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## Notes on some specimens of the genus *Plecotus* Geoffroy, 1818 (Mammalia, Chiroptera) from the Netherlands<sup>1)</sup>

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### INTRODUCTION

In 1912, MILLER united all the West European bats with very long ears joined across the forehead and with 36 teeth into one species, *Plecotus auritus* (LINNAEUS, 1758). By doing so he followed BLASIUS (1857), DOBSON (1878) and TROUËSSART (1910). This situation, one species without subspecies, remained till 1940. In that year V. & E. MARTINO described a subspecies of the Long-eared Bat, *Plecotus auritus meridionalis*, based on animals from Slovenia, Yugoslavia. The animals were characterized by having larger skulls than the bats in Northern Europe.

In 1957, BAUER studied a collection of bats from Spain. He described a new subspecies, *Plecotus auritus hispanicus*, on bats from the surroundings of Linares de Riofrio, Salamanca. The bullae auditori of the Spanish animals were smaller than those of animals from Austria. The bats from Salamanca were more yellow-brown-coloured than the animals from Austria; the latter were grey-coloured with a brownish hue. From the description of BAUER (1957) it is clear that the author came across a taxonomic problem he could not explain at that time.

A year later, in 1958, TOPAL described and pictured the baculum (os penis) of bats in the Carpathian Basin. In the Long-eared Bats he found two different kinds of bones, one kind he attributed to *Plecotus auritus auritus*, the other kind provisionally to *Plecotus auritus meridionalis*. The author stated: "The difference (between the two kinds of bacula) is so strong, that it supports rather powerfully the justness of a specific separation". In that same year BAUER deposited his thesis at the University of Vienna. In this thesis (of which a revised version was printed in 1960) he was able to prove,

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independently from TOPAL, the occurrence of two different kinds of Long-eared Bats in Austria.

In 1959 LANZA, in the appendix to the Chiroptera part of the Fauna d'Italia, probably not knowing of the thesis of BAUER, after having discovered two kinds of Long-eared Bats in Italy too, also went into the problem. According to LANZA it seems that the Russian scientists KUZYAKIN (1950) and ABELENTSEV, PIDOPLICKO & POPOV (1956) had already found two forms of the genus *Plecotus* in their country. They identified the larger, more grey-coloured bat, as being *Plecotus wardi* THOMAS, 1911. LANZA too used the name *Plecotus wardi* for the second species found in Italy. The subspecies described by the MARTINOS he regarded as not distinct from *Plecotus wardi*.

A year later, BAUER (1960) published the above-mentioned revised version of his thesis. In this paper he gave a long list of characters different in the two species. Many of the differences are quite clear, others are rather subject to age and preservation and are therefore somewhat difficult to observe. The author published also data on the differences in biology and in habitat-selection between the two species of Long-eared Bats found in Austria. After a review of the nomenclature of the two species, he gave to the larger, more grey-coloured sympatric species the name *Plecotus austriacus* FISCHER, 1829.

We share the opinion of BAUER in choosing that name for the second European species of Long-eared Bat. After studying the literature on bats of Western Europe of the last century, we came to the following lists of synonymy:

*Plecotus auritus* (LINNAEUS, 1758).

*Vespertilio auritus*, in LINNAEUS, 1758.

*Vespertilio otus*, in BOIE, 1825.

*Vespertilio cornutus*, in FABER, 1826.

*Plecotus communis*, in LESSON, 1827.

*Plecotus brevimanus*, in JENYNS, 1828.

*Plecotus auritus* var. *typus*, in KOCH, 1862.

*Plecotus auritus* var. *montanus*, in KOCH, 1862.

*Plecotus austriacus* FISCHER, 1829.

*Vespertilio auritus* var. B, in DESMAREST, 1820.

*Plecotus auritus*, in JENYNS, 1828.

*Plecotus auritus*  $\gamma$  *Austriacus*, in FISCHER, 1829.

*Vespertilio brevimanus*, in BONAPARTE, 1837.

*Plecotus kirschbaumii*, in KOCH, 1860.

*Plecotus auritus* var. *brevipes*, in KOCH, 1862.

In his second publication, BAUER (1960) came to the conclusion that the Spanish subspecies of Long-eared Bat, described by him in 1957, also belonged to the rediscovered species *Plecotus austriacus*.

Later, in 1960, LANZA published more data on the two kinds of Long-eared Bats in Italy. According to him the only reliable character for dis-

tinguishing the two species is the shape of the baculum. In his paper he gave long lists of measurements of the fore-arm, the ear, the baculum and the skull of specimens of *Plecotus auritus* and *Plecotus austriacus* (*P. wardi*).

Without giving exact data NIETHAMMER (1961) mentioned the occurrence of the two bat species in the Southwestern part of West Germany. The scientists C. & I. KÖNIG (1961) found *Plecotus austriacus* in the delta region of the river Rhône, France. They published data and measurements on these animals in a paper on bats from the South of France.

HANAK (1962) studied the bats of the genus *Plecotus* in Czechoslovakia. He found both species in this country. In a preliminary study he published some data on the differences (dimensions, colours and biology) between *P. auritus* and *P. austriacus*. In his article we find distribution maps of the two species in Czechoslovakia and in Europe, as well as two fine photographs of *Plecotus austriacus*.

In the Netherlands, VAN WIJNGAARDEN (1962) published the finding of a specimen of *Plecotus austriacus*. The animal was found in an artificial cave, a marl quarry, in the Southern part of the province of Limburg. The bat was identified by its size, its coloration and by the particular way it was hibernating. It was hanging from the roof of the cave with its wings folded around like a Horseshoe Bat. Unfortunately the specimen was not preserved, so no check on the identity can be made.

After the afore-mentioned publications, the authors of this note became interested in the problem of the two sibling species of *Plecotus* in Western Europe. They wanted to know whether the Southern species was represented among the bats from the Netherlands in the collections of the Zoological Museum in Amsterdam.

#### MATERIAL AND METHODS

For our study we used the following bats of the genus *Plecotus* from the Netherlands in the collection of the Zoological Museum, Amsterdam (= ZMA): males from Maastricht ZMA 1947, ZMA 4741; Sibbe ZMA 5094; Geulem ZMA 3046; Arnhem ZMA 2922; Heelsum ZMA 1600; Eerbeek ZMA 2915; Vriesseveen ZMA 2910; Bilthoven ZMA 4932; Nieuwersluis ZMA 2912—13; Naarden ZMA 2924; Amsterdam ZMA 1500, ZMA 2917, ZMA 2919, ZMA 2921 and Haarlem ZMA 2918.

Females from the following places: Maastricht ZMA 1891, ZMA 2916, ZMA 4145, ZMA 4154, ZMA 5191; Geulle ZMA 2920, ZMA 3048; Zuid Limburg (without exact locality) ZMA 1973; Plasmolen ZMA 1488; Apeldoorn ZMA 2925; Nieuwersluis ZMA 2914; Amsterdam ZMA 2923 and Nederland (without exact locality) ZMA 5192.

Skulls of Long-eared Bats, without sex-indication coming from Leiden ZMA 1979, Eerbeek ZMA 1981 and Swalmen ZMA 5193 were studied too.

Thanks to the kind co-operation of Dr. J. W. SLUITER and Dr. P. F. VAN HEERDT (Zoological Laboratory, Utrecht), we were able also to measure skulls of *Plecotus auritus* found at Honswijk (2 specimens), Goes, Apeldoorn, Scheulder, Baarn and Utrecht (all without sex-indication). We also were

able to study a skull of a male from Baarn (ring number 21537) and of females from Maastricht (ring number 16424), Utrecht (ring number 7618) and Baarn (ring numbers 21536—37, 21545).

For comparison we studied the following animals: males from Spain (Linares de Riofrio, Salamanca) SMF 17897—98, SMF 18145, SMF 19654—55, SMF 20687. Females from Spain (Linares de Riofrio): SMF 18143—44, SMF 20688—95 and ZMA 2784. A female from Pont-du-Gard, France ZMA 1598 and a male from Polignac (Hte. Loire), France SMF 15267 (see FELTEN & KÖNIG, 1955). A juvenile male from Luri, Cap Corse, Corsica SMF 19370. Females from Isle of Lokrum, Yugoslavia ZMA 4182/1—4182/5; a male from Cernicov, Czechoslovakia SMF 19925; a female from Frojach ob Murtal, Austria, SMF 18017; one male, three females and a non-sexed bat (all juvenile) from Serfaus, Austria, ZMA 5116—20.

In the Rhine-Main region, West Germany, we studied males from: Espenschied SMF 11362—63, Erdbach SMF 15142 and SMF 15144, St. Goar SMF 15183, Friedrichsdorf SMF 15236, Imsbach SMF 19401, Hardenberg SMF 19402, Herrborn SMF 19332 and Imsbach SMF 15445.

The authors are very grateful to Dr. H. FELTEN for permitting them to study the bats in the rich collections of the Senckenberg Museum at Frankfurt/Main (= SMF).

All the bats from the Netherlands in the collection of the Zoological Museum in Amsterdam are preserved in spirit. This renders them unsuitable for study of colours and colour distribution. It has the advantage, however, of preserving the body dimensions more reliably than in dried study-skins.

The body- and skull measurements were taken by a vernier calliper to the nearest tenth of a millimeter. The length of the fore-arm was measured from

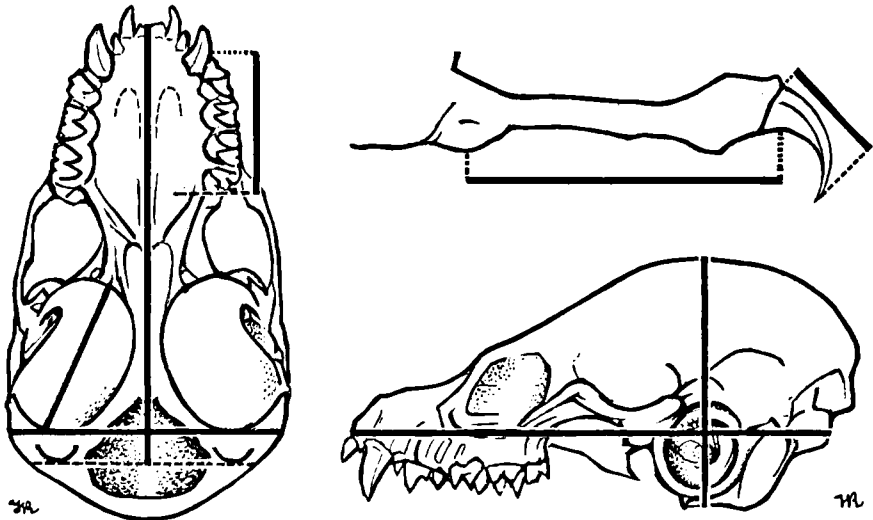


FIGURE 1. Skull and thumb of a Long-eared Bat. The straight lines indicate the measurements taken.

the midpoint of the elbow to that of the wrist on the dorsal side of the folded wing (see HUSSON, 1960, p. 23, fig. 3). The ear and the tragus were measured from the external meatus to the tip. The thumb and the skull dimensions were measured as indicated in figure 1. The standard deviation or  $\sigma$  was calculated by using the following formula:

$$\sigma^2 = \left[ \sum (x^2) - \frac{(\sum x)^2}{n} \right] / (n-1)$$

The authors are very thankful to Mr. R. W. HAYMAN of the British Museum (Natural History) in London, for checking the English of this note. The second author also wishes to express her gratitude for receiving a scholarship for studying in the Netherlands.

#### RESULTS AND DISCUSSION

After study of the Long-eared Bats from the Netherlands and after having measured their body- and skull dimensions, we came across two animals, which attracted attention. They were characterized by having shorter thumbs, shorter hindfeet, longer ears and by having a longer and broader tragus. The skulls of these two animals were somewhat longer and the bullae auditori comparatively much larger. Without doubt these two bats belong to the species *Plecotus austriacus* FISCHER, 1829.

The first animal, a female (ZMA 2920), was collected by Mr. J. E. VAN DER DUSSEN in August 1940, in a castle in the village of Geulle in the southern most part of the province of Limburg. The second bat, a male (ZMA 4741), was found on February 8, 1962 by P. J. VAN NIEUWENHOVEN and the first author of this note. The animal came out of a crevice in a wall, which blocked the entrance of a cave (an old marl-quarry) behind the castle "Neer-Canne", near the town of Maastricht. In construction work on that wall, the hibernating bat became injured and had to be killed.

Of this specimen (ZMA 4741) we checked the shape and the dimensions of the baculum. It had the build as described by TOPAL (1958) and LANZA (1959 & 1960). Also the bacula of specimens of *Plecotus auritus* from the Netherlands agreed with the published data.

In table I, body- and skull dimensions of *Plecotus auritus* and *Plecotus austriacus* from the Netherlands are given. In figures 2 & 3 graphical representations of some dimensions are published in order to show more clearly the differences in size between the two species.

For a long time it was known that Long-eared Bats could be found hibernating, either hidden in holes and cracks, or hanging free, just like Horse-shoe Bats. KOCH in 1862 (page 409) wrote: "Bei uns hängt sie im Winterschlaf meistens frei, seltener findet man sie in Ritzen eingeklemmt; in Westphalen und in Süddeutschland, sowie auch in der unteren Lahnggend habe ich sie dagegen mehr in Ritzen eingeklemmt gefunden". As the free-hanging animals were mostly found in the warmest parts of the caves, it was assumed that these differences (way and place of hibernation) had to

TABLE I. Body- and skull dimensions of *Plecotus auritus* (LINNAEUS, 1758) and *Plecotus austriacus* FISCHER, 1829 from the Netherlands.

	Sex	<i>P. austriacus</i>	<i>Plecotus auritus</i>			
			n	range	mean	s.d.
Length forearm	♂ ♂	38,1	16	36,7—39,3	37,71	0,82
	♀ ♀	40,5	12	37,7—40,1	38,78	0,90
Length thumb	♂ ♂	5,4	16	6,1— 7,3	6,67	0,38
	♀ ♀	5,7	13	6,0— 7,3	6,80	0,51
Length thumb + nail	♂ ♂	7,0	16	7,7— 9,6	8,58	0,53
	♀ ♀	7,2	13	7,6—10,2	8,70	0,74
Length hindfoot	♂ ♂	5,8	16	6,8— 8,7	7,42	0,51
	♀ ♀	7,0	12	6,0— 8,1	7,55	0,71
Length hindfoot + nail	♂ ♂	7,7	16	8,3—10,3	9,31	0,50
	♀ ♀	8,7	12	8,0—10,4	9,33	0,69
Length ear	♂ ♂	35,5	16	27,9—33,9	31,91	1,55
	♀ ♀	36,4	13	31,0—35,5	33,20	1,49
Length tragus	♂ ♂	16,7	16	12,6—15,4	14,01	0,78
	♀ ♀	16,8	13	12,9—15,8	14,06	0,84
Breadth tragus	♂ ♂	5,8	16	4,6— 5,2	4,90	0,22
	♀ ♀	5,9	13	4,5— 5,2	4,85	0,24
Condylbasal length	♂ ♂	15,8	13	14,5—15,4	14,98	0,25
	♀ ♀	16,8	13	14,8—15,7	15,30	0,24
Mastoid breadth	♂ ♂	8,5	12	7,6— 8,6	8,17	0,28
	♀ ♀	8,4	13	8,0— 8,6	8,28	0,17
Height over bullae	♂ ♂	7,8	13	7,1— 7,7	7,39	0,20
	♀ ♀	7,8	12	7,1— 7,7	7,43	0,17
Length of bulla	♂ ♂	4,5	14	3,5— 4,2	3,94	0,17
	♀ ♀	4,6	12	3,7— 4,4	4,00	0,20
Distance C - M <sup>3</sup>	♂ ♂	5,9	17	5,0— 5,4	5,24	0,11
	♀ ♀	6,1	17	5,0— 5,5	5,30	0,14

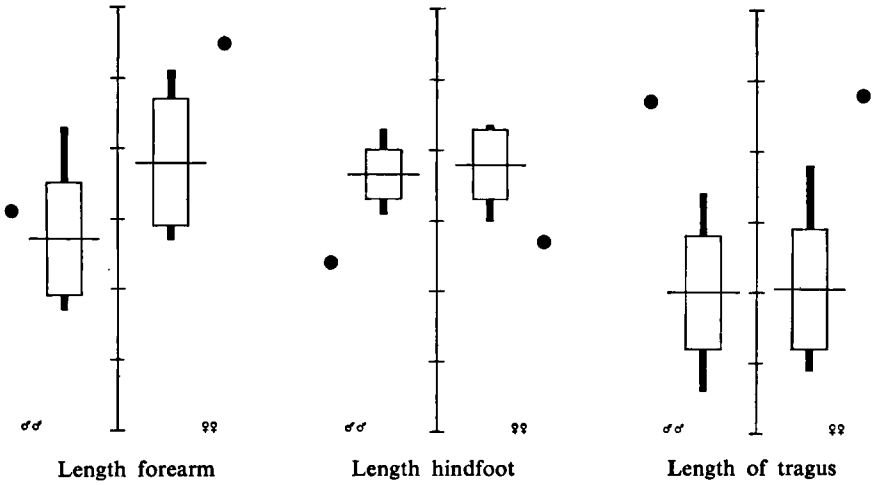


FIGURE 2. Graphical representation of some body dimensions of *Plecotus auritus* (LINNÆUS, 1758) and *Plecotus austriacus* FISCHER, 1829 from the Netherlands. The heavy vertical lines indicate the ranges, the squares the means  $\pm$  the standard deviations. For other data see table I.

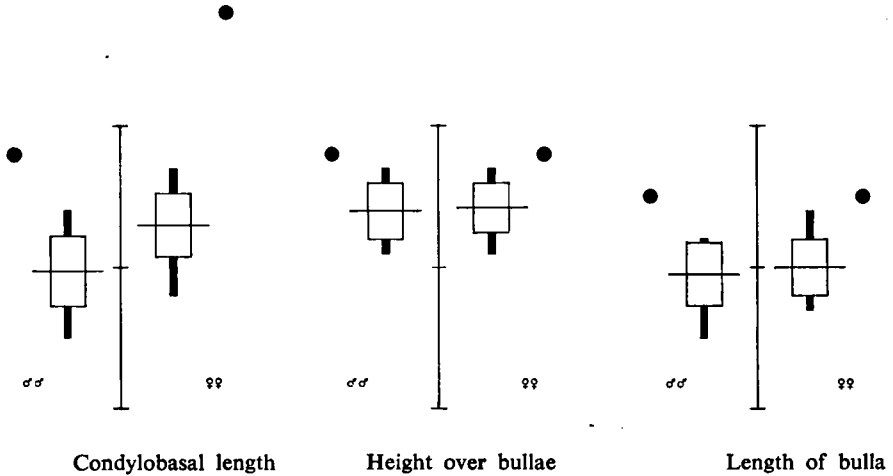


FIGURE 3. Graphical representation of some skull dimensions of *Plecotus auritus* and *Plecotus austriacus* from the Netherlands. For explanation see fig. 2 and table I.

do with the difference in species. Up till now, however, we have not found any positive correlation between the way of hibernating and the place during hibernation of the two species. At least three specimens of *Plecotus auritus* now in the collection of the Zoological Museum, were found hanging from the roof of caves with their wings around them. Of some others of the same species it is known that they were found in holes and cracks.

A short time ago Dr P. J. VAN NIEUWENHOVEN drew our attention to the fact that in Long-eared Bats animals are found with flesh-coloured faces and with black-coloured ones. We have not enough data to base an opinion whether this difference has anything to do with the difference in species. In our view, it would be useful in the future to pay attention to this phenomenon during field-work.

After comparing our data on the Long-eared Bats from the Netherlands and on the animals we used for comparison, with the data on *Plecotus auritus* and *Plecotus austriacus* recently published, we were rather struck by the homogeneity in dimensions. As an example for this homogeneity we publish

TABLE II. Condylobasal length of skulls of the Common Long-eared Bat, *Plecotus auritus*, after own data and those of BAUER (1957 & 1960), LANZA (1960), C. & I. KÖNIG (1961) and HANAK (1962).

	Sex	n	Range	Mean	S.d.
( 1) Netherlands	♂ ♂	13	14,5—15,4	15,0	0,25
( 2) Netherlands	♂ ♀	13	14,8—15,7	15,3	0,24
( 5) Rhine-Main region; Germany (SMF)	♂ ♂	7	14,6—15,5	14,90	0,31
( 7) Austria (SMF 18017)	♀	1	—	15,5	—
(19) Czechoslovakia (after HANAK)	♂ ♀	?	14,3—15,8	15,1	—
(11) France (SMF 15267)	♂	1	—	14,50	—
(15) Italy (after LANZA)	♂ ♂	9	14,5—16,0	15,22	0,45
(—) Spain (SMF 20688)	♀	1	—	15,5	—

TABLE III. Condylobasal length of skulls of the Southern Long-eared Bat, *Plecotus austriacus*, after own data and those of BAUER (1957 & 1960), LANZA (1960), C. & I. KÖNIG (1961) and HANAK (1962).

	Sex	n	Range	Mean	S. d.
( 2) Netherlands	♂	1	—	15,8	—
( 3) Netherlands	♀	1	—	16,8	—
( 6) Rhine-Main region; Germany (SMF 15144, 15236, 15445)	♂ ♂	3	16,0—16,2	16,1	—
(20) Austria (after BAUER)	♂ ♂	3	15,8—16,6	16,2	—
(21) Austria (after BAUER)	♀ ♀	4	16,1—16,7	16,35	—
( 8) Czechoslovakia (SMF 19925)	♂	1	—	16,1	—
(18) Czechoslovakia (after HANAK)	♂ ♀	?	15,7—16,9	16,3	—
(10) France (after C. & I. KÖNIG)	♂ ♂	6	16,0—16,8	16,2	—
( 9) France (after C. & I. KÖNIG)	♀ ♀	8	16,1—16,6	16,5	—
(12) France (ZMA 1598)	♀	1	—	15,9	—
(14) Italy (after LANZA)	♂ ♂	25	16,0—16,8	16,25	0,23
(16) Spain (after BAUER and own data)	♂ ♂	13	15,3—16,7	16,10	0,44
(17) Spain (after BAUER and own data)	♀ ♀	15	15,7—17,0	16,26	0,24
(13) Corsica (SMF 19370)	♂	1	—	15,9	—



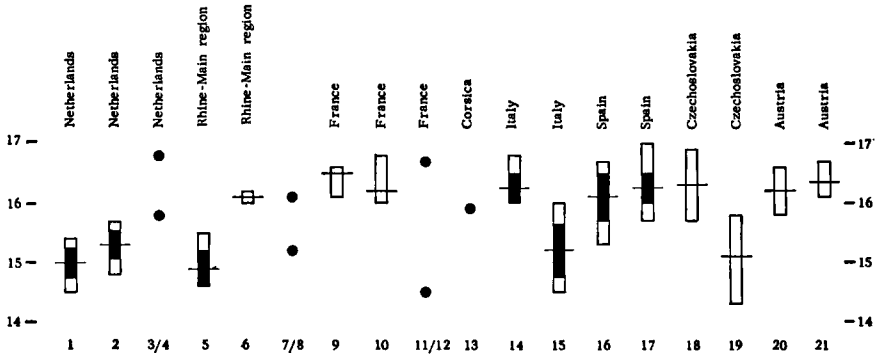


FIGURE 4. Condylobasal length in *Plecotus auritus* and *Plecotus austriacus* from Western Europe. Based on tables II and III. Horizontal lines indicate the means, the bars represent the range of the dimensions, the black parts in the bars indicate the mean  $\pm$  the standard deviation. The numbers under the bars correspond with the numbers between brackets in tables II and III.

a compilation of our own data on the condylobasal length and those found in literature (see tables II & III). Figure 4 is again a graphical representation of the lists of measurements in the tables. In this compilation we did not work up the data on both species of *Plecotus* from the Balkans, as the second author intends to publish soon a study on these bats.

Looking at the tables and the figure, we have the impression that two specimens from Salamanca, Spain, studied by BAUER (1957) may warrant re-examination. These bats, males, are in the collections of the Naturhistorisches Museum in Vienna (without collection number) and have a condylobasal length of 15,3 and 15,5 millimeters respectively. The more so, as a female (SMF 20688) from the same region with a condylobasal length of 15,5 millimeters, is most probably a specimen of *Plecotus auritus*. If the two mentioned Long-eared Bats from Spain also belong to the species *Plecotus auritus*, we probably have in Spain the same situation as described by LANZA (1960) for Italy. In the south of Italy, *Plecotus austriacus* is found in the plains, *P. auritus* high up in the mountains.

From the description of JENYNS (1828) it is clear that he knew both species. It would be interesting, however, to know more about the occurrence and the distribution of *Plecotus austriacus* in Great Britain. The same can be said for Belgium and for France (in particular for the northern part of that country).

As to the nomenclatorial controversy, mentioned in the introduction of this note, we believe it better, while waiting for a revision of the extra-European *Plecotus*, not to place *Plecotus wardi* THOMAS, 1911 in the synonymy of *Plecotus austriacus* FISCHER, 1829. For that our knowledge of bats of the genus *Plecotus* in Asia is still too sketchy.

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