IDENTIFICATION OF WHISKERED AND BRANDT'S BATS

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Dentition

Dentition is sometimes a difficult feature for identification because the bats are small and you are normally working under bad light. Baagøe (1973) however, concluded that dentition was the only reliable way of distinguishing between female *M. mystacinus* and *M. brandtii.* Statistically the best identification feature was upper jaw dentition with an overall classification rate of about 91%. The difference lies in the presence or absence of a cusp or protocone on the 4th upper premolar (the cusp is absent or smaller than the 3rd upper premolar in *M. mystacinus* and the same height or large than the 3rd upper premolar in *M. brandtii*). Lower jaw dentition was also found to be a good identification feature with an overall classification rate of 83%. In the lower jaw the difference lies in the ratio of lower premolar 2 to lower premolar 3. Whiskered bats have lower premolar 3 less than half the height of premolar 2, while in *M. brandtii* premolar 3 is more than half the height of premolar 2. However, both species can have premolar 2 and 3 of similar sizes. Note that Baagøe (1973) also points out that dentition is only reliable as a distinguishing feature when looking at the dentition in the lower jaw, not the upper jaw. However, the bats used by Baagøe were not identified by molecular methods and may consequently have been wrongly identified.

Penis shape

It has generally been believed that penis shape is a very good identification feature to distinguish between *M. brandtii* and *M. mystacinus* (Hanak 1970). There is some disagreement whether this is also true for sub-adults. *M. mystacinus* have been believed to have a thin and straight penis, while *M. brandtii* have been thought to have a bell or club shaped penis. There is even a little rhyme to make remembering it easier: wee willie whiskered and big bell shaped Brandt's. However, my results show that penis shape is not always a reliable identification feature. While all the *M. mystacinus* males had a thin penis, just over 30% of the *M. brandtii* males had a thin penis and just under 70% had a club shaped penis. It is therefore not completely safe to assume that a bat with a thin penis is *M. mystacinus*. However, if the bat has a club shaped penis, it is reasonable to assume it is *M. brandtii*. Note that the *M. brandtii* with a thin penis were adults.

Tragus shape

Tragus shape can be used to distinguish between the two species with 85% certainty and is therefore a good identification feature. While *M. brandtii* has a tragus with a convex posterior edge, *M. mystacinus* has a tragus with a concave or straight posterior edge.

Length of thumb claw

Length of the claw on the thumb could also be used to distinguish between the two species with 87% overall certainty. However, there is some overlap. The whiskered bats had thumb claw lengths from 1.2-2.1 mm, while the Brandt's bats had thumb claw lengths between 1.5-2.3 mm. This feature can therefore only be used for the regions with no overlap i.e. for bats with very short or very long thumb claws.

Using the identification features

No single feature was found to discriminate between the two species with 100% certainty. However, it is important to keep in mind that this is a very small sample size so we have to be careful when drawing conclusions as to which features are better for identification. On the other hand, even with such a small sample size we can still see a trend in that there is more or less overlap for all identification features. However, *M. mystacinus* is generally smaller then *M. brandtii* for all continuous variables.

I suggest that the best way of distinguishing between the two species is by using a combination of upper jaw dentition, penis shape, tragus shape, thumb claw length and lower jaw dentition. Identification should then be based upon how many features correspond with each species. However, until a feature with no overlap between species has been detected or identification can be verified using molecular methods, all identification of whiskered and Brandt's bats should be regarded with some caution. On the other hand, it is still important to keep in mind that the five features mentioned above, used in combination, did classify 100% of the bats correctly and that each of these features when used separately could classify over 80% of the bats to the correct species.

Feature	Minimum	Maximum	Mean	S.D.
Forearm length	32.9	35.1	33.8	0.7
Tragus width	1.2	2.0	1.8	0.2
Tragus length	5.0	8.4	6.6	0.9
Thumb length	4.0	6.3	5.3	0.5
Thumb claw length	1.2	2.1	1.6	0.3
5th digit length	38.3	41.2	40.0	1.0
Calcar length	10.2	16.6	13.0	2.2
Foot length	5.0	8.2	7.3	0.8
Foot claw length	1.0	2.3	1.7	0.3
Weight	4.0	6.5	5.1	0.6

Table 1. *M. mystacinus* continuous variables (n= 16, females= 6, males= 10)

Feature	Minimum	Maximum	Mean	S.D.
Forearm length	33.4	36.0	34.8	0.9
Tragus width	1.6	2.4	2.0	0.3
Tragus length	5.8	7.8	6.7	0.6
Thumb length	5.5	6.4	5.9	0.3
Thumb claw length	1.5	2.3	1.9	0.2
5th digit length	39.6	42.6	41.0	0.7
Calcar length	10.2	18.2	15.4	1.8
Foot length	6.8	8.3	7.7	0.5
Foot claw length	1.7	2.5	1.9	0.2
Weight	4.0	8.0	5.7	1.0

Table 2. *M. brandtii* continuous variables (n= 17, females= 4, males= 13)