



Cumulative Assessment of Snake Diversity and Observed Abundance in East Singhbhum and Saraikela-Kharsawan, Jharkhand, India

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<https://doi.org/10.55041/ijst.v2i8.070>

Cite this Article: Thakur, Shivam, Prosenjit Sarkar, Chandan Pathak, Abhishek Kumar, Saba Ansari, Smitha Pankaj, and Amar Kumar. "Cumulative Assessment of Snake Diversity and Observed Abundance in East Singhbhum and Saraikela-Kharsawan, Jharkhand, India." International Journal of Science, Strategic Management and Technology 02, no. 8 (2026): 1-18. <https://doi.org/10.55041/ijst.v2i8.070>.

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Abstract

Snakes form an important component of terrestrial and semi-aquatic food webs, but local inventories remain necessary for documenting regional species composition and establishing baseline records for conservation planning. An observational inventory was conducted from March 2024 to July 2026 in East Singhbhum and Saraikela-Kharsawan districts of Jharkhand, India. Records were obtained through visual encounter surveys, nocturnal observations, opportunistic encounters, rescue and relocation records, and road observations. A total of 369 recorded individuals representing 24 species were compiled. The highest numbers of records were for *Ptyas mucosa*, with 65 records (17.62%), followed by *Fowlea piscator* (58; 15.72%) and *Amphiesma stolatum* (37; 10.03%). Shannon-Wiener diversity was $H' = 2.600$, Simpson diversity ($1 - D$) was 0.903, and Pielou's evenness was $J' = 0.818$). Non-venomous species accounted for 302 of the recorded individuals (81.84%), while venomous and semily venomous species together accounted for 67 (18.16%). The study therefore provides a baseline species list and pooled record distribution that can support future standardized surveys.

Keywords: Ophiofauna; snake diversity; species composition; observed records; conservation ecology

1. Introduction

Snakes are diverse predators occurring across terrestrial and aquatic environments and contribute to food-web regulation through interactions with prey and other predators (Wallach *et al.*, 2014; Uetz *et al.*, 2024). Their ecological importance includes predation on rodents, amphibians, birds and other small vertebrates, although the magnitude of these functions varies among habitats and species (Fitch, 1949; Gibbons, 1988). Regional inventories are useful because species occurrence can vary substantially among landscapes and because records from human-use areas, forests, agricultural land and water-associated habitats can complement formal biodiversity surveys. India supports a diverse snake fauna, and updated national checklists continue to refine the number and distribution of recorded species (Aengals *et al.*, 2011; Mohapatra *et al.*, 2024). Snakes also frequently occur in human-dominated landscapes, where encounters and rescue events can generate useful occurrence information. However, records obtained through different detection methods are not directly equivalent measures of population density or abundance. A cumulative inventory can nevertheless provide a useful baseline when its limitations are explicitly recognized. The Dalma landscape spread across east Singhbhum and Saraikela Kharsawan district, of eastern Jharkhand contains a heterogeneous mixture of forest, agricultural, rocky, grassland and water-associated habitats. Despite the ecological importance of the landscape, locally compiled information on snake diversity remains comparatively limited. The present study therefore compiles snake records from East Singhbhum and Saraikela-Kharsawan and summarizes the recorded species composition and distribution of pooled individual records. The specific objectives were to: (i) document snake species recorded between March 2024 and July 2026; (ii) compile the number of recorded individuals for each species; (iii) calculate descriptive diversity, dominance and evenness indices from the pooled dataset; and (iv) provide a conservation-oriented baseline while explicitly acknowledging the limitations associated with heterogeneous sampling methods.

2. Study Area

The study was conducted within the Dalma landscape of eastern Jharkhand, India, with records compiled from East Singhbhum and Saraikela-Kharsawan districts. The study area includes a heterogeneous mosaic of agricultural land, forest, rocky terrain, grassland and water-associated habitats, including reservoirs. Field observations were made across accessible sites representing these habitat types. The regional location of the study area is shown in Figure 1.



Figure 1- Regional map showing the East Singhbhum and Saraikela-Kharsawan study area and surrounding Dalma landscape.

3. Materials and Methods

3.1 Field observations and record sources

Field records were compiled from visual encounter surveys (VES), opportunistic sightings, nocturnal observations, rescue and relocation records, and road observations. A Garmin eTrex® 22x handheld GPS was used to record geographical coordinates where available. Photographs were obtained using DSLR and long-zoom cameras, including Nikon D90, Nikon D7500 with a 200–500 mm lens, and Nikon P1000. Headlamps and flashlights were used during nocturnal observations. Safety equipment included snake hooks/catching sticks, high-ankle safety footwear and protective gloves. During VES, suitable habitats were searched and encountered snakes were recorded. Opportunistic records obtained during other ecological or wildlife-conservation activities were also included. Road observations included live snakes and individuals found dead following road traffic. Nocturnal surveys were conducted to improve detection of species that are active at night. Rescue and relocation records were included as occurrence evidence from human-use areas. Information supplied by local residents, forest personnel and snake rescuers was treated as supplementary occurrence information rather than as an independent standardized sampling method. For each available record, the date, time, species identity, location, habitat, number of individuals and photographic evidence were documented. Duplicate records judged to represent the same individual were removed during final compilation.

3.2 Species identification and classification

Species names were standardized using the taxonomic sources cited in the reference list, particularly The Reptile Database and the national reptile checklist (Uetz *et al.*, 2024; Mohapatra *et al.*, 2024; **Bijay Basfore 2024**). Conservation categories were retained as reported in the species table and should be rechecked against the current IUCN Red List assessment immediately before submission. Venom-status categories were assigned according to the classification used in the study species list.

3.3 Data analysis

Species richness (S) was calculated as the number of recorded species. Relative abundance of each species was calculated as $n_i/N \times 100$, where n_i is the number of recorded individuals for species i and N is the total number of recorded individuals. Shannon-Wiener diversity was calculated as $H' = -\sum(p_i \ln p_i)$, where $p_i = n_i/N$. Simpson dominance was calculated as $D = \sum p_i^2$ and Simpson diversity as $1 - D$. Pielou's evenness was calculated as $J' = H'/\ln(S)$. Descriptive statistics included mean, median, standard deviation, variance, coefficient of variation and sample skewness. An exploratory chi-square goodness-of-fit test compared the pooled species-record counts with an equal-count expectation ($N/S = 15.375$ records per species). This test is descriptive only; it does not test habitat effects, seasonal effects, population density or differences in detection probability among species.

4. Results

4.1 Species composition and pooled record frequencies

The cumulative dataset contained 369 recorded individuals representing 24 snake species. The highest record frequency was for *Ptyas mucosa* (65; 17.62%), followed by *Fowlea piscator* (58; 15.72%) and *Amphiesma stolatum* (37; 10.03%). Other frequently recorded species were *Indotyphlops braminus* (36; 9.76%), *Python molurus* (29;

7.86%) and *Eryx conicus* (27; 7.32%). Three species—*Eryx johnii*, *Atretium schistosum* and *Lycodon jara*—were represented by single records. Species-wise record frequencies and relative representation are provided in Table 2.

Table 1. Checklist of snake species recorded during the study, with vernacular names, venom status and conservation category.

Sr. No.	Common name	Vernacular name	Venom status	Conservation status	Scientific name
1	Bamboo Pit Viper	Bans Botiya/Hara Saanp	Venomous	LC	<i>Craspedocephalus gramineus</i>
2	Russell's Viper	Chandra boda saanp	Venomous	LC	<i>Daboia russelii</i>
3	Banded Krait	Rana/Raj saanp	Venomous	LC	<i>Bungarus fasciatus</i>
4	Common Krait	Pahadi Chitti saanp	Venomous	LC	<i>Bungarus caeruleus</i>
5	Monocled / Indian Spitting Cobra	Chandranag / Ekphan wala saanp	Venomous	LC	<i>Naja kaouthia</i>
6	Indian Spectacled Cobra	Kharish / Nag saanp	Venomous	LC	<i>Naja naja</i>
7	Common Cat Snake	Bharatiya gaam/Billi saanp	Semily venomous	LC	<i>Boiga trigonata</i>
8	Forsten's Cat Snake	Manjar saanp / Rajnag	Semily venomous	LC	<i>Boiga forsteni</i>
9	Indian Rock Python	Ajgar saanp	Non-venomous	NT	<i>Python molurus</i>
10	Common Sand Boa	Boira saanp	Non-venomous	NT	<i>Eryx conicus</i>
11	Red Sand Boa	Domunha Saanp	Non-venomous	NT	<i>Eryx johnii</i>
12	Buff-striped Keelback	Haldiyaala Saanp	Non-venomous	LC	<i>Amphiesma stolatum</i>
13	Checkered Keelback / Water Snake	Jal Doriya/Paani saanp	Non-venomous	LC	<i>Fowlea piscator</i>
14	Green Keelback Snake	Hara Saanp	Non-venomous	LC	<i>Rhabdophis plumbicolor</i>
15	Olive Keelback Snake	Jitni Doriya / Doriya Saanp	Non-venomous	LC	<i>Atretium schistosum</i>

Sr. No.	Common name	Vernacular name	Venom status	Conservation status	Scientific name
16	Banded Racer	Dhool Nagin	Non-venomous	LC	<i>Lycodon fasciolatus</i>
17	Banded Kukri Snake	Chakuwala Saanp	Non-venomous	LC	<i>Oligodon arnensis</i>
18	Barred Wolf Snake	Barji/Bhediya Saanp	Non-venomous	LC	<i>Lycodon striatus</i>
19	Common Wolf Snake	Ghar Ghati Saanp	Non-venomous	LC	<i>Lycodon capucinus</i>
20	Twin-spotted Wolf Snake	Saand Saanp / Bhediya Saanp	Non-venomous	LC	<i>Lycodon jara</i>
21	Copper-headed Trinket Snake	Ban-Sundari Saanp	Non-venomous	LC	<i>Coelognathus radiatus</i>
22	Bronze-backed Tree Snake	Ghoda Saanp	Non-venomous	LC	<i>Dendrelaphis tristis</i>
23	Indian Rat Snake	Dhamin/Ghoda Pachhad	Non-venomous	LC	<i>Ptyas mucosa</i>
24	Brahminy Blind Snake	Andha Saanp	Non-venomous	LC	<i>Indotyphlops braminus</i>

Table 2. Species-wise number of recorded individuals and relative representation in the cumulative dataset.

Sr. No.	Scientific name	Recorded individuals (n _i)	Relative representation (%)
1	<i>Craspedocephalus gramineus</i>	2	0.54
2	<i>Daboia russelii</i>	8	2.17
3	<i>Bungarus fasciatus</i>	9	2.44
4	<i>Bungarus caeruleus</i>	17	4.61
5	<i>Naja kaouthia</i>	2	0.54
6	<i>Naja naja</i>	22	5.96
7	<i>Boiga trigonata</i>	3	0.81
8	<i>Boiga forsteni</i>	4	1.08
9	<i>Python molurus</i>	29	7.86
10	<i>Eryx conicus</i>	27	7.32
11	<i>Eryx johnii</i>	1	0.27
12	<i>Amphiesma stolatum</i>	37	10.03
13	<i>Fowlea piscator</i>	58	15.72

Sr. No.	Scientific name	Recorded individuals (n_i)	Relative representation (%)
14	<i>Rhabdophis plumbicolor</i>	2	0.54
15	<i>Atretium schistosum</i>	1	0.27
16	<i>Lycodon fasciolatus</i>	2	0.54
17	<i>Oligodon arnensis</i>	3	0.81
18	<i>Lycodon striatus</i>	9	2.44
19	<i>Lycodon capucinus</i>	17	4.61
20	<i>Lycodon jara</i>	1	0.27
21	<i>Coelognathus radiatus</i>	7	1.90
22	<i>Dendrelaphis tristis</i>	7	1.90
23	<i>Ptyas mucosa</i>	65	17.62
24	<i>Indotyphlops braminus</i>	36	9.76
	Total	369	100.00

Species Abundance of the Recorded Snake Assemblage

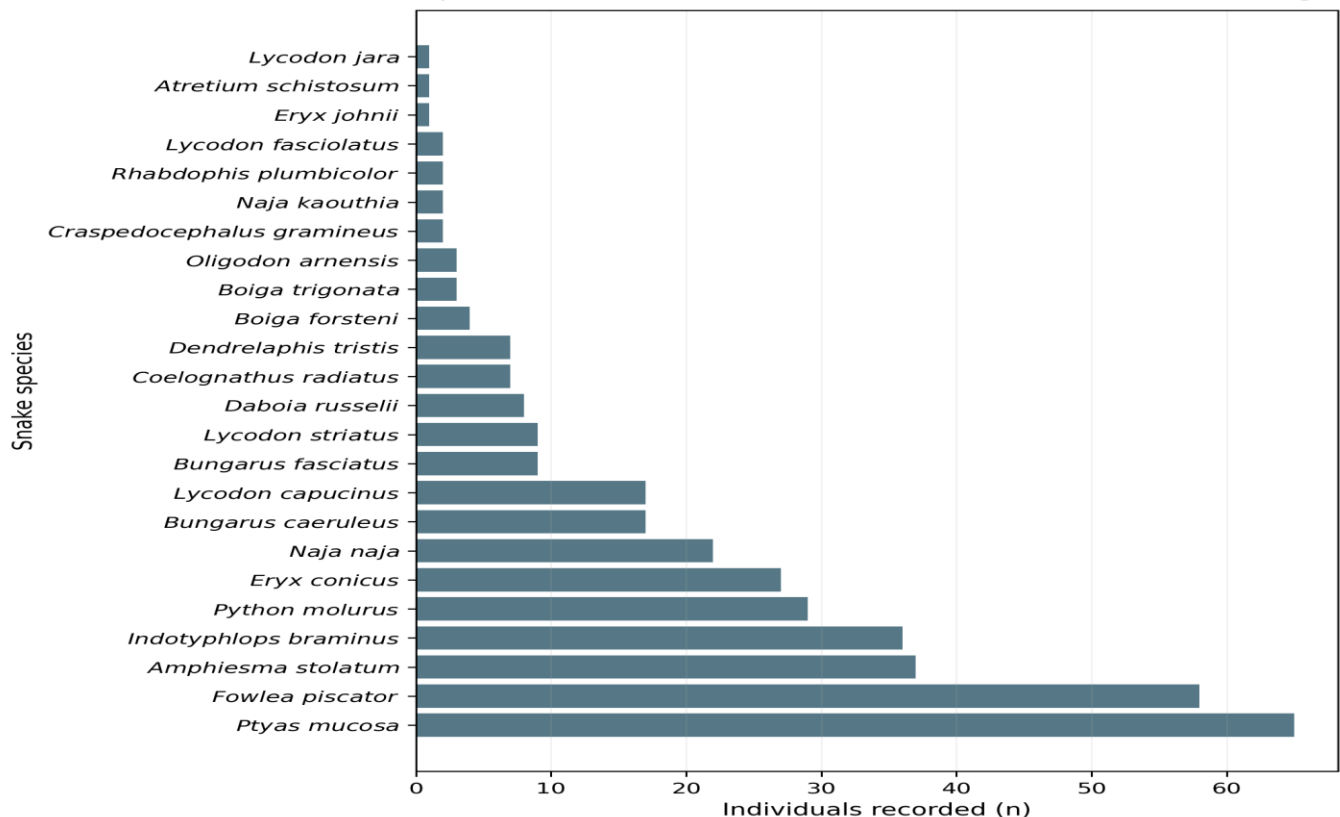


Figure 2. Species-level abundance of the 24 recorded snake species.

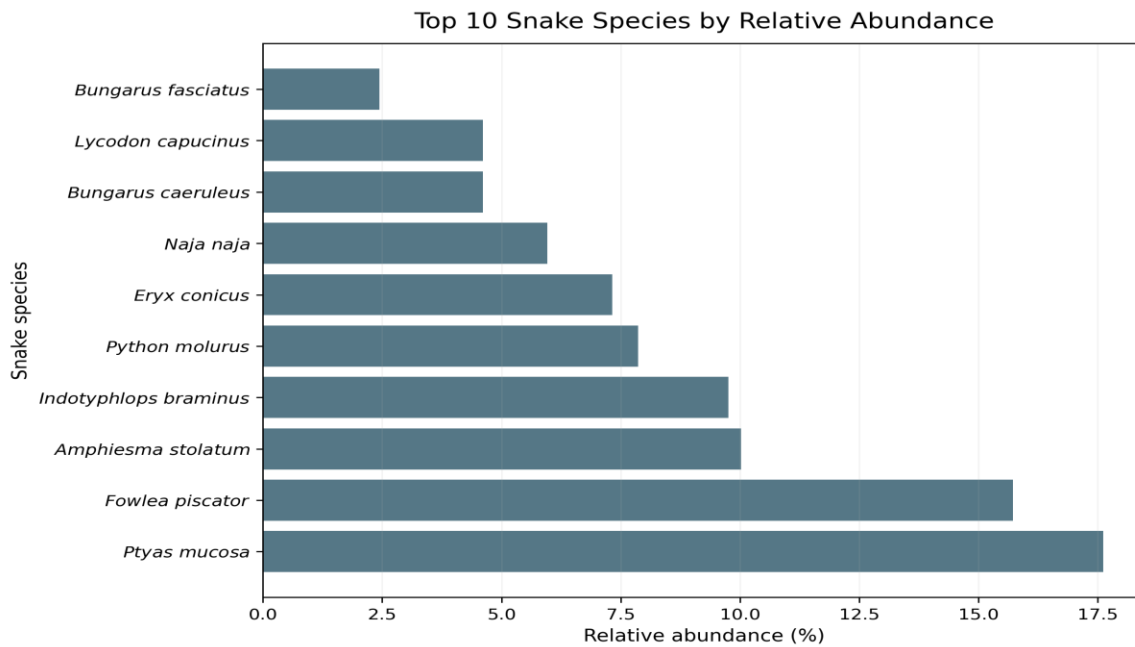


Figure 3. Relative representation of the ten most frequently recorded species.

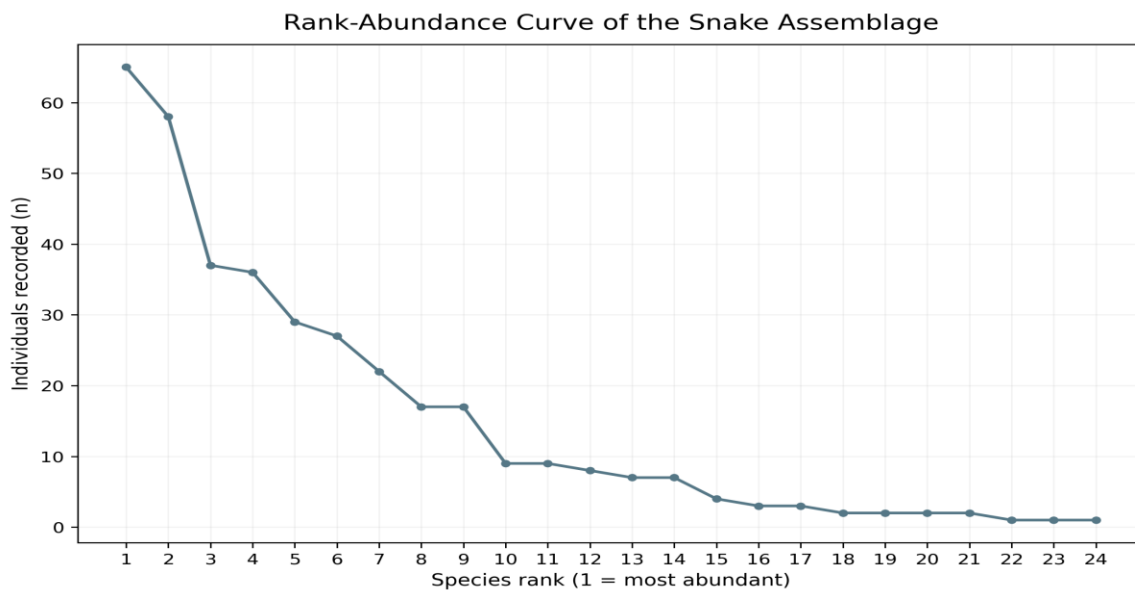


Figure 4. Rank-abundance curve based on pooled species-record frequencies.

4.2 Diversity and Evenness

The pooled dataset yielded a Shannon–Wiener diversity index of $H' = 2.6004$, Simpson dominance of $D = 0.0974$, Simpson diversity of $1 - D = 0.9026$, and Pielou's evenness of $J' = 0.8182$. These values describe the distribution of the recorded individuals among the 24 species. Because sampling effort and detection probability were not standardized among methods and sites, the indices should be interpreted as descriptors of the cumulative record set rather than direct estimates of community-wide population structure.

Table 3. Diversity, dominance and evenness indices calculated from the pooled record dataset.

Index	Formula	Value
Shannon–Wiener diversity (H')	$-\sum(p_i \ln p_i)$	2.6004
Species richness (S)	Number of recorded species	24
Maximum Shannon diversity	$\ln(S)$	3.1781
Pielou's evenness (J')	$H'/\ln(S)$	0.8182
Simpson dominance (D)	$\sum p_i^2$	0.0974
Simpson diversity ($1 - D$)	$1 - D$	0.9026

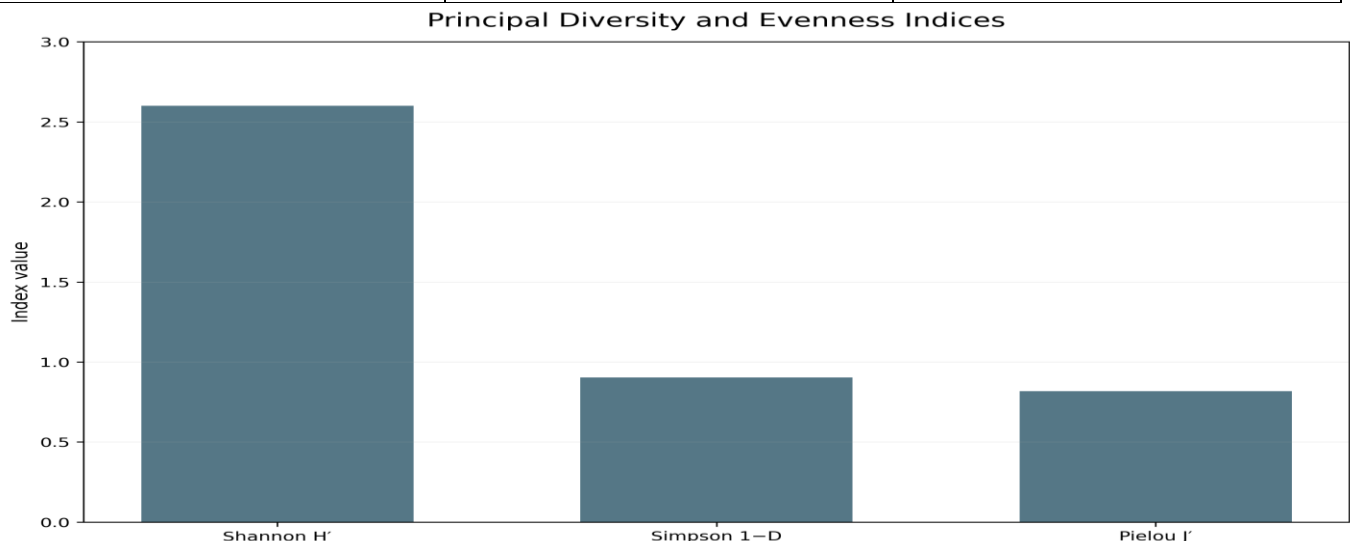


Figure 5. Diversity and evenness indices calculated from the pooled record dataset.

4.3 Venom-status composition

Six venomous species accounted for 60 recorded individuals (16.26%), two semily venomous species accounted for 7 (1.90%), and 16 non-venomous species accounted for 302 (81.84%). Together, venomous and semily venomous species represented 67 recorded individuals (18.16%).

Table 4. Composition of recorded individuals by venom status.

Category	No. of species	Recorded individuals (n)	Relative representation (%)
Venomous	6	60	16.26
Semily venomous	2	7	1.90
Non-venomous	16	302	81.84
Total	24	369	100.00

Figure 6. Proportion of recorded individuals by venom-status category.

4.4 Conservation-status composition

Based on the conservation categories listed in Table 1, 21 recorded species and 312 individuals (84.55%) were categorized as Least Concern (LC), while three species and 57 individuals (15.45%) were categorized as Near Threatened (NT). These percentages describe the conservation categories represented in the recorded dataset and should not be interpreted as local population-risk estimates.

Table 5. Composition of recorded individuals by conservation-status category.

IUCN category	No. of species	Recorded individuals (n)	Relative representation (%)
Least Concern (LC)	21	312	84.55
Near Threatened (NT)	3	57	15.45
Total	24	369	100.00

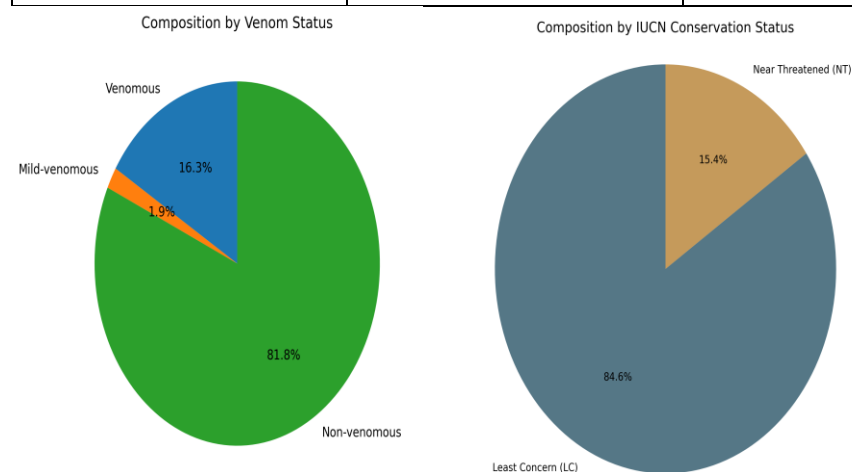


Figure 7. Proportion of recorded individuals by Conservation and Venom-status category.

4.5 Descriptive statistics and equal-count test

Across the 24 species, the mean number of recorded individuals was 15.375 and the median was 7.5. The minimum and maximum counts were 1 and 65, respectively. The sample standard deviation was 18.165, the variance was 329.984, the coefficient of variation was 118.15%, and sample skewness was 1.560. Three species were singletons and four were doubletons. An exploratory chi-square goodness-of-fit test gave $\chi^2 = 493.634$ with 23 degrees of freedom ($p < 0.001$), indicating that the pooled record counts departed strongly from an equal-count distribution. This result simply describes inequality in the pooled records; it does not establish ecological causes of the differences.

Table 6. Descriptive statistics of pooled species-record counts.

Measure	Basis	Value
Total recorded individuals	Σn_i	369
Species richness	S	24
Mean records per species	N/S	15.375
Median records per species	Median(n_i)	7.5
Minimum records	min(n_i)	1
Maximum records	max(n_i)	65
Standard deviation	Sample SD	18.165
Variance	SD ²	329.984
Coefficient of variation	SD/mean $\times$ 100	118.15%
Sample skewness	Sample skewness	1.560
Excess kurtosis	Sample excess kurtosis	1.831
Singleton species	$n_i = 1$	3
Doubleton species	$n_i = 2$	4

5. Discussion

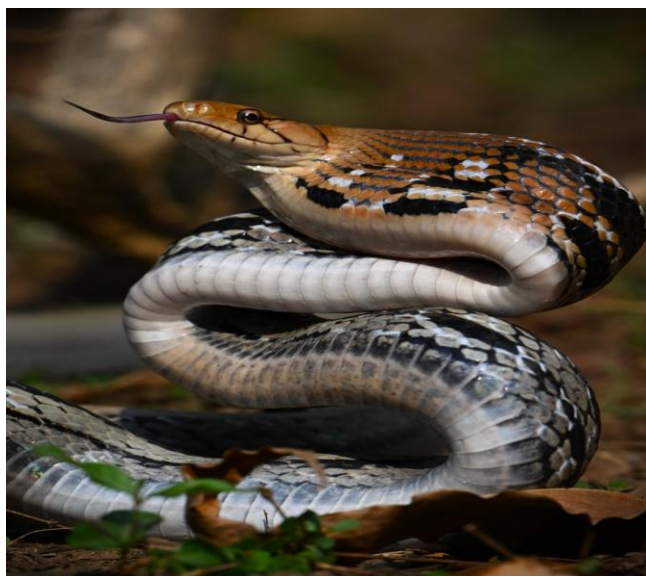
The study recorded 24 snakes from East Singhbhum and Saraikela-Kharsawan during the study period. The pooled dataset was numerically dominated by a small number of species, particularly *Ptyas mucosa*, *Fowlea piscator* and *Amphiesma stolatum*. Such differences may reflect genuine differences in local occurrence, habitat use, detectability, encounter probability or the contribution of rescue and road records. Because the study did not use comparable effort across sites and methods, the present counts cannot be used to rank species by true population abundance or to compare habitats statistically. The observed diversity indices indicate that the 369 records were distributed among 24 species rather than being concentrated in a single taxon. The relatively high evenness value is consistent with the presence of several moderately frequent species alongside a smaller number of rare species. However, diversity indices calculated from pooled records can be influenced by unequal sampling effort and differences in detectability. They should therefore be used here as descriptive summaries of the dataset. The inclusion of rescue, opportunistic and road records increased the geographic and ecological breadth of the inventory and is useful for documenting species presence in human-use areas. At the same time, these records are generated by different processes. Rescue records may be biased toward species that enter houses or other human-use areas, whereas road records depend on road accessibility and traffic. Nocturnal surveys may increase detection of nocturnally active species. Consequently, the combined dataset should be viewed as a cumulative occurrence

inventory rather than a standardized community census. The conservation-status composition shows that most recorded individuals belonged to species classified as Least Concern, while three recorded species were listed as Near Threatened in the study classification. These categories describe global conservation assessments and should not be interpreted as evidence that local populations are secure or threatened without region-specific demographic information. Future work should therefore combine standardized repeated sampling with habitat-specific effort, seasonal replication and, where appropriate, occupancy or abundance models. The study provides a useful baseline list for future monitoring, but the present design has important limitations. Sampling effort was not expressed in standardized units such as transect length, search hours, number of observers or site-visits. The dataset also combines live encounters, rescue records, road observations and supplementary reports. These limitations prevent reliable inference about detection probability, population density, habitat preference, seasonal trends or temporal changes. Future surveys should retain the species-level baseline while recording effort and sampling units separately for each method and habitat.

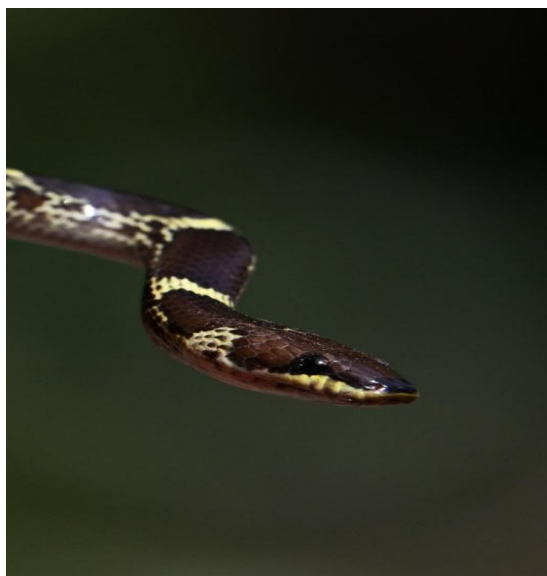
6. Conclusion

The cumulative survey documented twenty-four snake species and three hundred sixty-nine recorded individuals from East Singhbhum and Saraikela-Kharsawan. The pooled record set was characterized by *Ptyas mucosa*, *Fowlea piscator* and *Amphiesma stolatum*, as the frequently recorded species. Shannon diversity ($H' = 2.6004$) Simpson diversity ($1-D = 0.9026$) and Pielou's evenness ($J' = 0.8182$) give summaries of the recorded assemblage. The main value of the study is the creation of a documented species baseline for the study districts. Standardized, habitat- and season-specific surveys are recommended for assessment of snake diversity, occupancy and population trends.

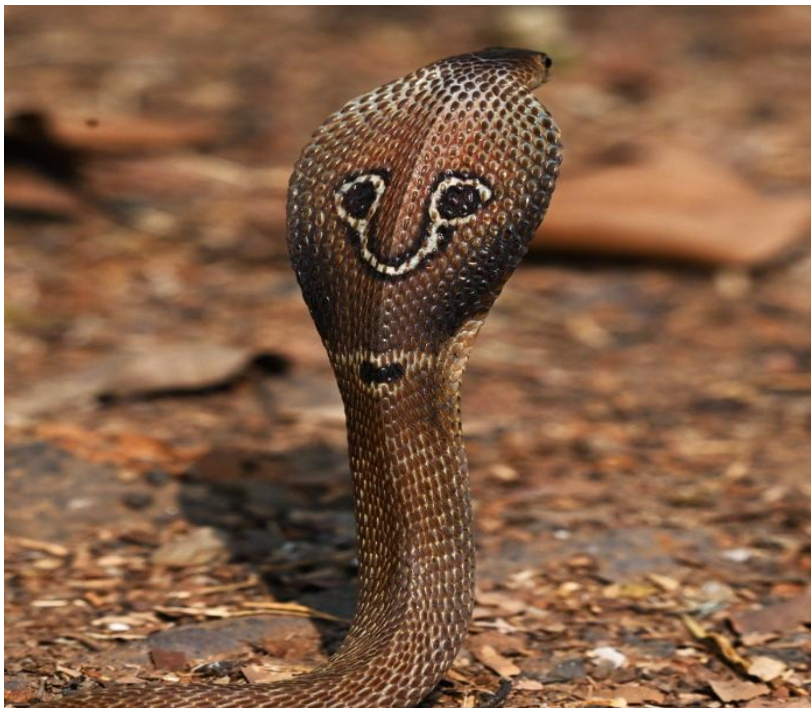
7. Representative Photographs



1. Copper-headed Trinket Snake



2. Common Wolf Snake



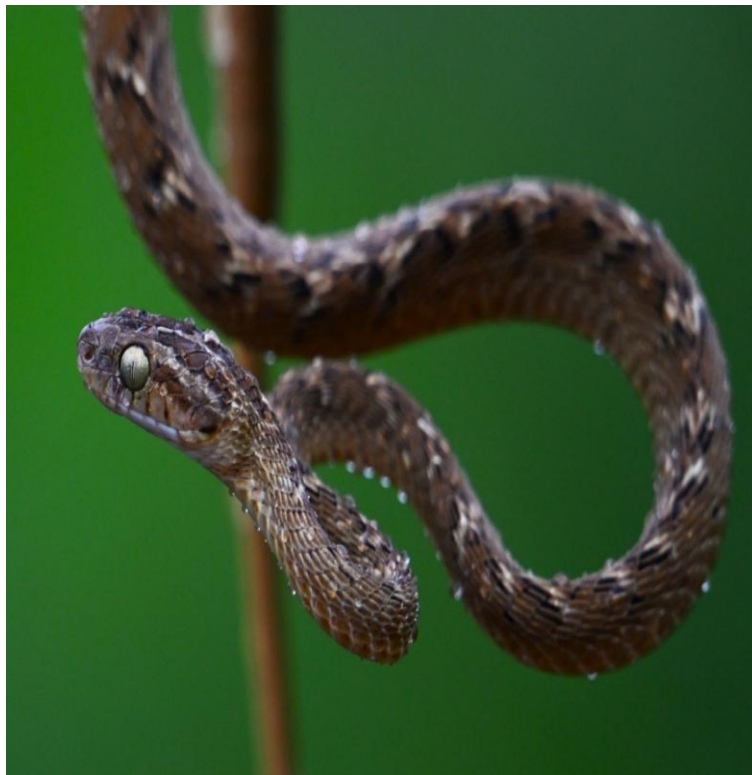
3. Spectacled Cobra



4. Russell's Viper



5. Monocled Cobra



6. Cat Snake



7. Common Krait



8. Banded Krait



9. Indian Rat Snake



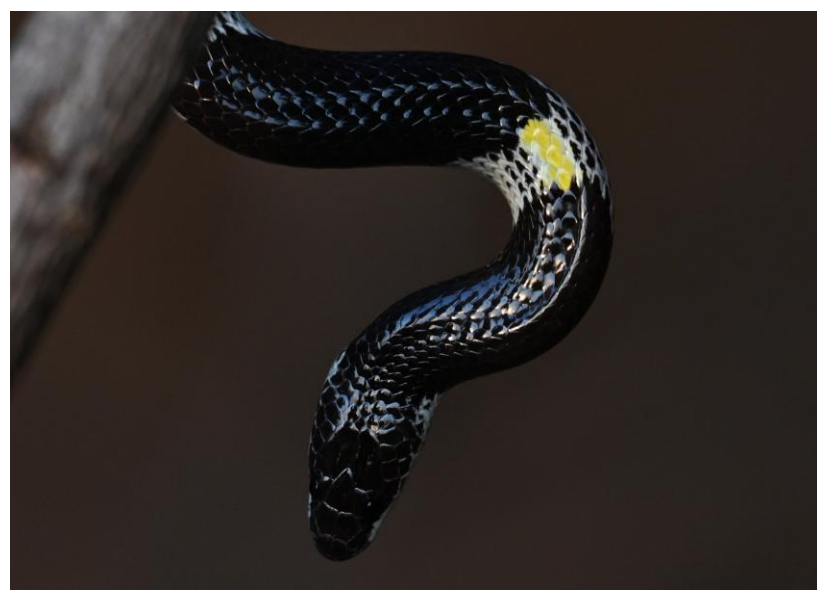
10. Oriental Rat Snake



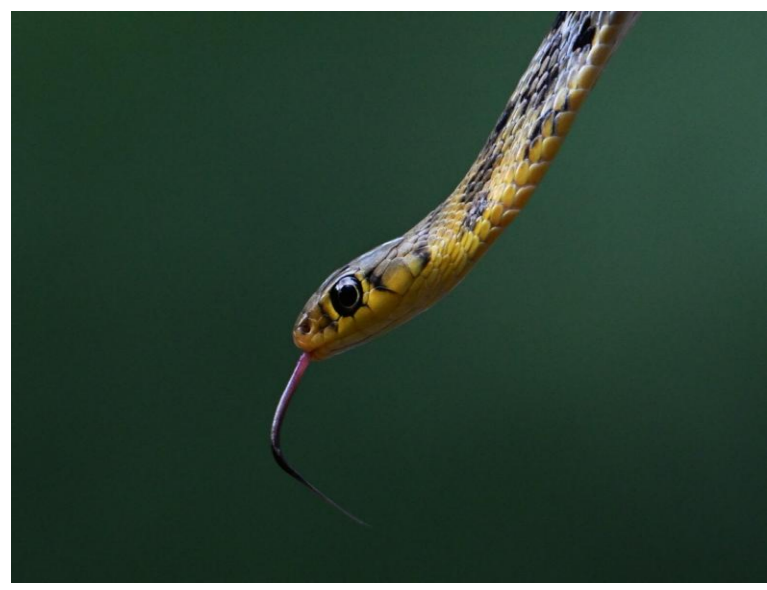
11. Common Bronze-back Tree Snake



12. Indian Rock Python



13.Barred Wolf Snake



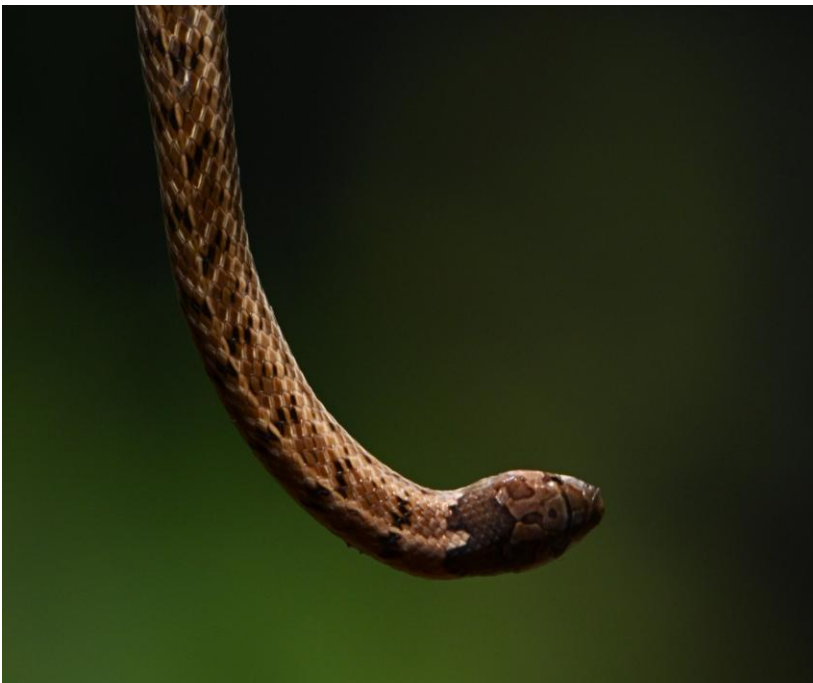
14. Buff-striped Keelback



15. Bamboo Pit Viper



16. Banded Kukri Snake



17. Russell's Kukri



18. Common Sand Boa



19. Red Sand Boa



20. Green Keelback Snake

Figure 8. Photographs of Snake species recorded during the study.



8. Ethical Considerations

Snake rescue and documentation activities were conducted with the intention of minimizing disturbance to animals and their habitats. Snakes encountered in human-use areas were rescued by registered trained/local rescuer and released into suitable natural habitats near the rescue locations where feasible. No snakes were intentionally killed, injured or collected for the purpose of this study. The rescuers and their team were also advised to handle the snake carefully. Photographic records and field observations were obtained without unnecessary handling or prolonged disturbance from a high resolution and zoom lens without going near the animal unnecessary. No specimens, body parts or biological samples were collected or retained. Work within forest or protected areas was undertaken with the cooperation of forest officials and local authorities where required. The study involved no experimental manipulation or intentional capture solely for research purposes. The authors should verify and report any specific permit numbers or institutional approvals, if applicable, before submission.

9. Acknowledgements

The authors sincerely acknowledge *Mrs. Soma Sarkar* and *Mrs. Gouri Guria* for their support and assistance during the study. We thank the forest officials for facilitating field observations and access to relevant information, and the local communities and villagers who assisted with field observations and documentation of snake records. We also thank *Mr. Akash Jaiswal* and *Ms. Reeta Sandil* for their assistance and contribution.

10. Conflict of Interest

The authors declare that they have no conflict of interest.

Funding- The study was self-funded.

12. References

1. Uetz, P., Freed, P., Aguilar, R., Reyes, F., Kudera, J., & Hosek, J. (2024). The Reptile Database. Available at: <http://www.reptile-database.org>.
2. Wallach, V., Williams, K. L., & Boundy, J. (2014). Snakes of the World: A Catalogue of Living and Extinct Species. CRC Press, Boca Raton.
3. Whitaker, R., & Captain, A. (2008). Snakes of India: The Field Guide. 2nd ed. Draco Books, Chennai.
4. Fitch, H. S. (1949). Study of snake populations in central California. *American Midland Naturalist*, 41, 513–579.
5. Gibbons, J. W. (1988). The management of reptiles, amphibians and small mammals in North America: the need for an environmental attitude adjustment. U.S. Department of Agriculture, Forest Service, GTR-RM-166.
6. Uetz, P. (2000). How many reptile species? *Herpetological Review*, 31, 13–15.
7. Pincheira-Donoso, D., Bauer, A. M., Meiri, S., & Uetz, P. (2013). Global taxonomic diversity of living reptiles. *PLOS ONE*, 8(3), e5974. <https://doi.org/10.1371/journal.pone.0059741>.
8. Aengals, R., Kumar, V. S., & Palot, M. J. (2011). Updated checklist of Indian reptiles. *Occasional Papers of the Zoological Survey of India*, 24.



9. Mohapatra, P. P., Ray, S., Sarkar, S., Deuti, K., Palot, M. J., Sethy, P. G. S., & Bahuguna, A. (2024). Checklist of Fauna of India: Chordata: Reptilia. Zoological Survey of India. <https://doi.org/10.26515/Fauna/1/2023/Chordata>.
10. Raj, R., Singh, M., Shahbaz, M., Zafar, M. M., Abhishek, Mall, A. K., & Yasmin, S. (2025). Species richness and conservation status of herpetofauna and mammals in Bhimbandh Wildlife Sanctuary, Bihar, India. Asian Journal of Environment & Ecology, 24(7), 198–213. <https://doi.org/10.9734/ajee/2025/v24i7762>.
11. IUCN (2026). The IUCN Red List of Threatened Species. Version 2026-1. International Union for Conservation of Nature. <https://www.iucnredlist.org>.
12. Manab Jyoti Kalita, Narayan Sharma, Ananda Ram Boro, 2024. An updated checklist of snakes (Reptilia: Squamata) in northeastern India derived from a review of recent literature. DOI: <https://doi.org/10.11609/jott.8741.16.11.26131-26149>.