The Bats of the Segeberg-Gipshöhle in Schleswig-Holstein

with some notes on the characters of North West European *Myotis* (Vespertilionidae)

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(With 1 Plate)

The cave near Segeberg, in central Schleswig-Holstein, is of special interest to the students of Chiroptera because it is the only cave in north west Germany, providing a suitable hibernaculum for the cave-dwelling bats of this region. It is situated in a prominent outcrop of rock rising about 200 feet above the surrounding countryside. The country consists of undulating agricultural land with numerous fir and beech woods and thick hedgerows. Also there is a very large lake extending several hundred acres close by and numerous smaller ones in the surrounding country.

The caves were first discovered in 1913 and they are very extensive indeed. Two large passages stretch towards the west and southeast, connecting great halls and grottoes. With it's side passages the cave is more than 600 metres long. It has been formed by the action of water on anhydrous calcium sulphate, forming gypsum, which swelled causing fissures, through which water seeped, dissolving the gypsum and forming the caves. The interior of the cave is very wet to day and rock falls often occur as a result of the continued action of water. The caves are open to the public and electric lighting has been installed in the main passages. This seems to have made little difference to the bats.

Very considerable researches have been carried out on the fauna of the cave by Erna Mohr (1929, 1931, 1937). As a result of some recent visits to the cave made by Surg. Lt. J. G. Harrison R. N. V. R., I am able to add three species of *Microchiroptera,* amongst the specimens he has sent me, which have not apparently been previously recorded from the cave.

All the species definitely recorded from the cave so far belong to the Genus *Myotis* (Mouse-eared Bats). Although Erna Mohr (1929) suspected the presence of the Serotine Bat *(Eptesicus serotinus* Schreber) in the cave, it was not possible to make a definite identification and to the best of my knowledge the presence of this species has not been confirmed since. The species which have occurred are listed individually below.

Myotis myotis Borkhausen Mouse-eared Bat. Mausohr

This large species was found in the cave by Erna Mohr (1929, 1931, 1937). There were a small number of both sexes in the cave on the first occasion that Dr. Harrison visited it on the 21st. March 1950 and a further specimen was found there on the 17th. January 1951. These were found hanging quite openly on the rock surfaces, some singly and two pairs side by side. Several were flying around in the cave on each occasion, showing that the hibernation torpor is not continuous.

Myotis nattereri Kuhl Natterer's Bat. Gefranste-Fledermaus

This was the only other species definitely identified by Erna Mohr (1929, 1931, 1937), who found many in the cave in 1925 and who shows a beautiful photograph (1931) of one clinging in a rock crevice in the cave. Three examples of this species were found there by Dr. Harrison on the 17th. January 1951. They were all found singly, clinging in narrow crevices.

It is interesting that two subspecies of Natterer's Bat have been supposed to occour in Germany. *M. n. spelaeus* Koch, (type locality Nassau), is said to differ from the typical form in size and to have a different hibernation biology, spending the winter in caves, while the typical form is said to hibernate in hollow trees. Ryberg (1947) does not think that these forms will prove to be morphologically distinct. It seems unlikely that an ecological barrier such as that postulated could be effective unless copulation, which is generally supposed to occur in the autumn, takes place in the caves, because the bats hibernating in caves almost all leave them to take up summer quarters in buildings and hollow trees. Certainly the three specimens in my possession from Segeberg show no significant differences from a series of British Natterer's Bats, but more material is required to verify or disprove this interesting assertion.

Myotis daubentonii Kuhl. Daubenton's Bat. Wasser-Fledermaus

It is curious that Erna Mohr evidently did not find any Water Bats in the cave, because it is quite numerous there at the present time. There were quite a number of them in the cave on March 21st. of 1950, when all those found were males, and a single female was found on the 17th. January 1951. These also were all found clinging in small crevices, once a pair together, but the others all singly, often within a few feet of each other.

Myotis mystacinus Kuhl Whiskered Bat. Bartfledermaus

A single male of this species was found in the cave on the 17th. January 1951 hanging in a crevice not far from two Daubenton's Bats.

Erna Mohr knew of no occurrence of this species in Schleswig-Holstein, while Ryberg (1947) marks no occurrence there in his map of the northern distribution of this species.

Myotis dasycneme Boie Rough-legged Bat. Teich-Fledermaus

On the 17th. January 1951 Dr. Harrison found one male example of this rare bat in the cave. It was hanging up on the rock surface completely in the open.

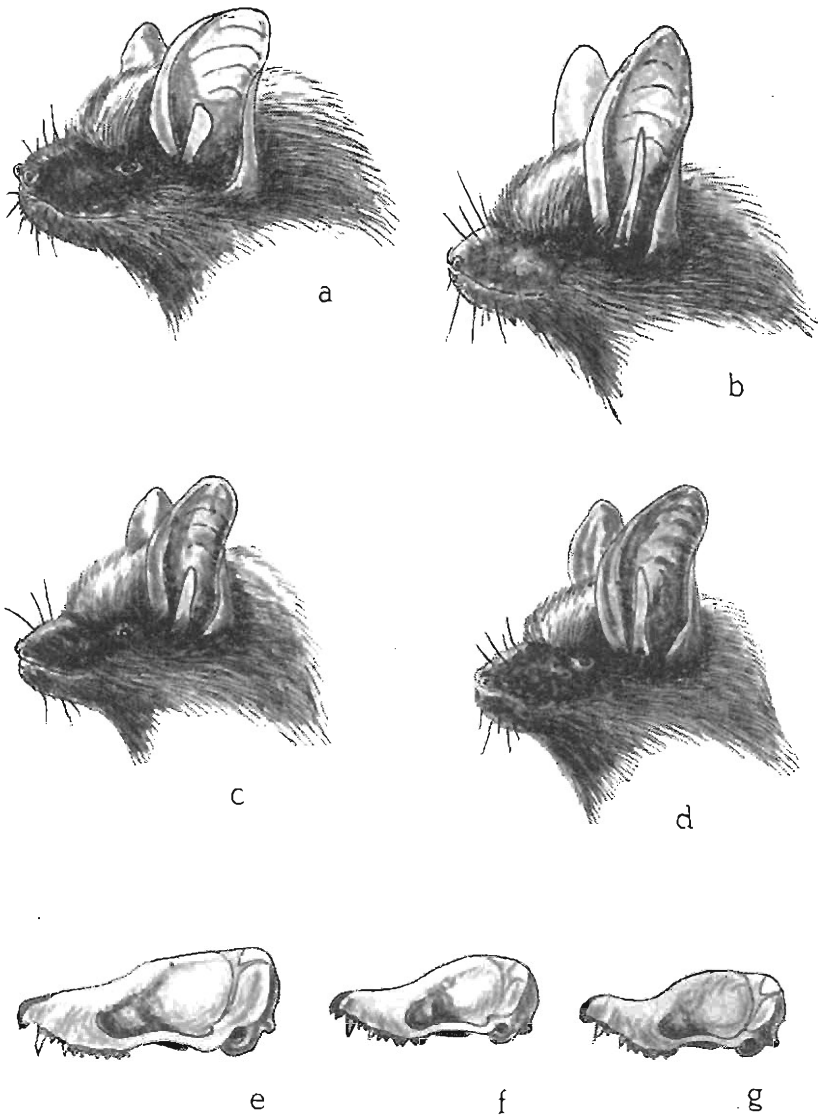
Erna Mohr knew of no occurrence of this bat in Schleswig-Holstein, while Ryberg (1947) marks one record in the province on his map of it's distribution in the north. From it's position this might well have come from the Segeberg vicinity but unfortunately I have not been able to trace the details of this record. Eykman (1937) describes the species as rare in Holland where it occurs however, not uncommonly in the South Limburg caves.

It is an interesting fact that neither Erna Mohr nor Dr. Harrison found any Horseshoe Bats *(Rhinolophidae)* in the cave, for the occurrence of these in North Germany has not been established in recent years. There is an uncertain report from Hamburg by Schmidt (1830), the validity of which was doubted by Pohle (1936), while Lehmann (1822) mentions the Greater Horseshoe *(Rhinolophus ferrum-equinum)* as occurring in the Hamburg district, a report which is almost certainly correct. The absence of Horseshoe Bats from the Segeberg cave, a locality seemingly so suitable for them as a hibernaculum, suggests that they can be but rare stragglers in Schleswig-Holstein. This conclusion is borne out by Eykman's statement (1937) that both Greater and Lesser Horseshoes are rare in Holland, where both have occurred in the South Limburg caves, the former only eight times in twenty years prior to 1937. A detailed study of the distribution of these curious bats needs to be made to discover why they are absent from some regions, such as East Anglia and Schleswig-Holstein, even though there are caves or artifical mines available for them and the countryside, at any rate in parts of these regions, seems suitable. In several visits to some chalk mines near Bury St. Edmunds in Suffolk during 1950 Mr. K. F. Burtsal and the author quite failed to find any Horseshoe Bats, while a recent visit, in March 1951, to a similar mine, not in chalk, however, at Godstone, in Surrey, revealed a single Greater Horseshoe Bat, *(Rhinolophus ferrum-equinum insulanus* Barrett-Hamilton). It seems very likely that the absence of suitable caverns must have been a strong limiting factor in the spread of these species in the temperate parts of their range, where hibernation is necessary for survival.

The bats of the Genus *Myotis* are a primitive Genus amongst the V e s p e r t i l i o n i d a e and all retain the second upper premolar tooth.

As they are not all easy to identify, I have included a tabular comparison of the salient features of all the species which are known in north-western Europe.

From this table it will be seen that, using the forearm as a convenient and accurate index of size, *Myotis myotis* is clearly distinguished by it's large size, surpassing that of all others. *M. dasyceme*, the next largest species, can only be confused on point of size with *M. bechsteinii* Kuhl, but the latter is at once distinguished by it's relatively huge ear, while the short, rounded tragus of *M. dasycneme* and it's almost straight dorsal pro-



Erklärung der Tafelfiguren:

a *Myotis dasycneme* Boie
♂ ad. No. 1.1104, face and ear × 2:1
17. I. 51, Segeberg, Gipshöhle, J. G. Harrison leg.

b *Myotis nattereri* Kuhl
♂ ad. No. 4.959, face and ear 2:1
12. XI. 49, Bury St. Edmunds, Suffolk, K. F. Burtsal leg.

c *Myotis daubentonii* Kuhl
♂ ad. No. 9.982, face and ear 2:1
21. III. 50, Segeberg, Gipshöhle, J. G. Harrison leg.

d *Myotis mystacinus* Kuhl
♂ ad. No. 5.693, face and ear 2:1
18. III. 48, Jughole Cave, Matlock, Derbyshire, A. B. Marsden-Smedley leg.

e *Myotis dasycneme* Boie
Skull of No. 1.1104, lateral view 2:1

f *Myotis daubentonii* Kuhl
♂ ad. No. 7.970, skull, lateral 2:1
21. III. 50, Segeberg Gipshöhle

g *Myotis mystacinus* Kuhl
♂ ad. No. 1.414, skull, lateral 2:1
18. IV. 45, Sevenoaks, Kent

file of the skull provide positive characters for the identification of this species. (See Figs. a and e). *M. bechsteinii* is similarly distinguished by it's large ear from all the smaller species. The table shows that there is overlap in the forearm measurements of all the smaller species and it is in the identification of these that most difficulty will be encountered and a careful consideration of all the salient characters becomes essential. Coloration in these small species is very variable and although colour differences may be reliable and fairly constant in a given area, when large series from different areas are examined however, it becomes clear that they are too variable to provide certain means for the identification of a single specimen from any place in the range of a species. *M. nattereri* is distinguished by the combination of it's size, which is in the upper limit of the group of small species under consideration, together with a dense fringe of hairs along the free part of the interfemoral membrance (distal to the calcar) and by it's tragus, which is sharply pointed and much more than half the height of the pinna (see Fig. b). *M. emarginatus* Geoffroy is almost exactly the same size as *M. nattereri* and it's tail membrance too, bears a thin fringe of hairs. The outer border of it's pinna, however, is deeply emarginate, with an almost right-angled notch at the junction of the middle and upper thirds. The tragus of this species is only just greater than half the height of the pinna and it's anterior border is straight, while p^2 is very small, only just reaching the cingulum of p^1. A useful point, but one which can only be appreciated in the presence of comparative material, is that

Tabular Comparison of Salient Cha-

External Characters	Forearm mm	Ear (mm from meatus)	Tragus
M. myotis	55—64	20—28	1/2 height of pinna Pointed Greatest breadth just above base Anterior border straight
M. dasycneme	44—47	13—17	Much less than 1/2 height of pinna Rounded Greatest breadth in upper half Anterior border just concave
M. bechsteinii	39—44	21—26 Very broad 13—16,5 max.	Just less than 1/2 height of pinna Pointed Greatest breadth just above base Anterior border concave
M. nattereri	36,5—41	Dusky, translucent 12—18	Much greater than 1/2 height of pinna Pointed sharply Greatest breadth just above base Anterior border concave
M. emarginatus	36—41	Black, opaque 15—17 Posterior border deeply emarginate at junction of upper and middle thirds	Just greater than 1/2 height of pinna Pointed Greatest breadth just above base Anterior border almost straight
M. daubentonii	34—39	Dusky, translucent 10—14	1/2 height of the pinna Pointed bluntly Greatest breadth just above base Anterior border almost straight
M. mystacinus	32—36	Blackish, semi-o-paque 11—15	Just greater than 1/2 height of pinna Pointed Greatest breadth just above base Anterior border straight

racters of N. West European Myotis

Foot and Tarsus	Tail Membrane	Condylobasal Length (mm)	Dorsal Profile	Teeth
Just greater than 1/2 length of Tibia	Border hairless	22—24	Slightly concavo-convex Sagittal crest well marked	p_1 and p_2 both small p_2 displaced from the toothrow
Much greater than 1/2 lenght of Tibia	A few scattered hairs on proximal part of border only (confined to calcar)	16—17	Almost straight from nasals to lambda Sagittal crest absent	p_2 small p_2 displaced internally slightly
1/2 length of Tibia	Border hairless	16—17	Concavo-convex, flat posteriorly Sagittal crest present, low	p_2 2/3 height of p_1 p_2 not displaced
1/2 length of Tibia	Dusky and translucent. Free border densely fringed with hairs, scattered ones proximally over calcar	14—15,5	Concavo-convex, flat posteriorly Sagittal crest absent	p_2 2/3 height of p_1 p_2 not displaced
1/2 length of Tibia	Black, opaque Thinly haired proximally and distally	14,5—15	Concavo-convex, flat posteriorly Sagittal crest absent	p_2 very small, only reaches to cingulum of p_1 p_2 not displaced
Greater than 1/2 length of Tibia	Dusky, translucent Some scattered hairs both distally and proximally	13—14	Concavo-convex, gently convex posteriorly Sagittal crest absent	p_2 1/2 height of p_1 p_2 not displaced
1/2 length of Tibia	Blackish, semi-opaque Some scattered hairs distally and proximally	12,5—13,5	Concavo-convex, flat or even slight second concavity posteriorly Sagittal crest absent	p_2 1/2 height of p_1 p_2 not displaced

the ears and membrances of *M. emarginatus* are blacker and more opaque than those of *M. nattereri*. The remaining two small species *(M. daubentonii* and *M. mystacinus)* have a condylobasal length of the skull of 14 mms. or less and the larger of the two, *M. daubentonii*, is at once distinguished from the larger members of the small group *(M. nattereri* and *M. emarginatus)* by it's large feet, obviously greater than half the length of the tibia. This character also distinguishes it from *M. mystacinus* and other points which help are the slightly shorter and blunter tragus compared with the latter, while the dorsal profile of the skull in *M. daubentonii* retains a somewhat immature appearance, being gently convex over the vertex, while in *M. mystacinus* it is flattened over the vertex or even with a slight concavity there. These points are illustrated in the figures (c, d, f and g). Here again the blacker, more opaque membranes and ears of *M. mystacinus* are obvious when comparative material is at hand. It is of interest to point out that examination with a magnifying lens reveals some scattered hairs along the border of the tail membranes of these two species and along the calcareal part of the border in *M. dasycneme*. The presence of these is not mentioned in most works and might lead to confusion with *M. nattereri*.

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Zusammenfassung

1. Von den in der Segeberger Gipshöhle im mittleren Schleswig-Holstein festgestellten Fledermaus-Arten werden drei für diese Höhle erstmalig nachgewiesen:
   Myotis daubentonii Kuhl — Daubenton's Fledermaus, Wasserfledermaus;
   Myotis mystacinus Kuhl — Bartfledermaus;
   Myotis dasycneme Boie — Teichfledermaus.
2. Das Vorkommen der beiden Hufeisennasen-Arten — *Rhinolophus ferrumequinum* Schreber und *Rh. hipposideros* Bechstein — konnte bisher nicht festgestellt werden; sie fehlen anscheinend in dieser Höhle.
3. Die Frage der berechtigten subspezifischen Unterteilung von *Myotis nattereri* Kuhl in *nattereri* Kuhl und *spelaeus* Koch bleibt offen.
4. An Hand einer Übersichtstabelle sowie einiger Abbildungen werden wichtige Unterscheidungsmerkmale nordwesteuropäischer *Myotis*-Arten herausgestellt und beschrieben.

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