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A case of radio tag recovery from *Nanorana vicina* (Stoliczka, 1872) (Anura: Dicroglossidae)

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Radio telemetry is used to study habitat use, movement pattern and migratory behaviour in anurans (Tatarian 2008; Ludwig et al. 2013; Pitt et al. 2017), and has been thoroughly experimented with, by using different techniques of tag attachments (Goldberg et al. 2002; Muths 2003; Watson et al. 2003; Leskover & Sinsch 2005; Berg et al. 2010). One of the constraints in anuran telemetry is the size of the transmitter concerning its battery life, which necessitates recovering the tag before signal loss and exhaustion of battery life. Moreover, habitats of some anurans contain potential snags such as vegetation, coarse woody debris that might get entangled in the waistbands and even the antennae, causing dislodgment of the transmitters (Groff et al. 2015). Studies have reported the recovery of functional radio tags shed by animals (Rathbun & Murphey 1996; Muths 2003; Forester et al. 2006; Sepulveda & Layhee 2015; Cooper 2017; Tabata et al. 2018). However, recovery of nonfunctional radio tags retained by the animals has not been documented thus far.

We used this technique to understand the ecology of *Nanorana vicina* (Stoliczka, 1872), commonly known as Stoliczka's torrent frog, adapted for life in mountain streams in the Western Himalayas. This stream-breeding dicroglossid frog is uniquely adapted to pool sections of the streams, as observed during our survey in Benog Wildlife Sanctuary, Uttarakhand (28° 60´ - 31°28´ N, 70°49´ - 80°60´ E). We radio-tagged and tracked a total of 16 individuals of *N. vicina* over a period of five months (May to September 2019). Altogether, 11 radio transmitters (SOPR- 2070, Wildlife Materials Inc, US) were used in this study, out of which, seven tags were attached to seven different individuals and the rest of the four transmitters were reused on nine

Figure 1. A radio-tagged *Nanorana vicina*.

different individuals over a different period. The transmitter has a battery body (Battery life — 134 days) and a whip antenna attached to the device. We used a very fine and stretchable Teflon tube with a nylon thread inside the radio tag through the crafted fine hole present on the tags. Body weight and snout-vent length of the tagged frogs were recorded before and after tagging. Body weight of individuals ranged from 115–190 gm (Average = 150 gm, n = 16). The tags were carefully tied to the groin region of the frogs with a harness weighing 3.5 gm (2.3% of average body weight) maintaining the consideration that it must not exceed 5% of the body weight of the frog (Goldberg et al. 2002). The transmitter frequency range (150.000 to 150.480) of the tags and individual IDs of each tagged frog were noted for further monitoring. The frogs were kept overnight under controlled conditions before they were released at the same area of capture. Throughout the course of our study, we have successfully recovered five nonfunctional tags within the span of five months (June to October) in the year 2019; however, the rest of the six tags remained missing due to the transmitter's signal failure.

On 27 April 2021, we manually recovered two more nonfunctional transmitters with intact radio belts tied to individuals. However, we did not find the remaining four tags. These two recovered tags were attached on 16 July and 8 August 2019. Subsequent examination revealed no potential signs of abrasion or lesion on the recovered frogs even after a long period of attachment to the transmitters. The individuals were seen within a 20 m radius from their initial place of tagging. To our knowledge, this is the first-ever report of such incidence taking place where the tags were recovered after a span of 21 months, even when they were nonfunctional.

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A note on the larval stage of the Sikkimese caecilian, *Icthyophis sikkimensis* Taylor, 1960

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Among the three modern amphibian orders, Gymnophiona (caecilians) are the least known (Zhang & Wake 2009). Caecilians are readily distinguished from members of Anura (frogs and toads) and Caudata (salamanders and newts) by their elongated, annulate and limbless bodies. Gymnophiona are found in the moist tropical and proximate temperate regions of South-east and South Asia, Africa, the Seychelles, Central and South America (Zhang & Wake 2009). Among the 215 currently recognised extant species under 10 families, the genus *Ichthyophis* is the most speciose, with 50 species (April 10, AmphibiaWeb 2022)

The Sikkimese caecilian, *Ichthyophis sikkimensis* Taylor, 1960, was described on the basis of a holotype and three paratypes from the Indian states of Sikkim and West Bengal. The species is known to occur in Sikkim and Darjeeling regions of West Bengal and the Ilam district of eastern Nepal (Taylor 1960; Sarkar et al. 1992; Pillai & Ravichandran 1999; Anders et al. 2002; Shah & Tiwari 2004; Kamei et al. 2009; Kamei 2017; Frost et al. 2022). *Ichthyophis sikkimensis* is classified as Data Deficient (DD) in the IUCN Red list of Threatened species because of "ongoing uncertainties as to its extent of occurrence, status and ecological requirements" (Ohler et al. 2004).

During a field survey conducted between 15–21 July, 2021 at Kalikhola Latpanchar, Darjeeling district, West Bengal State, a caecilian was found while searching for earthworms under wet stones on sandy-gravel substratum beside a running stream inside a forest at Kalikhola (26° 44′ 34″ N, 88° 34′ 22″ E). The specimen was collected by Md. Nurul Hassan on 19.07.2021 on a rainy day during peak monsoon season and euthanised by injecting 70% ethanol into the heart, then washed with water and preserved for two days in 4% formaldehyde solution. Later it was washed in running tap water and transferred to 70% ethanol for final preservation and deposited in the collections of the Zoological Survey of India as ZSI A 15401. The specimen was identified as a larva of *Ichthyophis* because of the presence of a spiracle and tail fin and also because the tentacle had not erupted. There are no published keys to ichthyophiid larvae, but the specimen is tentatively identified as *I. sikkimensis* (Taylor 1960) because it is a late-stage larva that lacks lateral yellow stripes. Measurements were taken with a Mitutoyo™ digital calliper to the nearest 0.1 mm under a Leica EZ4 stereo binocular microscope and a Lensel magnanoscope.

The developmental stages of *Icthyophis sikkimensis* is poorly known, with no published description of the larvae. For the first time, we present information on the larval morphology