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SNAKE DIVERSITY IN GOLDEN TRIANGLE OF THAR DESERT OF RAJASTHAN, INDIA

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AUTHORS' CONTRIBUTIONS

This work was carried out in collaboration between both authors. Author RK performed the filed study and wrote the first draft of the manuscript, and Author AP managed the analyses and supervised the study. Both authors read and approved the final manuscript.

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ABSTRACT

The pattern of ecological assemblage in the arid and semi-arid region of the Thar Desert in Rajasthan altering at a high pace after the Indira Gandhi Nahar Pariyojna canal expansion for three decades. About this, this study revises the most favoured, secretive, and environment-sensitive underprivileged taxa (serpents) in the framework of diversity and occurrence in the golden triangle of the Thar Desert of Rajasthan state (Jodhpur, Jaisalmer, and Bikaner). Overall, 22 species and one subspecies were identified in four years of extensive field study based on the active search, night drives, scale counting, and topographical database. This study's finding pointed out the apparent abolition of previously most common snake such as Russell's viper and Indian rock python, Contrast to this, potential colonies of lesser-known Sindh Awl-headed snake, Afro-Asian sand snake, and Red-spotted royal snake has exposed.

Keywords: Occurrence; Snake diversity; Thar desert.

1. INTRODUCTION

Diversity studies in ecology provide better potential for eco-sensitive species like snakes. However, snakes have a significant concern about a global decline in some current research [1, 2]. The snake extinction risk calculation misjudged, other than long-period studies on snake's diversity, richness, density, and demography, involves comprehending this risk [3]. Thus, essential data on life history aspects for understanding the species ecology and comprehensive distribution data for biogeographic studies and conservation assessments are still missing for a considerable proportion of important diverse areas such as the Thar Desert of Rajasthan. Concise, disruptive, and scanty records are available about the occurrence, distribution pattern, and population abundance of snakes from the Thar Desert [4 –9]. Studies suggest district-wise distributions of snakes in this part were not uniformly distributed.

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Further, [10] and [11] provided comprehensive information.

During the last three decades, this semi-arid and arid terrain has undergone complete eco-transformation. An increase in biotic pressure has interacted with the fragile environment to create terrifying environmental problems. The present study records a new data set from the desert's altering ecosystem after expanding the Indira Gandhi Nahar Pariyojna (IGNP) canal. As, such our knowledge of the diversity and distribution of the snake in the Thar Desert of Rajasthan is somewhat scanty, and the snake inhabiting this region had no clear picture. Therefore, it decided to study diversity and distribution by the snakes in the Thar Desert of Rajasthan.

2. MATERIALS AND METHODS

Fieldwork was concentrated in three districts in stabilised dunes, barren dunes, agricultural fields, grasslands, rocky terrain, canal territory and urban areas of the golden triangle, including Jodhpur, Jaisalmer, and Bikaner districts. Extensive search, night drives, repeated seasonal surveys, visual encounters, including rescue operations, were the prime methodology applied in surveys. The surveys plotted over the entire year from September 2015 to August 2019. From March to September are characterized by vigorous accessibility of any snake species. Golden triangle (Bikaner, Jodhpur, and Jaisalmer district) located within the north-eastern porch in Rajasthan state of Indian administrative boundaries (Fig. 1).

Snakes were examined and diagnosed to study their morphology and ecology dataset and released after that in suitable nearby habitat [12]. No specimen collected for preservation purposes. Measurements and other characters compared with available literature and diagnosis keys [6, 11, 13]. The observed fauna categorized as Common(C) and Uncommon (UN), and Rare (R) based on encounter. The Snakes were photographed, examined, and released at the previously desert habitat to around.

3. OBSERVATION AND RESULTS

There are 22 snake species and one subspecies observed of seven families in the entire study period. Two species Brahmin Worm Snake *Indothyphlops braminus* and Beaked Worm Snake *Grypotyphlops acutus* represents Typhlopidae family; Two species Red Sand Boa *Eryx johnii* and Common Sand Boa *Gongylophis conicus* represent Erycidae family; 11 snake species i.e. Common Trinket Snake *Coelognathus helene helena*, Indian Rat Snake *Ptyas mucosa*, Glossy-Bellied Racer *Platyceps ventromaculatus*, Black-Headed Royal Snake *Spalerosophis atriceps*, Red-Spotted Royal Snake *Spalerosophis arenarius*, Sindh Awl-headed Snake *Lytorhynchus paradoxus*, Indian Streaked Kukri snake *Oligodon taeniolatus*, Common Kukri Snake *Oligodon arnensis*, Common Wolf Snake *Lycodon aulicus*, Barred Wolf Snake *Lycodon striatus*, and Common Cat Snake *Boiga trigonata* represents Colubridae family; one species Checkered Keelback *Fowlea piscator* belongs to Natricidae family; two species Afro-Asian Sand Snake *Psammohis schokari* and Leith's Sand Snake *Psammophis leithii* represents family Lamprophiidae; three species i.e. Common Indian Krait *Bungarus caeruleus*, Sindh Krait *Bungarus sindanus sindanus* and Spectacled Cobra *Naja naja* represents by family Elapidae whereas one species Indian Saw Scaled Viper *Echis carinatus carinatus* and one subspecies Sochurek's Saw Scaled Viper *Echis carinatus sochureki* represents Viperidae family (Table 1).

Comparing the species diversity, most of the species are common in three districts. However, Bikaner represents four species more than to the Jaisalmer, i.e., *G. acutus, C. helena helena, P. mucosa*, and *O. arnensis*, whereas three species more to Jodhpur district, i.e., *C. helena helena, O. arnensis*, and *B. sindhanus*. In contrast to this, Jaisalmer has *E. carinatus sochureki* only occurrences in the district, whereas *P. leithii* snakes only occurred in the Jodhpur district (Fig. 2).

Overall, results obtained in the entire study area among 626 snakes individuals. Maximum 276 recorded from the Bikaner district of 21 species and then 213 from Jodhpur of 18 species and a minimum 176 recorded from Jaisalmer of 17 species. Shannon Wiener index analyzed and resulted in maximum diversity in the Bikaner district (H 2.588), then Jodhpur (H = 2.525), and least in Jaisalmer district (H = 2.305).

4. DISCUSSION

Species based occurrence revealed new information on their previously known area of occurrence in many species. In western Rajasthan, 16 snake species were reported in a thorough study of [14]. A recent study in two urban desert areas (Jodhpur and Jaisalmer) accounted for 14 species of snakes [15]. Whereas, this

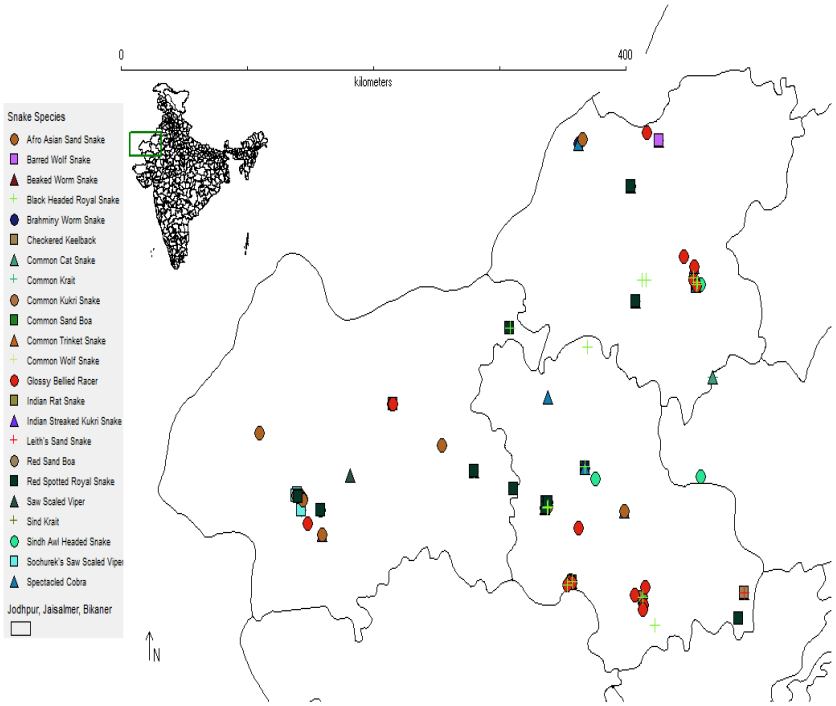

Fig. 1. Representative Map of snakes species recorded from Jodhpur, Jaisalmer and Bikaner district (Jodhpur 26.2800°N, 73.0200°E, Jaisalmer 26.9200°N, 70.9000°E, and Bikaner 28.0167°N, 73.3119°E districts of Thar Desert of Rajasthan

Table 1. A total of 22 snake species and one subspecies were observed in the study period from the golden triangle

S. No.	Common Name	Scientific Name	Vernacular	Nature	IUCN status
Typhlopidae (Merren, 1820)					
1.	Brahminy Worm snake	*Indotyphlops braminus* (Daudin, 1803)	Andha Saanp	NV	NA
2.	Beaked worm Snake	*Grypotyphlops acutus* (Duméril & Bibron, 1844)	-	NV	LC
	Erycidae (Grey, 1825)				
3.	Common Sand Boa	*Eryx conicus* (Reynolds & Henderson, 2018)	Domuhi	NV	NA
4	Red Sand Boa	*Eryx Johnii* (Russell, 1801)	Domuhi, Bogi, Peeld	NV	NA
Colubridae (Oppel, 1811) Subfamily- Colubrinae					
5.	Common Trinket Snake	*Coelognathus helena* (Daudin, 1803)	-	NV	NA
6.	Indian Rat Snake	*Ptyas mucosa* (Linnaeus, 1758)	Dhaman	NV	NA
7.	Glossy-Bellied Racer	*Platyceps ventromaculatus* (Gray, 1834)	Sagi, Ghorawa	MV	NA
8.	Black-Headed Royal Snake	*Spalerosophis atriceps* (Fischer, 1885)	Rajatbansi	NV	NA
9.	Red-Spotted Royal Snake	*Spalerosophis arenarius* (Boulenger, 1890)	Dungi, Laal phoonki	NV	NA

S. No.	Common Name	Scientific Name	Vernacular	Nature	IUCN status
10.	Sindh Awl-headed Snake	*Lytorhynchus paradoxus* (Gunther, 1875)	-	MV	NA
11.	Indian Streaked Kukri snake	*Oligodon taeniolatus* (Jerdon, 1853)	-	NV	LC
12.	Common Kukri Snake	*Oligodon arnensis* (Shaw, 1802)	-	NV	NA
13.	Common Wolf Snake	*Lycodon aulicus* (Linnaeus, 1754)	-	NV	NA
14.	Barred Wolf Snake	*Lycodon striatus* (Shaw, 1802)	-	NV	NA
15.	Common Cat Snake	*Boiga trigonata* (Schneider, 1802)	-	MV	LC
Natricidae					
16.	Checkered Keelback	*Fowlea piscator* (Schneider, 1799)	Pani ka Saanp	NV	NA
Lamprophiidae (Fitzinger, 1843)					
Pammophiinae					
17.	Afro-Asian Sand Snake	*Psammophis schokari* (Forskal, 1775)	Shigg, Tauntt	MV	NA
18.	Leith's Sand Snake	*Psammophis leithii* (Gunther, 1869)	Shigg	MV	NA
Elapidae (Boie, 1827)					
19.	Common Indian Krait	*Bungarus caeruleus* (Schneider, 1801)	Peevna	V	NA
20.	Sindh Krait	*Bungarus sindanus* (Boulenger, 1897)	Peevna, Kojki	V	NA
21.	Spectacled Cobra	*Naja naja* (Linnaeus, 1758)	Naag, Kalindhar	V	NA
Viperidae (Oppel, 1811)					
22	Indian Saw Scaled Viper	*Echis carinatus* (Schneider, 1801)	Pad, Bandi	V	NA
22a	Sochurek's Saw Scaled Viper	*Echis carinatus sochureki* (Stemmler, 1969)	Pad, Bandi	V	NA

Abbreviations used as V-venomous, NV – Non-Venomous, MV- Mild Venomous, NA – Not Accesses, LC – Least concern

study reports 22 species and one subspecies from the Jodhpur, Jaisalmer, and Bikaner district of Thar Desert of Rajasthan. Few species persistently dispersed throughout the three districts, such as *I. brahminus, E. Johnii, E. conicus P. venromaculatus, B. trigonata, N. naja, B. caeruleus, P. schokari, S. arenarius, L. paradoxus, L. aulicus*, and *E. carinata carinata*. Several other species are three to four localities, such as *G. acutus, O. teaneolatus, F. piscator*, and *B. sindanus*. Nevertheless, some species are scarce and occurred only in one or two localities, i.e., *C. helena helena, P. mucosa, O. arnensis, P. leithii*, and *E. carinata sochureki* in the entire study period.

Finding of this study pointed out the straightforward abolition of previously most common snake reported by [4, 8, 11] such as *Duboia ruselli, Python molurus, Spalerosophis diedema diedema*, and *Myriopholis blanfordi* and vary rare sighting of *Ptyas mucosa, Coelognathus helena helena, Psammpohis leithii, Oligodon arnensis, Lycodon striatus, Bugarus sindhanus*, and *Echis carinatus sochureki* recorded from the study.

IGNP is witnessing extraordinary expansion, growth, and developmental activities such as buildings, road construction, deforestation, unscientific agriculture practices, unsuitable crop, water-intensive crops, excess uses of chemical fertilizers, and pesticides. Simultaneously, deteriorated situations in the canal area also emerged due to natural causes of land degradation, the encroachment of dunes, a prosper imbalance in lithological factors, and increased forest areas [16]. Recently some negative issues such as waterlogging and salinity have started to emerge near the canal area. These changes directly or indirectly led to the thickening of the soil surface, moisture, and lower temperature that impact the poikilothermic animal such as snakes, lizards, and frogs [17].

Fig. 2. Represented images of various snake species recorded during the study: 1. *G. conicus*, 2. *P. mucosa*, 3. *P. ventromaculatus*, 4. *S. arenarius*, 5. *L. paradoxus*, 6. *O. taeneolatus*, 7. *L. striatus*, 8. *F. piscator*, 9. *P. schokari*, 10. *B. ceruleus*, 11. *N. naja*, 12. *E. c. carinatus*, 13. *E. johnii*, 14. *O. arnensis*, and 15. *L. aulicus*

5. CONCLUSION

Conclusively, it is apparent from this research that the human population explosion had claimed several kinds of a new creation, habitat encroachment, disorganized agricultural practices, and urbanization changed the topography of the region. Corresponding to this, various kinds of eco-transformation have occurred due to expanding the Indira Gandhi Nahar Pariyojana canal in the Thar region [18]. These changes have adversely affected Snakes' diversity, distribution, and habitat preference in Jodhpur, Jaisalmer, and Bikaner district. Significantly conclusion can be made as:

Overall, it reflects that the snake diversity in this region needs further surveys to collate information about the present-day population, diversity, and threats to the species and their habitat preferences.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Reading CJ, Luiselli L, Akani GC, Bonnet X, Amori G, Ballouard JM, Filippi E, Naulleau G, Pearson D, Rugiero L. Are snake populations in widespread decline? Biology Letters. 2010;6:777-780.
2. Goiran C. Shine R. Decline in sea snake abundance on a protected coral reef system in the New Caledonian Lagoon. Coral Reefs. 2013;32:281-284.
3. Cayuela H, Akani GC, Hema EM, Eniang EA, Amadi N, Ajong SN, Dendi D, Petrozzi F, Luiselli L. Life history and age-dependent mortality processes in tropical reptiles. Biological Journal of the Linnean Society. 2019;128:251–262.
4. Sharma RC. Herpetofauna of the Thar Desert. In Faunal Diversity in the Thar Desert: Gaps in Research, (Eds. Gosh AK, Baqri H & Prakash I). Scientific Publishers, Jodhpur. 1996;297-306.
5. Sharma RC. Fauna of India and adjacent countries. Vol II. Reptilia (Sauria). Kolkata (Zoological Survey of India). 2002; 430 S.
6. Sharma RC. The fauna of India and the adjacent countries. Reptilia (Serpents) -111 Published by the Director, Zoological Survey of India, Kolkata. 2007;410.
7. Sharma G. A review on the Studies on Faunal diversity, status, Threats, and Conservation of the Thar Desert or Great Indian Desert Ecosystem. Biological Forum – An International Journal. 2013;5(2):81-90.
8. Das I. Checklist of the reptiles of India with English common names. Hamadryad, Mamallapuran. 1997;22(1):32–45.
9. Daniel JC. The Book of Indian reptiles and amphibians. Bombay Natural History Society & Oxford University Press. 2002;8:238.
10. Sharma RC. Handbook – Indian snakes. Zoological Survey of India, Kolkata. 2003;i-xx + 1-292:1-69.
11. Whitaker R, Captain A. Snakes of India. The field guide, Draco Books, Chennai. 2004;481.
12. Dowling HG. A proposed standard system of counting ventral's of snakes. Br. J. Herpetol. 1991;11:97–99.
13. Smith MA. The fauna of British India, Ceylon and Burma, including the whole of the Indo-Chinese sub-region. Reptilia and Amphibia. Vol. III– Serpents. Taylor and Francis, London. 1943;12:583 + 1 map.
14. Sinha B, Sharma RC. Records of *Eryx Johnii* (Russell, 1801) (Ophidia: Boidae) and *Echis Carinatus* (Schneider, 1801) (Ophidia: Viperidae) from the Thar desert, Rajasthan, India, with distributional notes on other snake. J. Bombay Nat. Hist. Soc. 2008;105(3):342-343.
15. Husain A, Purohit S. Rescue and rehabilitation of Urban Snakes in Western Rajasthan with their Account. International Journal of Theoretical & Applied Sciences. 2019;11(2):17-28.
16. Hussain A, Tayyab M, Asif. Indira Gandhi canal project environment and changing scenario of western Rajasthan: A case Study. 2018;(3)4:15-19.
17. Hussain A. Indira Gandhi canal project and their adverse impact on the environment of western Rajasthan. International Journal of Humanities and Social Science Research. 2019;5(1):61-64.
18. Sukhwal BL. The Indira Gandhi canal project and its impact on the Thar Desert Region of India' Asian Geographer. 1988;6(1):29-42.