



## LONG-EARED BATS, GENUS *PLECOTUS* (MAMMALIA: CHIROPTERA), IN BULGARIA: A REVISION OF SYSTEMATIC AND DISTRIBUTIONAL STATUS

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**Abstract.** In the morphological analysis, all available museum material of long-eared bats coming from the territory of Bulgaria, nominately identified as *P. auritus* (12 specimens) and *P. austriacus* (69), was compared with four species of *Plecotus* from Central Europe, the Balkans and Asia Minor. According to the results of the analysis, only two species can be considered as verified to occur in the territory of Bulgaria – *P. auritus* and *P. austriacus*. Unlike in Central Europe, *P. auritus* is restricted to mountain ranges in Bulgaria; most of its records (86%) come from the elevation of more than 1000 m a.s.l. (mean altitude is 1202 m a.s.l.). On the contrary, *P. austriacus* is a species of low altitudes, occurring at elevations exceeding 1000 m a.s.l. only exceptionally (mean altitude is 465 m a.s.l.).

■ Mammalia, Chiroptera, *Plecotus*, systematics, distribution, Bulgaria.

### INTRODUCTION

Long-eared bats of the genus *Plecotus* GEOFFROY, 1818, are a common part of Bulgarian fauna. Occurrence of long-eared bats has been known from the territory of recent Bulgaria since the study of mammal fauna began there. The first finding is mentioned by Kovačev (1906) from Obrazcovija Čiflik in the east of the country (near Varna), later on records of long-eared bats were reported from other parts of Bulgaria: from Sitnjakovo in the Rila Mts. (Boetticher 1925), from Lileč (= Liljač) near Kjustendil (Kovačev 1925) and from Sozopol near Burgas (Wolf 1940).

More records were made after the World War II, when a more detailed research of Bulgarian fauna, including bats, was started. Markov (1955a), Beron (1959), and Hanák et Josifov (1959) reported repeated findings of long-eared bats in the Borovec resort in the Rila Mts. Markov (1955b) and Markov et Hristov (1960) mentioned records from Dobrudža. Martino (1955), Beron (1959), and Hanák et Josifov (1959) gave records from the city of Sofia. Beron (1958, 1959, 1962, 1963) described findings of long-eared bats from 20 caves and mines in the wider surroundings of Sofia (districts of Loveč and Sofia). Records from the surroundings of Varna (Evksinograd and Kunino) are given by Hanák et Josifov (1959).

Until the early 1960s, all records of long-eared bats from Bulgaria were ascribed to the species *Plecotus auritus* (LINNAEUS, 1758), as the genus *Plecotus* was then considered to be monotypic (Ellermann et Morisson-Scott 1951). Gaisler et Hanák (1964) were the first

to report on the occurrence of a newly identified species *Plecotus austriacus* (FISCHER, 1829) in Bulgaria (Prohodna cave near Karlukovo, Temnata dupka cave near Lakatnik, and a cave near Kavarna). This was in agreement with the findings of Beron (1964), who confirmed the presence of both then known European species of the genus *Plecotus* in Bulgaria in sympatry for the first time; he reported the species *P. auritus* from Pamporovo near Smoljan (Rhodopes Mts.) and ascribed also some older findings of long-eared bats from two sites in the Rila Mts. (Boetticher 1925, Markov 1955a, Beron 1959, Hanák et Josifov 1959) to this species. Beron (1964) also described records of 10 specimens of the species *P. austriacus* from several sites around Sofia and ascribed findings of long-eared bats from Bulgaria published by Kovačev (1906, 1925), Wolf (1940), Beron (1958, 1959, 1962, 1963), and Hanák et Josifov (1959) to this species, i.e. almost all, except for two sites situated in the Rila Mts.

Until now, large number of records of bats of the genus *Plecotus* (mostly *P. austriacus*, however) from the whole territory of Bulgaria have been published. The brown long-eared bat, *P. auritus*, which is considered to be a “boreal” or “northern” element of the Balkan fauna (Helvesen et Weid 1990, Hanák et al. 2001), has been recorded only in 21 sites in Bulgaria, thus ranking among the rarest species in the country (Ivanova 1995, Pandurska 1996). Besides three localities mentioned by Beron (1964), the following findings have been published: mine near Urvič (Sofia Dist.) (Beron 1970); Samurski dupki cave and Ledenica cave (Smoljan Dist.) (Horáček et al. 1971, 1974, Hürka 1984); Lilova cave (Pazardžik Dist.) (Grimmberger 1993); mine in the Izdrimec hill, Travninata cave, building on the Murgaš hill, Goljama Balabanova cave (all sites in the Sofia Dist.) (Pandurska et Beshkov 1998a); cave near Leško (Blagoevgrad Dist.) (Pandurska et Beshkov 1998b); Mäglivijat Snjag cave (Sliven Dist.) (Ivanova 1998); Mazata and Rogáčevata caves (Plovdiv Dist.) and two sites in the Džendema reserve near Táža (Stara Zagora Dist.) (Ivanova 1998, Beron et al. 2000a); caves near Ginci (Sofia Dist.) (Pandurska et Beshkov 1998a, Pandurska et al. 1999); Dolna Karanska cave and a cave near Orehovo (Smoljan Dist.) (Hanák et al. 2001). All records of *P. auritus* come from mountain areas – Rhodopes Mts., Pirin Mts., Rila Mts., Vlahina Mts., Vitoša Mts., and the whole ridge of Stara Planina (Balkan) Mts., i.e. mostly all higher mountain ranges of Bulgaria.

The grey long-eared bat, *P. austriacus*, is found in Bulgaria much more often than the former species. A large number of localities are known from the literature – besides the 27 sites given by Beron (1964) and Gaisler et Hanák (1964), there are 47 localities where the species has been recorded (repeated findings are reported from some of them). Occurrence of *P. austriacus* is thus reported from all parts of Bulgaria, in all altitudes ranging from the sea level to middle mountain elevations (Dusbábek 1964a, b, Hürka 1965, Kolebinova et Beron 1965, Beron et Guéorguiev 1967, Beron 1968, 1970, Hürka 1970, Beron 1973, Jančev et Stojkova 1973, Belcheva et al. 1992, Popov et Ivanova 1995, Obuch et Benda 1996, Ivanova 1997, 1998, Pandurska et Beshkov 1998a, b, Undžijan 1998, Pandurska et al. 1999, Beron et al. 2000, Hanák et al. 2001, Ivanova 2001).

Until recently, all European populations of long-eared bats were ascribed to two species only, *P. auritus* and *P. austriacus* (Paz 1994, Schober et Grimmberger 1998, Mitchell-Jones et al. 1999). However, several genetic and morphological studies carried out in the last years (Kiefer et Veith 2002, Kiefer et al. 2002, Mayer et Helversen 2001, Mucedda et al. 2002, Spitzenberger et al. 2001, 2002) have confirmed the existence of at least five species of the genus *Plecotus* in Europe: in addition to *P. auritus* and *P. austriacus*, there are *P. kolombatovici* ĐULIĆ, 1980, *P. alpinus* KIEFER et VEITH, 2002 (= *P. microdontus* SPITZENBERGER, 2002) and *P. sardus* MUCEDDA, KIEFER, PIDINCHEDDA et VEITH, 2002. Ex-

cept for the latter species which has been recorded only in Sardinia so far (Mucedda et al. 2002, Kiefer et Mucedda 2003), the other four species occur in south-eastern Europe (Đulić 1980, Hanák et al. 2001, Kiefer et al. 2002, Spitzenberger et al. 2002, Kiefer et Helversen 2003a, b). Concerning the Balkan peninsula, all these four species have been confirmed to occur in Croatia and Greece, both inland and on some islands. The Bulgarian fauna thus might be also richer in the two newly identified species of the genus *Plecotus* which occur in a close neighbourhood of the country.

The aims of the paper are (1) to revise all available museum material in order to find out all forms of the genus *Plecotus* inhabiting the territory of Bulgaria and also to verify the possibility of identification of those species based on morphological traits (see Spitzenberger et al. 2002); (2) using the precisely revised material, to describe distribution of the particular forms in Bulgaria and to assess their general ecological requirements in south-eastern Europe (see Beron 1964 and the data quoted above).

## MATERIAL AND METHODS

In the analysis, all available museum material of long-eared bats coming from the territory of Bulgaria (see the List of the material examined), nominately identified as *P. auritus* (12 specimens) and *P. austriacus* (69 specimens), was used. For morphological analysis, mostly skulls were used. This material was compared with the defined material of four species (see Appendix for the comparative material used) – *P. auritus* and *P. austriacus* from Central Europe and from the Balkans; *P. alpinus* and *P. kolombatovici* (identification of most specimens of both species was verified by genetic analysis) from the Pyrenees, Alps and Dinaric Mts. (PA) and from Croatia, Greece and Turkey (PK). The specimens were measured in a standard way using mechanical or optical callipers. The measurements were taken according to Stebbings (1967), Häussler et Braun (1991) and Rabeder (1972, 1974), the dental measurements were taken including cingula of the respective teeth (Menu 1983).

### List of the material examined

*Plecotus auritus*: 1 ind. (NMNHS [skeletal parts]), Bansko (Blagoevgrad Dist.), Vihrenska propast chasm, 30 Aug 1972, leg. P. Beron; – 1 m ad. (NMP 49078 [S+A]), Jagodina (Smoljan Dist.), Dolna Karanska dupka cave, 16 Aug 1978, leg. V. Hanák, D. Holečková et J. Jirouš (cf. Hanák et al. 2001); – 4 m ad., 1 m sad., 2 f sad. (NMP 49070, 49072–49077 [S+A]), Gela (Smoljan Dist.), Ledenica cave, 13 Aug 1978, leg. V. Hanák, D. Holečková, J. Jirouš et V. Vohralík (cf. Hanák et al. 2001, Hürka 1984); – 1 m ad. (NMNHS 113 [S]), Kalofer (Plovdiv Dist.), Raj hut, Rogačevata peštera cave, 18 Aug 1997, leg. T. Ivanova (cf. Ivanova 1998, Beron et al. 2000a); – 1 m ad. (NMP 49082 [S+A]), Orehovo (Smoljan Dist.), cave in a quarry, 25 Aug 1980, leg. D. Holečková, J. Jirouš et V. Vohralík (cf. Hanák et al. 2001); – 1 m sad. (NMP 50441 [S+A]), Rilski Manastir (Kjustendil Dist.), Kirilova Poljana, mine, 18 Dec 2002, leg. P. Benda et T. Ivanova.

*Plecotus austriacus*: 1 f ad. (NMNHS [S]), Gabare (Vraca Dist.), Starata Prodánka cave, 3 March 1968, leg. P. Beron (cf. Beron 1970); – 1 m ad., 3 m sad., 1 f ad. (NMP 49132–49136 [S+A]), General Todorov (Blagoevgrad Dist.), Pčelina hill, tunnel, 4 and 11 Aug 1994, leg. P. Benda (cf. Hanák et al. 2001); – 1 fa (NMNHS [S]), Gložene (Loveč Dist.), leg. P. Beron; – 3 m ad. (NMP 49084–49086 [S+B]), Gorna Breznica (Blagoevgrad Dist.), theatre, 16–20 July 1981, leg. I. Horáček, J. Flousek et V. Vohralík (cf. Hanák et al. 2001); – 1 m ad. (NMP 49079 [S+A]), Jagodina (Smoljan Dist.), Dolna Karanska dupka cave, 16 Aug 1978, leg. V. Hanák, D. Holečková et J. Jirouš (cf. Hanák et al. 2001); – 1 m ad. (NMP 50056 [S+B]), Kamen Brjag (Dobrič Dist.), 9 July 1987, leg. M. Šálek; – 1 m ad., 2 m sad., 2 f ad. (IVB 42, 73 [S+B]; NMP 49052–49054 [S]), Karlukovo (Loveč Dist.), Bankovica cave, 3 Oct. 1962, leg. J. Gaisler, 7 Feb 1965, leg. V. Hanák, J. Gaisler, K. Hürka et J. Figala (cf. Gaisler et Hanák 1964, Hanák et al. 2001); – 3 m ad. (NMP 49067, 49068, 49071 [S+A]), Karlukovo (Loveč Dist.), Prohodna peštera cave, 6 and 7 Aug 1978, leg. V. Hanák, D. Holečková, J. Jirouš et V. Vohralík (cf. Hanák et al. 2001); – 1 m ad. (NMP 50235 [S+A]), Karlukovo (Loveč Dist.), Temnata dupka cave, 5 July 1975, leg. J. Červený; – 1 m ad. (NMP 49069 [S]), Karlukovo (Loveč Dist.), a cave behind monastery, 8 Aug 1978, leg. V. Hanák, D. Holečková, J. Jirouš et V.

Vohralík (cf. Hanák et al. 2001); – 1 f ad. (IVB 74 [S+B]), Karlukovo (Loveč Dist.), a cave near the Prohodna peštera cave, 7 Feb 1965, leg. V. Hanák, J. Gaisler, K. Hürka et J. Figala; – 2 m ad. (NMP 49064, 49065 [S+A]), Karlukovo (Loveč Dist.), ridge above rocky amphitheatre, 12 and 15 June 1977, leg. V. Hanák, F. Pojer et J. Škopek (cf. Hanák et al. 2001); – 1 m ad., 2 f ad., 1 f ad. (IVB 38–41 [S+B]), Kavarna (Dobrič Dist.), a cave near sea, 11 Sept 1962, leg. J. Gaisler (cf. Gaisler et Hanák 1964, Hanák et al. 2001); – 1 f ad. (NMNHS [S]), Kostinbrod (Sofia Dist.), 21 March 1967: coll. leg. P. Beron (cf. Jančev et Stojkova 1973); – 1 m ad. (NMP 49051 [S]), Lakatnik (Sofia Dist.), Gornata peštera cave, 18 March 1956, leg. M. Josifov (cf. Beron 1962, Gaisler et Hanák 1964, Hanák et al. 2001); – 5 m ad., 3 f ad., 2 f ad., 1 ind. (NMP 49055–49063 [S+B], 50145 [B], 50438 [A+S]), Lakatnik (Sofia Dist.), Suhata peštera cave, 21 Dec 1956, leg. V. Beškov (cf. Hanák et Josifov 1959), 10 Feb 1965, leg. V. Hanák, J. Gaisler, K. Hürka et J. Figala (cf. Hürka 1965, Hanák et al. 2001), 16 Dec 2002, leg. P. Benda et T. Ivanova; – 1 f ad. (NMP 50440 [A+S]), Lakatnik (Sofia Dist.), Svinškata dupka cave, 16 Dec 2002, leg. P. Benda et T. Ivanova; – 1 m ad., 1 m ad., 3 f ad., 1 f ad. (NMP 50103 [S], 50436, 50437 [A+S], IVB 76–78 [S+B]), Lakatnik (Sofia Dist.), Temnata dupka cave, 10 Feb 1965, leg. V. Hanák, J. Gaisler, K. Hürka et J. Figala (cf. Hürka 1965, Hanák et al. 2001), 16 Dec 2002, leg. P. Benda et T. Ivanova; – 1 f ad. (NMP 49066 [S+A]), Momčilgrad (Kărdžali Dist.), water pool, 18 June 1977, leg. V. Hanák, F. Pojer et J. Škopek (cf. Hanák et al. 2001); – 7 m ad. (NMP 49080, 49081, 49083, 49087–49090 [S+A]), Orehovo (Smoljan Dist.), caves, 24 and 25 Aug 1980, leg. D. Holečková, J. Jirouš et V. Vohralík, 28 and 29 June 1984, leg. T. Scholz et D. Král (cf. Hanák et al. 2001); – 1 ind. (NMNHS 075 [S]), Pernik (Pernik Dist.), leg. T. Ivanova; – 2 m ad. (NMP 49130, 49131 [S+A]), Ploski (Blagoevgrad Dist.), cave, 30 and 31 July 1994, leg. P. Benda (cf. Hanák et al. 2001); – 1 m ad. (NMP 40922 [S+A]), Sliven (Sliven Dist.), 6 October 1982, leg. B. Pražan (cf. Hanák et al. 2001); – 1 m ad. (NMNHS [S]), Sofia (Sofia Dist.), 27 April 1963, leg. P. Beron; – 1 f ad. (ZFMK 39.21 [S+B]), Sozopol (Burgas Dist.), 8 May 1938, leg. H. Wolf (cf. Wolf 1940); – 1 ind. (NMNHS [S]), Sveti Nikola (Varna Dist.), Tauk Liman, small cave, 5 April 1994, leg. T. Ivanova; – 1 f ad. (IVB 75 [S+B]), Zlatna Panega (Loveč Dist.), Panežka izvora cave, 8 Feb 1965, leg. V. Hanák, J. Gaisler, K. Hürka et J. Figala (cf. Hanák et al. 2001); – 4 ind. (NMNHS [S]), Bulgaria, exact data not available (? Sofia Dist.).

## Abbreviations

### Material

S = skull, A = alcohol specimen, B = dry skin (balg); m = male, f = female, ind. = sex indetermined.

### Measurements

Cranial and dental measurements: LCr = greatest length of skull; LCb = condylobasal length of skull; LCc = condylocanine length of skull; LaZ = zygomatic width; Lal = width of interorbital constriction; Lalnf = width between foramina infraorbitalia; LaN = neurocranium width; ANc = neurocranium height; ACr = skull height (incl. bullae tympanicae); LBT = length (largest diameter) of tympanic bulla; CC = rostral width between canines (incl.); P<sup>4</sup>P<sup>4</sup> = rostral width between third upper premolars (incl.); M<sup>3</sup>M<sup>3</sup> = rostral width between third upper molars (incl.); I<sup>1</sup>M<sup>3</sup> = length of upper teeth-row between I<sup>1</sup>M<sup>3</sup> (incl.); CM<sup>3</sup> = length of upper teeth-row between CM<sup>3</sup> (incl.); M<sup>1</sup>M<sup>3</sup> = length of upper teeth-row between M<sup>1</sup>M<sup>3</sup> (incl.); CP<sup>4</sup> = length of upper teeth-row between CP<sup>4</sup> (incl.); LI<sup>1</sup> = mesiodistal length of first upper incisor; LaI<sup>1</sup> = palatolabial width of first upper incisor; AI<sup>1</sup> = height of first upper incisor crown (from cingulum to the tip); LCn = mesiodistal length of upper canine; LaCn = palatolabial width of upper canine; ACn = height of upper canine crown (from cingulum to the tip); LP<sup>3</sup> = mesiodistal length of first upper premolar; LaP<sup>3</sup> = palatolabial width of first upper premolar; AP<sup>3</sup> = height of first upper premolar crown (from cingulum to the tip); LM<sup>1</sup> = mesiodistal length of first upper molar (over parastyle and metastyle edges); LaM<sup>1</sup> = largest palatolabial width of first upper molar from parastyle; LM<sup>3</sup> = mesiodistal length of third upper molar over metaconus; LaM<sup>3</sup> = palatolabial width of third upper molar from parastyle; ACin = height of mesiopalaatal cingular cusp of P<sup>4</sup>; LMD = mandible length; ACo = height of coronoid process; I<sub>1</sub>M<sub>3</sub> = length of lower teeth-row between I<sub>1</sub>M<sub>3</sub> (incl.); CM<sub>3</sub> = length of lower teeth-row between CM<sub>3</sub> (incl.); M<sub>1</sub>M<sub>3</sub> = length of lower teeth-row between M<sub>1</sub>M<sub>3</sub> (incl.); CP<sub>4</sub> = length of lower teeth-row between CP<sub>4</sub> (incl.).

Wing measurements: LAt = forearm length (incl. wrist); LPol = thumb length (excl. claw).

### Collections

CUP – Department of Zoology, Charles University, Prague, Czech Republic; IVB – Institute of Vertebrate Zoology, Brno, Czech Republic; JGUM – Department of Ecology, Johannes Gutenberg University, Mainz, Germany; MUB – Department of Zoology and Ecology, Masaryk University, Brno, Czech Republic; NMNHS – National Museum of Natural History, Sofia, Bulgaria; NMP – National Museum, Prague, Czech Republic; SMF – Senckenberg Museum, Frankfurt am Main, Germany; SNMB – Slovak National Museum, Bratislava, Slovakia; ZFMK – Zoological Institute Alexander Koenig, Bonn, Germany; ZIN – Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia.

## RESULTS AND DISCUSSION

Bauer (2001) mentions the combination of  $CM^3$  and LBT among metric identification characters of the species *P. auritus*, *P. austriacus* and *P. alpinus* in Austria. Comparison of these two measurements taken on our study material from Bulgaria with those of comparative material (Fig. 1) shows three evident size groups – large specimens ( $CM^3 > 5.7$  mm,  $LBT > 4.35$  mm) belong clearly to the species *P. austriacus*, small specimens ( $CM^3 < 5.7$  mm,  $LBT < 4.25$  mm) to *P. auritus*, and the group of intermediate specimens ( $CM^3 < 4.7$  mm,  $LBT 4.2–4.6$  mm) includes the species *P. alpinus* and *P. kolombatovici*. Bulgarian specimens and specimens of the comparative samples of *P. auritus* and *P. austriacus* from central Europe form identical clusters, while no Bulgarian specimen is found in the cluster of the species *P. alpinus* and *P. kolombatovici*. This is in agreement with the results of the canonical discriminant function defined by Spitzenberger et al. (2001, 2002), using five cranial measurements (LCc,  $CM^3$ , LMd,  $CM_3$ , and LBT) (Fig. 2). Central-European and Bulgarian specimens of *P. auritus* and *P. austriacus* form two species clusters (*auritus* X: 0.14–0.48; Y: 3.49–3.87; *austriacus* X: 0.08–0.38; Y: 4.02–4.43), separated from the cluster which includes specimens of *P. alpinus* and *P. kolombatovici* (X: –0.03–0.22; Y: 3.72–4.09). In order to identify *P. alpinus* within the studied sample, Spitzenberger et al. (2002) mention also the comparison of ACn and AI<sup>1</sup>. The comparison of our set of specimens has shown the same ratio of these measurements as in Spitzenberger et al. (2002), the species *P. alpinus* thus has not been confirmed in the set of Bulgarian specimens. The analysis did not result in clear species identification – within our set which includes four species, there was an overlap of all species clusters (Fig. 3). However, all Bulgarian specimens fall into clusters made of the central-European specimens of *P. auritus* and *P. aus-*

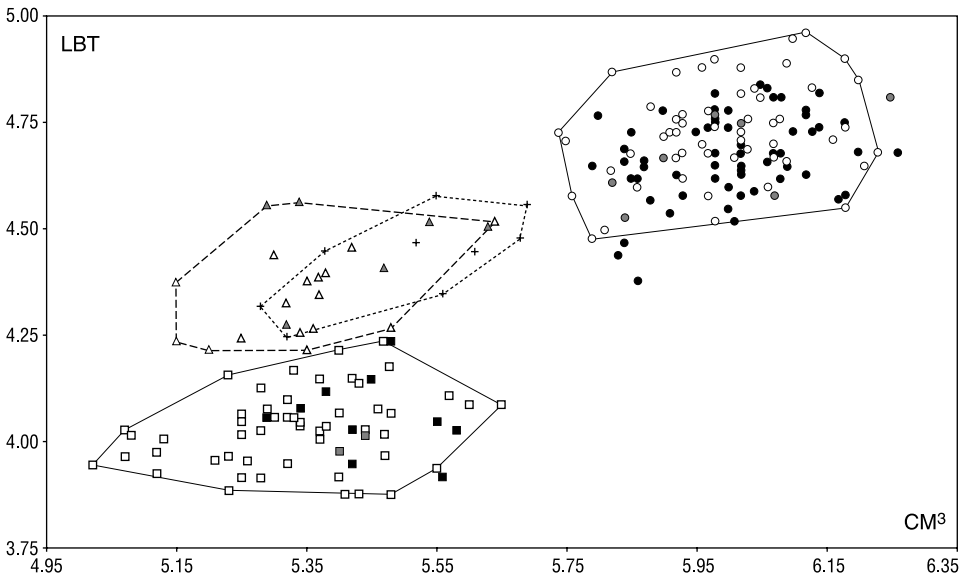


Fig. 1. Bivariate comparison of the length of upper teeth-row ( $CM^3$ ) versus the length of tympanic bulla (LBT). Explanatory notes: squares – *P. auritus*, circles – *P. austriacus*, crosses – *P. alpinus*, triangles – *P. kolombatovici*; open symbols – central-European specimens, black symbols – Bulgarian specimens, grey symbols – specimens from other parts of the Balkans (in *P. auritus* and *P. austriacus*) or from Asia Minor (in *P. kolombatovici*); polygons show comparative populations of the respective species.

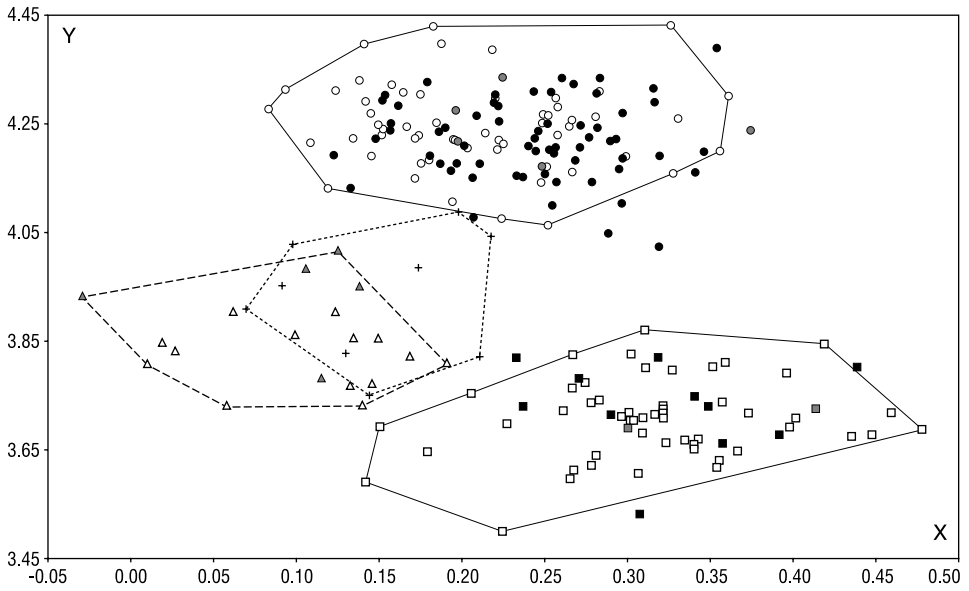


Fig. 2. Plot of specimens against their values for two canonical discriminant functions after Spitzenberger et al. (2002).

$$X = -0.07278 \times LCc + 0.05374 \times CM^3 + 0.13652 \times LMD + 0.18976 \times CM_3 + 0.48842 \times LBT$$

$$Y = -0.11727 \times LCc + 0.16848 \times CM^3 + 0.27054 \times LMD + 0.08229 \times CM_3 - 0.53452 \times LBT$$

See Fig. 1 for explanatory notes.

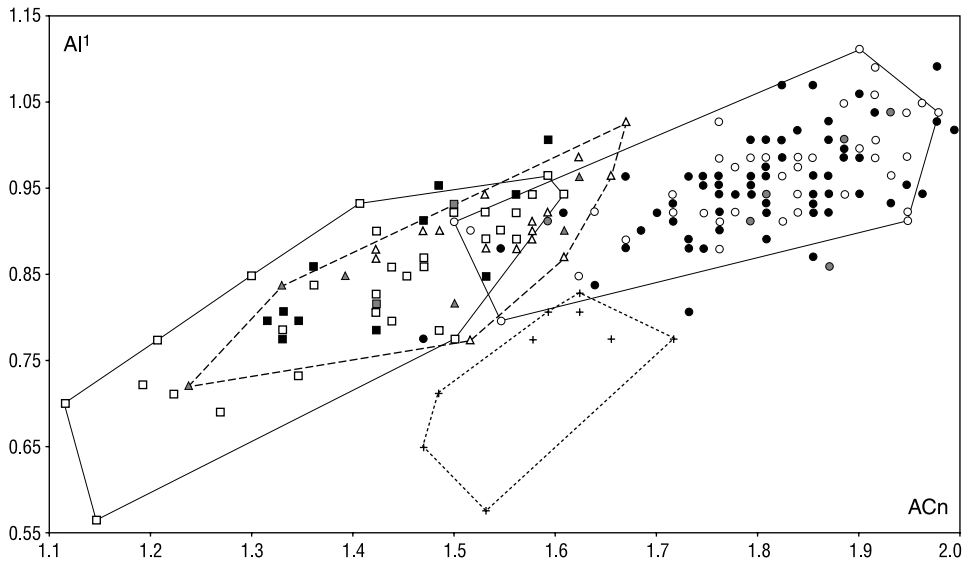


Fig. 3. Bivariate comparison of the height of upper canine (ACn) versus the height of first upper incisor (AI<sup>1</sup>). See Fig. 1 for explanatory notes.

*triacus*. This identification method has undoubtedly a significant limitation due to the different rate of abrasion of crown tops of the compared teeth.

According to the morphological comparison, it is evident that our study sample of more than 80 specimens of long-eared bats from Bulgaria consists only of the species *P. auritus* and *P. austriacus*. The original identification of museum specimens was thus correct (see the List of material examined). Therefore, only these two species can be considered as verified to occur in the territory of Bulgaria. Comparison of measurements of bats of the genus *Plecotus* from Bulgaria and comparative populations are given also in Table 1. Data given in this table suggest that the Bulgarian populations of *P. auritus* and *P. austriacus* do not differ too much from central-European samples.

Although it cannot be concluded from the results of the species analysis that there is no chance of presence of the two other species, *P. alpinus* and *P. kolombatovici*, in Bulgaria, their occurrence (if any) is probably very rare and they cannot be considered as typical representatives of Bulgarian fauna. In Greece, all four species of the genus *Plecotus* have been recorded, *P. kolombatovici* ranking among the most abundant (45% of examined specimens; Tab. 2); this species is a typical representative of the genus in Greece and is as numerous as *P. austriacus*. However, *P. kolombatovici* is more abundant in southern parts of Greece (Hanák et al. 2001, Kiefer et Helversen 2003), the northernmost sites are situated in the Chalkidiki peninsula (own data), while it has not been recorded in Thrace and northern Macedonia so far (Spitzenberger et al. 2001, Hanák et al. 2001, Kiefer et Helversen 2003b). It can be concluded that, although *P. kolombatovici* may be locally abundant (Dalmatia, southern Balkans), it probably does not occur in the north-western part of the Balkans and its prospective occurrence in Bulgaria would be probably only the margin of the species range. Current knowledge of distribution of *P. alpinus* suggests an islet-like pattern of occurrence in high mountain ranges of southern Europe (Pyrenees, Alps, Dinaric Mts., Pindos Mts.). This might also indicate its possible occurrence in the mountain areas of Bulgaria (e.g. Rila Mts., Pirin Mts.). It should be the aim of further detailed field studies to confirm the occurrence of both newly identified species in Bulgaria.

Hanák (1969) described differences in altitudinal distribution of *P. auritus* and *P. austriacus* in central Europe. He considered *P. auritus* to be the species of high elevations, isolated altitudinally from *P. austriacus*, considered as the inhabitant of lowlands. Although Hürka (1971) cast doubt on Hanák's statement for central-European populations, our findings show that this altitudinal separation really exists in Bulgaria (Fig. 4). While the revised specimens of *P. austriacus* come from localities situated at the altitudes

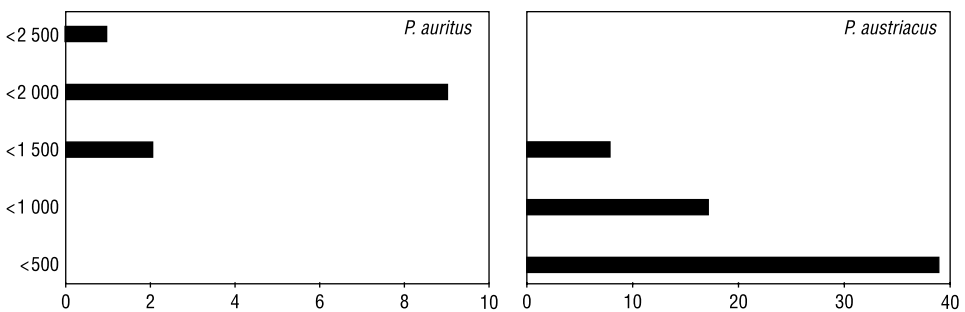


Fig. 4. Altitudinal distribution (metres a.s.l.) the origin of examined specimens of both Bulgarian *Plecotus* species.

Tab. 1. Basic statistical data on the measurements of samples of the material examined. CE – Central European samples, BG – Bulgarian samples

	<i>P. alpinus</i>					<i>P. auritus</i> – CE					<i>P. auritus</i> – BG				
	n	min	max	M	SD	n	min	max	M	SD	n	min	max	M	SD
LAt	5	39.3	42.1	40.12	1.158	45	35.6	42.8	39.07	1.557	10	38.7	41.0	39.86	0.847
LPol	5	6.1	7.0	6.50	0.339	33	6.5	7.8	7.07	0.229	10	7.0	7.8	7.34	0.267
LCr	9	15.87	17.18	16.56	0.395	55	15.42	16.90	16.19	0.354	12	15.69	16.53	16.27	0.244
LCb	9	14.68	16.07	15.44	0.449	53	14.32	15.68	14.94	0.343	12	14.62	15.40	15.11	0.240
LCC	9	14.13	15.41	14.86	0.407	53	13.85	14.98	14.41	0.291	11	14.13	14.78	14.53	0.227
LaZ	8	8.42	8.78	8.64	0.122	47	8.12	9.26	8.73	0.211	12	8.54	8.81	8.70	0.078
LaI	9	3.08	3.62	3.37	0.153	55	3.17	3.72	3.44	0.106	12	3.14	3.64	3.39	0.127
Lafmf	9	3.62	4.32	4.08	0.253	55	3.74	4.41	4.07	0.120	12	3.96	4.27	4.11	0.121
LaN	8	8.02	8.37	8.21	0.122	53	7.73	8.65	8.28	0.170	12	7.78	8.39	8.18	0.184
ANc	9	4.82	5.37	5.18	0.198	52	5.03	5.52	5.30	0.132	12	5.08	5.44	5.24	0.116
ACr	8	7.08	7.62	7.38	0.196	54	6.82	7.58	7.29	0.154	11	7.12	7.42	7.29	0.112
LBT	9	4.25	4.58	4.43	0.109	55	3.88	4.24	4.03	0.089	11	3.82	4.24	4.04	0.115
CC	8	3.44	3.84	3.68	0.117	55	3.57	4.14	3.80	0.113	11	3.68	3.88	3.78	0.065
P <sup>2</sup> P <sup>4</sup>	9	4.71	5.27	4.93	0.196	53	4.07	5.27	4.98	0.176	12	4.91	5.18	5.00	0.077
M <sup>3</sup> M <sup>3</sup>	9	6.02	6.48	6.19	0.138	55	5.78	6.45	6.14	0.144	12	5.82	6.27	6.12	0.129
I <sup>1</sup> M <sup>3</sup>	9	6.27	6.75	6.52	0.186	54	5.97	6.69	6.34	0.154	11	5.48	6.68	6.36	0.334
CM <sup>3</sup>	9	5.28	5.69	5.51	0.151	55	5.02	5.65	5.33	0.138	11	5.18	5.58	5.42	0.122
M <sup>1</sup> M <sup>3</sup>	9	3.03	3.29	3.17	0.083	55	3.05	3.42	3.21	0.079	12	3.08	3.32	3.18	0.068
CP <sup>4</sup>	9	2.42	2.71	2.55	0.095	55	2.14	2.65	2.45	0.101	11	2.45	2.66	2.55	0.065
LI <sup>1</sup>	9	0.57	0.66	0.60	0.032	51	0.53	0.71	0.62	0.041	11	0.55	0.63	0.59	0.026
Lal <sup>1</sup>	9	0.38	0.48	0.41	0.035	51	0.34	0.48	0.41	0.035	11	0.37	0.47	0.41	0.034
AI <sup>1</sup>	9	0.58	0.83	0.75	0.084	34	0.57	0.96	0.84	0.087	11	0.78	1.01	0.86	0.079
LCn	9	0.92	1.10	0.99	0.050	52	0.83	1.08	0.96	0.049	11	0.89	1.06	0.95	0.056
LACn	9	0.73	0.86	0.79	0.040	52	0.71	0.90	0.81	0.044	11	0.71	0.93	0.76	0.060
ACn	9	1.47	1.72	1.59	0.080	36	1.12	1.61	1.42	0.124	11	1.32	1.60	1.43	0.102
LP <sup>3</sup>	9	0.42	0.48	0.45	0.020	53	0.39	0.55	0.45	0.039	11	0.40	0.48	0.43	0.024
LaP <sup>3</sup>	9	0.46	0.55	0.49	0.026	53	0.44	0.60	0.51	0.038	11	0.44	0.51	0.48	0.019
AP <sup>3</sup>	9	0.36	0.52	0.46	0.049	36	0.38	0.58	0.50	0.052	11	0.46	0.63	0.52	0.056
LM <sup>1</sup>	9	1.23	1.40	1.32	0.052	38	1.15	1.37	1.27	0.048	12	1.24	1.33	1.29	0.032
LaM <sup>1</sup>	9	1.45	1.64	1.56	0.071	37	1.42	1.69	1.56	0.061	12	1.52	1.70	1.59	0.052
LM <sup>3</sup>	9	0.61	0.65	0.63	0.016	38	0.52	0.73	0.64	0.038	12	0.55	0.68	0.64	0.043
LaM <sup>3</sup>	9	1.55	1.69	1.64	0.053	37	1.52	1.74	1.65	0.048	12	1.53	1.71	1.66	0.054
ACin	9	0.03	0.11	0.07	0.026	35	0.03	0.20	0.11	0.040	12	0.04	0.18	0.12	0.038
LMd	9	10.24	10.92	10.54	0.275	55	9.68	10.83	10.31	0.223	11	9.88	10.64	10.32	0.203
ACo	9	2.75	3.10	2.94	0.121	53	2.54	3.18	2.83	0.130	11	2.83	3.03	2.91	0.065
I <sub>1</sub> M <sub>3</sub>	9	6.40	7.08	6.80	0.217	53	6.27	6.93	6.62	0.147	11	6.52	6.88	6.71	0.123
CM <sub>3</sub>	9	5.73	6.21	5.97	0.173	53	5.45	6.12	5.75	0.139	11	5.61	6.24	5.85	0.176
M <sub>1</sub> M <sub>3</sub>	9	3.50	3.74	3.62	0.092	55	3.42	3.87	3.63	0.096	11	3.55	3.87	3.67	0.109
CP <sub>4</sub>	9	2.11	2.32	2.23	0.078	53	1.98	2.31	2.16	0.077	11	2.06	2.31	2.20	0.072

of up to 1500 m a.s.l. and most specimens (61%) were found in sites situated up to 500 m a.s.l., all reliably identified specimens of *P. auritus* come from localities situated above 1000 m a.s.l., most specimens (83%) having been found more than 1500 m a.s.l.

Comparing our results with the published data (see Introduction), there is an accordance in altitudinal distribution of record localities of *P. austriacus* (Fig. 5). All known localities are situated at the altitudes from the sea level up to 1500 m a.s.l. (mean 465 m a.s.l.) and come from the whole territory of Bulgaria (Fig. 7), i.e. in agreement with the conclusions of Pandurska (1996). In *P. auritus*, the situation is only slightly different (Fig. 5) – most published localities (86%) are situated at the altitudes of more than 1000 m a.s.l., only four of them between 450 and 700 m a.s.l., mean altitude being 1202 m a.s.l. The lowest altitude represents the finding reported from the Lilova cave (Grimmberger 1993), however, even this locality is situated in the Rhodopes Mts. Based on all records of *P. auritus* in Bulgaria (Fig. 6) – both published data and specimens morphologically revised within this study – this species can be classified as a mountain ele-



Tab. 1. continued.

	<i>P. alpinus</i>				<i>P. auritus</i> – CE					<i>P. auritus</i> – BG					
	n	min	max	M	SD	n	min	max	M	SD	n	min	max	M	SDL
At	21	36.1	39.0	37.64	0.846	49	37.7	43.5	40.01	1.083	55	36.5	41.8	39.69	1.130
LPol	16	5.4	6.2	5.71	0.235	32	5.0	6.2	5.63	0.282	53	5.3	6.3	5.82	0.225
LCr	22	15.87	16.97	16.32	0.262	59	16.78	18.12	17.39	0.271	64	16.52	18.13	17.32	0.343
LCb	22	14.68	15.73	15.16	0.245	59	15.67	16.88	16.25	0.254	63	15.49	16.86	16.21	0.298
LCc	22	14.15	15.18	14.63	0.230	58	15.05	16.36	15.73	0.247	62	14.95	16.07	15.62	0.279
LaZ	21	8.36	8.97	8.57	0.137	54	8.85	9.68	9.24	0.178	61	8.85	9.53	9.21	0.180
LaI	22	2.93	3.48	3.21	0.146	59	3.06	3.57	3.34	0.105	66	3.08	3.75	3.39	0.122
LaInf	22	3.70	4.23	3.99	0.150	59	4.03	4.68	4.35	0.140	66	3.98	4.75	4.34	0.133
LaN	22	7.62	8.67	8.12	0.249	59	8.12	9.10	8.58	0.181	65	7.91	8.85	8.47	0.175
ANc	22	5.13	5.58	5.39	0.114	58	5.02	5.67	5.39	0.151	63	4.89	5.81	5.38	0.169
ACr	22	7.24	7.88	7.55	0.134	59	7.20	8.27	7.67	0.179	63	7.23	7.95	7.64	0.160
LBT	22	4.22	4.57	4.37	0.114	59	4.48	4.96	4.73	0.107	63	4.38	4.84	4.67	0.098
CC	22	3.50	3.88	3.62	0.086	59	3.83	4.35	4.10	0.118	65	3.84	4.37	4.13	0.105
P <sup>4</sup> P <sup>4</sup>	22	4.50	4.88	4.69	0.108	59	4.88	5.51	5.18	0.129	66	4.88	5.51	5.18	0.124
M <sup>3</sup> M <sup>3</sup>	22	5.66	6.15	5.87	0.135	56	6.13	6.80	6.46	0.163	64	6.08	6.82	6.46	0.157
I <sup>1</sup> M <sup>3</sup>	22	6.12	6.64	6.33	0.123	56	6.73	7.23	6.95	0.134	63	6.72	7.26	6.99	0.128
CM <sup>3</sup>	22	5.15	5.64	5.37	0.130	57	5.74	6.23	5.99	0.120	64	5.79	6.26	5.98	0.109
M <sup>1</sup> M <sup>3</sup>	22	3.13	3.42	3.24	0.076	58	3.26	3.71	3.50	0.101	64	3.34	3.71	3.50	0.081
CP <sup>4</sup>	22	2.37	2.62	2.49	0.070	58	2.63	2.99	2.83	0.080	65	2.72	3.02	2.87	0.074
LI <sup>1</sup>	22	0.53	0.64	0.60	0.034	50	0.50	0.70	0.63	0.040	64	0.53	0.72	0.61	0.037
LaI <sup>1</sup>	22	0.35	0.44	0.40	0.030	50	0.34	0.51	0.44	0.039	65	0.38	0.55	0.45	0.033
AI <sup>1</sup>	22	0.72	1.03	0.89	0.067	44	0.80	1.10	0.96	0.062	64	0.78	1.09	0.95	0.063
LCn	22	0.91	1.07	0.98	0.040	51	1.06	1.32	1.19	0.058	65	1.06	1.30	1.16	0.057
LaCn	22	0.74	0.83	0.78	0.030	51	0.89	1.10	1.00	0.050	65	0.84	1.09	0.97	0.055
ACn	22	1.24	1.67	1.53	0.109	46	1.50	1.98	1.82	0.116	64	1.47	2.00	1.81	0.100
LP <sup>3</sup>	22	0.38	0.47	0.41	0.029	52	0.39	0.55	0.46	0.030	65	0.39	0.52	0.45	0.034
LaP <sup>3</sup>	22	0.42	0.53	0.48	0.026	52	0.47	0.62	0.56	0.035	65	0.47	0.66	0.55	0.041
AP <sup>3</sup>	22	0.37	0.48	0.43	0.035	46	0.40	0.62	0.53	0.049	64	0.37	0.62	0.51	0.057
LM <sup>1</sup>	22	1.20	1.36	1.28	0.045	50	1.31	1.44	1.39	0.033	66	1.30	1.49	1.40	0.039
LaM <sup>1</sup>	22	1.48	1.67	1.59	0.053	50	1.58	1.74	1.66	0.043	66	1.56	1.76	1.66	0.042
LM <sup>3</sup>	22	0.56	0.67	0.59	0.026	49	0.59	0.76	0.66	0.038	65	0.57	0.71	0.65	0.034
LaM <sup>3</sup>	22	1.50	1.72	1.59	0.050	49	1.60	1.84	1.72	0.062	65	1.57	1.81	1.71	0.058
ACin	20	0.02	0.23	0.09	0.059	47	0.02	0.16	0.07	0.031	65	0.02	0.13	0.07	0.260
LMd	21	9.88	10.52	10.23	0.166	59	10.81	11.97	11.26	0.227	64	10.68	11.62	11.21	0.205
ACo	21	2.73	3.20	2.97	0.105	59	3.05	3.63	3.31	0.127	64	2.93	3.61	3.32	0.147
I <sub>1</sub> M <sub>3</sub>	21	6.43	6.87	6.59	0.117	57	7.01	7.57	7.24	0.121	64	6.95	7.57	7.26	0.133
CM <sub>3</sub>	21	5.37	6.13	5.79	0.160	58	6.21	6.76	6.45	0.116	64	6.20	6.73	6.44	0.117
M <sub>1</sub> M <sub>3</sub>	21	3.58	3.87	3.71	0.075	58	3.74	4.16	3.97	0.101	64	3.74	4.24	3.99	0.098
CP <sub>4</sub>	21	2.06	2.31	2.17	0.063	59	2.32	2.62	2.47	0.066	65	2.35	2.85	2.49	0.079

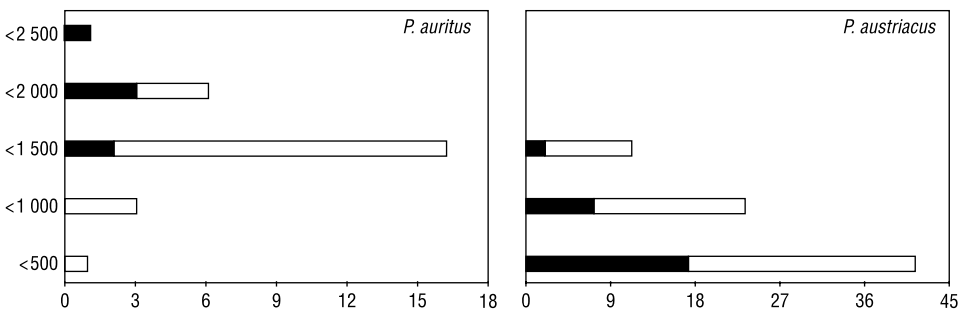


Fig. 5. Altitudinal distribution (metres a.s.l.) of record localities of both Bulgarian *Plecotus* species: black – localities of the origin of examined specimens, dashed – localities of published records. Based only on data published after 1963 (i.e. by Beron 1964, Gaisler et Hanák 1964 and later, see the text).

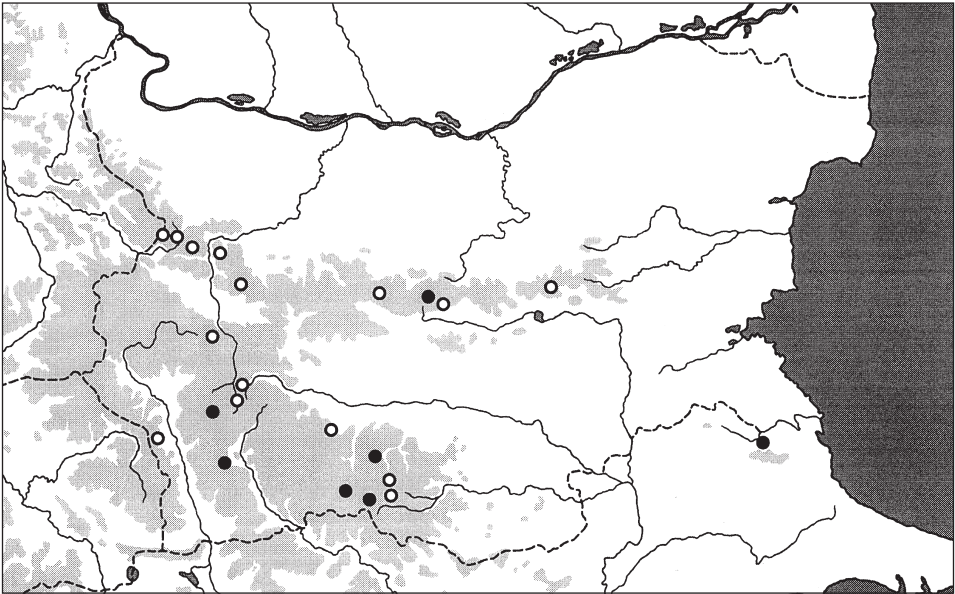


Fig. 6. Records of *P. auritus* in Bulgaria. Dots – localities of the origin of examined specimens, open circles – localities of published records; shaded is area over 750 m a.s.l.

ment, inhabiting all higher mountain ranges of Bulgaria. The only regions in Bulgaria exceeding 800 m a.s.l. where *P. auritus* has not been recorded are the Sredna gora Mts. and Strandža Mts. (however, the species is reported from the Turkish part of the Strandža Mts. – Benda et Horáček 1998). Altitudinal distribution of the species as suggested by Pandurska (1996) thus cannot be accepted.

It can be concluded that in the Balkan region, *P. auritus* is restricted to mountain ranges; in Bulgaria, it was found at the elevation of less than 1000 m a.s.l. only exceptionally (three times), however, all these sites are connected with a forested alpine system (see also Hanák et al. 2001). Ecological requirements of *P. auritus* in the Balkans seem to be similar to those of *P. alpinus* (Kiefer et Helversen 2003a). On the contrary, *P. austriacus* is a species of low altitudes, occurring at elevations exceeding 1000 m a.s.l. only exceptionally.

country specimens	Greece		Bulgaria	
	n	%	n	%
<i>P. auritus</i>	1	3	12	15
<i>P. alpinus</i>	2	7	–	–
<i>P. austriacus</i>	13	45	69	85
<i>P. kolombatovici</i>	13	45	–	–

Tab. 2. Comparison of the fauna of long-eared bats of Greece (mainland only) and of Bulgaria. Based on comparison of the number of revised museum specimens of the respective species. Material examined in the present study and the data by Hanák et al. (2001) and Spitzenberger et al. (2001) are included.

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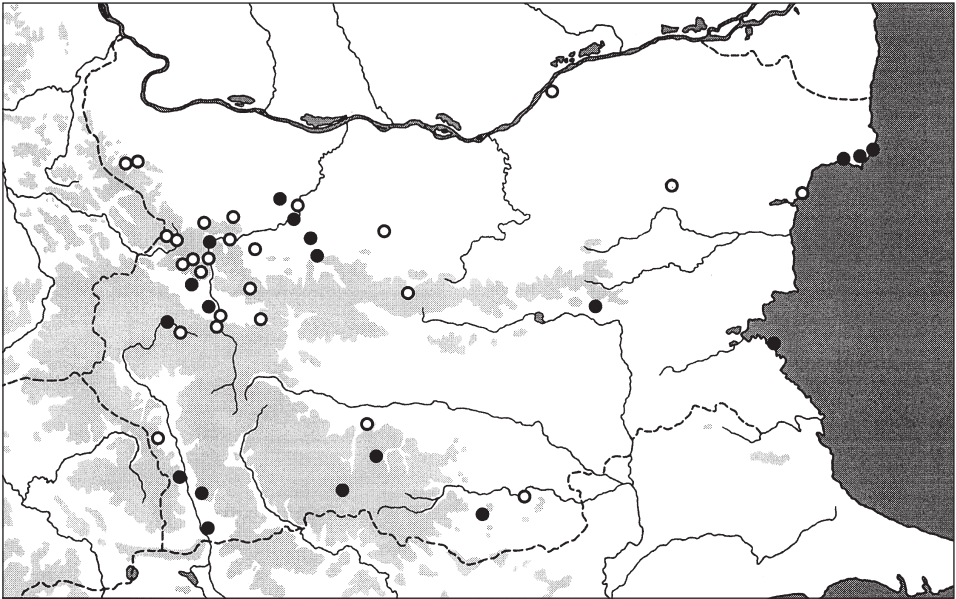


Fig. 7. Records of *P. austriacus* in Bulgaria. See Fig. 6 for explanatory notes.

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## APPENDIX

### Comparative material examined

#### *Plecotus auritus* (LINNAEUS, 1758)

**A u s t r i a:** 1 m ad (JGUM [S]), Salzburg, 1 Sept 2000, leg. G. Reiter; – 1 ind. (ZFMK 2001.333 [S]), Maria Alm, Kärnten.

**C z e c h R e p u b l i c:** 1 m ad., 3 f ad. (NMP 50504–50507 [S+B]), Albrechtice v Jizerských horách (Jablonec nad Nisou Dist.), former Bílá Desná dam, tunnel, 13 Feb 1962, leg. V. Hanák; – 1 m ad, 3 f ad, 1 f sad (NMP 49116 [S+B], 50487, 50492, 50496, 50497 [S]), Bechyně (Tábor Dist.), castle cellar, 31 Jan 1962 and 18 March 1965, leg. V. Hanák; – 1 f sad. (IVB 7 [S+B]), Chlum (Benešov Dist.), mine, 31 Jan 1955, leg. J. Gaisler; – 2 f ad. (IVB 11, 12 [S+B]), Dobrá (Frýdek-Místek Dist.), 27 Aug 1954, leg. J. Gaisler; – 1 m ad. (NMP 50502 [S+B]), Hrubý Rohozec (Semily Dist.), castle cellar, 12 Feb 1962, leg. V. Hanák; – 1 m sad (NMP 50491 [S+B]), Jílové u Prahy (Praha-západ Dist.), mine, 23 March 1962, leg. V. Hanák; – 1 m ad. (IVB 13 [S+B]), Josefov (Blansko Dist.), Býčí skála cave, 17 March 1962, leg. J. Gaisler; – 1 m ad. (IVB 5 [S]), Karlštejn (Beroun Dist.), castle, 12 March 1955, leg. J. Gaisler; – 1 m ad. (NMP 50501 [S]), Koloděje nad Lužnicí (České Budějovice Dist.), castle cellar, 21 Jan 1971, leg. V. Hanák; – 1 f ad. (IVB 20 [S+B]), Lažánky (Blansko Dist.), Kateřinská cave, 4 March 1963, leg. J. Gaisler; – 1 m ad., 1 f sad. (NMP 50494, 50503 [S+A]), Lipová-Lázně (Jeseník Dist.), Na Pomezí and Rasovna caves, 22 Jan 1966, leg. V. Hanák; – 1 m ad. (NMP 39149 [S]), Loreta (Klatovy Dist.), 31 Dec 1984, leg. M. Anděra; – 1 m ad. (NMP 50495 [S+B]), Lužany (Plzeň-jih Dist.), 23 Jan 1963, leg. V. Hanák; – 1 m ad., 2 f ad., 1 ind. (MUB 1.1.82, 1.2.12, 1.2.48 [S+B], 1.1.81 [S]), Malá Morávka (Bruntál Dist.), Pod Jelení cestou mine, 14 Jan 1971, 24 Feb 1973, 9 Feb 1974, leg. J. Gaisler; – 1 f sad. (NMP 50493 [S+B]), Mořina (Beroun Dist.), mine, 23 March 1962, leg. V. Hanák; – 1 m ad. (IVB 10 [S]), Nákří (České Budějovice Dist.), 9 Sept 1955, leg. J. Gaisler; – 1 m ad. (IVB 6 [S+B]), Olšovec (Přerov Dist.), mine, 9 Feb 1961, leg. J. Gaisler; – 1 m ad. (IVB 27 [S+B]), Ostrov u Macochy (Blansko Dist.), 9 Jan 1968, leg. J. Gaisler; – 2 f ad. (NMP 50499, 50500 [S]), Písek (Písek Dist.), castle cellar, 31 Jan 1962, leg. V. Hanák; – 1 f ad. (IVB 4 [S+B]), Pohořelice (Břeclav Dist.), 22 Aug 1958, leg. J. Gaisler; – 1 f ad. (IVB 28 [S+B]), Polná (Jihlava Dist.), 18 June 1963, leg. J. Gaisler; – 1 f ad. (NMP 50999 [S]), Praha-Lhotka (Novodvorská) (Praha Dist.), 17 June 1988, leg. J. Kadeřábek; – 1 m ad. (IVB 26 [S+B]), Studenec (Třebíč Dist.), 6 Sept 1966, leg. J. Gaisler; – 1 f ad. (MUB 1.1.23 [S]), Tišnov (Brno-venkov Dist.), Květnice, mine, 11 Nov 1950, leg. J. Gaisler; – 2 f ad. (IVB 21 [S+B]), 29 [S]), Tišnov (Brno-venkov Dist.), Předklášteří, 19 June and 5 July 1963, leg. J. Gaisler; – 3 m ad. (NMP 50488–50490 [S+B]), Vřesce (Tábor Dist.), mine, 15 March 1962, leg. V. Hanák; – 1 f ad. (IVB 24 [S+B]), Zábřeh (Šumperk Dist.), Lesnice, 2 July 1964, leg. J. Gaisler; – 1 m ad., 1 f sad., 1 ind. (NMP 49093, 49094 [S+B], 50498 [S]), Zvíkovské Podhradí (Písek Dist.), Zvíkov, castle cellar, 24 Feb 1960, leg. V. Hanák.

**D e n m a r k:** 1 fa (ZFMK [S+B]), Mousted/Viborg, 11 April 1966, leg. H. Roer.

**F r a n c e:** 1 ind. (JGUM [S+B]), La Giétaz, Savoie, June 1999; – 1 ind. (JGUM [S]), Saint Germain la Chaubotte, Savoie, July 1999, leg. S. Vincent.

**G r e e c e:** 1 m ad. (NMP 48567 [S+B]), Paralia Skotinas (Pieria Dist.), river estuary, 19 Sept 1988, leg. V. Hanák et V. Vohralík.

**S l o v a k i a:** 1 ind. (SNMB 98 [S]), Buková (Trnava Dist.), 14 Dec 1960, leg. F. Matoušek; – 1 m sad., 1 f sad. (IVB 17, 19 [S+B]), Dobšinská Ladová Jaskyňa (Rožňava Dist.), cave, 3 March 1963, leg. J. Gaisler; – 1 m ad. (MUB 1.1.34 [S+B]), Jelenec (Nitra Dist.), 1 July 1966, leg. J. Gaisler; – 1 f ad. (IVB 22 [S+B]), Zuberec (Tvrdošín Dist.), Zverovka hut, 12 Aug 1963, leg. J. Gaisler.

**T u r k e y:** 1 m ad. (CUP T93/51 [S+A]), Sarpdere (Kirkklareli Dist.), Kiz mağara cave, 17 Oct. 1993, leg. I. Horáček.

***Plecotus alpinus* KIEFER et VEITH, 2002**

A n d o r r a: 1 f ad. (JGUM [S+B]), Ordino, 20 Nov 2001, leg. M. J. Dubourq.

A u s t r i a: 1 f ad. (ZFMK 2001.327 [S+B]), Fischertratten, 15 May 2000, leg. G. Reiter; – 1 f (63.225 [A]), Gailtal, Kärnten, 1 July 1960, leg. M. Eisentraut; – 1 ind. (JGUM [S]), Tirol, leg. A. Voraner.

C r o a t i a: 1 m ad. (SMF 44898 [S]), Ogulin, 1972, leg. J. Galencir; – 1 f ad. (SMF 32962 [S]), Rovinj, 17 June 1967, leg. V. Brendov.

F r a n c e: 1 ind. (JGUM [S]), Sardière, Savoie, July 1999, leg. S. Vincent; – 1 m ad. (ZFMK 2001.325 [S+B]), Ristolos, Haute Alpes, 24 Aug 2001, leg. P. Favre.

G r e e c e: 1 m ad. (JGUM [S+B]), Timfristos (Fthiótida Dist.), 12 June 2001, leg. O. v. Helversen.

L i e c h t e n s t e i n: 1 m ad. (ZFMK 61.451 [S+B]), Schaan, 23 Aug 1961, leg. E. v. Lehmann.

***Plecotus austriacus* (FISCHER, 1829)**

C z e c h R e p u b l i c: 5 m ad., 1 m sad., 4 f ad., 2 f sad. (NMP 49113–49115 [S+B]), 50471–50479 [S]), Bechyně (Tábor Dist.), castle cellar, 31 Jan 1962 and 18 March 1965, leg. V. Hanák; – 1 m ad. (NMP 49100 [S+B]), Bělá pod Bezdězem (Mladá Boleslav Dist.), castle cellar, 12 Feb 1962, leg. V. Hanák; – 1 m ad., 1 f sad. (NMP 50483, 50484 [S]), Benátky nad Jizerou (Mladá Boleslav Dist.), castle cellar, 12 Feb 1962, leg. V. Hanák; – 2 m sad., 1 f ad., 1 f sad. (IVB 83, 84, 86, 87 [S+B]), Budišov (Třebíč Dist.), 7 Sept 1966, leg. J. Gaisler; – 1 f ad. (NMP 40140 [S+A]), Dolní Podluží (Děčín Dist.), 1986; – 1 m ad. (NMP 39589 [S+A]), Hostouň (Kladno Dist.), 27 Feb 1934, leg. V. Štátný; – 1 f ad. (NMP 50502 [S+B]), Hrubý Rohozec (Semily Dist.), castle cellar, 12 Feb 1962, leg. V. Hanák; – 1 m ad. (NMP 50470 [S]), Karlštejn (Beroun Dist.), castle cellar, 19 Jan 1962, leg. V. Hanák; – 1 m ad., 1 m sad., 2 f ad., 1 f sad. (NMP 49105–49107, 49110, 49111 [S+B]), Klášterec nad Ohří (Chomutov Dist.), monastery cellar, 15 Feb 1962, leg. V. Hanák; – 1 m ad., 1 f ad. (NMP 50480, 50481 [S]), Koloděje nad Lužnicí (České Budějovice Dist.), castle cellar, 31 Jan 1962, leg. V. Hanák; – 1 m ad. (NMP 49095 [S+B]), Lipnice nad Sázavou (Havlíčkův Brod Dist.), castle cellar, 30 Jan 1961, leg. Novotný; – 1 f sad. (NMP 49112 [S+B]), Locket (Sokolov Dist.), castle cellar, 15 Feb 1962, leg. V. Hanák; – 1 m ad. (NMP 40141 [S+A]), Lounín (Beroun Dist.), 21 June 1986; – 1 m ad. (NMP 49101 [S+B]), Mnichovo Hradiště (Mladá Boleslav Dist.), castle cellar, 12 Feb 1962, leg. V. Hanák; – 1 f sad. (IVB 88 [SB]), Mikulov (Břeclav Dist.), Soutěska area, 24 April 1989, leg. J. Gaisler; – 1 f ad. (IVB 71 [S+B]), Moravský Krumlov (Znojmo Dist.), 26 June 1964, leg. J. Gaisler; – 1 m ad. (NMP 50997 [S+A]), Němčany (Vyškov Dist.), 13 March 1989, leg. M. Vlašín; – 1 f ad. (NMP 40630 [S+A]), Nivnice (Uherské Hradiště Dist.), 10 Aug 1987, leg. M. Vlašín; – 1 m ad. (NMP 39374 [S+A]), Praha-Hostivař (Praha Dist.), building, 19 Oct. 1985, leg. M. Anděra; – 1 m ad. (NMP 39843 [S+A]), Rovina (Beroun Dist.), 4 Oct. 1986, leg. R. Horný; – 1 f ad. (IVB 24 [S+B]), Slavkov u Brna (Vyškov Dist.), 9 June 1962, leg. J. Gaisler; – 1 m ad. (IVB 80 [S+B]), Sloup (Blansko dist.), 14 March 1965, leg. J. Gaisler; – 1 m sad (NMP 49117 [S+B]), Štěpánovice (České Budějovice Dist.), church attic, 30 Aug 1959, leg. V. Hanák; – 1 f ad. (IVB 72 [S+B]), Tišnov (Brno-venkov Dist.), Olší, 9 July 1964, leg. J. Gaisler; – 1 f ad. (NMP 49096 [S+B]), Velehrad (Uherské Hradiště Dist.), monastery cellar, 10 Feb 1961, leg. V. Hanák; – 2 m ad., 3 f ad. (NMP 49097–48099 [S+B]), 50485, 50486 [S]), Zvřetice (Mladá Boleslav Dist.), 12 and 15 Feb 1962, leg. V. Hanák.

F r a n c e: 1 m ad. (ZFMK 63.235 [S+A]), Banyuls-sur-Mer, church attic, 17 June 1959, leg. A. Heymer.

G r e e c e: 1 ind. (ZFMK 77.49 [S+B]), Chalkidike (undef.), 28 May 1962, leg. H. Wolf; – 1 m ad. (ZFMK 77.50 [S+B]), Mákri (Évros Dist.), 21 May 1962, leg. H. Wolf; – 1 m ad. (SMF 23025 [S+B]), Meteora (Tríkala Dist.), 10 Sept 1963, leg. D. Kock; – 1 f ad. (NMP 49045 [S+A]), Pagagiánnis (Flórina Dist.), over river, 2 Sept 2001, leg. P. Benda.

S e r b i a: 1 f sad. (NMP 49050 [S]), Petrovaradin (near Novi Sad), Feb 1965, leg. V. Hanák; – 1 f sad. (IVB 79 [S]), Velika Plana (near Smederevska Palanka), 12 Feb 1965, leg. J. Gaisler.

- S l o v a k i a:** 1 m ad. (SNMB 741 [S+B]), Bratislava (Bratislava Dist.), 21 Oct. 1966, leg. A. Volf; – 1 f ad. (SNMB 35 [S]), Buková (Trnava Dist.), 14 Feb 1960, leg. F. Matoušek; – 1 m ad. (MUB 1.2.51 [S+B]), Krásnohorské Podhradie (Rožňava Dist.), castle cellar, 4 Feb 1970, leg. J. Gaisler; – 1 f ad. (NMP 50482 [S]), Slánské Nové Město (Košice-okolie Dist.), Jan 1966; – 1 f ad. (NMP 49103 [S+B]), Smolenice (Trnava Dist.), Driny cave, 11 Feb 1961, leg. V. Hanák; – 1 m ad., 1 ind. (SNMB 571 [S+B], 660 [S]), Trnava (Trnava Dist.), 25 Sept 1961 and 25 Aug 1964, leg. F. Matoušek; – 1 m ad. (NMP 49108 [S+B]), Vážec (Liptovský Mikuláš Dist.), Vážecká cave, 14 Feb 1961, leg. V. Hanák.
- S l o v e n i a:** 1 f ad. (ZIN 35071 [S+B]), Sv. Miklož pri Ormožu, 6 June 1936, leg. V. Martino.
- Plecotus kolombatovici* ĐULIĆ, 1980**
- C r o a t i a:** 1 m ad. (NMP 49092 [S]), Stari Grad, Hvar Is., 1 Sept 1977, leg. J. Červený et B. Kryštufek; – 1 m ad. (NMP 49091 [S]), Zavala, Hvar Is., Belušica pećina cave, 29 Aug 1977, leg. J. Červený et B. Kryštufek.
- G r e e c e:** 1 m ad. (SMF 44918 [S+B]), Agia Fotia, Híos Is., 23 May 1972, leg. D. Kock; – 1 m ad. (NMP 48569 [S]), Delfi (Fokída Dist), 23 Sept 1988, leg. V. Hanák et V. Vohralík; – 1 m ad. (NMP 48585 [S+B]), Kleidoniá (Ioánnina Dist.), above the Voidomatis river, 27 Sept 1988, leg. V. Hanák et V. Vohralík; – 1 f ad. (NMP 48725 [S+A]), Kombotades (Fthiótida Dist.), above the Sperhiás river, 9 Sept 1996, leg. P. Benda, M. Uhrin et M. Andreas; – 3 m ad. (NMP 48726–48728 [S+A]), Kombotades (Fthiótida Dist.), a cave, 10 Sept 1996, leg. P. Benda, M. Uhrin et M. Andreas; – 1 m ad. (ZFMK 97.214 [S+B]), Lefkimmi, Kerkira Is., 27 March 1961, leg. J. Niethammer; – 1 f ad. (NMP 48572 [S+B]), Micro Pápigo (Ioánina Dist.), above a pool, 25 Sept 1988, leg. V. Hanák et V. Vohralík; – 4 m ad. (NMP 48573–48576 [S+B]), Pápigo (Ioánina Dist.), cave, 26 Sept 1988, leg. V. Hanák et V. Vohralík; – 1 m ad. (NMP 48609 [S+B]), Petralóna (Halkidikí Dist.), a cave above the village, 28 Sept 1988, leg. V. Hanák et V. Vohralík.
- T u r k e y:** 1 m ad. (NMP 48087 [S+A]), Çevlik (Hatay Dist.), ancient ruins, 1 July 1997, leg. P. Benda; – 1 f ad. (JGUM [S]), Karadere (Muğla Dist.), Letoon, ruins, Feb 1999, leg. A. Kiefer; – 1 m ad. (CUP T93/64 [S+A]), Narlikuyu (Icel Dist.), cave, 29 Oct. 1993, leg. P. Benda et I. Horáček; – 2 m ad., 1 f ad. (CUP T93/73–75 [S]), Bozagaç (Icel Dist.), Yalan Dünya mağara cave, 30 Oct. 1993, leg. P. Benda et I. Horáček.