

Bufo kotagamai, a new toad (Bufonidae) from Sri Lanka

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Abstract

A new toad, *Bufo kotagamai* (Bufonidae) from Sri Lanka is described. This species is distinguished from all other Sri Lankan *Bufo* except *B. atukoralei* and *B. fergusonii* by the presence of parietal ridges. *Bufo kotagamai* is distinguished from *B. atukoralei* and *B. fergusonii* by having the first finger longer than the second whereas it is equal in length in the latter two species.

KEY WORDS: Amphibia, Bufonidae, *Bufo*, Sri Lanka, toad.

Introduction

Six species of *Bufo* (Bufonidae) have been reported from Sri Lanka: *B. atukoralei* Bogert & Senanayake, 1966, *B. fergusonii* Boulenger, 1892, *B. kelaartii* Günther, 1858, *B. melanostictus* Schneider, 1799, *B. microtympanum* Boulenger, 1882 and *B. stomaticus* Lutken, 1863. In the course of a research project on Amphibia in the Sinharaja Man and Biosphere Reserve, Sri Lanka, in 1990, we discovered a *Bufo* species which was clearly distinct from all these. It is described here as *B. kotagamai*.

Materials and methods

Morphological measurements were taken to ± 0.1 mm. Measurements were made as follows (all longitudinal measurements along the mid-axis of the body unless specified otherwise). Head length: distance between tip of snout and level of posterior border of tympani; head width: maximum width of head; snout length: distance between tip of snout and anterior border of eye; eye diameter: maximum horizontal diameter; width of upper eyelid: maximum dorsal width; interorbital width: minimum distance between the upper eyelids on the dorsum, including the cranial crests; nostril diameter: horizontally across mid-point of nostril; tympanum diameter: horizontally across mid-point of tympanum; length of parotoid: distance between the anteriormost point of parotoid at end of supratympanic crest and posterior end point of the gland; width of parotoid: maximum width of right parotoid; length of forearm: distance between outer points of flexed right elbow and wrist joints; length of tibia: distance between outer points of the flexed right knee and ankle joints. Fingers were measured from their tips to the median inferior proximal base of the palm with the hand laid flat and the fingers straightened.

Abbreviations. Snout to vent length, SV; National Museum of Natural History (Washington, D.C.), USNM; National Museum of Sri Lanka, NMSL; Australian National Museum (Sydney), AMS; standard deviation, s.d.

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Figure 1. *Bufo kotagamai*, male, 38.6 mm SV, living specimen, now NMNH paratype (photo: Rahula Perera).

Bufo kotagamai, Fernando & Dayawansa, new species
(Figures 1, 2 & 5)

Holotype. USNM 311595 H, 39.8 mm SV male, Sri Lanka: Sinharaja Man and Biosphere Reserve, Hal Mandiya, 50m from research station (6° 25'N, 80° 25'E), P. Fernando and N. Dayawansa, June 1990 (kept in captivity until December 1990 and then fixed).

Paratypes. All material from Sri Lanka. NMSL AB-31190(6)a (1 ex., 40.3 mm SV, male), same data as holotype. AMS (1 ex., 33.1 mm SV, male), Kitulgala, Forest Reserve (6° 25' N, 80° 25' E), P. Fernando, M. Siriwardhane & V.U. Weeratunge, July 1993. USNM (1 ex., 62.7 mm SV, female), Massena Forest Reserve (6° 40' N, 80° 38' E), P.B. Karunaratne & L. Karunaratne, October 1993. USNM (1 ex., 38.6 mm SV, male), same data as holotype. WHT 0481 (1 ex., 34.8 mm SV, male), Kitulgala Forest Reserve, P. Fernando, M. Siriwardhane and V.U. Weeratunge, July 1993. WHT 0482 (1 ex., 55.5 mm SV female), Massena Forest Reserve, P.B. Karunaratne & L. Karunaratne, October 1993. WHT 0483 (1 ex., 21.6 mm juvenile), Sinharaja Man and Biosphere Reserve, upper Hal Mandiya (near caves), N. Dayawansa, 1992.

Diagnosis

B. kotagamai is distinguished from all other *Bufo* known from Sri Lanka and southern India by the combination of following characters: prominent parietal ridges on head, first finger slightly longer than the second and long, narrow, unlobulated parotoid glands.

Description

Morphometric data for six paratypes are given in Table 1. Mean length of head 0.8 of width (s.d. 0.1). Head with prominent supraorbital and parietal ridges. Postorbital and supratympanic ridges discernible. Mean eye diameter 1.1 times

Table 1. Morphometric data of AMS, USNM, WHT paratypes of *B. kotagamai*.

	mean	s.d.	Range
% of SV			
Head length	27.0	3.4	23.2 - 31.5
Head width	34.5	1.1	32.7 - 35.9
Forearm length	29.8	1.6	27.2 - 31.6
Tibia length	40.9	2.8	36.8 - 44.1
% head length			
Snout length	35.7	3.2	32.8 - 40.1
Eye diameter	39.3	3.4	34.1 - 43.4
Upper eyelid width	33.7	3.6	27.2 - 37.9
Eye to nostril	28.3	2.8	25.3 - 33.3
Nostril diameter	5.5	1.4	3.2 - 7.1
Tympanum diameter	21.3	4.0	14.4 - 24.9
Left parotoid length	66.7	15.3	44.7 - 83.3
Right parotoid length	67.0	17.4	44.7 - 89.1
Left parotoid width	21.2	7.9	13.6 - 29.9
Right parotoid width	20.7	6.9	15.4 - 31.6
% of third finger length			
1st finger length	67.1	5.6	62.6 - 76.6
2nd finger length	59.1	5.6	49.7 - 63.3
4th finger length	71.8	2.7	67.2 - 73.6

snout length (s.d. 0.2). Mean distance from anterior margin of eye to nostril 80% snout length (s.d. 0.1). Canthus rostralis angular. Loreal region concave, almost vertical. Interorbital 1.2 (s.d. 0.2) in upper eyelid width. Tympanum distinct, rounded. Tympanum diameter 0.6, (s.d. 0.1) in eye diameter. Parotoid length 3.3 (s.d. 0.8) times width. Parotoid extends from supratympanic ridge to beyond shoulder. Fingers free; length of first finger 1.1, (s.d. 0.1) times that of second. Small inner and a large outer palmar tubercle. Toes one fourth webbed. Subarticular tubercles moderately developed. Inner and outer spade-shaped metatarsal tubercles, moderate and subequal. Tibiotarsal articulation reaches posterior border of eye. Heels overlap when the hind limbs are folded so that the tibiae are at right angles to the body. SV 2.5 (s.d. 0.2) times length of tibia. Skin dry, covered with small tubercles and spinous warts. Larger tubercles scattered on the upper eyelids, dorsum of body and limbs. Outer edge of upper eyelid glandular. Ventral surface granular.

Colouration. In life, orange brown on dorsal surface, mottled with dark brown. A light cross band between the eyes. A distinct dark cross band on forearm, forefoot, tarsus and tibia. A less distinct cross bar on upper arm and femur. Lower jaw with alternate dark and light markings. Ventral surface whitish, mottled with dark brown, the mottling present as a median dark band especially evident over the sternum. Supraorbital and parietal ridges, tips of digits and tips of spinous warts black.

In specimens preserved in alcohol the dorsal colour tends to become duller and take on a greyish hue.



Figure 2. *Bufo kotagamai*, female, WHT482 (photo: Saman Liyanage).

Etymology

The species name *kotagamai* is a patronym honouring Sarath W. Kotagama for the distinguished service he has rendered in the fields of natural history, ecology and conservation in Sri Lanka, and as Director of the Department of Wildlife Conservation (1989–1992).

Distribution

Bufo kotagamai is known from three locations (Fig. 3): the Sinharaja Man and Biosphere Reserve (Fig. 4), the Makandawa Forest Reserve, Kitulgala and the Massana Forest Reserve near Ratnapura. Sinharaja and Kitulgala are of the lowland rain forest type (Gunatilleke, 1985) and Massena of the low montane forest type.

Behaviour and ecology

Bufo kotagamai has only been observed during the night and in close proximity to streams (except for the two female specimens collected around noon 2–3 km from the nearest stream in a closed canopy area; P.B. Karunaratne, pers. comm.). In Sinharaja, it is usually seen on collections of leaf debris, sand banks and rocks on the side of the Hal Mandiya Stream. In Kitulgala it was observed on rocky stream banks. The sightings of *B. kotagamai* in Sinharaja have been few and infrequent. From 1990 to date it has been observed on less than ten occasions during observation periods of about three days a month. On all the instances that it was observed, three to six individuals were seen within a range of about 50m of each other. All the males collected had black nuptial excrescences on the inner two fingers (absent on the juveniles and females). *Bufo kotagamai* has not been observed to vocalize in the natural habitat (captive specimens emitted a moderately loud call at night, "Krr...krr...krr..." in a high-pitched trill). In captivity, *B. kotagamai* preferred termites to other foods. It also took a few small grasshoppers but showed no interest in flies, earthworms or large grasshoppers. The gut of one specimen (WHT482) fixed immediately after capture was examined and found to contain (P.B. Karunaratne, pers. comm.) the following insects: Colioptera: *Tenebroides* (Trogositidae), *Coccinella* (Coccinellidae); Hymenoptera: *Camponotus* (Formicidae); Isoptera: *Odontotermes* (Termitidae).

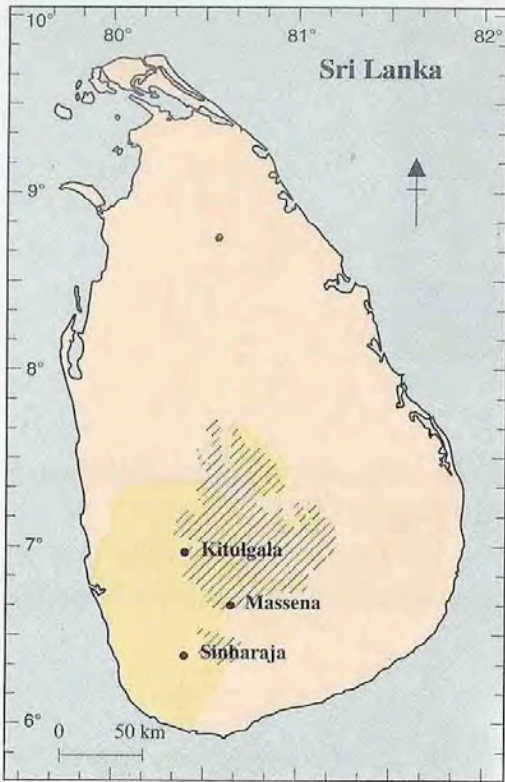


Figure 3. Locations from which *Bufo kotagamai* has been collected in Sri Lanka. The wet zone (> 2,500 mm rainfall p.a.) is in green; the stippled area is > 500 m elevation a.s.l.



Figure 4. Type locality of *Bufo kotagamai*: Hal Mandiya stream in the Sinharaja Man and Biosphere Reserve (photo: Vimukthi Weeratunga).

Discussion

Although *Bufo kotagamai* is immediately distinct from all other *Bufo* reported from Sri Lanka and South India, in body habitus it is somewhat similar to *B. kelaartii* with which it shares its habitat. It is, however, easily differentiated from *B. kelaartii* by the presence of cranial crests (absent in *B. kelaartii*, Kirtisinghe, 1955). In *B. kotagamai*, the parietal spur of the cranial crest is very well developed. The only other *Bufo* species with parietal ridges reported from Sri Lanka and southern India are *B. parietalis* Boulenger, 1882 (India), *B. fergusonii* (India and Sri Lanka) and *B. atukoralei* (Sri Lanka) (Daniel, 1963; Dutta, 1983; Kirtisinghe, 1957; Kotagama et al., 1980; Senanayake, 1987). *Bufo parietalis* is distinguished by having oval parotoids and a ratio of 0.39 in SV / tibia length (Daniel, 1963) vs. thin, long parotoids and a SV / tibia ratio of 2.37 in *Bufo kotagamai*. In *B. fergusonii* and *B. atukoralei* the first and second fingers are of equal length while the first finger is slightly longer than the second in *B. kotagamai*. In addition, the parotoids in *B. fergusonii* are round (Boulenger 1892) with a length / width ratio of 0.7-1.3 (Bogert and Senanayake, 1966) and those of *B. atukoralei* lobulated, with a ratio of 2.0-2.6 (Bogert and Senanayake 1966). The mean parotoid length / width ratio of *B. kotagamai* is 3.3 (range 2.6-5.4). The other species of *Bufo* known from Sri Lanka differ from *B. kotagamai* in the following characters: *B. stomaticus*— no bony ridges on head, length of snout less than diameter of eye; *B. microtympanum*— diameter of tympanum less than half that of eye, parotoids oval, first finger not extending beyond second; *B. melanostictus*— parotoids kidney-shaped, a double row of

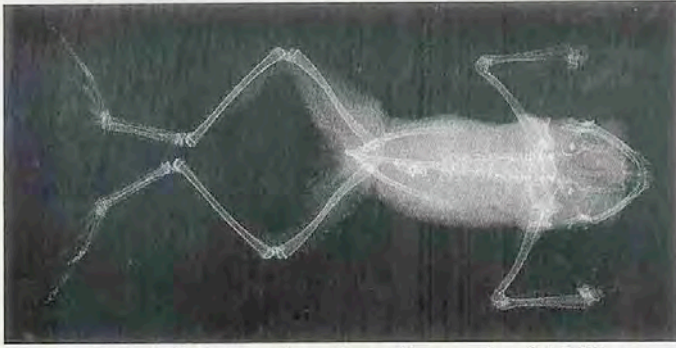


Figure 5. *Bufo kotagamai*, male radiograph of AMS paratype (courtesy AMS).

prominent warts on dorsum, heels do not overlap when hind limbs are folded so that the tibiae are at right angles to body (Kirtisinghe 1957).

Bufo kotagamai is considered endemic to Sri Lanka. *Bufo kelaartii* and *B. atukoralei* are also considered endemic to the island (Kirtisinghe, 1957; Bogert & Senanayake, 1966).

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