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On the Taxonomical Status of *Myotis abei* YOSHIKURA, 1944 (Chiroptera, Vespertilionidae)

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ABSTRACT—The type specimen of *Myotis abei* YOSHIKURA, 1944 was examined and compared with species of subgenera *Leuconoe* and Selysius from Japan and adjacent territories. The analysis of external characters and measurements indicated that *M. abei* should be recognised as a junior synonym of *Myotis daubentoni* (KUHL, 1817).

Key words: *Myotis abei*, *Myotis daubentoni*, Chiroptera, taxonomy, synonym

INTRODUCTION

The taxonomic status of several *Myotis* species has recently been revised (Benda and Tsytsulina, 2000; Tsytsulina, 2001), but the genus still includes taxa with doubtful status. One of these is *Myotis abei*, described by Yoshikura (1944) from south-east Sakhalin, Shirotoru town (now Makarov). The species is known only from the type locality and a single type specimen. Originally, the specimen was deposited at the Yamashina Institute for Ornithology and Zoology (Tokyo), but was later moved to the National Science Museum in Tokyo (collection number M-5840 o.5371). The skull of the specimen was lost during the transfer and now the type is represented only by a dry skin specimen.

Yoshikura (1944) described *M. abei* as a form of 'hohohige kaumori', a whiskered bat in Japanese, and noted its similarity to *M. mystacinus gracilis* Ognev, 1927. Later he named it in English as Abe's whiskered bat (Yoshikura, 1956), i.e. belonging to the subgenus *Selysius*. In the original description of the species, Yoshikura (1944) pointed out that the wing membrane was attached to the proximal part of metatarsus, as in *Myotis dasycneme*. It is recognised that the attachment of the wing membrane to the base of the first toe is a characteristic feature of the subgenus *Selysius*, whereas insertion to the metatarsus (*M. daubentoni*, *M. capaccini*, *M. dasycneme* and others) and tibia (*M. macrodactilus*) is a characteristic feature of the subgenus *Leuconoe* (e.g., Tate, 1941; Koopman, 1994). Nevertheless, subsequent taxonomic revisions placed *M. abei* in different sections within *Myotis*, and usually provided no comment on the reasons for such placements. Ellerman and Morrisson-Scott (1951, 1966) included *M. abei* in *Myotis incertae sedis*. Imaizumi (1954) included *M. abei* in his key to east Asian species of *Myotis*, but did not make any comment about this species. According to this key, the only difference between *M. abei* and *M. daubentoni* is the wing membrane insertion: attachment to the ankle in *M. abei*, and to the middle of the metatarsus in *M. daubentoni*. Later, in his synopsis of Japanese whiskered bats, Imaizumi (1958) did not mention *M. abei* at all. This implies that Imaizumi did not recognise *M. abei* within *Selysius*. Yoshikura (1956) listed *M. abei* along with *M. mystacinus gracilis*, *M. ikonnikovi* and *M. daubentoni ussuriensis* in the revision of insectivores and bats of Sakhalin. Besides measurements, he listed six qualitative characters that distinguish these three species. *Myotis abei* differs from *M. daubentoni* in three of them. These characters are: location of the wing membrane insertion (to the ankle in *M. abei*, and to the middle of metatarsus in *M. daubentoni*), relative size of the tarsus to the tibia (about half as long in *M. abei*, and decidedly more than half as long in *M. daubentoni*) and colour of ventral pelage (slaty black in *M. abei* and gray in *M. daubentoni*). Measurements were given only for single specimens of both *M. abei* and *M. daubentoni*.

Corbet (1978) did not indicate subgeneric membership, but placed *M. abei* together with *M. mystacinus*, *M. brandtii* and *M. ikonnikovi*. Pavlinov and Rossolimo (1987) considered the taxonomic status of *M. abei* as unclear. In her book about Japanese bats Yoshiyuki (1989) did not provide any comments about *M. abei*. Koopman (1993) treated *M. abei* as a member of the subgenus *Leuconoe* and later in the more detailed publication (Koopman, 1994), placed *M. abei* in the *daubentoni* group. Pavlinov *et al.* (1995) placed *M. abei* in *Leuconoe incertae sedis*, but noted that the taxonomic status of the species was unclear. Horachek *et al.* (2000) suggested that *M. abei* is conspecific with *M. brandtii*.

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In 2002, Pavlinov *et al.* included *M. abei* in the subgenus *Leuconoe*, but also noted that the taxonomic status and morphological features of *M. abei* were unclear and the species appeared to resemble *M. daubentoni*. The present study sought to clarify the position of the type specimen by comparing it with specimens of other *Myotis*.

MATERIALS AND METHODS

The type specimen of *M. abei* was examined and compared with 46 specimens of *M. daubentoni*, 52 *M. macrodactylus*, 24 *M. pruinosus*, 76 *M. ikonnikovi*, and 71 *M. brandtii gracilis* from Japan and adjacent territories (Appendix 1). *Myotis pruinosus* was also included in the comparison as a representative of the subgenus *Leuconoe*, despite of distribution limited by Honshu, and also because of its small size. Measurements including forearm length, tibia and tarsus length, and condylo-basal cranial length were taken from adult specimens. Coloration was studied in all available specimens (i.e. irrespective of age).

RESULTS AND DISCUSSION

In small *Myotis* species the location of the wing membrane is an important diagnostic character for species identification. Within the considered species, the wing membrane is attached to the metatarsus in *M. daubentoni*, to the tibia in *M. macrodactylus*, and to base of the first toe in *M. pruinosus*, *M. brandtii* and *M. ikonnikovi*. The type specimen of *M. abei* exhibits wing membrane attachment to the upper half of the metatarsus, but in close proximity to the metatarsal articulation. The size ratio of the tarsus and metatarsus is also used to characterise subgenera within *Myotis*. In the subgenus *Leuconoe*, the combined length of tarsus and metatarsus is equal to or greater than half of the tibia length, whereas in the subgenus *Selysius* it is less than half (Table 1). In the type specimen of *M. abei* this ratio is within the range of *M. daubentoni* (Table 1).

Contrast is evident in the coloration of the dorsal and ventral pelage in the *M. abei* specimen, one of the features characteristic of *M. daubentoni*, whereas in the other considered species there is no such a contrast (Table 1). The type specimen of *M. abei* has brown dorsal fur, in clear contrast to the lighter fur on the ventral surface (as in *M. daubentoni*, Fig. 1). Yoshikura (1944, 1956) described the colour of the ventral pelage of the type specimen as 'slaty black', whereas it is evidently light grey on the type specimen. While fur colour can change during long storage in museums, it seems unlikely that a dry preserved specimen would change colour on one side only (the dorsal pelage remains dark).

In both publications concerning *M. abei*, Yoshikura (1944, 1956) noted that the type specimen was an adult male. However, it is evident that the specimen is a subadult since the wing epiphyses have not yet calcified (Fig. 1, C). Even as a subadult, the specimen has a forearm length within the range characteristic of *M. daubentoni* (Table 1). Only two samples of *M. daubentoni* from Sakhalin were included in our study, however detailed analysis of geographic variation in *M. daubentoni* in the Russian Far East was made by Tiunov (1997). He demonstrated that Daubenton's bats from Sakhalin belong to the subspecies *M. daubentoni ussuriensis* Ognev, 1927 and do not differ in their basic external and selected cranial measurements from *M. d. ussuriensis* from other localities (Tiunov, 1997). Furthermore, qualitative characters such as type of wing membrane insertion, pelage colour, and the tarsus-metatarsus ratio of Sakhalin's *M. daubentoni* are within the characteristic range of *M. daubentoni* (M.P. Tiunov, personal communication, Table 1). Maeda (1985) analysed skull and external measurements in *M. daubentoni* in Hokkaido, Sakhalin, Iturup Is. and Korea and did not find any significant differences between sex and populations.

Table 1. Measurements and characteristic features of *M. abei* and 5 considered *Myotis* species.

Characters	*M. abei* (Yoshikura, 1944, 1956)	*M. abei* type specimen	*M. daubentoni*	*M. macrodactylus*	*M. pruinosus*	*M. ikonnikovi* and *M. brandtii gracilis*[1)]
Wing membrane Insertion	At proximal side of metatarsus	At proximal part of metatarsus	At metatarsus	At the lower part of tibia	At the base of the first toe	At the base of the first toe
Colour of back	Dark brown	Brown	Brown to bronze, often with a reddish tinge	Dark greyish brown	Dark greyish-brown to black with golden tips of hairs	Dark brown sometimes with golden tips of hairs
Colour of belly	Dark grey	Contrasting with back, silvery grey	Contrasting with back, silvery grey to white	Grey to dark grey	Silvery grey	Pale
Tarsus plus metatarsus cum	About half as long as tibia	About half of tibia length	More than half of the tibia length	Much more than half of tibia	More than half of the tibia length	Evidently less then half of tibia length
ungulus (ratio to tibia length)	(47%)[2)]	(55%)	(51–60%)	(70–86%)	(62–65%)	(39–45%)
Forearm length (mm)[3)]	34.5	33.5	33.5–40.0	35.5–41.5	30.5–34.0	30.0–33.5
Condylo-basal Length (mm)[3)]	11.2	–	12.7–13.7	14.7–15.5	12.0–12.8	12.1–13.6

[1)] *M. ikonnikovi* and *M. brandtii gracilis* as representatives of *Selysius* species share features, by which they differ from *Leuconoe* species. These two species differ from each other by other characters.
[2)] In both Yoshikura's publications (1944, 1956) it is not indicated whether metatarsus was measured with or without claws. Comparing to our measurements, Yoshikura's measurement of foot (7.5 mm) seems to be with claws.
[3)] The given ranges based on adult specimens' measurements.

Fig. 1. Type specimen of *M. abei* YOSHIKURA, 1944 (NSMT M-5840 o.5371), views from below (A), above (B), and magnified view of wing articulations (C).

In terms of cranial measurements, the condylo-basal length shown by Yoshikura (1944, 1956; which was not measured in the present study due to missing skull), is smaller and outside the size range of adult *M. daubentoni*. It is well known that skull grows slower than limb bones, i.e. it reaches its definitive size slowly than forearm (e.g. Swarthz, 1997), therefore the measurement of condylo-basal length in the subadult specimen of *M. abei* might be of little use. Taking the conflicting observations into consideration (age of the specimen, pelage coloration, the wing membrane insertion), we believe that the description of *M. abei* as a distinct species is a result of misidentification. The specimen preserved in the National Science Museum (Tokyo) and recognised as the type specimen of *M. abei* is actually *M. daubentoni*. Thus, *M. abei* should be considered as a junior synonym of *M. daubentoni*.

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Appendix 1

The list of examined *Myotis* specimens (species, region, number and sex, collection numbers). Collections acronyms are as follows: BM – Burke Museum of Natural History and Culture, University of Washington, USA; BPI – Institute of Biology and Soil Science, Vladivostok, Russia; KM – Nara Educational University, Nara, Japan; NSMT – National Science Museum in Tokyo, Japan; ZMMU – Zoological Museum of Moscow University, Moscow, Russia; ZIN – Zoological Institute of Russian Academy of Science, Saint Petersburg, Russia; KT – private collection of the author, HS – captured, measured and released during field surveys in 2003.

M. abei — Sakhalin, Russia (1♂): NSMT M 5840 o.5371.

M. daubentoni — Hokkaido, Japan (12♀, 10♂): NSMT 14794, 14797–98, 18438, 18440, 22526, 22529, 22531–33, 22534, 25335–42.; KT J3, J6, J7; South Korea (1♀, 1♂): KT Ma1, Ma2; Russian Far East (6♀, 7♂): ZMMU 86494–96, 86503–06, 86508, 104343, 104344, 104358, 104359, 10362; South Siberia, Russia (2♀, 2♂, 6u): ZIN 64466, 64473–74, 64477, 33154, 33156, 61858, 103861–62, 154255.

M. macrodactylus — Honshu, Japan (9♀, 16♂, 2u): NSMT 18374, 18276–78, 20702–05, 22422–24, 22538–48, 23403–07; Hokkaido, Japan (14♀, 11♂): KT J5; HS H-1-14, S-1-6, N-3-6; South Korea (1♂): KT Ma3.

M. pruinosus — Honshu, Japan (7♀, 15♂, 2u): NSMT 14842; KM 12183, 12191–92, 12357–61, 12368, 12385, 12893–97, 12934, 12951, 12952, 13029–31, 13033–34.

M. brandtii — Hokkaido, Japan (38♀, 11♂, 2u): NSMT 46, 15194; KM 546–52, 554–61, 2843–44, 3049, 3051, 3058–60, 3063, 3070, 3119, 3123–24, 3126, 3152, 3153, 11299–301, 12199, 12202, 12206–08, 12225, 12228–32, 12316–19, 12336; Russian Far East (3♀, 9♂): ZMMU 84013, 104422–23, 104427; ZIN 9844, 39437, 39438, 84013, BPI 527, 557, 569, 570; Kamchatka (1♀, 2♂): ZMMU s-51175, ZIN 24-1913(1), 49759; Sakhalin (1♀, 1♂): ZMMU s-35351, ZIN 41671.

M. ikonnikovi — Hokkaido, Japan: (18♀, 24♂): KM 665, 2795, 2800–04, 2839, 3122, 3125, 3149–51, 3154, 3156–57, 6745, 6748, 12210–11, 12348–49, 12433–40, 12442–43, 12445, 12488, 12837, 12842, 12890, 12904–06, 12943, 12986; Russian Far East (18♀, 13♂, 6u): ZIN 5127, 8997, 9254, 30451, 49998–50000, 62310, 63809, 81699, 81701; ZMMU 50954, 52493, 84009, 96372, 103913, 104418–21, 110031, 158583, 165490–92, 165522; BPI 815, 958, 976, 984, 1001, 1004–05, 1007, 1043, 53 – 89; Kamchatka (1♀): BM 39061.