A GLIMPSE OF OPHIDIOFAUNAL DIVERSITY IN AND AROUND THE CAMPUS AREA OF GOVERNMENT MAHAMAYA COLLEGE RATANPUR, BILASPUR (C.G.) INDIA

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ABSTRACT

A survey was conducted to understand the status and diversity of Ophidians at Ratanpur area between 2017 to 2020. Ratanpur is located in eastern part of Chhattisgarh. Ratanpur is an ancient, historical, Mythological, and eco-tourist valuable place of Chhattisgarh, India. The area was thoroughly surveyed to prepare a checklist of the snake diversity along with their vernacular, local and scientific names with the help of local people and referred literature. Their reproductive status and various aspects of their microhabitats were also assessed.

The present study revealed that the Ratanpur area of C.G. harbors 17 ophidian species belonging to 06 families. Family colubride is dominant family (Contributed maximum 07 species) whereas family Pythonide contributed only 01 species. The presence of five deadliest snakes, 11 oviparous, 01 viviparous, 03 ovoviviparous and 02 parthenogenetic snakes, Family viparidae (Daboia russelii) is common and abundant snake species are the significant findings of the present study.

Their number is gradually declining due to anthropogenic *activities. Our primary duty is to protect these limbless speechless, shy and misunderstood creature in situ and conserve them to protect food chain and for balanced ecosystem.*

The present study will help to prepare a preliminary and a baseline data of snake diversity for awareness, future study, and extension of advanced research activities in the region.

Keywords: - *In situ conservation, snake diversity, Ophidian.*

INTRODUCTION

Snakes are one of the most important reptiles, invading in all parts of the world, including oceans, some of the harshest and more environmentally unstable ecosystem on the Earth except on the poles and Antarctica. Their ecological significance, global diversity and evolutionary role have played a primary part in the origin and subsequent radiations of amniotes vertebrates (Daniel Pincheitra Donoso et al. 2013, Sumida and Martin, 1997, Reisz, 1997). The acquisition of water-independent reproduction, establishment of first fully terrestrial mode of life, and their universally known Mesozoic proliferation followed by mass extinction are the most important milestones of vertebrate evolutionary history.

In the phylogenic tree snakes are placed in the sub order serpents of class Reptiles under Phylum Chordata. Thin, elongated, cylindrical, limbless body, specific scaly and colour pattern, speechless, shy nature, presence of Jacobson's organ, bifid tongue with some test buds, transverse cloaca are the key characteristics of snakes. Snakes represent a powerful model for the lineage terrestrial vertebrate in term of high adaptability, species richness, morphological and ecological diversity and also for understanding the processes involved in preliminary adaptation and evolution.

There are approximately about 3,619 known snake species recorded under 26 families in the globe (Vetz and Hosek 2016). India horbers 236 species of snakes and out of which 13 known species are poisonous (Sourabhsulabh and pushpraj shivahare 2018).

Snakes are ecologically significant and are useful creatures. Snakes are said to be friends of farmers, act as a natural predators for harmful insects and pests found in agricultural field (Pavan Laxmanrao Jadhav et al.2018). They are an important component of food chain and are also significant for maintaining the balance of ecosystem. Except these significance, their number, species richness and diversity is gradually declining due to - fear of snake bite, aversion of snake, lack of awareness and inadequate knowledge (Satish kumar 2012), anthropogenic activities (road killing, conflict with man, collection of venom and scaly skin, animal trafficking, snake capturing by charmers, scarcity of prey animals, unawareness about the protocols given in the scheduled of Wild Life Protection Act, 1972. These are some major threats and important challenges in the survival and conservation of snakes (Todd 2010, Satish Kumar 2012, Pavan Laxmanrao Jadhav 2018).

Due to their ecological and agricultural significance and their gradually declining number, it requires an urgent need for continuous monitoring on their habitat, diversity and species richness of snake to make a balance and better ecology. The study concerning snake diversity is scanty in Ratanpur area and there is a dearth of research in the field of snake diversity in this area.

Thus an attempt is made to comprehend and determine the curiosity, diversity, distribution, species richness and varied morphs of the snake species in Ratanpur region of Bilaspur, C.G. India. The study was made at different micro habitats (Niches) of the snake species found in the premises of Govt. Mahamaya college campus and around Ratanpur region, Dist. Bilaspur (C.G.), India. During study period the inventory checklist of snake diversity and species richness of this area was prepared.

The main objectives of the present study are – rescue snake against conflict with man and aware people against snakes to change their attitude and phobias towards these shy, mute and misunderstood creatures.

Study Site - Ratanpur is an ancient, historical (Capital of Maratha king Ratndev), Religious (Temples of Goddess Mahamaya and Lakhnidevi, Bhairobaba, Ram tekari, Hanuman garhi), Mythological (Discussed in Ramayan), and eco-tourist (Hathikila, Khuntaghat dam, Kaka pahad) valuable place of Chhattisgarh, India. Ratanpur is situated in 24 K.M. away from Bilaspur District. The Govt. Mahamaya college is situated 3 K.M. Away from ratanpur on the Chapora-belgehna route. Geographically Ratanpur is located in eastern part of Chhattisgarh and fall within latitude 22’30” to 22’18” and longitude 82’16” to 82’10”.

The Climatic and ecological conditions have dense brushy forestation, ponds, large dam and their serpentine shaped canals, large sprayed airy and wetland area. The geographical status consists of ponds, dams, forests, caves, thickets on the gentle to steep slopes of hills. The diversified climatic, ecological and geographical conditions of Ratanpur area will provide optimum natural environmental conditions for shelter of variety of serpental fauna.

The present study was conducted in five selected sites at Ratanpur. The campus area of Government Mahamaya College Ratanpur was denoted as central site or Site no. 1. The total area of Ratanpur, around college campus was divided into four locations or study sites as North-east (NE), south-east (SE), south-west (SW) and north-west (NV).

MATERIAL AND METHODS

The collection of scattered and available information’s regarding snakes and studies were conducted from January 2017 to February 2020 and by using following methods –

1. **Visual encounter and survey method (VES) –** To prepare an inventory of snake diversity, the study sites were rigorously and thoroughly searched by regular and opportunistic visit (preferably early morning and at night during mansoon and summer season) (Heyer1994, Sobhagya et al. 2014).
2. **Direct and time bound observations –** These observations were conducted to assess the microhabitats (niches) of snakes.
3. **The multiple sampling techniques (MST) –**Was used to assess their diurnal and nocturnal habits. (Dar et al. 2008, Pal 2012, Sahu et al. 2014).

4. **Capture and Release Technique –** Live specimens were captured, coloured digital photographs were captured and were released in the same microhabitats where they were captured (Rai R.K. and Raj B.S. 2015 (A, B).
5. **Specimen preparation –** The specimen of dead snakes were prepared by using standard protocols (Sahu R and Rai R. K., 2019).
6. **Study of soil chemistry –** To assess the impact of soil chemistry on snake abundance and their body coloration pattern, the average value of soil characteristics of snake effected area were compared with snake unaffected areas. The soil characteristics were observed by using standard protocols
7. **Identification -** The preliminary identification of snakes was conducted with the help of local people, naturalist, fisherman, charmers, snake rescuers and professional herpetologists. The species specific identification of captured specimens was completed by using taxonomic key characteristics cited in the literatures and field guide books (Daniel 2002, Whitaker and Captain 2004, Whitaker and captain 2008, Dutta et al. 2009).

OBSERVATIONS

The checklist of snake diversity and species richness were prepared with the help of local people, charmers, snake catchers and rescuers. On the basis of visual availability during the study period, the observations of different parameters regarding snakes were noted in the table no. 1.

S. No.	Family	Name of Snakes		Status				Microhabitat		
		Scientific Name	Common or Local Name	in Ratanpur area	Poisonous status	Schedule in WPA, 1972	IUCN Status	Habit	Adaptive Type	Reproductive type
1.	Boidae	*Eryx conicus* (Schneider, 1801)	Rough tailed, Common or Brown Sand Boa	C	NV/LC	Sch IV	NE	GL/ HH/SC	N/C/T/F	**V**
2.		*Eryx johnii* (Russell, 1801)	Red Sand Boa, Dumuhi, Double mouthed & Phutka sap	C	NV/LC	Sch IV	NE	AG/GL/ HH/SC	B/N/C/T/ F	OVV
3.	Pythonide	*Python molurus* (Linnaeus, 1758)	Indian rock Python, Ajgar Sap	VC	NV/LC	Sch I (Part II)	NE	DF/GL/S C	N/A/ CO/ T	O
4.	Colubride	*Lycodon aulicus* (Linnaeus, 1758)	Common Wolf Snake, Kaudia, Chiti	FC	NV/LC	Sch IV	NE	DF/HH/S C	N/A/T	O
5.		*Dendrelaphis tristis* (Daudin, 1803)	Common Bronze Back, Tree snake, Kauchia	R	NV/LC	Sch IV	NE	AG/DF/S C	D/A/T	O
6.		*Oligodon arnensis* (Shaw, 1802)	Common or Banded Kukri Snake, Mati Hara Sap	FC	NV/LC	Sch IV	NE	DF/HH/S C	N/T	O
7.		*Ptyas mucosa* (Linnaeus, 1758)	Indian Rat snake, Dhamana	FC	NV/LC	Sch II (Part II)	NE	AG/DF/ HH/ SC	D/T/A/ SA	O
8.		*Fowlea piscator* (Schneider, 1799)	Water Snake, Paniwala sap, Dodhia, Checkered keelback	VC	NV/LC	Sch II (Part II	NE	DF/ HH	AQ/N	O
9.		*Cronella brachyuran* (Gunther, 1866)	Indian Smooth snake, Suvaro sap	VR	NV/LC	Sch IV	NE	DF/HH	N/B	O
10.		*Amphiesma stolatum* (Linnaeus, 1758)	Buff Stiped Keel back, Bamuni saap	VC	NV/LC	Sch IV	NE	AG/GL/ HH/SC	B/D/T	O
11.	Elapidae	*Bungarus caeruleus* (Schneider, 1801)	Common Indian Krait, Blue krait, Chiti Sap	FC	V/ NT/D	Sch IV	NE	AG /DF/ HH/SC	AQ/N/ T	O
12.		*Bungarus fasciatus* (Schneider, 1801)	Banded Krait, Ahiraj, Rana or Raja Sap	R	V/NT/D	Sch IV	NE	DF/HH/ SC	N/T	O
13.		*Naja naja* (Linnaeus, 1758)	Spectacled Cobra, Binocelate Cobra, Nag Sap	R	V/NT/D	Sch II (Part II)	NE	DF/HH/ SC	N/T	O
14.	Typhlopidae	*Indotyphlops braminus* (Daudin,1803)	Brahminy, Common Worm Snake, Teli Sap	C	NV/LC	Sch IV	NE	DF/HH/ SC	B/C/N/T/ F/ aq	P
15.		*Rhinotyohlops acutus* (wallach, 1994)	Beakes worm snake	C	NV/LC	Sch IV	NE	DF/HH/ SC	B/C/T/F/ Aq	P
16.	Viperidae	*Daboia russelii* (Shaw and Nodder,1797)	Pitless viper, Russell′s Viper,Daboia, Kadar	FC	V/HT/D	Sch II (Part II)	NE	DF/HH/ SC	T/N/C/ F	OVV
17.		*Echis carinatus* (Schneiderr, 1801)	Afai, Indian saw-scaled Viper	VR	V/HT/D	Sch IV	NE	DF/HH/ SC	N/C/F	OVV

Table No. 1. A checklist of snake fauna of Ratanpur region, (These snakes belonging to 6 families and 17 species).

NOTE: Details of terminologies used in the table -

- **Status in Ratanpur –** C = Common, FC = fairly Common, R = Rare, VC = Very common, VR = very rare.
- **Poisinous status –** D = Deadliest snake, HT = Hemotoxic, LC = Least Concern, NT = Neurotoxic, NV = Non Venomous, V = Venomous.
- **IUCN Status –** NE = Not Evaluated
- **Micro habits -** AG = Agricultural Fields, DF = Deep forest, GL = Grass Land, HH = Human Habitation, SC = Scrub Forest (The scrub forest includes the areas where small bushes grow densely).
- **Adaptive types** - A = Arboreal, AQ = Aquatic, aq = semi aquatic, B = Burrowing, C = Crepsucular, CO = Constrictor, D = Diurnal, F = Fossorial, N = Nocturnal, SA = Semi arboreal, T = Terrestrial.
- **Reproductive type** - O = Oviparous, OVV = Ovoviviparous, P = Parthenogenetic, V=Viviparous.

Fig. 1

Fig. 2.

Fig. 3.

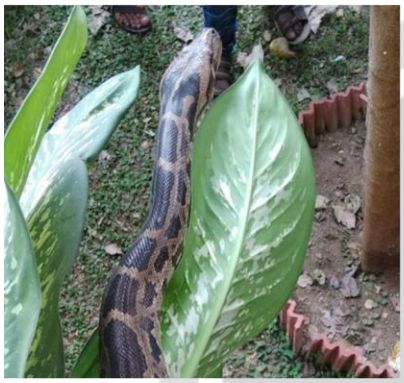

Fig. 4

Fig. 5.

Fig. 6.

Fig.7

Fig. 8

Fig. 9.

Figure showing –

Fig. 1. Study site (Location of Ratanpur).
Fig. 2. Common sand boa (*Eryx conicus*).
Fig. 3. Red sand boa (*Eryx johnii).*
Fig. 4. Indian rock python (*Python molurus*).
Fig. 5. Wolf snake (*Lycodon aulicus*).
Fig. 6. Albino wolf snake (*Lycodon aulicus*).
Fig. 7. Banded kukri snake (*Oligodon arnensis).*
Fig 8. Rat snake, Dhaman (*Ptyas mucosa).*
Fig. 9. Dodhia , Paniwala sap (*Fowlea piscator).*

Fig. 10.

Fig. 11.

Fig. 12.

Fig. 13. .

Fig.14.

Fig. 15.

Fig. 16

Fig. 17.

Fig. 18.

Figure showing –

Fig. 10. Dodhia , Paniwala saap in road accident (*Fowlea piscator).*
Fig. 11. Indian smooth snake (*Cronella brachyuran).*
Fig. 12. Buff Stiped Keel back, Bamuni saap (*Amphiesma stolatum).*
Fig. 13. Common worm snake (*Indotyphlops braminus).*
Fig. 14 Beaked worm snake (*Rhinotyohlops acutus).*
Fig. 15. Common krait (*Bungarus caeruleus).*
Fig. 16. Banded krait (*Bungarus fasciatus.*
Fig. 17. Spectacled Cobra snake (*Naja naja).*
Fig. 18. Daboia russelii (*Daboia russelii).*

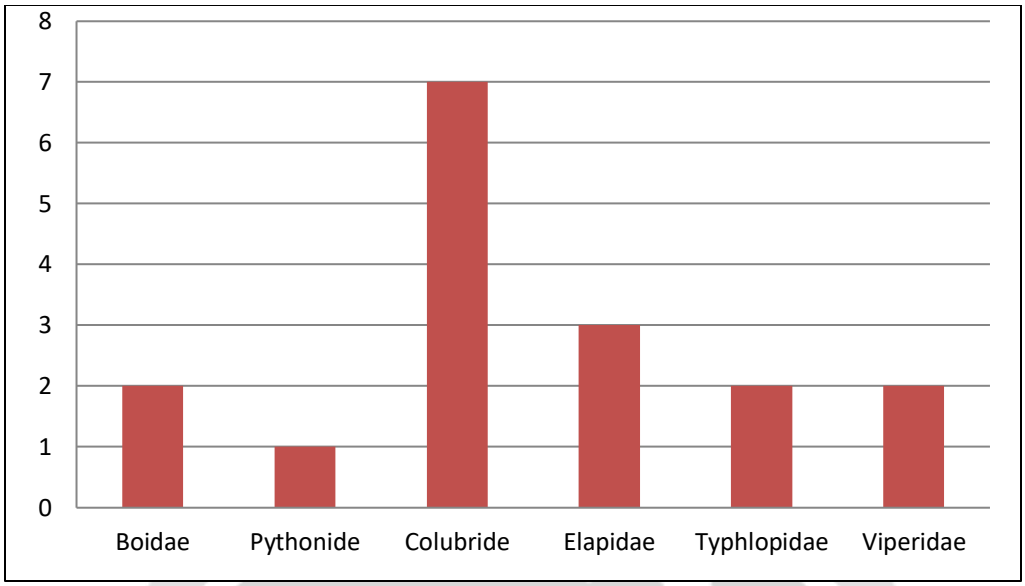

Fig. 1. Bar Diagram Showing number of snake species (Family Wise) of Ratanpur region.

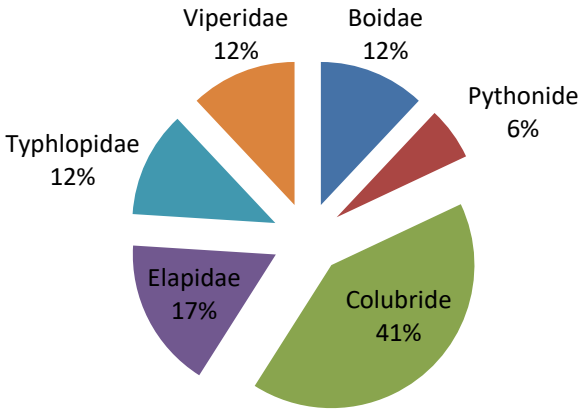

Fig.2. Percentage contribution of ophidians families of Ratanpur region during investigation

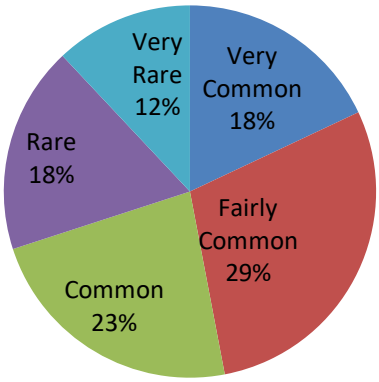

Fig. 3 Frequency in sighting of ophidians of Ratanpur region during study period

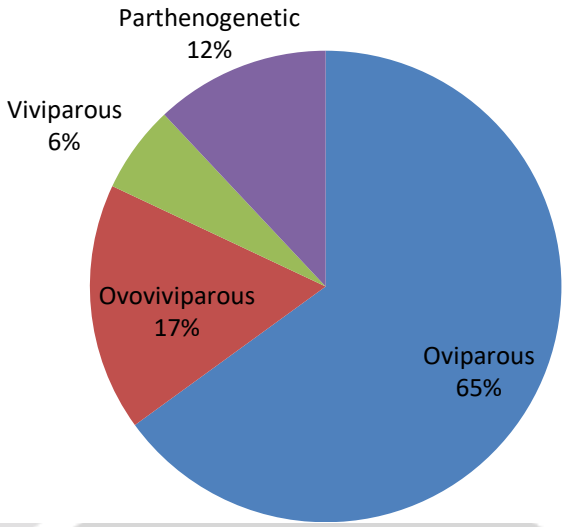

Fig. 4 **Reproductive status of ophidians species of Ratanpur region**

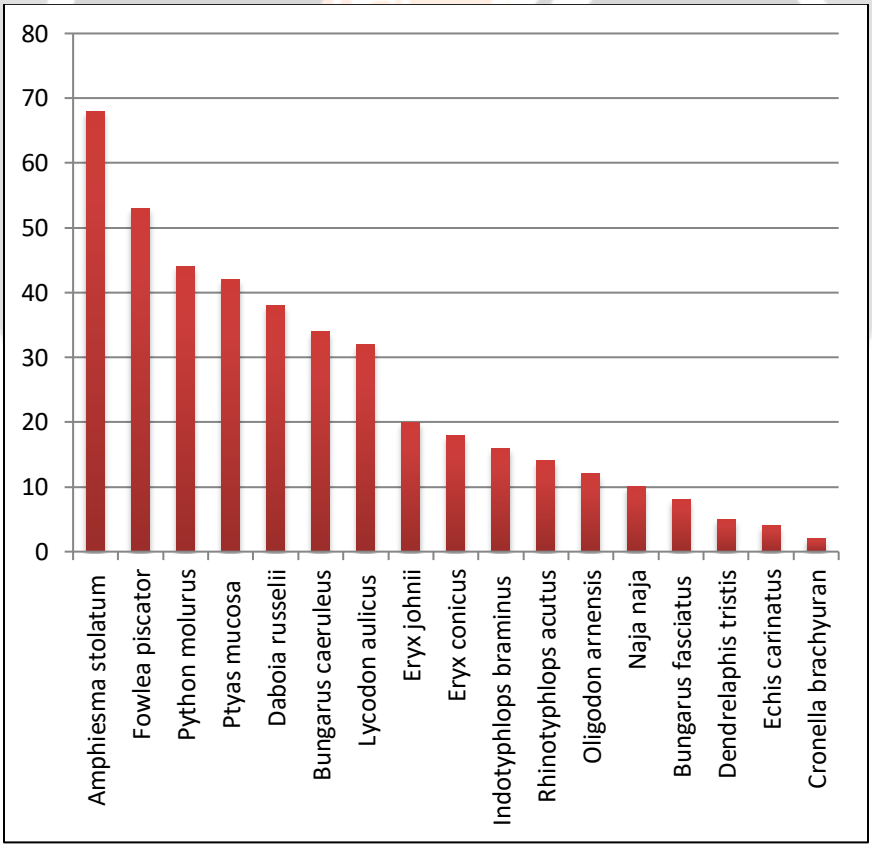

Fig. 5. Relative abundance of snake species found in Ratanpur area

The diversity and species richness of snakes in Ratanpur area were studied. The Ratanpur harbors 17 Species of snakes belonging to 06 Families. Among them 02 snake species (12 %) belonging to Family Boidae , 01 species (06 %) of Family Pythonide, 07 species (41 %) of Family Colubride, 03 species (17%) of Family Elapidae, 02 species (12 %) of Family Typhlopidae, 02 species (12%) of Family Viperidae, were observed. Family colubridae dominates (Contribute maximum 07 Species) in the other 05 families and family Pythonide contributes minimum 01 Species.

The observations showed that 05 snakes species (29.41 %) were venomous and 12 snakes species (70.58 %) were non venomous. Among venomous snakes 03 Snake species are neurotoxic and 02 Species are hemotoxic in nature. All the five snake species were deadly snake species. The viper snakes are found in maximum observations. The viparidae species richness peaked at hilly and open aired area. Most of the venomous snakes were observed in residential areas and study site no. 1. Among non-venomous snakes 12 (70.58 %) were found very common and Indian smooth snake are very rare in appearance in the area.

The study of adaptive behavior showed that 02 species were semi-aquatic, 01 species semi-arborial, 04 species were arboreal, 02 species were aquatic, 05 species were burrowing, 06 were crepuscular, 01 species were constrictor, 04 species were diurnal, 06 were fussorial, 13 were nocturnal and 14 species were Showing terrestrial behavior.

The observations showed that the 15 species prefers scrub forest, 04 species prefers grassland, 05 species prefers agricultural and 14 species prefers deep forest region for their microhabits. Among them 15 species were observed in human habitat region. The reproductive behavioural study revealed that 11 species were oviparous, 01 species are oviparous, 03 species were ovoviviparous (Stidworthy J. 1974, Daniels J. C., 2002) and 02 species were parthenogenitic (Dowell M.C. 1974) in nature.

The species richness and species density were showed seasonal and diurnal fluctuations. The species richness is high during monsoon period. The observations revealed that their vital activities are influenced by the intensity of light. The soil chemistry also influences the abundance, appearance and body colouration of snakes. Species richness and density are maximum in the area where pH, Electrical conductivity and percentage of nitrogen and potassium are high. The metallic elements and amount of Carbon and phosphorous effects the body colouration pattern. The snake of more metallic area was darker then less metallic area.

DISCUSSION

Snakes are limbless, worldwide distributed, evolutionary and ecologically significant serpents. The ecological and geological characteristics of Ratanpr provided optimal natural environmental conditions for shelter of various faunas. These conditions also make Ratanpur as biodiversity rich area.

The snake diversity of this area was studied. The present study suggested that Ratanpur area harbors 17 species of snakes (05 species poisonous and 12 species nonpoisonous). The presence of five deadliest snakes, two parthenogenetic snake and one rare snake of India and species dominancy of vipers are the remarkable findings of the present study.

Unawareness of people, human snake conflicts and road killings are the main threats of this area. The changing environmental conditions and anthropogenic activities are also gradually declining their species richness of this area. Local residential people are slow, continuous learning and developing new refined methods to protect themselves against snake bite.

It is observed that a part of basil plant shows some irritative effects to snakes (Mahar et al. 2017). To prevent against snake conflict and for safe life, Local residential people used different parts of some other plants, viz. Rudraksh (Laeocorpus granites), sarpgandha, Indian snake root or devil pepper or serpentine wood (Rauvolfiaserpentina). Basil plant is used as snake repellent and oil cake of Madhuca indica (Sapotaceae) is used for fumigation (Mahar et al. 2017).

The present study suggests that the Ratanpur area is considered as 'snake abundance area'. Due to their ecological, agricultural, zoological significance and gradually declining species richness, special awareness, educational and rescued program, continuous monitoring on snake diversity in this area is urgently required.

Indian rock python (Molurus *molurus)* and Russell's Viper (Daboi*a russelii*) were included under schedule 1 and schedule II, part II of W.L.F. Act 1972, were rescued from inside the campus area by the author and were released in their natural microhabitat (niche) near rocky, sloppy and brushy area of Kakapahad, located near study site no. 1. The 'snake capture, rescued and release on their natural habitat program' is going on throughout the year. The program is jointly monitored by the volunteers of the department of Zoology and local rescuers.

The study of snake diversity and species richness by the help of barcoding is a new flourishing field of herpetological (Amphibians and reptiles including Chelone and Crocodile) research. Radiotelemetry is also used for studying certain aspects of life history and ecology of snakes. More scientific research and instigation by using current and advanced scientific techniques are required for future and better improvement of snake diversity. These activities are significant for entity of snakes and will also help to protect the survival of ecosystem.

The present study will prepare a preliminary and a baseline data of snake diversity for future study, and extension of advanced research activities based on various aspects of snakes in this region. This present study is providing a primary model to understand the preliminary adaptation and mechanism of camouflage.

This study is a pioneer scientific study on snake in the region. This study will also initiate the people for awareness about snakes, further advanced scientific activity, in situ protection and conservational strategies related to this ecological important, limbless speechless, shy and misunderstood creature.

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