



# Rapid Assessment of Amphibians at Milonchari Area in Bandarban District, Bangladesh

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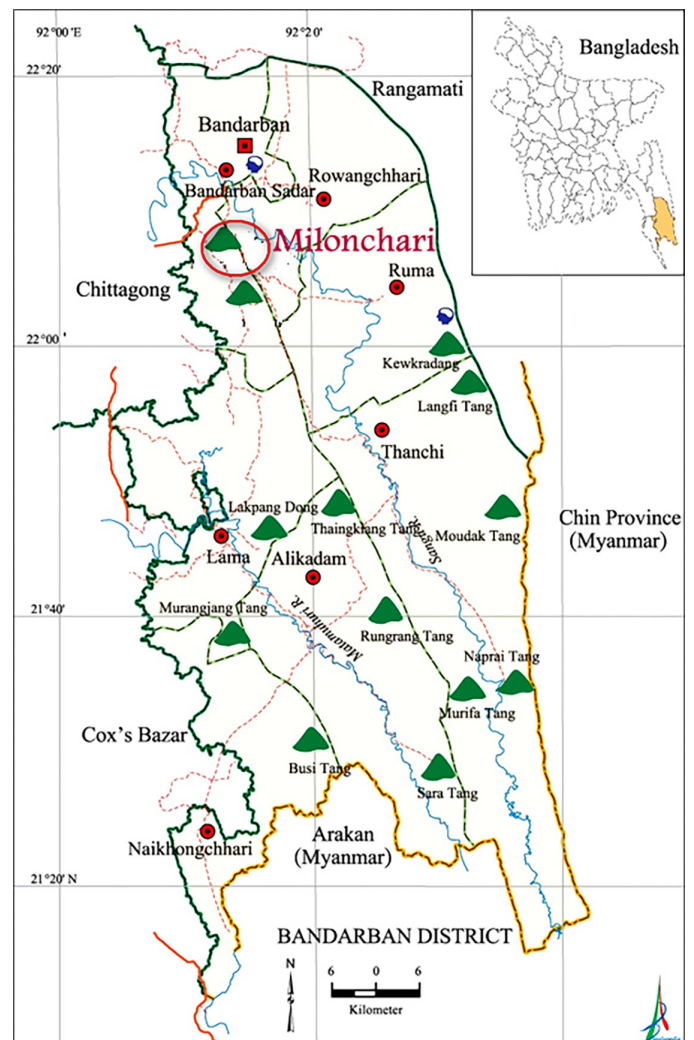
Bangladesh is a global biodiversity hotspot in tropical Asia with a unique and diverse biota in a wide variety of poorly unexplored habitats. Situated at the junction of the Indo-Himalayan and Indo-Chinese Sub-regions (Stanford 1991), it has 25 recognized bioecological zones based on temperature, precipitation, soil quality, hydrological conditions, and the diversity of flora and fauna (Nishat et al. 2002). Over 1,600 animal species have been documented in Bangladesh, including 138 mammals, 566 birds, 167 reptiles, 49 amphibians, 253 freshwater fishes, 141 crustaceans, and 305 species of butterflies (IUCN Bangladesh 2015).

Forty-nine species of amphibians have been recorded in Bangladesh (Hasan et al. 2014). Two are listed by IUCN Bangladesh (2015) as Critically Endangered (CR), three as Endangered (EN), five as Vulnerable (VU), six as Near Threatened (NT), six as Data Deficient (DD), and the remaining 27 as species of Least Concern (LC).

Amphibians play vital roles in natural ecosystems, often functioning to control biological pests (e.g., Matthews et al. 2002; Whiles et al. 2006). However, location-specific information on amphibian diversity and habitat preferences in Bangladesh is insufficient. Herein we present the results of a rapid assessment of amphibian diversity and habitat preferences in the Milonchari Area of the Bandarban District in Bangladesh. This area is covered by highly diverse, mostly intact, and poorly explored forests that extend into Myanmar and northeastern India. Rapid Assessments are accelerated, targeted, and flexible studies of biodiversity that focus on species related to specific vegetation types or topographical characteristics (Sayre et al. 2000).

At 1800–0100 h over three nights from 24–26 May 2017, we conducted visual-encounter surveys in the Milonchari Area of the Bandarban District (21°48'N, 92°24'E) using headlamps and flashlights while following a transect and emphasizing amphibian habitats that included small permanent and intermittent pools and streams and areas with dense vegetation. We captured at least one indi-

vidual of every species encountered and photographed them in daylight. We subsequently released most of them but



**Fig. 1.** Map of the Bandarban District showing the location of the Milonchari Area, where we conducted a rapid assessment of amphibian diversity and habitat preferences (adapted from *Banglapedia: The National Encyclopedia of Bangladesh*).



**Fig. 2.** Asian Common Toad (*Duttaphrynus melanostictus*; left), Marbled Toad (*Duttaphrynus stomaticus*; center), and Skipper Frog (*Euphlyctis cyanophlyctis*; right).

preserved a few cryptic specimens in 60% ethanol for further examination. With the exception of frogs in the genus *Fejervarya*, which are cryptic and require genetic analyses to distinguish, we identified frogs to species with the assistance of Drs. Kaushik Deuti (Zoological Survey of India), Abhijit Das (Wildlife Institute of India), and Mohammad Abdul Wahed Chowdhury (University of Chittagong, Bangladesh).

We found 17 of the 49 species of anurans known from Bangladesh, one of which is Endangered, three Near Threatened, and 13 of Least Concern (Table 1). In the fol-

lowing species accounts, AOO = Area of Occupancy, EOO = Extent of Occurrence.

**Bufonidae**

*Duttaphrynus melanostictus* (Asian Common Toad). N > 80 (breeding chorus). EOO = 222,509 km<sup>2</sup> and AOO = 132,741 km<sup>2</sup> (Rahman 2015a). Globally, this species is found in Bangladesh, Cambodia, China, India, Indonesia, Lao PDR, Malaysia, Myanmar, Nepal, Papua New Guinea, Pakistan, Singapore, Sri Lanka, Thailand, and Vietnam (van Dijk et

**Table 1.** List of species found during a rapid assessment of amphibian diversity and habitat preferences in the Milonchari Area of the Bandarban District in Bangladesh with national and global conservation status. Some species listed herein as *Fejervarya* sp. might be more accurately assigned to the genus *Minervarya* (Sanchez et al. 2018; Köhler et al. 2019). *Feihyla vittata* was until recently (Li et al. 2013) placed in the genus *Chiromantis* (as *C. vittatus*). *Theلودerma andersoni* has recently been considered to be in the genus *Philautus*, but the taxonomy is not fully resolved (e.g., Hou et al. 2017).

Family	Species	Conservation Status	
		Bangladesh	Global
Bufonidae	<i>Duttaphrynus melanostictus</i>	LC	LC
	<i>Duttaphrynus stomaticus</i>	LC	LC
Dicroglossidae	<i>Euphlyctis cyanophlyctis</i>	LC	LC
	<i>Fejervarya</i> spp.	LC	LC
	<i>Hoplobatrachus tigerinus</i>	LC	LC
	<i>Ingerana borealis</i>	NT	VU
	<i>Occidozyga lima</i>	LC	LC
Megophryidae	<i>Megophrys parva</i>	NT	LC
Microhylidae	<i>Kaloula pulchra</i>	NT	LC
	<i>Microhyla berdmorei</i>	LC	LC
	<i>Microhyla ornata</i>	LC	LC
Ranidae	<i>Clinotarsus alticola</i>	LC	LC
	<i>Hylarana leptoglossa</i>	LC	LC
Rhacophoridae	<i>Feihyla vittata</i>	LC	LC
	<i>Polydectes leucomystax</i>	LC	LC
	<i>Rhacophorus bipunctatus</i>	LC	LC
	<i>Theلودerma andersoni</i>	EN	LC



**Fig. 3.** Four Cricket Frogs (*Fejervarya* spp.) not assigned to species. Note that some species listed herein as *Fejervarya* sp. might be more accurately assigned to the genus *Minervarya* (Sanchez et al. 2018; Köhler et al. 2019).

al. 2004a). This species is the most frequently encountered amphibian in Bangladesh, where it occurs in a variety of habitats, including the hill country and all terrestrial forest ecosystems, throughout the mainland into coastal areas and onto offshore islands (M.A.R. Khan 1982, 1987, 2015; M.M.H. Khan 2008; Pratihari et al. 2014; Rahman 2015a).

*Duttaphrynus stomaticus* (Marbled Toad).  $N > 30$ . EOO = 82,486 km<sup>2</sup> and AOO = 17,528 km<sup>2</sup> (Rahman 2015b). Globally, this species is found in Afghanistan, Bangladesh, India, Iran, Nepal, Oman, and Pakistan (Stöck et al. 2009). In Bangladesh, these toads are distributed through central and southwestern parts of the country, particularly the chars of the Ganges-Brahmaputra-Meghna River Systems; the species also has been recorded from Rajshahi, Rangpur, and Sundarbans (A.B.M.S. Alam et al. 2012; Pratihari et al. 2014; Hasan et al. 2014; M.A.R. Khan 2015; Rahman 2015b).

#### Dicroglossidae

*Euphlyctis cyanophlyctis* (Skipper Frog or Skittering Frog).  $N > 15$ . EOO = 222,509 km<sup>2</sup> and AOO = 139,772 km<sup>2</sup> (Chowdhury 2015a). Globally, this species is found in Afghanistan, Bangladesh, Bhutan, India, Iran, Myanmar, Nepal, Pakistan, Sri Lanka, and Vietnam (M.S. Khan et al. 2009). In Bangladesh, this species has the widest distribution of all anurans, ranging from coastal areas into the hilly terrain of the Bandarban District (M.A.R. Khan 1987, 2015; M.S. Alam et al. 2008; Mahony and Reza 2008; Mahony et al. 2009; Chowdhury 2015a).

*Fejervarya* spp. (Cricket Frogs).  $N > 200$ . These species are widely distributed throughout the Indian Subcontinent (IUCN Bangladesh 2015). Note that some species listed herein

as *Fejervarya* sp. might be more accurately assigned to the genus *Minervarya* (Sanchez et al. 2018; Köhler et al. 2019).

*Hoplobatrachus tigerinus* (Indian Bullfrog).  $N > 60$ . EOO = 222,509 km<sup>2</sup> and AOO = 139,772 km<sup>2</sup> (Sultana 2015). Globally, this frog is found in Afghanistan, Bangladesh, India, Myanmar, Nepal, and Pakistan (Padhye et al. 2008). In Bangladesh, this species probably is the most widely distributed of the larger anuran species (M.A.R. Khan 1982, 1987, 2015; Hasan et al. 2014; Sultana 2015).

*Ingerana borealis* (Northern Frog or Boreal Floating Frog).  $N > 120$ . EOO = 41,602 km<sup>2</sup> and AOO = 10,626 km<sup>2</sup> (Hasan 2015a). Globally, this species is found in Bangladesh, Bhutan, and India (Lau et al. 2004a). In Bangladesh, this species is found in the mixed evergreen forests in the hilly areas of the northeastern and southeastern parts of the country (Hasan et al. 2014; Sarker and Lovlu 2014; Hasan 2015a) and is particularly abundant in and around Madhabkunda (M.A.R. Khan 2015).

*Occidozyga lima* (Puddle Frog).  $N > 5$ . EOO = 41,602 km<sup>2</sup> and AOO = 10,626 km<sup>2</sup> (Hasan 2015c). Globally, this species occurs in Bangladesh, Cambodia, China, India, Indonesia, Lao PDR, Malaysia, Myanmar, Thailand, and Vietnam (van Dijk et al. 2004b). In Bangladesh, these frogs inhabit mixed evergreen forests and surrounding areas in the southeastern part of the country (Hasan et al. 2014; Hasan 2015c).

#### Megophryidae

*Megophrys parva* (Concave-crowned Horned Frog, Mountain Horned Frog).  $N > 150$ . EOO = 13,320 km<sup>2</sup> and AOO = 2,722 km<sup>2</sup> (Chakma 2015a). Globally, this species is found in Bangladesh, Bhutan, China, India, Lao PDR, Myanmar,



**Fig. 4.** Indian Bullfrog (*Hoplobatrachus tigerinus*; left), Northern Frog (*Ingerana borealis*; center), and Puddle Frog (*Occidozyga lima*; right).



**Fig. 5.** Concave-crowned Horned Frog (*Megophrys parva*; left), Asian Painted Frog (*Kaloula pulchra*; center), and Berdmore's Narrow-mouthed Frog (*Microhyla berdmorei*; right).

Nepal, Thailand, and Vietnam (van Dijk et al. 2004c). In Bangladesh, this species has been reported from the Chittagong Hill Tracts, Chittagong, and Greater Sylhet; it is particularly abundant in the Madhabkunda Eco-park (Chakma 2015a; M.A.R. Khan 2015).

#### Microhylidae

*Kaloula pulchra* (Painted Bullfrog or Asian Painted Frog).  $N > 50$ . EOO = 41,602 km<sup>2</sup> and AOO = 10,623 km<sup>2</sup> (Ahsan 2015). Globally, this species is found in Bangladesh, Cambodia, China, India, Indonesia, Lao PDR, Malaysia, Myanmar, Nepal, Singapore, Thailand, and Vietnam (Kuangyang et al. 2004). In Bangladesh, it is found in and around mixed-evergreen forests in the eastern, northeastern, and southeastern parts of the country and near human habitations in the hill districts (M.A.R. Khan 1982, 1987, 2015; Hasan et al. 2014; Ahsan 2015).

*Microhyla berdmorei* (Berdmore's Narrow-mouthed Frog).  $N > 20$ . EOO = 93,049 km<sup>2</sup> and AOO = 36,293 km<sup>2</sup> (Chowdhury 2015b). Globally, this species is found in Bangladesh, Cambodia, China, India, Indonesia, Malaysia, Myanmar, Thailand, Lao PDR, and Vietnam (van Dijk et al. 2004d). In Bangladesh, these frogs are found in the deciduous and mixed evergreen forests of the central, eastern, northeastern, and southeastern parts of the country (Asmat et al. 2003; Hasan et al. 2014; Chowdhury 2015b; M.A.R. Khan 2015).

*Microhyla ornata* (Ornate Narrow-mouthed Frog, Ant Frog).  $N > 100$  (breeding chorus). EOO = 222,509 km<sup>2</sup> and AOO = 136,929 km<sup>2</sup> (Hasan 2015b). Globally, this species is found in Bangladesh, India, Bhutan, Nepal, Pakistan, and

Sri Lanka (Dutta et al. 2008). In Bangladesh, these frogs are widely distributed and occur in a variety of habitats (Hasan et al. 2014; Hasan 2015b; M.A.R. Khan 2015).

#### Ranidae

*Clinotarsus alticola* (Point-nosed Frog).  $N > 25$ . EOO = 41,602 km<sup>2</sup> and AOO = 10,624 km<sup>2</sup> (Rahman 2015c). Globally, this species is found in Bangladesh, India, Myanmar, and Thailand (van Dijk et al. 2004e). In Bangladesh, this species is found in the northeastern and southeastern parts of the country (M.M.H. Khan 2008; Mahony et al. 2009; M.A.R. Khan 2015; Rahman 2015c).

*Hylarana leptoglossa* (Cope's Assam Frog).  $N > 8$ . EOO = 55,093 km<sup>2</sup> and AOO = 1,626 km<sup>2</sup> (Ahmed. 2015). Globally, this frog is found in Bangladesh, India, Myanmar, and Thailand (IUCN SSC Amphibian Specialist Group 2016). In Bangladesh, these frogs are widely distributed throughout the country, where they appear to be rather partial to deciduous and mixed evergreen forests, as well as other well vegetated habitats (Romer 1949; Asmat et al. 2003; Hasan et al. 2014; Ahmed. 2015; M.A.R. Khan 2015).

#### Rhacophoridae

*Feihyla vittata* (Striped Asian Treefrog).  $N > 10$ . EOO = 41,602 km<sup>2</sup> and AOO = 10,626 km<sup>2</sup> (Hasan 2015d). Globally, these frogs are known to occur in Bangladesh, Cambodia, China, India, Lao PDR, Myanmar, Thailand, and Vietnam (Lau et al. 2004b). In Bangladesh, this species occupies mixed evergreen forests and surrounding areas in Chittagong and Sylhet Divisions (Hasan et al. 2014; Hasan 2015d).



**Fig. 6.** Ornate Narrow-mouthed Frog (*Microhyla ornata*; left), Point-nosed Frog (*Clinotarsus alticola*; center), and Cope's Assam Frog (*Hylarana leptoglossa*; right).



**Fig. 7.** Striped Asian Treefrog (*Feihyla vittata*; left), Common Asian Treefrog (*Polypedates leucomystax*; center left), Twin-spotted Treefrog (*Rhacophorus bipunctatus*; center right), and Anderson's Bush Frog (*Theloderma andersoni*; right).

*Polypedates leucomystax* (Common Asian Treefrog).  $N > 100$  (breeding chorus). EOO = 221,137 km<sup>2</sup> and AOO = 136,929 km<sup>2</sup> (Hasan 2015e). Globally, this species is found in Bangladesh, Brunei Darussalam, Cambodia, China, India, Indonesia, Lao PDR, Malaysia, Myanmar, Nepal, the Philippines, Singapore, Thailand, Vietnam, and Japan (Diesmos et al. 2004). In Bangladesh, these frogs are widely distributed throughout the country, ranging from coastal areas to the hilltops (M.A.R. Khan 1982, 1987, 2015; Hasan et al. 2014; Hasan 2015e).

*Rhacophorus bipunctatus* (Twin-spotted Treefrog).  $N > 20$ . EOO = 35,483 km<sup>2</sup> and AOO = 10,549 km<sup>2</sup> (Chakma 2015b). Globally, this species is found in Bangladesh, China, India, Malaysia, Myanmar, and Thailand (Ohler et al. 2008). In Bangladesh, these frogs occur in mixed evergreen forests, including secondary forests, in the northeastern and southeastern parts of the country (Ali Reza and Mukul 2009; Chakma 2015b; M.A.R. Khan 2015).

*Theloderma andersoni* (Anderson's Bush Frog, Anderson's Bubble-nest Frog).  $N = 1$ . EOO = 312 km<sup>2</sup> and AOO = 95 km<sup>2</sup> (M.M.H. Khan 2015). Globally, this species is found in Bangladesh, China, India, and Myanmar (van Dijk et al. 2004f). In Bangladesh, these frogs occur in and around Kaptai National Park in the Rangamati District (M.A.R. Khan 2012); although not found elsewhere, they likely occur in other suitable habitats in the southeastern part of the country (M.M.H. Khan 2015).

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