

Seasonal Reptilian Diversity at Gautala Reserve Forest, Aurangabad (M.S.), India.

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Abstracts

Reptiles are playing a vital role in ecology. These reptiles show a diverse range of habitat adaptations. They are dispersed in extreme desert conditions as well as in low-temperature areas and they are broadly dispersed across the world. The occurrence of reptiles is a sign of rich biodiversity and ecology. To assess the distribution of the reptile species in a given area, a reptilian species survey was carried out in the Gautala Reserve Forest, where 15 different spots were selected during the rainy, winter, and summer seasons. A checklist was created for the period of 2017-2018. During the investigation, a total of 28 species of reptiles from 6 families were found. The transect method was used to sample direct and indirect evidence of reptilian species. This paper discusses seasonal variations in reptilian diversity and statistical analysis methods. The Boidae family has fewer species than various other families, compared to the huge number of species of the Colubridae family reported in the current study. According to the IUCN, Three species of reptiles, the Common Sand Boa (*Gongylophis Conicus*), India Rock Python (*Python molurus molurus*), and John's Sand Boa (*Eryx johnii*), are Near Threatened (NT- Decreasing), and one species of reptile, the Gunther's Racer (*Coluber gracilis*), is Data Deficient (DD-Unknown). The remaining 24 species of reptiles are considered Least Concerned. Baseline information on the resilience of these reptile species was collected for the current investigation. These details will be useful for future planning on the preservation of reptile diversity.



Article History

Received: 15 February 2023

Accepted: 29 May 2023

Keywords

Diversity;
Reptiles;
Seasonal and
Reserve Forest.

Introduction


In India, there are reported to be 518 species of reptiles, including crocodiles (03), 202 several lizard species, 34 varieties of turtles, and 279

species of snakes. However, (192) species are documented as endemic to the country.¹ Reptiles are playing a vital role in ecology. These reptiles show a diverse range of habitat adaptations.

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Doi: <https://dx.doi.org/10.12944/CWE.18.2.27>

They are dispersed in extreme desert conditions as well as in low-temperature areas and they are broadly dispersed across the world. Crocodiles, tortoises, turtles, lizards, skinks are with legs whereas snakes are legless. Reptiles are generally present in all kinds of ecosystems, and their existence is a sign of a functioning ecology and biodiversity. All reptiles can be located in a wide range of habitats and microhabitats, which are mainly located in deserts and forests. The diversity and ecosystems also provide better support for the growth of the reptile population. In addition to becoming located in human settlements, such as towns and villages, these reptiles can also cause conflicts with humans. Due to this, common people in certain regions could be motivated to preserve biodiversity and ecosystems or even be aware of the importance of reptiles. Their feeding habits are different. Additionally, the majority of reptiles are carnivorous, and the prey they consume ranges in size from a variety of insects to the rare huge animal in the case of crocodiles or pythons. However, just a few reptiles are herbivorous, including spiny-tailed lizards, marine turtles, and land tortoises. Some species have adapted to specialized diets, such as snakes that consume eggs, and others, like the king cobra and krait, prey on reptiles. The preliminary study on snake kills on highways. As they have included the 68 instances of road fatalities from 21 different species.²

The dynamic form of the soil erosion issue and the benefits of soil conservation point to the necessity

of considering both a short-term and long-term view of the situation. Agronomic and mechanical approaches to soil and water preservation, which are divided into two major categories, degrade the ecology of reptiles.³ According to the current study, this reserve is dedicated to a wide variety of habitats that are beneficial for herpetofauna, specifically reptiles. It is more likely that ecological diversity will support a wide range of reptiles, especially snakes.⁴ One of the most abundant reptiles in this reserve is the snake, and the variety of this species is either understudied or poorly known. The present study documented the present status of observed reptilian species found in the Gautala reserve forest.

Material and Methods

All through the duration of the study, the Gautala reserve forest was frequently visited to collect information on reptiles during the rainy, winter, and summer seasons. A study was conducted to describe the reptile fauna in the Gautala reserve forest from 2017 and 2018 (Fig 1). Direct evidence of reptiles was found using the transect method. In the direct method, they were observed and photographed using a high-resolution DSLR camera, the Canon EOS 200D, and lenses 18-55 mm and 55-250 mm. The reptiles were observed through field binoculars with an 8 × 30 magnification. For the statistical analysis, 'R' software was applied. As a result, both direct and indirect methodologies were used to assess their presence.⁵

Map of Gautala Reserve Forest

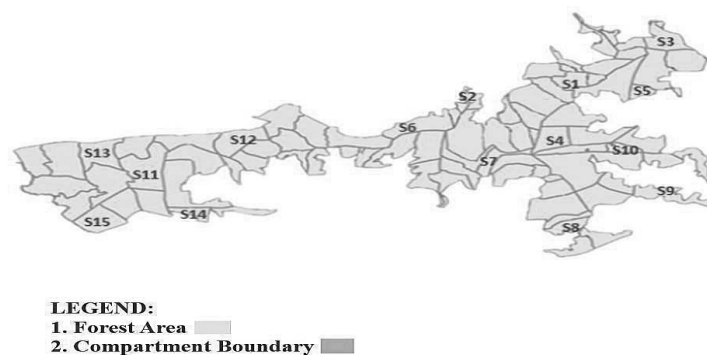


Fig. 1: Study area with selected 15 spots.⁶⁻⁸

Survey and Monitoring of Reptiles

Various investigation methods have been used, such as i) Visual encounter and transect surveys in the field. ii) Keeping track of the species using indirect evidence such as shell, moult, and footprints. Additionally, by interviewing residents of nearby villages, forest personnel, and wildlife enthusiasts and presenting them with colour photographs of the species, secondary data about the numerous kinds of reptiles was acquired.⁹⁻¹⁰

When conducting this survey, photographs were taken for the identification of the reptilian species. The identification of the reptilian species was performed through the use of standard field guides in consultation with experts. After recording the necessary information, reptile species were caught and released in the same region as needed for the close investigation. As a result, all identified reptilian species were classified using IUCN (International Union for Conservation of Nature) data as either endemic or non-endemic. Within the reserve forest area, fifteen sampling spots were selected using systematic sampling. A GPS receiver (Garmin GPS map 76CSx, Garmin) was used to confirm appropriate pacing.

Identification

The field guide books were used during fieldwork i.e. The Book of Indian Snakes: A Field Guide, the Book of Environment and Ecology, Fowler's Zoo and Wild Animal Medicine, and among others. For identifying species of vertebrates, field guides (mentioned above) and standard keys are used. The laboratories of the specialists (The Department of Environmental Sciences at the Dr. B.A.M. University, Aurangabad).

Statistical Analysis

The descriptive analysis method was utilized in the current study to identify identified reptile species with similar diversity, as measured by the variety of species during the summer, winter, and rainy seasons. The statistical data analysis program "R Studio" was used for the analyses.⁶⁻⁸

Descriptive Analysis

It is one of the most popular techniques for conducting successful data analysis. In order to summarize the results from the current study's data collection on reptilian diversity, statistical analysis, and descriptive analysis were applied.

The Frequency Distribution

The number of observed reptile species and the proportion of each group were used to calculate the frequency distribution, which provided a summary of the category distribution. It was also used to describe the geographic extent of the reptilian diversity.

Measures of Central Tendency

A data set of observed reptile species was centered using the mean, mode, and median. The central tendency method was used to calculate the average data value.

Measures of Dispersion

Seasonal change in reptile diversity was quantified using dispersion measures. Variance and standard deviation are the two approaches used most frequently to describe the distribution of reptilian diversity.

Equations

Among the many significant sources of averages is the arithmetic mean. Consider the arithmetic mean formula for example

$$\mu = \frac{\sum x}{N} \quad \dots(1)$$

Where,

μ is the population mean,

x is the sample means,

$\sum x$ and N , and then divide by the number of reptilian species, N .

The mean equation can alternatively be expressed as follows to show this

$$\mu = \frac{\sum f_i(x_i)}{N} \quad \dots(2)$$

Where,

f_i denotes the frequency of individuals within the population who have the value x_i .

Results and Discussion

During the study, there were observed 28 different kinds of reptiles from six different families. Out of the 28 species of reptiles that were seen, five were venomous, four were semi-venomous, and the remaining 14 were non-venomous. There are different families of observed Reptilian species of Gautala Reserve forest such as Boidae,

Colubridae, Elapidae, Lamprophiidae, Typhlopidae, and Viperidae. These are the six reptiles families found in the Gautala forest area, which contains 28 reptilian species (Table 1).

Table 1: Checklist of observed Reptilian species found in Gautala reserve forest

Sr No.	Common Name	Scientific Name	Family	Venom	IUCN
1.	Common Sand Boa	<i>Gongylophis Conicus</i>	Boidae	Non-Venomous	NT-Decreasing
2.	Common Indian Trinket Snake	<i>Coelognathus helena helena</i>	Colubridae	Non-Venomous	LC-Stable
3.	Indian Rat Snake	<i>Ptyas mucosa</i>	Colubridae	Non-Venomous	LC-Decreasing
4.	Banded Racer	<i>Argyrogena fasciolata</i>	Colubridae	Non-Venomous	LC-Stable
5.	Gunther's Racer	<i>Coluber gracilis</i>	Colubridae	Non-Venomous	DD- Unknown
6.	Banded Kukri Snake	<i>Oligodon arnensis</i>	Colubridae	Non-Venomous	LC-Stable
7.	Variegated kukri snake	<i>Oligodon taeniolatus</i>	Colubridae	Non-Venomous	LC-Stable
8.	Bronzeback Tree Snake	<i>Dendrelaphis tristis</i>	Colubridae	Non-Venomous	LC-Stable
9.	Common Wolf Snake	<i>Lycodon aulicus</i>	Colubridae	Non-Venomous	LC-Stable
10.	Barred Wolf Snake	<i>Lycodon striatus</i>	Colubridae	Non-Venomous	LC-Stable
11.	Dumeril's Black-Headed Snake	<i>Sibynophis subpunctatus</i>	Colubridae	Non-Venomous	LC-Stable
12.	Checkered Keelback Water Snake	<i>Xenochrophis piscator</i>	Colubridae	Non-Venomous	LC-Stable
13.	Buff-Striped Keelback	<i>Amphiesma stolatum</i>	Colubridae	Non-Venomous	LC-Stable
14.	Green Keelback	<i>Macropisthodon plumbicolor</i>	Colubridae	Non-Venomous	LC-Stable
15.	Indian Smooth Snake	<i>Coronella brachyura</i>	Colubridae	Non-Venomous	LC-Unknown
16.	Common Indian Cat Snake	<i>Boiga trigonata</i>	Colubridae	Semi-Venomous	LC-Stable
17.	Common Vine Snake	<i>Ahaetulla nasuta</i>	Colubridae	Semi-Venomous	LC-Stable
18.	Common Indian Krait	<i>Bungarus caeruleus</i>	Elapidae	Venomous	LC-Stable
19.	Slender Coral Snake	<i>Calliophis melanurus</i>	Elapidae	Venomous	LC-Unknown
20.	Spectacled Cobra	<i>Naja naja</i>	Elapidae	Venomous	LC-Stable
21.	Leith's Sand Snake	<i>Psammophis leithii</i>	Lamprophiidae	Semi-Venomous	LC-Unknown
22.	Western Sand Snake	<i>Psammophis condanarus</i>	Lamprophiidae	Semi-Venomous	LC-Unknown
23.	Brahminy Worm Snake	<i>Ramphotyphlops braminus</i>	Typhlopidae	Non-Venomous	LC-Increasing
24.	Beaked Worm Snake	<i>Grypotyphlops acutus</i>	Typhlopidae	Non-Venomous	LC-Unknown
25.	India Rock Python	<i>Python molurus molurus</i>	Typhlopidae	Non-Venomous	NT- Decreasing

26.	John's Sand Boa	<i>Eryx johnii</i>	Typhlopidae	Non-Venomous	NT- Decreasing
27.	Russell's Viper	<i>Daboia russelii</i>	Viperidae	Venomous	LC-Decreasing
28.	Saw-Scaled Viper	<i>Echis carinatus</i>	Viperidae	Venomous	LC- Stable

EN- Endangered, VU- Vulnerable, LC: Least Concern, NT: Near Threatened, DD- Data Deficient.¹⁵

Reptilian species were very high in the rainy season compared to other seasons and very low in the summer season, according to the season-wise results. Each family in the Reptilian species was a similar seasonal pattern (Figure 1.). The Colubridae family includes a huge number of observed reptilian species, while the Boidae family contains fewer individuals than other families (Figure 3). The Patna (Spots-11) has more reptilian species

than the other spots. For this reason, food supplies are widely available for these reptilian species (Figure 4). Observed reptilian species are very high in the rainy season compared to other seasons and very low in the summer season, according to the season-wise results. The seasonal patterns are similar for each family of observed reptilian species (Figure 2).

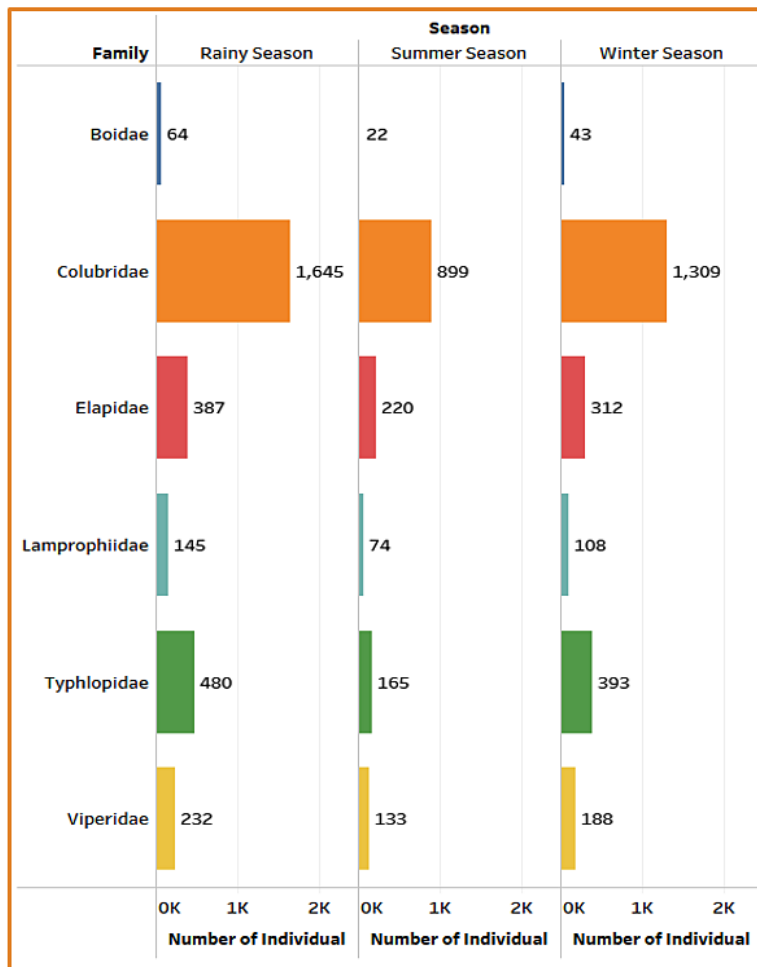


Fig. 2: Season wise total number of observed reptilian species of different families

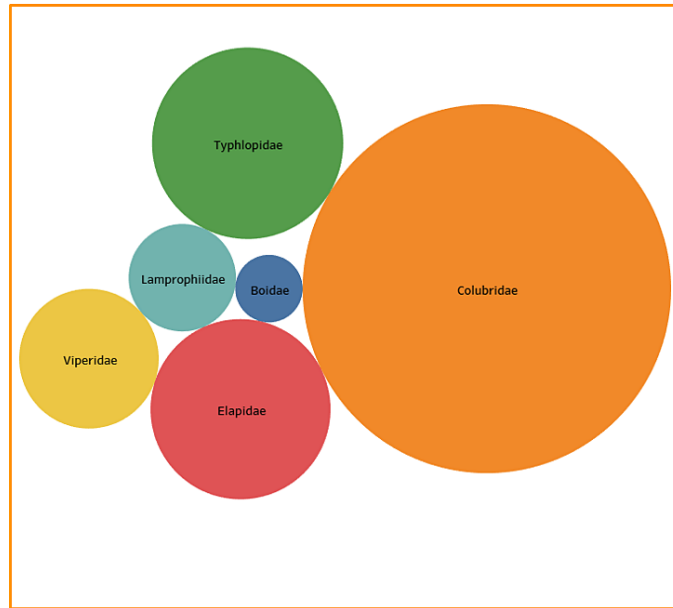


Fig. 3: Total number of observed reptilian species of different families

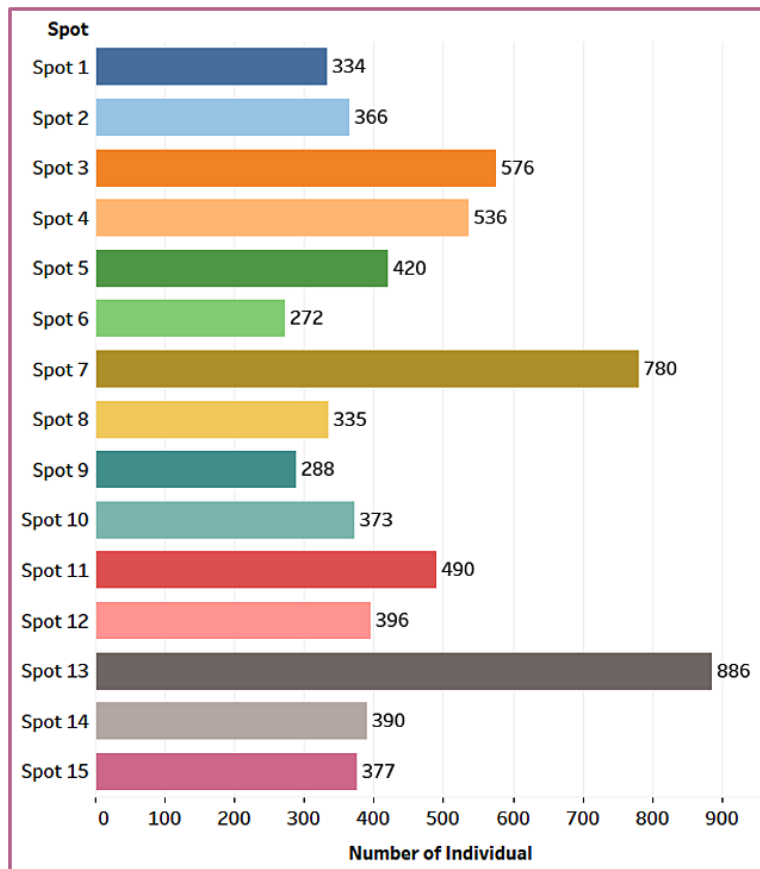


Fig. 4: Total number of observed reptilian species of different spots

The Gandhamardan Hills contained a higher family of Colubridae species. Due to anthropogenic pressures that are drastically depleting the globe, the Boidae family was found to be very rare in this study.¹¹ These outcomes are similar to the results of current study. The International Union for Conservation of Nature (IUCN) lists current state of observed reptilian species in Table 1, and only a limited number of reptiles are in the rare category, which is globally threatened. As a result, conservation plans for these rare and endangered snakes in the Gautala reserve forest are urgently desired. Long-term programs to track population variations.¹² And remediate these patterns are required due to general worldwide decreases in specific snakes and other reptiles.¹³ As snakes are the top predators among reptiles, their population loss could harm the sustainability of several ecosystems.^{11,14} These valuable species

are increasingly disappearing from the planet. Agricultural and deforestation are two of the most severe anthropogenic stresses affecting the Gautala reserve forest. These are the factors that will decrease not only snake populations but also the Gautala reserve forest's whole biodiversity.

Statistical Analysis of Observed Species of Reptiles

In the present study, observed species of reptiles identified in the Gautala reserve forest were described by statistical patterns in descriptive analysis. The total number of reptiles from different families was analyzed seasonally. For all types of observed reptiles, the rainy season has more species than other seasons, but the winter season has lower species than other seasons (Figure 2).

Photoplate 1: Photography showing observed reptile species found in the Gautala reserve forest



a) **John's Sand Boa (*Eryx johnii*)**

Conclusion

The current study identified the six reptile families Boidae, Colubridae, Elapidae, Lamprophiidae, Typhlopidae, and Viperidae. The Gautala forest area is home to 28 different species of reptiles. The Boidae family has fewer species than other families, although the Colubridae family has a huge number of species. Common Indian Trinket Snake, Bronzeback Tree Snake, Dumeril's Black-Headed Snake, Indian Rat Snake, Common Wolf Snake, Barred Wolf Snake, Buff-Striped Keelback, Checkered Keelback Water Snake, Green Keelback, Indian Smooth Snake, Common Indian Cat Snake, Common Vine Snake are the most frequently seen reptilian species (Colubridae). As a result, the International Union for Conservation of Nature (IUCN), Three observed species of reptiles, the India Rock Python (*Python molurus molurus*), Common Sand Boa (*Gongylophis Conicus*), and John's Sand Boa (*Eryx johnii*), are Near Threatened (NT- Decreasing), and one observed species of reptile, the Gunther's Racer, is Data Deficient (DD-Unknown) (*Coluber gracilis*). The remaining 24 observed species of reptiles are categorized as Least Concerned (LC) through the International Union for Conservation of Nature (IUCN). The extinction of these important species is becoming more frequent. These outcomes show the sanctuary's accessibility to a variety of complex habitat structures.

In the current study, the highest observed reptilian species counts were found in spot 11, while the lowest was found in spot 6. Additionally, the species

richness of these several families of detected reptilian species varied from location to location. The diversity of reptilian species may change based on the habitat, and the availability of food, water, and shelter, among other factors. To more effectively treat older taxonomic studies and to count endemic taxa in the Gautala reserve forest region, baseline data will be beneficial. In statistical analysis, the descriptive analysis used for observed reptilian species counts. The seasonal fluctuations in reptile populations in various seasons compared to other seasons, the rainy season has more species, whereas the winter season has less species. The descriptive analysis showed a significant difference between the average observed reptilian species counts at all spots seasonally.

Acknowledgments

I would especially like to thank Prof. Dr. Satish Patil Sir for his guidance and assistance. Also, I would like to express a special thanks to Late Prof. Dr. Satish Mokashe Sir for providing such valuable information on the related topic. Thanks to my colleagues and the entire staff of the Department of Environmental Science. The authors would like to express thanks to the Forest Department and Wildlife Staff of Gautala Sanctuary.

Funding

Short-Term Doctoral Fellowship of Indian Council of Social Science Research (ICSSR).

Conflict of Interests

The authors have no Conflict of Interests.

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