Round-eared tube-nosed bat (Murina cyclotis) from Southwest Sri Lanka

Vesper bats (Family Vespertilionidae) are the most diverse bat family in Sri Lanka, represented by 12 species (Yapa & Ratnavira 2013, Yapa 2017, Edirisinghe et al. 2018, Kotagama & Goonatilake 2019). The round-eared tube-nosed bat, *Murina cyclotis* is one of the rarest vespertilionid bats (Yapa 2017). The species is distributed in South and Southeast Asia (Corbet & Hill 1992, Bates & Harrison 1997), and it belongs to a cryptic species complex (Francis et al. 2010, Soisook et al. 2013). The distribution range of *M. cyclotis* is patchy and in Sri Lanka it is known only from a few localities (Phillips 1932, 1935, 1980, Bates & Harrison 1997, Menon 2003, Francis 2008). Given its widespread range, it is listed as Least Concern in the International Union for the Conservation of Nature (IUCN) Red List, whereas the National Conservation Assessments of Sri Lanka listed *M. cyclotis* as Near Threatened (NT) (IUCN-MOE 2012). Here, we provide a new site record for this species from southwestern Sri Lanka.

The range extension is from the vicinity of an ancient Buddhist monastery, Bambaragala Aranya Senasanaya (6.512750° N, 80.748667° E, alt. ~150 m a.s.l.) in Pallebedda, Ratnapura District, Sabaragamuwa Province, Sri Lanka (Fig. 1). The locality is in the lowland intermediate bio-climatic zone (annual mean rainfall is 1500–2000 mm and temperature is 27.8–29.6 °C). Visual encounter surveys were carried out for a period of six days (25–30 July 2016) in dry-mixed evergreen forests in the monastery grounds involving four trained field biologists, during both the day (08:00–14:00 h) and night (18:00–21:30 h). Microbats encountered at the site were captured using hand nets (net depth: 45 cm, net diameter: 30 cm, mesh size: 1.5 × 1.5 mm). For all bats captured, standard length measurements (following Srinivasulu et al. 2010) were taken using digital vernier callipers (Type RD 10) in the field. Morphological characteristics and body coloration were also documented. The captured bats were identified to the species level based on Phillips (1935), Corbet & Hill (1992), Bates & Harrison (1997), and Srinivasulu et al. (2010) prior to releasing. Air temperature and relative humidity were measured using a multi-digital hygrometer (TA-138, China), and wind speed using a digital anemometer (MS-6252-A, China). A Garmin Etrex handheld GPS receiver was used to georeference the roosting sites.

![Figure 1. Distribution of Murina cyclotis in Sri Lanka. Historical locations are based on Phillips (1935), Bates & Harrison (1997), Yapa & Ratnavira (2013), Yapa (2017); Map © A.A.T. Amarasinghe](image)

Two specimens of *M. cyclotis* (male and female) were captured at 10:19 h on 27 July 2016, while they were roosting on the underside of a large, dry leaf of narrow woolly-stipuled lotus croton, *Macaranga peltata* (Family Erythroxylaceae). This roosting site (1.8 m in height) had about 45–60% canopy cover. During the time of observation, the wind speed was 0.72–1.44 km/h (average 1.68 km/h), ambient temperature was 26.8–28.2 °C (average 26.7 °C), and humidity ranged between 69–76% (average 69.5%). The bats remained in this roosting site during the daylight and emerged to forage in the evening (18:45 h). These individuals flew very slowly along a walking
trail about one meter above the ground. They had golden fur coloration throughout the body (Fig. 2). The morphometric variables and morphological characteristics are provided in Tables 1 and 2. In addition to M. cyclotis, Rhinolophus rouxii, Hipposideros speoris, Megaderma spasma, Kerivoula picta and Cynopterus sphinx were also observed foraging along the same footpath. Our observations of M. cyclotis are in agreement with the current knowledge of its autecology. In South Asia, this species is considered a forest dweller and roosts among leaves of cardamom plantations nested in forested landscapes as well as in caves in small colonies (Molur et al. 2002, Yapa 2017). Its low-flying behaviour while foraging has also been recorded elsewhere (Bates & Harrison, 1997, Aul et al. 2014). Both the habitat and the regional landscape in the study area can be described as predominantly forested lands (Fig. 3), which matches the previous observations in Southeast Asia and mainland South Asia where M. cyclotis occurred in less-disturbed lowland forests and lower montane forests (Phillips 1932, 1935, Nowak 1991, Rickart et al. 1991, Ruedas et al. 1994, Yapa & Ratnavira 2013).

However, this species had previously been recorded in Sri Lanka only from Gammaduwa, Mousakanda, Kandy, and Matala (Phillips 1935); Medamahanuwa (Bates & Harrison 1997); Kurenegala (Yapa & Ratnavira 2013); and Wasgamuwa (Yapa 2017). Most of the historical records (before 1970) were reported in and around the central highlands of Sri Lanka. Thus, our observation is the first record for this species from the lowland forests of the intermediate bioclimatic zone of Ratnapura District in the south of the island. Based on our observations and earlier records (Bates & Harrison 1997, Phillips 1935, Soisook et al. 2013), M. cyclotis is likely a species restricted to forested areas, including secondary forests.

Table 1. Morphometric variables recorded from Murina cyclotis specimens from the Bambaragala Aranya Senasanaya, Sri Lanka, and comparisons with Phillips (1935) and Bates & Harrison (1997); measurements in mm; — not measured.

| Measurement                  | This study               | Phillips (1935)   | Bates & Harrison (1997) |
|------------------------------|--------------------------|-------------------|-------------------------|
|                              | Male (n=1) Female (n=1) | Male (n=10) Female (n=2) | Males and Females (n=unknown) |
| Head and Body length         | 41.1 44.2               | 46.0–48.0 48.5     | 38.0–50.0               |
| Ear length                   | 14.5 13.6               | 14.0–15.0 13.7–15.5 | 13.0–16.0               |
| Ear width                    | 9.1 8.4                 | —                  | —                       |
| Tragus length                | 7.7 6.1                 | —                  | —                       |
| Tragus width                 | 2.1 1.6                 | —                  | —                       |
| Forearm length               | 31.9 32.0               | 30.6–31.0 32.5–33.0 | 29.7–34.5               |
| Thumb +1st claw length       | 6.8 8.3                 | —                  | —                       |
| 2nd metacarpal               | 27.2 27.7               | —                  | —                       |
| 3rd metacarpal               | 30.2 30.3               | —                  | —                       |
| 4th metacarpal               | 29.3 28.6               | —                  | 27.1–31.5               |
| 5th metacarpal               | 29.7 29.7               | —                  | 27.6–32.0               |
| 1ph 3mt length               | 13.5 14.4               | —                  | —                       |
| 2ph 3mt length               | 16.5 18.3               | —                  | —                       |
| 1ph 4mt length               | 10.1 10.5               | —                  | —                       |
| 2ph 4mt length               | 9.9 10.3                | —                  | —                       |
| 1ph 5mt length               | 9.9 10.1                | —                  | —                       |
| 2ph 5mt length               | 9.4 10.2                | —                  | —                       |
| Wingspan length              | 220.0 220.0             | 229.0             | —                       |
| Penis length                 | 3.4                     | —                  | —                       |
| Penis width                  | 1.5                     | —                  | —                       |
| Testicle length              | 1.8                     | —                  | —                       |
| Testicle width               | 1.7                     | —                  | —                       |
| Tibia length                 | 17.4 17.6               | —                  | —                       |
| Calcar length                | 12.5 19.0               | —                  | —                       |
| Hind foot length             | 7.3 9.1                 | 6.8–8.0 8.0–9.0    | 7.0–10.0                |
| Tail length                  | 29.0 32.5               | 33.2–34.0 34.0     | 32.0–41.0               |
Figure 2. Unique characters of *Murina cyclotis* specimen (a male) recorded from Bambaragala, Sri Lanka: (A) facial structure, (B) throat area [see the fur colour], (C) external ear lobe and tragus; (D) ventral and (E) dorsal aspects of the semitransparent interfemoral (tail) membrane, (F) short light brown hairs around penis and the scrotum, (G) ventral aspect of the wing membrane (patagium); (H) ventral and (I) dorsal aspects of the body including the proximal parts of the patagium, (J) ventral aspect of the expanded wings; and (K) a different individual (a female) at the roosting site, on a *Macaranga peltata* tree (Family Euphorbiaceae).
Table 2. Detailed morphological features of *Murina cyclotis* recorded from the Bambaragala Aranya Senasanaya area, Sri Lanka.

| Morphological character         | Male                                      | Female                                        |
|---------------------------------|-------------------------------------------|-----------------------------------------------|
| Nose shape                      | tubular nostrils                          |                                               |
| Head                            | muzzle relatively long, blunt but rather narrow; eyes rounded and small |                                               |
| Ears                            | relatively large and rounded; orange gold colour with few short hairs at base of ears |                                               |
| Tip of the ear                  | orange gold colour with few short hairs close to the tip |                                               |
| Tragus                          | long, narrow and tapering; narrow at the base, a small notch present at the base |                                               |
| Dorsal area                     | dark orange gold hairs present on the head and body |                                               |
| Ventral area                    | dark orange gold hairs present on nape and chest; abdomen area light orange to creamy yellow colour | not well-developed, covered with light orange to creamy yellow colour |
| Breast (Nipple)                 |                                            |                                               |
| Ante-brachial membrane          |                                            | present                                       |
| Radio-metacarpal pouch           |                                            | absent                                        |
| Wing membrane                   | dark orange gold to yellow with short hairs close to the body |                                               |
| Forearms                        | upper surface with short, sparse dark orange gold with short hairs | dark orange gold with short hairs |
| 1st metacarpal thumb            |                                            | naked                                         |
| 2nd–5th metacarpals             |                                            |                                               |
| 1st–5th phalanx                 |                                            |                                               |
| 1st–5th metacarpals             |                                            |                                               |
| Dorsal surface of tibia         | dark orange gold with short hairs         |                                               |
| Interfemoral membrane (dorsal)  | dark orange gold with short hairs         |                                               |
| Interfemoral membrane (ventral) | orange gold to yellow with short hairs    |                                               |
| Wing attached to                | base of the claw of the outer toe         |                                               |
| Penis (Foreskin)                | light orange gold to yellow with short hairs | —                                             |
| Vagina                          | —                                         | light orange gold to yellow with short hairs |
| Testicles                       | light orange gold to yellow with short hairs | —                                             |
| Anus                            | light orange gold to yellow with short hairs | —                                             |
| Hind feet                       | well-developed and dark orange gold with short hairs | —                                             |
| Calcar                          | well-developed and dark orange gold with short hairs | —                                             |
| Tail                            | enclosed in inter-femoral membrane        |                                               |
The distribution, taxonomy, ecology and the status of most of the chiropterans, especially microbats in Sri Lanka, are poorly known. Recent documentation of new site records and distribution of lesser known species of bats in Sri Lanka highlights the need for more extensive studies to understand the distribution and habitat preference of bats to augment historical records (Ruhsamen et al. 2004, Nanayakkara et al. 2012, Edirisinghe et al. 2013, 2020a–b, Welappulli-Arachchi et al. 2014). Such new studies will play a crucial role in the conservation of these species (Dittus 2017).

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