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## ***PSEUDOPHILAUTUS DILMAH*, A NEW SPECIES OF SHRUB FROG (AMPHIBIA: ANURA: RHACOPHORIDAE) FROM A THREATENED HABITAT LOOKKANDURA IN SRI LANKA**

**L.J. Mendis Wickramasinghe<sup>1</sup>, Imesh Nuwan Bandara<sup>2</sup>, Dulan Ranga Vidanapathirana<sup>3</sup>,  
Kamani H. Tennakoon<sup>4</sup>, Sameera R. Samarakoon<sup>5</sup> & Nethu Wickramasinghe<sup>6</sup>**

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<sup>1,2,3,6</sup> Herpetological Foundation of Sri Lanka, 31/5, Alwis Town, Hendala, Wattala, Sri Lanka

<sup>2</sup> Ellangāwa Unity Care for Community and Nature, Hapugoda, Ambathenna, Sri Lanka

<sup>4,5,6</sup> Institute of Biochemistry, Molecular Biology, Biotechnology, University of Colombo, Sri Lanka

<sup>1</sup> boiga2000@gmail.com (corresponding author), <sup>2</sup> imeshnu1@gmail.com, <sup>3</sup> dulanrangavp@gmail.com,

<sup>4</sup> kamani@ibmbb.cmb.ac.lk, <sup>5</sup> ranganath148@yahoo.com, <sup>6</sup> nemzy821@gmail.com

**Abstract:** A new species of shrub frog *Pseudophilautus dilmah* is described from the Central Hills of Sri Lanka. This unique species is distinguished from all the other congeners from a combination of characters; snout rounded in lateral aspect, bluntly pointed in dorsal and ventral aspect, canthus rostralis rounded, vomerine teeth, lingual papilla and nuptial pads absent, dermal fringe distinct on inside of fingers III and IV, small blunt tubercles on metacarpal and ulnar folds, toes basally webbed, interorbital area smooth, upper eyelid prominent tubercles present, anterior and posterior dorsum without horny spinules but tubercles present, upper part of flank weakly granular, supratympanic fold distinct, prominent small calcar present at the distal end of the tibia, throat granular, chest and belly coarsely granular. Based on comparison of 16s rRNA gene we also show that the species is genetically distinct from other members of *Pseudophilautus* for which gene sequences are available. The high rate of deforestation and anthropogenic activities threaten this population in its natural habitat.

**Keywords:** Amphibian, biodiversity hotspot, Dilmah Shrub Frog, new taxa, *Pseudophilautus dilmah*.



DATA DEFICIENT	LEAST CONCERN	NEAR THREATENED	VULNERABLE	ENDANGERED	CRITICALLY ENDANGERED	EXTINCT IN THE WILD	EXTINCT
DD	LC	NT	VU	EN	CR	EW	EX

*Pseudophilautus dilmah* sp. nov.  
Dilmah Shrub Frog



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## INTRODUCTION

Sri Lanka, along with the Western Ghats of India, is one of the 34 biodiversity hotspots of the world and is credited with a rich amphibian fauna (Meegaskumbura et al. 2002; Mittermeier et al. 2004). Of recent times a large number of species has been added to the list with the total number of amphibian species adding up to 119 (see Fernando & Siriwardhane 1996; Manamendra-Arachchi & Pethiyagoda 1998, 2001, 2005; Meegaskumbura & Manamendra-Arachchi 2005; Fernando et al. 2007; Meegaskumbura et al. 2007, 2011; de Silva 2009; Wickramasinghe et al. 2012a, 2013a), while that of *Pseudophilautus* Laurent, 1943 now stands at 75 species (see Manamendra-Arachchi & Pethiyagoda 2005; Meegaskumbura & Manamendra-Arachchi 2005; Meegaskumbura et al. 2007, 2011, 2012; Wickramasinghe et al. 2013a). Of the 35 globally extinct amphibians prior to 2012, 21 alone were declared from Sri Lanka (Stuart et al. 2008). But after the rediscovery of three species (Wickramasinghe et al. 2012b, 2013b,c), now the total number of extinct amphibians stands at 18. Out of the predicted 18 extinct species, 17 belong to the genus *Pseudophilautus* (see Manamendra-Arachchi & Pethiyagoda 1998, 2005; Manamendra-Arachchi & de Silva 2004; IUCN & MENR 2007; Meegaskumbura et al. 2007; Stuart et al. 2008).

We have meticulously conducted explorations on amphibians in the last few years in the Central Hills of Sri Lanka including Peak Wilderness, Horton Plains and the Knuckles massif and subsequently describe a new species of *Pseudophilautus* from Loolcondra Estate (Fig. 1), adjacent to the Galaha Forest Reserve in Deltota (07°17'N & 080°70'E) on the border of Kandy and Nuwara-Eliya districts of Central Province.

The British colonials pronounced the Sinhala native term "Loolkandura" as "Lool-conde-ra" (Jayasuriya et al. 1993), and the English spelling has remained unchanged till date, here we shall be using the former spelling for reasons discussed later. Loolkandura and Galaha forest reserve are located in the Central Hills, which lead to Piduruthalagala, bordering the two districts of Kandy and Nuwara Eliya. Today this forest area is under the Department of Forest Conservation. The first tea plant is said to have been planted here by James Taylor in 1867, and the first tea estate established after clearing large areas of pristine forests. The tea estate is surrounded by severely fragmented and disturbed patches of pristine lower montane rain forests belonging to the Galaha Forest Reserve. The Loolkandura forest is surrounded by mostly tea estates, and a thin strip of forest connects

with the Galaha Forest Reserve, while an entirely separated, large natural forest patch is located within the Loolkandura Tea Estate. The vegetation within the Loolkandura forest area can be grouped into six types, viz: natural forest, secondary forest, natural grassland, tea plantation, abandoned tea plantation, and pinus plantation.

We here describe a new species of shrub frog *Pseudophilautus dilmah*, from the Loolkandura forest of the Central Province of Sri Lanka. The species is reported as a result of an ongoing island-wide survey documenting the diversity of herpetofauna in Sri Lanka.

## MATERIALS AND METHODS

Sampling was done mostly nocturnally, and photographs of most specimens were taken in the wild to avoid any confusion of change in colour after captivity and to avoid over collection of the same species. The specimens were photographed in life (Canon EOS 7D, Canon 100mm F/2.8 IS USM Macro Lens, Canon MT-24EX Macro Twin Lite Flash with Vello Bounce Dome Diffuser). Geographical coordinates were determined from GPS readings (Gamin eTrex Vista) at the locality. Specimens collected in the field were first fixed in 90% ethanol for two hours and stored in 70% ethanol. The material referred to is deposited in the Natural History Museum, London, UK (BMNH); the Museum of Comparative Zoology, Cambridge, USA (MCZ); the National Museum, Sri Lanka (NMSL); the Department of Wildlife Conservation, National Wildlife Research and Training Center, Girithale (DWC) (Appendix 1). The new type material discussed in this paper is also deposited in NMSL and DWC.

## Morphometry

The new species was compared with all types from Sri Lanka deposited in the NMSL, and additional data were gathered from Manamendra-Arachchi and Pethiyagoda (2005), special attention was given to extinct species. The specimens formerly belonging to the Wildlife Heritage Trust (WHT) bearing WHT numbers are currently deposited in the NMSL, catalogued under the same numbers. For the description section all known species of Sri Lanka were grouped into four categories based on their snout-vent length, very small (10–15 mm), rather small (16–30 mm), moderate (31–45 mm) and large (46–60 mm). The proposed species was critically compared with species of similar morphological characters and/or with similar colouration.

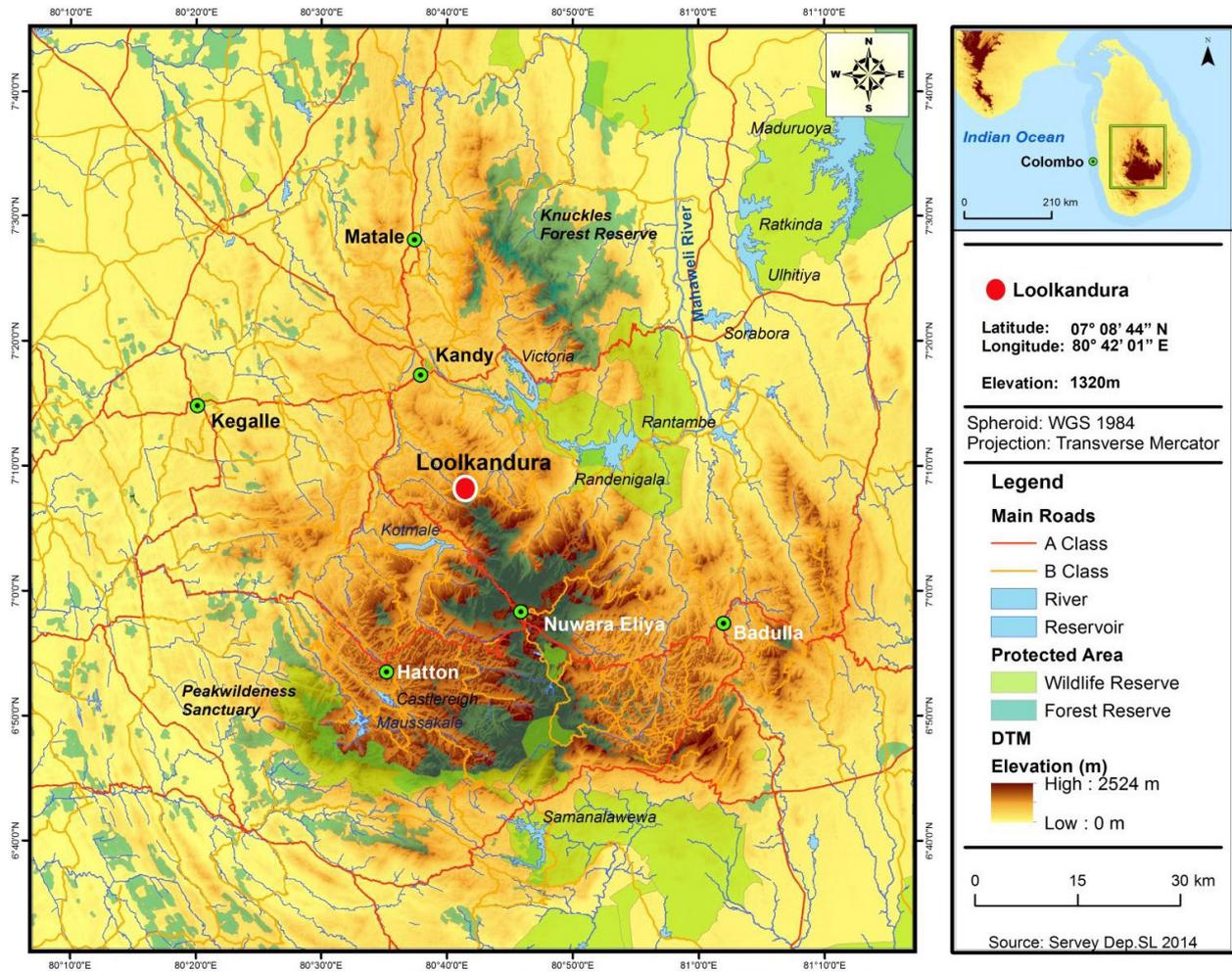


Figure 1. Type locality of *Pseudophilautus dilmah* sp. nov.

Forty-four external measurements (Table 1) of specimens were taken with a Mitutoyo digital vernier calliper to the nearest 0.1mm, and observations were made through a Leica M50 (10–40) microscope. Nomenclature of external anatomy abbreviated in the text and external measurements taken are listed alphabetically herein: maximum breadth of disk of the third finger (DB), taken from anterior to posterior edge of circum-marginal groove; distance between back of eyes (DBE), measured between posterior edge of eyes; distance between front of eyes (DFE), measured between anterior edges of eyes; length of disk of the third finger (DL), taken from anterior edge of circum-marginal groove to posterior edge of disk; width of disk of the third finger (DW), measured across the inner and outer edges of circum-marginal groove; eye diameter (ED), horizontal diameter of eye; eye to nostril distance (EN), measured between anterior most point of eye and middle of nostril; eye to snout distance (ES), measured

between anterior most point of eye and tip of snout; thigh (femur) length (FEL), distance between vent and knee with both thigh and shank flexed; first finger length (FL-1), measured between proximal margin of the most proximal subarticular tubercle or crease of articulation and the tip of first finger; second finger length (FL-2), measured between proximal margin of the most proximal subarticular tubercle or crease of articulation and the tip of second finger; third finger length (FL-3), measured between proximal margin of the most proximal subarticular tubercle or crease of articulation and the tip of third finger; fourth finger length (FL-4), measured between proximal margin of the most proximal subarticular tubercle or crease of articulation and the tip of fourth finger; foot length (FOL), distance between heel and tip of fourth toe with both foot and shank flexed; groin to knee distance (GK), measured between groin and the tip of knee; head depth (HD), distance between the apex of eye and the bottom of

jaw; head length (HL), distance between angle of jaws and snout tip; head width (HW), measured across angle of jaws; inner metatarsal tubercle length (IML), distance between the distal and proximal edges of the inner metatarsal tubercle; internarial distance (IN), least distance between the inner margin of nares; interorbital width (IO), least distance between the upper margins of orbits; knee-angle length (KT), distance from knee-angle to tibio-tarsal articulation; lower arm length (LAL), taken from elbow to posterior-most margin of inner palmar tubercle; mandible-back of eye distance (MBE), distance between angle of jaws and posterior-most point of eye; mandible-front of eye distance (MFE), taken as distance between angle of jaws and anterior-most point of eye; mandible-nostril distance (MN), taken as distance between angle of jaws and middle of nostril; palm length (PAL), taken from posterior-most margin of inner palmar tubercle to tip of disk of third finger; snout-nostril distance (SN), taken as distances between middle of nostril and tip of snout; snout-vent length (SVL), measured from tip of snout to vent; tympanum-back of eye distance (TBE), distance between anterior-most point of inner margin of inner rim of tympanum and posterior most point of eye; tarsal length (TAS), measured between the tibio-tarsal articulation and anterior edge of inner metatarsal tubercle; tibia length (TBL), distance between knee and heel with both shank and foot flexed; first toe length (TL-1), measured between proximal margin of the most proximal subarticular tubercle or crease of articulation and the tip of first toe; second toe length (TL-2), measured between proximal margin of the most proximal subarticular tubercle or crease of articulation and the tip of second toe; third toe length (TL-3), measured between proximal margin of the most proximal subarticular tubercle or crease of articulation and the tip of third toe; fourth toe length (TL-4), measured between proximal margin of the most proximal subarticular tubercle or crease of articulation and the tip of fourth toe; fifth toe length (TL-5), measured between proximal margin of the most proximal subarticular tubercle or crease of articulation and the tip of fifth toe; tympanum-nostril distance (TND), distance between anterior-most point of inner margin of inner rim of tympanum and middle point of nostril; tympanum-front of eye distance (TFE), taken as distance between anterior-most point of inner margin of inner rim of tympanum and anterior-most point of eye; tympanum height (TYH), vertical diameter of the inner rim; tympanum width (TYW), horizontal diameter of the inner rim; upper arm length (UAL), distance between axilla and elbow; upper eyelid width (UEW),

measured from bony edge of supraorbital to outer edge of upper eyelid; vent to knee-angle length (VKL), distance measured from knee-angle to vent.

Comparison was carried out amongst congeners which closely resembled the new species. In the comparison tables for morphological characters (Table 2), and characters in the skin (Table 3), an empty cell in the table denotes either the same character as that of the new species, or for few extinct species when there was no data available.

Additional data for comparison were collected from Meegaskumbura & Manamendra-Arachchi (2005, 2011); Meegaskumbura et al. (2009); Pethiyagoda & Manamendraarachchi (2005); Wickramasinghe et al. (2013a).

### Molecular phylogenetic analysis

The phylogenetic relationships of the newly described species to other species of the genus *Pseudophilautus* in Sri Lanka, for which data is available, were estimated using the mitochondrial 16S ribosomal RNA region. Whole cellular DNA was extracted from ethanol preserved muscle tissue sample from the specimen number DWC 2015.01.001 of the new species and NMSL 2013.01.01 NH of *P. bambaradeniyai*. The tissue sample was digested at 55°C using STE buffer (0.1 M NaCl, 0.01 M TRIS, EDTA 0.001 M and 25 µl of 10% SDS) with 10µl of 20 mg/ml Proteinase K. Final extraction was carried out using the phenol-chloroform method. Polymerase chain reaction (PCR) amplifications of the 16S ribosomal RNA region were carried out in 25 µl reactions using the forward primer- 5'-GCCTGTTATCAAAAACAT-3' and reverse primer 5'-CCGGTCTGAACTCAGATCACGT-3' (Frost et al. 2006) with Promega GoTaq DNA polymerase enzyme in an Eppendorf Master cycler. The thermal profile was an initial denaturation step for seven minutes at 94°C, and 35 cycles of denaturation for 40 seconds at 94°C, annealing for 30 seconds at 52°C and extension for 30 seconds at 72°C, followed by final extension for 10 min at 72°C. Amplified DNA fragments were purified using the 'Promega Wizard Gel and PCR clean up' system. Purified PCR products were sequenced using a BigDye Terminator sequencer v. 3.0 (Applied BioSystems, CA, USA) in 8 µl reactions. The sequence chromatograms were visualized in a Genetic Analyzer 3500 Dx (Applied Biosystems, CA, USA).

The newly generated sequences have been deposited in GenBank under the accession numbers KP272046 and KP272047. Additional sequences of the Sri Lankan *Pseudophilautus* species were obtained from GenBank (Appendix 2). Gene sequences were aligned

using MUSCLE (Edgar 2004). Molecular phylogenetic analysis was performed using MEGA 6 (Tamura et al. 2013). The best fit model for nucleotide substitution was selected from 24 models using MEGA 6 based on the minimum Bayesian Information Criterion (BIC) value (Schwarz 1978; Nei & Kumar 2000). Best fit model was used for computing the pairwise distances between the sequences and for maximum likelihood analysis. Maximum likelihood tree was rooted with *Raorchestes charius*, an Indian species that represent *Raorchestes*, the sister group to the Sri Lankan genus *Pseudophilautus*. Tree was drawn using FigTree v1.4.2 (Morariu et al. 2009).

## RESULTS

### *Pseudophilautus dilmah* sp. nov. (Figs. 1–2; Images 1–4; Table 1)

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**Holotype:** NMSL 2015.01.01 NH, 01.v.2011, adult male 19.7mm SVL (Image 1), Loolkandura (Lulcondera), Kandy District, Central Province, Sri Lanka (07°08'44.96"N & 080°42'01.13"E; 1324m) coll. L.J.M.W. & I.N.B.

**Paratypes:** DWC 2015.01.001, adult female, 20.0mm SVL (Image 2); DWC 2015.01.002, adult male, 19.2mm; the same date, locality and collectors.

**Diagnosis:** Body rather small size (SVL 19–20 mm). Snout rounded in lateral aspect, bluntly pointed in dorsal and ventral aspect. Canthus rostralis rounded. Vomerine teeth, lingual papilla and nuptial pads absent. Dermal fringe distinct on inside of fingers III and IV, small

blunt tubercles on metacarpal and ulnar folds. Toes basally webbed. Interorbital area smooth. Upper eyelid prominent tubercles present. Anterior and posterior dorsum without horny spinules but tubercles present. Upper part of flank weakly granular. Supratympanic fold distinct. Prominent small calcar present at the distal end of the tibia. Throat granular, chest and belly coarsely granular.

### Description of holotype

Body small size (SVL 19.7mm), elongate (SVL/HW 2.6). Head small (HL/SVL 0.4), about as wide as long (HW/HL 1.0), convex above. Snout rounded in lateral aspect, bluntly pointed in dorsal and ventral aspect (ES/DFE 0.8, SN/IN 0.6), its length longer than horizontal diameter of eye (ES/ED 1.2). Internasal space and loreal region concave. Canthus rostralis rounded. Interorbital space convex, larger than upper eyelid (IO/UEW 1.7), and internasal distance (IN/UEW 1.4); distance between front of eyes  $3/5^{\text{th}}$  the distance between back of eyes (DBE/DFE 1.6). Nostrils oval, without flap of skin laterally, closer to tip of snout than to eye (SN/EN 0.7). Pupil horizontally elliptical. Tympanum distinct, oval (TYH/TYW 1.3), smaller than half eye diameter (TYH/ED 0.4), tympanum-eye distance  $3/4^{\text{th}}$  the tympanum width (TBE/TYW 0.8). Pineal ocellus, vomerine teeth, and lingual papilla absent. Arm short, thin (LAL/FEL 0.5, UAL/FEL 0.3). Lower arm as long as palm length (LAL/PAL 1.0), longer than upper arm (LAL/UAL 1.4). Fingers thin, 3rd finger the longest (Image 3). Relative length of fingers  $I < II < IV < III$  (FL-1/FL-3 0.6, FL-2/FL-3 0.6, FL-4/FL-3 0.8), (Table 1). Tips of fingers rounded enlarged, discs present on all fingers, with distinct basal and circum marginal grooves. Dermal fringe distinct on inside of



Image 1. *Pseudophilautus dilmah* sp. nov. holotype male in life (NMSL 2015.01.01 NH).



Image 2. *Pseudophilautus dilmah* sp. nov. paratype female in life (DWC 2015.01.001).



Image 3. *Pseudophilautus dilmah* sp. nov. holotype male (NMSL 2015.01.01 NH), ventral aspect of left hand. Scale = 2.5mm.



Image 4. *Pseudophilautus dilmah* sp. nov. holotype male (NMSL 2015.01.01 NH), ventral aspect of left foot. Scale = 2.5mm.

Table 1. The morphometric measurements (mm) of the type series of *Pseudophilautus dilmah* sp. nov.

<i>Pseudophilautus dilmah</i> sp. nov.							
	Holotype NMSL-NH	Paratype DWC	Paratype DWC		Holotype NMSL-NH	Paratype DWC	Paratype DWC
	2015.01.01	2015.01.001	2015.01.002		2015.01.01	2015.01.001	2015.01.002
Sex	Male	Female	Male	Sex	Male	Female	Male
SVL	19.7	20.0	19.2	KT	9.5	8.8	8.8
DB	0.4	0.6	0.5	LAL	5.1	4.4	4.8
DBE	6.2	6.9	7.2	MBE	3.1	3.9	3.6
DFE	4.0	4.4	4.3	MFE	5.7	6.0	5.4
DL	1.0	0.7	0.8	MN	7.1	7.8	7.4
DW	1.1	1.0	1.2	PAL	5.2	5.9	4.9
ED	2.8	2.8	2.8	SN	1.2	1.6	1.6
EN	1.7	1.8	1.9	TBE	0.7	0.5	0.7
ES	3.2	3.1	3.1	TAS	6.3	6.2	6.1
FEL	10.4	10.0	9.9	TBL	10.5	10.5	10.6
FL1	1.8	1.5	1.6	TL1	1.5	1.6	1.4
FL2	2.0	2.0	1.8	TL2	1.8	1.8	1.9
FL3	3.1	3.8	3.2	TL3	2.8	2.6	3.0
FL4	2.4	1.9	2.7	TL4	3.9	4.3	4.0
FOL	13.7	13.6	13.3	TL5	2.9	3.1	3.1
GK	8.0	7.4	8.3	TND	7.6	5.0	5.4
HD	4.5	4.5	3.6	TFE	3.6	3.3	3.5
HL	7.8	9.7	7.7	TYH	1.2	1.0	1.3
HW	7.7	8.0	8.1	TYW	0.9	1.0	1.2
IML	0.7	0.7	1.1	UAL	3.5	2.9	3.6
IN	2.0	2.0	2.0	UEW	1.4	1.8	1.5
IO	2.4	2.5	2.4	VKL	10.3	8.2	7.8

fingers III and IV, small blunt tubercles on metacarpal and ulnar folds. Rudimentary webbing present. Distal subarticular tubercles present in all fingers; prominent, rounded, single. Penultimate subarticular tubercles present in third and fourth fingers, rounded, single. Inner palmar tubercle indistinct, single, oval, larger than outer palmar tubercle. Nuptial pads absent. Outer palmar tubercle indistinct, single, oval, smaller than distal subarticular tubercles. Few supernumerary tubercles present on palm. Prepollex absent. Femur longer than fourth toe length (FEL/TL-4 2.7), foot length longer than thigh (FOL/FEL 1.3), tarsus shorter than tibia length (TAS/TBL 0.6). Toes thin, 4<sup>th</sup> toe being the longest (Image 4). Relative length of toes I < II < III < V < IV (TL-1/TL-4 0.4, TL-2/TL-4 0.5, TL-3/TL-4 0.7, TL-5/TL-4 0.7). Tips of toes rounded, enlarged, discs present on all toes with distinct basal and circum marginal grooves. All toes basally webbed. Dermal fringe present on all toes, fringe along postaxial edge of toe V, and metatarsal fold, small undulating tubercles present on outer edge of tarsal fold. Distal subarticular tubercles prominent, rounded and single, present on all toes, larger than other tubercles (except metatarsal tubercles). Penultimate subarticular tubercles present in III, IV and V toes, rounded, and single. Anti penultimate subarticular tubercles fourth and fifth toes, indistinct, rounded, and single. Few supernumerary tubercle present, indistinct. Inner metatarsal tubercle oval prominent and large, its length half in length of toe I (IML/TL-1 0.5). Outer metatarsal tubercle present, small and indistinct.

#### Skin of dorsal and lateral body

Dorsal and lateral regions of snout smooth. Prominent tubercles between eyes and on upper eyelid. Side of head smooth. Median dermal ridge absent. Anterior and posterior part of back with tubercles, without horny spinules. Upper part of flank weakly granular. Lower part of flank granular. Latero-dorsal folds, lateral line system, fejevarya line, cephalic ridges, and co-ossified skin absent. Supratympanic fold distinct. Upper arm, lower arm, and foot smooth. Anterior, dorsal, and posterior part of thigh smooth. Leg, and tarsus smooth with few tubercles. Prominent small calcar present at the distal end of the tibia. Hand smooth.

#### Skin of ventral part

Throat granular, margin of throat smooth with prominent tubercles. Chest and belly coarsely granular. Upper arm granular. Lower arm smooth. Thigh smooth. Leg smooth. Tarsus smooth. Vent anteriorly smooth, either side weakly granular. Macroglans absent.

#### Colour in life

Dorsum cream with light brown patches, dark brown cross band between eyes, pair of dark brown dots placed behind the cross band, a pair of broad light brown longitudinal bands ending at the sacrum, dark brown blotches on groin, lateral body lighter with a light olive greenish tinge; limbs cream, fore limbs, hind limbs, fingers and toes with light brown cross bands; ventral side belly off white with light brown blotches, chest off white with few blotching, throat uniform off white, hands, feet and webbing lighter (Image 1).

#### Colour in alcohol

Colour pattern remains with a little darkening, ventral side off white with dark brown blotching.

#### Colour variation

Dorsal colour varies ranging to a lighter brownish tinge, and at the ventral side belly shows prominent dark blotches.

#### Etymology

The species epithet *dilmah* is named after Dilmah Conservation, for its dedicated efforts to biodiversity conservation on the Island. Dilmah is treated as an invariable noun in apposition to the generic name.

#### Suggested vernacular names

Dilmah panduru madiya, and Dilmah Shrub Frog in Sinhala, and English respectively.

#### Molecular analysis

The final alignment consisted of a total of 590 base pairs (bp). Model test identified Tamura & Nei (1993) nucleotide substitution model with gamma distribution (BIC = 7964.99, lnL = -3360.55, G = 0.26) as the best-fit model. Maximum likelihood analysis of the 16S rRNA fragment (Fig. 2) places *Pseudophilautus dilmah* sp. nov. in a monophyletic group along with *P. schmarda* (Kelaart 1854) and *P. hankenii* Meegaskumbura & Manamendra-Arachchi 2011. Pairwise genetic distance between *P. dilmah* sp. nov. and *P. schmarda* was 1.9% while it was 1.6% between the former and *P. hankenii*. There was a 10% divergence in the 16s rRNA gene between *P. dilmah* sp. nov. and *P. bambaradeniyai* Wickramasinghe et al. 2012, the morphologically most closely related species.

#### Comparison

A critical comparison was made amongst all congeners, and Table 2 provides discriminating morphological characters against all congeners, while

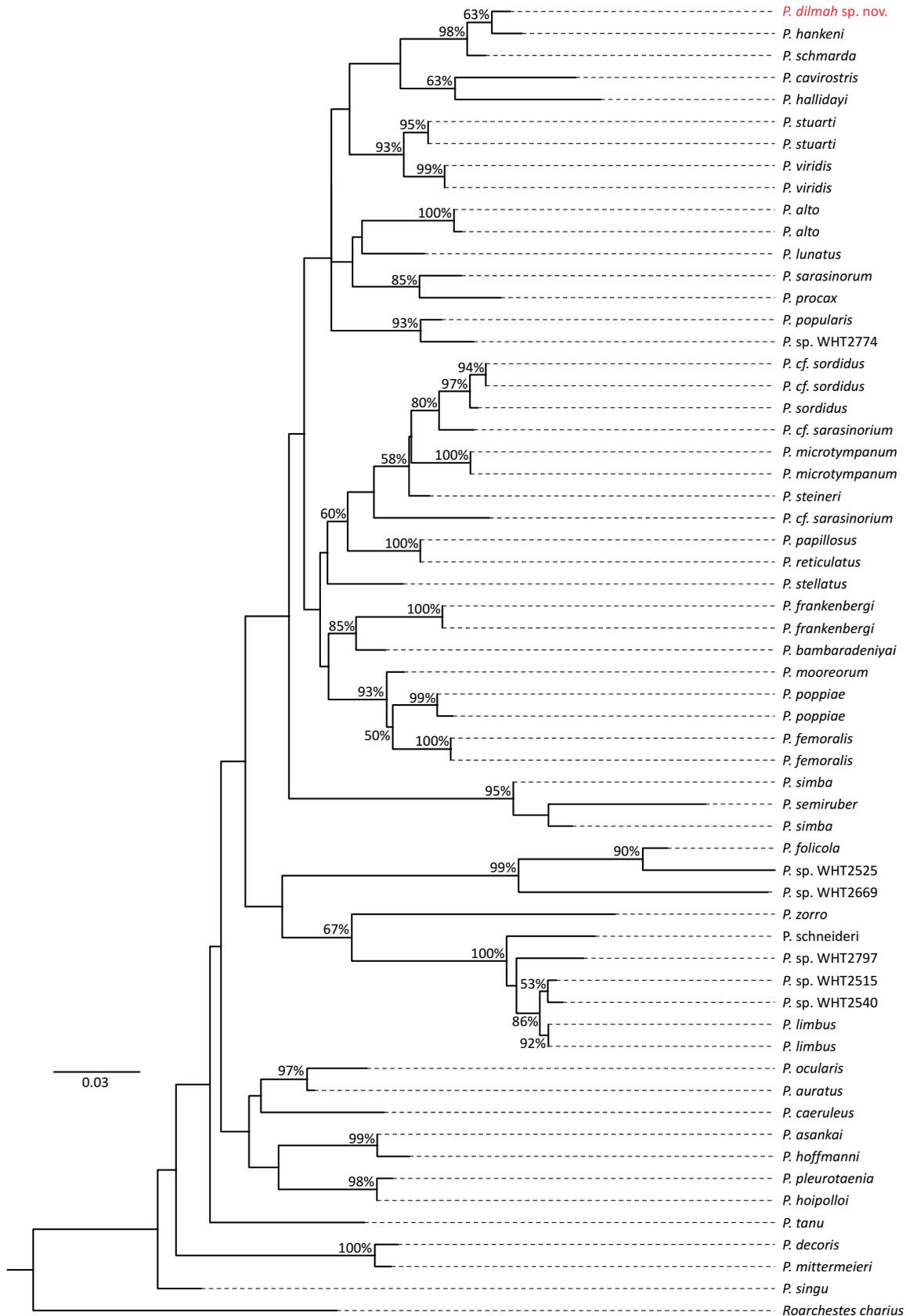


Figure 2. Maximum likelihood tree of 16S rRNA gene fragments, with bootstrap values shown at nodes. *Pseudophilautus dilmah* sp. nov. (marked with an asterisk) is placed in a monophyletic clade with *P. schmarda* and *P. hankeni*.

**Table 2.** Characters that differentiate *Pseudophilautus dilmah* sp. nov., among congeners of the genus *Pseudophilautus*. An empty cell in the table denotes either the same character as that of the new species, or for few extinct species when there was no data available.

Species name	SVL	Head dorsally	Snout lateral	Canthus rostralis	Vomerine teeth	Lingual papilla	Fringe on fingers	Nuptial pad	Calcar
<i>P. dilmah</i> sp. nov.	19.2–20.0	Convex	Rounded	Rounded	Absent	Absent	Present	Absent	Present
<i>P. bambaradeniyai</i>	17.3–20.2		Truncate				Absent		Absent
<i>P. decoris</i>	18.3–23.9	Flat	Obtusely pointed			Present			
<i>P. hankeni</i>	18.3–21.9		Pointed				Absent		
<i>P. mittermeieri</i>	16.3–18.4		Pointed						
<i>P. schmarda</i>	17.7–30.0		Obtusely pointed	Sharp					
<i>P. singu</i>	16.1–16.6					Present	Absent		
<i>P. abundus</i>	25.4–37.0	Concave	Pointed or oval		Present	Present			Absent
<i>P. adpersus</i>	33.3–41.7	Flat	Truncate	Sharp					Absent
<i>P. alto</i>	17.0–27.5		Obtusely pointed					Present	
<i>P. asankai</i>	18.9–27.3		Obtusely pointed						Absent
<i>P. auratus</i>	21.7–26.4	Flat	Blunt		Present				Absent
<i>P. caeruleus</i>	16.3–19.0	Flat	Obtusely pointed	Sharp		Present	Absent		Absent
<i>P. cavirostris</i>	38.4–48.9	Concave	Oval	Sharp	Present				
<i>P. cuspis</i>	17.6–28.9		Sharply Pointed	Sharp			Absent	Present	
<i>P. dayawansai</i>	24.5–30.1		Truncate			Present			
<i>P. dimbullae</i>	44.8		Truncate	Sharp	Present				Absent
<i>P. eximius</i>	35.3	Flat		Sharp		Present			Absent
<i>P. extirpo</i>	43.5	Flat	Blunt	Sharp		Present			Absent
<i>P. femoralis</i>	23.4–28.8	Flat	Truncate						Absent
<i>P. fergusonianus</i>	26.9–44.5	Concave or flat			Present			Present	Absent
<i>P. folicola</i>	23.7–29.4	Flat		Sharp	Present				Absent
<i>P. frankenbergi</i>	26.7–29.3	Flat		Sharp					
<i>P. fulvus</i>	33.4–46.8			Sharp	Present			Present	
<i>P. hallidayi</i>	32.9–42.9				Present			Present	Absent
<i>P. halyi</i>	27.9	Uneven		Sharp				Present	Absent
<i>P. hoffmanni</i>	21.2–23.4	Flat							Absent
<i>P. hoipolloi</i>	22.0–28.6		Blunt						Absent
<i>P. hypomelas</i>	11.2–22.4		Acuminate				Absent		Absent
<i>P. jagathgunawardanai</i>	35.8–40.4			Sharp		Present	Absent		Absent
<i>P. karunarathnai</i>	16.2–19.2				Present			Present	Absent
<i>P. leucorhinus</i>	19.8	Flat	Oval	Sharp			Absent		Absent
<i>P. limbus</i>	25.7	Concave	Obtusely pointed		Present	Present	Absent		
<i>P. lunatus</i>	40.9	Flat	Oval		Present	Present			
<i>P. macropus</i>	27.4–42.7		Oval		Present	Present		Present	Absent
<i>P. maia</i>	46.6	Concave	Truncate	Sharp	Present				Absent
<i>P. malcolmsmithi</i>	14.9		Pointed	Sharp			Absent		
<i>P. microtypanum</i>	23.9–49.0		Oval		Present			Present	
<i>P. mooreorum</i>	29.4–35.0	Flat							Absent
<i>P. nanus</i>	34.8		Oval		Present		Absent	Present	Absent
<i>P. nasutus</i>	17.4		Pointed	Sharp			Absent		
<i>P. nemus</i>	20.7		Obtusely pointed				Absent	Present	Absent
<i>P. newtonjayawardanei</i>	38.4	Concave							Absent
<i>P. ocularis</i>	23.1–33.4	Flat	Blunt		Present				
<i>P. oxyrhynchus</i>	18.6	Flat	Pointed	Sharp			Absent		

Species name	SVL	Head dorsally	Snout lateral	Canthus rostralis	Vomerine teeth	Lingual papilla	Fringe on fingers	Nuptial pad	Calcar
<i>P. papillosus</i>	40		Truncate	Sharp	Present	Present		Present	
<i>P. pardus</i>	32.1			Indistinct			Absent		Absent
<i>P. pleurotaenia</i>	25.6–30.3		Truncate						Absent
<i>P. poppiae</i>	21.3–26.0								Absent
<i>P. popularis</i>	17.7–24.7						Absent	Present	Absent
<i>P. procax</i>	25.1–26.8	Concave	Pointed or oval		Present	Present			Absent
<i>P. puranappu</i>	33.6–51.1	Concave			Present	Present	Absent	Present	Absent
<i>P. regius</i>	18.3–21.7	Flat	Oval					Present	Absent
<i>P. reticulatus</i>	42.5–61.1	Convex or flat	Truncate or oval	Sharp	Present	Present		Present	
<i>P. rugatus</i>	17.5			Sharp			Absent		
<i>P. rus</i>	20.6–24.1	Flat	Oval		Present		Absent		Absent
<i>P. samarakoon</i>	20.4–24.6		Truncate						
<i>P. sarasinorum</i>	22.6–38.1	Flat				Present	Absent		Absent
<i>P. schneideri</i>	19.9–22.8		Pointed	Sharp	Present		Absent		
<i>P. semiruber</i>	13.4		Oval						Absent
<i>P. silus</i>	35.4–51.8		Oval	Sharp	Present			Present	Absent
<i>P. silvaticus</i>	24.3–31.3		Oval	Sharp	Present	Present	Absent		Absent
<i>P. samba</i>	12.6–15.6		Truncate				Absent		Absent
<i>P. sirilwijesundarai</i>	22.3–32.5				Present				Absent
<i>P. sordidus</i>	22.2–39.4		Blunt		Present	Present	Absent		Absent
<i>P. steineri</i>	30.4–41.6	Flat		Sharp	Present			Present	Absent
<i>P. stellatus</i>	39.6–55.3	Concave			Present				
<i>P. stictomerus</i>	23.2–36.0		Obtusely pointed		Present		Absent	Present	Absent
<i>P. stuarti</i>	24.2–32.4	Flat		Sharp			Absent		Absent
<i>P. tanu</i>	13.5–13.9		Obtusely pointed				Absent		
<i>P. temporalis</i>	28.4–31.0				Present		Absent		Absent
<i>P. variabilis</i>	35.7	Flat	Truncate						
<i>P. viridis</i>	27.4–36.3		Blunt or rounded	Indistinct					Absent
<i>P. zal</i>	20.0–32.5							Present	Absent
<i>P. zimmeri</i>	31.6		Blunts	Sharp	Present			Present	
<i>P. zorro</i>	22.9–30.1	Concave	Pointed	Sharp			Absent	Present	

Table 3 provides discriminating characters of the skin and it was evident that *Pseudophilautus dilmah* sp. nov., resembles *P. bambaradeniyai* (Image 5), due to similar colour pattern, comparable adult body size, and because both species are found in the Central Hills. *Pseudophilautus dilmah*, can be easily differentiated from *P. bambaradeniyai* by the absence of horny spinules on the anterior dorsum (vs present), snout rounded in lateral aspect (vs truncate), fringe on fingers present (vs absent), and calcar present (vs absent).

Although *P. dilmah* sp. nov., is genetically most closest to *P. hankenii* (Image 6) and *P. schmarda* (Image 7), with genetic distances of 1.6% and 1.9% respectively, the species is morphologically distinct and can be

separated by the presence of the following combination of characters: from *P. hankenii*, by snout in lateral aspect rounded (vs pointed), fringe on fingers present (vs absent), interorbital area smooth (vs glandular warts bearing horny spinules), dorsum having tubercles (vs glandular warts bearing horny spinules), upper flank weakly granular (vs glandular warts bearing horny spinules), chest and belly coarsely granular (vs granular); from *P. schmarda* by snout rounded in lateral aspect (vs obtusely pointed), canthus rostralis rounded (vs sharp), interorbital area smooth (vs glandular folds, glandular warts and horny spinules), dorsum having tubercles (vs glandular folds, glandular warts and horny spinules), upper flank weakly granular (vs glandular warts bearing



Image 5. *Pseudophilautus bambaradeniyai* holotype male in life (NMSL 2013.01.01 NH).



Image 6. *Pseudophilautus hankeni* unpreserved male specimen.



Image 7. *Pseudophilautus schmarda* unpreserved female specimen.

horny spinules), throat granular (vs glandular warts), chest and belly coarsely granular (vs granular), underside of thigh smooth (vs granular).

To a lesser extent *P. dilmah* may be confused with *P. decoris* (Manamendra-Arachchi & Pethiyagoda 2005),

*P. mittermeieri* (Meegaskumbura & Manamendra-Arachchi 2005), and *P. singu* (Meegaskumbura et al., 2009), because of similar morphological characters, hence these species were included at the beginning of the comparison tables.

## DISCUSSION

*Pseudophilautus dilmah* sp. nov., appears to be more resembling to *P. bambaradeniyai*, (Fig. 2) than to any other species of the same genus. But considering molecular evidences *P. bambaradeniyai* has been placed in a well separated clade with *P. frankensbergi* (Meegaskumbura & Manamendra-Arachchi 2005) with a pairwise genetic distance of 10%, which suggests a species level divergence. Although they were both found from the Central Hills they are allopatric. Lookandura the type locality of *P. dilmah* sp. nov., is positioned towards the northern tip of the Central Hills where as Peak Wilderness the type locality of *P. bambaradeniyai*, and the only locality it is found in, is positioned towards south-west of Lookandura (Fig. 1).

Although *P. dilmah* sp. nov., is genetically most closest to *P. hankeni* and *P. schmarda*, with genetic distances of 1.6% and 1.9%, respectively, the species is morphologically distinct and can be separated by the characters mentioned in the comparison. Furthermore *P. hankeni* is distributed in the Knuckles massif which is geographically well separated, and although *P. schmarda* is distributed in the Central Hills they are allopatric (Fig. 1). Although 3% genetic distance is a good indication Vences et al. (2005) mention that interspecies genetic distances could be from 1% to 10% and allopatric species are known with less than 3% differences. The pairwise distance for *P. pleurotaenia* (Boulenger 1904) and *P. hoipolloi* (Manamendra-Arachchi & Pethiyagoda 2005), for *P. asankai* (Manamendra-Arachchi & Pethiyagoda 2005) and *P. hoffmanni* (Meegaskumbura & Manamendra-Arachchi 2005), for *P. decoris* and *P. mittermeieri*, were 0.5%, 1%, and 1.4%, respectively. All of which are considered valid morphologically yet have a lower genetic distance than 1.6% for *P. dilmah* and *P. hankeni*, and 1.9% for *P. dilmah* and *P. schmarda*, hence our current genetic distances from its sister taxa suggests species level divergence.

Although to a lesser extent considering morphological characteristics *P. dilmah* may be confused with *P. decoris*; distributed in the Rakwana range, pairwise genetic distance of 18.3%; with *P. mittermeieri*; distributed in the lowland rain forests to lower montane



Image 8. Tea plantations at the edge of a forest patch.



Image 9. Unreachable areas of pristine forests surrounded by tea plantations.



Image 10. The forest fragmentation spread over a large area of the Loolkandura, threatened habitat.



Image 11. Forest fragmentation.

rain forests, pairwise genetic distance of 17.3%, and with *P. singu*; distributed in the lowland rain forests, pairwise genetic distance of 10.1%, considering their geographic distribution and molecular divergence the new species is well separated from all the above three species.

The natural forest cover in the type locality is fast declining mainly due to encroachment by tea plantations (Images 8–10), which has evidently led to forest fragmentation (Image 11). In order to protect the species from habitat loss, the few remaining areas which is home to the species needs legal protection. It is hoped with the discovery of the species in this locality the authorities will take necessary measures to protect the natural forest cover which is home to the newly described species *P. dilmah*.

#### Proposed conservation status

The species was recorded from an elevation of about 1300m, and commonly seen perched on 1–2m high bushes. The specimens were found in natural

forest cover as well as in the disturbed areas, with no canopy cover and in areas with regenerated forest covers. The area which the species was reported is currently under severe anthropogenic pressures. Since the colonial period the area was subjected to clearing of pristine forest covers for coffee, cinchona and later tea and cardamom plantations. A few remnant patches of unique “mid elevation lower montane forest”, which shows the mixed characteristics of montane forests and lower montane forests, exist in some areas. Especially, natural forests remain only in the tough terrains where colonials could not spread the plantations and most of the stream banks are also severely affected due to encroaching tea cultivations (Images 8–11).

The proposed conservation status for the species according to the IUCN Red List Criteria can be considered Critically Endangered (criteria B1ab(iii)). Since the extent of occurrence is <100km<sup>2</sup>, is recorded from a single location, and their habitats under sever threat.

**Table 3. Characters in the skin structure that differentiate *Pseudophilautus dilmah* sp. nov., among congeners of the genus *Pseudophilautus*. An empty cell in the table denotes either the same character as that of the new species, or for few extinct species when there was no data available.**

Species name	Interorbital area	Anterior dorsum	Posterior dorsum	Upper flank	Throat	Chest	Belly	Underside of thigh
<i>P. dilmah</i> sp. nov.	Smooth	Tubercles	Tubercles	Weakly granular	Granular	Coarsely granular	Coarsely granular	Smooth
<i>P. bambaradeniyai</i>		Prominent tubercles and horny spinules	Horny spinules	Smooth	Weakly granular	Weakly granular	Granular	
<i>P. decoris</i>	Glandular warts	Glandular warts	Glandular warts	Glandular warts	Glandular, warty, or roughly granular			Granular
<i>P. hankeni</i>	Glandular warts bearing horny spinules	Glandular warts bearing horny spinules	Glandular warts bearing horny spinules	Glandular warts bearing horny spinules		Granular	Granular	
<i>P. mittermeieri</i>	Glandular warts	Glandular warts	Glandular warts	Glandular warts		Granular	Granular	Granular
<i>P. schmarda</i>	Glandular folds, glandular warts and horny spinules	Glandular folds, glandular warts and horny spinules	Glandular folds, glandular warts and horny spinules	Glandular folds, glandular warts and horny spinules	Glandular warts	Granular	Granular	Granular
<i>P. singu</i>	Scattered, glandular tubercles	Scattered, glandular tubercles	Scattered, glandular tubercles	Scattered, glandular tubercles		Granular	Granular	
<i>P. abundus</i>		Horny spinules (absent in females)	Horny spinules (Absent in females)	Smooth	Coarsely granular		Granular	Granular
<i>P. adspersus</i>	Smooth except for a few scattered glandular warts	Smooth except for a few scattered glandular warts	Smooth	Granular	Weakly granular			Weakly granular
<i>P. alto</i>	Horny spinules in males	Horny spinules in males, warty in females	Horny spinules in males, warty in females	Horny spinules in males		Granular	Granular	Granular
<i>P. asankai</i>	Very fine, horny spinules	Very fine, horny spinules	Very fine, horny spinules	Horny spinules		Granular	Granular	Granular
<i>P. auratus</i>	Shagreened	Shagreened	Shagreened	Granular or smooth	Smooth or granular	Smooth or granular	Granular	Granular
<i>P. caeruleus</i>	Glandular warts and horny spinules	Glandular warts and horny spinules (females lack horny spinules)	Glandular warts and horny spinules (females lack horny spinules)	Glandular warts and horny spinules	Granular with scattered glandular warts, smooth in females	Granular in males, smooth in females		Granular
<i>P. cavirostris</i>	Glandular warts	Heavily tuberculated, glandular warts	Heavily tuberculated, glandular warts	Smooth	Smooth	Smooth	Granular	Granular
<i>P. cuspis</i>	Horny spinules	Horny spinules with a "J" shaped pattern of tubercles	Horny spinules	Smooth or with glandular warts	Smooth	Smooth or granular	Granular	Granular
<i>P. dayawansai</i>	Smooth, with a ridge across braking medially	Smooth	Weakly tubercular	Granular	Shagreened	Weakly granular	Granular	Weakly granular
<i>P. dimbullae</i>	Shagreened	Shagreened	Shagreened	Shagreened	Weakly granular	Weakly granular		Coarsely granular
<i>P. eximius</i>		Smooth	Smooth	Smooth	Smooth	Weakly granular		Coarsely granular
<i>P. extirpo</i>	Shagreened	Shagreened, with a few glandular warts	Shagreened, with a few glandular warts	Granular	Weakly granular	Weakly granular		Coarsely granular
<i>P. femoralis</i>	Finely granular	Finely granular	Finely granular	Finely granular	Smooth	Weakly granular		Coarsely granular
<i>P. fergusonianus</i>	Shagreened, males glandular warts and horny spinules	Shagreened, Males glandular warts and horny spinules	Few glandular warts, males with glandular warts and horny spinules	Shagreened, males with glandular warts and horny spinules	Weakly granular	Smooth, granular	Granular	Granular
<i>P. folicola</i>		Smooth or granular	Smooth	Granular	Granular or smooth	Granular or smooth	Granular	Granular

Species name	Interorbital area	Anterior dorsum	Posterior dorsum	Upper flank	Throat	Chest	Belly	Underside of thigh
<i>P. frankenbergi</i>	Shagreened	Shagreened, horny spinules scattered	Shagreened, horny spinules scattered	Shagreened		Granular	Granular	Granular
<i>P. fulvus</i>	Shagreened	Shagreened	Shagreened	Shagreened		Granular	Granular	Granular
<i>P. hallidayi</i>	Glandular warts, with horny spinules in males	Glandular warts, with horny spinules in males	Glandular warts, with horny spinules in males	Glandular warts, with horny spinules in males	Smooth, granular in males	Smooth, granular in males	Granular	Granular
<i>P. halyi</i>	Shagreened with glandular warts	Shagreened with glandular warts	Shagreened with glandular warts	Glandular warts		Granular	Granular	Granular
<i>P. hoffmanni</i>		Smooth	Smooth	Smooth		Granular	Granular	
<i>P. hoipolloi</i>		Smooth or shagreened	Smooth or shagreened	Smooth or granular	Shagreened	Shagreened	Granular	Granular
<i>P. hypomelas</i>		Smooth	Smooth	Smooth	Smooth	Smooth	Granular	Weakly granular
<i>P. jagathgunawardanai</i>	Smooth, with two cross dermal fringes	Smooth	Smooth	Smooth	Weakly granular	Weakly granular	Granular	Granular
<i>P. karunarathnai</i>	Weakly tubercular	Smooth	Spinulate			Granular	Granular	Granular
<i>P. leucorhinus</i>		Smooth with a few scattered glandular warts	Smooth with a few scattered glandular warts	Smooth with glandular warts	Granular, but not rough	Granular, but not rough		Coarsely granular
<i>P. limbus</i>	Weakly granular	Weakly granular	Weakly granular	Granular		Granular	Granular	Granular
<i>P. lunatus</i>		Smooth	Smooth	Glandular warts	Smooth	Smooth	Smooth	
<i>P. macropus</i>	Smooth with a few scattered glandular warts	Shagreened or smooth, with a few scattered glandular warts	Shagreened or smooth, with a few scattered glandular warts	Granular with a few scattered glandular warts	Smooth or granular	Granular	Granular	Smooth, distally granular.
<i>P. maia</i>		Glandular warts	Glandular warts	Glandular warts		Granular	Granular	Granular
<i>P. malcolmsmithi</i>		Smooth, '\ /' shaped ridge	Smooth	Glandular warts	Smooth	Smooth	Granular	Granular
<i>P. microtypanum</i>		Smooth above, shagreened and with glandular warts, males with horn like spinules	Smooth above, shagreened and with glandular warts, males with horn like spinules	Granular		Granular	Granular	Granular
<i>P. mooreorum</i>	Horny spinules in males	Horny spinules in males, finely granular or shagreened in female	Horny spinules in males, finely granular or shagreened in female	Horny spinules in males		Granular	Granular	Granular
<i>P. nanus</i>	Few glandular warts	Few glandular warts	Few glandular warts	Glandular folds	Weakly granular	Weakly granular		
<i>P. nasutus</i>	Glandular warts	Tuberculated, horn like spinules	Tuberculated, horn like spinules	Smooth		Granular	Granular	Granular
<i>P. nemus</i>		Glandular warts	Glandular warts	Smooth	Granular but not rough			Granular
<i>P. newtonjayawardanei</i>	Shagreened, with a prominent ridge	Shagreened	Shagreened	Shagreened		Granular	Granular	Granular
<i>P. ocularis</i>	Shagreened or with glandular warts	Shagreened or with glandular warts	Shagreened or with glandular warts	Shagreened or glandular warts	Granular or with glandular folds	Granular or with glandular folds	Granular or with glandular folds	Granular or glandular folds
<i>P. oxyrhynchus</i>		Smooth	Smooth	Smooth	Smooth	Smooth	Granular	
<i>P. papillosus</i>	Glandular warts	Glandular warts	Glandular warts	Glandular warts		Granular	Granular	Granular
<i>P. pardus</i>		Smooth	Smooth	Granular	Weakly granular			Coarsely granular

Species name	Interorbital area	Anterior dorsum	Posterior dorsum	Upper flank	Throat	Chest	Belly	Underside of thigh
<i>P. pleurotaenia</i>	Shagreened	Shagreened with a few scattered glandular warts and horny spinules (males)	Shagreened, few scattered glandular warts and horny spinules (males)	Shagreened, few scattered glandular warts, and horny spinules		Granular	Granular	Granular
<i>P. poppiae</i>	Horny spinules in males, finely granular or shagreened in female	Horny spinules in males, finely granular or shagreened in female	Horny spinules in males, finely granular or shagreened in female	Horny spinules in males, finely granular or shagreened in female		Granular	Granular	
<i>P. popularis</i>		Horny spinules	Horny spinules	Horny spinules		Granular	Granular	Granular
<i>P. procox</i>		Horny spinules (spinules Absent in females)	Horny spinules (spinules Absent in females)	Smooth	Coarsely granular		Granular	Granular
<i>P. puranappu</i>		Weakly shagreened	Few horny spinules, Prominent tubercles	Weakly tubercular	Weakly granular	Weakly granular	Granular	Weakly granular
<i>P. regius</i>	Horny spinules	Horny spinules	Horny spinules	Glandular		Granular	Granular	Granular
<i>P. reticulatus</i>	Shagreened with a few scattered glandular warts	Shagreened with a few scattered glandular warts, finely tuberculated	Shagreened with a few scattered glandular warts, finely tuberculated	Shagreened with a few scattered glandular warts	Smooth or granular	Smooth or granular	Granular	Granular
<i>P. rugatus</i>	Smooth except for a few scattered glandular warts	Smooth except for a few scattered glandular warts	Smooth except for a few scattered glandular warts	Glandular warts	Weakly granular	Smooth except for mid-area, which is granular		Coarsely granular
<i>P. rus</i>		Glandular warts	Glandular warts	Granular		Granular	Granular	Granular
<i>P. samarakoon</i>	Tubercular			Tubercular	Weakly granular	Weakly granular	Granular	Weakly granular
<i>P. sarasinorum</i>	Glandular warts	Glandular warts, males with horny spinules scattered	Glandular warts, males with horny spinules scattered	Glandular folds	Glandular warts	Smooth	Granular	
<i>P. schneideri</i>	Small tubercles with horny spinules	Small tubercles with horny spinules	Small tubercles with horny spinules	Small tubercles with horny spinules		Granular	Granular	
<i>P. semiruber</i>		Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	
<i>P. silus</i>		Glandular warts	Glandular warts	Glandular warts		Granular	Granular	Granular
<i>P. silvaticus</i>	Glandular warts	Glandular warts	Smooth	Glandular warts	Granular in males, smooth in females	Granular in males, smooth in females	Granular in males	Granular
<i>P. samba</i>		Glandular warts	Smooth		Weakly granular	Weakly granular		Coarsely granular
<i>P. siriwijesundarai</i>	A prominent tubercle present	Shagreen with few tubercles	Shagreen	Areolate	Shagreen	Weakly granular		Granular
<i>P. sordidus</i>	Glandular warts	Glandular warts, males horny spinules scattered	Glandular warts, males horny spinules scattered	Glandular warts, with horny spinules in males	Smooth	Smooth	Granular	Granular
<i>P. steineri</i>	Glandular warts and horny spinules	Glandular warts and horny spinules, females lack horny spinules	Glandular warts and horny spinules, females lack horny spinules	Glandular warts and horny spinules		Granular	Granular	Granular
<i>P. stellatus</i>	Weakly shagreened	Weakly shagreened	Weakly shagreened	Shagreened to weakly areolate	Weakly granular	Weakly granular	Granular	Granular
<i>P. stictomerus</i>		Shagreened, horny spinules in males	Shagreened, horny spinules in males	Shagreened, horny spinules in males	Smooth or shagreened	Smooth or shagreened	Granular	Granular
<i>P. stuarti</i>	Horny spinules	Horny spinules, females lack horny spinules	Horny spinules, females lack horny spinules	Smooth		Granular	Granular	Granular
<i>P. tanu</i>	Shagreened	Shagreened	Shagreened	Granular		Granular	Granular	Granular

Species name	Interorbital area	Anterior dorsum	Posterior dorsum	Upper flank	Throat	Chest	Belly	Underside of thigh
<i>P. temporalis</i>		Smooth	Smooth	Smooth	Smooth	Smooth		Weakly granular
<i>P. variabilis</i>		Smooth	Smooth	Granular		Granular	Granular	Granular
<i>P. viridis</i>	Horny spinules (smooth in females and immature males)	Horny spinules (smooth in females and immature males)	Horny spinules (smooth in females and immature males)	Horny spinules (smooth in females and immature males)		Granular	Granular	Granular
<i>P. zal</i>	Shagreened	Weakly tubercular	Weakly tubercular	Granular		Granular	Granular	Granular
<i>P. zimmeri</i>	Glandular warts	Glandular warts	Glandular warts	Granular		Granular	Granular	Granular
<i>P. zorro</i>	Horny spinules	Horny spinules, Anterior dorsum with "(/)-shaped pattern of tubercles	Horny spinules	Glandular warts	Smooth	Mid chest smooth	Granular	

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## Appendix 1. Material examined

*Pseudophilautus abundus* (Manamendra-Arachchi & Pethiyagoda 2005). Holotype: WHT 3006; Labugama Forest Reserve, Labugama, alt. 78m (06°51'N & 080°10'E); Paratypes: WHT 2302; 2303; 3457; 3459; 3494; 3496, Dediyaigala Forest Reserve, Akuressa, alt. 150m (06°10'N & 080°26'E); WHT 1711; 3455; 3456; 3495, Kanneliya (Galle), alt. 150m (06°15'N & 080°20'E).

*Pseudophilautus alto* (Manamendra-Arachchi & Pethiyagoda 2005). Holotype: WHT 2721; Paratypes: WHT 2723; 2718; 2719; 2720; 2722; 2724; Horton Plains National Park, alt. 2135m (06°46'N & 080°47'E).

*Pseudophilautus asankai* (Manamendra-Arachchi & Pethiyagoda 2005). Holotype: WHT 3507; Paratypes: WHT 3504; 3505; 3506; 5425, Agra Arboretum, Torrington Estate, near Agarapatana, alt. 1665m (06°50'36" N, 80°40'40" E); WHT 2100, Moray Estate, Rajamally, alt. 1370m (06°48'N & 80°31'E); WHT 5472, Dayagama Estate, 3rd division, Dayagama, alt. 1830m (06°50'N & 80°40'E).

*Pseudophilautus auratus* (Manamendra-Arachchi & Pethiyagoda 2005). Holotype: WHT 2356; Paratypes: WHT 2357; 2375; 2433; 2782, Morningside Forest Reserve (near Rakwana), alt. 1060m (06°24'N & 080°38'E); WHT 3282, Handapan Ella Plains (near Rakwana), alt. 1270m (06°26'N & 080°36'E); WHT 3298, Sinharaja World Heritage Site (near Kudawa), alt. 513m (06°25'N & 080°25'E).

*Pseudophilautus bambaradeniyai* Wickramasinghe, Vidanapathirana, Rajeev, Ariyaratne, Chanaka, Priyantha, Bandara & Wickramasinghe 2013. Holotype: NMSL 2013.01.01 NH; Paratypes: DWC 2013.01.001, DWC 2013.01.002, Sripada World Heritage Site, (Adam's peak), Ratnapura District, alt. 1334m (06°48'31.38" N, 080°28'14.46" E).

*Pseudophilautus caeruleus* (Manamendra-Arachchi & Pethiyagoda 2005). Holotype: WHT 2514; Paratypes: WHT 2511; 2512; 2513, Bogawanthalawa–Balangoda road (near Udugama), alt. 810m (06°44'N & 80°41'E); WHT 2101A; 2101B, Moray Estate, Rajamally, alt. 1370m (06°48'N & 80°31'E).

*Pseudophilautus cavirostris* (Günther 1869). WHT 1294, Haycock (Hiniduma, Galle), alt. 660m (06°20'N & 80°18'E); WHT 3299; 3300, Sinharaja World Heritage Site, Weddagala, alt. 513m (06°25'N & 80°25'E); WHT 3389, Kitulgala, alt. 200m (07°00'N & 80°24'E); WHT 2318; Kosmulla near Neluwa, alt. 450m (06°23'N & 80°23'E); WHT 2046; 2425, Pathanegala (Knuckles), alt. 1,000m (07°33'N & 80°44'E); WHT 2045; Kadugannawa, alt. 450m (07°15'N & 80°30'E); WHT 3483; Pussellawe, alt. 986m (07°00'N & 080°54'E).

*Pseudophilautus cuspis* (Manamendra-Arachchi & Pethiyagoda 2005). Holotype: WHT 1177(e); Paratypes: WHT 1177(a); 1177(b); 1177(c); 1177(d); 1177(f); 1177(g); 1177(h); 1177(i); 1177(j), Koskulana (near Panapola), alt. 460m (06°25'N & 080°27'E).

*Pseudophilautus dayawansai* Wickramasinghe, Vidanapathirana, Rajeev, Ariyaratne, Chanaka, Priyantha, Bandara & Wickramasinghe 2013. Holotype: NMSL 2013.02.01 NH; Paratypes: DWC 2013.01.003, DWC 2013.01.004, Sripada World Heritage Site, (Adam's peak), Ratnapura District, alt. 1679m (06°48'30.89" N 080°29'19.18" E).

*Pseudophilautus decoris* (Manamendra-Arachchi & Pethiyagoda 2005). Holotype: mature female, 23.9 mm SVL, WHT 2358; Paratypes: WHT 3194; 3257; 3258; 3265; 3266; 3267; 3268; 3269; 3271; 3270; 3272; Morningside Forest Reserve (near Rakwana), alt. 1060m (06°24'N & 080°38'E).

*Pseudophilautus dimbullae* (Shreve, 1940). Holotype: MCZ A- 20878; Queenwood Estate, Dimbulla.

*Pseudophilautus eximius* (Shreve, 1940). Holotype: MCZ A-20879, Queenwood Estate, Dimbulla.

*Pseudophilautus femoralis* (Günther 1864). WHT2701; 2702; 2703; 2704; 2705; 2706; 2707; 3540; 3537; 3538; 3539; 2478; 2479, 7 Jun. 1999, Horton Plains National Park, alt. 2135m (06°46'N & 80°47'E).

*Pseudophilautus fergusonianus* (Ahl 1927). WHT 731; 2233, Kumaradola, Monaragala, alt. 305m (06°53'N & 081°22'E); WHT 1012, Kitulhela (near Moragahapitiya), Monaragala, alt. 520m (07°20'N & 81°28'E); WHT 2400; 2401; Sera Ella (near Pottotawela), Knuckles, alt. 460m (07°35'N & 80°45'E); WHT 2038; 2039; 2040, Puwakpitiya (near Laggala), Knuckles, alt. 450m (07°34'N & 80°45'E); WHT 3360, Deniyaya, alt. 460m (06°21'N & 080°34'E); WHT 3361; 3362; 3363; 3364; 3365, Pitadeniya (near Watugala), alt. 320m (06°22'N & 080°28'E) WHT 3168; 3177; 3195, Gannoruwa Forest reserve, Kandy, alt. 684m (07°17'N & 080°35'E); WHT 3178; 3179; 27; 3180; 3181; 3182, Puwakpitiya, Knuckles, alt. 414m (07°34'N & 080°44'E); WHT 3229, Hantana, Kandy, alt. 600m (07°15'N & 080°37'E); WHT 3380; WHT 3381; NMSL 2006.64.1, Medapitiya, Wasgamuwa.

*Pseudophilautus folicola* (Manamendra-Arachchi & Pethiyagoda 2005). Holotype: mature female, 29.4mm SVL, WHT 2645; Paratypes: WHT 2646; 2647; 2649; 2650; 2651; 2652, Kottawa (Galle), alt. 60m (06°06'N & 080°20'E).

*Pseudophilautus frankenbergi* (Meegaskumbura & Manamendra-Arachchi 2005). Holotype: WHT 2554; Paratypes: WHT 2551; 2552; 2555; 2556, Namunukula Peak, alt. 1980m (06°56'N & 081°07'E); WHT 2726; 2727; 2728; Horton Plains National Park, alt. 2135m (06°46'N & 081°07'E).

*Pseudophilautus fulvus* (Manamendra-Arachchi & Pethiyagoda 2005). Holotype: WHT 2949; Paratypes: WHT 2948, Laggala (Knuckles), alt. 1220m (07°33'N & 080°44'E); WHT 3112; 3114; 3463, Moussakanda, Gammaduwa, Knuckles, alt. 915m (07°34'N & 080°42'E); WHT 3121; Puwakpitiya (near Laggala), Knuckles, alt. 450m (07°34'N & 080°45'E).

*Pseudophilautus hallidayi* (Meegaskumbura & Manamendra-Arachchi 2005). Holotype: WHT 3575; Paratypes: WHT 3573; 3576; 3577, Hanthana range, Kandy, alt. 510 to 800m (07°15'N & 080°34'E); WHT 6072, Tonacombe Estate, Namunukula, alt. 1320m (06°52'N & 081°07'E).

*Pseudophilautus hoffmanni* (Meegaskumbura & Manamendra-Arachchi 2005). Holotype: WHT 6120; Paratypes: WHT 3222; 3223; 3542, Corbett's Gap (Knuckles Hills), alt. 1245m (07°22'N & 80°51'E).

*Pseudophilautus hoipoloi* (Manamendra-Arachchi & Pethiyagoda 2005). Holotype: WHT 2673; Paratypes: WHT 2674; 2675, Haycock (Hiniduma), alt. 660m (06°20'N & 080°18'E); WHT 2405; 2406; 2407; 2408; 2409, Kahaduwa (Galle), alt. 15m (06°04'N & 080°12'E); WHT 3196; 3197; 3198; 3199; 3200, Udugama (Galle), alt. 30m (06°14'N & 080°20'E); WHT 3201, Kodagoda (Galle), alt. 45m (06°02'N & 080°23'E).

*Pseudophilautus jagathgunawardanai* Wickramasinghe, Vidanapathirana, Rajeev, Ariyaratne, Chanaka, Priyantha, Bandara & Wickramasinghe 2013. Holotype: NMSL 2013.03.01 NH; Paratypes: DWC 2013.01.005, DWC 2013.01.006, Sripada World Heritage Site, (Adam's peak), Ratnapura District, alt. 1642m (06°48'31.45" N 080°29'10.69" E).

*Pseudophilautus karunarathnai* Wickramasinghe, Vidanapathirana, Rajeev, Ariyaratne, Chanaka, Priyantha, Bandara & Wickramasinghe 2013. Holotype: NMSL 2013.04.01 NH; Paratypes: DWC 2013.01.007, DWC 2013.01.008, Sripada World Heritage Site, (Adam's peak), Ratnapura District, alt. 1334m (06°48'31.38" N 080°28'14.46" E).

*Pseudophilautus limbatus* (Manamendra-Arachchi & Pethiyagoda 2005). Holotype: WHT 2700; Haycock, alt. 560m (06°20'N & 080°18'E).

*Pseudophilautus lunatus* (Manamendra-Arachchi & Pethiyagoda 2005). Holotype: WHT 3283; Handapan Ella Plains, alt. 1270m (06°26'N & 080°36'E).

*Pseudophilautus macropus* (Günther 1869). WHT 3390; 3391; 3392; 3393; 3394; 3395; 3396; 3397; 3398; 3399; 3400; 3401; 3402; 3403; 3404; 3405; 3406, Mousakanda (Gammaduwa), Knuckles, alt. 760m (07°34'N & 80°42'E); WHT 3183, Divulgahapathana, Knuckles, alt. 603m (07°33'N & 80°43'E); WHT 5900, Bambaraella, Knuckles, alt. 1260m (07°24'N & 80°47'E).

*Pseudophilautus microtypanum* (Günther 1859). WHT 2710; 2708; 2712; 2713; 3436; 3437; 3438; 3439; 3440; 3441; 3442; 3443; 3444; 3446, Horton Plains National Park, alt. 2135m (06°46'N & 80°47'E); WHT 3260, Agra Arboretum, near Agaratana, alt. 1555m (06°51'N & 80°41'E).

*Pseudophilautus mittermeieri* (Meegaskumbura & Manamendra-Arachchi 2005). Holotype: WHT 3522; Paratypes: WHT 3523; 3524; 3525; 3526, Kottawa, Galle, alt. 60m (06°06'N & 080°20'E); WHT 2668, Beraliya forest, Elpitiya, alt. 150m (06°16'N & 080°11'E).

*Pseudophilautus mooreorum* (Meegaskumbura & Manamendra-Arachchi 2005). Holotype: WHT 5862; Paratypes: WHT 5868; 5869, Hunnasgiriya (Knuckles), alt. 1100m (07°23'N & 080°41'E); WHT 2477; 3209; 6124, Corbett's Gap (Knuckles), 1245m (07°22'N & 080°51'E).

*Pseudophilautus nemus* (Manamendra-Arachchi & Pethiyagoda 2005). Holotype: WHT 1319; Haycock (Hiniduma), alt. 660m (06°20'N & 080°18'E).

*Pseudophilautus newtonjayawardanei* Wickramasinghe, Vidanapathirana, Rajeev, Ariyaratne, Chanaka, Priyantha, Bandara & Wickramasinghe 2013. Holotype: NMSL 2013.05.01 NH; Sripada World Heritage Site, (Adam's peak), Ratnapura District, alt. 1559m (06°48'36.10" N 080°28'59.36" E).

*Pseudophilautus ocularis* (Manamendra-Arachchi & Pethiyagoda 2005). Holotype: WHT 2360; Paratypes: WHT 2373; 2376; 2377; 2378, Morningside Forest Reserve (near Rakwana), alt. 1060m (06°24'N & 080°38'E); WHT 3288; 3289; 3290; 3291; 3292; 3293, Handapan Ella Plains (near Suriyakanda), alt. 1270m (06°26'N & 080°36'E).

*Pseudophilautus papillosus* (Manamendra-Arachchi & Pethiyagoda 2005). Holotype: WHT 3284; Handapan Ella Plains (near Rakwana), alt. 1270m (06°26'N & 080°36'E).

*Pseudophilautus pleurotaenia* (Boulenger 1904). WHT 3176; 5824; Gannoruwa Forest reserve, Kandy, alt. 684m (07°17'N & 080°35'E); WHT 5860; 5861; Nawalapitiya, alt. 700m (07°03'N & 080°32'E).

*Pseudophilautus poppiae* (Meegaskumbura & Manamendra-Arachchi 2005). Holotype: WHT 3285; Handapan Ella Plains (near Suriyakanda), alt. 1270m (06°26'N & 080°36'E); Paratypes: WHT 2030; 2029; 2475; 2778; 2781; 3533; 3534; 3535; ; 3536, Morningside (near Rakwana), alt. 1060m (06°24'N & 080°38'E).

*Pseudophilautus procox* (Manamendra-Arachchi & Pethiyagoda 2005). Holotype: WHT 3279; Paratypes: WHT 2786; 2787; 3277; 3278; 3280; 3281, Morningside Forest Reserve (near Rakwana), alt. 1060m (06°24'N & 080°38'E).

*Pseudophilautus puranappu* Wickramasinghe, Vidanapathirana, Rajeev, Ariyaratne, Chanaka, Priyantha, Bandara & Wickramasinghe 2013. Holotype: NMSL 2013.06.01 NH; Paratypes: DWC 2013.01.009, DWC 2013.01.010, Sripada World Heritage Site, (Adam's peak), Nuwara Eliya District, alt. 2106m (06°48'26.03" N 080°29'58.09" E).

*Pseudophilautus regius* (Manamendra-Arachchi & Pethiyagoda 2005). Holotype: WHT 3122; Paratypes: WHT 5827; 5828; 5829, Angammadilla, Polonnaruwa, alt. 90m (07°51'N & 080°55'E).

*Pseudophilautus reticulatus* (Günther 1864). WHT 2286; 2287; 2290; 2291, Kosmulla (near Nelliwa), alt. 320m (06°24'N & 80°23'E); WHT 2288; 2289, Dediya Forest Reserve, Akuressa, alt. 150m (06°10'N & 80°26'E); WHT 2344, Yagirala, alt. 30m (06°22'N & 80°10'E); WHT 3230, Induruwa, (Ratnapura), alt. 150m (06°45'N & 80°26'E); NMSL 2006.66.1; Gilemale forest, alt. 150m (06°45'N & 080°26'E); WHT 2520; 2521, Check Poleat Gap (near Norton Bridge), alt. 800m (06°56'N & 80°30'E); WHT 3366, Haycock (Hiniduma), alt. 660m (06°20'N & 80°18'E)

*Pseudophilautus rus* (Manamendra-Arachchi & Pethiyagoda 2005). Holotype: WHT 3474; Paratypes: WHT 3475; 3476; WHT 3477, Kiribatumbura (near Peradeniya), alt. 450m (07°16'N & 080°34'E); WHT 5437; 5439; 5436; WHT 5440; 5438; 5432; 5435; 5434, Pilimatalawa (near Peradeniya), alt. 658m (07°15'N & 080°34'E).

*Pseudophilautus samarakoon* Wickramasinghe, Vidanapathirana, Rajeev, Ariyaratne, Chanaka, Priyantha, Bandara & Wickramasinghe 2013. Holotype: NMSL 2013.07.01 NH; Paratypes: DWC 2013.01.011, DWC 2013.01.012, Sripada World Heritage Site, (Adam's peak), Ratnapura District, alt. 1334m (06°48'31.38" N 080°28'14.46" E).

*Pseudophilautus sarasinorum* (Müller 1887). WHT 2480; 2481; 2482; 2483, Bogawanthalawa-Balangoda road, alt. 1300m (06°45'N & 080°42'E); WHT 2426; 2427; 2428; 2429, Corbett's Gap, alt. 1000m (07°22'N & 080°50'E).

*Pseudophilautus schmarda* (Kelaart 1854). Neotype: WHT 3353; Horton Plains National Park, alt. 2135m (06°46'N & 80°47'E).

*Pseudophilautus silus* (Manamendra-Arachchi & Pethiyagoda 2005). Holotype: WHT 3453; Paratypes: WHT 3451; WHT 3452; WHT 3454; WHT 3460, Agra Arboretum, near Agaratana, alt. 1555m (06°51'N & 080°41'E); WHT 3412, Tangamalai Sanctuary, near Haputale, alt. 1600m (06°46'N & 080°55'E);

*Pseudophilautus silvaticus* (Manamendra-Arachchi & Pethiyagoda 2005). Holotype: WHT 3295; Paratypes: WHT 3296, 3378; 3379; 3461; 3462, Handapan Ella Plains (near Suriyakanda), alt. 1270m (06°26'N & 080°36'E); WHT 3275; WHT 3276, Morningside Forest Reserve (near Rakwana), alt. 1060m (06°24'N & 080°38'E); WHT 3310; 3316, Sinharaja World Heritage Site (near Kudawa), alt. 513m (06°25'N & 080°25'E).

*Pseudophilautus simba* (Manamendra-Arachchi & Pethiyagoda 2005). Holotype: WHT 3464; Paratypes: WHT 3465; WHT 3466; WHT 3467, Morningside Forest Reserve (near Rakwana), alt. 1060m (06°24'N & 080°38'E).

*Pseudophilautus sirilwijesundarai* Wickramasinghe, Vidanapathirana, Rajeev, Ariyaratne, Chanaka, Priyantha, Bandara & Wickramasinghe 2013. Holotype: NMSL 2013.08.01 NH; Paratypes: DWC 2013.01.013, Sripada World Heritage Site, (Adam's peak), Ratnapura District, alt. 1679m (06°48'30.89" N 080°29'19.18" E).

*Pseudophilautus sordidus* (Manamendra-Arachchi & Pethiyagoda 2005). Holotype: WHT 2379; Paratypes: WHT 2383; 2384; 2385; 2386; 2389; 2390; 2391; 2393; 2395; 2397; 2398, Kanneliya Forest Reserve (Galle), alt. 150m (06°15'N & 080°20'E); WHT 2380; WHT 2381, Haycock (Hiniduma), alt. 660m (06°20'N & 080°18'E); WHT 2382, Haycock (Hiniduma), alt. 150m (06°18'N & 080°19'E); 2387; WHT 2396, Millawa Forest Reserve (near Morawaka), alt. 150m (06°17'N & 080°28'E); WHT 2988, Welikanna, Waga (near Labugama), alt. 78m (06°51'N & 080°09'E); WHT 2998, Labugama Forest Reserve, alt. 78m (06°51'N & 080°10'E); WHT 3303; 3304; 3306, Sinharaja Forest Reserve (Halmandiya), alt. 513m (06°25'N & 080°25'E); NMSL 2006.65.1. Denenakanda, Peak Wilderness.

*Pseudophilautus steineri* (Meegaskumbura & Manamendra-Arachchi 2005). Holotype: WHT 3210; Paratypes: WHT 3519; 3521; 3520, 6116; 3518, Corbett's Gap (Knuckles Hills), alt. 1245m (07°22'N & 080°51'E).

*Pseudophilautus stictomerus* (Günther 1876). WHT 1173; 2402, Kottawa (Galle), alt. 60m (06°06'N & 080°20'E); WHT 2403; 2404, Kanneliya (Galle), alt. 150m (06°15'N & 080°20'E); WHT 3301, Sinharaja Forest (near Kudawa), alt. 513m (06°25'N & 080°25'E); WHT 3355; 3356; 3357; 3358; 3359, Kosmulla (near Nellsuwa), alt. 320m (06°24'N & 080°23'E).

*Pseudophilautus stuarti* (Meegaskumbura & Manamendra-Arachchi 2005). Holotype: WHT 3208; Paratypes: WHT 3207; 3206; 3218, 3527, 357 Corbett's Gap (Knuckles Hills), alt. 1245m (07°22'N & 080°51'E).

*Pseudophilautus viridis* (Manamendra-Arachchi & Pethiyagoda 2005). Holotype: WHT 5127; Paratypes: WHT 3488; 3489; 5104; 5105; 5106; 5099; 5100; 5103; 5126, Agra Arboretum, near Agarapatana, alt. 1555m (06°51'N & 080°41'E); WHT 2763; 2764; 2765; 2766; 2767; 2768, 4999, Ambewela (near radio station), alt 1830m (06°53'N & 080°48'E).

*Pseudophilautus zorro* (Manamendra-Arachchi & Pethiyagoda 2005). Holotype: WHT 3169; Paratypes: WHT 3175; 3204; 3205, Gannoruwa Forest Reserve, Kandy, alt. 684m (07°17'N & 080°35'E); WHT 3508, Tiverton Estate (near Peradeniya), alt. 450m (07°16'N & 080°34'E).

## Appendix 2. GenBank accession numbers of the 16S mtDNA fragments used for the phylogenetic analyses. (NA= Not Applicable)

Taxon	Collection #	Genbank Accession number #
<i>P. alto</i>	WHT5029	GQ204677
<i>P. alto</i>	WHT2723	AY141827
<i>P. asankai</i>	WHT5107	FJ788160
<i>P. auratus</i>	WHT2792	AY141835
<i>P. bambaradeniyai</i>	HFS004	KP272047
<i>P. caeruleus</i>	WHT2511	AY141810
<i>P. cavirastris</i>	WHT3299	FJ788156
<i>P. cf. sarasinorum</i>	WHT2484	AY141808
<i>P. cf. sarasinorum</i>	WHT2489	AY141809
<i>P. cf. sordidus</i>	WHT_H12	AY141837
<i>P. cf. sordidus</i>	WHT_H15	AY141838
<i>P. charius</i>	NA	GQ204683
<i>P. decoris</i>	WHT3271	FJ788163
<i>P. dilmah</i>	HFS006	KP272046
<i>P. femoralis</i>	WHT2566	AY141817
<i>P. femoralis</i>	WHT2772	AY141831
<i>P. folicola</i>	WHT6114	GQ204680
<i>P. frankenbergi</i>	WHT2552	AY141814
<i>P. frankenbergi</i>	WHT2555	AY141815
<i>P. hallidayi</i>	WHT_H11	AY141839
<i>P. hankeni</i>	WHT6302	GU593348
<i>P. hoffmanni</i>	WHT3223	FJ788161
<i>P. hoipolloi</i>	WHT2675	AY141822
<i>P. limbus</i>	WHT2690	AY141823
<i>P. limbus</i>	WHT2700	AY141825
<i>P. lunatus</i>	WHT3283	FJ788169
<i>P. microtypanum</i>	WHT2558	AY141816
<i>P. microtypanum</i>	WHT5065	GQ204678
<i>P. mittermeieri</i>	KAN2	FJ788162
<i>P. mooreorum</i>	WHT3209	FJ788153

Taxon	Collection #	Genbank Accession number #
<i>P. ocularis</i>	WHT2887	FJ788164
<i>P. papillosus</i>	WHT3284	FJ788170
<i>P. pleurotaenia</i>	WHT3176	FJ788165
<i>P. poppiae</i>	WHT5026	FJ788154
<i>P. poppiae</i>	WHT2779	FJ788155
<i>P. popularis</i>	WHT3191	FJ788168
<i>P. procax</i>	WHT2786	AY141834
<i>P. reticulatus</i>	WHT3230	GQ204674
<i>P. sarasinorum</i>	WHT2481	AY141807
<i>P. schmarda</i>	WHT2715	AY141826
<i>P. schneideri</i>	WHT2667	AY141820
<i>P. semiruber</i>	WHT5831	GU593347
<i>P. simba</i>	WHT6004	GQ204679
<i>P. simba</i>	WHT3221	FJ788167
<i>P. singu</i>	WHT2658	AY141819
<i>P. sordidus</i>	WHT2699	AY141824
<i>P. sp</i>	WHT2774	AY141832
<i>P. sp</i>	WHT2525	AY141812
<i>P. sp</i>	WHT2540	AY141813
<i>P. sp</i>	WHT2797	AY141836
<i>P. sp</i>	WHT2515	AY141811
<i>P. sp</i>	WHT2669	AY141821
<i>P. steineri</i>	WHT3210	FJ788157
<i>P. stellatus</i>	HFS01002	JN862536
<i>P. stuarti</i>	WHT3207	FJ788158
<i>P. stuarti</i>	WHT3208	FJ788159
<i>P. tanu</i>	WHT6343	FJ788171
<i>P. viridis</i>	WHT2627	AY141818
<i>P. viridis</i>	WHT2766	AY141830
<i>P. zorro</i>	WHT3175	FJ788166

**RED LIST ASSESSMENT: PSEUDOPHILAUTUS DILMAH**

Kingdom: Animalia

Phylum: Chordata

Class: Amphibia

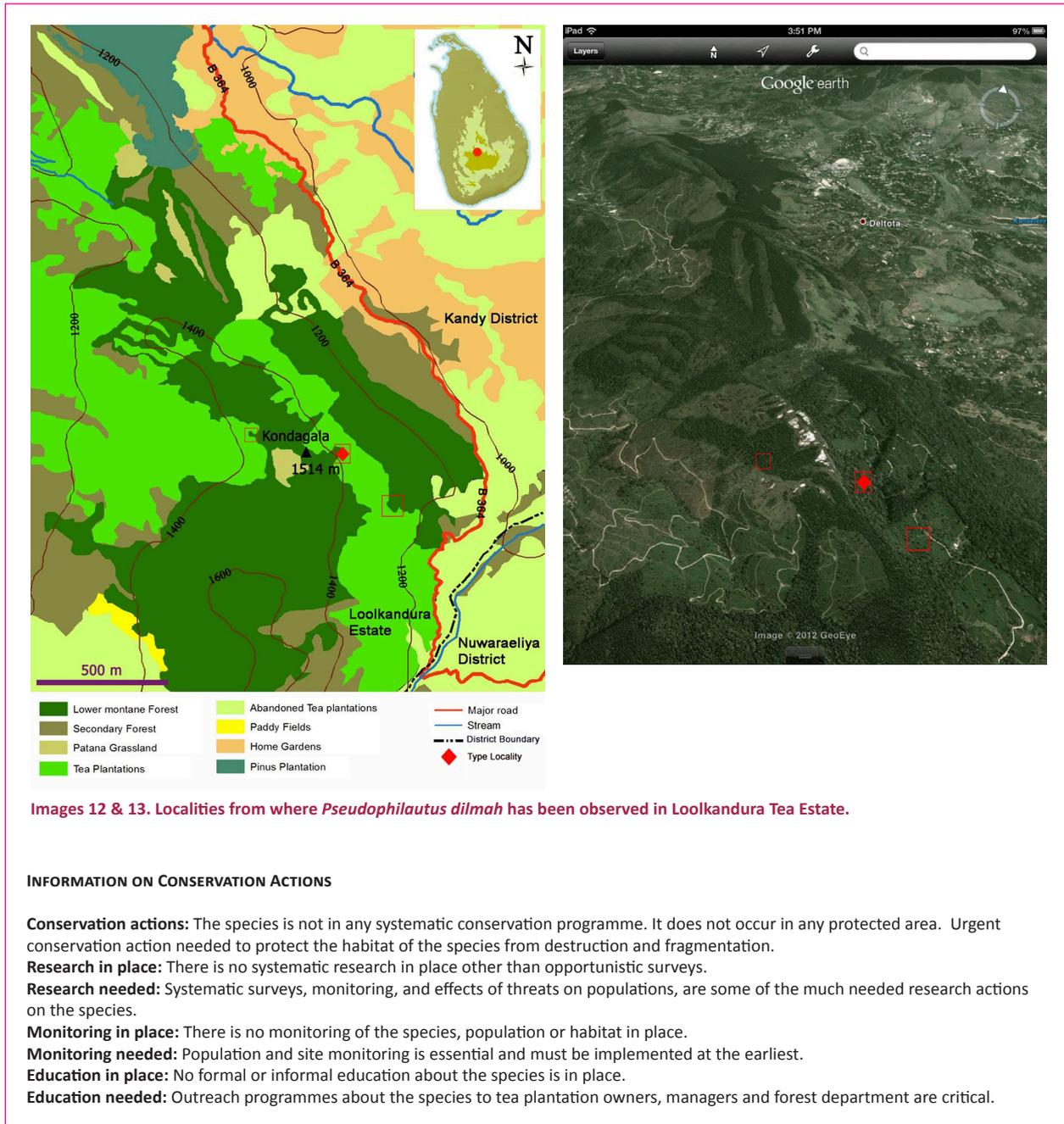
Order: Anura

Family: Rhacophoridae

Genus: *Pseudophilautus*Species: *dilmah*

Authority: Wickramasinghe, Bandara, Vidanapathirana, Tennakoon, Samarakoon &amp; Wickramasinghe, 2015

**Common name:** Dilmah Shrub Frog (English); Dilmah Panduru Madiya (Sinhala)**Taxonomic notes:** The species described by Wickramasinghe et al. in 2015 from Lookandura Tea Estate in Central Hills of Sri Lanka, is morphologically and genetically distinct from closely related congeners in the type locality.**ASSESSMENT INFORMATION****Red List Category and Criteria (Version 3.1):** Critically Endangered B1ab(iii)**Justification:** *Pseudophilautus dilmah* is assessed as Critically Endangered as it is restricted to a single location within a very small range of less than 100km<sup>2</sup>. The species is threatened by expanding tea plantations destroying, fragmenting and degrading the remaining mid elevation lower montane forests, the home of the species.**GEOGRAPHIC RANGE / DISTRIBUTION INFORMATION****Range description:** The species is restricted in its distribution to the natural forests of the mid elevation lower montane type in Lookandura Tea Estate in the northern end of the Central Hills of Sri Lanka.**Countries of occurrence:** Endemic to Sri Lanka**Extent of Occurrence (EOO):** EOO is estimated to be less than 100km<sup>2</sup>, but could be less than 10km<sup>2</sup> with three known points in the forests surrounding the Lookandura Tea Estate (Images 12 & 13).**Area of Occupancy (AOO):** The AOO is not estimated although the species is very narrowly distributed.**Number of locations:** The species is currently known from three points in the surrounding natural forests around the tea estate. Due to the threats from expansion of the tea plantation, the threat is similar in all the three known localities and hence can be considered a single location.**Range map:** Images 12 & 13.**POPULATION INFORMATION****Population:** There is no information on the population of the species. It is commonly found in the area along with its congeners.**Population trend:** The population is presumed to be declining since the expanding tea plantation is negatively impacting the natural forests, home to the species.**HABITAT AND ECOLOGICAL INFORMATION****Habitat and ecology:** It is a small-sized frog found up to a height of 1m in the bushes of natural forests of Lookandura. It occurs in lower montane forests at 1300m elevation along with its congeners *Pseudophilautus alto*, *P. fergusonianus*, *P. microtypanum*, *P. pleurotaenia*, *P. popularis*, *P. rus*, *P. sarasinorium*, *P. semiruber*, *P. silus* and *P. viridis*.**INFORMATION ON THREATS****Threats:** The main threat to the species is the ever-expanding tea plantations into the remaining natural forests.**USE AND TRADE INFORMATION****Use:** The species is not in use.**Livelihoods and sustenance:** There is no dependence on the species.**Off take from the wild:** The species is not harvested.**Commercial value:** The species has no local, domestic, national or international commercial value.



Images 12 & 13. Localities from where *Pseudophilautus dilmah* has been observed in Lookandura Tea Estate.

**INFORMATION ON CONSERVATION ACTIONS**

**Conservation actions:** The species is not in any systematic conservation programme. It does not occur in any protected area. Urgent conservation action needed to protect the habitat of the species from destruction and fragmentation.

**Research in place:** There is no systematic research in place other than opportunistic surveys.

**Research needed:** Systematic surveys, monitoring, and effects of threats on populations, are some of the much needed research actions on the species.

**Monitoring in place:** There is no monitoring of the species, population or habitat in place.

**Monitoring needed:** Population and site monitoring is essential and must be implemented at the earliest.

**Education in place:** No formal or informal education about the species is in place.

**Education needed:** Outreach programmes about the species to tea plantation owners, managers and forest department are critical.

**Author Details:** L.J. MENDIS WICKRAMASINGHE, is the founder, President of the Herpetological Foundation of Sri Lanka, and is the Principal Investigator in the current project. He has close to two decades of field herpetological (reptile and amphibian) experience in Sri Lanka with a focus on taxonomic identifications. IMESH NUWAN BANDARA, M.Sc, B.Sc specializing in Zoology at the University of Peradeniya, Sri Lanka, with a keen interest in sustainable development, community based conservation, traditional agricultural practices, ethnobotany, local biodiversity and behavioral ecology of herpetofauna and other wild fauna. DULAN RANGA VIDANAPATHIRANA, is the Vice-President, and a founder member of the Herpetological Foundation of Sri Lanka, with over 10 years of field herpetological, and birding experience in Sri Lanka. Currently working in several projects on herpetology in the country at the HFS. KAMANI HEMAMALA TENNEKON, Professor of Molecular Life Sciences, Institute of biochemistry, Molecular Biology and Biotechnology; University of Colombo. Current research interests include, Cancer Molecular Genetics, DNA variation, Molecular Medicine, and Medicinal Plants. SAMEERA R. SAMARAKOON (B.Sc. in Biological Science, M.Sc. in Molecular Life Sciences, Post graduate Diploma in Toxicology, PhD in Molecular Biology and Medicinal Chemistry) working as a scientific officer at the Institute of Biochemistry Molecular Biology and Biotechnology, University of Colombo, Sri Lanka. NETHU WICKRAMASINGHE, is the Projects Co-ordinator, at the Herpetological Foundation of Sri Lanka, completed the basic degree in chemistry at the University of Delhi. A Teacher and a freelance Nature Writer, currently conducting Phylogenetic Research Work, at the IBMBB, University of Colombo.

**Author Contributions:** LJM was involved in designing the study, conducting the field survey, conducting museum reference work, gathering, and analyzing the data, and compiling the MS. INB was involved in field research work, writing and data compiling. DRV was involved in field research work, writing and data compiling. KHT was involved in the overall designing of the molecular study. SRS was involved in conducting and designing the molecular component of the study. NW was involved in conducting the molecular work and writing of the MS.

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