

A new species of *Philautus* (Anura: Rhacophoridae) from the Eastern Ghats, south-eastern India

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Abstract

A new species of *Philautus* is described from the vicinity of Vishakhapatnam, Andhra Pradesh in south-eastern India. The new species is compared with congeners from peninsular India and Sri Lanka. Since the members of the genus are restricted to wet evergreen forests of the region, remnant patches of wet forests within a now largely degraded and arid Eastern Ghats are apparently refugia, supporting species that are tolerant of mesic conditions.

KEY WORDS: taxonomy, amphibians, *Philautus*, new species, Eastern Ghats, India.

Introduction

The genus *Philautus* Gistel, 1848 shows a disjunction in its distribution, with member species ranging from Sri Lanka and south-western peninsular India, and then, after a gap of over a thousand kilometres, reappearing in north-eastern India, from where they range south (to the Malay Peninsula and Archipelago) and east (to southern China and the Philippines; see Frost, 1985; Inger and Dutta, 1986). No species had been reported from peninsular India outside of the Western Ghats, prior to the reports by Sathyamurthi (1967) and Sarkar et al. (1993), who recorded *P. variabilis* from Golconda Hills, Andhra Pradesh State, south-eastern India. While examining the herpetological

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collections of the United States National Museum and the Zoological Survey of India, eight examples of a *Philautus* were discovered that were collected from the Eastern Ghats, including the material referred to by Sarkar et al. (1993). Prior to their discovery, the south-western Indian *Philautus* fauna was known to contain 22 species, the Sri Lankan fauna seven species, with three species that reportedly co-occur in Sri Lanka and mainland India (Dutta, 1985; Dutta and Manamendra-Arachchi, 1996).

Allocation to the genus is for presence of the following features described as diagnostic by Liem (1970): small body size (SVL < 25 mm), lack of vomerine teeth, fingers free, toes up to half webbed, circummarginal groove present, digital disc present and trapezoidal frontoparietal of the cranium. Dubois (1981) assigned the group to the tribe Philautini, within the family Ranidae (subfamily Rhacophorinae). While there has been no revision of the speciose fauna from south-western India since Ahl (1931), Dring (1987) revised the Bornean *Philautus* species and considered loss of vomerine teeth, reduction or loss of nuptial pads and pigmented ova to be derived characters within the genus.

Materials and methods

Measurements were taken with Mitutoyo™ dial vernier callipers (to the nearest 0.1 mm) from specimens that have been preserved in ethanol. Data on measurements of the paratypes should be used with caution since these were measured over 120 years after collection. The following measurements were taken: snout-vent length, SVL (from tip of snout to vent); tibia length, TBL (distance between surface of knee to surface of heel, with both tibia and tarsus flexed); trunk length, TL (distance between posterior edge of forelimb at its insertion to body to anterior edge of hind limb at its insertion to body); head length, HL (distance between angle of jaws and snout-tip); head width, HW (measured at angle of jaws); head depth, HD (greatest transverse depth of head, taken beyond orbital region); eye diameter, ED (diameter of orbit); eye to tympanum distance, E-T (distance between posterior most point of eyes and anterior most point of tympanum); upper eyelid width, UE (greatest width of upper eyelid); interorbital width IO (least distance between upper eyelids); internarial distance, IN (distance between nostrils); eye to snout-tip distance, E-S (distance between anterior-most point of eyes to tip of snout); eye to nostril distance, E-N (distance between anterior-most point of eyes and nostrils); greatest horizontal diameter of tympanum, HTYD (measured along horizontal plane); greatest vertical diameter of tympanum, VTYD (measured along vertical plane); and diameter of disk on finger III, FIID (width of disk at tip of finger III). X-rays were taken with a Picker unit (Picker X-ray Corporation, Cleveland, USA), operated at 20 kV (2 milliamperes) for 30 seconds, using Kodak Industrex M film.

Institutional abbreviations follow Leviton et al. (1985). Sources of information of distribution of conspecifics with which the new species has been compared are Duellman (1993), and Frost (1985). Comparative material examined are in Appendix I, other nominal species, especially Rao's (1937) new species, which are, with a single exception (*Philautus charius*), known only from the types that are now lost (see Frost, 1985) are from the original description.

Philautus terebrans sp. nov.

Figures 1-4

Holotype. Male, 21.6 mm SVL, USNM 239428 (adult male with enlarged testes and distended median vocal sac), Peddavalasa (17° 47'N; 82° 16'E), ca. 1,000 m altitude, Vishakhapatnam, Andhra Pradesh State, south-eastern India, collected by M. Bruce Beehler, 16 October, 1983.

Paratypes. (See Table 1 for measurements), ZSI 2868-74 (data on sex in Table 1), Golconda Hills (17° 22'N; 78° 26'E), Vishakhapatnam District, Andhra Pradesh State, south-eastern India, collected by R. H. Beddome, 9 July, 1877.

Diagnosis

Philautus terebrans sp. nov. is diagnosable from known congeners in possessing the following characteristics: head wider than long; webbing on toe IV reaches approximately midway between proximal and basal subarticular tubercle as a broad web, base of disk as a narrow sheath; and contour of centrum of vertebrae VIII not cylindrical; size range of type series, 12.8-21.6 mm (SVL).

Description

(Based on holotype.) A small species of *Philautus* (SVL 21.6 mm); habitus relatively robust with a narrow waist (Fig. 1); head long (HL/SVL ratio 0.26), wider than long (HL/HW ratio 0.65), snout flattened (HL/HD ratio 1.63), obtusely pointed, projecting a little beyond mandible, nostrils closer to tip of snout than to orbit (E-N/E-S ratio 0.56), canthus rostralis vertical in transverse section; lores weakly concave. Eye large (ED/HL ratio 0.54), its diameter greater than eye-nostril distance (ED/E-N ratio 1.55), interorbital distance slightly less than twice width of upper eyelid (IO/UE ratio 1.91); internarial region narrow (IN/ED ratio 0.77); supratympanic fold commences from posterior corner of orbit, crossing over tympanum, and dipping down, to cross over insertion of forelimb; tympanum small, flattened, less than orbit in diameter (HTYD/ED)

Table 1. Measurements of holotype and 7 paratypes of *Philautus terebrans* (in mm).

	USNM 239428	ZSI 2868	ZSI 2869	ZSI 2870	ZSI 2871	ZSI 2872	ZSI 2873	ZSI 2874
Sex	male	female	male	female	male	female	female	female
SVL	21.6	16.2	14.8	14.2	15.2	12.8	15.0	14.8
TL	10.0	6.8	6.2	4.9	7.5	5.9	7.4	7.2
HL	5.7	4.6	4.3	4.3	4.9	4.2	4.1	4.7
HW	8.8	5.0	4.5	5.1	5.0	4.6	4.2	4.8
HD	3.5	3.1	3.2	3.1	3.3	3.1	3.3	3.2
ED	3.1	2.1	2.1	2.1	2.3	2.1	1.9	1.9
UE	2.2	1.3	1.1	1.2	0.9	0.7	1.1	1.2
IO	4.2	3.0	2.8	3.1	3.2	2.8	2.5	3.2
IN	2.4	1.8	1.2	1.9	1.7	1.4	1.3	1.9
E-S	3.6	2.2	2.0	2.3	2.0	1.8	2.2	2.3
E-N	2.0	1.4	1.3	1.5	1.7	1.3	1.2	1.7
TBL	9.5	9.1	6.7	8.2	7.2	7.0	7.0	7.9
FIID	1.3	0.6	0.5	0.6	0.6	0.4	0.5	0.5

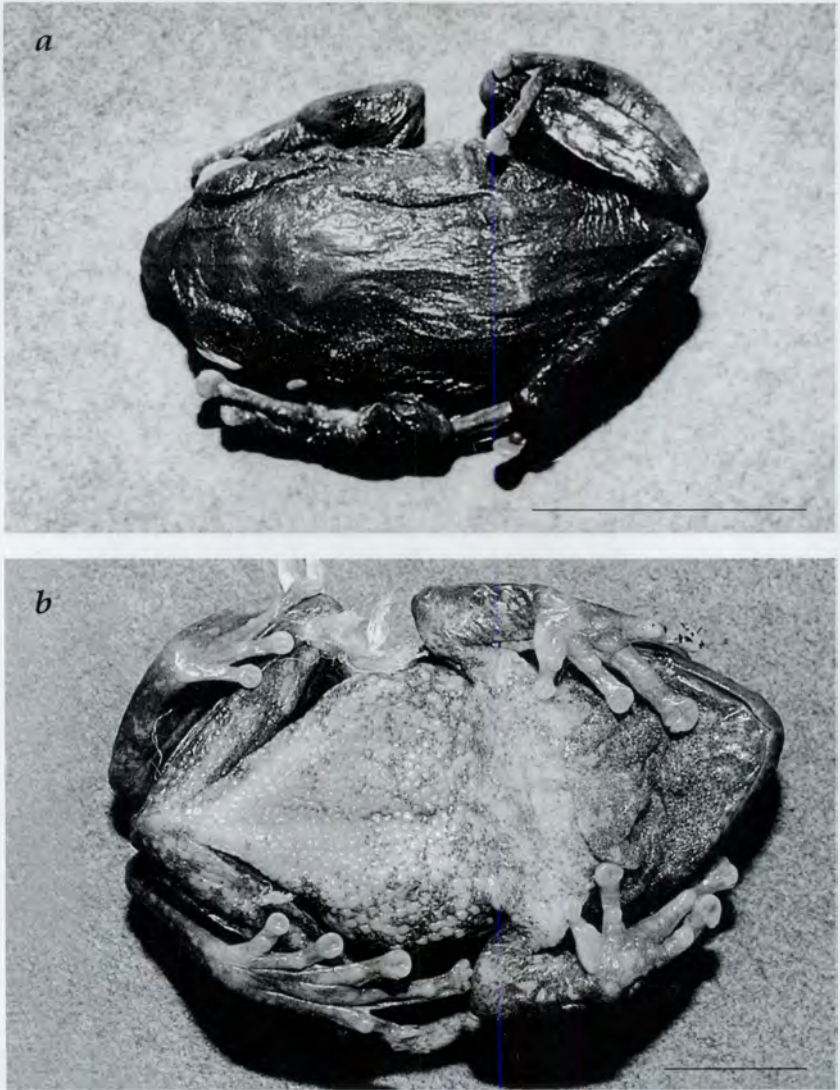


Figure 1. Holotype of *Philautus terebrans* (USNM 239428): (a) dorsal aspect; (b) ventral aspect. Marker = 10 mm.

ratio 0.42), situated postero-ventrally orbit (Fig. 2); its greatest diameter at a horizontal plane (HTYD/VTYD ratio 1.08). Nostrils laterally orientated and oval in shape, their greatest diameters vertically orientated. Vomerine teeth absent; choanae oval, separated from each other by a distance over 2 times width; inferior aspect of snout weakly nicked; inner margin of mandible tip with a slight w-shaped notch. Tongue large (4.8 mm in length), elongate (3.0 mm

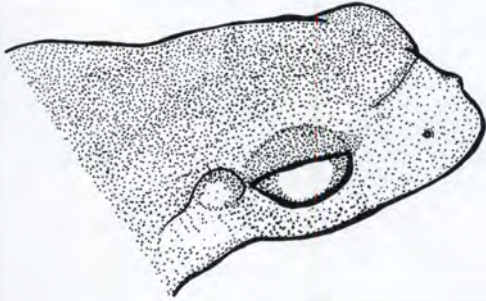


Figure 2. Head of holotype of *Philautus terebrans* (USNM 239428) in lateral view. Marker = 3 mm.

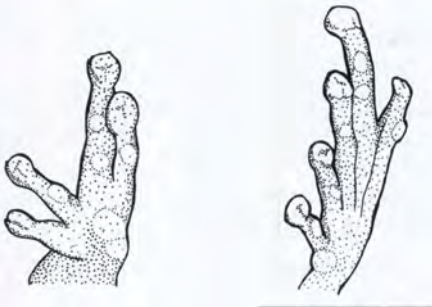


Figure 3. Fore and hind limb of the holotype of *Philautus terebrans* (USNM 239428), showing the subarticular tubercles and webbing on the palm (left) and sole (right), respectively. Markers = 3 mm.

in width), its dorsal surface smooth, lacking papillae; bifid, free posteriorly for over 33 percent of its length.

Tips of fingers dilated into large, rounded and flattened disks, with distinct circummarginal grooves separating dorsum of disks from ventrum; with a smooth, pale nuptial pad on dorsal surface of finger 1. The largest digital disk is on finger III, which is equal to horizontal diameter of tympanum (FIID/HTYD ratio 1.0). Fingers unwebbed (Fig. 3.1); dorsal surface of base of finger I with a large nuptial pad, relative lengths of fingers: $3 > 2 > 4 > 1$.

Tibia long (TBL/SVL ratio 0.44); tips of toes strongly dilated into flattened disks, with circummarginal grooves that separate dorsum of disks from ventrum; and are as large as than those on fingers. Reduced webbing on toes: toe I with rudimentary webbing, outer side without a dermal fringe; webbing on toe II up to distal subarticular tubercle on outer and rudimentary at inner edge; on toe III, webbing is up to distal subarticular tubercle on outer edge, and distal subarticular tubercle on inner, on toe IV, between distal and basal subarticular tubercle on both sides of two; and on toe V, to distal subarticular tubercle as a broad web, reaching disk base as a narrow sheath on inner edge (Fig. 3.2); outer edge of toe V without a dermal fringe; tarsal fold absent; a small elongated inner metatarsal tubercle and a larger, oval outer metatarsal tubercles; relative lengths of toes: $4 > 5 > 3 > 2 > 1$.

Dorsum of body with uniformly scattered white-tipped pustules, with interspaces much greater than conical pustules. Upper eyelids smooth; throat,

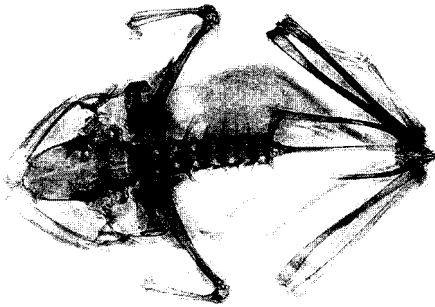


Figure 4. Radiograph of the holotype of *Philautus terebrans* (USNM 239428).

pectoral; abdominal region as well as undersurface of thighs coarsely granular; undersurface of forelimbs weakly tuberculate. Cloacal opening directed postero-ventrally, slightly below upper level of thighs.

Osteology. Radiograph (Fig. 4) of the holotype shows trapezoidal frontoparietals, convex anterior end of maxilla, reduced nasals, presacral region with seven vertebrae, sacral vertebra expanded distally, sphenethmoid exposure large; and contour of centrum of vertebrae VIII not cylindrical, considered to be a pedomorphic condition by Liem (1970: 32).

Colouration (in preservative). Unpatterned brownish-grey dorsally, fore and hind limbs banded with dark brown. A dark interorbital bar present. Tips of digits of fore and hind limbs cream. Throat brownish, pectoral and abdominal regions with brown variegations. An elongated, cream patch on inguinal region, anterior to which are two cream spots.

Etymology

The species name *terebrans* (Latin for boring), is in allusion to the lack of striking external features in the new species.

Natural history

No ecological data are available on the type series, and the larval stages of the new species are unknown.

Comparisons

In the following list, the new species from Andhra Pradesh, south-eastern India, is compared with congeners from southern India and Sri Lanka. Only characters that separate congeners from the new species have been listed.

Philautus beddomii (Günther, 1875) (distribution: south-western India), tympanum small, concealed; snout length equals orbit; metatarsal tubercle present; and dorsum green; *P. bombayensis* (Annandale, 1919) (distribution: south-western India), tongue with a median papilla; tympanum concealed; outer toes with dermal fringes; and upper eyelids with tubercles; *P. charius* Rao, 1937 (distribution: south-western India), head width exceeding length; tympanum in contact with orbit; upper eyelids with conical tubercles; webbing on toe IV between proximal and basal subarticular tubercles; and tongue with numerous scattered conical papillae; *P. chalazodes* (Günther, 1875) (distribution:

south-western India), presence of a median conical papilla on tongue, small concealed tympanum; and dorsum greenish: *P. crnri* Dutta, 1985 (replacement name for *Philautus longicrus* Rao, 1937: distribution: south-western India), presence of an outer metatarsal tubercle; and dorsum with dermal folds and tubercles; *P. elegans* Rao, 1937 (distribution south-western India), a median lingual papilla present; eye-nostril distance exceeds eye-snout distance; and dorsum crimson; *P. eximius* Shreve, 1940 (distribution: Sri Lanka), fingers weakly webbed; webbing on toe IV on inner edge, to distal subarticular tubercle, and on outer edge, between disk and distal subarticular tubercle; inner metatarsal tubercle present; and on outer edge, between disk and distal subarticular tubercle; inner metatarsal tubercle present; area surrounding vent tuberculate; a conical lingual papilla; and presence of dermal median ridge from snout-tip to above vent; *P. femoralis* (Günther, 1864) (distribution: south-western India and Sri Lanka), webbing on toe IV, on outer edge, broadly to distal subarticular tubercle, reaching disk base as a narrow sheath, and on inner edge, broadly to basal subarticular tubercle, reaching disk base as a narrow sheath; head with a dark lateral head stripe; and tongue with numerous scattered conical papillae; *P. flaviventris* (Boulenger, 1882) (distribution: south-western India), tongue with a median papilla; snout as long as orbit; tympanum small; and posterior edge of thighs with rounded yellow spots.

Philautus glandulosus (Jerdon, 1853) (distribution: south-western India), tympanum in contact with orbit; toe IV webbing, on outer edge, between basal and distal tubercle; on inner edge, up to basal tubercle; presence (illustrated in Ahl, 1931: 131) of a dark line between posterior corner of orbit and inguinal region; and tongue with numerous scattered conical papillae; *P. hassanensis* Dutta, 1985 (replacement name for *Philautus montanus* Rao, 1937: distribution: south-western India), lingual papilla present; snout not projecting beyond mandible; larger size: SVL of holotype (sex not mentioned) of *P. montanus* was 37.0 mm; and a v-shaped occipital fold; *P. hypomelas* Günther, 1876, small, indistinct tympanum, an acutely orientated snout; dorsum with a thin dermal median ridge; and webbing on toe IV either broadly up to proximal tubercle, continuing as a narrow sheath to distal tubercle or as a narrow sheath to basal tubercle; *P. kottigeharensis* Rao, 1937 (distribution: south-western India), acutely orientated snout; eye-nostril distance equals eye-snout distance; presence of a lingual papilla; and dorsum tuberculate.

Philautus leucorhinus (Lichtenstein & Martens, 1856) (distribution: south-western India and Sri Lanka), acutely orientated snout; upper eyelids warty; webbing on toe IV, on outer edge, broadly to basal, reaching distal subarticular tubercle as a narrow sheath; on inner edge, up to basal subarticular tubercle; and tongue with numerous scattered conical papillae; *P. melanensis* Rao, 1937 (distribution: south-western India), lingual papilla present; orbit diameter equals width of upper eyelid; and absence of an outer metatarsal tubercle; *P. narainensis* Rao, 1937 (distribution: south-western India), lingual papilla present; and absence of a supratympanic fold; *P. nasutus* (Günther, 1868) (distribution: Sri Lanka), presence of a dermal flap on tibio-tarsal articular region; presence of tubercles on body dorsum; presence of an inner metatarsal tubercle and presence of a thin dermal median ridge from snout-tip to above vent.

Philautus noblei (Ahl, 1972) (distribution: south-western India), fingers with rudimentary webbing; lores vertical and supratympanic fold indistinct; *P. parkeri* (Ahl, 1972) (distribution: south-western India), larger body size: 35 mm; loreal stripe brownish; and presence of a lingual papilla; *P. pulcherimus* (Ahl, 1927; replacement name for *Ixalus pulcher* Boulenger, 1882: distribution: south-western India), webbed fingers; head width exceeding length; dorsum green; toes "half to two-thirds webbed", vocal sac on thoracic region, and dorsum with a dark saddle-like mark; *P. signatus* (Boulenger, 1882) (distribution: south-western India), tongue with a conical papilla; head width exceeding length; snout as long as orbit; an acutely orientated snout; tympanum small, concealed, upper labials with white spots; and dorsum with an X-shaped mark; *P. swamianus* Rao, 1937 (distribution: south-western India), lingual papilla present; and supratympanic fold inconspicuous *P. temporalis* (Günther, 1864) (distribution: south-western India and Sri Lanka), tympanum in contact with orbit; snout acutely oriented; fingers weakly webbed; and webbing on inner side of toe IV fails to reach basal tubercle; *P. travancoricus* (Boulenger, 1891) (distribution: south-western India), snout as long as orbit; tympanum concealed; dorsum pale, the type being described as being "cream-colour" and larger size (SVL 31 mm); and *P. variabilis* (Günther, 1868) (distribution: south-western India and Sri Lanka), tympanum in contact with orbit; and webbing on toe IV between basal and distal tubercles on outer edge, and up to basal tubercle on inner edge.

Discussion

The Eastern Ghats are the weathered remains of a fragmented and often discontinuous mountain range that runs between the Khondmal Hills of Orissa State, south of the River Ganga, to its meeting point with the hill ranges of the Nilgiris, the Anaimalais and the Palnis in southern Tamil Nadu State (Mani, 1974). Although the reptile fauna shows endemicity both at the generic and specific levels (Das, 1996), no endemic amphibians have hitherto been reported. The present report of the rhacophorid, in addition to another congeneric rhacophorid, the description of which is now in preparation, suggests a higher diversity of amphibians on these hill ranges and its associated plains than previously assumed. Since the holotype of the new species were collected from primary forests, the continued protection of these remnant forest patches, and identifying other relict forests that are refugia for presumably once widespread species, is of great importance to the protection of the remaining biological diversity of the Eastern Ghats.

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APPENDIX

List of comparative material examined

- Philautus bombayensis*: ZSI 18814, 18818, Khandala, Pune District, Maharashtra, south-western India; ZSI 18288, Castle Roack, North Kanara District, Karnataka State, south-western India.
- Philautus chalazodes*: ZSI 17027, Anaimalai Hills, Tamil Nadu State, south-western India.
- Philautus charius*: FMNH 218101-02, Ponmudi, Trivandrum District, Kerala State, south-western India; ZSI/SRS VA unregistered (field no. 18), Silver Cascade, Kodaikanal, Tamil Nadu State, south-western India.
- Philautus eximius*: MCZ 20879-84 (syntypes of *Philautus eximius* Shreve, 1940), "Queenwood Estate, Dimbulla, 5000 feet, Ceylon" (=Sri Lanka).
- Philautus femoralis*: FMNH 218114-117, Ponmudi, Trivandrum District, Kerala State, south-western India; MCZ 15407, Sri Lanka.
- Philautus flaviviridis*: ZSI 10588, "South India"
- Philautus hypomelas*: BMNH 1947.17-10; 1947.2.7.47-52 (syntypes of *Ixalus hypomelas* Günther, 1876), "Ceylon" (=Sri Lanka).
- Philautus glandulosus*: FMNH 74159-60, "South India", MCZ 79851, Ootacamund to Nilambur, Tamil Nadu State, south-western India; MCZ 15408, Kudra Mukh, south-western India.
- Philautus leucorhinus*: FMNH 173352, 173358, Ratnapura, Sri Lanka; MCZ 8198-99, India and Ceylon; MCZ 1322, "India", MCZ 3487, Nuwara Eliya, Central Province, Sri Lanka.
- Philautus nasutus*: MCZ 3787, Punduloya, Sri Lanka; WHT01148, Watagala, near Deniyaya, Sri Lanka; ZSI 10797, "Ceylon" (=Sri Lanka).
- Philautus pulcherrimus*: ZSI/SRS VA 674, Varagaliar Shola, Top Slip, Anaimalai Wildlife Sanctuary, Tamil Nadu, south-western India; ZSI 13565, "South India".
- Philautus signatus*: ZSI/SRS VA 452, Silent Valley, Kerala State, south-western India; ZSI 2827, "Travancore", Kerala State, south-western India.
- Philautus strictomerus*: ZSI 10946, "Ceylon" (=Sri Lanka).
- Philautus temporalis*: FMNH 174296-97, Kotegehar, Karnataka State, south-western India.
- Philautus variabilis*: FMNH 218133-34, Ponmudi, Trivandrum District, Kerala State, south-western India; FMNH 212990, Chandanthode Reserve, Trichur District, Kerala State, south-western India; MCZ 1276, India; MCZ 12895, 15019, Bogawan Talawa, Central Province, Sri Lanka; WHT 01156, Kanneliya, Galle, Sri Lanka; ZSI/SRS VA 672, Kamaraj Sagar, Ooty, Tamil Nadu, south-western India.