



# Frogs in the Genus *Fejervarya* (Anura: Dicroglossidae) of the Nazipur Area, Patnitala Upazila, Naogaon District in Northwestern Bangladesh

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Photographs by the senior author

Bangladesh, located at the junction of the Indo-Himalayan and Indo-Chinese Subregions (Stanford 1991) and part of the Indo-Burmese biodiversity hotspot (Myers et al. 2000), has a rich biota. Hasan et al. (2014) recorded 71 species of amphibians, including nine species in the genus *Fejervarya*. Frogs in this genus, variously referred to as Terrestrial Frogs, Cricket Frogs, or Wart Frogs, are assigned to the family Dicroglossidae, subfamily Dicroglossinae, and include 39 currently recognized species of small to medium-sized frogs distributed widely over southern and southeastern Asia (Frost 2015). These frogs are characterized by the presence of the “*Fejervarya* line” on both sides of the belly and the absence of a rictal gland at the mouth commissure. In earlier publications, most species were referred to *Rana limnocharis*, a species as then defined with a wide range extending from Pakistan to China, Japan, and Indonesia. After reassignment to the genus *Fejervarya*, the name *F. limnocharis* was restricted to populations in Indonesia and Malaysia (Dubois and Ohler 2000; Veith et al. 2001).

The slight morphological differences among the species in this genus have generated some confusion; consequently, various species have been collectively identified as belonging to the *Fejervarya limnocharis* complex (e.g., Islam et al. 2008). However, biochemical and molecular phylogenetic analyses clearly illustrate the presence of several cryptic species in the genus from the South Asian Region (Toda et al. 1998; Kurabayashi et al. 2005; Djong et al. 2007; Hasan et al. 2012). Kuramoto et al. (2007) described four cryptic species from the Western Ghats of India, and Howlader (2011a) discovered two previously unknown species in Bangladesh (*Fejervarya frithii* from Jessore and *F. asmati* from Chittagong). Note, however, Howlader (2011b) subsequently recognized distinct South Asian and Southeast Asian morphs and assigned several species to the genus *Zakerana*. Herein,

however, we follow Frost (2015) in retaining the name *Fejervarya* for all species.

## Methods

Our study site (Fig. 1) was at Nazipur Area, Patnitala Upazila, Naogaon District (25°2'42.23"N, 88°45'4.47"E; elevation 24 m asl). We conducted surveys in known *Fejervarya* habitats along ponds, rivers, canals, temporary pools, paddy fields, and wet grasslands. We spent 27 nights from 1930–1130 h searching for amphibians in June–September 2013 and collected one representative specimen of each species to compare morphometric data with previously published reports by Borthakur et al. (2007; for *F. nepalensis*, *F. pierrei*, and *F. teraiensis*), Howlader (2011a; for *F. asmati*), and Kurniawan et al. (2011; for *F. cancrivora*).

Based on morphological and morphometric descriptions in the sources listed above and supplemented by those in Dubois (1975, 1984), Schleich and Kästle (2002), Islam et al. (2008), Howlader (2011b), and Hasan et al. (2014), we used eleven parameters for species identification: SVL (snout-vent length), HL (head length), HW (head width), SL (snout length), IN (internarial distance), EN (distance from front of eyes to nostril), NS (nostril-snout length), EL (eye length), TL (tibial length), finger formula, and tubercle arrangements. We used digital calipers to take measurements of the representative individual of each species after confirmation of identity.

## Results

During our surveys, we encountered five species in the genus *Fejervarya*. All measurements are in mm. (1) **Nepal Cricket Frog (*Fejervarya nepalensis* [Dubois 1975])**; Fig. 2. Adult female: SVL 38.5; HL 11.5; HW 10.2; SL 6.00; IN 3.2; EN 3.00; NS 2.4; EL 5.00; TL 17.00. Small frogs with a distinct narrow middorsal line (MDL), sometimes absent. Skin fringe indistinct on outer side of 5th toe. Right finger length (RFL) 2<1<4<3. Body tubercles

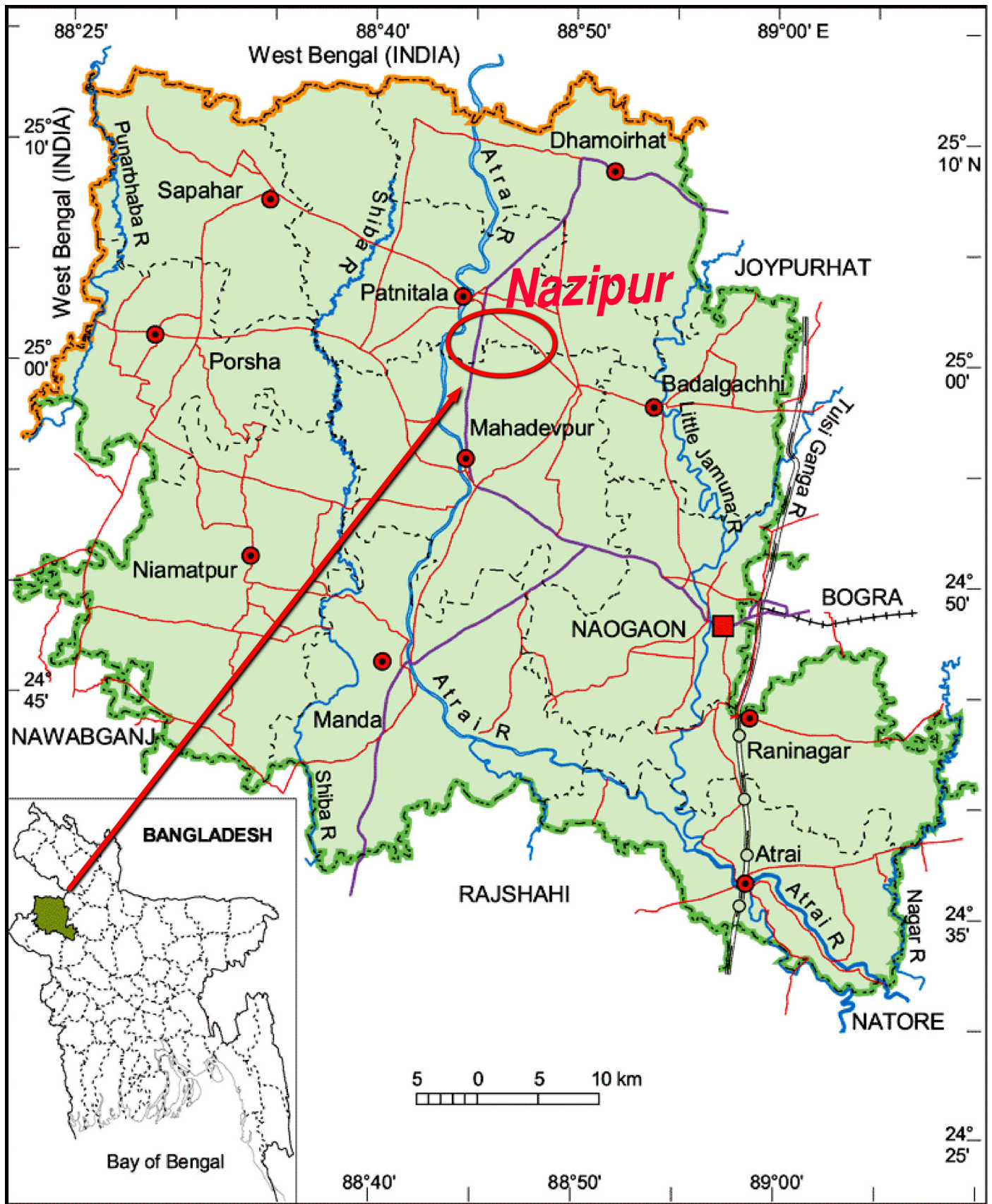


Fig. 1. Location of the study area in the Nazipur Area of Bangladesh.

oblong, arranged in longitudinal folds; snout jutting over lower jaw. Collected from the bank of a small pond covered with grasses. (2) **Pierre's Cricket Frog (*Fejervarya pierreii* [Dubois 1975])**; Fig. 3. Adult male: SVL 40.00; HL 13.8; HW 12.00; SL 5.8; IN 2.2; EN 3.00; NS 3.2; EL 5.6; TL 17.00. Small frogs with a distinct wide middorsal line (MDL) extending from tip of snout to vent. Skin fringe not present on outer side of 5th toe. Right finger length (RFL)  $2=4<1<3$  (1st finger longer than 2nd and 4th). Throat dark laterally and pale medially in male. Body tubercles oblong, arranged in rows; snout tip markedly jutting over lower jaw. Collected from the edge of a temporary pool. (3) **Terai Cricket Frog (*Fejervarya teraiensis* [Dubois 1984])**; Fig. 4. Adult male: SVL 50.00; HL 8.5; HW 17.00; SL 9.5; IN 4.00; EN 5.2; NS 4.2; EL 7.5; TL 21.4. Large frogs with highly variable middorsal lines (MDL) (i.e., present-absent; if present, distinct to indistinct, narrow to broad, same width throughout or irregularly broad). Distinct skin fringe on outer side of 5th toe. Right finger length (RFL)  $2=4<1<3$  (1st finger distinctly longer than 2nd and 4th. "W" shaped dark mark on throat of male. Snout scarcely jutting over lower jaw. Collected

among bushes and grasses along the bank of a stream. (4) **Asmat's Cricket Frog (*Fejervarya asmata* Howlader 2011)**; Fig. 5. Adult female: SVL 31.5; HL 11.6; HW 10.6; SL 5.2; IN 3.1; EN 3.8; NS 2.1; EL 4.5; TL 16.3. Small frogs also with distinct narrow middorsal lines (MDL). Right finger length (RFL)  $2<4<1<3$ . Tips of fingers bluntly rounded and fingers lacking dermal ridges. Sub-articular tubercles prominent, rounded, single tubercle per digit; two distinct capsule-shaped palmar tubercles; supernumerary tubercles absent. Nostrils much closer to snout tip than eyes. Collected from an open area adjacent to a canal. (5) **Mangrove Frog (*Fejervarya cancrivora* [Gravenhorst 1829])**; Fig. 6. Adult female: SVL 69.00; HL 21.9; HW 23.5; SL 8.5; IN 3.9; EN 5.5; NS 4.3; EL 7.0; TL 35.0. Larger than other four species. Head comparatively narrow with oval snout. Right finger length (RFL)  $2<4<3<1$ . Fingers without dermal fringes. Toes almost pointed, web almost reaching tips on outer borders of 1st, 2nd, and 3rd toes, inner border of 5th toe, and outermost tubercle of 4th toe. Irregular longitudinal ridges present on back. Collected from a wet grassland bordering rice paddies.



Fig. 2. Nepal Cricket Frog (*Fejervarya nepalensis*).



Fig. 3. Pierre's Cricket Frog (*Fejervarya pierreii*).



Fig. 4. Terai Cricket Frog (*Fejervarya teraiensis*).



Fig. 5. Asmat's Cricket Frog (*Fejervarya asmati*).

### Discussion

According to Hasan et al. (2014), nine species occur in Bangladesh, over half of which are present in our study area, suggesting that this site supports a high diversity of amphibians. Further investigations are likely to reveal more species in the genus *Fejervarya* from this region.

Frogs are highly sensitive to environmental changes that can lead to extinction, and frequently are considered accurate indicators of environmental stress. Excessive exploitation of natural resources (i.e., cutting vegetation, flooding bodies of water, and widespread use of pesticides), an expanding human footprint corresponding to a growing human population, diseases, climate change, and increases in UV radiation might be affecting amphibian populations in the region, lending urgency to the need for more surveys, detailed studies, and implementation of measures for conserving amphibians in rapidly degrading habitats.

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Fig. 6. Mangrove Frog (*Fejervarya cancrivora*).

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