



Differential Responses to Disturbance by Brumating Shillong Bush Frogs (*Raorchestes shillongensis*) (Rhacophoridae)

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The Shillong Bush Frog (*Raorchestes shillongensis*), which is endemic to the East Khasi Hills District of Meghalaya, Northeast India, was first described by Pillai and Chanda (1973) from the Malki Forest of the Shillong Plateau based on specimens collected during the winter months of 1971 and 1973. Although some treefrogs are known to brumate in various hibernacula, such as soil, dead logs, tree holes, and banana stems (Saikia et al. 2021), little is known about the hibernacula of bush frogs. An exception is a record of a brumating *Raorchestes* sp. found in a banana stem at New Malidor, Assam (Saikia et al. 2021).

On 1 December 2024, the first author observed a group of three Shillong Bush Frogs (two males and one female) brumating beneath a flowerpot in his homestead at Dhankheti, Shillong, India, approximately 1 km from the species' type locality in Malki Forest. The frogs were huddled together on a thin layer of soil beneath the pot, which had been resting undisturbed on a wooden box for several months. The observation was made around 1145 h, when the pot was moved for the first time in a long while (Fig. 1A). Though inactive, the frogs gradually opened their eyes, responding sluggishly to being disturbed. At 1151 h, one of the males suddenly became active and leaped away from the group. About a minute later, the second male began to stir, hopping in small steps around the still motionless female (Fig. 1B), followed by another circle alongside her. At 1202 h, when the second male leaped away (Fig. 1C), the female moved (Fig. 1D), leaping about 30 cm, followed by another jump, before escaping from the brumating site. The delayed responses are clearly evidence of brumation instead of the frogs merely seeking refuge under the flowerpot. Also, while Shillong Bush Frogs are known for their polymorphism, displaying vibrant color variations (Boruah et al. 2018; Saikia and Kharkongor 2022), the brumating individuals were notably pale, aligning with observations by Pillai and Chanda (1973).

Although breeding biology has been well documented (Boruah et al. 2017), little is known about the species' overwintering behavior. Although the type series of Shillong Bush Frogs consisted of brumating individuals, and solitary brumating frogs have been observed previously by the first author, this new observation offers fresh insights into their brumation behavior, particularly their response to disturbance. The contrasting responses among the brumating individuals suggest variability in arousal thresholds and recovery times from dormancy. This variation could be influenced by factors such as sex, individual physiology, or depth of brumation, and could have ecological or survival implications, especially under changing environmental conditions or predator threats.

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Figure 1. Sequential images of brumating Shillong Bush Frogs (*Raorchestes shillongensis*) in Dhankheti, Shillong, India: Two males and a female brumating under a flowerpot (A), the second male to become active hopping around the still motionless female (B), the second male hopping away (C), and the female moving last (D). Photographs by Bhaskar Saikia.