

# On recent sightings of a little-known south Indian toad, *Duttaphrynus hololius* (Günther, 1876) with notes on its morphological characterization and ecology

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**Abstract.** *Duttaphrynus hololius* (Günther, 1876), a rarely-sighted, endemic toad species known only from a few documented specimens was re-sighted in Devarabetta, Krishnagiri dt., Eastern Ghats hill range, Tamil Nadu state, southern India. Data from our four live, uncollected conspecifics are provided to update and expand the external morphological characterization of this species. In-life colouration and baseline ecological data are provided herein for the first time. Possible extent of distribution of this species and some issues regarding its sighting records in the past are also discussed.

**Keywords.** In-life colouration, expanded characterization, natural history, distribution.

## Introduction

Günther (1876) described the toad *Bufo hololius* based solely on the holotype BMNH 1947.2.20.50 originating from “Malabar”, a part of the Western Ghats hill range in south-western India. Currently, this species is attributed to the genus *Duttaphrynus* (after Bocxlaer et al., 2009). This species is still valid, with no synonyms known. During the last century, *D. hololius* has been reported a few times from the following areas in the Eastern Ghats hill range; Chittoor and Nellore (Satyamurti, 1967); Nagarjunsagar (Pillai and Ravichandran, 1991) and Bannerghatta (Daniels, 1992). Dutta (1997), Dubois and Ohler (1999) and Srinivasulu and Das (2008) doubted conspecificity between the holotype and subsequently collected specimens of Satyamurti (1967) and Pillai and Ravichandran (1991), due to lack of explicit comparison with the holotype and habitat heterogeneity between the type locality and subsequently reported localities. Furthermore, Krishnamurthy and Sakunthala (1993) and Andrew and George (1998) in the form of anecdotal checklists without additional information on morphology, reported *D. hololius* from Kerala, Western Ghats. But, as currently understood (Biju, 2001; Biju

et al. 2004; Dinesh et al. 2009; Radhakrishnan and Ravichandran, 1999) the occurrence of this species in Western Ghats is unclear. Additionally, general information on *D. hololius* has remained scarce, This species still remains poorly-known, as recent treatises on Indian toads (Dubois and Ohler, 1999; Daniel, 2002; Daniels, 2005) could not throw light on this species. Based on field observations of *D. hololius* by the authors, data is provided on morphology (following Dutta and Manamendra-Arachchi, 1996) and preliminary ecology in order to increase knowledge of this little-known, endemic species. Colour photographs and basic ecological data are herein provided for the first time.

## Materials and Methods

In August 2009, during daytime (11.20-16.15 hrs.), a total of four *D. hololius* (three imagos sensu Dubois and Ohler, 1999 and one adult) (Fig. 1-2) were located in Devarabetta Forest, Eastern Ghats hill range, Tamil Nadu, India. These individuals were photographed, measured, examined in-situ and released. Our examination and measurement procedures followed Dutta and Manamendra-Arachchi (1996). Meristic and morphometric details were recorded using magnifying hand lenses. Measurements of the toads were taken using vernier calipers to the nearest millimeter. All photographs were taken using Canon Powershot A640 model digital camera and the voucher photographs are deposited in Zoological Survey of India – Southern Regional Station. Geographic coordinates and altitude of our sighting-locality was recorded using a Garmin 12 channel Global Positioning System.

## Results

**Description:** Small to medium sized toad (16 – 40 mm); habitus depressed; head wider (9 mm) than long (8 mm) and deep / high (4 mm); flat above; no

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**Figure 1.** *Duttaphrynus hololius* adult.

cephalic ridges; canthus rostralis sharp; loreal concave; interorbital space (5 mm), flat, nearly twice as wide as internarial distance (3 mm); nostrils circular, oriented laterally, closer to tip of snout-tip (1 mm) than to eye (2 mm); pupil horizontally oval; tympanum distinct, borders postcircumorbital, circular (3 mm), 75% of eye diameter (4 mm); pineal ocellus absent; paratoid glands flattened, extending downwards up to antehumeral region; skin smooth, with very minute dots and densely scattered circular glandules, that are denser laterally; dorsolateral, rostro-ocular, supratympanic and tarsal skin folds absent; venter smooth anteriorly, coarse and granular posteriorly; limbs dorsally with a few scattered small, pustular glandules, denser around limb insertions; metapodia and digits smooth; digital formula- manus: 3>4>1>2, pes: 4>3>5>2>1; digit-tips, except 1<sup>st</sup> finger, without enlarged discs and ventrolateral grooves; fingers without webs, toes webbed only at the base, not exceeding penultimate subarticular tubercle of the 4<sup>th</sup> toe; subarticular tubercles prominent rounded or oval, all present; two distinct palmar tubercles; metacarpal tubercles, inner one smaller rounded outer one larger, thrice as large as inner, slightly elliptical vertically; inner metatarsal tubercle distinct, oval, larger than outer metatarsal tubercle which is small and rounded.

**Colour in life:** Imagos brightly and contrastingly coloured; dark blackish and pale whitish hues

intermixed with bright scarlet red dots on the dorsum; larger individual overall drab brownish grey; dorsum grayish tan to brown with alternate patches of lighter and darker shady marblings; an inverted V mark of a lighter shade, consisting of a broad, indistinctly outlined greyish brown wash suffused with reddish marblings; a very thin, feeble, pale vertebral stripe dorsally from snout to vent; bulged, circular glandular patches lighter and reddish compared to surrounding skin colour; rostral, labial, interorbital, supraorbital, supratympanic and quadratomandibular regions greyish white; loreal, suborbital, subtympenic, frontal and parietal regions dark brownish grey; paratoid glands and tympanum with both darker and lighter shades of grey; dorsal part of both fore- and hind limbs pale greyish white with two to three dark brown oblique ovoid crossbars; venter largely pale pinkish white, with parts of throat, gular sac, axilla, chest, abdomen and tibia pinkish white.

**Measurements in mm (n=4):** Snout-vent length 16-40 (28.0 ± 5.51); head length 6-13 (9.5 ± 1.59); head width 6-14 (10.0 ± 1.66); head depth 3-7 (5.0 ± 0.93); forelimb length 9-20 (14.5 ± 2.21); hind limb length 11-42 (26.5 ± 6.11); eye-snout distance 3-5 (4.0 ± 0.47); eye-nostril distance 2-3 (2.5 ± 0.19); horizontal eye diameter 2-5 (3.5 ± 0.53); horizontal tympanum diameter 2-4 (3.0 ± 0.52); inter-orbital distance 4-6 (5.0 ± 0.42); inter-narial distance 2-4 (3.0 ± 0.45).



**Figure 2.** *Duttaphrynus hololius* imago.

**Field observations:** All individuals were found resting under rocks near small streams or moss growths within Devarabetta Forest (ca. 12°35'N 77°41'E; 820–880 m asl). The hill-slopes of the area are dominated by scanty vegetation such as small herbs and shrubs (< 1m height) scattered across the rocky ground substratum. The rocks were small (< 0.5 m across) and occupied underneath by small animals, including invertebrates. The dry, steep stream-bed was narrow (1m wide) and locally covered by few moss patches. Several parts of the stream-bed were wet due to dribbling water from uphill. Despite intensive searches, there were no further sightings of *D. hololius* in other habitats in the vicinity. Syntopic anurans recorded were *Duttaphrynus melanostictus* (Schneider, 1799); *Kaloula taprobanica* Parker, 1934; *Microhyla ornata* (Duméril and Bibron, 1841); *M. rubra* (Jerdon, 1853); *Polypedates maculatus* (Gray, 1834); *Fejervarya* sp. and *Euphlyctis cyanophlyctis* (Schneider, 1799).

## Discussions

In the field, *D. hololius* can only be confused with *Duttaphrynus stomaticus* (Lütken, 1862), which also completely lacks “cephalic ridges” sensu Dubois and Ohler (1999), but can be distinguished as follows: skin with glandular patches in *D. hololius* (vs. skin with pointed tubercles in *B. stomaticus*); absence of spiny warts or tubercles on head and limbs (vs. presence); webbing in toes 1/4<sup>th</sup> (vs. 2/3<sup>rd</sup>); inner metatarsal tubercle larger than

the outer (vs. equal); habitus depressed (vs. plump and rounded). Additionally, the distribution of *D. stomaticus* in southern India is not clear, as Biju (2001) mentioned it from Tamil Nadu, but Dinesh and Radhakrishnan (2009) did not. Unfortunately, even a specimen-based report (CM 60170-71 from Mela Neelitha Nallur, Tirunelveli district, Tamil Nadu state; see Dutta, 1997) of *D. stomaticus* was not unequivocally accepted. Rao (1920) described *Bufo stomaticus peninsularis* as a new “variety” from Mavakotte and Watekollé located in the Coorg region of the Western Ghats. This taxon was however subjectively synonymised with the nominal form by Daniel (1963), who stated that purported character-variations of *peninsularis* fall within the range of intraspecific variation of *D. stomaticus*. Thus, following a conservative approach (see Dutta, 1997; Daniels, 2005), since a subjective junior synonym occurs in the Western Ghats, it is implied that *D. stomaticus* occurs in the Western Ghats. Dubois and Ohler (1999) stated after their morphological analysis of Asian and Oriental Bufonids that *D. hololius* should provisionally be regarded as a member of *D. stomaticus* species-group, pending its revision. However, Bocxlaer et al. (2009) stated after molecular revision that *D. hololius* belongs to “Remaining Indian Subcontinent” clade while *D. stomaticus*, the species with which *D. hololius* was associated by Dubois and Ohler (1999), belongs to “Western Ghats–Sri Lanka hotspot” clade, contradicting Dubois and Ohler (1999). Unfortunately,

Bocxlaer *et al.* (2009) have erroneously allocated *D. stomaticus*, a species having its type locality in Assam (Dutta, 1997), considered to be absent in Sri Lanka (Manamendra-Arachchi and Pethiyagoda, 1998) and known with certainty from the Western Ghats only by the type of its junior subjective synonym *Duttaphrynus stomaticus peninsularis* (Rao, 1920), to the “Western Ghats–Sri Lanka hotspot” clade, disregarding its type locality. However, *D. hololius*, though originating from Malabar (Günther, 1876) is sporadically distributed in the rest of peninsular India too and so belongs to “Remaining Indian Subcontinent” clade, as stated by Bocxlaer *et al.* (2009).

The paucity of sightings of this species despite intensive and long term field surveys even from localities within the known distribution, (e.g., Rao *et al.* (2004) in Nagarjunsagar, where Pillai and Ravichandran (1991) recorded this species) proves the elusiveness of such a lesser-known herpetofaunal taxon. However, our study uncovered four individuals within a period of just two days. This record further emphasizes the lack of knowledge on the herpetofaunal communities in southern India, even outside the Western Ghats.

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## References

- Andrew, M.I., George, S. (1998): Amphibian resources of Kerala. *Cobra* **33**: 41-48.
- Biju, S.D. (2001): A synopsis to the frog fauna of the Western Ghats, India. *Occas. Publ. Indian Soc. Conserv. Biol.* **1**: 1–24.
- Biju, S.D., Dutta, S.K., Vasudevan, K., Vijayakumar, S.P., Srinivasulu, C., Bhuddhe, G.D. (2004): *Duttaphrynus hololius*. In: IUCN 2010. IUCN Red List of Threatened Species. Version 2010.4. <[www.iucnredlist.org](http://www.iucnredlist.org)>. Downloaded on 17 February 2011.
- Bocxlaer, V., Biju, S.D., Loader, S.P., Bossuyt, F. (2009): Toad radiation reveals into-India dispersal, as source of endemism in Western Ghats-Sri Lanka biodiversity hotspot. *BMC Evol. Biol.* **9**:131.
- Daniel, J.C. (2002): *The Book of Indian Reptiles and Amphibians*. Mumbai, India, Oxford University Press.
- Daniels, R.J.R. (1992): Range extension in some south Indian amphibians. *Hamadryad* **17**: 40-42.
- Daniels, R.J.R. (2005): *Amphibians of Peninsular India*. Hyderabad, India, Indian Academy of Sciences Universities Press.
- Dinesh, K.P., Radhakrishnan, C. (2009): Amphibia. In: *Fauna of Tamil Nadu. State Fauna Series, Part I.*, p 1-256. Director, Ed., Calcutta, India, Zoological Survey of India.
- Dinesh, K.P., Radhakrishnan, C., Gururaja, K.V., Bhatta, G.K. (2009): An annotated checklist of Amphibia of India with some insight into the patterns of species discoveries, distribution and endemism. *Zool. Sur. Ind. Occ.* **302**: 1-153.
- Dubois, A., Ohler, A. (1999): Asian and Oriental toads of the *Bufo melanostictus*, *Bufo scaber* and *Bufo stejnegeri* groups (Amphibia, Anura): a list of available names and redescription of some name-bearing types. *J. S. Asian Nat. Hist.* **4**(2): 133-180.
- Dutta, S.K., Manamendra-Arachchi, K. (1996): *The Amphibian Fauna of Sri Lanka*. Colombo, Sri Lanka, Wildlife Heritage Trust of Sri Lanka.
- Dutta, S.K. (1997): *The Amphibians of India and Sri Lanka; Checklist and Bibliography*. Orissa, India, Odyssey Publishing House.
- Günther, A. (“1875” 1876): Third report on collections of Indian Reptiles obtained by the British Museum. *Proc. Zool. Soc. London* **1875**: 567-577.
- Krsihnamurthy, S.V., Sakunthala, K. (1993): Amphibian fauna of Sringeri taluk (Chickamagalure district: Karnataka). *J. Ind. Inst. Sc.* **1**(10): 14-17.
- Manamendra-Arachchi, K., Pethiyagoda, R. (1998): A synopsis of the Sri Lankan Bufonidae (Amphibia: Anura), with description of two new species. *J. S. Asian Nat. Hist.* **3**(1): 213-246.
- Pillai, R.S., Ravichandran, M.S. (1991): On a rare toad *Bufo hololius* Günther from Nagarjunsagar, Andhra Pradesh. *Rec. Zool. Sur. Ind.* **88**(1): 11-14.
- Radhakrishnan, C., Ravichandran, M.S. (1999): A note on the distributional record of a rare toad, *Bufo hololius* Günther (Amphibia: Bufonidae). *Rec. Zool. Sur. Ind.* **97**(3): 203-204.
- Rao, C.R.N. (1920): Some South Indian Batrachia. *J. Bombay Nat. Hist. Soc.* **27**(1): 119-127.
- Rao, K.T., Ghate, H.V., Sudhakar, M., Javed, S.M.M., Krishna, I.S.R. (2004): Herpetofauna of Nallamalai hills, with eleven new records from the region including ten new records for Andhra Pradesh. *Zoo’s Print J.* **20**(1): 1737-1740.
- Satyamurti, S.T. (1967): *The South Indian Amphibia in the Collection of the Madras Government Museum*. Madras, Madras Government Museum.
- Srinivasulu, C., Das, I. (2008): The herpetofauna of Nallamalai hills, Eastern Ghats, India: An annotated checklist, with remarks on nomenclature, taxonomy, habitat use, adaptive types and biogeography. *Asiat. Herp. Res.* **11**: 110-131.
- Thurston, E. (1888): *Catalogue of Batrachia, Salientia and Apoda (frogs, toads and caecilians) of southern India*. Madras, The Superintendent, Government Press.