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Karyotype of Harrison's tube-nosed bat *Murina harrisoni* (Chiroptera: Vespertilionidae: Murininae) based on the second specimen recorded from Hainan Island, China

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The bat genus *Murina* contains 17 recognized species (Simmons 2005), eight of which are distributed in China (Wang 2003). Csorba and Bates (2005) described the Harrison's tube-nosed bat, *Murina harrisoni*, as a new species based on a single female specimen from Kirirom National Park, Kompong Speu Province, Cambodia. They assumed this species was widespread in the forests of Southeast Asia, but its distribution is unclear because no additional specimens have been recorded since the first capture in Cambodia. We collected an adult female specimen of this species in September 2008 in Jianfengling, Hainan Island, China. This second specimen, confirmed as *Murina harrisoni*, provides a new record for China. The present paper is the first report describing the karyotype of *M. harrisoni*, with additional morphological data based on the second specimen of the species.

Materials and methods

We collected the specimen (female) on 17 September 2008 from a tropical rain forest in Jianfengling National Forest Park in the southwest region of Hainan Island (18°44.62'N, 108°51.70'E) at an altitude of 808 m using a harp trap. The specimen is deposited at the Institute of Biodiversity in Huanan, Guangzhou University (IBHG 08295) as a dried skin and a skull. Jianfengling National Forest Park, established in 1992, is situated between Ledong Xian and Dongfang Xian, Hainan Province, about 90 km southwest of Haikou. The park covers an area of 44,700 ha and has an altitude that ranges from sea level to 1,412 m at the peak of Jianfengling Mountain.

The climate alternates between pronounced dry and rainy seasons. Numerous small streams occur in the narrow valleys.

External measurements were taken from the specimen to the nearest 0.1 mm using digital calipers. The body mass of the live individual was recorded to the nearest 0.1 gram. The skull was subsequently extracted, prepared, and measured. Cranial and dental measurements were taken to the nearest 0.01 mm by the first author using digital calipers.

Chromosomal preparations were made from tail and lung tissue cultures following the methods of Harada and Yosida (1978). Differential staining using the G-band and C-band techniques was applied following Seabright (1971) and Sumner (1972), respectively.

Results and discussion

Morphology

The specimen (IBHG 08295) completely agrees with the diagnosis of *M. harrisoni* and its external and craniodental nonmetric characters are essentially concordant with the description of that holotype. Most external and craniodental measurements are also similar to those for the holotype as given below. Therefore, we identified the specimen (IBHG 08295) as *M. harrisoni*.

This is a medium-sized tube-nosed bat with a forearm length of 36.0 mm. Pelage color almost agrees with the description of Csorba and Bates (2005): uniform reddish-brown, dark dorsal fur (even darker at terminal points), and white throughout the length of the ventral surface (Fig. 1). Ear length is 15.7 mm and the ear conch is

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Fig. 1. External features (left) and skull (right) of *Murina harrisoni* from Hainan Island, China (IBHG 08295). Bar on the skull photo indicates approximately 5 mm.

without an emargination on the posterior border. The tragus is bent slightly backward. The tail membrane and the back of the foot are evenly furred above, and the last vertebra is free from the uropatagium. The plagioptagium is attached to the base of the first toe.

External measurements are as follows (values for holotype by Csorba and Bates [2005] in parentheses): weight 5.1 g; head and body length, from the tip of the snout to the base of the tail, dorsally 51.1 mm; tail length, from the tip of the tail to its base adjacent to the anus 40.7 mm; foot length, from the extremity of the heel behind the *oscalcis* to the extremity of the longest digit, not including the claws 9.2 mm; ear length, from the lower border of the external auditory meatus to the tip of the pinna 15.7 (14) mm; forearm length, from the extremity of the elbow to the extremity of the carpus with the wings folded 36.0 (35.9) mm.

The skull (Fig. 1) has a condylo-basal length of 16.64 mm, which is comparable to the value of 16.73 mm for

the holotype. Sagittal and lambdoid crests are distinct. Narial emargination is narrow, with the length considerably exceeding the width. The length of the palatal emargination also slightly exceeds the width. The anterior part of the rostrum is bulbous to accommodate the large canines. The first upper incisor (I^2) is rather slender and bifid with a secondary, very short, cusp. The principal cusp of the robust second incisor (I^3) is relatively short, only slightly exceeding half the height of I^2 . I^3 is situated adjacent to I^2 , such that I^2 is essentially obscured by I^3 when viewed laterally. The crown area of P^2 is subequal in size with that of P^3 .

Craniodental measurements (in mm) are as follows (values for the holotype are in parentheses): greatest anteroposterior length of the skull, taken from the most projecting point at each extremity 18.29 (18.39); condylo-basal length, from the exoccipital condyle to the alveolus of the anterior incisor 16.64 (16.73); condylo-canine length, from the exoccipital condyle to the alveolus of the anterior canine 16.15; zygomatic breadth, the greatest width of the skull across the zygomatic arches 10.79 (11.33); breadth of braincase at the posterior roots of the zygomatic arches 9.11 (9.61); postorbital constriction 4.44 (4.51); maxillary tooth row length, from the alveolus of the upper canine to the back of the crown of the third upper molar 6.3 (6.49); upper canine-premolar length, from the front of the upper canine to the back of the crown of the posterior premolar 3.16 (3.37); mandibular tooth row length, from the alveolus of the lower canine to the back of the crown of the third lower molar 7.06 (7.15); lower canine-premolar length, from the front of the lower canine to the back of the crown of the posterior premolar 3.15 (3.19); upper canine width, taken across the outer borders of the upper canines 4.88 (5.2); palatal width, taken across the outer borders of the third upper molar, at the widest part 6.27 (6.37); mandible length, from the most posterior part of the condyle to the most anterior part of the mandible 13.01 (13.03); height of the coronoid process, taken perpendicularly from the extremity of the coronoid process to the indentation of the ramus mandibulae 5.15 (5.21).

Ecological notes

The specimen was caught in a harp trap set across a small stream. The study site was located in the core zone of the Jianfengling National Forest Park in an area of essentially undisturbed tropical rain forest. Light rain was falling on the night of capture. Two specimens of *Rhinolophus affinis* were also caught in another harp trap

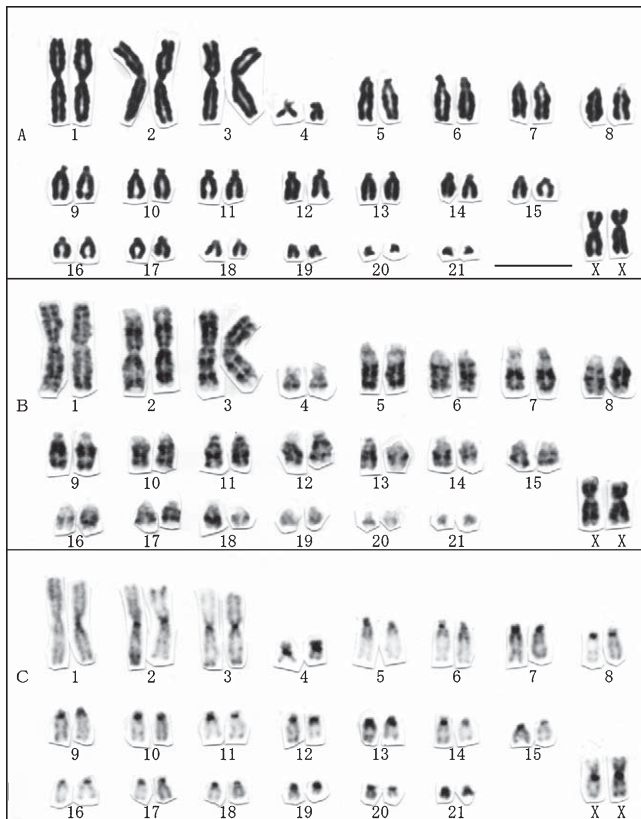


Fig. 2. Conventional staining (A), G-banded (B), and C-banded (C) karyotypes of *Murina harrisoni* from Hainan Island, China (IBHG 08295).

at this site on the same night. The holotype was collected in a mist net across a river in a disturbed semievergreen gallery forest with many immature trees (Csorba and Bates 2005).

Karyotype

The karyotype of *Murina harrisoni* is $2n = 44$ and $FN = 50$, with three large metacentric, one small submetacentric, and 17 medium to small pairs of acrocentric chromosomes of gradually decreasing size (Fig. 2). Y chromosome could not be determined because the specimen was female. Based on the comparative karyotypes reported by McBee et al. (1986) and Lin et al. (2002) for the subfamily Murininae, the X chromosome pair could be identified as medium-sized metacentric element.

For the subfamily Murininae, karyotypes were reported for *M. puta* from Taiwan ($2n = 44$, $FN = 50$; Lin et al. 2002), *M. leucogater* from Guizhou, China ($2n = 44$, $FN = 58$; Gu 2006), *Harpiocephalus mordax* from Thailand ($2n = 40$, $FN = 58$; McBee et al. 1986), and *H.*

harpia from Taiwan ($2n = 44$, $FN = 52$; Lin et al. 2006). The karyotype of *M. harrisoni* reported herein resembles the conventional karyotype of *M. puta* from Taiwan, while differences in $2n$ and FN exist compared to the other Murininae species. However, karyological homology with *M. puta* should be confirmed with G-banded and C-banded karyotypes that have not yet been examined in *M. puta*. Further karyological comparisons with more species are also necessary to clarify the chromosome evolution of the subfamily Murininae.

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