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**The Occurrence of *Myotis brandtii* (Eversmann, 1845)  
in Poland**

[With 2 Tables &amp; 3 Figs.]

Studies were made, on the basis of collections of the skulls of whiskered bats from Poland and Czechoslovakia (*M. mystacinus*, n=59, *M. brandtii*, n=39) of the taxonomic value of mandible length and height of *ramus mandibulae*. It was found that the length of the mandible is of help as a supplementary character in identification of these bats from owl pellets and fossil material. The craniological description of whiskered bats from Poland reveals their great similarity to populations from Federal Republic of Germany and Czechoslovakia. *M. mystacinus* occurs all over Poland, whereas *M. brandtii* has currently been found in: the Pomeranian Lake District and Masovian and Podlaski Lowland areas, the Kraków—Częstochowa, Małopolska and Lublin Uplands and in the Świętokrzyskie Mountains.

## 1. INTRODUCTION

The distribution of *M. brandtii* in Europe has not yet been fully investigated on account of the lack of detailed data from Hungary, Roumania and Poland (Hanák, 1970). During the present century this species has been shown as a form contemporary for Europe by Topál (1958), who also gives it as from the Pleistocene in Hungary. *M. brandtii* has been found to be present in northern (Wallin, 1969 — after Hanák, 1970), central (Gauckler & Kraus, 1970; Mošanský & Gaisler, 1965; Hanák, 1965, 1970 and 1971; Winfried, 1972) and southern parts of the European continent (Lanza, 1959 after Hanák, 1970). It has also been found that whiskered bats occurring in Europe are distinguished by the dual character of their morphological differences, which were initially considered as separating these animals into subspecies. The differences in the shape and size of *os penis*, the characters of their teeth and also body and skull measurements have resulted in these two forms recently being given the status of species (Topál, 1958; Gauckler & Kraus, 1970; Hanák, 1971).

According to Kowalski (1964) whiskered bats living in Poland belong to the nominative subspecies — *Myotis mystacinus mystacinus* (Kuhl, 1819). We know little about the distribution of whiskered bats in Poland, despite the fact that they are fairly generally considered as bats which »commonly« occur over the whole of the country. In reality the information to be found in literature on Poland is exceptionally scanty and appears in the form of an occasional mention in faunistic literature (Wałęcki, 1881; Herold, 1934; Skuratowicz, 1939, 1948; Gaffrey, 1944; Kowalski, 1953; Wołoszyn, 1964, 1968), in reports on bat ringing operations (Kowalski *et al.*, 1957), parasitological publications (Ryberg, 1947; Skuratowicz, 1962, 1966, 1968) and publications concerned with analysis of owls' food (Cais, 1963; Kulczycki, 1964).

The purpose of the present study was to examine the criteria for distinguishing whiskered bats, to give their morphological description and contemporary distribution in Poland.

## 2. MATERIAL AND METHODS

The material at my disposal consisted of the skulls of the two species: *M. mystacinus* (n=59) and *M. brandtii* (n=39), obtained from trapping and from owl pellets, collected in Poland (collections: Department of Systematic and Experimental Zoology of the PAS in Kraków, Institute of Biological Bases of Animal Production of the Agricultural College in Wrocław, the Zoological Institute of PAS in Warsaw and also the Mammals Research Institute of PAS in Białowieża) and Czechoslovakia (Ústav pro výzkum obratlovců ČSAV in Brno and Katedra systematické zoologie PF KU in Praha). The following two measurements were made on the bats' mandibles: (1) length of mandible, measured from the anterior edge of alveolus  $I_1$  to the end of *proc. articularis mandibulae* and (2) height of *ramus mandibulae*, measured from *incisura praeangularis mandibulae* to the apex of *proc. coronoideus mandibulae*, with accuracy to 0.1 mm (Ruprecht, 1969). In addition the following measurements were made on the skulls: Cb length, length of upper tooth row and zygomatic breadth. The places of occurrence of the two species of bats were marked on a map of Poland — scale 1:2,000,000, which was reduced to the requirements of this publication. In the present discussion a total of 9 stations of *M. brandtii* and 20 of *M. mystacinus* have been taken into consideration, while the 23 remaining stations of the two species have of necessity, on account of the impossibility of obtaining material as proof, been treated only as places in which whiskered bats of unknown systematic appurtenance occur.

## 3. RESULTS

### 8.1. Distinguishing between Whiskered Bats on the Basis of Mandible Measurements

The method previously described (Ruprecht, 1969) of simultaneous comparison of mandible measurements was used to distinguish the

whiskered bats. These characters vary in their value for diagnosis in the case of whiskered bats. Although the values of measured mandible length occur in extreme individuals of the two species in classes of 9.9/10.0 mm, and cover 20.3% of the *M. mystacinus* specimens and 10.2% of those of *M. brandtii* (Fig. 1), they make it possible to identify the greater part of the material. The height of *ramus mandibulae*, on the other hand, is not of any great taxonomic value in distinguishing between the two species on its basis, but even so *M. brandtii* is differentiated by

Table 1  
Variations in mandible dimensions in two species of whiskered bats.

Species	<i>Myotis mystacinus</i> (n=59)			<i>Myotis brandtii</i> (n=39)		
	min—max	$\bar{x} \pm SD$	C.v.	min—max	$\bar{x} \pm SD$	C.v.
Mandible length	9.2—10.0	9.65±0.44	4.6	9.9—10.8	10.32±0.32	3.0
Height of <i>ramus mandibulae</i>	2.5— 3.0	2.73±0.14	5.2	2.6— 3.1	2.87±0.24	8.5

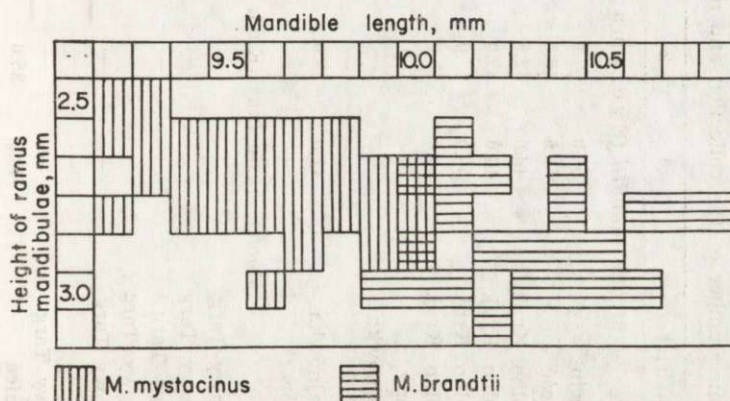


Fig. 1. Relation of mandible length and height of *ramus mandibulae* in whiskered bats.

a mandible with a higher *proc. coronoideus* (Fig. 1, Table 1). The coefficient of variation (C.v.) shows that variations in mandible length in the two species of whiskered bats is relatively slight in comparison with height of *ramus mandibulae* (Table 1).

**3.2. Morphological Description of Whiskered Bats from Poland**

Specimens of *M. mystacinus* obtained under field conditions had been caught at all seasons of the year, whereas the majority of *M. brandtii*

Table 2

Body and skull dimensions in *M. brandtii* and *M. mystacinus* from Poland.  
 Explanation: 1 — head and body, 2 — tail length, 3 — ear length, 4 — forearm, 5 — Cb. length, 6 — length of maxillary tooth-row, 7 — zygomatic breadth, 8 — mandible length, 9 — height of ramus *mandibulae*. M — male, F — female.  
 In the first column number of the collection and month of the capture are given.

No. coll.	sex	Locality, district	1	2	3	4	5	6	7	8	9
<i>Myotis brandtii</i> (Eversmann, 1845)											
— Jan.	M	Czernin, Szczecin	50.0	37.0	—	—	—	—	—	—	—
1 Aug.	M	Kosobudy, Zamość	51.5	40.5	16.0	36.0	14.1	5.5	8.8	—	—
48 July	F	Borówki, Sępólno Kraj.	48.0	32.5	14.0	35.0	13.6	5.3	8.3	10.3	2.9
51 July	F	Borówki, Sępólno Kraj.	46.7	35.0	13.0	35.0	13.7	5.4	8.6	10.3	2.9
68 Aug.	F	Borówki, Sępólno Kraj.	50.0	38.0	15.0	36.0	14.0	5.5	8.0	10.6	3.0
83 Aug.	F	Borówki, Sępólno Kraj.	50.0	40.0	15.0	37.5	14.2	5.6	8.7	10.5	3.0
— July	—	Kraków—Bielany	—	—	—	—	14.0	5.4	8.7	10.4	2.9
42497 Sept.	—	Białowieża, Hajnówka	—	—	—	—	13.3	5.0	8.3	9.9	3.0
— July	—	Łągów, Opatów	—	—	—	—	—	—	—	10.1	3.0
24136 Jan.	M	Białowieża, Hajnówka	41.0	39.0	12.0	34.0	13.7	5.3	8.2	10.0	2.9
— Oct.	—	Narol, Lubaczów	—	—	—	—	14.0	5.4	—	10.3	2.9
<i>Myotis mystacinus</i> (Kuhl, 1819)											
1010/59 March.	F	Kościelisko, Nowy Targ	—	—	—	—	13.1	5.0	7.8	9.5	2.8
1005/59 Nov.	F	Kościelisko, Nowy Targ	—	—	—	—	12.8	4.7	7.9	9.5	2.7
1014/59 Sept.	M	Zakopane, Nowy Targ	—	—	—	—	12.9	4.9	8.2	9.7	2.8
1006/59 Feb.	—	Kościelisko, Nowy Targ	—	—	—	—	12.9	4.9	8.4	9.4	2.8
1003/59 Feb.	M	Kościelisko, Nowy Targ	—	—	—	—	12.9	4.8	8.5	9.8	2.6
2530/63 April	F	Ojców, Olkusz	—	—	—	—	12.6	4.9	7.9	9.3	2.7
2745/64 Aug.	—	Czorsztyn, Nowy Targ	—	—	—	—	13.1	4.8	8.2	9.7	2.7
— Aug.	M	Zbiczno, Brodnica	40.0	35.0	11.0	34.0	12.9	5.3	8.3	—	—
3176/67 May	F	Babia Góra, Sucha Beskidzka	—	—	—	—	12.8	5.0	8.0	9.5	2.6
3177/67 July	—	Babia Góra, Sucha Beskidzka	—	—	—	—	13.0	5.0	8.0	9.7	2.8
— June	—	Scinawa, Wołów	—	—	—	—	12.7	4.9	—	—	—

were specimens collected in summer (Table 2). A very large part of the material of both species consisted of bats obtained from owl pellets, and therefore were almost certainly caught during the activity period.

Specimens of *M. brandtii* in Poland are distinguished by fairly large skull dimensions (Table 2) but are, however, similar in this respect to those from Czechoslovakia (Hanák, 1971) and southern Germany Federal Republic (Gauckler & Kraus, 1970) — Fig. 2. Variations in condylobasal length are very small in *M. brandtii* from Poland (C.v.=2.8%), which forms evidence of the uniformity of the material. Similarly specimens of *M. mystacinus* from Poland fail to exhibit differences from the whiskered bats from the Czechoslovakian and German populations (Fig. 2). All three populations provide very uniform material

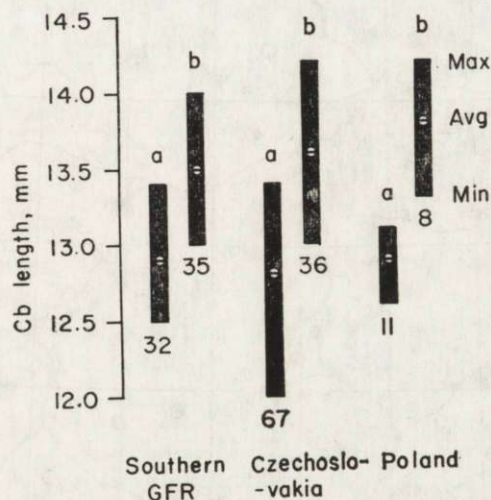


Fig. 2. Variations in condylobasal length in whiskered bats from the population aspect (Southern Federal Republic of Germany, Czechoslovakia, Poland), a — *Myotis mystacinus*, b — *Myotis brandtii*

in respect of Cb length. Variations in this character in specimens from Poland are also very slight (C.v.=2.0%). The results obtained would appear to indicate that differences between populations in respect of the skull measurements of these bats are very slight.

### 3.3. Distribution of Whiskered Bats in Poland

*M. mystacinus* is distributed fairly evenly over the whole of Poland, except that the majority of the stations of this species are located in the south (Fig. 3). The maximum number of points is contained between 49°

and 52° northern geographical latitude, and the number of stations decreases in a northern direction. The results obtained, although fragmentary, would appear to show that *M. mystacinus* occurs all over Poland (cf. also Kowalski, 1964).

*M. brandtii* was found for the first time in Poland during the present century, among specimens collected by Dr. G. Heinrich in the Byd-

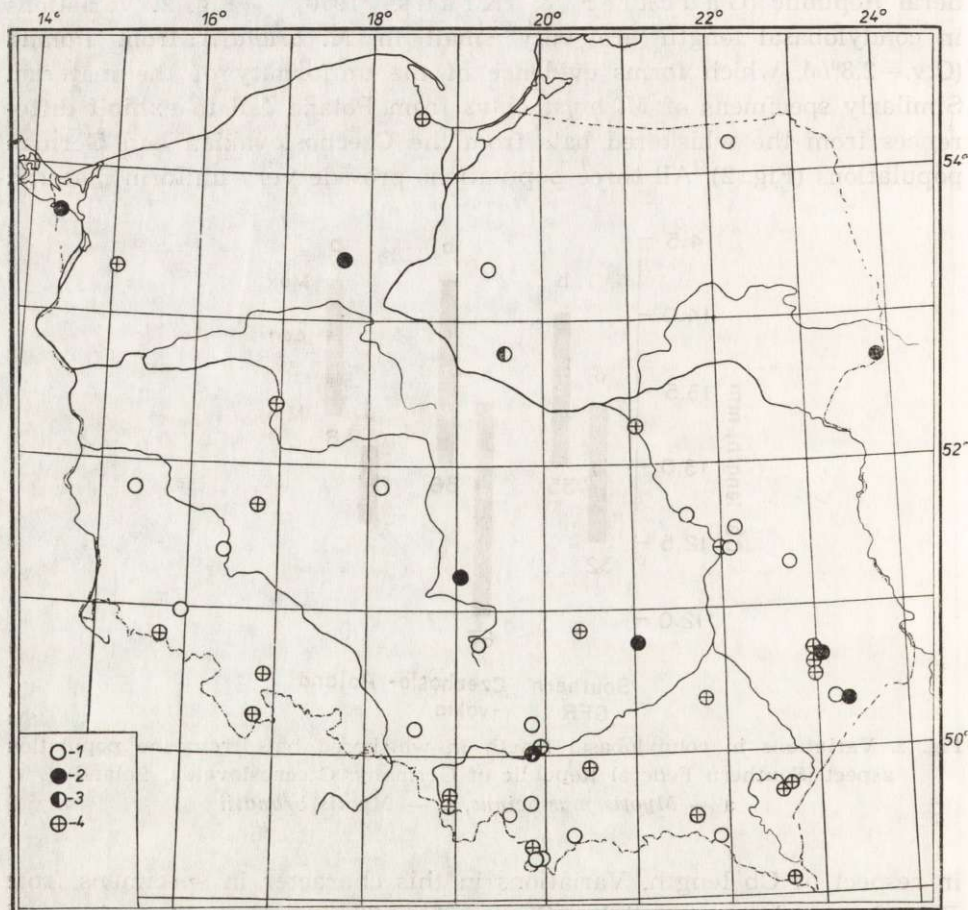


Fig. 3. Geographical distribution of whiskered bats in Poland.

1—*Myotis mystacinus*, 2—*Myotis brandtii*, 3—stations common to both species, 4—places in which whiskered bats of unknown systematic appurtenance occur.

goszcz voivodship (Borówki in the Sępólno Kraj. administrative district), which were at first identified as *M. mystacinus*. Part of the collection is at present in the Zoological Museum of the Humboldt University in Berlin (Hanák, 1970), and several other specimens in the collections

of the Zoological Institute in Warsaw (coll. nos. 48, 51, 68 and 83 — Table 2). A specimen of a bat from Czernin in the Szczecin voivodship, collected by Dr. W. Herold on 26.I.1924 and identified by Professor dr. H. Pohle as *M. mystacinus*, was held to be *M. brandtii* (Herold, 1934). The correctness of the decision to allocate it to the species *M. brandtii* would appear to be justified by the body dimensions of this specimen and also the later suggestions made by Gaffrey (1944), according to whom the specimen from Czernin belongs to a different subspecies than the nominative one. The same was done in the case of the specimen collected by Professor dr. W. Skuratowicz in the Kosobudy Forest Administration District, Zamość administrative district (29 August 1940). The body dimensions of the bat indicate that it is a case here of a large male individual of *M. brandtii* (cf. Table 2; Skuratowicz, 1948). The specimen collected in the Łagowska Cavern in the Świętokrzyskie Mountains on 19.7.1960 by Dr. B. W. Wołoszyn, despite the fairly considerable damage to the skull, was held to belong to *M. brandtii*, and this was confirmed in a letter from Dr. V. Hanák.

Currently this species has been found in the following parts of Poland: in the Pomeranian Lake District (Szczecin Lowland Region and the Tucholskie Forests) in the northwest part of the Masovian Lowland Region, in the Podlaska Lowland Region (Białowieża Primeval Forest), in the Świętokrzyskie Mountains, on the Kraków—Częstochowa, Małopolska and Lublin uplands. The extreme northern stations on which *M. brandtii* occurs in Poland at the present time are as follows: Czernin, Szczecin district, Borówki, Sępólno Krajeńskie district, Mochowo, Sierpc district and Białowieża, Hajnówka district (Fig. 3).

#### 4. DISCUSSION

When specimens of whiskered bats from owl pellets or fossil material are available it is desirable in addition to measurements of the mandible for exact identification of the species, also to take the morphological characters of the premolars of the maxilla and mandible as a basis (cf. Gauckler & Kraus, 1970; Hanák, 1970, 1971).

The Central European populations of the two species of whiskered bat proved to be very similar to the Polish, and this had in fact been found to be the case earlier on in relation to different populations of the two European species of the genus *Plecotus* (Ruprecht, 1969).

The original statement made by Kowalski (1964) that Poland was supposedly inhabited by representatives of the nominative subspecies only — the present species *M. mystacinus* — proved to be inexact both

in the light of Wołoszyn's results (1970) and the material presented here.

It would appear that the chief reason for the infrequent presence of bony fragments of whiskered bats in owl pellets is the fact that individuals of these species are only sporadically caught by owls. Remains of other species of bats were far more often found in owl pellets, particularly when these birds had caught the bats within the compact range of the given species (Ruprecht, 1971). The larger number of stations found in the south of Poland would appear to be due in part to the more intensively continued studies on bats in this part of Poland. In addition one of the causes of the small number of stations with which the present author had to do is the fact that whiskered bats occur only in very small numbers in Polish collections.

On the basis of the results obtained on the distribution of the two species of whiskered bats in Poland it may be concluded that they most certainly occur sympatrically over a considerable part of Poland. The co-occurrence of the two species was found in the north-west part of the Masovian Lowland area (specimens from owl pellets found at Mochowo in the Sierpc district, collected on 27.10.1965), although they also occurred *M. mystacinus* (Wołoszyn, 1970) dominated at greater heights. These data, although limited, would appear to provide confirmation of Hanák's view (1970) that the geographical ranges of these two forms overlap considerably in Central Europe.

The two species of whiskered bats were encountered together in subfossil bone material from the Holocene in caves in the Tatra Mountains, especially in the caves situated lower down, since fragments of *M. mystacinus* (Wołoszyn, 1970) dominated at greater heights. These data indicate that the whiskered bats from the Holocene, or at least those which occurred in the Tatra caves, were morphologically differentiated, exhibiting certain differences in the vertical settlement of mountain zones. The fact that *M. brandtii* was found for the Pleistocene in Hungary and also its presence in Holocene sediments in Tatra caves (Wołoszyn, 1970) permit of considering it as an originally Central European form, whereas *M. mystacinus*, in Hanák's opinion (1970), settled on the European continent during the post-glacial period. Morphological differences between the two forms of whiskered bats, chronological in their appearance in Europe, ecological differentiation, and also the fact of their sympatric occurrence over a very large area of the European continent, would seem to confirm the assumption originally put forward by Topál (1958) and Hanák (1965) that they represent two species — *M. mystacinus* and *M. brandtii*.



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#### WYSTĘPOWANIE *MYOTIS BRANDTII* (EVERSMANN, 1845) W POLSCE

##### Streszczenie

Szereg różnic morfologicznych stwierdzonych u dwóch europejskich podgatunków nocka wąsatka — *Myotis mystacinus mystacinus* (Kuhl, 1819) i *Myotis mystacinus brandtii* (Eversmann, 1845), zadecydował, że obecnie obu tym formom przypisuje się już status gatunkowy. Obok nocka wąsatka, *M. mystacinus* (Kuhl, 1819), w skład fauny nietoperzy Polski wchodzi nowy gatunek — nocek Brandta, *M. brandtii* (Eversmann, 1845). Na podstawie zbioru czaszek obu gatunków tych nietoperzy z Polski i Czechosłowacji (*M. mystacinus* — n=59, *M. brandtii* — n=39) zbadano wartość taksonomiczną długości żuchwy i wysokości *ramus mandibulae*. Stwierdzono, że długość żuchwy wykazuje niewielki stopień zachodzenia w swych wartościach u obu gatunków, okazując się przydatną cechą przy oznaczaniu ich z wypluwek sów lub materiałów kopalnych (Ryc. 1, Tabela 1). Dokonano charakterystyki kranologicznej *M. mystacinus* i *M. brandtii* z Polski stwierdzając duże ich podobieństwo do populacji z południowej części NRF i Czechosłowacji (Ryc. 2, Tabela 2). Wyniki opracowania rozmieszczenia obu gatunków nietoperzy wskazują, że nocek wąsatka występuje na terenie całego kraju, podczas gdy nocek Brandta został aktualnie stwierdzony na: Pojezierzu Pomorskim (Niz. Szczecińska i Bory Tucholskie), w północno-zachodniej części Niz. Mazowieckiej, na Niz. Podlaskiej (Puszcza Białowieska), w Górach Świętokrzyskich oraz na Wyżynie Krakowsko-Częstochowskiej, Małopolskiej i Lubelskiej (Ryc. 3).