

Studies On The Resting Behaviour Of Scorpion In Captivity

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Abstract : Scorpions are nocturnal terrestrial arthropods and known as living fossil. Scorpions show combination of physiological adaptations, along with behavior, morphology which regulate their habitat. Scorpions use its body and venom as defense against natural predators. They will aggressive and inject venom if they are molested or threatened. Maximum activity seen in reproductive period of scorpions, young scorpions reach maturity slowly and may require five years to attain their maturity. Scorpion feeds by cannibalism or upon small organisms like rodents, insects, and other small animals. This present study was undertaken for analysis of resting behavior in scorpion in captive condition of some random species of India. During captive condition these natural activity changed, as there was no need to struggle for shelter, food and any threat from predators. This study can help naturalists and researchers for exploring more of this phylum in some extent from different countries of the planet.

Keywords- Scorpion, living fossil, captive condition, activity, India, laboratory testing ground.

I. Introduction

Scorpions are ancient terrestrial Arthropods belonging to subphylum Chelicerata (Goyffon and Tournier, 2014). They are referred as ancestral arthropods for the origin and morphology of body. They are known as 'living fossils' due to apparent conservative nature (Lourenco, 2016).

During the day, they hide beneath rocks, in cracks or burrows or beneath the loose outer layers of the many plants shrubs and trees. They are stationary or solitary in nature (Cala-Riquelme, Colombo, 2011). Scorpions show well adapted behavior to regulate the terrestrial habitat along with physiological and morphology adaptations. All most every species of them are nocturnal and burrowing. (Nazari et al, 2018). The life span may ranges in between 4 to 25 years. They live in 20-35°C temperature ranges, and able to survive at below freezing to desert heat temperatures range (G.B Rathod, 2013). Whole body of scorpions are fluoresce under UV light. Prior molt of Pullus do not produce fluorescence. These fluoresce nature lead to easy collection of these nocturnal animals (Ythier, 2018).

Scorpions have a natural defense against predators that is venom. They will inject venom if they are threatened. The venom will run through the body of the prey and it will decompose and liquefy the insides and allows the scorpion to consume it (G.B Rathod, 2013). Scorpions are shy animals, normally run away and conceal if disturbed but can sting if molested or threatened. Young scorpion reach maturity gradually and require five years to reach their maturity level (Bastawde, 1980).

Scorpions are distinguished into males and females. Spring season is suitable for mating for suitable climatic condition like long days and temperatures rise. The gestation period lasts for three or four months and depends up on the food and temperature. The hatches pullus have some morphological similarity to adults. (Goyffon and Tournier, 2014). During the reproductive period or activity period male scorpion are highly mobile and vagrant and engaged in searching of mates (Santibanez-Lopez et al., 2015).

The aim of this study is to investigate the resting behaviour of the scorpions in captive condition. The objective of this work will help the naturalists, scientists and researchers to know the value of captive behaviour of scorpion to and to take appropriate decision. This study is an attempt for guidance along with reference to their captive behaviour and also can provide basic knowledge.

II. Materials and methods

The specimens were collected from beneath the rocks, under bark, gap of soil, leaf litter. Thirty sample scorpions were captured and kept inside a Laboratory Testing Ground (LTG). The LTG was a plastic tray with natural conditions which were provided to all sample scorpions. There were some soil poured, some stones were fixed with gum on its surface and some grasses were planted on the surface. Water was half filled on the surface of all LTG till half of the stones submerged inside water. A piece of steel net was covered the whole tray of LTG.

The samples were collected phase wise. In August and September a phase of scorpion samples were collected from many different villages of western Odisha, they are included Bijepur, Sarandapali, M.Srigida and Sohela. 23 sample scorpions were captured in the first phase of collection.

In October and November, the second phase of scorpion sample collection was done from Khandagiri, Bhubaneswar, Odisha, India and 7 scorpions were collected in this phase.

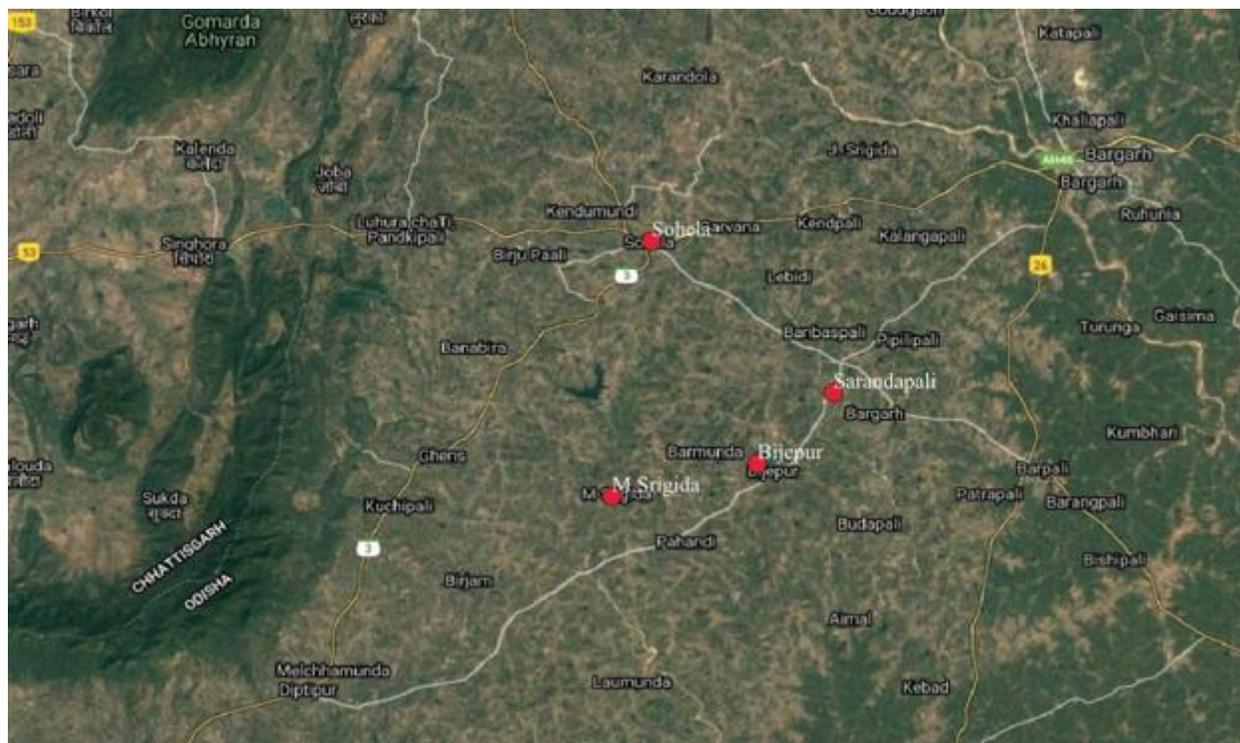


Figure 1 – Showing the area of sample collection during phase 1

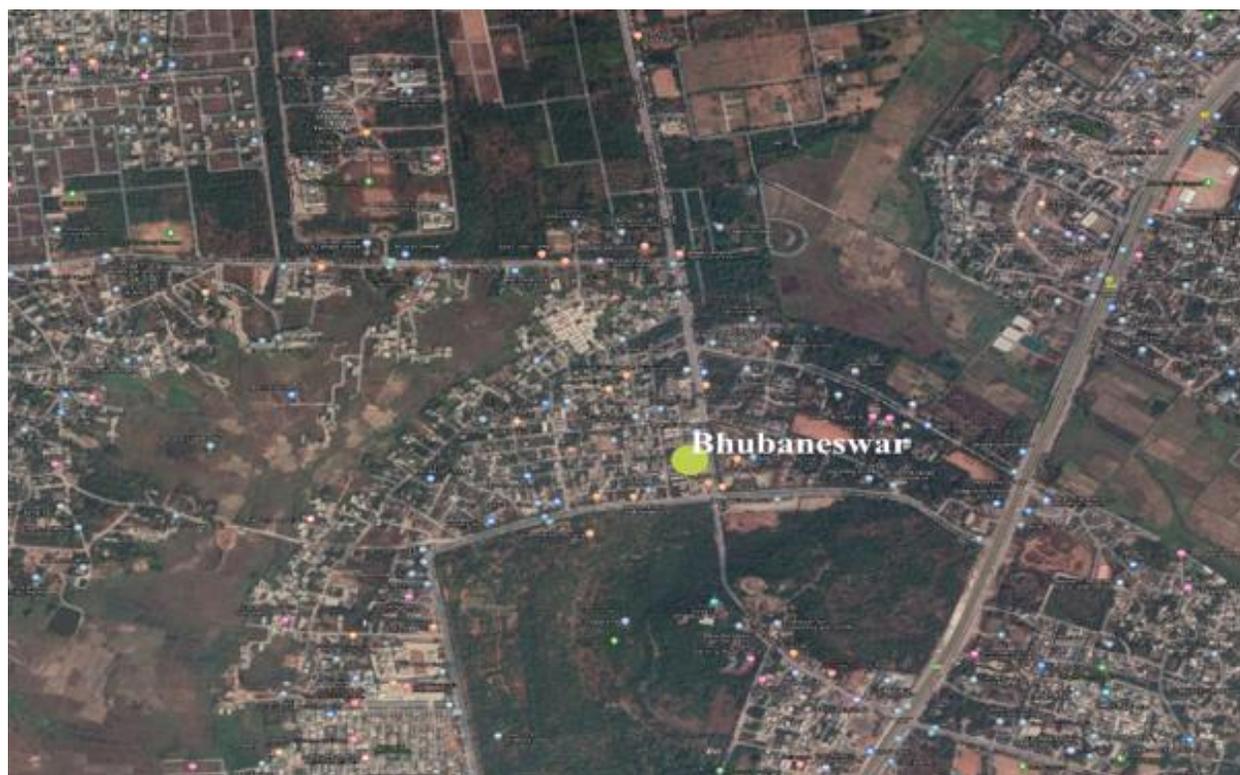


Figure 2 – Showing the area of sample collection during phase 2

The samples were named and marked for identification. They were observed daily and data were collected. Regular resting behaviour of all the scorpions were recorded by using a mobile phone (Redmi Note 7s) camera. For further detailed study purpose, several video clips were also captured. The activities and behavior were noted down. All the sample scorpions were captured for resting ethogram analysis. All sample scorpion were released to their original habitat after 40 days of their data collection.

III. Results and discussion

The first activity of scorpions during foraging was exploration of the Laboratory Testing Ground (LTG) environment by touching the substrate with pedipalps to find the food source. Observations shows that telson does not influence on this behaviour.

Ethogram of resting behaviour was observed and analysed. Sleeping is the process of the body in complete resting position. During this process no movement of the body parts occurs. During resting condition of the scorpion, it was observed that some of the parts of its body were placed constantly in some particular places for a certain time period. During resting condition the scorpion placed its metasomal segments in many places continuously such as inside water and grass. When the scorpion was in resting condition the placement of chela was also take in a particular place for a particular time period.

Table 1 – Showing the resting time and its percentage of the samples during captivity:

Name of Sample	Resting time (In Minutes)	Resting Time (In percentage)
S1	56725.37	98.48%
S2	55896.11	97.04%
S3	56232.29	97.62%
S4	54283.33	94.24%
S5	55966.24	97.16%
S6	56251.18	97.65%
S7	55289.41	95.98%
S8	55156.38	95.75%
S9	54392.37	94.43%
S10	53426.14	92.75%
S11	56142.19	97.46%
S12	53231.54	92.41%
S13	54426.32	94.49%
S14	54786.47	95.11%
S15	55922.27	97.08%
S16	55774.08	96.83%
S17	53472.53	92.83%
S18	56221.03	97.60%
S19	55329.14	96.05%
S20	56131.22	97.45%
S21	53783.47	93.37%
S22	55382.51	96.15%
S23	54633.25	94.84%
S24	56236.31	97.63%
S25	54776.2	95.09%
S26	55902.04	97.05%
S27	53996.42	93.74%
S28	56108.36	97.41%
S29	55007.27	95.49%

S30	56330.56	97.79%
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Table 2 – Active time of sample S1 during day and night time (As an example):

No of Days	Duration in daytime (In minute)	Duration in daytime (In percentage)	Duration in night (In minute)	Duration in night (In percentage)
1	15.58 Min	1.08%	00 Min	0%
2	00 Min	0%	2.33 Min	0.16%
3	00 Min	0%	1.04 Min	0.07%
4	4.42 Min	0.30%	36.28 Min	2.51%
5	3.23 Min	0.22%	22.56 Min	1.56%
6	00 Min	0%	11.38 Min	0.79%
7	27.52 Min	1.91%	158.09 Min	10.97%
8	00 Min	0%	1.13 Min	0.07%
9	5.23 Min	0.36%	00 Min	0%
10	0.24 Min	0.01%	00 Min	0%
11	1.14 Min	0.07%	7.01 Min	0.49%
12	00 Min	0%	3.46 Min	0.24%
13	00 Min	0%	2.26 Min	0.15%
14	382.2 Min	26.52%	00 Min	0%
15	00 Min	0%	1.44 Min	0.10%
16	00 Min	0%	00 Min	0%
17	6.25 Min	0.43%	4.52 Min	0.31%
18	1.13 Min	0.07%	11.06 Min	0.76%
19	00 Min	0%	8.02 Min	0.55%
20	7.28 Min	0.50%	17.31 Min	1.20%
21	00 Min	0%	2.28 Min	0.15%
22	1.12 Min	0.07%	00 Min	0%
23	3.24 Min	0.22%	7.51 Min	0.52%
24	13.32 Min	0.92%	17.03 Min	1.18%
25	0 Min	0%	0 Min	0%
26	0 Min	0%	0 Min	0%
27	00 Min	0%	0.26 Min	0.01%
28	00 Min	0%	00 Min	0%
29	19.30 Min	1.34%	23.18 Min	1.60%
30	6.33 Min	0.43%	0.17 Min	0.01%
31	00 Min	0%	4.14 Min	0.28%
32	0.19 Min	0.01%	1.57 Min	0.10%
33	00 Min	0%	8.47 Min	0.58%
34	2.35 Min	0.16%	16.01 Min	1.11%
35	0 Min	0%	0 Min	0%
36	00 Min	0%	2.43 Min	0.16%
37	00 Min	0%	00 Min	0%
38	3.26 Min	0.22%	00 Min	0%
39	00 Min	0%	00 Min	0%
40	00 Min	0%	00 Min	0%

I) Calculations for average of the total sleeping time:

i) Let the average of the total sleeping time (In minute) = x

$$\Rightarrow x = \frac{\text{The sum sleeping time (In minutes)}}{\text{Total numbers of samples}} = \frac{1657212}{30} = 55240.4 \text{ Minute}$$

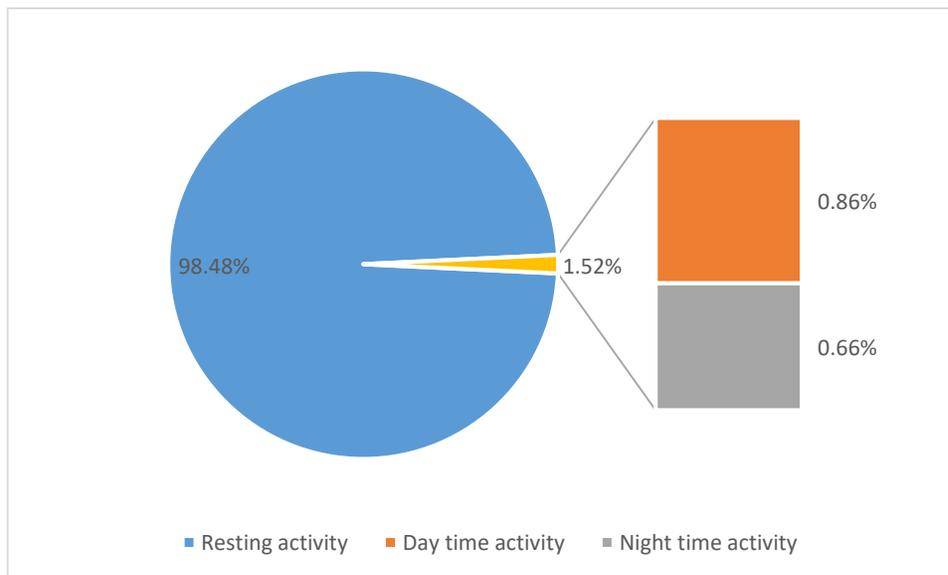
ii) Let the average of the total sleeping time (In percentage) = y

$$\Rightarrow y = \frac{x}{\text{the total time of captivity (In minutes)}} \times 100 = \frac{55240.4}{57600} \times 100 = 95.90\%$$

II) Calculations for average day and night activity of sample S1:

i) The average time of activity per day during day time = $\frac{\text{the sum of duration (Day)}}{\text{total days of captivity}} = \frac{503.33}{40} = 12.58 \text{ minutes}$

ii) The average time of activity per day during night time = $\frac{\text{the sum of duration (Night)}}{\text{total days of captivity}} = \frac{371.3}{40} = 9.28 \text{ minutes}$



Graph 1- Showing the percentage of time of sample S1 activities during captivity



Figure 3- Scorpion in resting condition putting its metasomal segments inside water



Figure 4- Scorpion in resting condition in a dry stone surrounded by grass

Table 1 showing the sleeping time of all scorpions in minutes and percentage. During observation it was recorded that maximum sleeping time was 56725.37 minute which was done by the sample S1 and it is 98.48% of the total time of captivity. The minimum sleeping time was recorded 53231.54 minutes which was done by the sample S12 and it is 92.41% of the total time of captivity. The average sleeping time of all the samples is 55240.4 minute which is 95.90% of the total time of captivity. Out of 30 samples S7, S8, S14, S25 and S29 shown total sleeping time near to average. Whereas S1, S2, S3, S5, S6, S10, S11, S12, S15, S17, S18, S20, S21, S24, S26, S27, S28 and S30 show large margin of difference from the average total sleeping time.

The table 2 is showing activities of sample S1 during day and night time as an example. In the 14th day it was showing the maximum activities where in the days of 2nd, 3rd, 6th, 8th, 12th, 13th, 15th, 16th, 19th, 21st, 25th, 26th, 27th, 28th, 31st, 33rd, 35th, 36th, 37th, 39th and 40th it was not showing any activities. In the 7th night the sample S24 showing highest activities where in the 1st, 9th, 10th, 14th, 16th, 22nd, 25th, 26th, 28th, 35th, 37th, 38th, 39th and 40th night it was not showing any activities. The average time of activity per day during day time is 12.58 minutes and the average time of activity per day during night time is 9.28 minutes.

IV. Conclusion

Scorpion is an important living fossil with ancient history among other terrestrial organism. This work represent that scorpion spend 95.90% of total captivity in sleeping condition. As per the observation it was concluded that, the scorpion show it's another activities only in necessary condition. This present investigation on scorpion will help naturalist and researchers with useful information of its feeding. This paper describe the feeding habit of terrestrial arthropod.

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