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Anurophagy in *Indirana chiravasi* (Anura: Ranixalidae) from Goa, India

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The Western Ghats endemic anuran genus *Indirana* Laurent, 1986 is presently constituted of 14 species (Frost, 2022). Members of this genus are small to moderate-sized, bear a large and distinct tympanum, Y-shaped terminal phalanges, and extensive to moderate webbing between the toes (Modak et al. 2015). This ancient anuran lineage is known to have an unusual reproductive mode (Gaitonde & Giri 2014) and larval development (Annandale 1918). The group also shows cryptic diversity (Nair et al. 2012; Ramesh et al. 2020). Modak et al. (2018) described *Indirana leithii* Boulenger, 1888 as primarily insectivorous after finding large proportions of insect appendages in the gut; they also reported the presence of arachnids, annelids, and a large amount of plant material in the diet of post-metamorphic *I. leithii*. Subsequently, Kulkarni et al. (2020) revealed the presence of cannibalistic tendencies in *Indirana leithii*. The diet composition of other members of *Indirana* is presently unknown and is poorly studied. We herein report an instance of anurophagy in *Indirana chiravasi* Padhye, Modak, and Dahanukar, 2014, a quite distantly related congener of *I. leithii* (Padhye et al. 2014).

March is a dry period in Goa with relatively low frog activity. During day surveys we came across bush frogs (mainly *Pseudophilautus* sp.) perched on tree branches, bushes, and also on the ground; and other individuals of *Indirana chiravasi* and *Minervarya* sp. along the stream and in the adjoining riparian zone. On 2 March 2021 at 0925 h, an adult *Indirana chiravasi* of unknown sex was found under a laterite rock along a dried-up stream near Mollem village, Goa (15°22’22.6”N 74°13’03.2”E). The individual was put into a plastic jar for further observations, where it regurgitated a partially digested bush frog about 10 minutes after its collection. We suspect the ingestion occurred the previous night and although unlikely, we do not rule out the possibility of this being a scavenging event. The predator and its prey were carefully removed and placed on a rock for photography (Figure 1). Due to the unavailability of instruments, no attempt was made to measure the size and weight of the specimens. The *Indirana* stayed at this spot near the bush frog

Figure 1. *Indirana chiravasi* and the regurgitated prey (bush frog). Photo by Varad Giri

carrion for a long time and did not attempt to eat it. The regurgitated frog was then transferred to a leaf to take pictures of its dorsum (Figure 2). The *Indirana*, a few minutes after regurgitating the carrion, hopped away on its own accord.

The predator was identified as *Indirana chiravasi* based on the following set of morphological characters: dark brown dorsum, head longer than wide with a brown stripe running from the tip of the snout to shoulder, distinct canthus rostralis, moderate webbing, and elongated inner metatarsal tubercle (See Padhye et al. 2014). Despite the specimen matching the descriptions of *Indirana salelkari* Modak, Dahanukar, Gosavi, and Padhye (2015) as well, we would like to retain the identification as *Indirana chiravasi* Padhye, Modak, and Dahanukar, 2014, which was reported from Bondla Wildlife Sanctuary, Goa (ca. 13 km from Mollem aerially) by Ramesh et al. (2020) under the voucher ID, CESF2288. *Indirana salelkari* on the other hand has been confirmed only from its type locality (Tanshikar Spice Farm, Netravali), which lies 33 km from Mollem aerially. Modak et al. (2015) did not sample their new species from other locales in Goa, nor did they provide distribution limits for *I. chiravasi* and *I. salelkari.* Garg and Biju (2016) further tagged three specimens collected from Jog falls, Unchalli falls, and Dandeli, all from the state of Karnataka as *Indirana salelkari*. Therefore, we assume this species' distribution to be stretching southwards from its type locality. The partially digested prey was identified as a bush frog using the following set of morphological characters: thin and slender hindlimbs, dilated digit tips, webbing between the toes, and granular belly.

Measey et al. (2015) found anurophagy in frogs to be more common than previously perceived, and to be influenced by the synergy of species diversity in habitat, invasiveness potential of an anuran, and its body size. The observation reported by Kulkarni et al. (2020) might be an outcome of increased density of foraging frogs during breeding (in Matheran) leading to competition among conspecifics for space and food. A similar report made by Modak et al. (2018) during the monsoon, suggests that cannibalism or even anurophagy is not a common event in the *Indirana leithii* populations of Matheran. Our observation, if not a scavenging event, could presumably be a case of "opportunistic predation" (as defined by Toledo et al. 2007), wherein the predator (*Indirana chiravasi*) had a relatively larger body and gape size than the bush frog. No concrete conclusions can be made without understanding the species' diet composition across seasons; this report stands to be the first diet record of *Indirana chiravasi*. Studies on the diet of *Indirana* frogs are essen-

Figure 2. Bush frog with partially digested and smudged dorsum. Photo by Varad Giri.

tial to understand the spectrum of prey items involved. Isolated natural history reports are often considered trivial and less 'impactful', but they go a long way toward developing an overall understanding of the species' ecology. Documentation of a species' diet, predation, reproduction, morphology, habitat use, behaviour, time of activity and so on — in short, natural history notes — have been found to be extremely valuable in macroecological studies and systematic reviews (Maritz et al. 2021).

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Confirmation of *Liopeltis rappi* (Günther, 1860) from Himachal Pradesh, India

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Liopeltis Fitzinger, 1943, is an Asian genus consisting of small, slender, and non-venomous colubrid snakes. It is characterized by a cylindrical body bearing smooth scales in 13, 15 or 17 rows, without the presence of apical pits. Ventrals are rounded and the tail is long with