

Insectivores (Mammalia: Eulipotyphla) in the Šariš Museum in Bardejov collection (Slovakia)

Alexander Csanády, Tomáš Jászay & Erika Fechová

Insectivores (Mammalia: Eulipotyphla) in the Šariš Museum in Bardejov collection (Slovakia). – Acta Mus. Siles. Sci. Natur. 71: 243-254, 2022.

Abstract: In study are presented data of the insectivores (Eulipotyphla from three families, i.e., Erinaceidae, Soricidae and Talpidae) specimens deposited in the collection of the Šariš Museum in Bardejov (SMB), Slovakia. In total, data of 469 individuals from twenty-eight sites of eastern Slovakia were evaluated. This collection includes individuals collected in various places and times mainly from northeastern Slovakia. Individuals were acquired in 1956–1982, but mainly in 1956 ($n = 150$, 31.9%) and 1979 ($n = 107$, 22.8%). Moreover, one specimen of the Miller's water shrew (*Neomys anomalus*) had signs of „melanism“, i.e., the dorsal side (back) was velvety black and a ventral (abdominal) side was the gray-black with a touch of silver.

Key words: Erinaceidae, Soricidae, Talpidae, faunistic data, Slovakia, natural history collections

Introduction

The importance of the vertebrate collections in Šariš museum in Bardejov (hereafter SMB) in studies of animal biodiversity was showed in previous studies (Hromada 2015, Hromada & Klimovičová 2015, Kaczmarski & Baranová 2015, Hromada *et al.* 2003, 2015, Mikula *et al.* 2018, Csanády 2020). In SMB's collection, were found more than five thousand individuals of wild mammals belonging to 67 species from 18 families (Hromada *et al.* 2015). Therefore, mammalogical collections represent an outstanding scientific time-capsule, which may be used as datasets for ecological evaluation in the future (Csanády 2020).

The main aim of this paper was clarified insectivore's composition deposited in SMB collection with more detailed information about the localities and interesting specimens of each species. Moreover, species and localities data presented in study were also included in the summarization of “*Mammals of Slovakia: distribution, bionomy and protection*“, as unpublished data (Krištofik & Danko 2012).

Material and Methods

In this study are presented and evaluated data of 469 individuals belonging to nine species of the insectivora (Eulipotyphla) from 28 localities of eastern Slovakia. All specimens with detailed locality given were georeferenced (see Tab. 1). All specimens (a mounted material, skins, and skulls) were divided by location and by spatiotemporal distribution of collection on a year-to-year basis (Tab. 2 – 4, Fig. 1 – 11). Specimens without detailed data were not included in the statistical summaries.

In SMB's collection was found specimens of three families, i.e., Erinaceidae, Soricidae and Talpidae (Krištofik & Danko 2012, Best 2018, Kryštufek & Motokawa 2018, Burgin *et al.* 2018). The first one was represented by one species (*Erinaceus roumanicus* Barrett-Hamilton, 1900), deposited in SMB collections as *Erinaceus europaeus*. The second one was represented by two subfamilies: Crocidurinae and Soricinae with seven species (*Crocidura leucodon* (Hermann, 1780), *C. suaveolens* (Pallas, 1811), *Neomys anomalus* Cabrera, 1907, *N. fodiens* (Pennant, 1771), *Sorex alpinus* Schinz, 1837, *S. araneus* Linnaeus, 1758 and *S. minutus* Linnaeus, 1766). Finally, family Talpidae was represented by one species (*Talpa europaea* Linnaeus, 1758).

Based on catalog protocols with body size measures, specimens of most individuals from the SMB's collection belong to the adult age category (Grulich 1967, Baláz & Ambros 2005, 2007).

Results and discussion

The analysis of protocol cards and collections confirmed that 94.0% of the samples was obtained from 14 localities. The most represented locality was the surroundings of the village Senné (24.0%) followed by several localities (e.g., Bardejov, Lenartov, Becherov, Nižný Komárnik and Červený kláštor).

Most SMB insectivore's specimens belonged to species classified by the IUCN Red List (for Europe) as least concern (LC, 8 species, 88.9%), followed by near threatened (NT, 1 species – *S. alpinus*, 11.1%). At the national level, the differences were slightly different (see below).

Tab 1: Overview of insectivores (Eulipotyphla) localities deposited in SMB collections.

Locality, GPS coordinates	N	%	Locality, GPS coordinates	N	%
Senné, 48°39'55"N, 21°01'55"E	109	23.2	Stebník, 49°22'42"N, 21°16'07"E	5	1.1
Bardejov, 49°17'40"N, 21°16'40"E	72	15.4	Vyšný Komárnik, 49°24'09"N, 21°42'11"E	4	0.9
Lenartov, 48°18'35"N, 21°01'15"E	57	12.2	Gaboltoť, 49°21'55"N, 21°08'33"E	3	0.7
Becherov, 48°25'11"N, 21°18'37"E	39	8.3	Chmeľnica, 49°17'44"N, 20°43'51"E	2	0.4
Nižný Komárnik, 48°25'11"N, 21°18'37"E	26	5.5	Mokroluh, 49°18'28"N, 21°12'52"E	2	0.4
Červený kláštor, 49°23'28"N, 21°05'17"E	23	4.9	? (Stebník – Becherov)** – 49°25'10"N, 21°18'35"E	2	0.4
Livov, 49°15'05"N, 21°18'37"E	18	3.8	Zborov / Chmeľová*, 49°22'11"N, 21°18'25"E	2	0.4
Stebnícka Huta, 49°24'52"N, 21°14'51"E	16	3.4	Fričovce, 49°00'58"N, 20°57'58"E	1	0.2
Čergov, 49°11'13"N, 21°10'19"E	14	2.9	Chmeľová, 49°23'59"N, 21°01'55"E	1	0.2
Hertník, 49°12'22"N, 21°13'34"E	15	3.2	Kríže, 49°14'34"N, 21°08'58"E	1	0.2
Bardejov (Bardejovské kúpele), 49°19'33"N, 21°16'37"E	13	2.8	Kurov, 49°20'35"N, 21°08'06"E	1	0.2
Stebnícka Huta (Hutisko), 49°23'49"N, 21°14'54"E	10	2.1	Livovská Huta, 49°14'36"N, 21°01'58"E	1	0.2
Nižný Komárnik / Vyšný Komárnik*, 49°22'30"N, 21°41'47"E	9	1.9	Ľubotín, 49°15'48"N, 20°52'34"E	1	0.2
Bardejov (Mníchovská dolina), 49°18'29"N, 21°14'20"E	8	1.7	Prešov, 48°59'46"N, 21°14'41"E	1	0.2

*Probably on the border of the two cadastral territories of municipalities (it was not possible to unambiguously determine based on the attached documentation).

**The impossibility of determining the exact location because the cadastral areas are not adjacent, probably somewhere between territories.

Erinaceidae – hedgehogs

Erinaceus roumanicus Barrett-Hamilton, 1900 – Northern white-breasted hedgehog

The summarization showed that there are 6 samples of *E. roumanicus* in the SMB's collection, while the male sex was represented by 3 individuals and 1 preparation belongs to a female. Four individuals were adults (see Fig. 3), and their body dimensions were recorded in the protocol cards. The two individuals did not have body size dimensions or a precisely defined sex and age (probably because they were subadults or juveniles). Localities were stated for all samples and all individuals were obtained from years 1959 to 1977 (Tab. 2, Fig. 1, 2).

Distribution and Conservation status in Slovakia:

Occurrence of *E. roumanicus* was recorded in approximately 78% of the Slovak territory and was confirmed in entire Slovakia, mainly in lowlands and highlands (Krištofik & Danko 2012).

According to Žiak & Urban (2001) the species was stated in Red List of Slovakia as species with data deficient (DD). In contrast, IUCN Red List for Europe indicated species as a least concern (LC) (Kryštufek 2007, Best 2018).

Tab 2: The hedgehogs (Erinaceidae) samples deposited in the SMB's collection.

<i>Erinaceus roumanicus</i>	N	%
Sample size	6	100
Sample of males	3	50
Sample of females	1	16.7
The number of localities information	6	100
The number of missing localities information	-	-
The number of missing date information	-	-
The number of missing sex information	2	33.3
Sample of skins	6	100
Samples of skulls	2	33.3

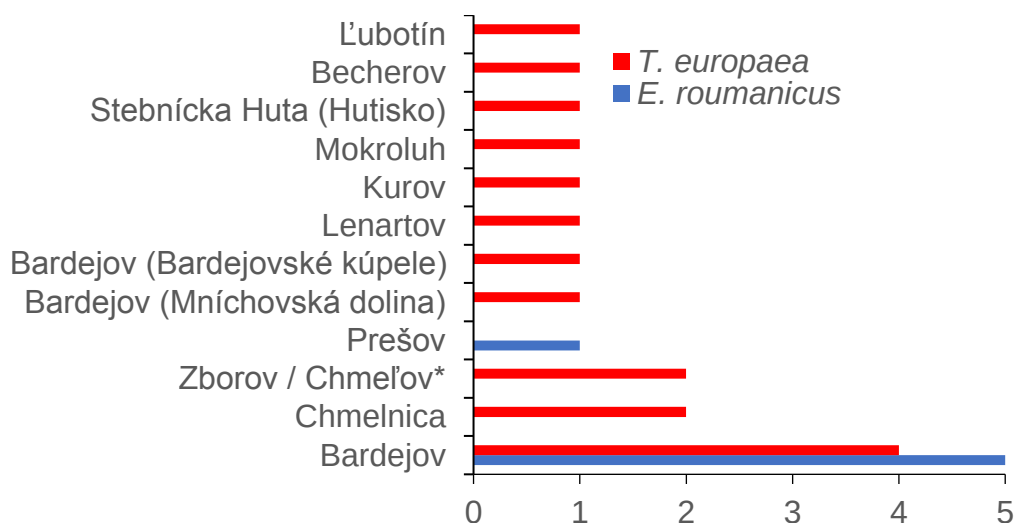


Fig 1: The Northern white-breasted hedgehog (*Erinaceus roumanicus*) and the European mole (*Talpa europaea*) deposited in the SMB's collection divided by localities.

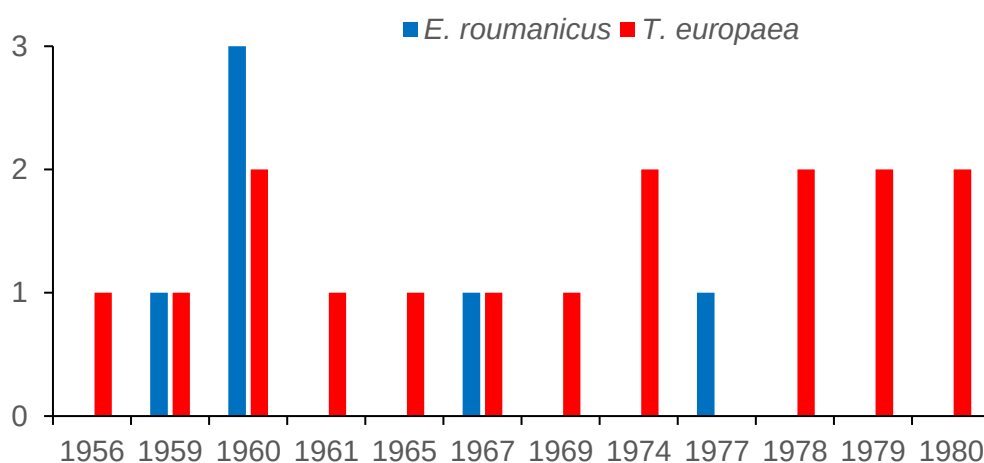


Fig 2: The Northern white-breasted hedgehog (*Erinaceus roumanicus*) and the European mole (*Talpa europaea*) deposited in the SMB's collection divided by years.



Fig 3: Skins of the Northern white-breasted hedgehog (*Erinaceus roumanicus*) deposited in SMB's collection.

Soricidae – shrews

Crocidura leucodon (Hermann, 1780) – Bicolored shrew

Inventarisation showed 16 individuals (3 males, 3 females, 4 individuals without sex determination (hereafter as „?“) and 6 ind. without date information of *C. leucodon* in the SMB's collection. Five individuals (3 males and 2 females) were adults and five individuals (1 female and 4 „?“) were subadults. The basic body dimensions were recorded for ten individuals in the protocol cards. Localities were stated for ten samples and individuals were obtained from two years 1956 and 1959 (Tab. 3, Fig. 4, 5).

Distribution and Conservation status in Slovakia:

Occurrence of *C. leucodon* was recorded in approximately 52.1% of the Slovak territory (Baláž & Ambros 2007, Krištofik & Danko 2012).

According to Žiak & Urban (2001) the species was stated in Red List of Slovakia as species with lower risk: least concern (LR: LC). In Europe (the IUCN Red List for Europe) was species stated with a least concern (LC) status (Kryštufek 2007, Burgin *et al.* 2018).

Crocidura suaveolens (Pallas, 1811) – Lesser white toothed shrew

Analyses showed 22 individuals (14 males, 4 females and 4 „?“) of *C. suaveolens* in the SMB's collections. In total, 18 individuals (13 males, 2 females and 4 „?“) were adults and three individuals (1 male and 2 females) were subadults. The basic body dimensions were recorded for all individuals in the protocol cards. Localities were stated for all samples and individuals were obtained from two years 1957 to 1982 (Tab. 3, Fig. 4, 5).

Distribution and Conservation status in Slovakia:

Occurrence of *C. suaveolens* was recorded approximately 60.3% of Slovakia in lowlands, highlands and basins and is predominantly synanthropic, but was not too abundant. Nevertheless, the species is more abundant than *C. leucodon* (Baláž & Ambros 2007, Krištofik & Danko 2012).

Red List of Slovakia (Žiak & Urban 2001) showed that species has conservation status as a lower risk: least concern (LR: LC). According to the IUCN Red List (for Europe), the species was defined as species with least concern (LC) status (Vohralík *et al.* 2007b, Burgin *et al.* 2018).

Tab 3: The shrews (Soricidae) samples deposited in the SMB.

<i>Crocidura leucodon</i>	N	%
Sample size	16	100
Sample of males	3	18.8
Sample of females	3	18.8
The number of localities information	10	62.5
The number of missing localities information	6	37.5
The number of missing date information	6	37.5
The number of missing sex information	10	62.5
Sample of skins	16	100
Samples of skulls	3	18.8
<i>Crocidura suaveolens</i>	N	%
Sample size	22	100
Sample of males	14	63.6
Sample of females	4	18.1
The number of localities information	21	95.5
The number of missing localities information	1	4.5
The number of missing date information	1	4.5
The number of missing sex information	4	18.1
Sample of skins	22	100
Samples of skulls	7	31.8
<i>Neomys anomalus</i>	N	%
Sample size	25	100
Sample of males	11	44.0
Sample of females	10	40.0
The number of localities information	24	0.96
The number of missing localities information	1	4
The number of missing date information	1	4
The number of missing sex information	4	16.0
Sample of skins	25	100
Samples of skulls	20	83.3
<i>Neomys fodiens</i>	N	%
Sample size	55	100
Sample of males	34	61.8
Sample of females	14	25.5
The number of localities information	55	100
The number of missing localities information	-	-
The number of missing date information	-	-
The number of missing sex information	7	12.7
Sample of skins	55	100
Samples of skulls	14	25.5

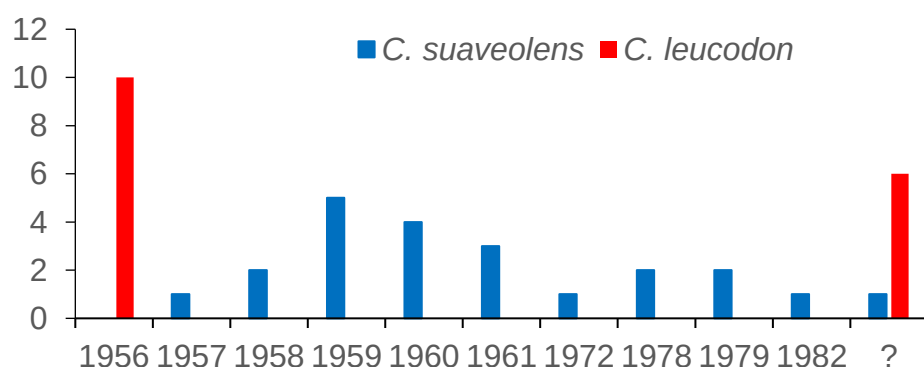


Fig 4: The Lesser white toothed shrew (*Crocidura suaveolens*) and Bicolored shrew (*C. leucodon*) deposited in the SMB collection divided by localities.

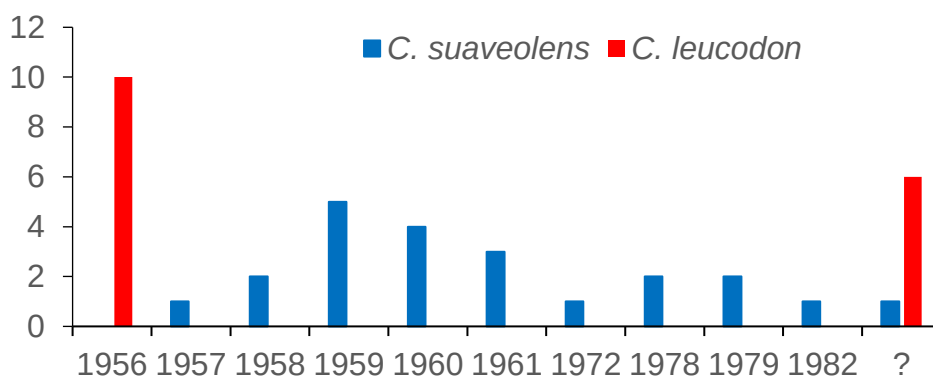


Fig 5: The Lesser white toothed shrew (*Crocidura suaveolens*) and the Bicolored shrew (*C. leucodon*) deposited in the SMB collection divided by years.

***Neomys anomalus* Cabrera, 1907 – Miller’s water shrew**

Analyses showed 25 individuals (1 males, 10 females and 4 „?“) of *N. anomalus* in the SMB’s collections. In total, 14 individuals (8 males, 5 females and 1 „?“) were adults and 11 individuals (2 male, 5 females and 4 „?“) were subadults. The basic body dimensions were recorded for 24 individuals in the protocol cards. Localities were stated for 24 samples and individuals were obtained from five years (Tab. 3, Fig. 6, 7). One male (protocol number 116/59) had signs of melanism, i.e., the dorsal side (back) was velvety black, and a ventral (abdominal) side was the gray-black with a touch of silver (see notes in protocol cards: *dark phase, no white fur on tail, the dark breast, the dark paws, the red-haired chin*, Fig. 8). Complete melanism in this species is also reported by Ambros *et al.* (1980).

Distribution and Conservation status in Slovakia:

Occurrence of *N. anomalus* was recorded in approximately 66.3% of the Slovak territory (Baláž & Ambros 2007, Krištofik & Danko 2012). Sumarization showed that species occurs in suitable habitats in entire Slovakia, from lowlands to the zone of dwarf pine, but it occurs mainly in the submountain areas.

Red List of Slovakia showed that species has conservation status as a lower risk: near threatened (LR: NT) (Žiak & Urban 2001). According to the IUCN Red List (for Europe), the species was defined as species with least concern (LC) status (Meinig *et al.* 2007a, Burgin *et al.* 2018).

***Neomys fodiens* (Pennant, 1771) – Water shrew**

Analyses showed 55 individuals (34 males, 14 females and 7 „?“) of *N. fodiens* in the SMB’s collections. In total, 44 individuals (26 males, 11 females and 7 „?“) were adults and 11 individuals (8 males and 3 females) were subadults. The basic body dimensions were recorded for 54 individuals in the protocol cards. Localities were stated for all samples and individuals were obtained from years 1956 to 1979 (Tab. 3, Fig. 6, 7).

Distribution and Conservation status in Slovakia:

Occurrence *N. fodiens* was recorded in approximately 66.1% of the Slovakia and occurs in suitable habitats in entire territory from lowlands to dwarf pine stands (Baláž & Ambros 2007, Krištofik & Danko 2012).

Red List of Slovakia (Žiak & Urban 2001) showed that species has conservation status as a lower risk: near threatened (LR: NT). According to the IUCN Red List (for Europe), the species was defined as species with least concern (LC) status (Meinig *et al.* 2007b, Burgin *et al.* 2018).

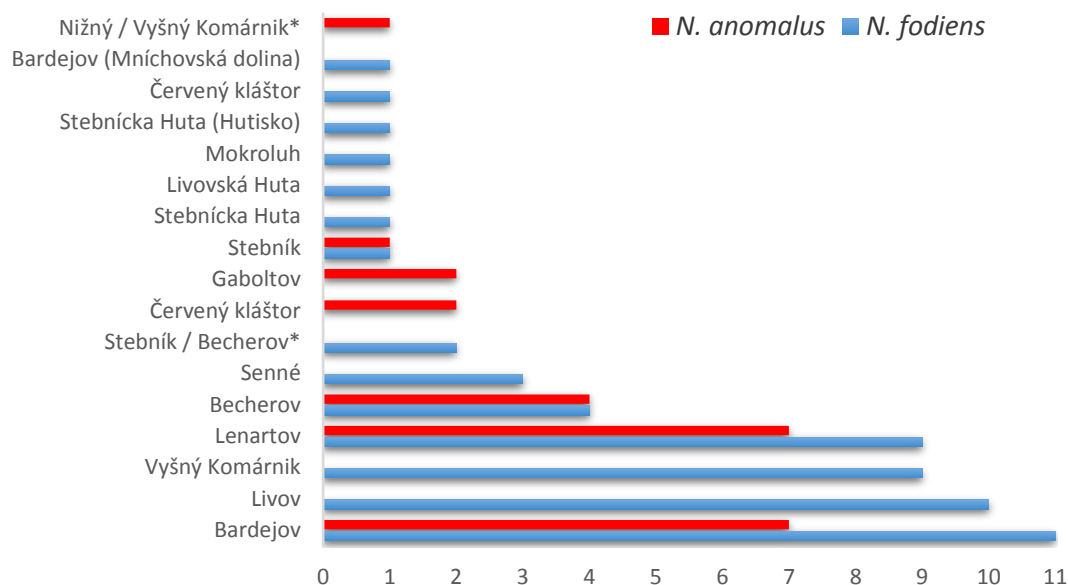


Fig 6: The Miller's water shrew (*Neomys anomalus*) and the Water shrew (*N. fodiens*) deposited in the SMB's collection divided by localities.

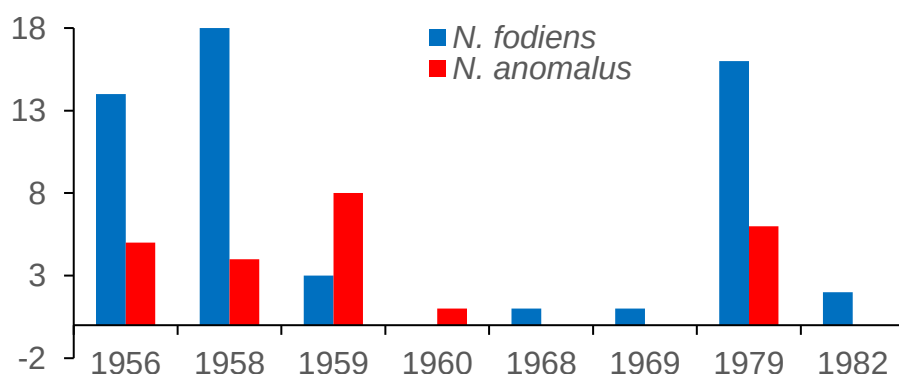


Fig 7: The Miller's water shrew (*Neomys anomalus*) and the Water shrew (*N. fodiens*) deposited in the SMB's collection divided by years.



Fig 8: Skins of the Miller's water shrew (*Neomys anomalus*) with anomalously ("melanistic") coloured fur (in protocol cards with No. 116/59 stated as "dark phase") deposited in SMB's collection.

***Sorex alpinus* Schinz, 1837 – Alpine shrew**

Analyses showed 18 individuals (7 males, 9 females and 2 „?“) of *S. alpinus* in the SMB's collection (Fig. 9). In total, 17 individuals (6 males, 9 females and 2 „?“) were adults and one individual (male) was subadult. The basic body dimensions were recorded for all individuals in the protocol cards. Localities were stated for all samples and individuals were obtained from years 1956 to 1982 (Tab. 4, Fig. 10, 11). Two individuals (No. 39/75, 40/75) captured 26 August 1975 in Bardejov (Mníchovská dolina) were deposited (with No. 28/75, 30/75) at the Institute of the Academy of Sciences in Brno (‘‘ČSAV in Brno’’).

Distribution and Conservation status in Slovakia:

Occurrence of *S. alpinus* was recorded in approximately 34.1% of the Slovakia and area lays first of all in northern and central part of the country, in medium high to high mountain ranges, which exceed the altitude of 1.000 m a.s.l. Continuously it occurs in area from the central and northern parts of external mountain ranges of West Carpathians to the Busov Mts., the Čergov Mts., the Bachureň Mts., the Branisko Mts., the Volovské vrchy Mts., Slovak karst and in the South to the Tribeč Mts., the Štiavnické vrchy Mts. and Revúcka vrchovina highlands. An isolated occurrence was discovered in the Slanské vrchy Mts. In East Carpathians it occurs in the the Vihorlatské vrchy Mts. and the Bukovské vrchy Mts. (Baláž & Ambros 2005, Krištofik & Danko 2012).

According to Žiak & Urban (2001), the species has conservation status as vulnerable (VU). Similarly, the IUCN Red List (for Europe) indicated the species from the point of view of protection as near threatened (NT) (Burgin *et al.* 2018, Meinig *et al.* 2020).



Fig 9: Skins of the Alpine shrew (*Sorex alpinus*) deposited in SMB's collection.

***Sorex araneus* Linnaeus, 1758 – Common shrew**

Analyses showed 268 individuals (115 males, 86 females and 67 „?“) of *S. araneus* in the SMB's collection. In total, 248 individuals (103 males, 79 females and 66 „?“) were adults and 20 individual (12 males, 7 females 1 „?“) were subadult. The basic body dimensions were recorded for 265 (body weight), 256 (head-and-body length, and hind foot length) and 257 (tail length) individuals in the protocol cards. Localities were stated for all samples and individuals were obtained from years 1956 to 1982 (Tab. 4, Fig. 10, 11, 12).

Distribution and Conservation status in Slovakia:

Occurrence of *S. araneus* was recorded in approximately 90.3% of the Slovak territory and was distributed from lowlands to high mountains (alpine zone). Similarly, frequent occurrence was recorded in different types of dispersed woody vegetation, in ruderal sites, in parks, in arable land, meadows, wetlands, wind shelter belts, reed stands, peat bogs, at water streams and water reservoirs. In autumn was also confirmed penetrates buildings. It lives in all types of forests, in dwarf pine stands and in alpine zone (Baláž & Ambros 2005, Krištofik & Danko 2012).

Red List of Slovakia showed that species was not listed, therefore their conservation status is least concern (LC) (see Žiak & Urban 2001). The IUCN Red List (for Europe) also stated the species as a least concern (LC) (Meinig *et al.* 2007c, Burgin *et al.* 2018).

Tab 4: The shrews and mole (Soricidae, Talpidae) samples deposited in the SMB's collection.

<i>Sorex alpinus</i>	N	%
Sample size	18	100
Sample of males	7	38.9
Sample of females	9	50
The number of localities information	18	100
The number of missing localities information	-	-
The number of missing date information	-	-
The number of missing sex information	2	11.1
Sample of skins	18	100
Samples of skulls	8	44.4
<i>Sorex araneus</i>	N	%
Sample size	268	100
Sample of males	115	42.9
Sample of females	86	32.1
The number of localities information	268	100
The number of missing localities information	-	-
The number of missing date information	-	-
The number of missing sex information	67	25
Sample of skins	267	99.6
Samples of skulls	43	16.0
<i>Sorex minutus</i>	N	%
Sample size	43	100
Sample of males	19	44.2
Sample of females	12	27.9
The number of localities information	39	90.7
The number of missing localities information	4	9.3
The number of missing date information	4	9.3
The number of missing sex information	12	27.9
Sample of skins	43	100
Samples of skulls	3	6.9
<i>Talpa europaea</i>	N	%
Sample size	16	100
Sample of males	12	75
Sample of females	3	18.8
The number of localities information	16	100
The number of missing localities information	-	-
The number of missing date information	-	-
The number of missing sex information	1	6.2
Sample of skins	15	93.8
Samples of skulls	7	43.8

***Sorex minutus* Linnaeus, 1766 – Pigmy shrew**

Analyses showed 43 individuals (19 males, 12 females and 12 „?“) of *S. minutus* in the SMB's collections. In total, 30 individuals (17 males, 12 females and 1 „?“) were adults and 13 individual (2 males, 11 „?“) were subadult. The basic body dimensions were recorded for 39 individuals in the protocol cards. Localities were stated for 39 samples and individuals were obtained from years 1958 to 1981 (Tab. 4, Fig. 10, 11).

Distribution and Conservation status in Slovakia:

Occurrence of *S. minutus* was recorded in approximately 81.9% of the Slovak territory, in entire country from lowlands to high mountains and was also found in alpine zone. Pigmy shrew prefers forests and humid places, but in Slovakia it inhabits a wide scale of habitats. It occurs mostly at water streams, in moist meadows, pastures, in peat bogs, reed stands, in dispersed woody vegetation and in arable land. It inhabits all types of forests, dwarf pine stands and alpine zone. It rarely occurs in dry habitats and urban habitats (Baláz & Ambros 2005, Krištofik & Danko 2012).

Red List of Slovakia showed that species was not listed, therefore their conservation status is least concern (LC) (Žiak & Urban 2001). The IUCN Red List (for Europe) also stated the species as a least concern (LC) (Meinig *et al.* 2007d, Burgin *et al.* 2018).

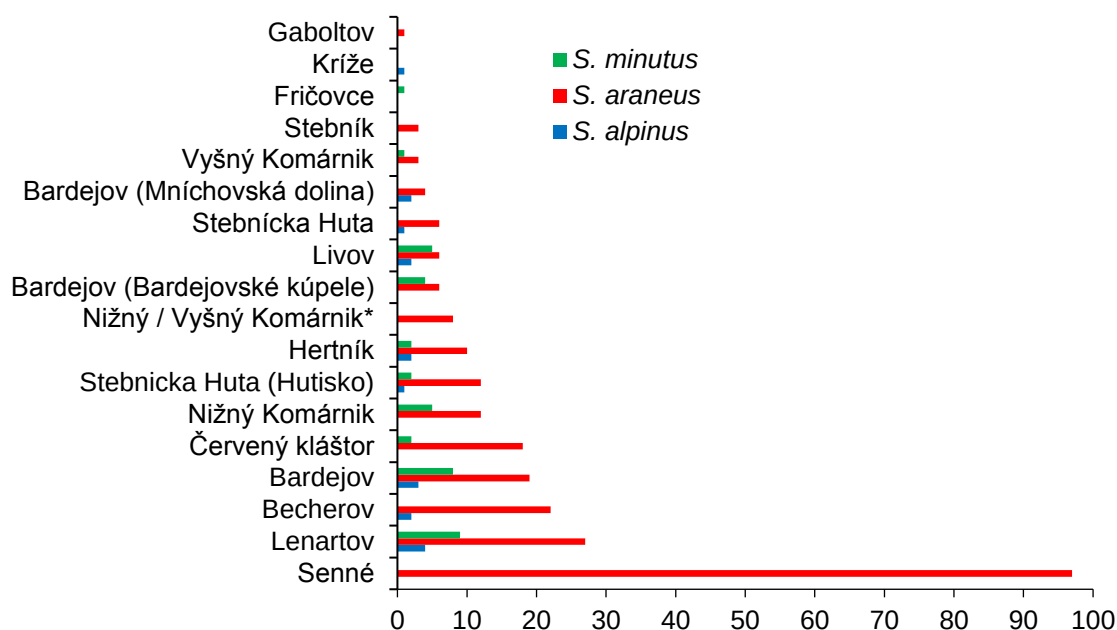


Fig 10: The Common shrew (*Sorex araneus*), the Pygmy shrew (*S. minutus*) and the Alpine shrew (*S. alpinus*) deposited in the SMB's collection divided by localities.

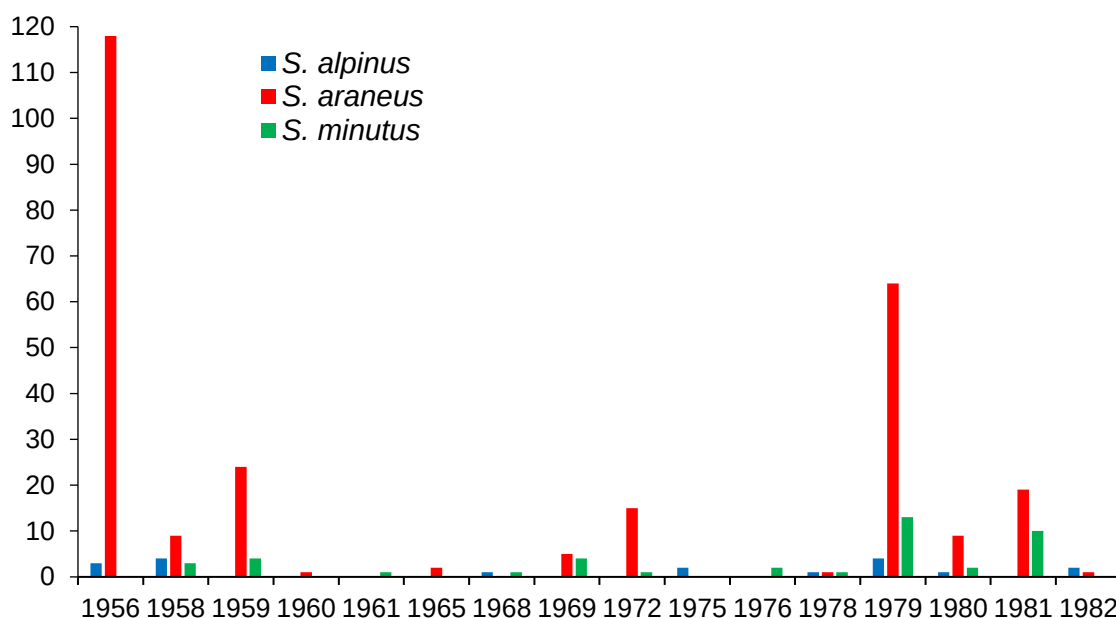


Fig 11: The Common shrew (*Sorex araneus*), the Pygmy shrew (*S. minutus*) and the Alpine shrew (*S. alpinus*) deposited in the SMB's collection.



Fig 12: Skins of Common shrew (*Sorex araneus*) deposited in SMB collection SMB's collection.

Talpidae – moles

***Talpa europaea* Linnaeus, 1758 – Common mole**

Result showed 16 individuals (12 males, 3 females and 1 „?“) of *T. europaea* in the SMB collections. In total, 15 individuals (11 males, 3 females 1 „?“) were adults and one individual (male) was subadult. The basic body dimensions were recorded for all 16 individuals in the protocol cards. Localities were stated for all samples and individuals were obtained from years 1956 to 1980 (Tab. 4, Fig. 1, 2).

Distribution and Conservation status in Slovakia:

Occurrence of *T. europaea* was recorded in approximately 90.3% of Slovakia, in entire country from lowlands to alpine meadows up to altitudes of cca. 2.000 m a.s.l. The species has not special requirements at choice of habitat and lives almost in all types of soils. Moles tend to escape only the moveable sands and permanently water-logged soils. It prefers meadows, pastures, dams, dikes, fields, ruderal habitats, wind shelterbelts; it also lives in river floodplains and in suburban and urban habitats (Krištofik & Danko 2012).

Red List of Slovakia showed that species was not listed, therefore their conservation status is least concern (LC) (see Žiak & Urban 2001). The IUCN Red List (for Europe) also stated the species as a least concern (LC) (Amori *et al.* 2017, Kryštufek & Motokawa 2018).

Conclusions

In this study we focused on insectivores (Erinaceomorpha, Soricimorpha) deposited in collection. Summarisation of samples deposited in SMB collection confirmed the occurrence of 469 individuals belonging to nine species of insectivores (Tab. 1–4). This collection includes specimens collected in various places and times (Fig. 1, 2, 4–7, 10–11) mainly from northeastern Slovakia. Individuals were acquired in 1956–1982, but mainly in 1956 (n = 150, 31.9%) and 1979 (n = 107, 22.8%). The SMB's collection contains individuals of both sexes and age groups (adult and subadults/juveniles) with body size values recorded in the protocol cards.

In public exhibition were also exposed mounted specimen of above-mentioned species which had fur with typical coloring for these species.

In conclusion, results presented in this study confirmed previous knowledges about occurrence of studied species as well highlighted the importance of SMB's collection.

Acknowledgement: This work was supported by grants KEGA 051PU-4/2021.

References

Ambros M., Dudich A., Kleinert J. & Štollmann A. (1980): Occurrence of total melanism of small terrestrial mammals In Slovakia. – *Biológia (Bratislava)* 35: 127-130.

- Amori G., Hutterer R., Mitsainas G., Yigit N., Kryštufek B. & Palomo L. (2017): *Talpa europaea*. The IUCN Red List of Threatened Species 2017: e.T41481A22320754. <https://dx.doi.org/10.2305/IUCN.UK.2017-2.RLTS.T41481A22320754.en>. Accessed 18/3/2021.
- Baláž I. & Ambros M. (2005): Biológia, ekológia a rozšírenie druhov rodu *Sorex* na Slovensku. Fakulta prírodných vied Univerzity Konštantína Filozofa v Nitre, 80 pp. + prílohy.
- (2007): Rozšírenie, habitus populácie a rozmnožovanie druhov *Crocidura* Herm. a *Neomys* Kaup. (Mammalia: Eulipothyphla) na Slovensku. Fakulta prírodných vied Univerzity Konštantína Filozofa v Nitre, 99 pp.
- Best T.L. (2018): Family Erinaceidae (hedgehogs and gymnures). In: Wilson D.E., Lacher T.E. & Mittermeier R.A. (eds). Handbook of the Mammals of the World. Vol. 8. Insectivores, Sloths and Colugos. Lynx Edicions, Barcelona, pp. 288-330.
- Burgin C.J., He K., Haslauer R., Sheftel B.I., *et al.* (2018): Family Soricidae (Species account of Soricidae). In: Wilson D.E., Lacher T.E. & Mittermeier R.A. (eds). Handbook of the Mammals of the World. Vol. 8. Insectivores, Sloths and Colugos. Lynx Edicions, Barcelona, pp. 394-551.
- Grulich I. (1967): Die Variabilität der taxonomischen Merkmale des Maulwurfs (*Talpa europaea* L., Insectivora) im Zusammenhang mit Alter und Geschlecht. – Zoologické listy 16: 125-144.
- Csanády A. (2020): Hares and rabbits (Leporidae) in collection of the Šariš Museum, Bardejov (Slovakia). – Theriologia Ukrainica 19: 60-65.
- Hromada M. (2015): Natural history collection of T. Weisz in scientific publications, 1983–2015. – Folia Oecologica, Acta Universitatis Presoviensis 7: 79-88.
- Hromada M. & Klimovičová M. (2015): From dusty collections to descriptions of new species – birds in Sarisske Museum Bardejov as valuable source for investigating mite biodiversity. – Folia Oecologica, Acta Universitatis Prešovensis 7: 109-114.
- Hromada M., Kuczyński L., Skoracki M., Antczak M. & Tryjanowski P. (2003): The value of the bird collections and associated data in regional museums: *Lanius excubitor* specimens in Šarišské Museum, Bardejov, Slovakia. – Bulletin of the British Ornithologists' Club 123A: 226-233.
- Hromada M., Čanády A., Mikula P., Peterson A.T. & Tryjanowski P. (2015): Old natural history collections for new millennium – birds and mammals in the collection of PhMr. Tibor Weisz in Sarisske Museum Bardejov, Slovakia. – Folia Oecologica, Acta Universitatis Presoviensis 7: 115-141.
- Krištofík J. & Danko Š. (eds), Mammals of Slovakia: distribution, bionomy and protection. Veda – Slovak Academy of Sciences (SAS), Publishing House, Bratislava, 712 pp.
- Kaczmarek M. & Baranová V. (2015): Carpathian newt collection in Sariske museum Bardejov, Slovakia – the largest in the world? – Folia Oecologica, Acta Universitatis Prešovensis 7: 89-97.
- Kryštufek B. (2007): *Erinaceus roumanicus*. The IUCN Red List of Threatened Species 2007: e.T136344A4277921. Accessed 18/3/2021.
- Kryštufek B. & Motokawa M. (2018): Family Talpidae (moles, desmans, star-nosed moles and shrew moles). In: Wilson D.E., Lacher T.E. & Mittermeier R.A. (eds). Handbook of the Mammals of the World. Vol. 8. Insectivores, Sloths and Colugos. Lynx Edicions, Barcelona, pp. 552-619.
- Meinig H., Bertolino S. & Kryštufek B. (2007a): *Neomys anomalus*. – The IUCN Red List of Threatened Species 2007: e.T29657A9512375. Accessed 18/3/2021.
- Meinig H., Bertolino S., Kryštufek B., Zagorodnyuk I., Amori G., Henttonen H., Spitzenberger F., Sheftel B. & Juškaitis R. (2007b). *Neomys fodiens*. – The IUCN Red List of Threatened Species 2007: e.T29658A9513603. Accessed 18/3/2021.
- Meinig H., Kryštufek B. & Fernandes M. (2007d): *Sorex minutus*. – The IUCN Red List of Threatened Species 2007: e.T29667A9518453. Accessed 18/3/2021.
- Meinig H., Kryštufek B., Sheftel B., Zagorodnyuk I., Amori G., Zima J. & Henttonen, H. (2007c): *Sorex araneus*. – The IUCN Red List of Threatened Species 2007: e.T29661A9515601. Accessed 18/3/2021.
- Meinig H., Bertolino S. & Zima J. (2020): *Sorex alpinus*. – The IUCN Red List of Threatened Species 2020: e.T29660A114024313. Accessed 18/3/2021.
- Mikula P., Csanády A. & Hromada, M. (2018): A critical evaluation of the exotic bird collection of the Šariš Museum in Bardejov, Slovakia. – ZooKeys (776): 139-152.
- Vohralík V., Zima J. & Kryštufek B. (2007a): *Crocidura leucodon*. The IUCN Red List of Threatened Species 2007: e.T29651A9509171. Accessed 18/3/2021.
- Vohralík V., Zima J., Kryštufek B., Sheftel B. & Meinig H. (2007b): *Crocidura suaveolens*. – The IUCN Red List of Threatened Species 2007: e.T29656A9511383. Accessed 18/3/2021.

Authors' addresses: Alexander Csanády & Erika Fechová, University of Prešov, Faculty of Humanities and Natural Sciences, Department of Biology, 17. novembra 1, SK-080 01 Prešov, Slovakia. E-mail: alexander.csanady@unipo.sk, alexander.canady@gmail.com
Tomáš Jászay, Šariš Museum in Bardejov, Rhodyho 2, 085 01 Bardejov, Slovakia. E-mail: tomasjaszay@nextra.sk