Key to the Identification of British Bat Remains

By
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Spelæologists periodically find remains of bats, mostly of no great age though some may date back to late glacial times. The remains are sometimes entombed in stalagmitic calcite which can be easily removed with dilute acetic acid. Mandibles and skulls are common though few bone associations occur. Existing keys to the identification of British and European bats all depend on having available at least a complete skeleton if not a complete animal. In the course of identifying fragmentary bat remains it became clear that skull material was adequate and in many cases the maxillary and palatal regions alone could suffice. These are fortunately frequently preserved and this key is based on dental characters and size factors in the skull.

The dental formulae throughout refer to the upper dentition. The condylo-basal length and maxillary tooth row (I^1–M^3) measurements are taken from Miller (1912) and the palatal measurements (length of hard palate in midline) are taken from material in the British Museum (Natural History) collections. Europe rather than Britain was chosen for the examples to obtain a larger sample and wide range. Three species included in the key (*V. murinus*, *M. dasycneme* and *M. emarginatus*) are not known in Britain today but might be expected to have occurred here in the past. The figures for the arithmetic means in millimetres are followed by the sample size in brackets. The figures quoted for the ranges are based on three standard deviations above and below the mean, which for all practical purposes will represent the real limits of the range. In cases where the sample size is less than 15 individuals the special formula $\sqrt{\frac{\Sigma\delta^2}{N-1}}$ for small sample standard deviation was used.

Dental formula distinguishes the horseshoe bats, and size differences allow the two species to be recognized. The same characters serve to differentiate the Serotine and *Vespertilio*. The six species with dental formula 2.1.2.3. fall into two groups on the characters of P^2 and the position of P^3, while within these groups size suffices to recognize the species, except for the two *Plecotus* species. *P. austriacus* has only recently been recognized in Britain; it is larger than the normal long-eared bat, but not wholly separable on size alone. The two *Nyctalus* species have a slight overlap on palatal size range but are otherwise distinguishable. The dental formula

Upper Dental Formula	Condylo-basal Length		Maxillary Tooth Row		Length of Palate		Notes	Identification
	Mean	Range	Mean	Range	Mean	Range		
1.1.2.3.	14·6 (33)	13·6–15·7	5·3 (35)	4·9–5·7	—	—		*Rhinolophus hipposideros* (Bechstein) Lesser Horseshoe Bat
	21·1 (37)	19·9–22·3	8·5 (37)	7·9–9·1	—	—		*Rhinolophus ferrumequinum* (Schreber) Greater Horseshoe Bat
2.1.1.3.	14·6 (6)	13·8–15·4	5·2 (6)	—	—	—		*Vespertilio murinus* L. Parti-coloured Bat
	20·2 (25)	18·3–22·0	7·9 (26)	7·2–8·6	—	—		*Eptesicus serotinus* (Schreber) Serotine Bat
2.1.2.3.	11·4 (38)	10·7–12·1	4·1 (38)	3·8–4·4	4·5 (9)	4·0–5·1	Upper canine separated from P^3 by small but fully developed P^2	*Pipistrellus pipistrellus* (Schreber) Pipistrelle
	15·0 (19)	13·8–16·2	5·2 (19)	4·8–5·6	6·2 (5)	5·8–6·6		*Plecotus auritus* (L.) Long-eared bat
	16·2 (8)	15·2–17·3	5·9 (8)	5·5–6·3	6·8 (5)	6·5–7·1		*Plecotus austriacus* (Fischer)
	13·4 (12)	12·8–14·0	4·7 (12)	4·4–5·0	4·8 (5)	4·4–5·2		*Barbastella barbastellus* (Schreber) Barbastelle
	15·4 (7)	14·4–16·4	5·9 (7)	5·6–6·2	5·7 (6)	5·3–6·0	Upper canine in contact with P^3; P^2 very small and much reduced	*Nyctalus leisleri* (Kuhl) Leisler's Bat
	18·3 (40)	16·9–19·6	7·1 (40)	6·7–7·5	6·6 (7)	5·8–7·4		*Nyctalus noctula* (Schreber) Noctule
2.1.3.3.	13·4 (18)	12·8–14·1	5·1 (18)	4·8–5·4	7·3 (15)	6·7–7·9	Protoconule present on molars; P^3 normal	*Myotis daubentoni* (Kuhl) Daubenton's Bat
	12·9 (11)	11·9–14·0	5·1 (13)	4·8–5·4	6·1 (5)	5·7–6·5	P^3 with fully developed protocone	*Myotis mystacinus* (Kuhl) Whiskered Bat
	16·2 (5)	15·2–17·3	6·2 (6)	5·9–6·5	9·6 (1)	—		*Myotis dasycneme* (Boie)
	14·4 (16)	13·7–15·1	5·9 (18)	5·5–6·3	7·2 (4)	6·5–7·8	P^3 with reduced protocone	*Myotis nattereri* (Kuhl) Natterer's Bat
	15·0 (3)	14·4–15·6	6·3 (5)	6·0–6·6	9·1 (7)	8·2–10·0		*Myotis emarginatus* (Geoffroy)
	16·3 (5)	15·2–17·3	6·9 (7)	6·6–7·2	9·6 (5)	8·2–11·0		*Myotis bechsteini* (Kuhl) Bechstein's Bat
	22·8 (41)	21·6–23·9	10·0 (44)	9·5–10·5	13·6 (5)	12·6–14·6		*Myotis myotis* (Borkhausen) Mouse-eared Bat

characterizes the genus *Myotis* and there are three specific groups. Daubenton's bat is unique in having a protoconule on the molars; it has retained the normal P^3. *M. mystacinus* and *M. dasycneme* have a normally developed protocone on P^3 and are separable on size. The four remaining *Myotis* species in the key all have a reduced protocone on P^3. Size differences enable *M. nattereri, bechsteini* and *myotis* to be recognized. The only overlap occurs with *M. emarginatus* whose size-range spreads across that of *M. nattereri* and *M. bechsteini.* Thus were this species, distributed today in central and southern Europe, to occur in British deposits it might not be recognized on the above data.

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REFERENCE

MILLER, G. S., 1912, *Catalogue of the Mammals of Western Europe.* London, British Museum.