

## A TARSIER CAPTURE IN UPPER MONTANE FOREST ON BORNEO

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### ABSTRACT

In November of 1998, we captured a tarsier above 1200 m elevation in West Kalimantan, Indonesia. This capture is the highest recorded elevation for a Western tarsier and is furthermore unusual in that the Bornean tarsier (*Tarsius bancanus*) is generally described as a lowland species. In this paper, we briefly summarize the geographic distributions and habitat associations of the seven recognized species of tarsiers, report on our high elevation capture, and discuss the implications of our finding.

**Keywords:** *Tarsius bancanus*, *T. syrichta*, *T. tarsier*, *T. spectrum*, biogeography, habitat, elevational distribution.

### INTRODUCTION

The recognized species of *Tarsius* are restricted to Southeast Asia. *T. tarsier* group (or Eastern tarsiers), comprising *T. tarsier* (= *T. spectrum*, see Groves *et al.* this volume), *T. pumilus*, *T. dentatus*, *T. pelengensis*, *T. sangirensis*, *T. lariang*, and *T. sp* is endemic to Sulawesi and nearby small islands (Groves 2001; Shekelle this volume). *Tarsius tarsier* shows great geographic variation in cranial morphology (Groves 1998) and vocalization (MacKinnon & MacKinnon 1980; Shekelle *et al.* 1997), and is likely a complex of several species. Brandon-Jones *et al.* (2004) identified *T. tarsier* as a senior subjective synonym of *T. spectrum*, and accepted Makassar (Ujung Pandang) in the southwestern peninsula as the type locality. It can be inferred from Groves (1998) that the tarsier in the northern peninsula of Sulawesi, which has been the focus of most behavioral and ecological research on Eastern tarsiers (e.g., Gursky 1998; MacKinnon & MacKinnon 1980), is an unnamed species. *Tarsius bancanus*, the Western tarsier, is found on Borneo, Sumatra and some of the interlying islands (e.g., Banka, Belitung and Serasan). *Tarsius syrichta* is restricted to the Philippine islands of Mindanao, Bohol, Samar, and Leyte (Groves 2001).

The Philippine and Western tarsiers, *T. syrichta* and *T. bancanus*, are generally described as lowland species (e.g., Musser & Dagosto 1997; Sussman 1999) but range into lower montane forest as well. Shekelle (personal communication) noted that

two Philippine specimens in the Field Museum of Natural History (FMNH56159 and FMNH67744) from the island of Mindanao (Davao City, Mt. McKinley, east slope, and Zamboanga, Sigayan, Katipunan, respectively) include provenience data stating that they were collected at 2500 ft (758 m). *Tarsius bancanus* is found in a variety of forest types including secondary growth (Le Gros Clark 1924; Niemitz 1979). Payne and Francis (1998) describe the range of this species as extending “above 900 m in the Kelabit Uplands of northern Sarawak”, in addition to lowlands of other regions of Borneo. Their upland reference probably corresponds to a single specimen in the Sarawak Museum that is identified as *T. bancanus* and whose associated information (Kool & Nawi 1995) includes only a collection date and a locality (12 August 1949, Bario Kelabit). The elevation at Bario is approximately 1100 m; thus, this record may represent the highest and the only previous montane record for this species. *Tarsius syrichta* is found in many habitats including early-mid successional forest, late successional secondary forest, agroforestry systems, primary lowland forest, and montane forest from 50 to 800 m (Dagosto & Gebo 1997; Neri-Arbodela *et al.* 2002; Rickart *et al.* 1993).

Eastern, or Sulawesian, tarsiers fall into two broad ecological groups—one that occupies a diversity of habitats from lowland forests and agroecosystems to lower montane forest, and another restricted to mountain tops. The members of the *T. tarsier* complex have been reported from all major

forest formations and some types of cultivated vegetation from sea level to 1500 m (MacKinnon & MacKinnon 1980) and are represented by museum specimens from this range of elevations (Musser & Dagosto 1987). *Tarsius dentatus* has been captured at sea level (Shekelle *et al.* 1997) and from 650 to 1100 m, and detected audibly from 500 to 1200 m (S. Merker, pers com), indicating an elevational distribution similar to that of the *T. tarsier* complex (although studies focusing on montane areas may show that it occurs higher as well).

The pygmy tarsier, *T. pumilus*, alone is restricted to high elevation mossy forest; the species is known from only three specimens, one from 1800 m and two from 2200 m, taken in the central region of Sulawesi (Musser & Dagosto 1987; Maryanto & Yani 2004). No overlap has been reported in the altitudinal distribution of *T. pumilus* and other Eastern tarsiers.

### Findings

During a survey of small mammal diversity in 1998, we captured a tarsier above 1200 m elevation in Bukit Baka-Bukit Raya National Park (BBNP) in West Kalimantan, Indonesia. To our knowledge, this represents the highest capture of a tarsier on the island of Borneo reported to date.

BBNP lies in the Schwaner Range, part of the axial chain of mountains that bisects Borneo. The park spans the border between West and Central Kalimantan, lying approximately between 112°15'-113°E and 0°1'-0°29'S (Jarvie *et al.* 1998). Bukit Baka (1600 m) and Bukit Raya (2278 m) are the two tallest mountains in Kalimantan, the Indonesian part of Borneo, and occur within the boundaries of BBNP.

Our survey of small terrestrial mammals and bats was conducted on the northern slopes of Bukit Baka in an area known locally as Gunung Lubang Tedung. We accessed the region by foot from the village of Nanga Juoi, which lies within the park and to the north of Lubang Tedung. Terrestrial mammals were trapped and bats were mist-netted in each major forest formation from lowland forest at 350 m to mossy forest at 1550 m, the peak of Lubang Tedung.

The KKP logging concession borders BBNP to the north and west of Bukit Baka. Thus, lowland

forest surrounding the park is heavily disturbed or has been converted to agriculture. Lowland forest at the foot of Gunung Lubang Tedung is utilized by local Dayak people, who occasionally harvest fruits, firewood, pig, and deer in the area. However, the lower slopes of Bukit Baka in the region of Lubang Tedung have not been deforested, and support a large zone (from approximately 350 to 700 m) of healthy, intact lowland and hill dipterocarp forest dominated by canopy trees in the genus *Shorea*. At about 700 m, the forest undergoes a transition from lowland dipterocarp forest to montane forest dominated by Fagaceae and patchy stands of *Agathis*. The mossy forests of the highest elevations (occurring above ~1500 m on Lubang Tedung) are dominated by Ericaceae and support high elevation specialists such as *Nepenthes* and podocarps in the genera *Dacrydium* and *Phyllocladus* (Jarvie *et al.* 1998).

On 23 November 1998, during the portion of our survey conducted in upper montane forest (Figure 1), we captured a tarsier in a mist net (Figure 2). The elevation of the capture site was between 1200 and 1250 m, a short walk (300 m) downslope of our camp at 1300 m. The net was set on a mossy ridge in low canopy forest 15-20 m in height. The bottom of the net hung approximately 1.5 m from the ground, and the animal was removed from the net at a height of 2.5-3.0 m. We photographed it at our camp and released it at the capture site.

Other small mammals captured in the upper montane habitat of Lubang Tedung include the murid rats *Leopoldamys sabanus*, *Maxomys whiteheadi*, and *M. surifer*, the shrew *Crocidura monticola*, and the montane squirrel *Dremomys everetti* and bat *Aethelops alecto*. As on several other mountains in West Kalimantan, fewer montane endemics are present than on mountains of northern Borneo. In addition, the ecological ranges of several species that in the north are generally considered to be lowland species extend well into the uplands in southwestern Borneo, demonstrating a regional lack of altitudinal zonation in most species (Gorog 2003).



**Figure 1.** Montane forest in BBNP near the capture site of a montane tarsier.

**Figure 2:** Western Tarsiers. (clockwise from upper left) montane tarsier from BBNP, montane tarsier from BBNP, *T. bancanus borneanus* from Sebangau (Central Kalimantan), captive *T. b. bancanus* from Taman Safari, captive *T. b. bancanus* from Taman Safari, montane tarsier from BBNP. Although the photos of the montane tarsier are slightly blurry, the tail tuft from the montane tarsier in this report appears to have fur that is shorter, sparser, and extends further along the tail than is seen in other Western Tarsiers. Appearance of the tail tuft is a key identifying feature in tarsier taxonomy, and is functionally related to leaping performance among other things. (Note: the color of the fur of captive tarsiers fades to shades that are not seen in wild animals).



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### Implications

Bornean mammals can be grouped into those that vary regionally (e.g., the subspecies of the treeshrews *Tupaia minor*, *T. picta*, and *T. glis* and of the tri-colored squirrel *Callosciurus prevostii* and white-fronted langur *Presbytis frontata*) or altitudinally (e.g., *Maxomys* spp. and *Sundamys* spp.), and those that show little variation across the island (e.g., the macaques *Macaca fascicularis* and *M. nemestrina*, the rusa *Cervus unicolor*, and the sunbear *Helarctos malayanus*) (Medway 1977). Current taxonomy and distributional data suggest that Bornean *T. bancanus* falls into this latter category; as of yet, only one morphological subspecies of the Western tarsier (*T. bancanus borneanus*) is recognized on Borneo (Groves 2001). In their 1987 paper on the identity of *T. pumilus*, Musser & Dagosto examined distinguishing characteristics of the tarsier species and provided the last comprehensive review of tarsier morphology. Despite their broad sampling of Bornean specimens, which included specimens from Sabah, Sarawak, and West Kalimantan, the authors' goal was not to evaluate variation in Bornean *T. bancanus*, and their study did not address the possibility of multiple differentiated forms on this island.

This new record at Bukit Baka suggests a greater morphological diversity in tarsiers on Borneo than is currently recognized. Sharp differences in tail morphology of the Eastern, Western, and Philippine tarsier species provide useful diagnostic characters for identifying species (summarized in Musser & Dagosto 1987; Shekelle 2003). The tail of the Philippine species is covered by relatively sparse, short hairs. The tails of the Sulawesi species are the most heavily haired, with the terminal tuft covering one third to almost one half of the tail. The Western tarsier possesses a more distinct tuft of long hairs confined to the distal third of the tail. The tail of the tarsier we captured at Bukit Baka was scruffier and more hirsute than that of a typical Western tarsier, but less hirsute than the tails of Eastern, or Sulawesi, tarsiers. In combination with its brownish coloration, which is generally greyer in the Bornean *T. bancanus*, the Bukit Baka individual does not look like a typical Western tarsier (C. Groves & M. Shekelle, pers com).

The high elevation tarsier we captured may represent a differentiated morph of *T. bancanus* and an altitudinal extension of the habitats thought to be occupied by this species. Alternatively, the individual captured at Bukit Baka may represent a new tarsier form. This is an interesting possibility given the existence of a distinct montane species, *T. pumilus*, on Sulawesi, but remains to be tested with specimens or genetic materials, neither of which could be collected from this animal.

High elevation regions of Kalimantan represent an increasing proportion of remaining natural habitat on Borneo, as lowland forest is rapidly reduced by large-scale logging operations (Curran *et al.* 1999). Many mammal species endemic to montane habitat have been recorded in northern (Malaysian) Borneo (Medway 1977), and new species have been described recently (e.g., Emmons 1993) from the relatively well-studied north. In contrast, few high elevation surveys have been conducted in Kalimantan, and the fauna of Indonesian Borneo is almost certainly richer than is currently thought. We hope with this report to inspire additional survey work and research in montane areas of Kalimantan.

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