



Ophiofaunal diversity of Bongaon Subdivision of West Bengal, India, with a note of possible threats to the Snake population of the area

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Abstract

An investigation on the ophiofaunal diversity of Bongaon subdivision of North 24 Parganas district of West Bengal, India was conducted from 2018 to 2019. Visual encounter (VES) method was used for sampling the snakes from the study area. A total of 20 species under 17 genera and 6 families were reported. Family Colubridae showed maximum species richness (55% of the total species) followed by Elapidae (20%) and Typhlopidae (10%). The relative abundance of colubridae was maximum (73.7%) followed by Elapidae (11.54%). The most dominant species was Checkered keelback (*Xenocrophis piscator*). Though the study reveals that the area is rich in snake diversity, but needs conservation. The study identified the possible causes of threats to the snake population in the study area which included Habitat destruction, Lack of Knowledge among people, Road kill and extensive use of pesticides.

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Introduction

The snakes are an important part of an ecosystem due to their position in a food chain as predator. They play 'Key ecological role' in controlling rodent pest (Fitch, H., 1949 & Gibbons, J., 1988). Snakes are found in a varied type of habitat that includes grassland, wetland, forest, agricultural fields, desert, sea, residential areas. The snakes are mainly predatory on rodents, birds, amphibian, small mammal etc. Snakes are one of the most successful living vertebrates (P. Uetz, 2000). They belong to order squamata and sub order ophidia. As on August 2020 more than 3800 species of snakes have been reported in the world (P. Uetz, P. Freed & J. Hosek, 2020). About 458 new species have been reported from 2000-2012 (D. Pincheira-Donso *et al.*, 2013). The populations of snakes are facing threats due to anthropogenic pressure. In India due to lack of awareness and proper knowledge among people hundreds of snakes are killed every year. Among reptiles, snakes being one of the top predators, their decline may have serious consequences for the functioning of many ecosystems (Reading, C.J. *et al.*, 2010). Therefore it needs continuous monitoring on

diversity and distribution of snakes in an ecosystem. Herpetologists are trying to study the diversity of snakes in different areas for better understanding of these animals and their conservation.

It is evident from literature that there is scanty information about the ophiofaunal diversity of North 24 Parganas district of West Bengal, India. The present study was aimed to study the diversity of snakes in Bongaon subdivision of North 24 Parganas district of West Bengal and an effort to determine the causes of snake kill in this area.

Material and methods

Study area

The study was conducted in different places within the Bongaon subdivision of North 24 Parganas district, West Bengal, India (Fig. 1). Bongaon is located at 23.07°N latitude and 88.82°E longitude and at an average altitude of 7 meters (22 feet) above mean Sea Level. The National Highway (NH) Number-34 goes through the Bongaon subdivision. Bongaon Subdivision is a part of Ichamati-Raimangal plain. It covers a total area of 838.17 sq Km.

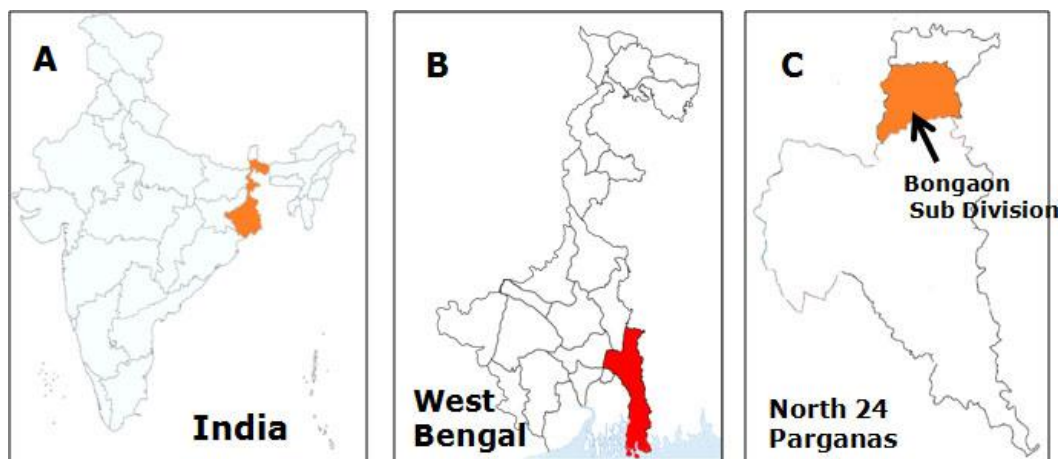


Fig. 1. Location of the study site. A: Map of India showing the state of West Bengal in Orange. B: Map of West Bengal showing North 24 Parganas District in red. C: Map of North 24 Parganas showing Bongaon Sub Division in Orange.

Sampling

The snake diversity was determined by extensive field survey. In addition data gathered from reports on road kills are also considered. Snakes are most active during monsoon and post monsoon. Thus the month

from June to November 2018-2019 were selected for the study. The visual encounter survey (VES) technique was used. This method involves walking through the study sites systematically searching for snakes. Periodical searching under rocks and debris

were carried out ensuring the microhabitats were not disturbed. Mostly direct sampling methods was used (A. Pal *et al.*, 2012; TA.Dar *et al.*, 2008).

Identification

The snake identification was mostly performed by taking photographs which was matched with referred literature (R. Whitaker, 2006; R. Hitaker and A. Captain, 2008; Khaire Neelamkumar, 1996). Photographs were mostly taken by DSLR camera (Sony 6000 alpha) using 16-50 and 50-210 lenses. The snakes were categorized as non-venomous, semi venomous and venomous.

Data Analysis

Community parameters like species richness and abundance were calculated for the total sample following Magurran & mc Gill (Magurran & mc Gill, 2011). Relative abundance of each species encountered during the study was calculated following (Chettri *et al.*, 2011). The biodiversity indices, Dominance (D), Simpson index (1-D), Shannon index (H), evenness, were calculated using PAST version 4.05 software (Hammer *et al.*, 2001).

Survey

For determining the reasons of snake killing by people a survey was carried out among people residing within the study area belonging to different socio economic background.

Results and discussion

In the present study a total of 312 specimen belonging 20 different species under 17 genera and 6 families were recorded with photographic evidences (Fig. 2, 3). The detailed list of snakes along with scientific name and IUCN status is mentioned in the Table 1. Among the six families recorded the highest number of species (eleven) belongs to family Colubridae and the lowest number of species (one in each family) was recorded under family Boidae, Homalopsidae and Viperidae. Out of the 20 species of snakes recorded in the area 11 were non venomous, 4 was mid venomous and 5 were venomous. Among the recorded specimens majority belong to low risk least concerned category of IUCN. However 5 specimens were low risk near threatened, one species (Beaked blind snake) was rare and one species (Monocled cobra) belong to Endangered category of IUCN.

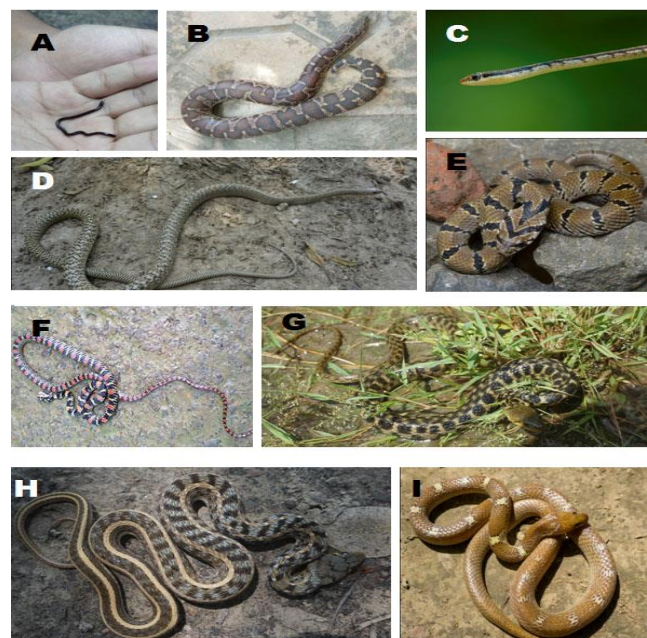


Fig. 2. Different species of snakes documented from Bongaon subdivision, North 24 parganas, West Bengal. A: Brahminy worm snake (*Ramphotyphlops braminus*), B: Common Sand Boa (*Gongylophis conicus*), C: painted Bronze back (*Dendrelaphis pictus*), D: Indian Rat Snake (*Pytus mucosa*), E: Common Kukri (*Oligodon arnensi*), F: Ornate Flying snake (*Chrysopelea ornata*), G: Checked keel back (*Xenocrophis piscatorv*), H: Buff striped keelback (*Amphiesm stolatum*), I: Common Wolf Snake (*Lycodon aulicus*)

Table 2. Diversity indices recorded during the study.

Indices	Calculated value
Taxa_S	20
Individuals	312
Dominance_D	0.1304
Simpson_1-D	0.8696
Shannon_H	2.406
Evenness_e^H/S	0.5543
Brillouin	2.289
Menhinick	1.132
Margalef	3.308
Equitability_J	0.8031
Fisher_alpha	4.766
Berger-Parker	0.2276

The relative density of each family was calculated and the result is represented in Fig. 4. Colubridae have the highest density (73.7%) with 11 species under 10 genera, followed by Elapidae (11.54%) with 4 species under 2 genera, Typhlopidae (6.09%) with 2 species under 2 genera, Homalopsidae (6.09%) with one

species, Boidae (1.28%) with one species and Viperidae (1.28%) with one species. The relative abundance of each species of snake was calculated and shown in Table 1. Relative abundance of snake species in the study area shows sparse distribution. Excepting for few species, the relative abundance of most of the species was low. Almost half of the total abundance was contributed by only two species i.e. *Pytus mucosa* and *Xenocrophis piscator* (cumulatively 44.5%). The most abundant species is *Xenocrophis piscator* (22.7% of total abundance) followed by *Pytus mucosa* (21.7% of total abundance).

Out of 20 species 8 species contributed to only about 9% of the population. This result supports well established community pattern i.e. a community is dominated by few common species.

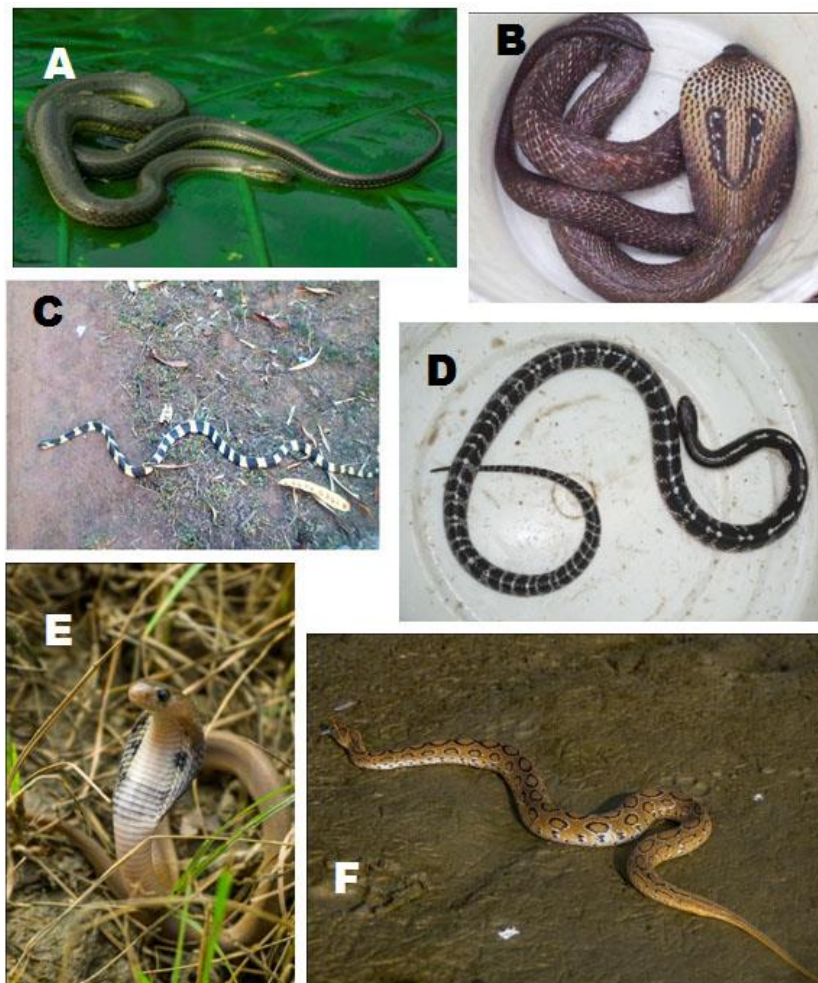


Fig. 3. Different species of snakes documented from Bongaon subdivision, North 24 parganas, West Bengal. A: Common smooth scaled water snake (*Enhydris enhydris*), B, E: Spectacle Cobra (*Naja naja*), C: Branded krait (*Bungarus faciatus*), D: Common Krait (*Bungarus caeruleus*), F: Russells viper (*Daboia russelii*).

The snake population in the study area was found to be diverse when tested using various diversity indices (Table 2). The Simpson's index amounts to 0.8696 which is quite high indicating a very high species

diversity. The value of Shannon-weiner index was found to be 2.4 which also indicate a high species richness and evenness. Berger-Parker index also indicates high species diversity.

Table 1. Checklist of Snakes recorded.

SL	Family	Common Name	Scientific Name	IUCN status	Type	Relative abundance
1	Typhlopidae	Brahminy worm snake	<i>Ramphotyphlops braminus</i> (Daudin,1803)	LR-lc	Non-Venomous	5.12
2		Beaked blind snake	<i>Rhityotyphlops acutus</i> (A.M.C. Duméril & Bibron, 1844)	R	Non-Venomous	0.96
3	Boidae	Common Sand Boa	<i>Gongylophis conicus</i> (Schneider, 1801)	LR-nt	Non-Venomous	1.28
4		common trinket snake	<i>Coelognathus helena helena</i> (Dudin 1803)	LR-lc	Non-Venomous	0.96
5	Colubridae	Indian Rat Snake	<i>Pytus mucosa</i> (Linnaeus, 1758)	LR-lc	Non-Venomous	21.79
6		common bronzeback tree snake	<i>Dendrelaphis tristis</i> (Dudin 1803)	LR-nt	Non-Venomous	3.2
7	Colubridae	Common Kukri	<i>Oligodon arnensi</i> (Shaw, 1802)	LR-lc	Non-Venomous	1.28
8		Painted Bronze Back Tree Snake	<i>Dendrelaphis pictus</i> (Gmelin1789)	LR-nt	Non-Venomous	0.96
9	Colubridae	Common Wolf Snake	<i>Lycodon aulicus</i> (Linnaeus, 1758)	LR-lc	Non-Venomous	8.65
10		Checked Keelback	<i>Xenocrophis piscator</i> (Schneider,1799)	LR-lc	Non-Venomous	22.75
11	Colubridae	Buff Striped Keelback	<i>Amphiesm stolatum</i> (Linnaeus,1758)	LR-lc	Non-Venomous	9.94
12		common Cat Snake	<i>Boiga trigonata</i> (Schneider, 1802)	LR-lc	Mid-Venomous	0.96
13	Homalopsidae	ornate flying snake	<i>Chrysopelea ornata</i> (Shaw, 1802)	LR-nt	Mid-Venomous	1.28
14		common Vine Snake	<i>Ahaetulla prasima</i> (Boie,1827)	LR-lc	Mid-Venomous	1.92
15	Homalopsidae	common smooth scaled water snake	<i>Enhydris enhydris</i> (Schneider, 1799)	LR-lc	Mid-Venomous	6.09
16		Spectracle Cobra	<i>Naja naja</i> (Linnaeus, 1758)	LR-nt	Mid-Venomous	6.41
17	Elapidae	Monoclet Cobra	<i>Naja kaouthia</i> (Lesson, 1831)	EN	Mid-Venomous	1.62
18		Common Krait	<i>Bungarus caeruleus</i> (Schneider, 1801)	LR-lc	Mid-Venomous	1.92
19	Viperidae	Banded Krait	<i>Bungarus faciatus</i> (Schneider,1801)	LR-lc	Mid-Venomous	1.6
20		Russells Viper	<i>Daboia russelii</i> (Shaw & Nodder,1797)	LR-lc	Mid-Venomous	1.28

LR-lc: Low risk least concerned; LR-nt: Low risk near threatened; R: Rare ; EN: Endangered

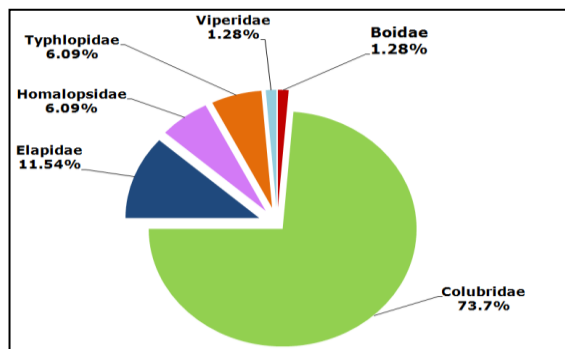


Fig. 4. Graphical representation of relative density of each family.

Brief account of the snake families reported

Family-Boidae

Boidae contains some of the largest all living snakes. There is 39 (Stimson, A. F. 1969) species in this family. Some members are tree dwellers, some are terrestrial and others are aquatic.

All Boas give birth to live young. They have elongated supra temporal bones and relatively rigid lower jaw. In our study we found only one species (*Eryx conicus*) under this family.

Family-Typhlopidae

This is family of weak jawed blindsnakes. There is over 200 species in this family (Mc Diarmid RW *et al.*, 1999). Colour ranges from brown to black, pink or yellow. They have cylindrical body with smooth or polished scales and small head with no teeth in the lower jaw. They mostly live in burrows and feed on termites, ant and insect larva. Some members are egg layers while others give direct birth to young. In our study we documented two species under this family. They were Brahminy worm snake (*Ramphotyphlops braminus*) and Beaked blind snake (*Rhinotyphlops acutus*)

Family-Colubridae

This is the largest snake family found in every continent except Antarctica. More than 2000 species of snake are there in this family (J. White, H. Persson, 1996). Though not universal feature of this family but most colubrid snakes are distinguished by presence of a unique organ, Duvernoy's gland. These are a pair of organ behind the eye on either side of the head and associated with rear teeth of maxillary bone. Though sometimes described as modified salivary gland, but they differ in origin and most are non-venomous. Only few species cause human fatalities.

The colours of snake of this family are very diverse. In the present study 11 species of Colubrid snakes were reported. Checkered keelback the most abundant species in this study belongs to this family.

Family-Elapidae

These are all front fang snake characterized by hollow, permanent relatively short fangs in front of the mouth. Because of the venom they are considered to be the most dangerous family of venomous snakes. More than 300 species of different snakes are there in this family (Uetz P *et al.*, 2000).

The king cobra is the world's largest venomous snake, belong to this family. Each year cobra and krait cause many deaths in India and other parts of Asia. They are mostly Oviparous. Four species was reported under this family from the study area.

Family-Viperidae

These are also family of venomous snakes consisting of more than 300 species (Uetz P *et al.*, 2000). They are heavy bodied. They feed on small animals and hunt them by striking and envenomating their prey. Vipers are characterized by presence of a pair of long, hollow, venom injecting fangs which are attached to maxilla. The fangs fold back in the mouth when they are not in use. Vipers have vertical pupils and keeled scales. Russell's Viper was the only species under this family that was reported in this study.

Causes of threat to the snake population

The snake population is under high risk. Our survey from the local people and observation lead us to identify the major possible threats to the snake population in the study area, which is listed below.

Habitat destruction due to anthropogenic interference

This area is rapidly developing with huge number of constructions being made. Both buildings and roads have been constructed in large numbers, resulting in habitat destruction of snakes and other animals.

Fear of getting bitten

The venomous snakes are killed in the fear of getting bitten. Rather than contacting the forest department for rescuing the snake, the people prefer to kill the snake and get rid of it. Majority of people are unaware about how to contact the forest department.

Extensive use of pesticides

A large part in the study area is agricultural land. Varieties of crops are grown round the year. For better yield of crops extensive amounts of chemical and pesticides are being used in the field. This chemicals and pesticide have an adverse effect on the snake population

Lack of knowledge and myths

Lack of proper knowledge among local peoples about snakes is a major reason for snake kill. Most of the people are not able to properly identify a snake and thus mistakes non venomous snakes as venomous and kill them out of fear of being bitten.

For example wolf snakes are often mistaken by people as poisonous common krait (Fig. 5A). There are also a number of myths about the snake among people.

Ornamental flying snake are killed due to the myth that they are highly venomous. People also have a wrong

belief that rat snake has venom in tail. This myths also lead to a large number of snake kill in this area.

Road Kill

Road kill also contribute to large number of snake kill in this area (Fig. 5. B,C).

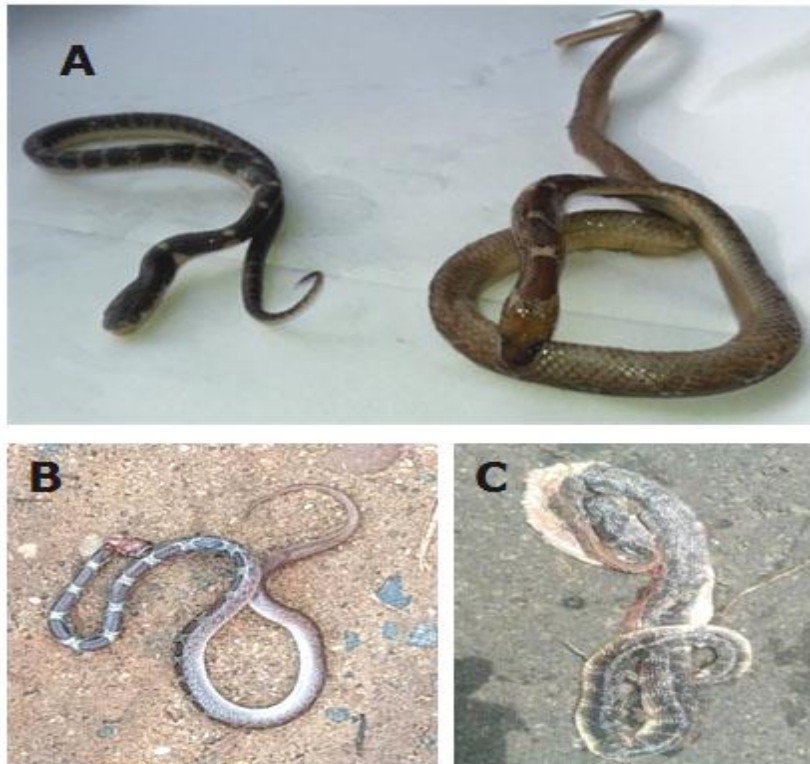


Fig. 5. A. wolf snakes (right) are often mistaken by people as poisonous common krait (left). B,C: Snake death due to road kill.

Conclusion

Very less scientific documentation of the snake diversity of this area is available. The report by (Nandy, N.C. *et al.*, 1993) about the wetland fauna of north 24 Parganas is quite old and confined to wetlands and they reported only 4 snake species.

The present study revealed the current status on snake diversity in Bongaon subdivision of North 24 Parganas, West Bengal. Our result from field observation indicates presence of 20 different snake species in the study area. Out of the 6 families, occurrence is dominated by Colubridae (73.7%) followed by Elapidae (11.54%), Typhlopidae and Homalopsidae (6.09% each) and Viperidae and Boidae (1.28% each). The most abundant species was

Xenocrophis piscator. Most of the snakes were reported from open areas like fields, agricultural land, water bodies. However some were also reported from residential area as well. Lack of knowledge, mishandling, fear of snake bite and careless behavior were the main reasons behind the killing of snake in this area. Continuous monitoring on the snake species diversity of this region is essential and through awareness program among people snake bite and snake kill may be prevented and snake diversity can be conserved.

Acknowledgement

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Abbreviations

IUCN: International Union for Conservation of Nature, LR-lc: Low risk least concerned; LR-nt: Low risk near threatened; R: Rare; EN: Endangered

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