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THE NARROW-WINGED PIPISTRELLE, *PIPISTRELLUS STENOPTERUS* (DOBSON) IN SINGAPORE (MAMMALIA: CHIROPTERA: VESPERTILIONIDAE)

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INTRODUCTION

The narrow-winged pipistrelle or Malaysian noctule, *Pipistrellus stenopterus*, was first described by Dobson (1875: 470, as *Vesperugo stenopterus*) from specimens obtained in Sarawak, East Malaysia. An excellent illustration of a male specimen (ventral view with left wing outstretched) was subsequently depicted in Dobson (1878: Pl. 13–1; see Fig. 1, reproduced below). The species had also been placed in the genus *Nyctalus*, but confirmed to be a *Pipistrellus* from the morphology of its baculum (Hill & Harrison, 1987). Corbet & Hill (1992) considered it to be a member of the *Pipistrellus* subgenus *Hypsugo*, but Volleth & Heller (1994) transferred it to the nominate subgenus *Pipistrellus*, based on karyological analysis. The distribution of *Pipistrellus stenopterus* appears to be confined to Sundaland. It has been reported from the Malay Peninsula, Sumatra (including the Riau Islands), Borneo, and the Philippine island of Mindanao (Simmons, 2005: 478; Kingston et al., 2006: 126; Francis, 2008: 240).

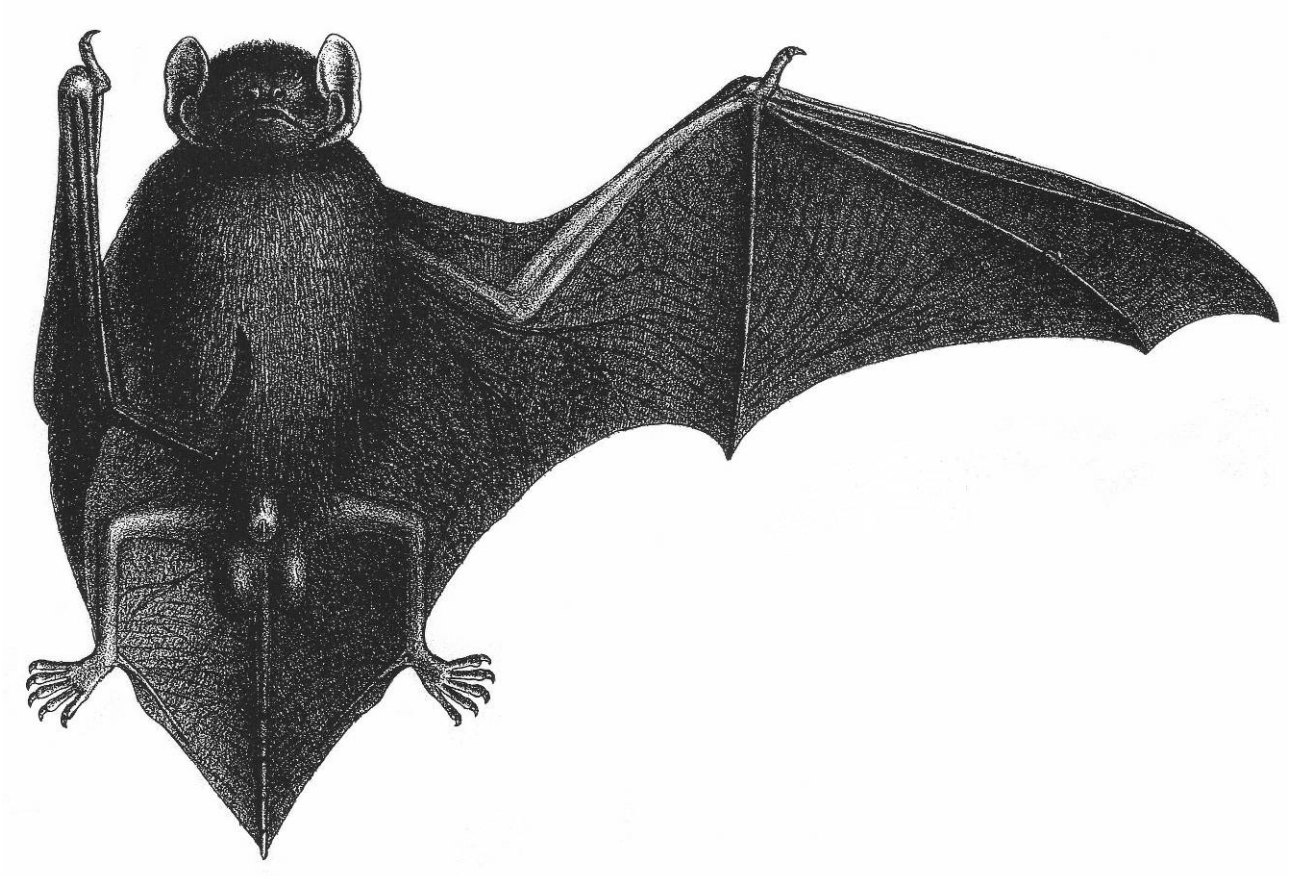

Fig. 1. Early illustration of an adult male *Pipistrellus stenopterus* (reproduced from Dobson, 1878: Pl. 13–1, as *Vesperugo stenopterus*). Drawing depicts ventral view with outstretched left wing to appreciate relative proportions of fingers.

According to various authors, including Harrison (1974: 131, as *Nyctalus stenopterus*), Medway (1983: 39), Payne et al. (1985: 208), Kingston et al. (2006: 125), and Francis (2008: 239), the following combination of characteristics serves to distinguish this bat from related species in Southeast Asia: (i) body with short fur, dark chocolate-brown to reddish-brown; (ii) wing membranes and ears blackish; (iii) forehead sloping and slightly domed in profile; (iv) muzzle broad and fairly heavy; (v) upper jaw with two pairs of incisor teeth, anterior premolar well-developed, displaced inwards and as large as outer incisor; (vi) ears broadly rounded, tragus broad, hatchet-shaped, strongly angled forward; (vii) wing narrow, metacarpal of fifth finger shorter than metacarpal of fourth finger; (viii) fore-arm length of adults from 37–42 mm.

In Jan.2010, a small, dark-brown bat conforming to the above diagnosis was encountered at the Bukit Timah Nature Reserve. Hence, this recent record of the narrow-winged pipistrelle provided the impetus for a detailed compilation of historical records for the species in Singapore, since a local specimen was last obtained 23 years ago.

PAST AND PRESENT RECORDS

Verified records of this bat in Singapore were retrieved from available literature and/or voucher specimens housed within the Zoological Reference Collection (ZRC) of the Raffles Museum of Biodiversity Research (RMBR), National University of Singapore. They are presented here in chronological order:

One adult female (ZRC.4.7359, fore-arm: 40.9 mm) obtained from the Singapore Botanic Gardens in 1912, appears to be the earliest record of *Pipistrellus stenopterus* in Singapore. The species was listed by Chasen (1925: 85, as *Nyctalus stenopterus*) in his summary of Singapore's mammalian fauna.

Prior to 1957, 15 adult females and a hairless pup were collected from their roost in a hollow dead tree stump in a garden at an undisclosed location (Hendrickson, 1957: 121, as *Nyctalus stenopterus*). All the specimens were euthanised and dissected. Of these, nine were found to be pregnant, one was the mother of the pup, while the remaining five had no embryos within. Hendrickson noted an apparent correlation between the coat colour of the adult females and the state of their pregnancy. All the non-pregnant bats and those in the early stages of pregnancy had dark chocolate fur. All, but one, of the bats in advanced stages of pregnancy and the sole nursing mother had reddish, or "chestnut" pelage. The bats are presumed to have been preserved, but there were no indications as to where the respective specimens were deposited.

Harrison (1974: 131) cited the Botanic Gardens as the Singapore locality for "*Nyctalus stenopterus*", apparently based on the 1912 specimen.

Two specimens at the ZRC: an adult male (ZRC.4.8165, fore-arm: 39.4 mm) and an adult female (ZRC.4.8164, fore-arm: 39.5 mm) were obtained from Chip Bee Gardens at Holland Village, between Sep. and Nov.1985. Although the specimen labels do not indicate the collector's identity, these bats could have been part of the 12 *Pipistrellus stenopterus* collected by Y. W. Sum, a zoology student at the National University of Singapore for her experiments on prey detection. Her bats were obtained from roosts in a "semi-detached houses in Holland Village and Bukit Timah" (Koh, 1986; Yang et al., 1990: 7). Pottie (1996: 102) mentioned a roost containing *Pipistrellus stenopterus* reported in 1986 at Rochester Park, which is near Holland Village. The source of this information was not stated, but appears to be from the unpublished thesis by Sum (1986). Pottie did not mention Holland Village or Chip Bee Gardens, from where Sum had obtained the specimens.

An adult female (ZRC.4.8149, fore-arm: 39.9 mm) was obtained at Eng Neo Avenue, in the Bukit Timah area, in Oct.1987.

A condensed version of Sum's earlier thesis (Sum, 1986) was subsequently published, with detailed analyses and insightful discussions (Sum & Menne, 1988). It was revealed that a total of 12 bats were "caught in an uninhabited house in Singapore", of which five individuals (three males, two females, weight ca. 13 g each) were subjected to experiments on simulated target (prey) discrimination. The experiments had been conducted between June to October 1986, and the bats were provided with adequate water and food (mealworms—beetle larvae) in captivity. The results of this carefully controlled series of tests revealed that *Pipistrellus stenopterus* are able to discern between the different fluttering frequencies of preferential prey, when the bats emit their frequency modulated (FM) echolocation calls.

The most recent record is an adult male from the Bukit Timah Nature Reserve (Figs. 2–5). It was found on 9 Jan.2010 (ca. 1700 hours), initially sprawled on the ground, near the Visitors' Centre. The bat was already weak, heavily infested with ticks and unable to fly. This individual was eventually preserved in ethanol and catalogued (ZRC.4.8636). Detailed measurements from this specimen were as follows—fore-arm: 40.5 mm, first finger: 6.5 mm, outstretched wing-span: 29 cm, head-body: 62.4 mm, tail: 40.5 mm, tibia: 17.2 mm, penis: 11.6 mm, ear: 13.8 mm, fresh weight: 16 g. The pelage was a uniform dark chocolate-brown, while the wing membranes, ears and facial skin were blackish-brown.

Other morphological features of this specimen that were consistent with the species include its characteristic head profile, muzzle shape, ear shape, relative lengths of metacarpals, as well as dentition. Its external genitalia matched that of the original illustration (Fig. 1) closely, with the descended testicles clearly visible. The scrotal sacs were contiguous with the inter-femoral membrane.

Prior to preservation, most (if not all) of the ectoparasitic ticks were carefully extracted from this bat host. In total, 85 individual ticks were found and removed for preservation. Most of the ticks were already well engorged, with the larger ones having a body diameter of ca. 1 mm (Fig. 5). Upon microscopic examination, these ticks were identified as *Argas pusillus* Kohls, 1950 (family Argasidae - referred to as 'soft ticks', Acari) (Lim Boo Liat, pers. comm., Apr.2010). In Peninsular Malaysia, the same species of ticks has also been recorded from *Pipistrellus stenopterus* as well (Beck, 1971: 150—Table 3, as *Nyctalus stenopterus*).

Fig. 2. Dorso-lateral profile of the adult male (ZRC.4.8636) found at the Bukit Timah Nature Reserve on the afternoon of 9 Jan.2010 (ca. 1700 hours). (Photograph by: Tzi Ming Leong).

Fig. 3. Anterio-dorsal profile of the male bat (ZRC.4.8636). (Photograph by: Tzi Ming Leong).

Fig. 4. Lateral close-up of the bat (ZRC.4.8636) to view shape of ear and associated tragus. Its ear length was 13.8 mm. (Photograph by: Tzi Ming Leong).

Fig. 5. Close-up of right wing of the bat (ZRC.4.8636, head towards right) to show the parasitic ticks (Acari: Argasidae: *Argas pusillus*, identified by B. L. Lim) attached to the arm and wing membrane. There were numerous ticks scattered over its entire body surface. A total of 85 individual ticks were removed from this bat host and preserved. The largest ticks had a diameter of ca. 1 mm. (Photograph by: Tzi Ming Leong).

NATURAL HISTORY AND CONSERVATION STATUS

According to various authors [Hendrickson (1957: 121, as *Nyctalus stenopterus*), Medway (1983: 39), Payne et al. (1985: 208), Kingston et al. (2006: 126), and Francis (2008: 239)], the narrow-winged pipistrelle appears to frequent open areas when in flight. It has been known to roost in: hollow trees in gardens, rubber plantations and forest; as well as in the roofs of houses in rural and urban areas, occasionally sharing the roost with the lesser Asian yellow house bat (*Scotophilus kuhlii*). This bat typically forages in open spaces, and has been collected while feeding over open fields, and even caught in mist nets set over a slow-flowing river. Despite its preference for open spaces, and its ability to roost in artificial structures, the apparent scarcity of the narrow-winged pipistrelle in Singapore probably points towards its elusive nature. It is likely that this bat has often been overlooked, as individual roosts may elude detection especially if they retreat within inconspicuous and inaccessible crevices of our highly urbanised, multi-storied city.

It may be possible to identify *Pipistrellus stenopterus* in flight with a bat detector. Its echolocation call was described in Kingston et al. (2003: 207–209, Fig. 1, Table 1; 2006: 126). Viewed with the naked eye, its flying silhouette should appear slightly smaller than the lesser Asiatic yellow house bat (*Scotophilus kuhlii*), and about twice the size of the diminutive Javan pipistrelle (*Pipistrellus javanicus*).

Previously, Pottie et al. (2005: 240, 246) regarded the local status of *Pipistrellus stenopterus* as indeterminate and 'possibly extinct'. They considered Hendrickson's (1957: 121) record as the last confirmed for Singapore. They also cited an unpublished record (without specimens) from the mid-1980's. Presumably, they were referring to the dissertation by Sum (1986), but unaware of the existence of additional preserved specimens at the RMBR.

The status of *Pipistrellus stenopterus* in Singapore was also regarded as "indeterminate" by Yang et al. (1990: 7) and Baker & Lim (2008: 170). It was listed as 'critically endangered' in Lim (2008: 267). Chan et al. (2009) mentioned that the species had not been seen in Singapore 'since 1986'. During the extensive faunal surveys of the Bukit Timah Nature Reserve and Central Catchment Nature Reserve in the early 1990's, there were no confirmed records for this particular species, but an unidentified species of *Pipistrellus* was highlighted nevertheless (Teo & Rajathurai, 1997).

Although recent roosting colonies of *Pipistrellus stenopterus* have yet to be detected, the latest encounter shows that the species still survives in Singapore. Along with its congener, the Javan pipistrelle (*Pipistrellus javanicus*) (see Chan et al., 2009), it may now be safely removed from either "indeterminate" or "extinct" status categories. The present close encounter with this narrow-winged pipistrelle represents yet another step forward in our objectives to better understand Singapore's bat diversity and ecology better, in tune with recent faunal surveys which have brought rare species and new records to light (Vaughan, 2010).

COMPARATIVE MATERIAL

Additional specimens of *Pipistrellus stenopterus* from neighbouring localities beyond Singapore were also referred to. These include: ZRC.4.7345–7358 (14 specimens: six males, eight females) Peninsular Malaysia: Negri Sembilan; Port Dickson, coll. E. Seimund, 10 Dec.1937 (dissected skulls of ZRC.4.7345–7355, 7358 examined); ZRC.4.7371–7376 (six specimens: one male, four females, one pup) Malaysian Borneo: Sabah; Kiau, coll. Apr.1929; ZRC.4.7343, 7344, 7360–7370 (13 specimens: two males, nine females, two pups) Indonesia: Sumatra; Riau Archipelago, Pulau Gallang, coll. 12 Jan.1926 (dissected skulls of ZRC.4.7343, 7344 examined). The skull and mandible of ZRC.4.7343 (field no. 6967, adult female, fore-arm: 41 mm; skull length: 17.6 mm, height: 11.0 mm, width: 12.1 mm) was measured and photographed to appreciate its size, shape and dentition (Fig. 6).

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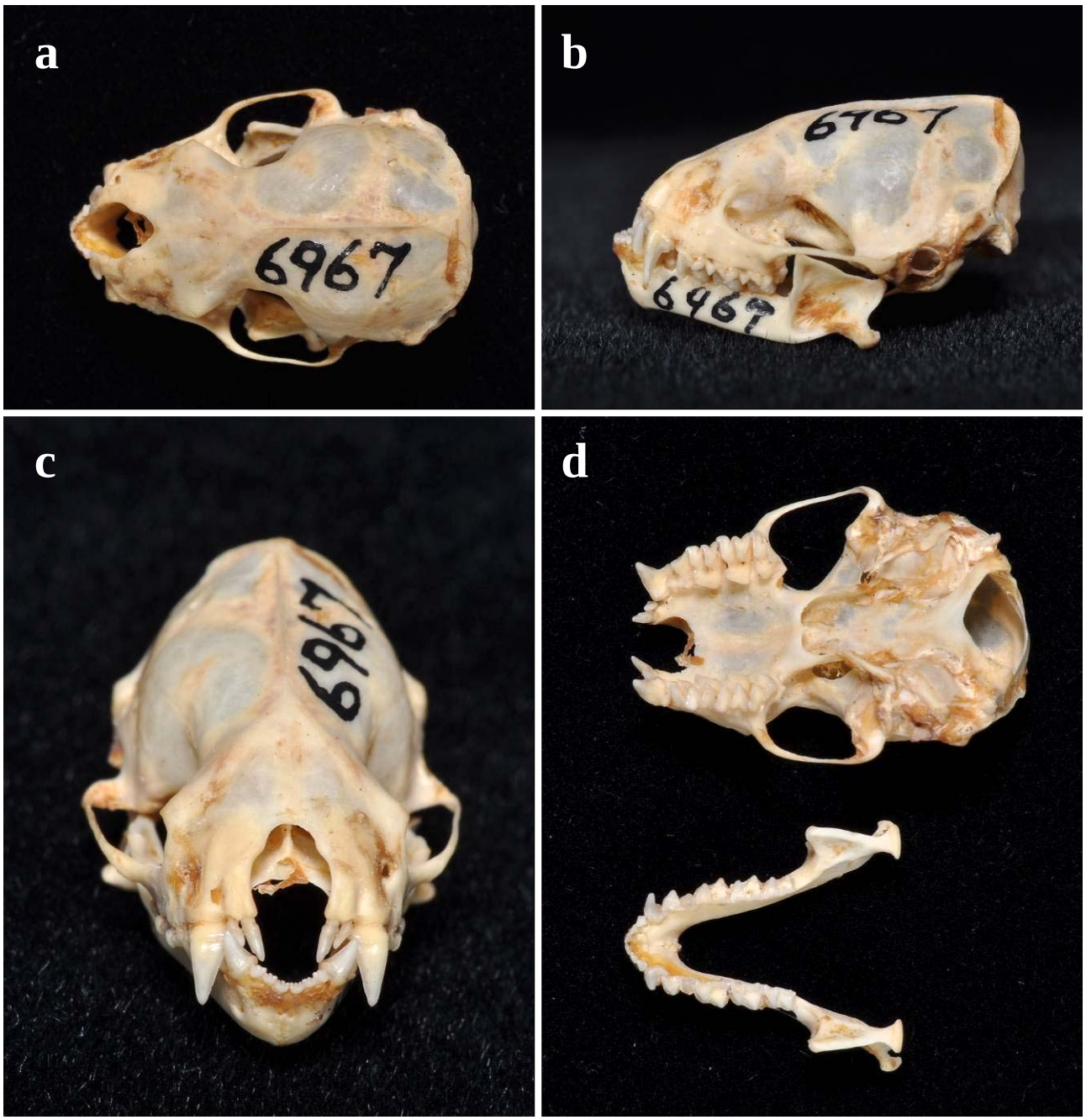

Fig. 6. Dorsal (a), lateral (b), frontal (c), and occlusal (d) views of the skull and mandible of a female *Pipistrellus stenopterus* (ZRC.4.7343, field no. 6967, coll. 12 Jan.1926; fore-arm: 41 mm; skull length: 17.6 mm, height: 11.0 mm, width: 12.1 mm) from Pulau Gallang (Riau Archipelago, Indonesia). (Photographs by: Tzi Ming Leong).