Lynx, n. s. (Praha), **42**: 83–89 (2011). ISSN 0024-7774 (print), 1804-6460 (online)

First record of *Miniopterus schreibersii* in the Czech Republic (Chiroptera: Miniopteridae)

První nález létavce stěhovavého (*Miniopterus schreibersii*) v České republice (Chiroptera: Miniopteridae)

Tomáš BARTONIČKA[1] & Petr JEDLIČKA[2]

[1] Department of Botany and Zoology, Faculty of Science, Masaryk University, Kotlářská 2, CZ–611 37 Brno, Czech Republic; bartonic@sci.muni.cz
[2] Institute of Scientific Instruments AS CR, Královopolská 147, CZ–612 64 Brno, Czech Republic; jedla@isibrno.cz

received on 31 May 2011

Abstract. On 21 April 2011, an adult male of the Schreibers' bat (*Miniopterus schreibersii*) was caught in the Hranická propast (Hranická Chasm, 49° 32' N, 17° 45' E, 315 m a. s. l., Hranice na Moravě, Přerov District), from a crevice of the chasm wall above a pond. This record represents the first evidence of this bat species as well as a new family in the Czech Republic. It documents the affinity of marginal populations of the species to warmer cave systems.

Key words. Distribution, Schreibers' bat, Central Europe, fauna.

INTRODUCTION

The Schreibers' bat, *Miniopterus schreibersii* (Kuhl, 1817), was a long time considered a polytypic species with one of the largest distribution ranges among mammals (Koopman 1994). Appleton et al. (2004) demonstrated that *Miniopterus schreibersii* actually represents a complex of allopatric species of a different origin with a vast distribution range, which includes the European, African, Asian, and Australian regions, though sharing nearly the same phenotypic design. It is a bat species that almost invariably inhabits underground roosts, predominantly caves and abandoned mine galleries. Two subspecies previously recognized in Europe and Asia Minor, *M. schreibersii schreibersii* and *M. schreibersii pallidus*, differ significantly in nuclear and mitochondrial DNA, as well as in morphology (Furman et al. 2009). Until recently, their records suggested allopatric distribution and their full species status. However, the new finding of the two taxa in sympatry very strongly justifies definition of these forms as two separate species (Furman et al. 2010, Bilgin et al. in press). According to this viewpoint, *Miniopterus schreibersii*, in strict sense, probably is not so widespread. Its geographic range covers North Africa, European and Asian regions adjacent to the Mediterranean, foothills of the Carpathian Mountains and the western Caucasus.

The Schreibers' bat frequently forms colonies of several hundred thousands of individuals. The bat density in such colonies can reach 2000 individuals per square meter. In the temperate zones of the Palaearctic, *M. schreibersii* migrates between nursery roosts and hibernacula. Seasonal

movements of *M. schreibersii* are among the most studied in European bats (e.g. Palmeirim & Rodrigues 1995 or Gaisler et al. 2003). Most populations use transit caves during migrations. Female bats are strongly attained to their place of birth and reproduction, so that a colony usually vanishes if the roost is destructed. However, little is known about the behaviour of male bats in summer and their migration (Hutson et al. 2001).

RECORD

On 21 April 2011, an adult male of *Miniopterus schreibersii* was caught by hand in the Hranická propast (Hranická Chasm, 49° 32' N, 17° 45' E, 315 m a. s. l., depth 244.5 m), Hranice na Moravě, Přerov District, in the square no. 6472 of the Czech mapping grid. The bat was found in daily lethargy in a crevice into the vertical cleft of a rock wall above a pond (10 m above the water surface), close to the corridor where a nursery colony of *Myotis myotis* (Borkhausen, 1797) leaves its roost in the Rotunda Cave. The respective specimen was deposited in the zoological collection of the National Museum, Praha (NMP

Fig. 1. The Schreiber's bat (*Miniopterus schreibersii*) from the Hranická Chasm.
Obr. 1. Létavec stěhovavý (*Miniopterus schreibersii*) z Hranické propasti.

93836; alcoholic specimen). External measurements of the specimen were as follows: weight 12.1 g, head and body length 51.7 mm, tail length 52.8 mm, forearm length 45.3 mm, foot length 10.1 mm, ear length 7.3 mm and tragus length 3.4 mm.

The Rotunda Cave is a part of the Hranická Chasm in the Hranický kras (Hranický Karst, Central Moravia, Czech Republic) (Falková & Řehák in press). The Hranická Chasm, the deepest abyss of the Czech Republic is not far from the Zbrašovské Aragonite Caves. Its dry section, which can be seen, is 69.5 m deep. The depth of the water-filled section was verified by the latest measurement in 2006 to be another –220 m. The total depth, as measured so far, is –289.5 m, but the bottom has not been reached yet. In the chasm, a unique maternity colony of *Myotis myotis* roosts in the small Rotunda Cave (ca. 18 m above water), with stable air temperature 14.5 °C and humidity 100% year round. The system of holes in Devonian limestone was created by hydrothermal processes. The chasm is mostly flooded by ca. 14–20 °C warm mineral water. Besides the *M. myotis* colony, high concentration of *Pipistrellus pipistrellus* (Schreber, 1774) is presumed, the bats being hidden in narrow rock crevices. Further 15 bat species were recorded on the top edge of the chasm by netting (Řehák & Falková 2010).

DISCUSSION

Although no recent record of *Miniopterus schreibersii* has been known in the Czech Republic until the above described finding (cf. Hanák et al. 1995, Hanák & Anděra 2005, Hanák & Anděra 2006, Anděra & Hanák 2007), a fossil Late Holocene record in the Moravian Karst indicated its occurrence (Horáček 1976, Horáček & Ložek 1988). In Europe *M. schreibersii* inhabits warm regions from the Iberian Peninsula, over the Balkans to the Caucasus (Mitchell-Jones et al. 1999, Horáček et al. 2000). Its occurrence in Slovakia is documented by winter and summer records in 7.9% of the territory. In general, two regions of occurrence of this species are distinguished, i.e. a smaller one in western Slovakia (Malé Karpaty Mts. and their surroundings) and a larger one in the Slovakian Karst, Muránska planina and Revúcka vrchovina Mts. (Uhrin et al. 1997). The results of the capture-mark-recapture experiments indicate that these two regions host two different populations (Gaisler et al. 2003). However, the population of *M. schreibersii* in the Malé Karpaty (Lesser Carpathians) region is nowadays only small and unstable. A nursery colony (200–500 individuals) in the Plavecká Cave disappeared in the 1980s (Gaisler & Klíma 1965, Uhrin et al. 1997). Only isolated individuals have been recently observed there and in the southern part of Malé Karpaty (Medené Hámre) (Lehotská 2002). The population of the Plavecká Cave is probably the nearest locality with long-term occurrence of the species to the Hranická Chasm in the Czech Republic (ca. 120 km). In Medené Hámre the bats were netted during the summer-autumn transition period (September) and later were checked also during winter census (Lehotská & Lehotský 1995).

Kürthy et al. (1995) reported summer activity of *M. schreibersii* at the ponds near Malacky by a bat detector. Echolocation calls of *M. schreibersii* are very similar to those of *Pipistrellus pygmaeus* (Leach, 1825), both species emitting FM-QCF calls with the peak frequency of 52–54 kHz (Skiba 2003). In addition, both species forage in a similar type of habitats, near linear vegetation, at water bodies but also as aerial hunters in open areas. Therefore the species identification based on echolocation calls only could be dubious. However, in the same area Gaisler & Klíma (1965) caught, with a hand net, one adult male and one pregnant female within a maternity colony of *Myotis myotis*, with admixed *M. blythii* (Tomes, 1857), in the attic of the Veľké Leváre Castle. The actual number of *M. schreibersii* individuals in the attic was not specified but the record confirmed summer occurrence of the species in this region.

Population of *M. schreibersii* in the western part of Slovakia is connected with populations in northern Austria, from where several findings of *M. schreibersii* are available (Spitzenber-

ger 1981, Spitzenberger & Bauer 2001). One of the oldest records of the species comes from St. Pölten west of Vienna. Jeitteles (1868) found there a hibernating female in a cellar on 21 November 1867. Banding data show that bats from the nursery colony in the Plavecká cave hibernated in the St. Margarethen cave in Austria (Matoušek 1960, Gaisler & Hanák 1969, Spitzenberger 1981).

According to the current distribution pattern, presence of the species in the Czech Republic has been considered very likely (Anděra & Horáček 2005). Southern Moravia has been supposed to be the most suitable region. Both winter and summer shelters are available there in natural caves usually with underground water currents and very large entrances providing the possibility of direct flights (Anděra & Horáček 2005). Therefore it was expected that *M. schreibersii* could regularly visit some caves in the Moravian Karst. Although very intensive bat studies were performed there and a high number of local field workers was involved, the species was never confirmed. Therefore we consider unlikely that the species would have remained unrevealed in the region for such a long time. However, more intensive netting in suitable localities such as the Sloupsko-šošůvské Caves or the Pekárna Cave are needed. As mentioned above, the Hranický Karst (including the Hranická Chasm) was created by hydrothermal processes, therefore the inside air temperature is rather high (14.5 °C) and the temperature of acidulous water in the pond varies from 13 to 24 °C and can warm up the inside air of the Rotunda Cave and ambient crevices. High water temperature could make the Hranická Chasm more interesting for *M. schreibersii* during spring when their body weight is low after hibernation (Hall 2006).

As a result, the Hranická Chasm is currently the northernmost known site of the species in central Europe, situated at a usual altitude, where the occurrence is likely to be natural. Until this record the northernmost locality was the Aksamitka cave in the Pieniny Mts. where Vachold (1956) was the first to find a small nursery colony. The most frequent altitudinal occurrence of *M. schreibersii* in Slovakia varies between 200 and 400 m a. s. l. (51.3% of all known localities) (Matis et al. in press).

Contrary to the continuous expansion of other true Mediterranean elements present in the bat fauna of the Czech Republic, particularly *Rhinolophus ferrumequinum* (Schreber, 1774), *Myotis blythii*, *Pipistrellus kuhlii* (Kuhl, 1817) and/or *Hypsugo savii* (Bonaparte, 1837), the Slovakian populations of *M. schreibersii* have recently declined dramatically, in some localities having dropped to population minimum (e.g. Plavecká Cave) (Matis et al. in press). Furthermore in western Slovakia several important roosts have been destroyed (Lehotská & Lehotský 1995). Also the Austrian and Hungarian populations of *M. schreibersii* have diminished and the species is now regarded as regionally extinct in parts of these countries (Spitzenberger 2005, Gombkötő & Boldogh 2007). In Austria, the hibernating population has declined from 2,500 to 1–2 individuals and all maternity colonies have been lost over the past 50 years. Extinction has occurred also in Germany and Ukraine (Hutson et al. 2001). In Switzerland, the species has declined since the 1960s and it is now close to extinction (Hutson et al. 2001). In Romania, half of the roosts have disappeared since the 1960s (Dragu 2009). Mortality of up to 60% in one year (2002) was reported in France (Roué & Némoz 2002), and 40% mortality occurred in Spain during the same period including 1,000 dead individuals out of 6,000 in one colony. However, no population decline has been recorded in large colonies in Croatia and Bulgaria (Hutson et al. 2001). Considering this, the record of *M. schreibersii* in the Czech Republic seems to be an anecdotal evidence unrelated to the expansion of other Mediterranean bat species.

Miniopterus schreibersii is known to form mixed colonies with other bat species, both in summer and winter. In Slovakia, co-occurrence with *Rhinolophus euryale* Blasius, 1853, *Myotis*

myotis, *M. blythii*, *Pipistrellus pipistrellus* and *Barbastella barbastellus* (Schreber, 1774) has been observed, with numerous aggregations recorded (e.g. *Miniopterus schreibersii*, *Myotis myotis* and *M. blythii* in the Plavecká Cave). Also the record from Veľké Leváre documents two individuals in a nursery colony of *Myotis myotis* and *M. blythii* roosting in the attics of the castle. Therefore, such occasional record could come from numerous nursery colonies of *M. myotis* in southern Moravia.

Miniopterus schreibersii is the 27th bat species known in the Czech Republic, when considering the records of *Nyctalus lasiopterus* (Schreber, 1780) mentioned by Řehák et al. (2003) as trustworthy, and represents herewith a new bat family (Miniopteridae) for the Czech Republic.

ACKNOWLEDGEMENTS

We are very grateful to V. Hanák for selfless help with old published and unpublished records of *Miniopterus schreibersii* and J. Gaisler and P. Benda for valuable comments on the manuscript. The survey was supported by the Ministry of Environment and the Ministry of Education, Youth and Sports of the Czech Republic (grant No. MSM0021622416).

SOUHRN

V Hranické propasti (střední Morava, 49° 32' s. š , 17° 45' v. d., 315 m n. m., kvadrát mapovací sítě 6472) byl 21. dubna 2011 do ruky odchycen dospělý samec létavce stěhovavého (*Miniopterus schreibersii*). Tento nález představuje první záznam tohoto druhu a současně zástupce nové čeledi Miniopteridae pro území České republiky. Odchyt také potvrzuje úzkou vazbu populací tohoto druhu na jeskynní systémy.

REFERENCES

Appleton B. R., McKenzie J.A. & Christidis L., 2004: Molecular systematics and biogeography of the bent-wing bat complex *Miniopterus schreibersii* (Kuhl, 1817) (Chiroptera: Vespertilionidae). *Molecular Phylogenetics and Evolution*, **31**: 431–439.

Anděra M. & Hanák V., 2007: *Atlas rozšíření savců v České republice. Předběžná verze. V. – Letouni* (*Chiroptera*) *– část 3. Netopýrovití* (*Vespertilionidae – Vespertilio*, *Eptesicus*, *Nyctalus*, *Pipistrellus a Hypsugo*) [*Atlas of the distribution of mammals in the Czech Republic. Provisional version. V. Bats* (*Chiroptera*) *– Part 3. Vespertilionid bats* (*Vespertilionidae – Vespertilio*, *Eptesicus*, *Nyctalus*, *Pipistrellus and Hypsugo*)]. Národní muzeum, Praha, 172 pp (in Czech, with a summary in English).

Anděra M. & Horáček I., 2005: *Poznáváme naše savce. 2. přepracované vydání* [*We Recognise Our Mammals. 2nd Revised Edition*]. Sobotáles, Praha, 327 pp (in Czech).

Bilgin R., Gürün K., Maraci O., Lučan R., Bartonička T., Hulva P. & Horáček I., in press: Syntopic occurrence in Turkey proves separate species status for *Miniopterus schreibersii schreibersii* and *Miniopterus schreibersii pallidus* (Mammalia: Chiroptera). *Acta Chiropterologica*.

Dragu A., 2009: Species structure of the bat community hibernating in Muierilor Cave (Southern Carpathians, Romania). *North-Western Journal of Zoology*, **5**: 281–289.

Falková L. & Řehák Z., in press: Časové změny v aktivitě *Pipistrellus pipistrellus* v blízkosti úkrytu v Hranické propasti (Česká republika) [Temporal changes in the activity of *Pipistrellus pipistrellus* close to its shelter in the Hranická Chasm (Czech Republic)]. Pp.: 75–81. In: Adamec M., Urban P. & Adamcová M. (eds.): *Výskum a ochrana cicavcov na Slovensku IX* [*Research and Conservation of Mammals in Slovakia IX*]. Štátna ochrana prírody SR, Banska Bystrica (in Czech, with an abstract in English).

Furman A., Çoraman E., Bilgin R. & Karataş A., 2009: Molecular ecology and phylogeography of the bent-wing bat complex (*Miniopterus schreibersii*) (Chiroptera: Vespertilionidae) in Asia Minor and adjacent regions. *Zoologica Scripta*, **38**: 129–141.

Furman A., Postawa T., Öztunç T. & Çoraman E., 2010: Cryptic diversity of the bent-wing bat, *Miniopterus schreibersii* (Chiroptera: Vespertilionidae), in Asia Minor. *BiomedCentral Evolutionary Biology*, **10**(121): 1–12.

Gaisler J. & Hanák V., 1969: Ergebnisse der zwanzigjährigen Beringung von Fledermäusen (Chiroptera) in der Tschechoslowakei: 1948–1967. *Acta Scientiarum Naturalium Academiae Scientiarum Bohemoslovacae Brno*, **3**(5): 1–33.

Gaisler J. & Klíma M., 1965: Letní nálezy některých méně známých netopýrů na Moravě a na Slovensku v období 1961–1964 [Summer findings of some less known bats in Moravia and Slovakia in 1961–1964]. *Lynx*, *n. s.*, **5**: 19–29 (in Czech).

Gaisler J., Hanák V., Hanzal V. & Jarský V., 2003: Výsledky kroužkování netopýrů v České republice a na Slovensku, 1948–2000 [Results of bat banding in the Czech and Slovak Republics, 1948–2000]. *Vespertilio*, **7**: 3–61 (in Czech, with an abstract in English)

Gombkötő P. & S. Boldogh S., 2007: Hossúszárnyú denevér *Miniopterus schreibersii* (Kuhl, 1819) [Schreibers' bat, *Miniopterus schreibersii* (Kuhl, 1819)]. Pp.: 127–128. In: Bihari Z., Csorba G. & Heltai M. (eds.): *Magyarország emlőseinek atlasza* [*Atlas of Mammals of Hungary*]. Kossuth Kiadó, Budapest, 360 pp (in Hungarian).

Hall L. S., 2006: The effect of cave microclimate on winter roosting behaviour in the bat, *Miniopterus schreibersii blepotis*. *Australian Journal of Ecology*, 7: 129–136.

Hanák V. & Anděra M., 2005: *Atlas rozšíření savců v České republice*. *Předběžná verze*. *V*. *– Letouni* (*Chiroptera*) *– část 1*. *Vrápencovití* (*Rhinolophidae*), *netopýrovití* (*Vespertilionidae – Barbastella barbastellus*, *Plecotus auritus*, *Plecotus austriacus*) [*Atlas of the Distribution of Mammals in the Czech Republic*. *Provisional Version*. *V*. *Bats* (*Chiroptera*) *– Part 1*. *Horseshoe Bats* (*Rhinolophidae*), *Vespertilionid Bats* (*Vespertilionidae – Barbastella barbastellus*, *Plecotus auritus*, *Plecotus austriacus*)]. Národní muzeum, Praha, 120 pp (in Czech, with a summary in English).

Hanák V. & Anděra M., 2006: *Atlas rozšíření savců v České republice*. *Předběžná verze*. *V*. *– Letouni* (*Chiroptera*) *– část 2*. *Netopýrovití* (*Vespertilionidae – rod Myotis*) [*Atlas of the Distribution of Mammals in the Czech Republic*. *A Provisional Version*. *V*. *Bats* (*Chiroptera*) *– Part 2*. *Vespertilionid Bats* (*Vespertilionidae – genus Myotis*)]. Národní muzeum, Praha, 187 pp (in Czech, with a summary in English).

Hanák V., Benda P. & Hanzal V., 1995: Přehled poznaného rozšíření netopýrů v ČR [Review of bat distribution in the Czech Republic]. *Czech Bat Conservation Trust Bulletin*, **5**: 3–15 (in Czech, with a summary in English).

Horáček I., 1976: Přehled kvartérních netopýrů (Chiroptera) Československa [Review of Quaternary bats of Czechoslovakia]. *Lynx*, *n*. *s*., **18**: 35–58.

Horáček I. & Ložek V., 1988: Palaeozoology and the Mid-European Quaternary past: scope of the approach and selected results. *Rozpravy Československé Akademie Věd*, *Řada Matematických a Přírodních Věd*, **98**(4): 1–106.

Horáček I., Hanák V. & Gaisler J., 2000: Bats of the Palearctic region: a taxonomic and biogeographic review. Pp.: 11–157. In: Woloszyn B. W. (ed.): *Proceedings of the VIIIth European Bat Research Symposium*. *Volume I*. *Approaches to Biogeography and Ecology of Bats*. Chiropterological Information Center, Institute of Systematics and Evolution of Animals PAS, Kraków, 280 pp.

Hutson A. M., Mickleburgh S. P. & Racey P. A., 2001: *Microchiropteran Bats*. *Global Status Survey and Conservation Action Plan*. IUCN, Gland, 258 pp.

Jeitteles L. H., 1868: Eine neue für Niederösterreich und die nördlichen Alpenländer neue Fledermaus. *Verhandlungen der Zoologisch-Botanischen Gesellschaft in Wien*, **10**: 121–124.

Koopman K. F., 1994: Chiroptera: Systematics. In: Niethammer J., Schliemann H. & Stark D. (eds.): *Handbook of Zoology*. *Volume VIII*. *Mammalia*. *Part 60*. Walter de Gruyter, Berlin, New York, 217 pp.

Kürthy A., Jarcik K. & Kürthyová M., 1995: Zhrnutie poznatkov o letných výskytoch netopierov na Záhorí po prvom roku činnosti tímu "Plecotus" [Review of the summer bat occurrence in the Záhorie region after the first year of activity of the team "Plecotus"]. *Netopiere*, **1**: 71–82 (in Slovak, with an abstract in English).

Lehotská B., 2002: Netopiere Malých Karpát [Bats of the Malé Karpaty Mts.]. *Lynx*, *n*. *s*., **33**: 141–184 (in Slovak, with an abstract in English).

Lehotská B. & Lehotský R., 1995: Lietavec sťahovavý (*Miniopterus schreibersii*) opäť v Malých Karpatoch. [*Miniopterus schreibersii* in the Malé Karpaty Mts. again]. Pp.: 87–92. In: Adamec M., Urban P. & Adamcová M. (eds.): *Výskum a ochrana cicavcov na Slovensku II* [*Research and Conservation of Mammals in Slovakia II*]. Štátna ochrana prírody SR, Banska Bystrica, 112 pp (in Slovak, with an abstract in English).

Matis Š., Uhrin M., Danko Š. & Krištofík J., in press: Lietavec sťahovavý – *Miniopterus schreibersii* [Schreibers' bat – *Miniopterus schreibersii*]. In: Krištofík J. & Danko Š. (eds.): *Alas cicavcov Slovenska – rozšírenie*, *bionómia a ochrana* [*Mammals of Slovakia – Distribution*, *Bionomy and Protection*]. Veda, Bratislava.

Matoušek F., 1960: Príspevok k ťahu lietavca sťahovavého (*Miniopterus schreibersii* Kuhl.) na Slovensku [Contribution to the migration of Schreibers' bat (*Miniopterus schreibersii*) in Slovakia]. *Acta Rerum Naturalium Musei Nationalis Slovaci Bratislava*, **6**: 72–78 (in Slovak).

Mitchell-Jones A. J., Amori G., Bogdanowicz W., Kryštufek B., Reijders P. J. H., Spitzenberger F., Stubbe M., Thissen J. B. M., Vohralik V. & Zima J., 1999: *The Atlas of European Mammals*. T & AD Poyser Ltd. London, 250 pp.

Palmeirim J. M. & Rodrigues L., 1995: Dispersal in colonial animals – the case of *Miniopterus schreibersii*. Pp.: 219–231. In: Racey P. A. & Swift S. M. (eds.): *Ecology*, *Evolution and Behaviour of Bats*. Oxford University Press, Oxford, 446 pp.

Roué S. Y. & Némoz M., 2002: *Mortalité exceptionnelle du Minioptère de Schreibers en France lors de l'année 2002*. Bilan national S.F.E.P.M., Paris, 27 pp.

Řehák Z. & Falková L., 2010: Netopýři Hranické propasti po 10 letech. Zpřístupněné jeskyně 2010 [Bats of Hranická Chasm after 10 years. Show Caves 2010]. *Ročenka Správy Jeskyní České Republiky*, **2010**: 67–68 (in Czech).

Řehák Z., Chytil J., Bartonička T. & Gaisler J., 2003: Výskyt drobných savců na území Biosférické rezervace Dolní Morava (rozšířená Biosférická rezervace Pálava). Část II. Netopýři – Microchiroptera [Distribution of small mammals in the Biosphere Reserve Lower Morava (extended BR Pálava). Part II. Bats – Microchiroptera]. *Lynx*, *n. s.*, **34**: 181–203 (in Czech, with an abstract in English).

Skiba R., 2003: *Europaische Fledermause*. *Kennzeichen*, *Echoortung und Detektoranwendung*. *Die Neue Brehm-Bücherei 648*. Westarp Wissenschaften, Hohenwarsleben, 212 pp.

Spitzenberger F., 1981: Die Langflügelfledermaus *Miniopterus schreibersii* (Kuhl, 1819) in Österreich. Mammalia austriaca 5. *Mitteilungen der Abteilung für Zoologie und Botanik am Landesmuseum Joanneum in Graz*, **10**(2): 139–156.

Spitzenberger F., 2005: *Rote Liste der Säugetiere Österreichs*. Pp.: 45–62. In: *Rote Listen gefährdeter Tiere Österreichs*. Böhlau, Wien, Köln, Weimar, 406 pp.

Spitzenberger F. & Bauer K., 2001: Langflügelfledermaus *Miniopterus schreibersii* (Kuhl, 1819). Pp.: 309–316. In: Spitzenberger F. (ed.): *Die Säugetierfauna Österreichs*. Grüne Reihe des Bungesministeriums für Land- und Forstwirtschaft, umwelt und Wasserwirtschaft, Graz, 896 pp.

Uhrin M., Lehotská B., Benda P., Lehotský R. & Matis Š., 1997: Rozšírenie netopierov na Slovensku. Časť 3, *Miniopterus schreibersii*. [Distributional patterns of bats in Slovakia. Part 3, *Miniopterus schreibersii*] *Vespertilio*, **2**: 113–130 (in Slovak, with an abstract in English).

Vachold J., 1956: K otázke výskytu a rozšírenia netopierov (Chiroptera) na Slovensku [To question of occurrence and distribution of bats (Chiroptera) in Slovakia]. *Biologické Práce*, **2**: 1–68 (in Slovak).