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Snake diversity of the Nagarahole wildlife range in Nagarahole tiger reserve, Western ghats, India: Insights from opportunistic observations

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ABSTRACT

Abstract: Snakes play an important ecological role in forest ecosystems by regulating prey populations and maintaining trophic balance. Despite their ecological importance, localized documentation of snake diversity in protected areas of the Western Ghats remains limited. An opportunistic survey was conducted in the Nagarahole Wildlife Range of Nagarahole Tiger Reserve between January 2024 and December 2025 to document snake diversity encountered during routine field activities. Observations were recorded during forest patrols, wildlife monitoring operations, and incidental encounters. Each observation included geographic coordinates, habitat type, and photographic documentation for species identification. A total of 26 snake species belonging to seven families were recorded during the study period. The assemblage included both venomous and non-venomous species such as the Indian Cobra, Common Krait, Russell's Viper and Indian Rock Python. The family Colubridae represented the highest species diversity. Most observations occurred during the monsoon season, suggesting seasonal activity patterns influenced by climatic conditions and prey availability. The findings provide baseline information on snake diversity in the Nagarahole Wildlife Range and highlight the importance of opportunistic data collection in documenting cryptic wildlife species.

1. Introduction

Snakes represent an important component of terrestrial ecosystems and contribute significantly to ecological balance by regulating populations of rodents, amphibians, and other small vertebrates (Whitaker & Captain, 2004). India supports a rich diversity of snake species due to its varied climatic conditions and habitat types (Daniel, 2002). The Western Ghats is globally recognized as one of the world's biodiversity hotspots and supports high reptile diversity including several endemic species (Vasudevan et al., 2001; Vijayakumar et al., 2014). Protected areas within this landscape play a crucial role in conserving reptile fauna. One such important protected area is Nagarahole Tiger Reserve, which forms part of the larger Nilgiri Biosphere Reserve.

While numerous ecological studies in Nagarahole have focused on large mammals such as elephants and tigers, relatively limited information exists on reptile diversity within the park. Snakes are often difficult to detect due to their secretive and cryptic behavior, making systematic surveys challenging. Opportunistic observations collected during routine forest activities can therefore provide useful information on species presence and distribution (Ganesh & Chandramouli, 2010).

The present study aims to document snake diversity recorded through opportunistic observations in the Nagarahole Wildlife Range during 2024–2025 and to provide baseline information for future reptile research and conservation.

2. Study Area

The study was conducted in the Nagarahole Wildlife Range of Nagarahole Tiger Reserve located in southern India. The park forms an important component of the Nilgiri Biosphere Reserve, one of the largest protected landscapes in the Western Ghats.

The park covers approximately 843.39km² and is characterized by tropical moist deciduous forests, dry deciduous forests, swampy grassland and riparian habitats. The region experiences three distinct seasons: summer, monsoon, and winter. Annual rainfall ranges between 1000–1500 mm, mainly influenced by the southwest monsoon. Our study area covers over 104 km² (Nagarahole Wildlife Range).

The diverse vegetation and habitat types support a wide variety of wildlife including elephants, tigers, ungulates, birds, and reptiles.

3. Materials and Methods

The opportunistic survey was conducted between January 2024 and December 2025 in the Nagarahole Wildlife Range of Nagarahole Tiger Reserve. Snake observations were recorded during routine field activities such as forest patrols, wildlife monitoring, and incidental encounters within the study area. Whenever a snake was encountered, basic information including the date and time of observation, geographic coordinates (GPS), habitat type, behaviour of the individual, and photographic documentation was recorded. These observations were subsequently compiled to create a georeferenced dataset of snake occurrences within the range. Species identification was carried out using standard herpetological field guides including The Book of Indian Reptiles and Amphibians (Daniel, 2002) and Snakes of India: The Field Guide (Whitaker & Captain, 2004). Taxonomic nomenclature and species validity were further verified using The Reptile Database (Uetz et al., 2024).

4. Results

A total of 26 snake species belonging to seven families were recorded during the study period in the Nagarahole Wildlife Range of Nagarahole Tiger Reserve (Table 1). Among the recorded taxa, the family Colubridae represented the highest species richness, indicating its dominance within the snake assemblage of the study area (Fig 1). The survey documented several venomous species including the Indian Cobra, Common Krait, Russell's Viper, Malabar Pit Viper, Hump-nosed Pit Viper, and Bibron's Coral Snake. In addition to these medically important species, several non-venomous snakes were also observed, including the Indian Rat Snake, Common Bronzeback Tree Snake, and Common Sand Boa. Snake observations were recorded across multiple habitat types such as forest interiors, riparian zones, swampy grasslands, and areas near human settlements, with relatively higher encounter rates in forest interiors and riparian habitats (Table 3). Geographic coordinates collected during field observations were used to generate a spatial distribution map illustrating the locations of snake sightings across the Nagarahole Wildlife Range. Seasonal patterns were also observed in the dataset, with the majority of sightings recorded during the monsoon season, followed by summer and winter. Increased humidity, moderate temperatures, and higher prey availability during the monsoon likely contribute to increased snake activity and detectability during this period (Table 4).

Table 1
Checklist of Snake Species Recorded in Nagarahole Wildlife Range

Sl. No	Common Name	Scientific Name	Family
1	Spectacled Cobra	*Naja naja*	Elapidae
2	Russell's Viper	*Daboia russelii*	Viperidae
3	Common Krait	*Bungarus caeruleus*	Elapidae
4	Malabar Pit Viper	*Trimeresurus malabaricus*	Viperidae
5	Hump-nosed Pit Viper	*Hypnale hypnale*	Viperidae
6	Bibron's Coral Snake	*Calliophis bibroni*	Elapidae
7	Common Cat Snake	*Boiga trigonata*	Colubridae
8	Collared Cat Snake	*Boiga nuchalis*	Colubridae
9	Green Vine Snake	*Ahaetulla nasuta*	Colubridae
10	Brown Vine Snake	*Oxybelis aeneus*	Colubridae
11	Ornate Flying Snake	*Chrysopelea ornata*	Colubridae
12	Brahminy Blind Snake	*Indotyphlops braminus*	Typhlopidae
13	Elliot's Shieldtail	*Uropeltis ellioti*	Uropeltidae
14	Indian Rat Snake	*Ptyas mucosa*	Colubridae
15	Trinket Snake	*Coelognathus helena*	Colubridae
16	Banded Kukri Snake	*Oligodon arnensis*	Colubridae
17	Russell's Kukri Snake	*Oligodon taeniolatus*	Colubridae
18	Common Wolf Snake	*Lycodon aulicus*	Colubridae
19	Travancore Wolf Snake	*Lycodon travancoricus*	Colubridae
20	Common Bronzeback Tree Snake	*Dendrelaphis tristis*	Colubridae
21	Buff-striped Keelback	*Amphiesma stolatum*	Colubridae
22	Checkered Keelback	*Fowlea piscator*	Colubridae
23	Olive Keelback	*Atretium schistosum*	Colubridae
24	Green Keelback	*Macropisthodon plumbicolor*	Colubridae
25	Common Sand Boa	*Eryx conicus*	Boidae
26	Indian Rock Python	*Python molurus*	Pythonidae

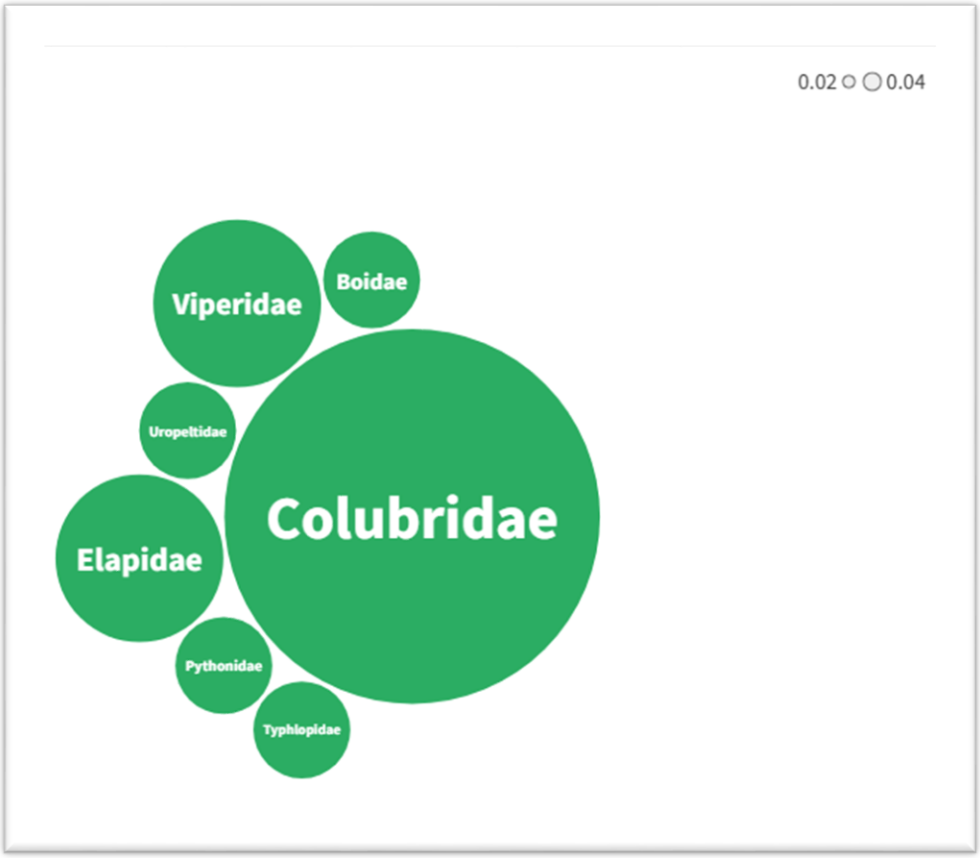

Figure 1: Family-wise Diversity of Snakes Recorded in Nagarahole Wildlife Range

Table 3
Habitat-wise Distribution of Snake Observations

Habitat Type	Observation Trend
Forest Interior	High
Riparian Habitat	Moderate–High
Human Settlement Edge	Moderate
Grassland	Low

Table 4
Seasonal Activity Pattern of Snake Observations

Season	Relative Observation Frequency
Monsoon	High
Summer	Moderate
Winter	Low

5. Discussion

The present opportunistic survey documented 26 species of snakes belonging to seven families in the Nagarahole Wildlife Range of Nagarahole Tiger Reserve. This diversity reflects the ecological richness of the Western Ghats landscape, which is widely recognized as a global biodiversity hotspot supporting high reptile diversity and endemism (Vasudevan et al., 2001; Vijayakumar et al., 2014). The region's varied habitats including moist deciduous forests,

riparian ecosystems, and grasslands provide suitable ecological niches for a wide range of reptile species (Daniel, 2002).

Studies conducted in other parts of the Western Ghats have reported higher snake diversity due to intensive sampling and longer study durations. For instance, surveys conducted in the High Wavy Mountains of the southern Western Ghats documented over 60 snake species, highlighting the high species richness of the region when multiple survey techniques and long-term sampling are applied (Ganesh et al., 2013). Similarly, herpetofaunal assessments from Meghamalai in the southern Western Ghats recorded high reptile diversity including numerous endemic taxa, indicating the importance of varied elevation gradients and diverse forest types in supporting reptile assemblages (Ganesh & Chandramouli, 2010).

The comparatively lower number of species recorded in the present study may be attributed to multiple factors. Firstly, the survey was conducted over a relatively smaller sampling area with largely similar habitat types, which may have limited the detection of habitat-specific and rare species. Secondly, the opportunistic nature of the survey, relying on incidental encounters during routine field activities rather than systematic sampling approaches, may have further constrained species detection. Standardized methods such as visual encounter surveys and nocturnal transects are known to significantly improve reptile detectability. Previous studies in tropical forest ecosystems have demonstrated that limited sampling effort, particularly the absence of dedicated night surveys, can lead to an underestimation of reptile diversity, as many species are arboreal and nocturnal in behavior (Doan, 2003; Garden et al., 2007).

Despite these limitations, the present study recorded several representative species typical of tropical forest ecosystems in southern India, including both venomous and non-venomous taxa such as the Indian Cobra, Common Krait, Russell's Viper, and Indian Rock Python. The dominance of species belonging to the family Colubridae in the observations is consistent with other studies conducted in the Western Ghats, where colubrid snakes often represent the largest proportion of snake assemblages (Whitaker & Captain, 2004).

Seasonal variation observed in the present study, with increased snake activity during the monsoon season, also aligns with patterns reported from other tropical forest ecosystems. Higher humidity levels, favorable temperatures, and increased prey availability during the monsoon contribute to greater snake activity and detectability during this period (Vitt & Caldwell, 2014).

Overall, the results of this study contribute valuable baseline information on snake diversity within the Nagarahole Wildlife Range. Opportunistic records collected by field personnel can serve as an important supplementary data source for biodiversity documentation in protected areas. However, future studies incorporating systematic survey techniques, long-term monitoring, and habitat-specific sampling would likely reveal additional species and provide a more comprehensive understanding of snake diversity and distribution in this landscape.

Conclusion

The opportunistic survey conducted during 2024–2025 documented 26 species of snakes belonging to seven families in the Nagarahole Wildlife Range of Nagarahole Tiger Reserve. The presence of both venomous and non-venomous species, including the Indian Cobra, Common Krait, and Indian Rock Python, indicates the ecological richness of the landscape. These observations provide valuable baseline information on snake diversity within the region and highlight the importance of protected forest habitats in supporting reptile communities. Although the study relied on opportunistic encounters, the findings demonstrate the usefulness of routine field observations in biodiversity documentation. Further systematic surveys, long-term monitoring, and habitat-specific studies are recommended to improve understanding of snake distribution, seasonal activity, and conservation needs within the park.

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