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A study on diversity of serpentofauna in sanghagara forest ecosystem, Keonjhar, Odisha

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Abstract : The present paper focuses on diversity of serpentofauna in Sanghagara forest ecosystem on the basis of observational method. This forest is located in between 21°01'-22°10' N latitude and 85°01'-86°02' E longitude. Sanghagara, one of the most significant and alluring natural scenic spots of Odisha, deserves its weightage, validity and importance because of assemblage of both floral and faunal diversity. The field study was undertaken twice a month and 16 serpentofaunal species were recorded during the survey. Recorded serpentofaunal diversity is dominated by members of the family Elapidae, Colubridae followed by Viperidae. Among these, *Ptyas mucosa* (Indian rat snake) and *Amphiesma stolatum* (Buff striped keelback) were most frequently observed followed by *Bungarus caeruleus* (krait) and *Bungarus fasciatus* (Banded krait). Findings include both poisonous and non-poisonous species of snakes. The body of snakes is different in different habitats. The diversity of serpentofauna has been observed to be decreased with increase in altitude of the forest area.

.Keywords: Sanghagara, Reptiles, Snakes, Diversity

INTRODUCTION

Reptiles are the first successful terrestrial tetrapods which are evolved from Labyrinthodont amphibians 300 million years ago (Romer, 1949). The development of internal fertilization enabled reptiles to be the first vertebrates which radiated out across the landscape, diversified quickly and become the dominant life form on the planet during the Triassic, Jurassic and Cretaceous period of Mesozoic era (245 million to 65 million years ago) of geological time scale. Healthy biodiversity is a healthy indicator of an ecosystem. Today, a drastic decline in biodiversity has been observed in different parts of the world in an alarming rate. The destruction in different forms such as degradation, fragmentation or outright loss

prompted mainly by several factors such as poverty, demographic factors, inadequate polices and economic incentives, anthropogenic activities such as overgrazing, deforestation, bushflies, shifting cultivation, developmental activities like mining, urbanization and road construction inside the protected areas are found to be the major causes of loss in biodiversity. Documentation, conservation and finding enhancement strategies of biodiversity is considered to be one of the important challenges in present day conservation, biological research and policy making process (Scott Mills, 2013). In view of the above background, several studies on species diversity have been undertaken (Romer, 1949; Selvanayagam et al., 1995; Shrestha, 1996; Urfi, 1997). Since investigation on serpentofauna in Keonjhar district is inadequate, the present study was undertaken to enlist and evaluate the status of snakes in hill forest, Sanghagara natural ecosystem, Keonjhar, Odisha.

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METHODOLOGY

For this study, field visits were carried out twice a month at the study site to survey the reptilian diversity from 2008 to 2013 in entire terrestrial site. The study site is situated between 21°10'N latitude and 85°11'-86°22'E longitude. It is bounded by Mayurbhanja district and Bhadrak district to the east, Dhenkanal and Sundergarh district to the west, Jajpur district to the south and Singhbhum of the State Jharkhand to the north. Individuals of a particular species were recorded by visual encounter surveys (Rodel and Ernst, 2000). However, active search involving turning rocks and logs, excavating burrows and termite mounds by the help of snake catcher also provided good results. During day time, attempt was made for heliothermic (basking) reptiles along forest trails, forest edges and stream sides. Data were collected for each individual species encountered during field work. The various aspects such as locality, date, time, weather condition, habitat, sex of each individual (when possible), co-existing species if any and behaviour were noted in a field data sheet. Taxonomic characters of captured species were noted during field work. Photographs of different species and habitat were collected by digital camera from various positions and angle of the species. Species were identified using the described keys (Smith, 1929; David and Vogel, 1996; Schleich and Kastle, 2002). Common English name of herpetofaunal species is followed after Captain and Bhatt (2000) and Jude Sekar (2012). The status of serpent species is enlisted by using the keys of Anderson (1871); Smith (1950); Bellairs and Underwood (1957); Carroll (1969); Das, (1994), Bhupathy (1995); Hermann (1997) and Venkateswarulu et al. (1995). Endangered species are checklisted by using Biswas et al. (1976); Grombridge (1981); Narayan and Rosland (1990); Murthy (1995); Aengels (1995); Klemens and Thorbjarnarson (1995); and Allen (1996).

RESULTS AND DISCUSSION

The snakes recorded belong to 5 families, 14 genera and 16 species in the survey. Among these, the family Colubridae is the dominant family followed by Elapidae and Viperidae (Table 1). The detailed description as to various observed and recorded species are as follows.

1. Typhlopidae

1.1. Blind snake

One of the blind snake species (*Typhlops diardii*) of

the family Typhlopidae was recorded on 18th June 2009, in tree crevices. It was of metallic colouration and measured 75cm (Fig.1).

Body was stout with distinctly flat ventrum having 22 scales round the mid-body. Head was flat and tail at vent was wider than long. Eyes were large with a distinct pupil. Nasal cleft was incomplete and was in contact with second supra-labial. Head squamous glands was confined to sutures, descend in parallel diagonal rows onto the supra-labial. The posterior nasal overlaps first and second supra-labials, third supra-labial was overlapped by pre-ocular and overlaps ocular and ocular was overlapped fourth supra-labial. Micro-tubercles were scattered on the surface of all head scales; dorsum was light brown in colour and ventrum was dirty white. Tail was with sharp ventral bent, rounded tip and with a strong cuspidate spine.

2. Boidae

2.1. Indian rock python ()

On 2nd February, 2010, one Indian rock python species (*Python molurus*) was encountered near rocky foothills in the study area. It was yellowish in colour and measured 5.5 m in length (Fig.2).

There were markings with light brown and tan rectangles placed over a typically cream coloured background and a partial arrow-shaped marking on the top of the head. When resting during daytime they were found in trees (they are good climbers with their prehensile tails), hollow trees, and on the ground in dense water reeds. They feed on mammals, birds and reptiles indiscriminately, but seem to prefer mammals, like mice, rats, pigs, deer etc. After a heavy meal, they are disinclined to move. *Python molurus* is a solitary species.

3. Colubridae

3.1 .Painted bronze back tree snake

On 25th August 2010, one bronze back tree snake species (*Dendrelaphis pictus*) was recorded among shrubs of stream side in study area (Fig.3).

In the Painted bronze back tree snake, the eye was as long as the distance between the nostril and eye. The rostral scale was more broad than deep, and was visible from above. Inter-nasal scales are as long as, or slightly shorter than, the prefrontal scales. The frontal scale was as long as its distance from the rostral or the tip of the snout, but shorter than the parietal scales. The loreal was long and there is one preocular and two post-oculars.

Scales are in 15 rows, vertebrals as large as the outer; Ventrals number 182, the anal scale was divided, and sub-caudals number 123.

The dorsal surface was olive or brown in colour with a yellow lateral stripe, bordered below by a dark line between the outer scales and the ventrals. A black stripe on each side of the head passes through the eye, breaks up into spots and separated by bluish-green bands on the nape. The upper lip was yellow, and the lower surface yellowish. Measured length of head and body was 740 mm and the tail was 440 mm.

3.2 .Green cat snake

One green cat snake species (*Boiga cynea*) was recorded on 5th September, 2010 in study area (Fig.4).

The *Boiga cyanea*, or Green Cat Snake, had a long body, head distinctly broader than neck, and large eyes with vertical pupil. Body colour was green whereas colour of lower jaw was cyan. It has a long prehensile tail which makes it pure arboreal. When threatened, it will become hostile and posture with a wide open mouth.

3.3. Common wolf Snake

One common wolf snake species (*Lycodon aulicus*) was encountered on 5th September near human habitation at study area (Fig.5).

Snout was broad, much depressed, long, spatulate, with the swollen upper lip, and without canthus rostralis. Rostral shield was very low, broad, slightly bent backwards on the upper surface of the snout. Anterior frontals were very small; posterior frontals were longer than broad. Nostril was small, directed upwards between two nasals, the anterior of which was situated on the foremost part of the snout. Abdomen and tail were with an angular ridge on each side. Ventral have 186 scales; anal bifid, sub-caudal have 57 scales. Each maxillary was armed with two fangs in front, placed in a transverse line, the outer being much larger than the inner; the lateral longitudinal series of teeth commences at some distance from the fangs; they were small and nine in number, the last being considerably larger than the others; pterygoido-palatine teeth small, of equal size; mandible with two fangs on each side and with a series of small teeth.

3.4. Indian rat snake

The rat snake species (*Ptyas mucosa*) was always encountered in and around human habitation of nearby villages. This species was also recorded in the study area while climbing a tree on 20th May, 2011 (Fig. 6 and 7)

Snout was obtuse, slightly projecting with large eye. Rostral was little broader than deep, visible from above. Suture between the inter-nasals was shorter than that between the pre-frontals; Frontal was as long as its distance from the end of the snout. There were three loreals. One large pre-ocular, with a small sub-ocular below and two post-oculars were present. Temporals 2+2; 8 Upper labials where fourth and fifth were enter the eye. 5 lower labials were in contact with the anterior chin shields, which were shorter than the posterior. Dorsal scales were in 17 rows at mid-body and strongly keeled on the posterior part of the body. Ventral scales were 183; anal divided; sub-caudals were 95. Dorsal surface was brown, frequently with distinct black cross-bands on the posterior part of the body and on the tail.

3.5. Buff striped keel-back

One buff striped keel-back species (*Amphiesma stolatum*) was recorded when it took refuge among soil cracks of field on 7th October, 2010. This species was also recorded in and around human habitations of nearby villages (Fig.8).

It was a small, slender snake. The buff striped keel-back was olive-brown in colour. The head and the body were of the same colour. The body of the buff striped keel-back was short, and it has a long slender tail which was a quarter of its length. Two yellow stripes along the length and to the sides of the spine were the distinctive feature of this snake. These stripes were diffuse at the head and were especially bright on the second half of its body. The keel-back has irregular blackish crossbars on the body. Near the head the crossbars were prominent, whereas on the second half of the snake they become diffuse. The sides of the head are yellow, and the head tapers to form a distinctive neck. The chin and throats were white in colour. There were black vertical markings in front of and behind the large eyes. The forked tongue was black. The underside was pale cream and has small black spots scattered along both the margins. It has keeled scales on the dorsal surface of the body.

4. Viperidae

4.1. Spot tailed pit viper

A male spot tailed pit viper species (*Trimeresurus erythrurus*) was caught on 10th June, 2011, by snake charmer. The species was found in an agricultural area near Sanghagara forest ecosystem (Fig.9). Measured body length was 430mm and tail length was 128mm.

Scalation: Dorsal scales were in 23 longitudinal rows at midbody. First upper labial was completely fused to nasal. There were 12 upper labials which were separated from sub-oculars by 2 rows of scales. 11 scales were present in a line between supra-oculars. Temporal scales were small and strongly keeled.

Color pattern: Head was uniformly green. Dorsal surface was bright green and light ventro-lateral stripe were present.

4.2. Saw-scaled viper

One saw-scaled viper species (*Echis carinata*) was encountered on 14th November, 2011 in study area (Fig 10). It was measured 48 cm (19 inches) in total length (body + tail.). Head was distinct from neck with very short and rounded snout. The nostril was between three shields and head was covered with small keeled scales, among which an enlarged supra-ocular was present. There were 13 inter-ocular scales across the top of the head and 17 circum-orbital scales. 3 rows of scales separate the eye from the supra-labials. There were 10 supral-abials, the fourth usually largest, and 11 sub-labials. There were 28 rows of dorsal scales that are keeled scales with apical pits on mid-body. On the flanks, this species had serrated keels. There were 143 ventral scales which were rounded and covered the full width of the belly. The sub-caudal were undivided and number 31, and the anal scale was single. The color-pattern consists of a pale buff and pale brown ground colour, overlaid mid-dorsally with a series of variably colored with whitish spots, edged with dark brown, and separated by lighter inter-blotch patches. A series of white bows run dorso-laterally. The top of the head has a whitish cruciform or trident pattern and there was a faint stripe running from the eye to the angle of the jaw. The belly was whitish to pinkish, uniform in color..

4.3. Daboia

One daboia species (*Daboia ruselii*) was recorded on 10th June, 2011 during survey (Fig.11). The measured head to tail length was 4 ft., 1 inch (124 cm). The length of tail was 7 inches (18 cm). The width and length of head were 2 inches (5 cm) and 2 inches (5 cm) respectively. The head was flattened, triangular and distinct from the neck. The snout was blunt, rounded and raised. The nostrils were large, each in the middle of a large, single nasal scale. The lower edge of the nasal touches the naso-rostral. The supra-nasal has a strong crescent shape and separates the nasal from the naso-rostral anteriorly. The rostral was as broad as it is high. The crown

of the head was covered with irregular, strongly fragmented scales. The supra-ocular scales were narrow, single, and separated by 7 scales across the head. The eyes were large, flecked with yellow or gold, and each is surrounded by 12 circum-orbital scales. There were 10 supra-labials, the 4th and 5th of which were significantly larger. The eye was separated from the supra-labials by 3 rows of sub-oculars. There were two pairs of chin shields, the front pair of which was enlarged. The body was stout. The dorsal scales were strongly keeled; only the lowest row was smooth. The tail was short with the paired sub-caudal numbering 56. Dorsally, the colour pattern consists of a deep yellow colour with three series of dark brown spots that run the length of the body. Each of these spots has a black ring around it. The outer border of this spot was intensified with a rim of white colour. The dorsal spots, 23 in number, grow together, while the side spots were broken apart. The head has a pair of distinct dark patches; one on each temple, together with a pinkish X marking that forms an apex towards the snout. Behind the eye, there was a dark streak, outlined in white puff.

5. Elapidae

5.1. Banded krait

One banded krait species (*Bungarus Fasciatus*) was recorded on 10th June, 2011 in study area near a termite mounds (Fig.12). Another species was also encountered on 28th August, 2011 near the gate of a building. *B. fasciatus* was easily identified by its alternate black and yellow cross-bands, its triangular body cross section, and the marked vertebral ridge consisting of enlarged vertebral shields along its body. The head was broad and depressed. The eyes were black. It had arrowhead-like yellow markings on its otherwise black head. The snake had an entire anal plate and single sub-caudal. The tail was small and ends like a fingertip. It was one-tenth the length of the snake. Banded kraits are shy, not typically seen, and are mainly nocturnal. During the day, they lie up in grass, pits, or drains. The snakes are lethargic and sluggish even under provocation. They are most commonly seen in the rains.

5.2. Krait ()

One krait species (*Bungarus caeruleus*) was recorded on 28th August, 2011 on road side passing through forest (Fig.13). The length was 0.9 m (3.0 ft). The head was flat and the neck hardly evident. The body was cylindrical,

tapering towards the tail. The tail was short and rounded. The eyes were rather small. The head shields were normal, with no loreals; four shields occur along the margin of the lower lip; the third and fourth supra-oculars touch the eye. The scales were highly polished, in 15 rows; the vertebral row was distinctly enlarged and hexagonal. Numbers of ventral scales were 189 and caudal were 47 and entire. Colouration was black, with 40 thin, white cross-bars which were absent anteriorly. There were narrow white lines found as a series of connected spots, with a prominent spot on the vertebral region. A white pre-ocular spot was present.

5.3. Black krait

One black krait species (*Bungarus niger*) was recorded on 5th September in study area by the help of local inhabitants (Fig.14). This species was medium in length, slender-bodied, and triangular in cross-section, with a short, pointed tail. The head was flat and slightly distinct from the neck. The eyes were medium in size, black with round pupils. Dorsal scales were smooth and glossy with scales of the vertebral row enlarged and hexagonal. Dorsal scale count was 15 - 15 - 15.

5.4. Cobra

One cobra species (*Naja naja*) was recorded on 21st December, 2011 on a tree, 3.6m above the ground during the survey. (Fig.15) The ventral scales or the underside colouration of this species was yellow. Dorsal scales have a hood mark. It was exhibited a light throat area followed by dark banding, which was 6 ventral scales wide. The hood mark was two circular ocelli patterns connected by a curved line, evoking the image of spectacles. The Indian cobra was a moderately sized, heavy bodied species. This cobra species can easily be identified by its relatively large and quite impressive hood, which it expands when threatened. This species has a head which is elliptical, depressed, and very slightly distinct from neck. The snout was short and rounded with large nostrils. The eyes were medium in size and the pupils were round. Dorsal scales were smooth and strongly oblique. Mid-body scales were in 23 rows with 171-197 ventral. There were 58 divided sub-caudal and the anal shield was single. There were 7 upper labials (3rd the largest and in contact with nasal

anteriorly, 3rd and 4th in contact with eye) and 9 lower labials (small angular cuneate scale present between 4th and 5th lower labial), as well as 1 pre-ocular in contact with inter-nasals, and 3 post-oculars. Temporals were 2 + 3.

5.5 Monocled cobra

The brown variety of this species (*Naja kaouthia*) was caught by the snake charmer during the survey period on 10th November, 2011. Another black coloured female species was recorded from human habitation, near the Sanghagara forest ecosystem (Fig.16). The monocled cobra has an O-shaped hood pattern, unlike that of the Indian cobra. The dorsal surface was brown with or without clearly defined cross bands. It had a black spot on the lower surface of the hood on either side, and one black cross-bars on the belly behind it. The rest of the belly was usually of the same colour as the back, but paler. The elongated nuchal ribs enable a cobra to expand the anterior of the neck into a "hood". Measured length was 1.35 m (4.4 ft) with a tail length of 23 cm (9.1 in). They have 176 ventral scales and 48 sub-caudal scales.

5.6 King cobra

On April 2010, one king cobra species (*Ophiophagus hannah*) was recorded when it entered into human habitation during day time (Fig.17 and 18). The measured length of king cobra was at 3 m (9.8 ft) and typically weighs about 6 kg. As per the snake charmer, length and mass of the snakes highly depend on their localities and some other factors. The skin of this snake was black and with faint, pale yellow cross bands on the ventral surface of the body, all along the length. The head was quite massive and bulky in appearance. 15 rows of dorsal scales were present along the centre of the king cobra's body. The sub-caudal scales were single in each row.

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Plate 1. Snakes of Sanaghagara forest



Fig.1 *Typhlops diardii* .



Fig.2 *Python molurus* .



Fig.3 *Dendrelaphis pictus* .



Fig.4 *Boiga cynea* .



Fig.5 *Lycodon aulicus* .



Fig.6 *Ptyas mucosa* .



Fig.7 *Ptyas mucosa*.



Fig.8 *Amphiesma stolatum*.



Fig. 9 *Trimeresurus erythrurus* .



Fig. 10 *Echis carinata*.



Fig 11 *Daboia russelii* .



Fig. 12 *Bungarus fasciatus* .



Fig.13 *Bungarus caerulus* .



Fig. 14 *Bungarus niger* .



Fig.15 *Naja naja*.



Fig. 16 *Naja kaouthia* .



Fig.17 *Ophiophagus hannah*.

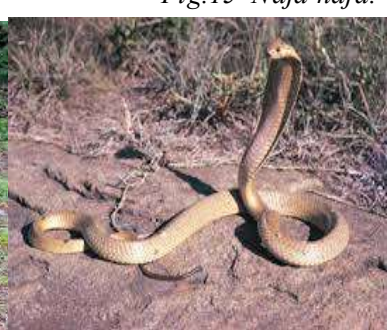


Fig.18 *Ophiophagus hannah* .

Table 1: List of snakes from Sanghagara forest

Family	Sl No	Common Name	Scientific Name	Habitat
Typhlopidae	01	Blind snake	<i>Typhlops diardii</i>	Near human habitation,shrub forest below rock boulder
Boidae	02	Burmese rock python	<i>Python molurus</i>	Trees, forest in mesic forest
Colubridae	03	Painted bronze back tree snake	<i>Dendrelaphis pictus</i>	On trees, near human habitation,scrub forest
	04	Green cat snake	<i>Boiga cynea</i>	Branches of trees
	05	Common wolf snake	<i>Lycodo naulicus</i>	Forest floor,leaf litter,below rock boulder,scrub forest
	06	Indian rat snake	<i>Ptyas mucosa</i>	Forest floor, termitemound,below rock boulder
	07	Buff striped keelback	<i>Amphiesma stolatum</i>	Grassland, near human habitat
Viperidae	08	Spot tailed pit viper	<i>Trimeresurus erythrurus</i>	Grass land ,peripheral region of forest
	09	Saw-scaled viper	<i>Echis carinata</i>	Schrubforest,near human inhabitants
	10	Daboia	<i>Daboia ruselii</i>	Scrub forest, near human habitats
Elapidae	11	Banded krait	<i>Bungarus fasciatus</i>	Scrub forest, near human habitat
	12	Krait	<i>Bungarus caerulus</i>	Near human habitat
	13	Black krait	<i>Bungarus niger</i>	Scrub and mesic forest, road side
	14	Cobra	<i>Naja naja</i>	Scrub forest, near human habitat, forest floor, degraded termite mound
	15	Monocled cobra	<i>Naja kaouthia</i>	At degraded forest edge, scrub forest
	16	King cobra	<i>Ophiophagus hannah</i>	Tree, shrub forest.

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