

## A New Species of *Plecotus* (Chiroptera, Vespertilionidae) from Taiwan\*

By

**Mizuko YOSHIYUKI**

Department of Zoology, National Science Museum, Tokyo

**Abstract** A new species of long-eared bat belonging to the genus *Plecotus* is described from Taiwan, under the name of *Plecotus taivanus*. It is similar to *P. homochrous* from Nepal and *P. puck* from Punjab, India in having large auditory bulla, short forearm, thumb and tibia, but is distinguished from them by the small ratio of forearm to total length. It seems to be at a less advanced stage of evolution than the above two species.

In May and June, 1991, a field research of small mammals was made in Taiwan by the present author, who participated in a zoological expedition to the high mountains of Taiwan made by the National Science Museum, Tokyo (leader, Dr. Shun-ichi UÉNO). The material obtained contained three specimens of a bat belonging to the genus *Plecotus* E. GEOFFROY SAINT-HILAIRE, 1818, hitherto unrecorded from the subtropical island.

The members of this genus are widely distributed in the Nearctic and Palearctic Regions and are represented by many forms described from Eurasia, North Africa and the Canary Islands, but unfortunately, their exact taxonomic status has not been clarified in spite of the efforts of such authors as BOBRINSKOJ (1926, 1929), OGNEV (1928), TATE (1942), ELLERMAN and MORRISON-SCOTT (1951, 1966), CORBET (1978), IBANEZ and FERNANDEZ (1985), and so on.

Therefore, the author made an attempt to typologically compare the Taiwanese specimens with all the named forms recorded from Asia, and has come to the conclusion that the former belong to an unknown species. It will be described in this paper.

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*Plecotus taivanus* sp. nov.

[Japanese name: Taiwan-usagikômorî]

*Holotype*. NSMT-M 29616, adult female, skin and skull, collected in a forest

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Table 1. External, cranial and dental measurements (in mm)

	FA	TL	HB	T	HFcu	HFsu	Tibia	E	Tragus	Thumb	BWt
NSMT-M 29616 ♀*	38.0	98.0	49.0	49.0	10.5	9.0	16.0	38.0	16.0×5.4	6.1	7.0
NSMT-M 29614 ♂	37.5	95.0	48.0	47.0	9.0	7.5	15.0	38.5	16.5×5.5	6.5	5.8
NSMT-M 29615 ♀	38.0	98.0	50.0	48.0	9.5	8.5	15.5	36.5	16.0×5.5	6.5	6.1

Abbreviations: FA, forearm; TL, total length; HB, head and body; T, tail; HFcu, hind foot cum CBL, condylobasal length; INT, interorbital constriction; ZYG, zygomatic width; WBC, width per molars (M2-M2); C-M3, length from upper canine to last molar; MAND, mandible; c-m3;

on Mt. An-ma Shan, at alt. 2,250 m, Ho-ping Hsiang, Tai-chung Hsien, on 29 May 1991 by Mizuko YOSHIYUKI. The holotype is preserved in the Mammal Section, Department of Zoology, National Science Museum, Tokyo.

*Measurements (in mm) of the holotype.* Forearm 38.0, head and body 49.0, tail 49.0, hind foot cum unguis 10.5, hind foot sine unguis 9.0, tibia 16.0, ear 38.0, length of tragus 16.0, greatest width of tragus 5.4, greatest length of skull without incisors 16.09, zygomatic width 8.11, width of skull 8.75, interorbital constriction 3.24, canine width at alveoli 3.62, width across upper molars 5.57, length from upper canine to last molar 5.19, upper tooth row at alveoli 5.61, postpalatal length 5.84, length of auditory bulla 4.23, mandible without incisors 9.84, length from lower canine to last molar 5.66, lower tooth row at alveoli 6.64, body weight 7.0 g.

*Specimens examined.* See Table 1.

*Diagnosis.* One of the smallest forms in the subgenus *Plecotus*, very small in dimensions of forearm, thumb, hind foot, tibia, skull, and C-M3, and with relatively wide tragus. Mean values of 3 specimens: forearm 37.8 mm, hind foot sine unguis 8.3 mm, tibia 15.5 mm, thumb 6.37 mm, greatest width of tragus 5.5 mm; greatest length of skull 15.65, and length from upper canine to last molar (C-M3) 4.97 (in mm). The fur rather rough with shorter hairs in the central portion of back, ventral and dorsal hairs nearly black or blackish brown at the bases and with buffy brown tips, wing and interfemoral membranes thin and blackish, the latter attached to the tip of last caudal vertebra. Skull with larger auditory bulla, narrower basisphenoid which is much less than width of M2, and shorter free portion of palate.

*Description.* External characters: Ear elongate oval, the anterior and posterior borders evenly convex, the tip rather narrowly rounded, its length from meatus almost equal to that of forearm, about 38.0 mm, with large anterior basal lobe; tragus simple, the anterior border slightly convex, smoothly and slightly turned outwards at the upper quarter of anterior border, the tip narrowly rounded, posterior border concave at the upper third, distinctly convex below, the greatest width about 5.47 mm, the length about 16 mm, with a prominent basal lobe; wing comparatively wide, third metacarpal longer than the fourth, the fifth slightly shorter than the fourth, first phalanx of the third finger longer than second phalanx; leg short and slender, the hind foot sine unguis longer than half tibial length, about 8.3 mm; carcar long and slender, equal to tibial length, with a slight distal lobe, but without keel, interfemoral membrane

of *Plecotus taivanus* sp. nov. from Taiwan.

GLS	CBL	INT	ZYG	WBC	LAB	C-C	M-M	C-M3	MAND	c-m3
16.09	14.73	3.24	8.11	8.75	4.23	3.62	5.57	5.19	9.84	5.66
15.35	14.15	3.33	7.67	7.77	4.09	3.3	5.27	4.88	9.32	5.38
15.51	14.64	3.53	8.00	8.29	4.29	3.47	5.35	4.84	9.76	5.51

unguis; HFsu, hind food sine unguis; E, ear; BWt, body weight; GLS, greatest length of skull; of braincase; LAB, length of auditory bulla; C-C, canine width at alveoli; M-M, width across up-length from lower canine to last molar. \* Type specimen.

attached to the tip of last caudal vertebra.

**Skull:** General aspect of skull small and weak. In dorsal view: supraorbital region sharply ridged, rostrum rather narrow, flattened with a median concavity; anterior naris deep, longer than wide, its posterior margin extending to level of anterior premolar (P2); zygoma relatively thin and weak, with postorbital expansion on anterior third of arch, braincase relatively broad; average 55.9% of condylobasal length of skull.

In lateral view: dorsal profile of short rostrum lower than frontal, slightly higher than occipital portion; anterior orbital ridge remarkable, lacrymal foramen anterior to the ridge and exposed on the muzzle.

In ventral view: palatal emargination slightly wider than length, its posterior margin extending to level of the middle of upper canines; postpalatal length rather short, average 35.8% of greatest length, distinctly shorter than breadth; median postpalatal process a single spine; large auditory bullae well swollen, roughly circular in outline; basisphenoid very narrow, much less than the breadth of M2. Coronoid, condyloid and angular process of mandible weak.

**Teeth:** Incisor 2 with distinct secondary cusp, about a half of shaft of I2 in height, I3 similar to P2 in crown area, clearly separated from C, P4 wider than long, P2 exceeding cingulum of canine in height, M1 and M2 subequal in crown area, without hypocone cusp, M3 small, less than a half of M1 and M2 in crown area, its 3rd commissure shorter than that of 2nd.

Lower incisors closely crowded and slightly imbricate, the row V-shaped; crown area increasing regularly from first to third. Lower canine small, slightly exceeding molars in height, its shaft concave posteriorly, flattened anteriorly, evenly convex antero-externally; cingulum well developed, crown area of anterior lower premolar (p2) about half that of p4; p3 very small, but in tooth row, its crown area about 60% of p2; m1, m2 subequal in crown area, m3 much smaller in crown area.

### Discussion

As the allocation of the Asiatic forms of the genus *Plecotus* is doubtful, the following named forms are tentatively recognized to be valid taxonomically. The combinations follow those given in original descriptions.



Fig. 1. Skull of *Plecotus taivanus* sp. nov., holotype, NSMT-M 29616, female, adult; 1, dorsal view of cranium; 2, ventral view of cranium; 3, lateral view of cranium; 4, dorsal view of mandible; 5, ventral view of mandible. Bar indicates 2.0 mm.

1. *Vespertilio auritus* LINNAEUS, 1758 (Type area, Sweden).
2. *Plecotus homochrous* HODGSON, 1847 (Type area, Nepal).  
[Range: Himalayas and the Khasi Hills (STERNDAL, 1982)].
3. *P. puck* BARRETT-HAMILTON, 1907 (Type locality, Murree, 7,500 ft., Punjab, India).
4. *P. sacrimontis* G. ALLEN, 1908 (Type locality, Mt. Fuji, Japan).  
[Range: Hokkaido, Honshu and Shikoku (YOSHIYUKI, 1989)].
5. *P. wardi* THOMAS, 1911 (Type locality, Leh, Ladak, Kashmir).
6. *P. ariel* THOMAS, 1911 (Type locality, Tatsienlu, 8,400 ft., Szechuan China).
7. *P. auritus kozlovi* BOBRINSKOJ, 1926 (Type locality, Barun Zasad, Eastern Tsaidam, Chinese Central Asia).
8. *P. mordax* THOMAS, 1926 (Type locality, Kashgar, Chinese Turkestan).
9. *P. auritus ognevi* KISHIDA, 1927 (Type area, North Sakhalin).  
[Range: Transbaikalia, Amur (IMAZUMI & YOSHIYUKI, 1969)].
10. *P. auritus uenoi* IMAIZUMI & YOSHIYUKI, 1969 (Type locality, Hwaam-gul Cave, Kangweon-do, Korea).  
[Range: Ussuri (IMAZUMI & YOSHIYUKI, 1969)].

These forms are tentatively classified into the following five groups by simple diagnostic features (in mm).

- A. Auditory bullae large and closely standing each other; distance between bullae decidedly narrower than the breadth of M2.
  - A1. Larger forms: forearm, tibia and thumb longer with large skull.
 

*Plecotus ariel*: FA 44 (type).  
*P. wardi*: FA  $43.71 \pm 0.85$  (N=8) (after BOBRINSKOJ, 1929).  
*P. kozlovi*: FA  $45.27 \pm 1.05$  (N=14) (after BOBRINSKOJ, 1929).  
*P. mordax*: FA 44 (type).
  - A2. Smaller forms: forearm, tibia and thumb shorter with small skull.
    - a1. TL (HB+T) less than 90 mm, FA rather long, more than 42% of TL (HB+T).
 

*P. homochrous*: FA 38, TL 84 (HB+T) (type).  
*P. puck*: FA 38, TL 90 (HB+T) (type).  
*P. uenoi*: FA 40, TL 89 (HB+T) (type).
    - a2. TL (HB+T) more than 95 mm, FA rather short, less than 40% of TL (HB+T).
 

*P. taiwanus*, FA 37.8 (average, N=3).
- B. Auditory bullae rather small and widely separated from each other; distance between bullae nearly as wide as M2. Forearm intermediate between A1 and A2.
  - B1. Lacrymal foramen exposed, anterior to anterior orbital ridge. *Plecotus sacrimontis*: FA  $41.93 \pm 1.46$  (N=39) (Mt. Fuji, after YOSHIYUKI, 1989).
  - B2. Lacrymal foramen not exposed, posterior to anterior orbital ridge.

*P. ognevi* FA 39.5 (average, N=3) GLS (skull) ♂♂ 17–17.5 (after OGNEV, 1928).

*P. auritus* FA 38.1–42.5, GLS (skull) ♂♂ 15.8–16.9 (after OGNEV, 1928).

As mentioned above, *P. taivanus* belongs to the group A2 and seems closely related to *P. homochrous* from Nepal and *P. puck* from Punjab, India. These three forms have several characters in common, such as comparatively short thumb, slender feet, and dull brown dorsal fur. However, *taivanus* is distinctly larger in total length (HB+T) than *homochrous* and *puck*, so that the ratio of FA to TL is smaller in *taivanus* (38.8–39.5%) than in *homochrous* (45%) and *uenoi* (44.9%). Relatively short FA of *taivanus* probably means that this form is in a less advanced stage of evolution than *homochrous*, *puck* and *uenoi*. As the taxonomic status of *homochrous* and *puck* is doubtful, I tentatively named the Taiwanese series as a full species.

Recently, IBANEZ and FERNADEZ (1985) recognized *Plecotus teneriffae* from the Canary Islands, which had been treated as a subspecies of *auritus*, as a distinct species by univariate and multivariate morphometric analysis. CORBET and HILL (1991) followed this arrangement.

I examined whether or not the selected measurements of *taivanus* are contained in the range of 99.73% ( $M \pm 3SD$ ) of the population of *teneriffae* and *austriacus* (according to Table 2 in IBANEZ & FERNADEZ, 1985). Among the selected measurements, forearm length, condylobasal length, zygomatic breadth, mastoid breadth, breadth across upper molars, maxillary toothrow, tympanic bulla, and mandible length of *taivanus* are smaller than the range of  $M \pm 3SD$  of *teneriffae* and *austriacus*. It is therefore evident that *taivanus* is specifically different from these two species.

Incidentally, the two specimens of *P. austriacus wardi* THOMAS, 1911, recorded by ZUOP-JIN *et al.* (1986) from Xizang are decidedly larger than *taivanus* in most of the important measurements.

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