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SHORT COMMUNICATION

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SHORT COMMUNICATION

First distribution record of the Asiatic Toad *Bufo gargarizans* Cantor, 1842 from India — Dibang Valley in Arunachal Pradesh

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Abstract: *Bufo gargarizans*, a species complex, has a wide distribution ranging from Japan to south-western China, Vietnam, and Russia but was not previously reported from India. Surveys conducted in Dibang Valley district of Arunachal Pradesh near the Indo-Tibetan border with China in 2014–15 revealed previously unreported specimens of the toad genus *Bufo*. Based on photographic comparisons with morphological characteristics obtained from published literature, we have identified the *Bufo* from Dibang Valley as the Asiatic Toad *Bufo gargarizans* Cantor, 1842. Individuals of the species reported from Dibang have a wide mid dorsal line in the dorsum, rarely observed in *Bufo gargarizans* except in the sub-populations on the Tibetan Plateau.

Keywords: Arunachal Pradesh, *Bufo gargarizans*, Dibang Wildlife Sanctuary, new country record, new distribution.

Bufo gargarizans Cantor, 1842 is a large-sized terrestrial toad (SVL males: 62–106 mm; females: 70–121 mm) distributed in eastern Asia, known to occur up to 4,300m (Fei et al. 2012). The populations on the Tibetan Plateau are some of the highest known records of any toad species (Fei et al. 2009; Zhan & Fu 2011). This species complex has a wide distribution range spanning most of central, southeastern, and northeastern China, the Russian far-east up to the Amur River Valley, throughout the Korean Peninsula, Japan, and Vietnam (IUCN SSC Amphibian Specialist Group 2019; Frost 2021 but see Che et al. 2020 for suggestions for a new taxonomic split for populations in Tibet). No records of the *Bufo gargarizans* species complex had been previously reported from India (Dinesh et al. 2020). In this paper, we report the first and the only known occurrence of *Bufo gargarizans* from the Indian subcontinent.

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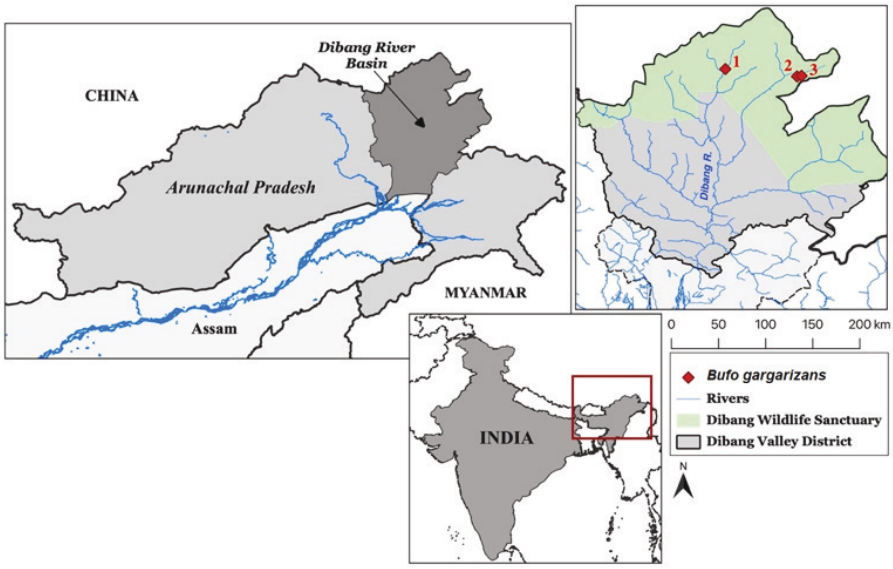

Figure 1. Locations 1 (29.198^{0}N; 95.895^{0}E), 2 (29.166^{0}N; 96.209^{0}E), 3 (29.168^{0}N; 96.229^{0}E) in Dibang Valley District where *Bufo gargarizans* specimens were recorded during field surveys.

From July to October of 2014 and 2015, while conducting mammalian surveys in Dibang Valley district of Arunachal Pradesh, India, we opportunistically encountered several individuals of a previously unreported *Bufo* species in the high-altitude marshlands near the Tibetan border. As we walked through the marshes, many toads jumped out of the grass in front of us drawing our attention. While no specimens were collected, a few different individuals were photographed and only one individual was measured for its SVL (Image 1). Based on preliminary photographic comparisons with the morphologically similar Asian Toad *Bufo gargarizans* Cantor, 184*,* known to occur in similar elevation range in southeastern Tibet (Frost 2021), we have identified the *Bufo* species from Dibang as *Bufo gargarizans*. Here, we present a detailed description of the Dibang specimens including the microhabitats where they were encountered. Though we suggest that the Dibang specimens are likely to be *Bufo gargarizans,* we call for further morphological and molecular work to confirm the taxonomy of this newly recorded toad from India.

Dibang Valley district (9,129km^2) is located between 27.133–28.783^{0}N and 94.1–95.9^{0}E along the Indian border with Tibet (China) in the state of Arunachal Pradesh. The northern part of the district falls within the Dibang Wildlife Sanctuary (4,149km^2). The region receives a mean annual rainfall of 1932–4442 mm (Guhathakurta et al. 2020). It is a heavily mountainous landscape with altitude ranging from 300m in the river valleys to 5,300m at the high peaks along the Indo-Tibetan border. This vast altitudinal range supports diverse habitats from tropical and subtropical wet forests in low-lying areas through temperate wet forest in mid elevations to alpine scrub and bare rock over 4,100m. Lying at the juncture of two biogeographical realms (Indomalayan and Palearctic), Dibang Valley forms part of the eastern Himalaya biodiversity hotspot and supports an exceptionally high species diversity across all floral and faunal groups (Sheth et al. 2020).

Bufo gargarizans from Dibang Valley

Morphologically, the toad species reported from Dibang Valley (Image 1) share the following significant similarities with *Bufo gargarizans* (see Fei Liang et al. 2012 for morphological details of the species). The specimens from Dibang Valley were dorsally dark gray to olive-brownish in color with a wide mid-dorsal line. The dorsal surface and flanks were rough with large warts. The ventral side from snout to vent was granular, grayish-yellow or light yellow in colour; belly smooth, and granular. Irregular dark spots or stripes were present on the ventral surface of the body and the flanks extending from the dorsal surface of the parotid gland to the thigh. There were 2–3 larger warts on the inner side of the upper eyelid. The head was triangular, tympanum large and distinct, parotid glands were bean-shaped. The tip of fingers and toes were soft and round. The SVL of the only individual of unknown sex measured was 62mm (n= 1).

We recorded abundant breeding populations of *Bufo gargarizans* at three different locations in two river valley systems inside Dibang Wildlife Sanctuary (Figure 1). All observations were made in the altitudes of 2,250–3,200 m near the Tibetan border. No specimens were recorded

Image 1. Adult *Bufo gargarizans* from Dibang Valley, Arunachal Pradesh, India: a—dorso-lateral view | b—dorsal view | c—ventral view | d—lateral view. © Sahil Nijhawan.

outside this altitudinal range. The microhabitat for all three breeding populations was similar—flat wetlands and marshes with stagnant water, covered with thick aquatic vegetation (Image 2). A few individuals were also encountered in small rainfed puddles and pools along human trails inside the forest, within close proximity to the marshlands. We also observed calls of the species between 14.00h and 16.30h. The toads were encountered only during surveys conducted in the summer and monsoon period from June until late September and not in surveys carried out in winter and spring—late January to early April.

These substantive morphological similarities and the proximity of the location of the specimens to the known distribution range of *Bufo gargarizans* indicate that the specimens from Dibang Valley likely belong to the *Bufo gargarizans* species complex.

Bufo gargarizans is locally known as 'Pambo'. The toad holds special importance for the animistic Idu Mishmi people of the Dibang Valley. According to an Idu Mishmi tale, the supreme spirit of the high mountains, 'Gõlõ', once lived as a toad. Since the Idu fear and respect Gõlõ, harming the toads is a strict taboo. The Idu Mishmi do not touch, kill or consume the toad, simply moving away when the toads are seen so as to not step on them accidently.

Discussion and Conclusions

Given the opportunistic nature of this study based on photographic comparisons and the taxonomic ambiguities around this species complex, our findings should be seen as preliminary and warrant further investigation. In this vein, we highlight three notable observations.

Firstly, the distribution and taxonomic classification of the *Bufo gargarizans* species complex has historically been a matter of much discussion and disagreement (Zhan & Fu, 2011). Zarevskij (1926) reclassified the populations on the Tibetan plateau as *Bufo tibetanus* based on some morphological differences, in particular

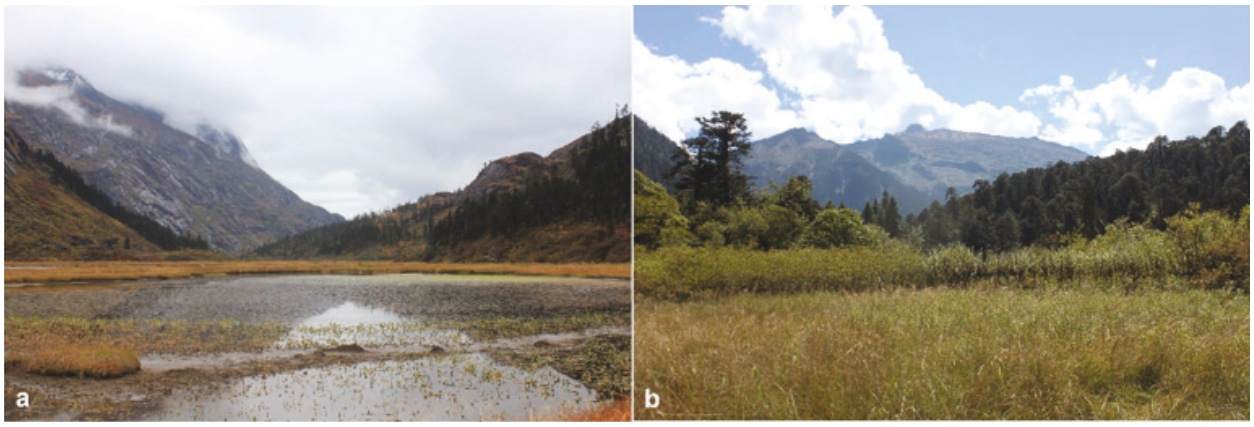

Image 2 . The microhabitat observed for three breeding populations of *Bufo gargarizans* in Dibang Valley, Arunachal Pradesh, India: a—riverine marshes covered in grass and other aquatic vegetation | b—bogs covered in tall thick grass. © Sahil Nijhawan.

a wide mid dorsal line in the dorsum of *Bufo tibetanus* which is less prominent in *Bufo gargarizans* found elsewhere (Liu & Hu 1961), gaining the support of a number of scientists later on (e.g., Borkin & Matsui 1987; Fei et al. 2009, 2012). The Dibang specimens, too, had a wide mid dorsal line akin to that reported from the Tibetan Plateau; however, despite significant morphological differences, a molecular study by Zhan & Fu (2011) did not find any support for the separation of *B. tibetanus* and *B. gargarizans* into distinct species. In 2019, the IUCN Amphibian Specialist Group recognized all previously thought species within the Asian Toad complex as a single species *Bufo gargarizans* (IUCN Amphibian Specialist Group 2019). Recently, Che et al. (2020) suggested that *Bufo gargarizans* from Tibet be reclassified as *Bufo* cf. *andrewsi* Schmidt, 1925 and predicted that the taxonomically widespread *Bufo gargarizans* will be partitioned into distinct species. Thus, the taxonomy of this species complex continues to be a matter of doubt and debate.

Secondly, in Dibang Valley, we observed the species exclusively during the peak monsoon months from July to September, with no individuals observed in field surveys conducted between January and April. Fei et al. (2012), on the other hand, reported January to June as the breeding season for *Bufo gargarizans* species complex. We believe that this difference could be due to a longer and colder winter in the high-elevation wetlands of Dibang Valley.

Lastly, and importantly, the species was not recorded in an earlier amphibian survey conducted across the Dibang River basin over an altitudinal gradient of 200–3,500m (Roy et al. 2018). While the high-altitude marshland habitats from where we report *Bufo gargarizans* were not surveyed during Roy et al.'s (2018) study, they sampled comparable elevations in the region during the monsoon season but did not encounter the species. This may indicate a narrow distribution of the species in Dibang Valley, restricted to areas with a specific habitat type (i.e., seasonal marshlands) within a small elevation range (2,250–3,200m). This is particularly interesting as studies from other parts of *Bufo gargarizans'* range have reported a wide altitudinal distribution (120–4,300m) for the species, spanning a variety of habitats including flood plains, river valleys, coniferous, mixed and deciduous forests, grasslands, and meadows (IUCN SSC Amphibian Specialist Group 2019).

In light of the ambiguous taxonomic classification of this species complex, we recommend that future research employ molecular techniques to conclusively ascertain the taxonomy of the specimens found in the upper reaches of the Dibang River basin. Future research should also explore the species' distribution and ecological correlates in other river valleys of the Dibang basin and across the Indo-Chinese borderlands in Arunachal Pradesh, particularly in the neighboring river basins of Subansiri, Siang, and Lohit, which are also likely to host high-altitude wetland habitats similar to those where *Bufo gargarizans* was encountered in the Dibang Valley. Finally, since *Bufo gargarizans* had not been previously reported from India (Dinesh et al. 2020), our present documentation from Arunachal Pradesh forms the first record of the species from India, throwing open prospects to better understand its geographic range.

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