists to study not only its dietary habits (BEGO 2003, BEGO & KADIASI 2008) but also to use it as an effective means to assess the distribution and species diversity of terrestrial small mammal (TSM) communities in Albania. Totally, 31 TSM species have been reported in Albania to date, of which 16 species have been reported through barn owl pellets (BEGO et al. 2008, PASPALI & BEGO 2008, PASPALI et al. 2013, BEGO et al. 2018, SMYRILIOU-ZERVA et al. 2019).

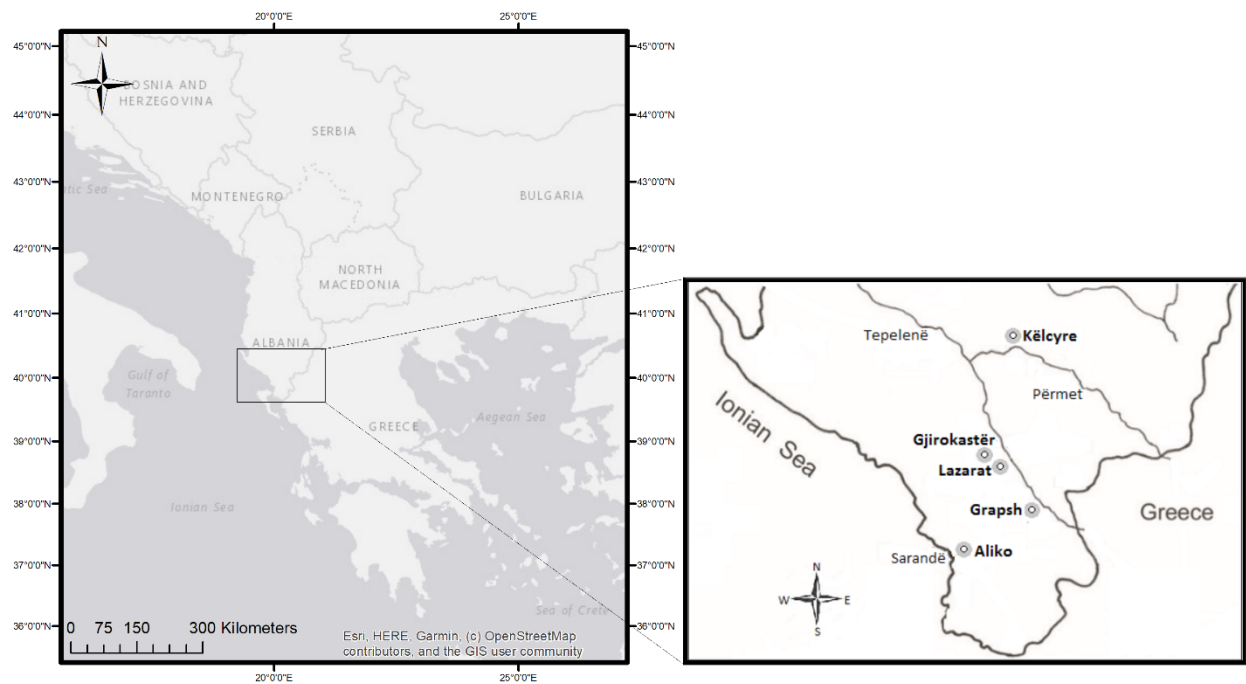


Fig. 1. Sample sites in the southern region of Albania where barn owl pellets were collected

The present study is a continuation of previous ones (starting in 2004) undertaken in the southern region of Albania. It aims to provide new data on mammal diet of the barn owl as well as on the distribution and population dynamics of TSM.

Materials and Methods

Study area

Three locations were sampled (Fig. 1):

Këlcyra (40.313°N 20.192°E) is a small town located between Trebeshina and Dhëmbeli Mountains. Its territory has a hilly-mountainous character. The town itself is located at 230 m a.s.l. It is placed at the confluence of the rivers Vjosa and Dëshnica, whose flows have created two narrow valleys covered mostly by mosaic agricultural lands. The Vjosa River collects a number of karstic springs and its riverbed represents unique habitats, in which riparian vegetation intersperses with herbaceous and woodland vegetation.

Gjirokaster, Lazarat and Grapsh are located on the west-facing slopes of the Drinos Valley (40°17'12"N 20°02'32"E) and are situated between 200 and 250 m a.s.l. The valley is distinguished for its high precipitation and rich hydrography. The main hydrographical artery is the Drinos River, one of the two main tributaries of the Vjosa River. Forest coverage is poor, with the main vegetation being shrubs and degraded oak woodland. Relatively well-developed and dense vegetation coverage is found

downstream in the valley, comprising typical riparian species dominated by the Oriental plane (*Platanus orientalis*) and willows (*Salix* spp.).

Aliko (39°52'N 20°5'E) is a village, part of the Finiqi Municipality and is confined by the Vurgu field. The latter has a length of 13 km and an altitude 0–30 m a.s.l. The Vurgu field is placed in the lower part of Bistrice and Kalasa River watersheds. Its geographical position in the southern corner of Albania and the influence of the Ionian Sea makes the area one of the warmest in the country. The area is dominated by the Mediterranean shrubs and oak woodland.

Sample collection methodology

The diet composition of the barn owl is revealed through examination of the skeletal residues of the prey items, mainly cranial remains, including skulls and jaws of prey found in the pellets. Each pellet was treated as an individual sample and analysed separately. Dry pellets were carefully examined and the skeletal residues were picked up with a forceps, avoiding the damage of the anatomic structures of skeletal residues. Prey was identified to the genus and species level following NIETHAMMER & KRAPP (1977, 1982, 1983), YALDEN (1977) and ERFURT (2003), apart from determination of sibling species of the genus *Mus*, where the works of MACHOLAN (1996) and KRYŠTUFEK & MACHOLAN (1998) were used. Diet was expressed in terms of frequency (F) and biomass (B) of the prey items identified. Diet di-

Table 1. Composition of the diet of the barn owl at the sites of the southern region of Albania by % frequency (F) and % biomass (B)

Prey species	Kelcyre		Gjirokaster, Lazarat, Grapsh		Aliko	
	F(%)	B(%)	F(%)	B(%)	F(%)	B(%)
<i>Crocidura</i> sp.	1.7	0.6	1.8	0.7	1.1	0.4
<i>Crocidura leucodon</i>	2.7	1.0	7.4	3.0	6.1	2.0
<i>Crocidura suaveolens</i>	15.0	5.4	21.0	8.6	12.0	3.7
<i>Suncus etruscus</i>	1.7	0.2	2.8	0.3	7.2	0.7
<i>Neomys anomalus</i>	-	-	0.5	0.3	-	-
<i>Muscardinus avellanarius</i>	2.0	2.4	0.2	0.3	14.0	16.0
<i>Micromys minutus</i>	-	-	-	-	1.7	0.7
<i>Apodemus</i> sp.	0.7	1.1	1.4	2.4	2.2	3.1
<i>Apodemus sylvaticus</i>	9.9	15.0	6.9	12	23.0	32.0
<i>Apodemus flavicollis</i>	1.5	2.3	0.2	0.4	0.3	0.4
<i>Apodemus epimelas</i>	-	-	0.2	0.6	-	-
<i>Mus</i> sp.	1.7	1.4	1.2	1.1	1.4	1.0
<i>Mus macedonicus</i>	24.0	20.0	19.0	18.0	25.0	19.0
<i>Mus domesticus</i>	2.0	1.6	1.8	1.7	0.6	0.4
<i>Rattus rattus</i>	0.2	2.9	-	-	1.7	17.0
<i>Microtus</i> sp.	-	-	-	-	0.3	0.3
<i>Microtus thomasi</i>	36.0	46.0	36.0	51.0	3.1	3.5
Total no. of prey	406		434		360	
FNB	4.39		4.57		6.12	
FNBsta	0.28		0.27		0.37	
i/r	0.3		0.5		0.4	

versity was calculated using the standardised Levins index (FNB_{STA}) (LEVINS 1968, COLWELL & FUTUYMA 1971). An environmental index was estimated from the ratio of insectivores to rodents (i/r) found in the diet (MAZZOTTI & CARAMORI 1998, MAGURRAN 2003) and used as an indication of possible biotope alteration within the range of the foraging area of barn owls. Pellets were collected at five stations within the territory of Gjirokastra and Vlora prefectures during 2018–2019. They were found in old abandoned houses, next to urban and rural areas in lowlands.

Results

At all five stations located on the territory of the Gjirokastra and Vlora prefectures, 425 pellets of barn owl were gathered and examined. Totally, 1200 items of TSM were obtained: 13 species, of which four insectivores (Eulipotyphla) and nine rodents (Rodentia). The average number of prey items per pellet varied between 2.8 and 2.9, while the maximum value was 8-9 items/pellet. On the territory of the Gjirokastra Prefecture (Kelcyre, Gjirokaster, La-

zarat and Grapsh), the most preferable prey species, both in terms of frequency and biomass, were *Microtus thomasi* (F = 35.5–36.5%, B = 46.0–51.0%), *Mus macedonicus* (F = 19.0–24.4%, B = 18.0–20.0%) and *Crocidura suaveolens* (F = 15.0–21.2%, B = 5.6–8.6%). On the contrary, in Aliko (Vlora Prefecture), the barn owl diet revealed significant differences as compared with sites in the Gjirokastra Prefecture; the most preferred mammals were rodents, with the predominance of *M. macedonicus* (F = 25.3%, B = 19.0%), *Apodemus sylvaticus* (F = 23.3%, B = 32.0%) and *Muscardinus avellanarius* (F = 14.2%, B = 16.0%) (Table 1, Figs. 2, 3, 4). Thus, in the most southern region of Albania, *M. macedonicus* and *A. sylvaticus* were almost equally preferred as prey by the barn owl, while voles contributed with only 3% of the prey in the diet of the barn owl. Overall, rodents were the dominant prey over insectivores in the study area (i/r varied between 0.26 and 0.50), while species diversity (FNB_{STA}) varied between 0.27 and 0.37. Both territories differed (in terms of diet composition of the barn owl) from one another by the presence/absence of two species: *Neomys anomalus* (found only in La-

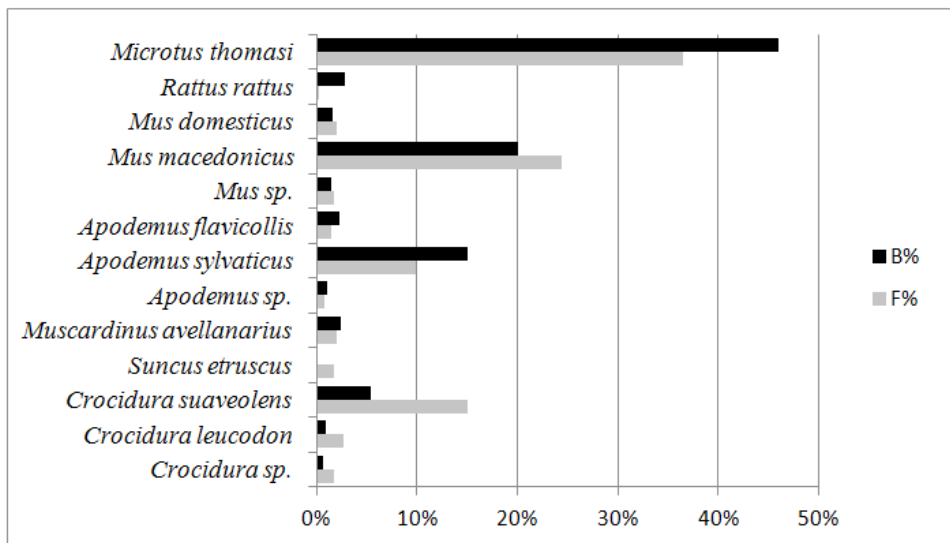


Fig. 2. Frequency and biomass of prey in the barn owl diet of the Kelcyra area, Gjirokaster Prefecture

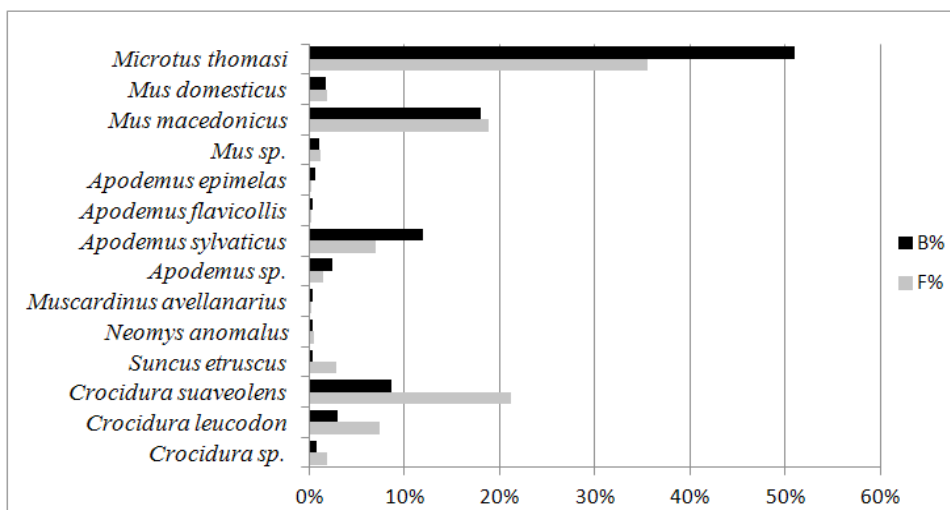


Fig. 3. Frequency and biomass of the prey in the barn owl diet of the Gjirokastra – Lazarat – Grapsh area, Gjirokaster Prefecture

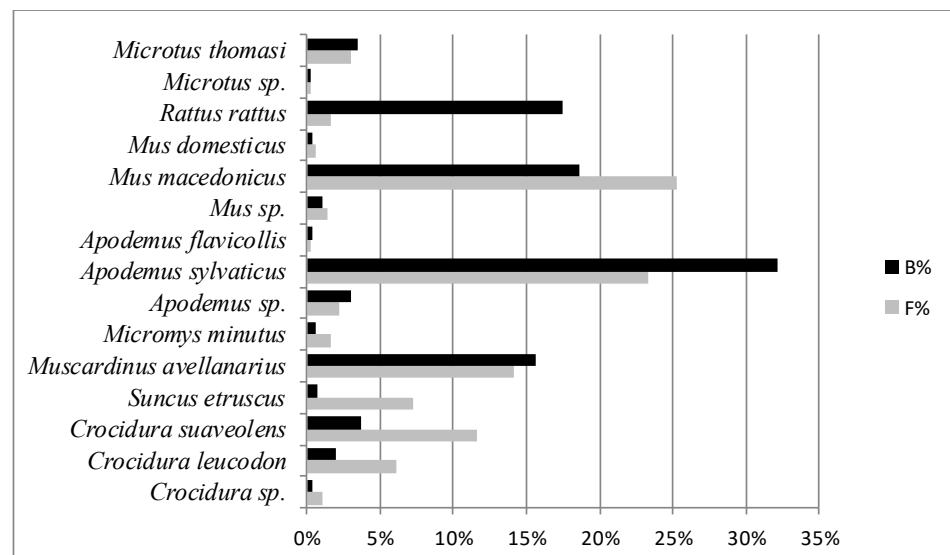


Fig. 4. Frequency and biomass of the prey in the barn owl diet of Aliko area, Vlora Prefecture

zarat, Grapsh) and *Micromys minutus* (found only in Aliko).

Discussion

The study area is situated between 0 and 250 m a.s.l. and is characterised by a uniform structure of land-use practice, dominated by annual crops and forage. This type of land use has notably influenced species diversity in the diet of the barn owl, which thus is low and almost even.

In the Gjirokastra Prefecture, as already anticipated, voles are the most preferable type of prey of the barn owl (above 35%), and this is quite similar with the feeding ecology of the species in Central and Eastern Europe (BOHR 1962, CHEYLAN 1976, VONDRÁČEK & HOŠEK 1984, TAYLOR 1994, OBUCH & Kürthy 1995, HORVÁTH et al. 2005, LATKOVÁ 2008, KITOWSKI 2013). Furthermore, voles continue to be the top prey for the barn owl in all our surveys conducted in this part of the southern region of Albania since 2004, with their frequency being estimated between 23% and 42% (PASPALI & BEGO 2008, PASPALI et al. 2013).

Contrarily, in Aliko, we found a completely new picture as compared to 2006 (PASPALI & BEGO 2008). On this territory, the barn owl exercises a notable feeding behaviour of an opportunistic predator and hunts different species, with the ability to switch to other prey species depending on their abundance (MURDOCH 1969, ANDERSSON & ERLINGE 1977). Voles and shrews are fully replaced by *Mus* and *Apodemus*. In the Vurgu field, where the Aliko Village is located, during our previous studies in 2006, 2007–2008, 2018–2019, a progressive increase of the barn owl preference for *M. macedonicus* (with 9.4%, 13%, and 25.3%, respectively), *A. sylvaticus* (with 3.1%, 9.9%, and 23.3%, respectively) and *M. avellanarius* (with 3.13%, 6.3%, and 14.2%, respectively) is noted. In 2019, in Aliko, for the first time mice exceed voles, with the latter almost disappearing as a prey item in the barn owl's diet. Voles had a drastic decline to only 3% in the barn owl diet, while back in 2006 voles represented about 46% of the barn owl prey (PASPALI & BEGO 2008). According to BONTZORLOS et al. (2009), barn owl can change its main prey in habitats where population of *Microtus* spp. is low and *Mus* spp. can replace *Microtus* spp. and *Crocidura* spp. in inland places with dry and hot Mediterranean climate (MILTSHEV et al. 2004, MILCHEV et al. 2006). Geographical variations in prey use by the barn owl have been attributed to different factors such as habitat, location, altitude, rainfall and temperature (HERRERA 1974b,

MARTI 1974, TORRE et al. 1996, YOM TOV & WOOL 1997). In our study area, the climatic characteristics are quite similar. It is demonstrated by the values of niche breadth and environmental index that oscillate in narrow limits ($i/r = 0.3 - 0.5$; $FBN_{sta} = 0.27 - 0.37$). Thus, the geographical particularities affecting small mammal diversity, along with habitat structure, are probably the factors involved in prey selection at the sites studied, as reported by MARTI (1988). The Vurgu field, over the recent years, is being more intensively used as an agricultural area; as a result, the habitat heterogeneity has gradually reduced. Consequently, in an agriculture land, the favourable conditions for rodent populations to grow have been gradually created, while the insectivore species that prefer vegetation dominated by shrubs and herbs have gradually declined. Nevertheless, insectivores are still an important prey in the diet of the barn owl. The fact that in Aliko the pygmy shrew (*S. etruscus*) represents 7% of the prey of the barn owl, regardless its small contribution to the diet as biomass, is underscored. The presence of this species on this territory is explained with the availability of the habitats preferred by it, such as riverbanks and lakeshores as well as human cultivated areas (abandoned gardens, orchards, vineyards, olive groves). In various studies in the Mediterranean region, the share of *S. etruscus* in the diet is usually high (NIETHAMMER 1989, TEMM 2000, POPOV et al. 2004, OBUCH & BENDA 2009).

The territory of the Gjirokastra Prefecture, contrary to Aliko, has a higher natural heterogeneity. The extended fields on both sides of the river valleys of Vjosa and Drino, often interrupted by abandoned plots of agricultural lands, are confined with hilly terrains and intersected by streams and torrents. These landscape features have notably contributed to the presence of shrews (*C. suaveolens*, *C. leucodon*). In our studies during 2004–2019 (PASPALI & BEGO 2008, PASPALI et al. 2013), shrews of the genus *Crocidura* were first or second most preferable prey for the barn owl on this territory. However, during the same period (2004–2019), a gradual decline of shrews from 37% to 30% was noticed, correlating with changes in the land use practices, with more land put under cultivation with annual crops, thus, negatively influencing the shrews' community. Another indicator of significant changes in the environment is the low presence of *N. anomalus* in the diet of the barn owl in the recent years. While during 2004–2011, the frequency of this species in the barn owl's diet was estimated to 2.48–4.56%, it sharply declined to only 0.46% in our last study. Degradation of natural habitats, climate changes and

impacts of wildfires are, in our opinion, the main contributing factors to such a decline of this species. The southern region of Albania is becoming more arid and hotter, contributing to the reduction of precipitations and river flows, due to which many river sections and torrents remain dry for longer period, which, in return, negatively affects the riparian vegetation, which is a preferred type of habitat for *N. anomalus* (SPITZENBERGER 1990, KRYŠTUFEK & QUADRACCI 2008). Bats and moles are absent in the barn owl's diet due to the fact that they are not an easy prey to catch by this predator. Moles exercise a very low surface activity (GIGER 1965). OBUCH & BENDA (2009) suggested that there was no specialisation to bat hunting by the barn owl in the Mediterranean region, albeit some studies would suggest some specialisation (SOMMER et al. 2005, BENDA et al. 2006). Nevertheless, when present, their frequency in the diet of barn owl is very low. Our study on the barn owl's diet conducted some ten years ago confirmed the same finding – moles accounted for 0.21% while bats – only 0.02% (PASPALI et al. 2013). Probability to encounter these types of prey in the barn owl diet increases when the number of the prey items is more than 1000.

In conclusion, the feeding behaviour of the barn owl in the southern region of Albania is typically selective, as it is has been reported in most of the Mediterranean and European countries. Our recent studies compared with those of the last decade reveal that the barn owl's diet composition in terms of prey items remained almost the same. Changes are notable in the prey preference and those changes are explained with spatial and temporal factors, such as landscape features of the territories, natural vegetation, habitat heterogeneity, land use and season.

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