

## New Species of *Philautus* (Anura: Ranidae, Rhacophorinae) from Ponmudi Hill in the Western Ghats of India

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**ABSTRACT.**—A new species of *Philautus* is described from Ponmudi Hill in the Western Ghats of India. It can be distinguished from all other members of the genus by the combination of its rather robust body, relatively large snout–vent length, rounded snout, protruding eyes, and vermiculated coloration of the posterior surface of the tibia. It is one of the largest species of the genus in the Western Ghats (adult males of type series up to 38.9 mm). It is currently known only from the type locality, where it is essentially an inhabitant of the canopy.

The Western Ghats mountain range in peninsular India is considered a global biodiversity hotspot (Myers, 1990). The fauna and flora of this region has attracted attention of systematists and evolutionary biologists because of the mixture of high-level endemism (Inger, 1999; Myers et al., 2000; Biju and Bossuyt, 2003; Roelants et al., 2004) and various affinities with other biogeographic regions (Inger, 1999; Bossuyt and Milinkovitch, 2001). Still, except for local surveys, no systematic studies on the amphibian fauna of the Western Ghats have been published, and our knowledge of this group is, thus, largely based on new species descriptions (Dutta, 1997; Das, 2000; Dubois et al., 2001; Bossuyt, 2002; Biju and Bossuyt, 2003; Kuramoto and Joshy, 2003), and checklists (e.g., Inger et al., 1984; Inger and Dutta, 1986; Daniels, 1997). On the backdrop of this deficiency, we started an extensive survey and documentation of the anuran fauna of this region from 1991 onward, which led to the discovery of many species new to science (Biju, 2001). Herein, we describe a new species of *Philautus* from Ponmudi Hill, a part of Agasthyamala Hill Range in the Western Ghats of India.

### MATERIALS AND METHODS

Measurements and terminology follow Bossuyt and Dubois (2001). The following measurements were taken, to the nearest 0.1 mm, using a digital slide-caliper (SVL, HL, and TL) or a binocular microscope with a micrometer ocular. SVL (snout–vent length), HW (head width, at the angle of the jaws), HL (head length, from rear of mandible to tip of snout), MN (distance from rear of mandible to nostril), MFE (distance from rear of mandible to anterior orbital border of eye),

MBE (distance from rear of mandible to posterior orbital border of eye), SL (snout length, from tip of snout to anterior orbital border of eye), EL (eye length, horizontal distance between bony orbital borders of eye), IUE (inter upper eyelid width, the short distance between the upper eyelids), UEW (maximum upper eyelid width), IN (distance between internal border of nostrils), IFE (internal front of eyes, shortest distance between anterior orbital border of eyes), IBE (internal back of eyes, shortest distance between posterior orbital border of eyes), NS (distance from nostril to tip of snout), EN (distance from nostril to anterior orbital border of eye), TYD (largest tympanum diameter), TYE (distance from posterior orbital border of eye to tympanum), FLL (forelimb length, from elbow to base of outer palmar tubercle), HAL (hand length, from base of outer palmar tubercle to tip of third Finger), TFL (third Finger length, from base of first subarticular tubercle), FD<sub>I-IV</sub> (disc width on Finger I-IV), FW<sub>I-IV</sub> (width of Finger I-IV, at base of disk), TD<sub>I-V</sub> (disk width on Toe I-V), TW<sub>I-V</sub> (width of Toe I-V, at base of disk), TL (tibia length), TW (maximum tibia width), FL (femur length), FOL (foot length, from base of inner metatarsal tubercle to tip of fourth Toe), FTL (length of fourth Toe, from base of first subarticular tubercle to tip of fourth Toe), TFOL (distance from heel to tip of fourth Toe), IMT (inner metatarsal tubercle length), and ITL (inner Toe length). Drawings of the holotype were made using a stereomicroscope with a drawing tube. Abbreviations for Institutes are listed elsewhere (Bossuyt and Dubois, 2001).

The new species was compared with all valid species names currently recognized in the genus *Philautus* (Bossuyt and Dubois, 2001; D. F. Frost, Amphibian species of the world: an online reference V3.0, <http://research.amnh.org/herpetology/amphibia/index.html> [American

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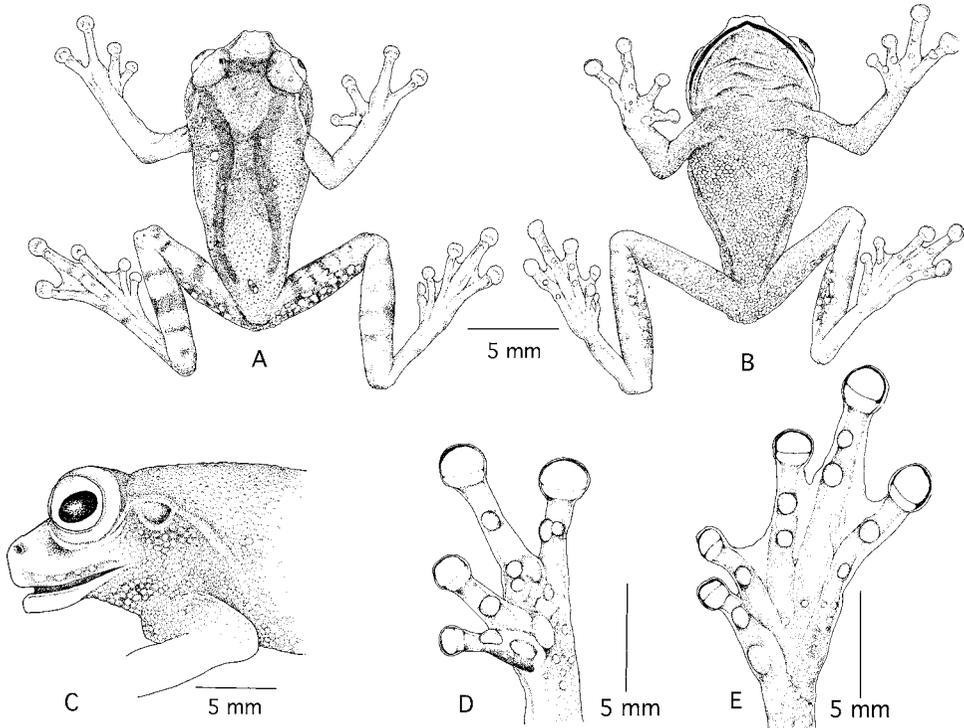


FIG. 1. Holotype of *Philautus ponmudi* sp. nov.: (A) dorsal view; (B) ventral view; (C) lateral view of head; (D) ventral view of hand; (E) ventral view of foot.

Museum of Natural History, 22 August 2004)), and especially with the name-bearing types of all the Western Ghats and Sri Lankan species (Appendix 1).

*Philautus ponmudi* sp. nov.  
Figures 1–2

**Holotype.**—Bombay Natural History Society, Mumbai, Maharashtra, India, BNHS 4257, an adult male, SVL 35.9 mm, from “upper sanatorium” Ponmudi (8°45’N, 77°08’E), altitude 1000 m, Thiruvananthapuram district, Kerala, India, collected by S. D. Biju on 7 July 1997.

**Paratypes.**—BNHS 4258, BNHS 4259, and TBGRI 2002.0050 (Tropical Botanic Garden and Research Institute, Thiruvananthapuram, Kerala, India), three adult males, SVL 36.3–38.9 mm, same locality and collection date as the holotype.

**Diagnosis.**—The new rhacophorine species is placed in the genus *Philautus* because of the granular belly, the large and transparent subgular pouch while calling, and the absence of vomerine teeth. It differs from all other members of the genus by the combination of the following characters: (1) rather robust body; (2) relatively large snout–vent length (adult male up to 38.9 mm); (3) rounded snout (Fig. 1A,B); (4) pro-

truding eyes (Figs. 1C, 2); and (5) vermiculated posterior surfaces of tibia.

**Comparison.**—*Philautus ponmudi* can be easily differentiated from all reported Indian species of this genus by the combination of its unique vermiculated posterior surfaces of the tibia and its large snout–vent size. It could be confused with *Philautus flaviventris* and *Philautus signatus*, because both of these have a comparable size. However, *P. ponmudi* differs from *P. flaviventris* by its larger size, SVL (mean  $\pm$  SD)  $37.4 \pm 1.5$  mm,  $N = 4$  (vs.  $29.4$  mm,  $N = 1$  in *P. flaviventris*), sharp canthus rostralis (rounded in *P. flaviventris*), and toe webbing reaching up to the distal subarticular tubercle on both sides of Toe IV (vs. toe webbing reaching only up to the penultimate subarticular tubercle on both sides of Toe IV in *P. flaviventris*); *P. ponmudi* differs from *P. signatus* by its larger size,  $37.4 \pm 1.5$  mm,  $N = 4$  (vs.  $31.1 \pm 2.3$  mm,  $N = 5$  in *P. signatus*), rounded snout (sharply pointed in *P. signatus*) sharp canthus rostralis (rounded in *P. signatus*), and the posterior surface of the thighs being light chocolate brown, vermiculated with gray patches of variable size (flesh white to light reddish in *P. signatus*).

**Description of the Holotype.**—A relatively large *Philautus* (SVL = 35.9), body rather robust; head



FIG. 2. Holotype of *Philautus ponnudi* sp. nov.

(Fig. 1C) wider than long (HW = 14.7, HL = 13.1, MN = 11.0, MFE = 8.9, MBE = 4.9), flat above; outline of snout in dorsal view and in profile rounded, slightly protruding; snout (SL = 4.9) longer than horizontal diameter of eye (EL = 4.4); canthus rostralis sharp, loreal region obtusely concave; interorbital space flat, wider (IUE = 4.0) than upper eyelid (UEW = 3.1), wider than internasal distance (IN = 3.3); distance between anterior margins of eyes (IFE = 7.2) 1.7 times in distance between posterior margins of eye (IBE = 12.6); nostrils oval, without lateral flap of skin, slightly raised, closer to tip of snout (NS = 1.8) than to eye (EN = 3.0); pupil oval, horizontal; tympanum (TYD = 1.5) rather distinct, rounded, nearly three times in eye diameter (Figs. 1C, 2), equal to tympanum–eye distance (TYE = 1.5); vomerine teeth absent; tongue large (6.6 × 5.3), cordate, emarginate, lobes obtuse, sparsely granular, lingual papilla present, pointed; supratympanic fold distinct, from posterior corner of eye to shoulder.

Forelimb (FLL = 8.6) shorter than hand (HAL = 10.0; TFL = 6.3); relative length of fingers: I < II < IV < III; tips of fingers with developed disks (FD<sub>I</sub> = 1.4, FW<sub>I</sub> = 0.8, FD<sub>II</sub> = 1.7, FW<sub>II</sub> = 1.00, FD<sub>III</sub> = 2.3, FW<sub>3</sub> = 1.1, FD<sub>IV</sub> = 2.4, FW<sub>IV</sub> = 1.0) with distinct circummarginal grooves; all fingers with dermal fringe on both edges; webbing on fingers absent; subarticular tubercles prominent, rounded, single (except IV 1, double), IV 2 absent (Fig. 1D); prepollex rather

distinct, oval; single palmar tubercle, oval, rather distinct; supernumerary tubercles present on Finger III.

Hind limbs moderately long, heels touch with limbs folded at right angles to the body; tibia more than four times longer (TL = 17.4) than wide (TW = 4.2), slightly shorter than thigh (FL = 18.0), longer than distance from base of internal metatarsal tubercle to tip of Toe IV (FOL = 14.6); distance from heel to tip of Toe IV (TFOL = 24.0) about three times length of Toe IV (FTL = 7.7); relative length of toes: I < II < III < V < IV; tips of toes with disks, rather wide compared to toe width (TD<sub>I</sub> = 1.3, TW<sub>I</sub> = 0.7; TD<sub>II</sub> = 1.5, TW<sub>II</sub> = 0.9; TD<sub>III</sub> = 2.0, TW<sub>III</sub> = 1.1; TD<sub>IV</sub> = 2.2, TW<sub>IV</sub> = 1.4; TD<sub>V</sub> = 2.3, TW<sub>V</sub> = 1.4), with a distinct circummarginal groove; webbing on toes moderate (Fig. 1E); small dermal fringe along Toe V, from tip of toe to second subarticular tubercle; subarticular tubercles rather prominent, rounded, simple, V2 extremely weakly developed, IV3 absent; inner metatarsal tubercle rather distinct (IMT = 1.4), oval, 2.5 times in length of Toe I (ITL = 3.5); supernumerary tubercles present on Toes III–V.

Skin of snout and between eyes shagreened, upper eyelids shagreened with a few prominent granular projections, side of head shagreened to granular, anterior, and posterior part of back shagreened with a few scattered horny spinules; upper and lower part of flanks granular, dorsal part of forelimbs and hind limbs shagreened;

TABLE 1. Measurements in millimeters (range, mean, and standard deviation) for the type specimens ( $N = 4$ ) of *Philautus ponmudi*.

|     | Range     | Mean | SD  |
|-----|-----------|------|-----|
| SVL | 35.9–38.9 | 37.4 | 1.5 |
| HW  | 14.7–15.0 | 14.8 | 0.2 |
| HL  | 13.1–13.6 | 13.5 | 0.2 |
| IFE | 7.2–7.4   | 7.3  | 0.1 |
| IBE | 12.6–13.8 | 13.2 | 0.5 |
| IUE | 4.0–4.9   | 4.6  | 0.4 |
| UEW | 3.1–3.6   | 3.4  | 0.2 |
| SL  | 4.9–5.5   | 5.2  | 0.3 |
| EL  | 4.4–5.3   | 5.0  | 0.4 |
| TYD | 1.5–1.6   | 1.6  | 0.0 |
| FLL | 8.4–8.8   | 8.6  | 0.2 |
| HAL | 10.0–10.6 | 10.3 | 0.3 |
| TFL | 6.1–6.6   | 6.4  | 0.2 |
| TL  | 17.3–17.8 | 17.6 | 0.2 |
| FOL | 14.4–14.8 | 14.6 | 0.2 |
| FTL | 7.7–7.9   | 7.8  | 0.1 |
| IMT | 1.4–1.7   | 1.5  | 0.1 |
| ITL | 3.5–3.9   | 3.7  | 0.2 |

ventral part of throat, chest, belly, and thighs granular (Fig. 1B).

*Color of Holotype in Life.*—Dorsum light gray-yellow with a few scattered white blotches and minute black spots, a pair of brown concave stripes running from behind the eye to the vent, uniting at the middle in a light brown color and forming an “X” on the back (Figs. 1A, 2); a light brown inverted triangular marking between the eyes, extending on the upper eyelid (Fig. 1A); snout light brown, loreal and tympanic region light brown, upper eyelid dark gray, groin light gray with numerous dark brown spots; iris golden brownish, encircled by gray ring; lips with brown bands (Figs. 1B, C); forelimbs light brown, with darker spots; hind limbs light brown with dark gray cross-bands, posterior surface of thigh light chocolate brown, vermiculated with gray patches of variable size; ventrally light gray, throat gray with dark brown specks of variable size; ventral side of feet light gray, of tibia light chocolate brown vermiculated with grayish-green patches.

*Color of Holotype in Preservative.*—Dorsum light gray with a dark gray “X” and minute black spots, upper eyelid dark gray, loreal and tympanic regions light brown, ventral side of abdomen gray with dark spots; forelimbs light gray, hind limbs light brown with dark brown cross bands; posterior surface of thighs light brown, vermiculated with variable sizes of light and dark gray patches; ventrally uniform light gray with light brown markings, especially on the throat.

*Male Secondary Sexual Characters.*—Nuptial spines present (Fig. 1D); median subgular vocal sac present; a pair of openings (vocal slits) present at the base of lower jaw.

*Variation.*—Measurements (range, mean, and standard deviation) of the type series are given in Table 1. The dorsal coloration is relatively invariable in the type series, but BNHS 4259 is somewhat darker gray. The “X” pattern on the dorsum is continuous in BNHS 4258 but discontinuous and less conspicuous in TBGRI 2002.0050.

*Distribution and Ecology.*—This species is currently known only from the type locality. Specimens were located by their call and collected from the forest canopy during a rainy evening after 2000 h. The type series was collected from between 8 and 15 m height in a tree from an evergreen forest patch surrounded by grasslands.

*Etymology.*—The species is named after Ponmudi, where the type series was collected. The specific name is considered an invariable noun in the nominative singular standing in apposition to the generic name.

#### DISCUSSION

Ponmudi Hill in the southern part of the Western Ghats is part of the Agasthyamala Hill Range (former Ashambu Hills), the herpetofauna of which has been explored both in the colonial past (Günther, 1876; Boulenger, 1882; Ferguson, 1904) and in more recent times (Inger et al., 1984). Still, *P. ponmudi* has not been located in any of the historical or recent collections from this region, which indicates that it must always have been overlooked in the field. Apart from the fact that collecting *Philautus* species is challenging because of their nocturnal habit and diminutive size, this species may have been missed because the lower vegetation layers are usually investigated most intensively during herpetological fieldwork. Although members of the subfamily Rhacophorinae are usually denoted as “tree-frogs” (Schjötz, 1999), members of the genus *Philautus* are more specifically known as bush-frogs or shrubfrogs (Bossuyt and Dubois, 2001). Publications on Indian *Philautus* illustrate that they are indeed mostly found on shrubs, from ground level till up to 3 m height (Inger et al., 1984; Bossuyt et al., 2001; Biju, 2003). Our observations, however, indicate that members of this genus occupy a wide range of microhabitats in the Western Ghats, ranging from the ground up to the highest layers of vegetation in the rain forest. The discovery of this new species from between 8 to 15 m high in the canopy illustrates this broad microhabitat preference and calls for more intensive searches in various microhabitats of evergreen forests.

*Acknowledgments.*—The authors are very grateful to J. R. B. Alfred and M. S. Ravichandran (ZSI); B. Clarke and M. Wilkinson (BMNH); A. Rehmani and V. Giri (BNHS); A. Dubois and

A. Ohler (MNHN); H. Grillitsch and F. Tiedemann (NMW); R. Günther (ZMB); R. F. Inger, H. K. Voris, and A. Resetar (FMNH); and R. Pethiyagoda (WHT) for giving access to specimens in their collection and to R. F. Inger, J. Wiens, and an anonymous reviewer for critical comments on an earlier version of the manuscript. SDB is grateful to the Muséum National d' Histoire Naturelle Paris (MNHN) fellowship 2001, Conservation International (CI) Washington, the Indian National Science Academy (INSA), and the Royal Society London fellowship 2003 for travel grants and museum studies and to the Kerala Forest Department for collection permits. FB is a postdoctoral researcher at the Fonds voor Wetenschappelijk Onderzoek Vlaanderen.

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Accepted: 6 April 2005.

## APPENDIX 1

*Specimens Examined*

*Philautus adspersus* (BMNH 1947.2.6.23); *Philautus amandalii* (BMNH 1947.2.26.58); *Philautus beddomii* (BMNH 1947.2.26.59–66, NMW 22884); *Philautus bombayensis* (ZSIC 18287, SDB 40175); *Philautus cavirostris* (BMNH 1947.2.7.83); *Philautus chalazodes* (BMNH 1947.2.6.35); *Philautus charius* (MNHN 1999.5597, SDB 4210–13, SDB 4497–4498); *Philautus dubius* (BMNH 1947.2.7.86); *Philautus femoralis* (BMNH 1947.2.26.89–90); *Philautus fergusonianus* (BMNH 1947.2.27.61); *Philautus flaviventris* (BMNH 1947.2.26.98); *Philautus glandulosus* (BMNH 1947.2.27.22, SDB 40239, SDB 6339); *Philautus griet* (KBIN 1919–1922, 1926, SDB 465); *Philautus hypomelas* (BMNH 1947.2.7.47–57); *Philautus jerdonii* (BMNH 1947.2.7.84); *Philautus leucorhinus* (ZMB 3057); *Philautus luteolus* (BNHS 4191–92, SDB 106); *Philautus microtympaum* (BMNH 1947.2.8.48); *Philautus nanus* (BMNH 1947.2.7.78); *Philautus nasutus* (BMNH 1947.2.6.21); *Philautus pleurotaenia* (BMNH 1947.2.7.64); *Philautus signatus* (BMNH 1947.2.27.36, BMNH 1920.11.4.1–2, SDB 4001; SDB 4006); *Philautus stictomerus* (BMNH 1947.2.8.54); *Philautus temporalis* (BMNH 1947.2.6.8–11); *Philautus timmiens* (BMNH 1947.2.6.14; SDB 523–524, SDB 40264); *Philautus travancoricus* (BMNH 1947.2.6.20; SDB 4500); *Philautus tuberochumerus* (BNHS 4193–94; SDB1101–1104); *Philautus variabilis* (BMNH 1947.2.7.87); *Philautus waynaadensis* (MNHN 1999. 5596; SDB 399–401).