

NEW LOCALITIES OF SMALL MAMMALS (MAMMALIA: EULIPOTYPHILA, RODENTIA) FROM THE BARN OWL (*TYTO ALBA*) DIET IN THE KAZANLAK VALLEY (CENTRAL SOUTH BULGARIA)

Boyan Milchev

University of Forestry, Department of Wildlife Management, 10 Kl. Ochridski Blvd.,
1765 Sofia, Bulgaria. E-mail: boyan.m@abv.bg

Received: 08 November 2012

Accepted: 30 December 2012

Abstract

The study bases on pellet analyses of Barn owl (*Tyto alba* (Scopoli, 1769)) in 27 breeding localities with total 18,314 preyed small mammals in the Kazanlak valley. Five species: *Sorex araneus* (Linnaeus, 1758), *Sorex minutus* (Linnaeus, 1766), *Suncus etruscus* (Savi, 1822), *Muscardinus avellanarius* (Linnaeus, 1758), and *Myodes glareolus* (Schreber, 1780) were found for the first time in the study area. The distribution of *Microtus subterraneus* (de Selys-Longchamps, 1836) was found to be much wider than reported. *Suncus etruscus* was the only Mediterranean and typical lowland inhabitant among them and the new localities mark the northern border of its distribution in Bulgaria. The other five species are common mountainous inhabitants with single localities in lowlands. The adjacent high mountains favor their distribution in the Kazanlak valley but they were rare preys of Barn owls between 0.01 % and 0.68 % among the small mammals.

Key words: Eulipotyphla, Rodentia, distribution, *Tyto alba*, diet.

Introduction

The fauna of small mammals (Eulipotyphla, Rodentia) in the Kazanlak plane has been investigated carefully by Hristov (1974), who trapped and studied 19 species. Popov (2003) and Peshev et al. (2004) added other 3 rodents (*Rattus norvegicus* (Berkenhout, 1769), *Mesocricetus newtoni* (Nehring 1898), *Microtus rossiaemeridionalis* (Ognev 1924) for the regional fauna. The analyses of owl diets has already proved their high effectiveness in studies of the species composition, distribution and relative numbers of small mammals in Bulgaria

(Popov 1993, Popov and Milchev 2001, Popov et al. 2004, Georgiev 2004, Milchev 2006, 2009). Such study has not been carried out in the Kazanlak valley.

This study presents new information about the species composition of the small mammals in the Kazanlak valley by analyses of the Barn owl diet.

Material and Methods

The study area covers the kettles of Kazanlak, Tvarditza and Shivachevo drained by the Tundzha River, located between the mountains Sredna gora on

Table 1. Cranial measurements (mm) of investigated shrews' species from the Kazanlak valley (CS Bulgaria).

Species	PL	BCW	ZW	IOW	PGW	Lcl ¹ -M ³	LcP ⁴ -M ³	LcM ¹ -M ³	LcA ¹ -A ⁵	LaA ¹ -A ⁵
<i>Sorex araneus</i>	2.61±0.10 2.37–2.89 n=72	9.40±0.25 9.07–9.69 n=5	5.29±0.18 4.85–5.67 n=63	3.71±0.21 3.4–4.54 n=70	5.56±0.20 5.15–5.88 n=65	8.39±0.23 8.04–8.87 n=25	4.71±0.13 4.43–5.05 n=58	3.35±0.11 3.09–3.61 n=58	2.78±0.18 2.32–2.99 n=37	2.19±0.13 2.06–2.53 n=25
<i>Sorex minutus</i>	6.57±0.19 6.19–6.8 n=41	7.61±0.26 7.32–7.94 n=4	4.51±0.14 4.28–4.74 n=33	2.90±0.12 2.47–3.14 n=41	4.40±0.13 4.18–4.64 n=35	6.59±0.23 6.19–6.86 n=6	3.91±0.15 3.45–4.38 n=42	2.81±0.12 2.37–3.09 n=42	2.05±0.08 1.98–2.16 n=7	1.65±0.08 1.44–1.75 n=23
<i>Suncus etruscus</i>	4.8 n=1					5.47 n=1	3.13 n=1	2.13 n=1	1.7 n=1	

the south and Stara planina on the north, around 800 km². Its western border is the transverse hill Krastetz (N 42° 35' E 25° 00', 540 m a.s.l.) and the eastern one is the Mejdenishki gorge of the Tundzha River (N 42° 35' E 26° 05', 190 m a.s.l.). The flat surface of the kettles is relieved by superficial cones formed by the rivers from Stara planina Mts and some inner eminence mainly around the two water reservoirs along the Tundzha River. The climate is moderate continental with middle temperatures in January around 0 °C up to +1,5 °C and in July around +21 °C. The cinnamonic forest soils (*Chromic cambisols*) predominate in the region (Georgiev 1998). Open areas with prevalence of arable land and low-exploited pastures dominate. The farmlands are cropped mainly with wheat, barley and sunflower. The rose and lavender plantations have larger cover in the northwestern and the western parts of the region. The forests are broad-leaved and have insignificant area, predominantly preserved along the river beds.

The material studied consists of intact and destroyed pellets of Barn owls from their nests and roosting places in 27 localities collected in the middle of June and at the beginning of September

2012. The mammals were identified according to Peshev et al. (2004) and our comparative collection. Estimates of the minimum number of individuals were based mainly on the remains of crania, cranial fragments and mandibles. Material was deposited in the National Museum of Natural History. The distribution of mammals was mapped using 10-km squares of the Universal Transverse Mercator grid. The scorable cranial dimensions were taken under a stereo-microscope or with a vernier caliper measuring according to Peshev et al. (2004). Skull: PL – palatal length; BCW – braincase width; ZW – zygomatic width; IOW – interorbital width; AOW – anterior interorbital width; PGW – postglenoid width; RW – maximal rostral width; IFW – foramina incisive width; IFL – foramina incisive length; PBL – palatal bridge length; DL – diastema length; LW – lacrimale width; Lcl¹-M³ – coronal length of I¹-M³; LcP⁴-M³ – coronal length of P⁴-M³; LcM¹-M³ – coronal length of M¹-M³; LaM¹-M³ – alveolar length of M¹-M³; LcA¹-A⁵ – coronal length of A¹-A⁵ (A¹-A⁴ for *Suncus etruscus* (Savi, 1822)); LaA¹-A⁵ – alveolar length of A¹-A⁵; Mandible: LMD – length; LDL – lower diastema length; HPC – height of coronoid process; HMd/M₂ – height of horizontal ramus un-

der M_{2i} , $LMD+I_1$ - length of mandible with I_1 ; Lcl_1-M_3 - coronal length of I_1-M_3 ; LcP_4-M_3 - coronal length of P_4-M_3 ; LcM_1-M_3 - coronal length of M_1-M_3 ; LM_1 - length of M_1 ; WM_1 - width of M_1 . The results of descriptive statistics in Table 1, 2, and 3 represent

18,314 preyed small mammals in the Barn owl diet in the Kazanlak valley.

1. Common shrew *Sorex araneus* (Linnaeus, 1758) is a numerous inhabitant in our mountains with single localities in lowlands (Peshev et al. 2004). This new for

Table 2. Mandible measurements (mm) of investigated small mammals' species from the Kazanlak valley (CS Bulgaria).

Species	LMd	LMd+ I_1	Lcl $_1$ - M_3	HPC	HMD/ M_2	LDL	LcP $_4$ - M_3	LcM $_1$ - M_3
<i>Sorex araneus</i>	9.63±0.23 9.18–10.28 n=71	11.69±0.26 11.14–12.46 n=70	7.72±0.25 6.7–8.35 n=66	4.57±0.13 4.23–4.85 n=72	1.40±0.08 1.24–1.6 n=72		4.73±0.11 4.48–5.1 n=67	3.79±0.11 3.61–4.12 n=67
<i>Sorex minutus</i>	7.52±0.21 7.11–8.14 n=39	9.13±0.27 8.51–9.59 n=39	6.11±0.21 5.72–6.49 n=38	3.11±0.12 2.94–3.36 n=39	0.87±0.06 0.72–0.98 n=39		3.90±0.13 3.66–4.12 n=37	3.20±0.12 2.99–3.45 n=38
<i>Suncus etruscus</i>	6.08±0.05 6.03–6.13 n=3	7.13±0.59 6.47–7.61 n=3	4.97±0.03 4.95–5 n=3	2.93±0.04 2.9–2.97 n=3	0.86±0.02 0.85–0.88 n=3			2.55±0.02 2.53–2.57 n=3
<i>Muscardinus avellanarius</i>	11.93±0.62 10.32–12.66 n=25	12.28 n=1		6.10±0.16 5.93–6.44 n=16	1.86±0.25 1.34–2.37 n=26	3.32±0.2 2.94–3.56 n=30	4.28±0.14 3.88–4.43 n=24	
<i>Myodes glareolus</i>	13.48–13.77 n=2	14.7–15.7 n=2	9.64–9.69 n=2	6.08 n=1	2.16–2.27 n=2	3.14–3.35 n=2		4.73–4.77 n=2
<i>Microtus subterraneus</i>	13.84±0.62 12.37–15.14 n=76	15.18±0.82 13.3–17.2 n=73	10.36±0.61 9.01–11.52 n=68	6.77±0.36 5.48–7.42 n=30	2.27±0.18 1.86–2.78 n=93	3.45±0.18 2.89–3.81 n=93		5.13±0.27 4.35–5.75 n=71

Table 3. Cranial measurements (mm) of the Common dormouse (*Muscardinus avellanarius*) from the Kazanlak valley (CS Bulgaria).

Species	RW	IFW	IFL	PBL	DL	PL	LaM 1 -M 3	AOW	LW	IOW
<i>Muscardinus avellanarius</i>	4.02–4.12 n=2	1.82±0.66 1.44–2.58 n=3	3.72±0.53 3.25–4.43 n=4	4.47±0.42 3.97–4.85 n=4	5.61±0.20 5.41–5.88 n=4	8.76 n=1	4.53±0.14 4.12–4.74 n=20	3.09 n=1	6.6–6.8 n=2	3.38±0.03 3.35–3.4 n=3

sent the following ones: arithmetic mean ± standard deviation; minimal – maximal observed values, n – sample size.

Results and Discussion

Five new species and one with only two known localities were found among

the study area species was discovered in 6 localities (315–470 m a.s.l.; Fig. 1) with 77 individuals (0.42 %, $n=18,314$, Table 1, 2). Hristov (1974) reported 1 specimen trapped in the nearby Karlovo valley.

2. Pygmy shrew *Sorex minutus* (Linnaeus, 1766) is a common mountainous inhabitant with patchy distribution in lowlands (Peshev et al. 2004). It is a new species for the area in 5 localities (310–

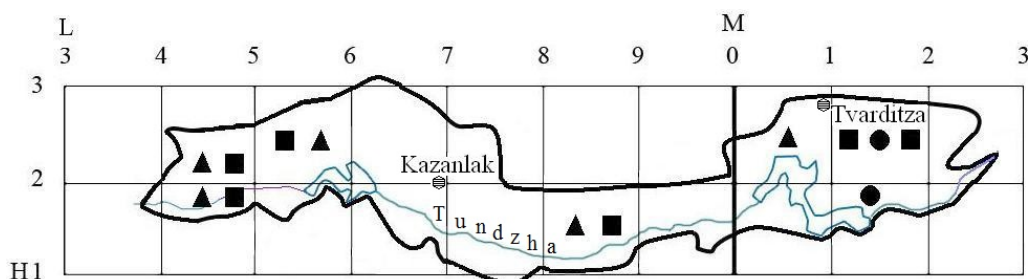


Fig. 1. Distribution of three shrews' species according to the Barn owl diet in the Kazanlak valley (CS Bulgaria): squares – *Sorex araneus*, triangulars – *Sorex minutus*, circles – *Suncus etruscus*.

470 m a.s.l.; Fig. 1) with 47 individuals (0.26 %, $n=18,314$, Table 1, 2).

3. Pygmy white-toothed shrew *Suncus etruscus* lives in open, mesophilous habitats with rich grass and frutescent vegetation in southeastern Bulgaria (Peshev et al. 2004). It is a new species for the study area and was found in 2 localities (260 and 280 m a.s.l.; Fig. 1) with 3 individuals (0.02 %, $n=18,314$, Table 1, 2).

4. Common dormouse *Muscardinus avellanarius* (Linnaeus, 1758) is a numerous inhabitant of mountainous forests and bushes and sparse in lowlands (Peshev et al. 2004). It is a new species for the region and was found in 8 localities (280–470 m a.s.l.; Fig. 2) with 30 individuals (0.16 %, $n=18,314$, Table 2, 3). Barn owls have preyed it most frequently among

dormouse species in this study (Fat dormouse *Glis glis* (Linnaeus, 1766) with 2 individuals in 2 localities and Forest dormouse *Dryomys nitedula* (Pallas, 1778) with 7 individuals in 5 localities).

5. Bank vole *Myodes glareolus* (Schreber, 1780) is a widespread rodent in a moist habitats in our higher mountains and occurs in single localities in lowlands (Peshev et al. 2004). This new species for the region was found in 2 localities (340 and 470 m a.s.l.; Fig. 2) with 2 individuals (0.01 %, $n=18,314$, Table 2).

6. Common pine vole *Microtus subterraneus* (de Selys-Longchamps, 1836) is numerous in the mountains and scarce in the lowlands (Peshev et al. 2004). Hristov (1974) reported 2 localities with 2 trapped individuals in the study area.

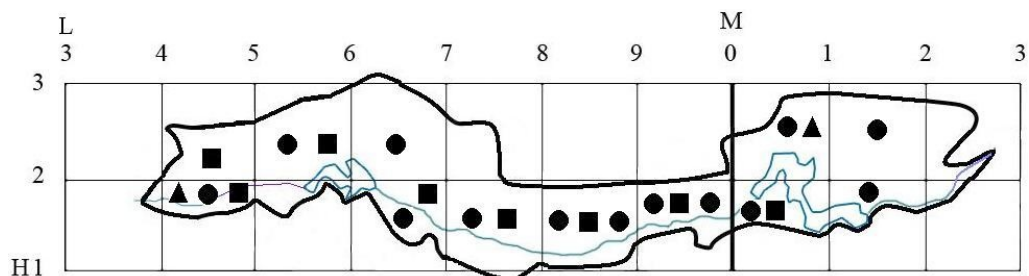


Fig. 2. Distribution of three rodents' species according to the Barn owl diet in the Kazanlak plane (CS Bulgaria): squares – *Muscardinus avellanarius*, triangulars – *Myodes glareolus*, circles – *Microtus subterraneus*.

The Barn owls preyed it in 13 localities (260–470 m a.s.l.; Fig. 2) with total 125 individuals (0.68 %, $n=18,314$). The measurements of the mandibles are presented in Table 2. The diagnostic for species determination M_1 have dimensions: LM_1 (mm) 2.54 ± 0.15 , 2.1–2.93, $n=125$; WM_1 0.94 ± 0.08 , 0.63–1.27, $n=125$.

Pygmy white-toothed shrew distribution is known mainly from studies of owl diets and covers flat and hilly areas from the South Black Sea coast to the east (UTM square NG67, 20 m a.s.l., Barn owl diet) **to the municipality of Sae-dinenie** in Upper Thracian plane to the west (KG88, 350 m a.s.l., Barn owl diet) (Popov et al. 2004, Milchev et al. 2006). **The most northern locality of this Mediterranean species** is in the municipality of Karnobat around an Eagle owl (*Bubo bubo* (Linnaeus, 1758)) **breeding locality** (NH02, 200 m a.s.l.; unpubl. data). The new localities in the Kazanlak valley are situated parallel to locality near Karnobat and mark the northern border of its distribution in the country. The Barn owls have preyed in all these border localities only 1 or 2 individuals of Pygmy white-toothed shrew. Their share in the mammalian part of the diet varied from 0.06 % ($n=1,615$ mammals, NG67, Miltshev et al. 2004) up to 0.14 % ($n=734$ mammals, MH12, this study) as one of the rarest mammal.

The other five species are typical mountainous mammals and rarely inhabit some intrazonal moist habitats, like mesophyllous riverside forests, bushes and other habitats in lowlands (Peshev et al. 2004). The mountains adjacent to the study area favor their distribution in the valley but they are sparse in the Barn owl diet here and most probably in the communities of small mammals, too.

Acknowledgments

I express my deep gratitude to D. Emin and G. Gruychev for their assistance in the field. The investigations were carried out under Grant 135/2012 of the Fund for Scientific Research, University of Forestry.

References

- GEORGIEV D. 2004. Conservation status of the small mammals (Mammalia: Insectivora, Lagomorpha, Rodentia) of Sakar mountain (South-eastern Bulgaria). *Scientific studies University of Plovdiv, Animalia* 40: 153–164.
- GEORGIEV M. 1998. Physical geography of Bulgaria. University Publishing House "St. K. Ohridski", Sofia, 406 p. (in Bulgarian).
- HRISTOV L. 1974. Insectivorous mammals and rodents in the Rose Valley. *Bulletin of the Institute of Zoology with museum* 39: 29–60 (in Bulgarian).
- MILCHEV B. 2006. First record of Romanian hamster *Mesocricetus newtoni* (Mammalia: Cricetidae) in South-East Bulgaria. *Acta zoologica bulgarica* 58: 203–207.
- MILCHEV B. 2009. New localities of Grey Dwarf Hamster *Cricetulus migratorius* (Pallas, 1773) (Mammalia: Cricetidae) in South-East Bulgaria. *Acta zoologica bulgarica* 61: 313–315.
- MILCHEV B., BOEV Z., KODJABASHEV N. 2006. Breeding distribution and diet composition of the Barn Owl (*Tyto alba* (Scopoli, 1769)) (Aves: Strigiformes) in the North-Western Upper Thracian Plane (Bulgaria). *Acta zoologica bulgarica* 58: 83–92.
- MILTSHEV B., BOEV Z., GEORGIEV V. 2004. Die Nahrung der Schleiereule (*Tyto alba*) in Südost-Bulgarien. *Egretta* 47: 66–77.
- PESHEV C., PESHEV D., POPOV V. 2004. Fauna Bulgarica, Vol. 27, Mammalia, Sofia, BAS. 632 p. (in Bulgarian).
- POPOV V. 1993. Small mammals (Insectivora, Lagomorpha, Rodentia). In:

Bulgaria's Biological Diversity: Conservation status and Needs Assessment, Vol. I. Pensoft: 615–630 (in Bulgarian).

POPOV V. 2003. Mammals in Bulgaria. Geosoft, Sofia, 280 p. (in Bulgarian).

POPOV V., MILCHEV B. 2001. New Data on the Morphology and Distribution of *Talpa levantis* Thomas, 1906 (Mammalia:

Insectivora) in Bulgaria. *Acta zoologica bulgarica* 53: 79–94.

POPOV V., MILCHEV B., GEORGIEV V., DIMITROV H., CHASSOVNIKAROVA T. 2004. Landscape Distributional Pattern and Craniometry of *Suncus etruscus* (Mammalia: Insectivora, Soricidae) in South-East Bulgaria. *Acta zoologica bulgarica* 56: 299–312.