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Cover - Star tortoise (*Geochelone elegans*) distributed many parts of the India particularly dry and scrub jungle forest
Photo: Dr.C.Arivazhagan

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FACTORS INFLUENCING RICHNESS OF HERPETO-FAUNA OF THE MUKURTHY NATIONAL PARK, THE NILGIRIS, TAMIL NADU

P. Kannan[1], P. Santosh[2], B. Ramakrishnan[3] and C. Arivazhagan[4]

Introduction

The Western Ghats is considered to be one of the world's most heavily populated biodiversity hotspots, is home for some of the world's most unique fauna and flora. There are about 157 species of reptiles is known from the Western Ghats, of which majority are snakes. Amphibian fauna of the Western Ghats can be arranged under 11 families, 29 genera and 157 speciesof which 134 are frogs and 23 are caecilians. Endemism is highest among herpetofauna in the Western Ghats. Tamil Nadu part of the Western Ghats extended from Nilgiri Biosphere Reserve in the North to Kothaiyar Kaliya reserve forest in the south. The Nilgiri Biosphere Reserve (NBR) was the first Biosphere Reserve in India, established in the year 1986 under UNESCO man and Biosphere Reserve Programme. The NBR is a treasure of biological diversity and hold great promise for our future. It is one of the World's treasure troves of plants and animals' life. The fascinating ecosystem harbor.many endemic herpetofauna of the Western Ghats. Among the 285 Species of vertebrate's endemic to the Western Ghats, nearly 156 (55%) are found in the Nilgiris. Herpetofauna are a major conspicuous component of the fauna of the Nilgiri Biosphere Reserve. The altitude, climatic gradients support and nourish different species of herpetofauna. Herpetofauna are distributed in a wide variety of habitats ranging from rain forest to desert and almost found in all niches from rock crevices to tree bark. Some of them are endemic to particular habitat and some of them are very common, found throughout the country (Daniels, 1992 and The Nilgiri District Gazetteer, 1995).

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Amphibians and reptiles render incalculable services to agriculture. Insects occupy first place amongst pest that damage standing crops. Majority of frogs and lizards feed on insects which are destroying the crops and forest ecosystem. Snakes have an irreplaceable role in ecology as the natural predators of rats and agricultural pests. Particularly in predominantly agricultural economies like India, the burgeoning rodent population, made worse by human overcrowding, proliferation of garbage and our unhygienic habits, has become one of the greatest scourges. Snakes are singularly designed and equipped to hunt for rats in their narrow subterranean burrows and hiding places in the open and in the granaries, storages etc. Similarly,those snakes which regularly feed on insects have been responsible for destroying vast number of insects which are pests in our ecosystem These groups of animals are mostly nocturnal in nature and some of them are active round the clock.

They render great service by exterminating nocturnal and diurnal insects. The significance of amphibians and reptiles for the biosphere of our planet consequently to mankind, is so great that it is difficult to equate it with that of another group of organisms.. Snakes and other reptiles may prove to be a valuable indicator species in local ecosystems. However, extensive loss and fragmentation of tropical forests in the past several decades have set the stage for an extinction crisis in the near future as remnant fragments undergo further fragmentation and degraded forests shed species more rapidly (Laurance *et al* 2002). Habitat fragmentation is a primary cause of decline for many species of wildlife particularly with herpetofauna. With impetus given by the Indian National Forest Policy-1952, major proportion of the grasslands and shoal forests had been converted into exotic plantations of black wattle *Acacia mearnsii,* Eucalyptus *Eucalyptus* spp. and pine *Callitris rhomboidea.* Impact of these alterations on wild flora and fauna are poorly understood. Taxa such as herpetofauna could be an ideal model to assess these impacts,as they are specific to certain microhabitats of the area.

Objectives

- To study the abundance and diversity of herpto fauna in Mukurthi National Park.
- To develop a checklist of herpetofauna on Mukurthi National Park.

Methodology

The field work was conducted between from 2016 to 2017 in *Acacia* removed areas of Mukurthi National Park. Searches were made during early morning and evening hours to find out the presence of herpetofauna in this area. Photographic documentation was done using Canon digital camera (1200 D). Three methods were used for data collection, namely visual encounter survey, Transect Survey and quadrate sampling.

A. Visual Encounter Survey

This method involved searching for herpetofauna in an area or habitat (Cambell and Chirstman, 1982) and recording all animals visible on the surface. Surveys were carried out in selected areas during pre-monsoon and post-monsoon seasons. While walking on the transects and quadrates which are earmarked for this study, we scanned the vegetation path, and other possible places for the recordings the species observed within a 3 m distance from the path. Often, we searched the leaf litter as semi fossorial species emerge slightly disturbed which allowed them to be recorded. The animal thus found is recorded in the data sheet such as species, number of individuals, time of the day and micro habitats. The sampling duration in each locality was largely depending up on the size of the area.

B. Transect Sampling

Transect sampling is ideal for studying elevation gradients from low lands to uplands depending on the area of the study site. A transect line was laid (2 km to 4 km) in depending up on the size of the area and the same data was collected and entered in the field data sheet.

C. Quadrate Sampling

10 × 10 m plots or quadrates were randomly laid in various habitats and the area were searched (Cambell and Chirstman, 1982) on locating snakes, several parameters such as micro and macro habitats, sex, size, climate, activity etc., were recorded. Nylon rope was used to lay quadrates and average time taken for searching each was quadrates about 15-20 minutes. All herpeto fauna sighted were noted. Abundance was estimated as number of individuals per unit area. The amphibians were identified by using the key (Daniel, 2002; Daniel, 2005). The reptilian species were identified by usingthe key (Smith, 1943; Whitaker and Captain, 2004).

Data Analysis

The raw data which were collected in the study area were pooled together for statistical analysis. The season wise data are also pooled together and analyzed. Herpeto faunal was estimated by using the simple formula

$$\text{Relative abundance} = \frac{\text{No. of Individuals of a species}}{\text{Total No. of individuals of all species}} \times 100$$

$$\text{Encounter rate} = \frac{\text{No. of Individuals of a species}}{\text{Total Kilometer surveyed}}$$

Result

Pre monsoon

A total of 45 plots, 3 transect lines and 2 man-hours of Visual Encounter surveys were conducted in wattle removed areas of Mukurthi National Park. Data obtained from these methods were pooled for all other analyses including opportunistic observations. Three species of endemic herpetofauna such as Horse-fields spiny lizards *Salea horsfieldii* (60%), Bronze-headed Vine Snake *Ahaetulla perroteti* (40%) were recorded during pre-monsoon survey given in (Table 1 & Fig. 1).

Post-monsoon

A total of 45 plots, 3 transect lines and 2 man-hours of Visual Encounter surveys were conducted in wattle removed areas of Mukurthi National Park. Data obtained from these methods were pooled for all other analyses including opportunistic observations. Six species of endemic herpetofauna were recorded. Of which Common Indian Toad (79.02%) was the most dominate species followed by Horse-fields Spiny Lizard (8.5%) and Indian Day Gecko (5.5% %) and Horseshoe Pit Viper (2.0%) during post monsoon survey.

Table 1. Herpetofauna recorded after the first-year maintenance of *A. mearnsii in* Mukurthi National Park (Pre-monsoon survey).

S. No	Common Name	Species Name	Total Number of individuals	RD	ER/KM
1	Horsfields Spiny Lizard	*Salea horsfieldii*	6	60	1.2
2	Bronze-headed Vine Snake	*Ahaetulla perroteti*	4	40	0.8

Table 2. Herpetofauna recorded after the first-year maintenance of *A. mearnsii in* Mukurthi National Park (Post-monsoon Survey).

S.NO	Common Name	Scientific name	Total No.of individuals	Relative density
1	Common Indian Toad	*Duttaphrynus melanostictus*	113	79.02
2	Horsfields Spiny Lizard	*Salea horsfieldii*	12	8.5
3	Indian Day Gecko	*Cnemaspis indica*	8	5.5
4	Horseshoe Pit Viper	*Trimeresurus strigatus*	3	2.0
5	Variable Ghat Frog	*Ghatixalus variabilis*	5	3.0
6	Bronze-headed Vine Snake	*Ahaetulla Perroteti*	2	1.3

Figure 1. Relative density of herpetofauna recorded after the first-year maintenance of A.*mearnsii* in Mukurthi National Park (Pre monsoon survey).

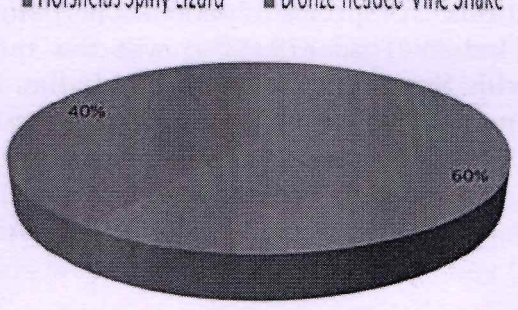


Figure 2. Relative density of herpetofauna recorded after the first-year maintenance of A.*mearnsii* in Mukurthi National Park (Post monsoon survey).

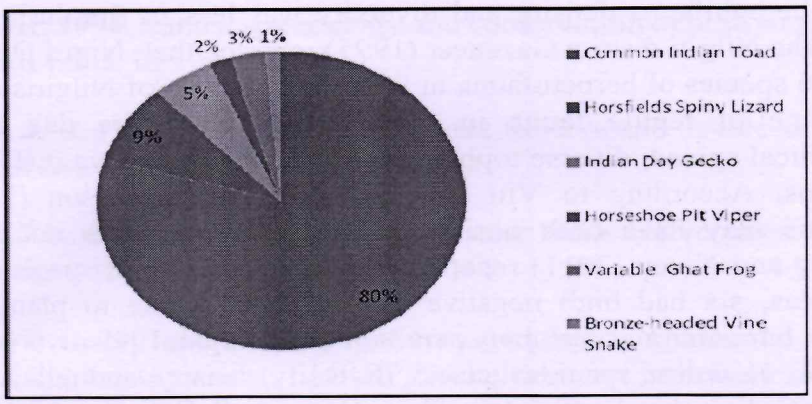
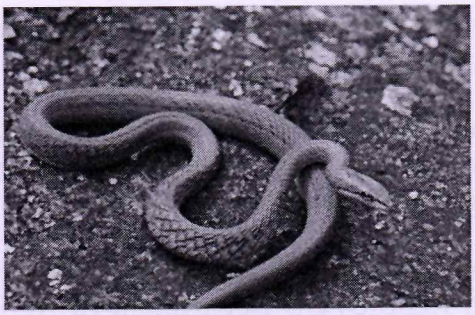


Plate 1. Various herpetofauna recorded after the first-year maintenance of *A.mearnsii* in Mukurthi National Park (Pre monsoon and post monsoon surveys)

Horsfields Spiny Lizard

Indian Day Gecko

Common Indian Toad



Bronze-headed Vine Snake

Conclusion

During the survey period few species of herpetofauna were observed. Overall herpetofauna density and diversity was less in the during the survey period. The Nilgiri district Gazetteer (1995) reported that, Nigiri District support nearly 86 species of herpetofauna in the upper reaches of Nilgiris district. Rich assemblage of reptile fauna in NBR could largely be due to its larger geographical spread, diverse topography (300-2,600 m above msl) and climatic conditions. According to Vitt et al. (1998) and Dickerson (2001) habitat alterations may have both positive and negative impacts on herpetofauna. Bhupathy and Nixon (2011) reported that, out of the eight species observed in these areas, six had high negative impact (>40%) due to plantations. Only *Kaestlea bilineata* and *Xylophis perroteti* got marginal positive impact due to plantation. However, species richness, diversity, density, and relative abundance of many species were low in plantations. However during survey period, number of species and relative density was low in target area, because reason for As stated earlier, monthly mean temperature during the study period ranged from 15° to 26° C (Nixon 2015), which is much lower than the optimal body temperature of many species of snakes (28-34° C; Lillywhite 1987). From our observations, ambient temperature appears to be one of the major factors determining the richness of reptiles in higher altitudes.

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GROWTH RATE OF CAPTIVE BORN COMMON SAND BOA (*ERYX CONICUS*) BABIES IN CHENNAI PARK

Dr. J. Subramanean[1] and K. Mirdhula[2]

Introduction

Common sand box or Russell's sand boa (*Eryx conicus*) is a viviparous non venomous snake and has a body that is cylindrical which tapers abruptly. Females are longer than males. Dorsal coloration is yellowish, brownish or greyish mixed with a dorsal series of blotches that end in black edged spots (Sharma, 2003). Babies measure 125 mm in total length as reported by (Whitaker and Captain, 2008). They mainly feed on rats, lizards and frogs.

Monitoring growth rate of captive breed babies were observed in Chennai Snake Park, in total 25 babies were born in captivity. How large are thehatchling, how efficiently they are assimilating their food and their evolved adult size are important (Mattison, 2007).

Baby snakes are easily predated by birds, bigger snakes and larger lizards inthe wild. Survival rate is minimum in the wild. Babies complete the initial shedding of skin at about one to three weeks of age. According to Flank(1998), the common sand boas is incomplete shedding of skin which is always caused by humidity levels that are too low. The present study is an attempt to record the growth rate of sand boa babies in captivity at Chennai Snake Park.

Observations:

The study was conducted in Chennai Snake Park, (13.004'N, 80.238'E) is an Indian herpetological zoo that was started during 1972 with the principal aim of creating awareness amongst the general public and educating school children on reptiles and snakes in particular. Due to the excellent maintenance of enclosures in semi natural conditions several snakes are breeding in captivity – common sand boa being one of them.

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Data Collection:

The data were collected from 6th June 2022, a total of 15 babies of common sand boa were observed. The babies were brought out when there was sunshine and allowed to stay to warm up and gain temperature. Initial feeding was started after the first slough. Sampling of weight and total length wasdone before feeding of baby mice. since they will eject out the eaten mice because of handling. The morphometric measurements (weight (gm) and length (cm)) were taken once in three months. Photo ID of each baby were taken for identification of individuals, each sand boa baby has a distinct blotch pattern. Based on this fact, photographs of babies were taken after one year in 21st September 2023 and matched with control Identity codes in October 2022 to get the annual growth rate. A measuring scale that records to the nearest 'mm' was used to measure total length. An electronic weighing machine that records to the nearest 'g' was used to calculate weight.

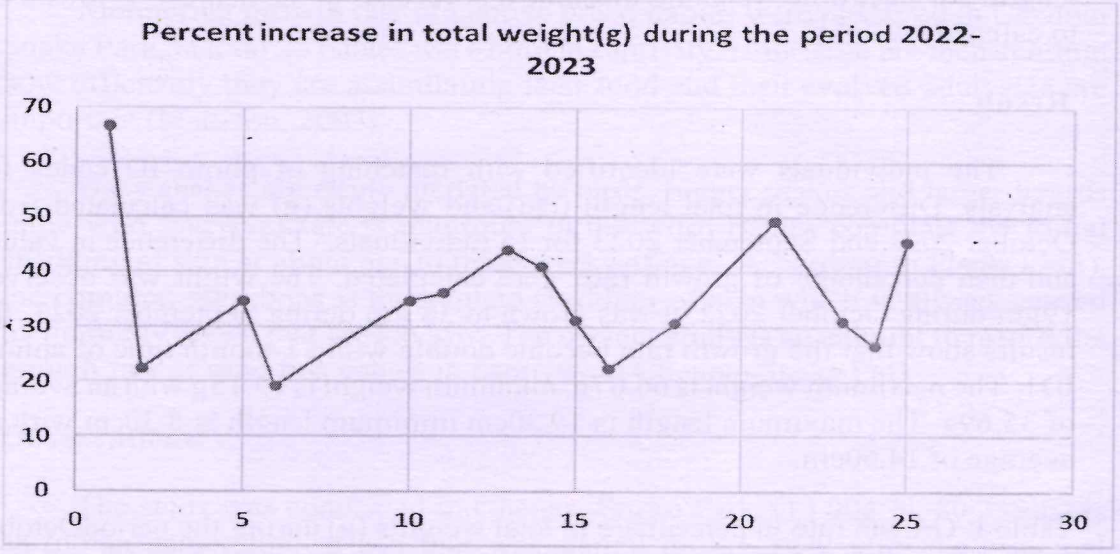
Result

The individuals were identified with matching of photo ID codes for analysis. Difference in total length (cm) and weights (g) was calculated from October 2022 and September 2023 for 15 individuals. The difference in values and then percentage of growth rate were calculated. The wight was observed 19gm during October 2022, it was grown to 38 gm during September 2023, the results show that the growth rate become double with 11-month time of animal ID1. The maximum weight is 66.67g, minimum weight is 19.15g with an average of 35.69g. The maximum length is 19.30cm minimum length is 8.30cm with an average of 14.60cm.

Table I: Growth rate in percentage in total weights (g) during the periodOctober 2022 to September 2023.

	October	September			
	16.10.2022	21.09.2023			
ID	Weight (g)	Weight (g)	Total	Difference	Percent growth (%)
1	19	38	57	19	66.67
2	19	30	49	11	22.45
5	18	34	52	18	34.62
6	19	28	47	9	19.15
10	16	33	49	17	34.69

11	15	32	47	17	36.17
13	21	54	75	33	44.00
14	18	43	61	25	40.98
15	22	42	64	20	31.25
16	14	35	49	11	22.45
18	17	32	49	15	30.61
21	21	62	83	41	49.40
23	20	38	58	18	31.03
24	18	31	49	13	26.53
25	18	48	66	30	45.45

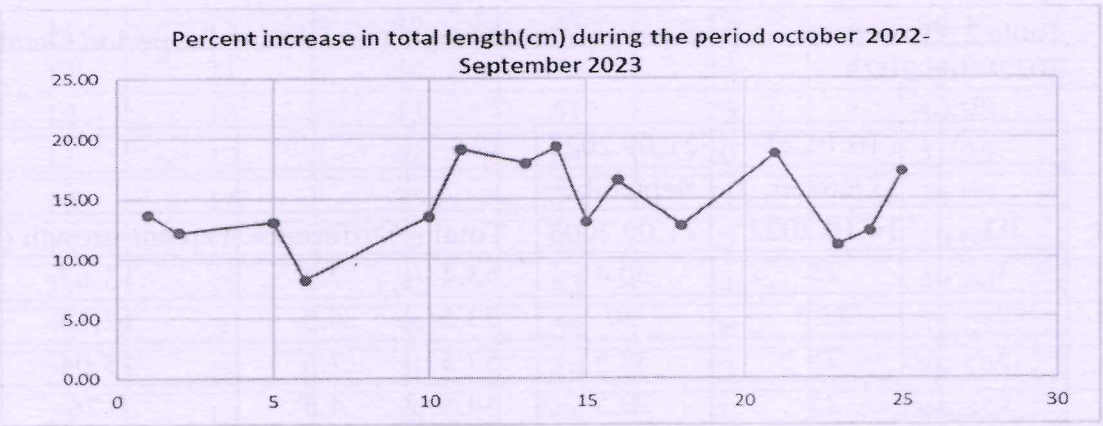


The line chart describes the maximum and minimum rates of growth rate for weights in percentage (%) for the sample population. The maximum annual growth rate is for the ID 1 (66.67%) and minimum value is for ID 6 (19.15%). The average and standard deviation for the population is 35.69707 ± 11.88157. The growth rates are similar in nature.

Table 2: Growth rate in percentage in total length (cm) during the period October 2022- Sep 2023

	16.10.22	21.09.2023			
	October	September			
ID	16.10.2022	21.09.2003	Total	Difference	Percent growth (%)
1	23	30.4	53.4	7.3	13.67
2	23.5	30	53.5	6.5	12.15
5	25	32.5	57.5	7.5	13.04
6	25	29.5	54.5	4.5	8.26
10	23	30.2	53.2	7.2	13.53
11	22	32.4	54.4	10.4	19.12
13	24	34.5	58.5	10.5	17.95
14	23	34	57	11	19.30
15	25	32.5	57.5	7.5	13.04
16	24	33.5	57.5	9.5	16.52
18	24	31	55	7	12.73
21	25	36.5	61.5	11.5	18.70
23	26	32.5	58.5	6.5	11.11
24	25	32	57	7	12.28
25	24	34	58	10	17.24

The line chart in Table 2 describes the maximum and minimum rates of growth rate for total length in percentage (%) for the sample population. The maximum annual growth rate is for the ID 14 (19.3%) and minimum value is for ID 6 (8.26%). The average and standard deviation for the population is 14.6 ± 3.3. The growth rates are similar in nature.



Discussion

Sampling of total population and weights was done once in October 2022 and September 2023. Many species of snakes breed well under captive conditions. This is a vital opportunity to monitor the growth rate patterns of the baby snakes, because it is difficult to monitor the babies in the wild as they disperse as soon as they are born. There is also lots of predation and early mortality in the wild. Bhupathy (1990) identified individual pythons based on their blotch structure in Kaelodeo national park for population estimation. Lakshmi Vijaykumar (1999) identified individuals of Indian and reticulated pythons on blotch structure and arrangement which was an easy tool for conservation. Common sand boa gives birth to 6-8 young according to Whitaker and Captain (2008) each of which measure close to 125mm at birth. Adults measure 500 mm- 1000 mm in total length. Das (2002) reports length values only for the adult sand boas and does not deal with the babies. In the current study the sample size of number of babies produced was high.

Conclusion

Common sand boa hatching rates reveal the fact that they can breed well in captivity. The sample size of 15 babies indicates they have rapid growth rate and breed well after the first slough. Environment is an important component of common sand boa ecology. In the wild hatchlings are born in the months of May and July. Young in the wild feed on insects, mice and small lizards. Here in snake park, they were fed on baby mole rats which they accepted readily after the first slough. Common sand boa is important for gene pool conservation.

Acknowledgements

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SNAKES IN CAPTIVITY AT INDIAN ZOOS-A REVIEW

R. Rajarathinam[1] and C. Arivazhagan[2]

Introduction

The history of the zoo movement in India goes back to 1854 when the first zoo of the country was opened by Raja Rajendra Mullick Bahadur in his private residential mansion called Marble Palace in the centre of Calcutta (Acharjyo, 1998) There were hardly 15 zoos in the country up to 1947. The major breakthrough in the establishment of zoos in the country took place only after Independence. There were 47 zoos including only one reptile park (Chennai Snake Park) in 1972 (Acharjyo, 1998).

Once a zoo is a place for relaxation, having fun and considered as an entertainment area. Over decades, zoos have been transferred into conservation and education centres. Zoo is a place for studying animal biology, behaviour and veterinary science. Zoos play a major role in conservation breeding of endangered animals for reintroduction. In India zoos are classified as Large, Medium, Small and Mini zoos based on area of the zoo's, number of visitors, no of species, no of individuals and no of endangered species. In the historical past list of Indian Zoos published in Indian Zoo Year Book Vol II (1998-99) there are 231 zoos (Large Zoos – 15), Medium Zoos -16, Small Zoos 25 and mini-Zoos – 175) spread in all the states and Union Territories except Chandigarh, Pondicherry and Lakshadweep Islands. These include 9 snake parks including two subsidiary units of Calcutta Snake Park and other reptile Zoos.

As per recent list published by Central Zoo Authority of India Web site, there are about 145 recognised Zoos. of which, 17 are large zoos, 24 are medium zoos, 32 are small zoos, 58 are mini zoos. 13 Rescue centres and one circus in India as on 31.12.2023.

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In Indian zoos different taxa are exhibited like mammals, Birds, Reptiles and amphibians. Reptiles are an elusive group of animals consisting, Crocodiles, lizards, tortoises, turtles and Snakes. In general, there are about 3600 snakes in the world of which more than 300 snakes are in India. Some of them are venomous. The Chennai Snake Park was the only reptile park established in 1972 in the country, specially to educate the snakes and other reptile species. Off late many snake parks have been established and some of them are closed.

The present paper dealt with Indian snakes in captivity based on the Zoo animal inventory for the year 2021-2022 published by the Central Zoo Authority of India.

In the past though some of the older zoos were exhibiting a few specimens of some of the larger reptiles like crocodiles, Indian python etc., more stress was given on exhibition of mammals and birds rather than reptiles. This apathy for exhibition of reptiles in captivity was mainly due to ignorance about identification, biology, behaviour and captive management of reptiles along with the fear psychosis prevailing among the public as well as the zoo personnel as all reptiles specially snakes were considered as "deadly and dangerous". Chennai Snake Park only zoo has high diversity of snakes among the zoos in India.

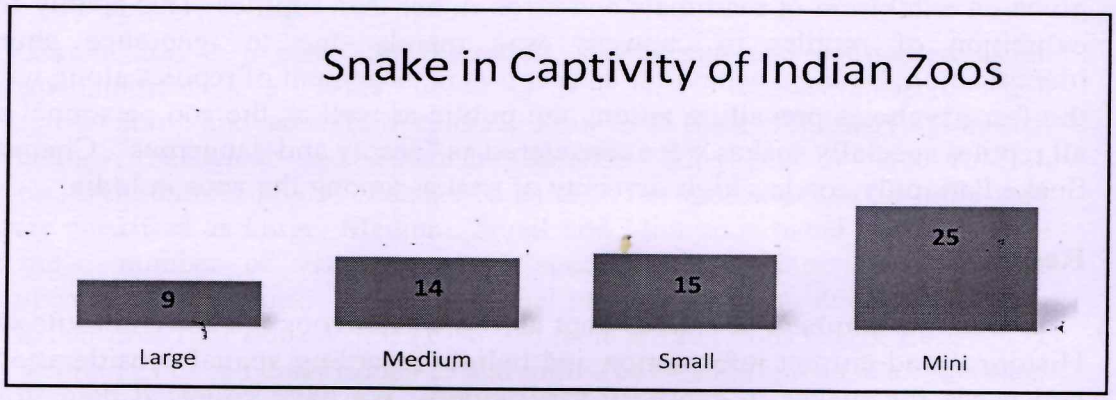
Result

Data on numbers of snakes kept across Indian zoos are fully not known. Historical and current information and beliefs regarding spatial considerations and needs for snakes in captivity vary widely. We have collected data from zoo web sites of each zoo, in total 63 zoos of which 9 Large zoos, 14 medium zoos, 15 small zoos and 25 mini zoos. Based on the inventory of zoos 2021-2022.However, the figure indicates that 1028 individuals of 36 species were kept in captivity across the country. Out of 63 zoos only 36 zoos kept the snakes in captivity remaining 27 zoos there is no snakes, mini zoo 17, smallzoo 8 and medium zoo 2 no were snakes kept in captivity; however, all the larger zoo kept the snake in captivity (see table 1 and Fig.1).

Table.1. Snake in Captivity of Indian Zoo's

S. No	Zoo types	No. of Zoo	No. Zoo snake not presence
1	Large	9	0
2	Medium	14	2
3	Small	15	8
4	Mini	25	17

Fig.1. Snake in Captivity of Indian Zoos



Among 36 species of snakes kept in captivity, of which 28 species are non-venomous and 8 species are venomous snakes. Based on the inventory we found that 4 major species of non-venomous snake such Indian Rock Python kept in 30 zoos, Common Rat Snake in 22 zoos, Red Sand Boa in 13 zoos and Checkered keelback kept in 13 zoos, remaining non venomous snakes veryfew numbers of zoos. On the other hand, in the case of venomous snakeSpectacled Cobra were kept in 21 zoos, Russell's viper 18 zoos and Common Krait kept in 10 zoos remaining 5 species of venomous snake kept in very few zoos of the country (See table 2). Out of 36 species exhibited by Indian zoos,15 species are under schedule I of Indian Wildlife (Protect) Acr,1972 and remaining 19 species are under schedule II of Indian Wildlife (Protection) Act,1972. Among the snakes exhibited by Indian zoos 33 are Indian species and the remaining are exotic species.

Table.2. Different Species Snake kept in Captivity in India

S. No	Name of the Snake in Captivity	No. of Zoo	Nature of Species	schedule
1	Indian Rock Python	30	Native	I
2	Reticulated Python	6	Native	I
3	Burmese Python	7	Exotic	I
4	Royal Python/ Ball Python	1	Exotic	I
5	Red Sand Boa	13	Native	I
6	Whitaker Boa	1	Native	I
7	Common Rat Snake	22	Native	I
8	Dog-faced Water Snake	2	Native	I
9	Checkered Keelback	13	Native	I
10	Spectacled Cobra	21	Native	I
11	Russell's Viper	18	Native	I
12	King Cobra	4	Native	I
13	Spitting cobra	1	Native	I
14	Monocled Cobra	2	Native	I
15	Olive keelback water snake	1	Native	I
16	Striped Keelback	4	Native	II
17	Cat Snake	4	Native	II
18	Banded Kukri Snake	3	Native	II
19	Common Vine Snake	5	Native	II
20	Ceylon Cat Snake	1	Native	II
21	Barred Wolf Snake	1	Native	II
22	Saw Scaled Viper	2	Native	II
23	Banded krait	2	Native	II
24	Bamboo Pit Viper	3	Native	II
25	Brown vine snake	1	Native	II
26	Green cat snake	1	Native	II
27	Diadem snake	1	Native	II
28	Green Anaconda	1	Native	II
29	Common Trinket Snake	6	Native	II
30	Common Wolf snake	4	Native	II

31	Common Sand Boa	7	Native	II
32	Common Indian Bronze back	3	Native	II
33	Common krait	10	Native	II
34	Green Keelback	2	Native	II
35	Copper-headed Trinket	1	Native	II
36	Banded Racer snake	2	Native	II

Conclusion

Keeping snakes in captivity basically people should be aware about snakes, especially the big four snakes such as Spectacled cobra, Russell's viper, Common Krait and Saw scaled Viper are more dangerous to human life, almost 30000 to 40000 people getting killed by snakes across the country. According to Suraweera *et al* (2020), estimated that India had 1.2 millionsnakebite deaths (average 58,000/year) from 2000 to 2019. Nearly half occurred at ages of 30–69 years and over a quarter in children < 15 years. Most occurred at home in the rural areas. About 70% occurred in eight higher burden states and half during the rainy season and at low altitude. The risk ofan Indian dying from snakebite before age 70 is about 1 in 250, but notably higher in some areas. More crudely, we estimate 1.11–1.77 million bites in 2015, of which 70% showed symptoms of envenomation. Prevention and treatment strategies might substantially reduce snakebite mortality in India.

Among the 9 large zoo highest diversity of snake exhibited in Sri Chamarajendra Zoological Garden, Mysore (n=13) followed by Assam state zoo cum Botanical Garden (n=10), Bannerghatta Biological Park, Karnataka (n=9), Kanpur zoological park (n=8), National Zoological Park, New Delhi (n=7), Sakkarbaug Zoo, Gujarath (n=7),Sanjay Gandhi Biological Park, Bihar (n=8), Nawab Wajid Ali Shah, Zoological Garden, Lucknow (n=6) and Indra Gandhi Zoological, Andhra Pradesh (n=3).

Out of 14 small zoos in India highest number of species exhibited in Chennai Snake Park Trust (n=22) followed by Aurangabad Municipal Zoo (n=10), Gandhi Zoological Park, Gwalior (n=6), Nisargakavi Bahinabai ChaudharyPranisangralay, Maharashtra (n=4), Indira Gandhi Zoological Park, Visakhapatnam (n=1), Tiger and Lion Safari, Shimoga (n=1), Wild Animals Conservation Centre (n=1). There are snake species exhibited in seven small zoos.

Out of 25 mini zoos, the highest species exhibited in Snake Park Malampuzha, Kerala (n=19), followed by Dehradun Mini Zoo (n=10), Shaheed Ashfaq Ullah Prani Udyan, Uttar Pradesh (n=4). In 6 zoos one snake species is exhibited. In 16 mini zoos no snake is exhibited.

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BREEDING BEHAVIOR OF INDIAN STAR TOTOISE (*GEOCHELONE ELEGANS*) IN GUINDY CHILDREN'S PARK, CHENNAI, TAMILNADU.

*N.Baskar

Abstract

Successful captive breeding has been observed in the Indian star tortoise, *Geochelone elegans*, in Guindy Children's Park. During the observation a successful mating was observed 13 times in different time of the day from November to January. The favorable diet including Tridax leaves and the favorable environmental parameters enable the breeding to be successful. Further observations and studies need to be made on the incubation periods and hatchling success.

Introduction

The Indian star tortoise (*Geochelone elegans*) wide spread species distributed in dry, arid and deciduous forest area of the Indian subcontinent from Thar Desert of Pakistan to India (Rajasthan, Gujarat, Karnataka, Andhra Pradesh, Orrisa, Tamil Nadu, Madhya Pradesh and Kerala) and further south in Sri Lanka (Deraniyagala, 1939;Das, 1995; de Silva, 2003).

The mainland population is recognized by two separate populations (western and southern), on the bases of morphometric characters and colour form. The western population occurs from Thar Desert, Pakistan to Rajasthan, Gujarat and western Madhya Pradesh, while the southern population is distributedfrom Orrisa, Andhra Pradesh, Karnataka, Tamil Nadu and Kerala. Both these population appear to be separated by Vindhya and Satpura mountains.

Jagannadha Rao (1995) and Das (1995) reviewed and summarized aspects of breeding biology of the species, particularly sexual maturity, egg and clutch size, incubation period and size of hatchlings. The present paper described the three months observation of star tortoise breeding behavior in the captive condition at Children's Park, Guindy.

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Study Site

The Guindy Children's Park (GCP) is with lush green and fabulous cover of canopy located (Lat: 13.004935, Lon: 80.236665) in the heart of the Chennai city. The *ex-situ* conservation centre has been maintained by Tamil Nadu Forest department. An area of 22acre area is allocated just adjacent to the Guindy National Park. The 19thcentury mini zoo is upgraded as medium zooby Central Zoo Authority during the year 2018-19. The wooded environment has lesser fauna in its captive collection viz Mammals, birds and reptiles. The herpetological section has 10 common species in the semi natural condition. The elegant species of star tortoises is an attractive species which has been in exhibit in the captive condition since 2000.

Enclosure Design

Medium sized chain linked house has three side wire mesh and one side concrete structure, keeper gate is ensured at the corner of the house. The area measures around 2-3meter squares, with soil and sand mixed substratum which includes feeding platform and water trough. Around the enclosure edge plants are planted to improve the aesthetic value of the house.

Design of star tortoise encloser at Children's Park, Guindy.

Indian star tortoises are generally crepuscular, which means they are active in the early morning and the late afternoon during dry, hot weather. The rest of the time, they shelter under vegetation or some other cover. In the rainy season, they are much more active, moving around and feeding for much ofthe day. They become inactive in western India and Pakistan during the colder

months of winter. These solitary animals do not hibernate, but when it is very dry and hot, or very cold, they stay inactive. Perception and communication appear to be mostly visual, though tactile and olfactory senses are also used during feeding, courtship, male competitive behavior, and nesting, and a male tortoise will vocalize to a female during mating.

Population Size

The sandy substratum has 10 individuals with the following sex ratio viz.,3 adult males, 4 adult females and 3 sub adult females. This group is quite comfortable and utilize the entire space for throughout the day for their activity. They used to prefer as resting place on both corner of the house during the photoperiod.

Feeding in captivity

The identified and quantified balance feeding items are given on every day during the morning hours. The diet items are given in the table 1.

Table .1. Feeding items given to star tortoise at Guindy Children's Park

Sl. No.	Feed items	Quantity		Remarks
1.	Carrot	30 gm		Tridax leaves are provided during the winter season.
2.	Cabbage	30 gm		
3.	Tomato	30 gm		
4.	Greens	30 gm		
5.	Tridax leaves	50 gm		

Courtship Behaviour

The elegant species is a successful breeder in the captive condition. In general, tortoises exhibit polygynandry, with multiple males and female's sexual relationships. Reproduction activity was noticed 13 times at different interval during the raining season i.e., November to January. The copulation took place for a few minutes. Subsequently the adult female preferred to stay under the shade of indoor plants.

During dry, hot weather Indian star tortoises are mostly active during the early morning and late afternoon. The rest of the day, these tortoises' shelter under shady cover. During the rainy season, their activity level increases tremendously and they can be observed moving around and feeding during much of the day. They become inactive during the colder winter months.

These tortoises are Polygynous (promiscuous), with multiple males and females all have mating relationships. Males compete for females by ramming rival males or flipping them onto their backs. In comparison to many other tortoise species, courtship occurs calmly - which in this species are often are much larger than males. The male tortoise was found to make signaling by circular movements around the female. Courtship lasts for 10-15 mins in a stretch and are known to make noise during the courtship.

When the rainy season arrives (mid-June to November in south India), breeding commences. About 60 to 90 days post-mating, usually in the evening, females begin wandering and sniffing the ground. When a female finds an acceptable nest site, she often urinates to soften the soil and begins excavating a flask-shaped nest with her hind feet. After she has laid her eggs, she re-fills the nest and flattens the soil with her plastron. The female lays from one to as many as nine clutches, of one to ten eggs per clutch, each year. Incubation lasts from 47 to 180 days; hatchlings weigh between 25 and 45 g and average about 35 mm in carapace length. In the wild, females may become sexually mature in 8 to 12 years and males in 6 to 8 years, but these times can be shortened considerably in captive tortoises Males expend considerable energy seeking females and fending off rival males. Females must contribute considerable energy towards producing and provisioning eggs and constructing nests. There is no post-nesting parental care of eggs or hatchlings. They were found to urinate on their nest region and over the eggs.

Aging Pattern

There was a four -month-old female young one. It was observed with butterfly- or bow-shaped pattern on the shell. Since there were widely different in age, the slow morphological structural variations are observed by making a comparative study among them. The star stipes weren't complete and this is also a component that describes the age of the animal.

Animal Interaction

During observation we noticed that, mostly lie one above the other closing themselves into the carapace. No conflicts were observed during the period. They are slow crawlers. They are often found to climb on one and other.

They are found to be social animals and easy to be tamed. They are polite and mostly do not react aggressively. Move freely over the other. Little ones are found to be more energetic.

Discussion

The Indian star tortoise *Geochelone elegans* is an extremely popular tortoise species for pet collectors around the world. It has been listed as Vulnerable under the IUCN since the natural populations are declining from being illegally smuggled for pet trade. The species is widely distributed in dry, arid and deciduous forest habitats (Das, 1995; de Silva, 2003). In India, there are two mainland populations- western and southern.

Several scientists have studied the captive breeding and management of Indian star tortoise (Deraniyagala, 1939; Kirsche, 1976; Das, 1991; Jagannadha Rao, 1995). Vyas in 2005 presented the observations between 1990-1996 at Sayaji Baug Zoo, Vadodara, Gujarat, India on the captive management and breeding biology of the species.

According to the present study, successful annual breeding has been observed. The breeding season of *Geochelone elegans* is considered as June to March,i.e., monsoon and winter. The arrival of monsoon initiates courtship behaviour in the males (Vyas, 2005). The breeding could be attributed to the feed provided to the tortoises that included tridax leaves. Tridax leaves are the natural diet of the species and are collected from the forest to feed the captive tortoises. The successful breeding can further be attributed to the ecological parameters. According to Vyas (2005), ambient temperatures play a

crucial role in breeding. Except for foraging, all activities were stopped as the temperatures raised to 37°C in summer months. In the cooler months of October to March, nesting activity was observed. Similarly, in the present study, the proximity of the zoo to the East Coast is an advantage.

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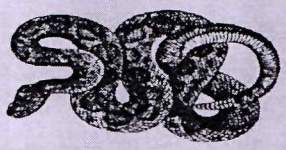
Reptile Amphibian potpourri



Sloughing and Feeding in Captive Young Russel's Vipers (*Vipera russelli*)

By
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In general, many snakes, soon after birth or hatch, start sloughing and take their first feed after a period of starvation. The factor that induces first feeding, the relationship between natal sloughing and 1st feeding, the type of first feed and the factors influencing molting intervals are still not clear from the earlier studies. Our five-month studies on the captive-born viper snakes has enlightened the above aspects.

The details of food, feeding and sloughing of the six captive-born Russel's viper (*Vipera russelli*) snakes are presented in Table 1. It is viewed by some authors (Naullean, 1973 and Groves & Altimari, 1979) that the first (natal) molt induces feeding in vipers because these snakes start taking their first feed after natal molt. But our studies reveal that this is not always true. Two of the six snakes in our experiment started drinking and feeding before their natal molt. Thus, it is understood that the first feeding of newborn Russel's vipers is not necessarily induced by the natal molt, although these two incidents (molting and feeding) are correlated.

Regarding the food of newborn vipers, it is said (Naullean and Brule, 1981) that young vipers, isolated from birth, accepted only small mammals (mice) and that chicks, reptiles and amphibians were always rejected. But our studies found that this is not always the case. Our newborn vipers were fed with frogs and sometimes with newborn rats from the date of their first feeding. Thus, frogs are also easily accepted by the young vipers.

Regarding the factors influencing the molting interval, R.A. Staler in 1939 (referred to by Naullean & Brule, 1981) considers that molting is influenced more by temperature than by food intake in a crotalid snake. But our snakes, reared under similar temperature conditions with different food intake, showed varied molting periodicity (Table 1). It is therefore understood that different food intake may also be a factor influencing molting in snakes.

The presence of sand particles in the stomach of one of our young Russel's vipers, even before it took its first feed, has lead us to believe that the juvenile vipers may feed on sand to start with. But this assumption needs more evidence and requires further investigation.

Another new point revealed in our study concerns the maximum size of a single feed that a young viper could consume. One of our young snakes, weighing 17.2gm, consumed a newborn rat weighing 10.3gm which is nearly 60% of its own body weight. In their detailed study on Russel's vipers, Naullean and Brule (1981) recorded 35% of the snake's body weight as the maximum single feed weight.

Acknowledgement:

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Editor Note: Above paper is reproduced from Animal Keeper Forum as we found interesting and relevant to the article growth rate of captive born common sand boa babies in Chennai Snake Park published in this issue.

Sloughing & Feeding in Captive Born Young Russel's Vipers. *Continued*

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TABLE 1: Details of feeding and molting in young Russel's viper snakes, born 28 July, 1985.

Snake No.	Date of natal molt	Date of subsequent molt	Date of first feeding	Average feeding interval (days)	Remarks
1	29.7.85	- - -	7.9.85	7.5	Died on 24.10.85 with sand in stomach.
2	26.9.85	- - -	10.9.85	3.6	Natal molt was delayed. Died on 28.9.85.
3	29.7.85	24.10.85 and 11.12.85	10.9.85	6.5	Largest young, alive.
4	29.7.85	25.9.85	6.9.85	6.3	Alive
5	nil	nil	nil	- -	Died on 6.9.85. Drank water on 2.9.85. No natal molt. Stomach had sand particles
6	29.7.85	29.9.85 and 27.11.85	10.9.95	6.5	Alive

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