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Inventory Survey on the Ophidian Fauna of Reiek Community Reserved Forest, Mamit District, Mizoram, India

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Abstract

Aim: The present study was conducted to survey and document the ophidian fauna of Reiek Community Reserved Forest, Mamit District, Mizoram, North-eastern India for the first time.

Methodology: Extensive survey for studying the ophidian fauna of Reiek Community Reserved Forest, Mamit District, Mizoram was conducted from October 2018 to September 2019 by using Visual encounter survey (VES) method for sampling. Specimens were caught with the help of a snake hook, tongs and also by hand, then kept in the snake bags. They were euthanized and fixed in 10% buffered formalin and later transferred in 70% ethanol in the Reptile Section, Departmental Museum of Zoology, Mizoram University, Aizawl. The specimens were identified based on the morphology by using the existing literature.

Results: A total of 28 species of snakes belonging to 20 genera of seven distinct families were documented and collected in the surveyed area. This work revealed that the diversity of snake fauna in the area is dominated by the family Colubridae (46.4 %), followed by Natricidae (21.4 %), Viperidae (10.7 %), Elapidae (10.7 %), Pareidae (3.6 %), Pseudaspidae (3.6 %), and Typhlopidae (3.6%), which altogether represents 53.8 % of the total snake species currently recorded from Mizoram.

Interpretation: The collection of snakes from the study site revealed high diversity of snake species. The occurrence of *Hebius venningi* represents the second report from the State, and it extends the range of distribution ca. 15 km NW from the first reported site. However, the flora and fauna of the study area are presumably disturbed by various anthropogenic interferences so that several interesting species and resources are likely to disappear from this area sooner or later.

Keywords: Mizoram, Northeast India, Reiek Community Reserved Forest, Snake diversity

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Introduction

The abundance and distribution of reptile species is highly uneven in India. The highest concentration of genera and species being represented by the northeast region and the Western Ghats. It therefore, appears that a careful analysis of the pattern of distribution of this sensitive reptilian fauna might give us better insights for understanding how closely organisms are tied to their habitats and other environmental habitats. Moreover, North-east India is the centre of attention as an area of global importance due to its rich floral and faunal diversity, covered by two global biodiversity hotspot areas, the Eastern Himalayas and Indo-Myanmar. According to Pawar (1999), although North-east India, being one of the biodiversity hotspots of the world, it is, in fact, one of the most beleaguered areas in terms of habitat degradation and loss today, little work has been done there in terms of herpetofaunal inventoring. However, all pieces of evidence suggested that the region is very rich in herpetofauna and that much of this diversity remains to be discovered (Pawar and Birand, 2001). Nonetheless, only a couple of studies have been conducted in the herpetofauna of Mizoram by few workers, most of the protected areas of the state have not yet been explored, except Palak National Wetland, Ngengpui Wildlife Sanctuary and Dampa Tiger Reserve (Pawar and Birand, 2001). After a recent record of 52 species of snakes by Lalremsanga and Lalrununga (2017), new additions on the snake fauna of Mizoram have been reported (Lalremsanga *et al.*, 2017; Lalbiakzuala and Lalremsanga, 2017; Vogel *et al.*, 2017; Lalremsanga *et al.*, 2018; Giri *et al.*, 2019; Ashaharaza *et al.*, 2019; Lalbiakzuala *et al.*, 2019). The present work deals with inventory survey and documentation of the diversity and habitat of snake found in the Reiek Community Reserved Forest, Mamit District, Mizoram, Northeast India for the first time.

Materials and Methods

Study area : Reiek Community Reserved Forest (Fig. 1), Mamit District, Mizoram ($92^{\circ}36'20''\text{E}$ – $93^{\circ}36'20''\text{E}$ and $23^{\circ}41'11''\text{N}$ – $23^{\circ}41'35''\text{N}$; area 10 sq.km) is ca. 25 km away from Aizawl, the capital of Mizoram and the highest peak is with an elevation of 1485 m asl. The temperature ranges between 8°C – 22°C in winter and 20°C – 28°C in summer with heavy rainfall (State Meteorological Centre, 2017). The study site does not enclose any major stream but is marked by the presence of small seasonal brooks and streams which later joins bigger streams that all flow into Tlawng River. The vegetation falls under tropical semi-evergreen forest or sub-tropical evergreen forest (Lalzarzovi and Lahnunluanga, 2018). The forest has been traditionally managed by villagers through selective felling such as harvesting of individuals of mature trees above certain diameter that varies from species to species and leaving few mother trees to promote regeneration (Devi *et al.*, 2018).

Visual encounter survey (VES) method was employed for sampling diurnal groups in terrestrial and freshwater habitats as

Fig. 1 : Topographic map of Reiek Community Reserved Forest, Mamit District, Mizoram.

per Doan (2003). For nocturnal groups, an artificial source of light was employed for spotting the animals. Thorough survey was conducted from October 2018 to September 2019 in the forest as well as among the vegetation surrounding human habitation by checking bushes, grounds, leaf litters, crevices of rocks and boulders, underneath tree-barks, rocks and pebbles, water bodies like streams, puddles, rock pools, canals, tanks, etc. Specimens were collected with the help of a snake hook and tongs, and also caught by hand. Individuals were released back to their natural habitat if a single individual of conspecies was already collected. Collected specimens were kept in the snake bags along with wet leaf litters to avoid dehydration and hot temperature. They were anaesthetized using 250 mg kg^{-1} of 0.7% sodium bicarbonate buffered MS-222 (Tricaine Methanesulfonate) solution by intracoelomic injection (ICo), and then euthanized using a second intracoelomic injection (ICo) of 0.1 ml unbuffered 50% (v/v) MS-222 solution by following Conroy *et al.* (2009), and then catalogued and fixed in 10% buffered formalin and later transferred in 70% ethanol to the Reptile Section, Department Museum of Zoology, Mizoram University (MZMU), Aizawl. The specimens were compared and identified by using existing literatures (Smith, 1943; Whitaker and Captain, 2008; Ahmed *et al.*, 2009; Das and Das, 2017). The common names were given on the basis of Uetz *et al.* (2019). Conservation

status was done on the basis of International Union for Conservation of Nature (The IUCN, 2019) (Table 1) A detail of the topographic map was obtained from the Mizoram Remote Sensing Application Center, Department of Science and Technology, Government of Mizoram.

Results and Discussion

From the present work, 28 species of snakes were documented from Reiek Community Reserved Forest. Majority of the species belonged to the family Colubridae, which contributes 13 species namely: *Boiga cyanea*, *Boiga ochracea*, *Coelognathus radiatus*, *Dendrelaphis cyanochloris*, *Gonyosoma prasina*, *Lycodon zawi*, *Oligodon albocinctus*, *Oligodon cinereus*, *Oligodon cyclurus*, *Oligodon dorsalis*, *Oreocryptophis porphyraceus*, *Ptyas korros* and *Sibynophis collaris* belonging to nine genera comprising 46.4 % of the present record (Fig. 2, 3). The snake family Natricidae was represented by six distinct species namely: *Hebius khasiense*, *Hebius venningi*, *Herpetoreas xenura*, *Pseudoxenodon macrops*, *Rhabdophis subminiatus* and *Smithophis bicolor*, which comprised 21.4% (Fig. 4), followed by Elapidae (*Bungarus fasciatus*, *Bungarus niger* and *Naja kaouthia*) (Fig. 5), and Viperidae (*Ovophis*

Fig. 2 : Colubrid snakes found in the study area: (A) *Boiga cyanea*, (B) *Boiga ochracea*, (C) *Dendrelaphis cyanochloris*, (D) *Gonyosoma prasina*, (E) *Oreocryptophis porphyraceus*, (F) *Coelognathus radiatus*, (G) *Sibynophis collaris*, (H) *Ptyas korros* and (I) *Lycodon zawi*.

Fig. 3 : Kukri Snakes found in the study area: (A) *Oligodon albocinctus*, (B) *Oligodon cinereus*, (C) *Oligodon cyclurus*, and (D) *Oligodon dorsalis*.

Fig. 4 : Natricid snakes found in the study area: (A) *Hebius khasiense*, (B) *Hebius venningi*, (C) *Herpetoreas xenura*, (D) *Pseudoxenodon macrops*, (E) *Rhabdophis subminiatus*, and (F) *Smithophis bicolor*.

Fig. 5 : Elapid snakes found in the study area: (A) *Naja kaouthia*, (B) *Bungarus fasciatus*, and (C) *Bungarus niger*.

Table 1 : List of snake species found in Reiek Community Reserved Forest, Mamit District, Mizoram

Family	Scientific name	Common name	IUCN status
Colubridae	<i>Boiga cyanea</i>	Green Cat snake	Not Evaluated (NE)
Colubridae	<i>Boiga ochracea</i>	Tawny Cat Snake	Least Concern (LC)
Colubridae	<i>Coelognathus radiatus</i>	Copper-headed Trinket Snake	Least Concern (LC)
Colubridae	<i>Dendrelaphis cyanochloris</i>	Wall's Bronzeback	Least Concern (LC)
Colubridae	<i>Gonyosoma prasina</i>	Green Trinket Snake	Least Concern (LC)
Colubridae	<i>Lycodon zawi</i>	Zaw's Wolf Snake	Not Evaluated (NE)
Colubridae	<i>Oligodon albocinctus</i>	White-barred Kukri Snake	Not Evaluated (NE)
Colubridae	<i>Oligodon cinereus</i>	Black-barred Kukri Snake	Least Concern (LC)
Colubridae	<i>Oligodon cyclurus</i>	Cantor's Kukri Snake	Least Concern (LC)
Colubridae	<i>Oligodon dorsalis</i>	Spot-tailed Kukri Snake	Not Evaluated (NE)
Colubridae	<i>Ptyas korros</i>	Indo-Chinese Rat Snake	Not Evaluated (NE)
Colubridae	<i>Sibynophi scollaris</i>	Collared Black-headed Snake	Least Concern (LC)
Colubridae	<i>Oreocryptophis porphyracea</i>	Black-banded Trinket Snake	Not Evaluated (NE)
Natricidae	<i>Hebius khasiense</i>	Khasi Hills Keelback	Not Evaluated (NE)
Natricidae	<i>Hebius venningi</i>	Chin Hills Keelback	Least Concern (LC)
Natricidae	<i>Herpetoreas xenura</i>	Wall's Keelback	Not Evaluated (NE)
Natricidae	<i>Rhabdophis subminiatus</i>	Red-necked Keelback	Least Concern (LC)
Natricidae	<i>Pseudoxenodon macrops</i>	Mock Cobra	Least Concern (LC)
Natricidae	<i>Smithophis bicolor</i>	Yellow-bellied Forest Snake	Not Evaluated (NE)
Pareidae	<i>Pareas monticola</i>	Common Slug Snake	Not Evaluated (NE)
Pseudaspidae	<i>Psammodynastes pulverulentus</i>	Common Mock Viper	Not Evaluated (NE)
Typhlopidae	<i>Argyrophis diardii</i>	Diard's Blind Snake	Not Evaluated (NE)
Viperidae	<i>Ovophis monticola</i>	Mountain Pit Viper	Least Concern (LC)
Viperidae	<i>Trimeresurus erythrurus</i>	Spot-tailed Pit Viper	Least Concern (LC)
Viperidae	<i>Trimeresurus popeiorum</i>	Pope's Pit Viper	Least Concern (LC)
Elapidae	<i>Bungarus fasciatus</i>	Banded Krait	Least Concern (LC)
Elapidae	<i>Bungarus niger</i>	Black Krait	Not Evaluated (NE)
Elapidae	<i>Naja kaouthia</i>	Monocled Cobra	Least Concern (LC)

monticola, *Trimeresurus erythrurus* and *Trimeresurus popeiorum*) (Fig. 6), contributing 10.7% each, Typhlopidae (*Argyrophis diardii*), Pseudaspidae (*Psammodynastes pulverulentus*), and Pareidae (*Pareas monticola*) comprising 3.6 % each (Fig. 7, 8). Moreover, the current snake species documented from the study site represents 53.8% of the total snake species recorded from Mizoram by Lalremsanga and Lalronunga (2017).

Among the 28 species of snakes recorded, seven species were deadly venomous: A natricid snake *R. subminiatus*, the three viperid species *T. erythrurus*, *T. popeiorum* and *O. monticola*, and the elapid snakes *B. niger*, *B. fasciatus* and *N. kaouthia*. Five species are mildly-venomous which comprises of the family Colubridae (*B. ochracea*), Pseudaspidae (*P. pulverulentus*), and Natricidae (*P. macrops*). A total of 16 species belonging to four distinct families are non-venomous species i.e. Colubridae (*C. radiatus*, *D. cyanochloris*, *G. prasina*, *L. zawi*, *O. albocinctus*, *O. cinereus*, *O. cyclurus*, *O. dorsalis*, *O. porphyraceus*, *P. korros*, and *S. collaris*), Natricidae (*H. khasiense*, *H. venningi*, *H. xenura*, and *S. bicolor*), Pareidae (*P.*

Fig. 6 : Viperid snakes found in the study area: (A) *Trimeresurus erythrurus*, (B) *Trimeresurus popeiorum*, and (C) *Ovophis monticola*.

Fig. 7 : *Argyrophis diardii* (A), *Psammodynastes pulverulentus* (B), and *Pareas monticola* (C).

Fig. 8 : Pie diagram representing the ophidian fauna of Reiek Community Reserved Forest in Mizoram, Northeast India.

monticola), and Typhlopidae (*A. diardii*). Furthermore, the occurrence of *H. venningi* represents the second report from the State (Lalbiakzuala and Lalremsanga, 2019), which extends the range of distribution ca. 15 km NW from the first reported site.

The collection of snakes from the study site revealed that the area harbours a high diversity of snake species. Unfortunately, the surveyed virgin forest area which was expected to be rich in flora and fauna is presumably disturbed by various activities of Tourism Department, Government of Mizoram where tourist constructions, sports facilities as well as other anthropogenic activities such as trekking, poaching, hunting, collection of firewood and timber, logging, etc. The

Biodiversity Management Committee (BMC), Reiek village, which was recently organised under the instructions of Environment, Forests and Climate Change, Government of Mizoram has starting activities like, garbage disposals in order to avoid pollution and to some extent, awareness on wildlife conservation and to promote ecotourism. Thus, proper management on the biodiversity of this area is now a great challenge otherwise several valuable species and resources will be vulnerable to declining or disappearing from this area sooner or later. This study will contribute to the documentation on the effects of anthropogenic activities as well as on the conservation of snake diversity in this particular area for future purposes.

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