

BURROW SIZE AND STRUCTURE OF THE SPINY-TAILED LIZARD (*Saara hardwickii*) IN THE BIKANER REGION: IMPLICATIONS FOR DESERT ADAPTATION

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Abstract

The Thar Desert extends across India and Pakistan in the Indian subcontinent. As far as the area of the Thar is concerned, 85% of it is located in India and 15% of area is in Pakistan. More than 70% of the Thar Desert in India is in the state of Rajasthan. Apart from this, it extends to Gujarat, Punjab and Haryana. In Pakistan it extends to Sindh and Punjab. Approximate 70% of Desert area is formed of the sandy soil and the sandy soil forms large sand dunes and these sand dunes keep changing their location with high wind velocity. Thar is the 17th largest hot Deserts in the world and 9th in temperature fluctuations and only 18% of its area is conserved for Desert flora and fauna. Thar is the most densely populated and biologically diverse Desert in the world. Thar Desert covers approximately 62% of the total area of Rajasthan. In Rajasthan, major Desert area exists in Jaisalmer, Barmer, Bikaner and Jodhpur districts. The Thar, along with the Rajasthan spreads to Haryana, Punjab and Gujarat states of India. Thar Desert is an extraordinary ecosystem with flora and fauna that are extremely specialized in their ability to withstand the extreme climatic conditions of the Desert. The reptilian fauna is widely distributed in the Thar desert. Out of 156 species of reptiles from India, as many as 65 species have been reported from the Thar. Spiny-tailed lizard is one of the herbivorous lizards in the world and it is found in the protected areas surrounding Bikaner city it is only herbivorous lizard present in the Rajasthan and Indian subcontinent. Spiny-tailed lizard is scheduled animal in WILDLIFE (PROTECTION) ACT, 1972, and is listed in Part-I of Schedule-II. The burrows are safe abode for animals, which serve the purpose of giving shelter to the animal as well as providing safe night roost. The pattern of the spiny tailed lizard's burrow can be different as the sexes differ significantly in body mass and shape. The young ones are very small and dig very tiny burrows. There is one common opening of the burrow for entry as well as exit.

KEY WORDS:- Thar Desert, flora and fauna, Spiny-tailed lizard, burrows.

INTRODUCTION

Desert is the barren area with low rainfall, extreme temperature variations and sparse vegetation. The harsh conditions of the desert make the creatures found here having several physiological and morphological adaptations to survive in the hostile climatic conditions. Worldwide, the deserts are divided into following five types on the basis of their origin and unique characters:

- a. Tropical desert,
- b. Coastal desert,
- c. Rain shadow desert,

- d. Interior desert,
- e. Polar desert.

The Thar Desert extends across India and Pakistan in the Indian subcontinent. As far as the area of the Thar is concerned, 85% of it is located in India and 15% of area is in Pakistan. More than 70% of the Thar Desert in India is in the state of Rajasthan. Apart from this, it extends to Gujarat, Punjab and Haryana. In Pakistan it extends to Sindh and Punjab. Approximate 70% of Desert area is formed of the sandy soil and the sandy soil forms large sand dunes and these sand dunes keep changing their location with high wind velocity. Thar is the 17th largest hot Deserts in the world and 9th in temperature fluctuations and only 18% of its area is conserved for Desert flora and fauna. Thar Desert covers approximately 62% of the total area of Rajasthan. Major Desert area exists in Jaisalmer, Barmer, Bikaner and Jodhpur districts Bikaner district, located in the northwestern Indian state of Rajasthan In Bikaner district, different type of Flora and Fauna are present. The Flora includes herbs, shrubs and desert trees. Sixty types of desert tree species are found here and the fauna of Bikaner district includes several group of desert species like mammals, amphibians, reptiles and aves. A very rich reptilian diversity is found here, specially lizard and snake species. Several types of lizards like Indian monitor, Desert monitor, Garden lizard, Fringe-toed agama, Colorful agama, Sind sand gecko, Sand fish, Spiny-tailed lizard, Wall gecko, Bark gecko, and snake species like Spectacled cobra, Common krait, Saw-scaled viper, Afro-asian sand snake, Red sand boa, Awl headed snake, Black-headed royal snake, Red spotted royal snake, Common cat snake, Glossy-bellied racer, Sind krait and Rat snake are found in conservation areas of Jorbeer and Kolayat. Reptiles are those coldblooded amniotes that lack feathers and hairs. Reptiles are the first vertebrates which are adapted for terrestrial life lizards are terrestrial, burrowing reptiles and are a diverse group of reptiles that inhabit various habitats worldwide despite their small size and simple anatomy. Desert lizards are extraordinarily adapted for the arid region. These Desert lizards, also known as dune lizards or sand reptiles, are a remarkable group of organisms that have adapted to the harsh and extreme conditions of arid environments. Spiny-tailed lizard is one of the herbivorous lizards in the world and it is found in the protected areas surrounding Bikaner city. It belongs to reptile family Agamidae and the Uromasticinae is its subfamily, which comprises of two genera – Saara and Uromastyx. Lizards of genus Saara occur in the desert belt of India, especially in the Thar desert. In the Thar Desert spiny-tailed lizard is also known as Indian spiny-tailed lizard. Spiny-tailed lizard is related to genus Uromastyx and these lizards are restricted to the hot desert of the world. The burrows are safe abode for animals, which serve the purpose of giving shelter to the animal as well as providing safe night roost. The pattern of the spiny tailed lizard's burrow can be different as the sexes differ significantly in body mass and shape. The youngones are very small and dig very tiny burrows. There is one common opening of the burrow for entry as well as exit.

METHEDODOLOGY

The detailed burrow shape, its shape, direction of opening, length and breadth of the opening were recorded using scale and the angle of entrance was recorded using a mobile app “Angle Meter 360”(figure 1).The adjoining areas of the burrow were carefully observed to record the tail trails and pug marks, which is an indication of active burrow. Adjoining areas were also observed to activity of any predator near the burrow. The dimensions of 50 burrows were recorded in the filed diary using scale. The burrow selection was totally random and also includes the burrows of juveniles as well as males and females. No separate measurement for the male and female sexes was taken.



Figure : 1 Noting down the burrow angle using mobile app.

Ten abandoned burrows were excavated using a small hoe and the angle at which it was dug was again recorded by using the mobile app “Angle Meter 360” and length was measured using stainless steel scale. Measurements of ten abandoned burrows was taken to ascertain the burrow structure. Abandoned burrows were selected for excavation so that animals were not disturbed at all.

THE BURROWS OF SPINY-TAILED

The spiny-tailed lizard lives solitarily in the burrow except the breeding season when hatchlings stay in the mother’s burrow for few initial days and until they are able to dig their own burrow. Burrows are homes of the living beings and are very important to animal as they give them protection from predators as well as hostile climatic conditions. If the details of the abodes of a living being are known, they can easily be monitored..(Plate 1,2).



Plate : 1 An active female burrow (notice the small opening size as compared to males)



Plate : 2 An active male burrow (notice the large opening size as compared to females)

The spiny-tailed lizard is a colonial lizard species, which prefers to stay close to vegetation that is food of this animal. The burrows of this lizard species were monitored in the quadrats to estimate population, sex ratio and breeding biology. The dimension of burrow openings was measured and length and breadth of each burrow opening was noted in the field diary. The burrows were selected randomly irrespective of sexes or age of the individuals. The data also includes some burrows of the juveniles as well. Mean length of 50 burrows and mean breadth of 50 burrows was measured using the following formula:

$$\text{Mean Length } (\bar{x}) = \Sigma x / n$$

$$\text{Mean Breadth } (\bar{x}) = \Sigma x / n$$

RESULT AND DISCUSSION

The dimension of fifty burrows that is the length and breadth of the burrow opening was measured in JCR and the results are shown in the following table 1

Table: 12 Dimensions of burrow opening in JCR

S. No.	Dimensions (in cm)	Length of Burrow opening	Breadth of Burrow opening
1	12.0X8.6	12.0	8.6
2	9.3X6.5	9.3	6.5
3	11.5X8.4	11.5	8.4
4	8.6X6.5	8.6	6.5
5	7.8X7.0	7.8	7.0
6	8.2X6.7	8.2	6.7
7	2.9X2.8	2.9	2.8
8	4.7X3.9	4.7	3.9
9	10.0X9.5	10.0	9.5
10	8.2X7.2	8.2	7.2
11	7.8X6.8	7.8	6.8

12	6.8X6.8	6.8	6.8
13	6.9X6.1	6.9	6.1
14	8.5X8.1	8.5	8.1
15	7.9X6.2	7.9	6.2
16	8.9X6.9	8.9	6.9
17	4.6X3.2	4.6	3.2
18	6.8X5.7	6.8	5.7
19	7.9X6.5	7.9	6.5
20	8.6X7.1	8.6	7.1
21	8.1X6.2	8.1	6.2
22	7.0X6.2	7.0	6.2
23	7.9X6.9	7.9	6.9
24	8.9X7.9	8.9	7.9
25	6.4X5.3	6.4	5.3
26	6.9X6.0	6.9	6.0
27	8.6X8.2	8.6	8.2
28	3.9X3.1	3.9	3.1
29	7.6X6.8	7.6	6.8
30	6.5X4.9	6.5	4.9
31	7.2X6.9	7.2	6.9
32	9.1X8.9	9.1	8.9
33	6.4X6.0	6.4	6.0
34	3.4X3.2	3.4	3.2
35	9.9X9.4	9.9	9.4
36	10.1X8.2	10.1	8.2
37	10.4X9.2	10.4	9.2
38	9.4X7.6	9.4	7.6
39	8.6X6.9	8.6	6.9
40	8.9X8.1	8.9	8.1
41	5.4X5.1	5.4	5.1
42	8.4X8.1	8.4	8.1
43	8.8X7.8	8.8	7.8
44	9.9X9.0	9.9	9.0
45	8.7X7.6	8.7	7.6
46	9.2X8.7	9.2	8.7
47	3.8X3.1	3.8	3.1
48	10.2X10.2	10.2	10.2
49	9.8X8.2	9.8	8.2
50	8.6X7.8	8.6	7.8
		$\bar{x} = 7.9$	$\bar{x} = 6.8$

The burrow of the spiny-tailed lizard features a single, well-camouflaged entrance that leads into a network of long, narrow channels and canals. These passageways are often twisted or spiral in shape, which helps regulate internal temperature and humidity while also preventing predators from easily reaching the inner chambers. At the end of these channels, the burrow opens into one or two large chambers—commonly called the resting chamber (used for daily shelter and temperature regulation) or the brood chamber (used by females for nesting and egg-laying). This deep, secure chamber is the lizard's primary refuge. When external temperatures become extreme—either too hot or too cold—or when a predator approaches, the lizard quickly retreats into this chamber. Once inside, its spiny tail can be used to block the passage, further deterring intruders. By remaining in the stable microclimate of the brood chamber, the lizard avoids lethal heat, conserves water, and survives harsh desert conditions.

Mean length of 50 burrows and mean breadth of 50 burrows was measured (Table) using the following formula:

$$\text{Mean Length } (\bar{x}) = \Sigma x / n = 331.3 / 50 = 6.62 \text{ (Length)}$$

$$\text{Mean Breadth } (\bar{x}) = \Sigma x / n = 331.3 / 50 = 6.51 \text{ (Width)}$$

The length of burrows varied from 2.9 to 11.5cm (Mean being 7.9) (Figure2) The breadth of burrows varied from 2.8 to 10.2cm (Mean being 6.8). Smaller measurements were those of the burrows of the young ones. The dimensions of the burrows of the Juvenile were much smaller than the adults. The burrows of males were much broader than the females and were easily recognizable from the structure.

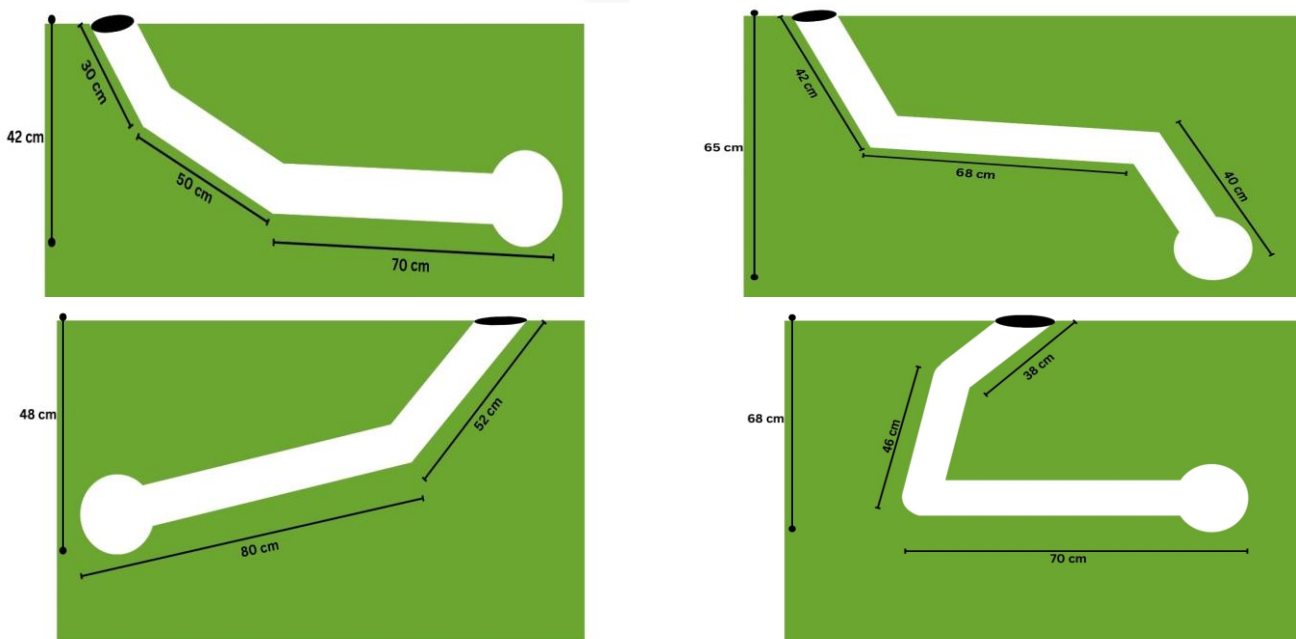


Figure 2: Various burrow patterns of the Spiny-tailed Lizard in th JCR

The mean depth of the burrows was 60.1cm below ground level and it varied from 39 to 82cm . The length of burrows varied from 117 to 159cm and the mean length being 139.5cm. The number of burrows per colony and burrow to burrow distance varied.

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