STUDY ON ACTIVITY PATTERN OF HANUMAN LANGUR AT JATASHANKAR, JUNAGADH

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Submitted by

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CERTIFICATE

This is to certify that <u>GEDIYA BHAGYASHRI H.</u> has successfully completed his/her B.Sc. project entitled <u>"STUDY ON ACTIVITY PATTERN OF HANUMAN LANGUR AT JATASHANKAR, JUNAGADH.</u> This project is submitted in part fulfillment of the requirement for the degree of Bachelor of Science in the subject Zoology to the Department of Zoology, Bahauddin Science College, Junagadh (affiliated with Bhakta Kavi Narsinh Mehta University, Junagadh) during the academic year 2023-2024. This work is original, and no part of this project report has been submitted for a degree, diploma, or other academic award of this college, university, or any other university.

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DECLARATION

I hereby declare that this report carries the research work carried out by me at the Department of Zoology, Bahauddin Science College, Junagadh. The report is submitted to the Bhakta Kavi Narsinh Mehta University and this work has not been submitted to any other University/Institution for the award of Bachelor of Science in Zoology or any other degree. Complete care has been ensured in developing this report, however, in case of any discrepancy or ambiguity in the report, I also declare that I shall be solely responsible for the same.

Place: Junagadh

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Abstract

The hanuman langur (*Semnopithecus entellus*) an associate of south Asian colobine is widely distributed in Indian forests and also in close vicinity of human habitations. it is a highly flexible social species occupying wide range of habitats. We studied the activity pattern of hanuman langur in area with high tourist presence using scan animal sampling technique. A quantitive analysis of activity pattern of hanuman langur was carried out to find out the time allotment in various activities from morning to evening. The study was conducted in the Girnar Wildlife Sanctuary, Gujarat in February 2024. The study group spent highest of 56.00 ± 5.38 % on sitting followed by $29.00 \pm 5.88\%$ on eating, $27.55 \pm 3.09\%$ on grooming, $9.14 \pm 3.61\%$ on locomotion, $10.83 \pm 2.71\%$ on sleeping. They also spent time on various types of events such as drinking, jumping, climbing, fighting. Hanuman langur spent more time in sitting probably because they look forward to food offered by pilgrims and tourists. They were more active in feeding natural food during morning and evening hours, and generally seen them resting during mid-day. Also, they found to spend less time in locomotion i.e., moving around, again probably because of more food opportunity near pilgrim path

Introduction

Activity pattern means how much time is spent by langur for performing certain activities. (Arjun Singh, Hemant Kumavat et al. 2020). Activity pattern is a vital part of behaviour in which animal make the activity of daily life, i.e., resting, eating, foraging, travelling and various social activity. (Arjun Singh, Hemant Kumavat at al. 2020).

Focusing on animal behaviour in the appropriate social structure will help the determining the management of wildlife animal. By studying the animal behaviour, we can better understand what they need and how we achieve. Daily activity pattern in different primate species have been studied earlier in both, wild and in captivity (Lindburg, 1971; Southwick et al., 1982; Malik, 1986; Chalise, 1999). From the study of langur's behaviour, langur changes behaviour according to seasons and food available (Chalise 1995, Koeing et al. 1997, Huang et al. 2017).

Primates are the most advanced order of the class Mammalia. The common Indian langur (*Semnopithecus entellus*) is a primate belonging to the sub-family Colobine along with langurs and leaf monkeys of Asia and Colobus monkeys of Africa. The langurs are described under sub order Simiae, super-family Cercopithecoidea and family Cercopithecoidea. They are commonly called as entellus langur or Gray langur or Hanuman langur. The name "langur" is derived from Sanskrit 'langulin' which means "having a long tail". The epithet

'hanuman' comes from the monkey-God and loyal servant of King Rama in Ramayana.

India is rich in the heritage of non-human primates having 17 species and about 30 subspecies. These 17 species are accorded different conservation status (Molur et al. 2003), among them Hanuman Langurs (*Semnopithecus entellus*) with several subspecies are considered as 'least concern' species in IUCN red list categories, CITES Appendix I and schedule II in Wildlife Protection Act, 1972, since they occupy large area geographically (Fooden, 1980; Prater, 1993) and exploit diverse habitats from dense forests to human-dominated landscape. Such species are usually considered "not at serious risk" (Wolfheime 1983; Choudhury, 1988).

The hanuman langur (*Semnopithecus entellus*) an associate of south Asian colobine is widely distributed. it is a highly flexible species happening in wide range of habitat (Oppenheimer 1977, Roonwal & Mohnot 1977, Mohnot 1974).

The hanuman langur (*Semnopithecus entellus*) is a common primate found in a wide range of habitat from arid regions on the edge of the desert in Rajasthan to the rain forest of western ghats and at attitude of 100-4270 M above means sea level (msl) in the Himalayas (bishop 1978; hardy 1978) forests, human habitation that is, cities, villages, roadsides, except in north-eastern states.(A. murmur, S. Chaudhari, P.C. Mazumdar and B. Talukder, 2004) in India , but in Bangladesh they are found only in the open wooded villages and not in forest (khan & Ahsan 1981), (Shivkumar Patil and Sanjeevereddy Modse, 2018).

The Hanuman Langur is largely a deciduous or dry deciduous forest animal and prefers dry tropical forest, scrub jungles and arid rocky area with xerophytic vegetation. Since the natural habitat of the langur is being eroded at fast pace, its presence near human habitation and religious places is a common sight (Chhangani, 2000), (Shivkumar Patil and Sanjeevereddy Modse, 2018). Because

of its digestive (Bauchop and Martucci, 1968) it can utilize a wide variety of food items.

These langurs are largely Gray (some more yellowish), with a black face and ears. Externally the various species mainly differ in darkness of the hands and feet, the overall colour and the presence or absence of crest. (Grooves, C. 2001, and Brandon-jones, D. 2004).

Langur mostly walk quadrupedally and spend half of their time on the ground and the other half in trees. They will also make bipedal hops, climbing and descending support with the body upright and leaps. (Ripley S. 1967).

Basically, colobine monkey were regarded as folivore indeed, because off their multi chambered stomach they are able to rely diet containing high amount of leaves. They also prefer seeds/fruits rather than leaf but eat leaves more in amount when seeds or fruits are unavailable (Stanford 1991). Hanuman langurs are highly adaptive species that occur in various habitats like different types of forest, agricultural area, in and around the human habitation. They are herbivorous and eat most part such as leaves, fruit, flowers and seed of the plant but leaves are the major source of food throughout the year (Chalise 1995, Alam et al. 2014, Patil and Morse 2019). Hanuman langur mostly depends on leaves (more than 50%) for food followed by fruits and flower and rarely feeds on insects (Chalise 1995) but feeding of primate is dependent on habitat quality, such as dietary quality, food abundance, distribution pattern of food plant and seasonal availability of food (Chalise 2000, Jaman and Huffman 2012). The distribution of food resources in time and space may affect the social organization of primates (Chalise 2000, Engel et al. 2010, Li et al. 2010).

➢ Hanuman langur in Girnar wildlife sanctuary:

The Hanuman langur, also known as the Gray langur, is a common species of monkey found in the Girnar Wildlife Sanctuary in Gujarat, India.

These langurs exhibit a complex social structure within their troops, which can consist of up to 20 individuals. The hierarchy within these troops is based on age and dominance, with older males typically holding the highest rank (Pillay et al., 2016). This social organization helps maintain order and cohesion within the group, allowing for efficient communication and cooperation.

Communication among Hanuman langurs at Girnar Wildlife Sanctuary is multifaceted and plays a crucial role in their social interactions. These monkeys use a variety of vocalizations, facial expressions, and body language to convey messages to one another. They have specific calls for different situations, such as alarm calls to alert the troop of potential dangers or mating calls to attract a mate (Kumar et al., 2018). This sophisticated communication system helps them navigate their environment and coordinate group activities effectively.

In terms of feeding behaviour, Hanuman langurs are primarily herbivores and consume a variety of plant materials, including leaves, fruits, and flowers. They forage both in trees and on the ground, using their dexterous hands to pick and eat food (Deshpande et al., 2019). Their dietary preferences and foraging strategies are shaped by the availability of resources in their habitat, highlighting their adaptability to different food sources.

Hanuman langurs at Girnar Wildlife Sanctuary are territorial animals that defend their home ranges from intruders. They use scent markings and vocalizations to demarcate their territory and communicate with neighbouring troops (Sharma et al., 2021). Maintaining territorial boundaries helps reduce conflicts over resources and ensures the stability of their social groups.

The adaptability of Hanuman langurs is evident in their ability to thrive in various habitats within the sanctuary, ranging from dense forests to open open patches. Their agility and climbing skills enable them to navigate diverse environments and access different food sources (Patel et al., 2018). This

adaptability is a key factor in their survival and success as a species in changing landscapes.

At Jatashankar in Junagadh, Hanuman langurs can be observed living in close proximity to human settlements, as well as in forested areas near temples and water bodies. Their adaptability to different environments allows them to thrive in a range of habitats, from urban areas to forested regions.

The behaviour of Hanuman langurs at Jatashankar is likely influenced by the presence of tourists and pilgrims who visit the area for its religious significance. These monkeys may interact with visitors, forage for food in the vicinity, and exhibit social behaviours within their troops.

Similar to other populations of Hanuman langurs, those at Jatashankar likely exhibit complex social structures, communication systems, and feeding behaviours. Their interactions with humans and other wildlife in the area may also shape their behaviour and adaptation strategies.

STUDY AREA

- ## <u>Girnar wildlife sanctuary:</u>

Girnar wildlife sanctuary is located in the Junagadh district of Gujarat state, it is a part of gir protected Area, which also include the Gir forest national park.

- ## <u>Girnar wildlife sanctuary History:</u>

The Girnar region has a long history of human habitation and religious significance due to the presence of mount Girnar, which is important pilgrimage site for Hindus and Jains. The sanctuary's history of the Gir forest and the conservation efforts for the Asiatic lion.

- ## <u>Girnar wildlife sanctuary Area:</u>

Girnar wildlife sanctuary covers an area of 178 sq. Km. (approximately 69 sq. miles), that is indeed a more precise and current measurement of the sanctuary's size.

- ## <u>Girnar wild life sanctuary hills:</u>

Girnar Wildlife sanctuary is situated in the foothills and slopes of the Girnar mountain range, which is a significant geographical feature in the region. The sanctuary is characterized by its hilly terrain and diverse ecosystem that range from dry deciduous forests to grasslands.

The Girnar mountain range itself is a prominent geographical and religious landmark in Gujarat, India. It is composed of several peaks and hills, with the highest peak being Girnar hill, also known as Guru Dattatreya peak. Which has religious significance for both Hindus and Jains. Girnar is one of the holiest places in Gujarat. Girnar is a collection of mountains (Jatashankar, Ambaji, Datatrey,

etc) in Junagadh. There are exactly 9999 steps from the trail head (Bhavnath) to last temple on the highest peak.

- ## **Girnar wildlife sanctuary flora:**

> ### **Dry deciduous forest:**

The sanctuary is home to various species of dry deciduous trees, such as teak, tendu, Khair, dhavda, dhak, salai

> ### **Grasses and Shrubs:**

Grassland and shrubs vegetation are also part of the sanctuary's landscape, providing food and shelter for animals. Various grass species contribute to the biodiversity of the area.

- ## **Girnar wildlife sanctuary fauna:**

> ### **Mammals:**

Leopard, lion, striped hyaena, jungle cat, ratel, blue bull, four-horned antelope, etc.

> ### **Reptiles:**

Mugger crocodile, Indian cobra, tortoise, monitor lizard, etc.

> ### **Birds:**

Brown capped pygmy Woodpecker, Indian peafowl, eagle, rock bush quail, crested tree swift, etc.

- ## **Weather:**

Girnar has a tropical climate, with winters being very cold and summers being too hot. Throughout the year, the temperature here are summer, winter and monsoon.

➢ **Summer:**

The area experiences summer during the months of March, April, May, and June. Since the temperature would be too high and the atmosphere dry, it is generally not advised for travelling. The temperatures may vary with the highest temperature of 44 degree and the lowest of 23 degrees.

➢ **Monsoon:**

Monsson is a time when girnar gets a moderate amount of rainfall. The months of monsoon here are during July, August and September. Though travellers can choose to go to girnar during this season, it would be difficult to climb the hills during monsoon.

➢ **Winter:**

The winter season here start from October till early February. The temperatures during this season fluctuates between 36 degree and 10 degrees.

• __Intensive Study site: Jatashankar temple trek__

This study is conducted in jatashankar, Junagadh district, Gujarat, India. Jatashankar is located at coordinates 21.5152 degree N and 70.4585 degree S. one river is pass through jatashankar.

➤ __Flora:__

There is a diverse plant species in study area and most common were teak, khair, Ambali, Karanj, Charel, neem etc.

➤ __Fauna:__

There is diverse animal species in jatashankar. Chital, langur, lion, crocodile, nilgai, leopard etc.

➤ __Climate:__

Our data conducted during, February. In that time jatashankar likely cool to mild temperature. Day time temperature might range from around 15 to 25 degree Celsius, with cooler night.

MAP OF STUDY SITE:

MATERIAL AND METHOD

- **Materials:**

➢ Global Positioning System

➢ Stop watch

➢ Camera

➢ Binocular

➢ Data sheet and stationery

- **Method:**

This data was conducted from 30|1|2024 to 4|2|2024. A total of 10 individual of troop representing various age and sex groups are observed.

- **Behavioural sampling:**

The Scan Animal Sampling technique (Altmann, 1974) was used to investigate the time activity budget. data collection was carried out during the daytime.

Hanuman langur troop in the intensive study area were habituated during reconnaissance study to the continuous presence of the observer in the vicinity. observations suggested a scan interval of 5 minutes to be appropriate for the study area.

Observations were recorded from 15–20-meter distance so that focal troop doesn't get disturbed.

The behaviour states in the present study were eating, sitting, grooming, sleeping, moving and other activities. A scan sampling session from dawn to dusk were carried out on hanuman langur.

The activity budgets were computed for hanuman langur. The samples for each activity were averaged on a hour basis and their standard error estimated. Hanuman langur habituated to human presence in Jatashankar were observe from early morning to late evening. Observations were recorded from a distance of 10-20 meter from the animals. Care was taken to avoid the influence of observer's presence on the natural movement of hanuman langur troop. The troop location seen by using a hand-held Global Positioning System (GPS) unit.

The total instantaneous sampling was carried out for 10 hours (8:00 am to 6:00 pm). for this sampling, stop watch\timer and binocular were used to observe the langur in far sight. Data collected from 30|1| 2024 to 4|2|2024.

- ## Behavioural of langur are classified into following categories:

➢ ## Locomotion: (Fig. 1)

The behavioural phenomenon in which hanuman langur produce motion displacing from one place to another place. (Manish Paudel, 2022).

Fig. 1

> **Foraging:**

The behavioural activity shown by langur to search for eating something, licking stone and drinking water.

> **Grooming: (Fig. 2)**

The behavioural activity in which langur search their own fur or other fur for lice, bugs or diet which include rubbing and scratching (Manish Paudel ,2012).

Fig. 2

> **Sleeping: (Fig. 3)**

At the evening when sunset, all individual of each troop would gather around the ground and at the on set of darkness. Thet would climb the trees or sleeping with have numerous branches, straight trunk and dense canopy, for roasting (Suryakant Chaturvedi at al. 2014).

Fig. 3

➢ **Feeding: (Fig. 4)**

Langur are used to take various type of food during day time. They take seeds, fruits, leaves and also eat bananas, grapes, biscuits, ground nuts offered by the tourist. (Biswaneswar, 2005).
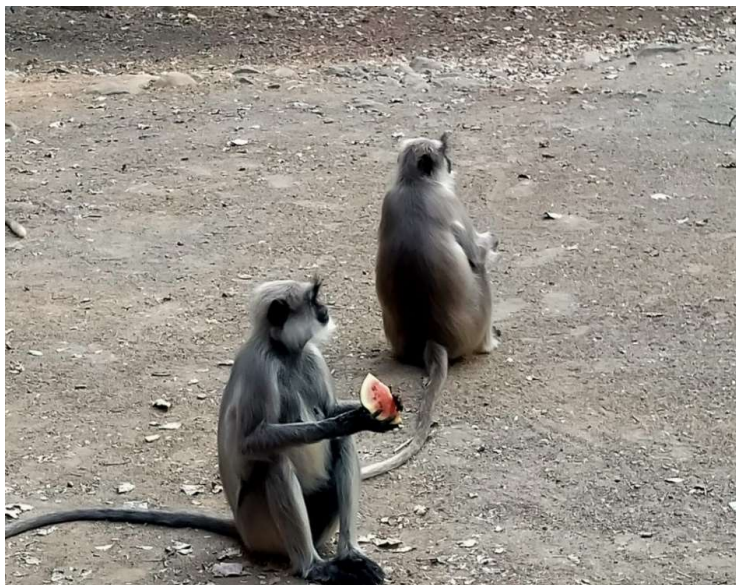

Fig. 4

➢ **Other activity:**

drinking

Hanging

Sitting

Parental care

RESULT & DISCUSSION

Activity

Time	Sleeping Mean (SE)	Eating Mean (SE)	Grooming Mean (SE)	Sitting Mean (SE)	Walking Mean (SE)
8:00-9:55	0.0 (0.0)	11.94 (5.29)	5.35 (2.27)	56.00 (5.38)	6.22 (2.81)
10:00-11:55	0.0 (0.0)	15.87 (5.29)	11.09 (2.31)	54.41 (4.37)	9.14 (3.61)
12:00-1:55	4.34 (1.17)	6.07 (1.44)	27.55 (3.09)	54.68 (3.30)	4.41 (1.52)
2:00-3:55	10.83 (2.71	2.35 (1.14)	17.67 (2.77)	54.88 (3.60)	4.48 (1.41)
4:00-5:55	0.00 (0.00)	29.00 (5.88)	6.09 (2.14)	48.16 (5.42)	6.77 (1.92)

Event

Time	Drinking Mean (SE)	Fighting Mean (SE)	Jumping Mean (SE)	Climbing Mean (SE)	Running Mean (SE)
8:00-9:55	0.00 (0.00)	0.00 (0.00)	7.08 (2.85)	4.03 (1.64)	0.00 (0.00)
10:00-11:55	1.29 (0.89)	0.60 (0.60)	4.76 (1.81)	2.38 (1.40)	0.00 (0.00)
12:00-1:55	1.97 (0.97)	0.00 (0.00)	0.98 (0.73)	0.46 (0.65)	0.00 (0.00)
2:00-3:55	3.21 (1.80)	0.00 (0.00)	3.19 (1.35)	2.34 (1.22)	1.86 (1.87)
4:00-5:55	1.24 (0.86)	0.83 (0.80)	3.10 (1.32)	1.32 (2.59)	1.29 (0.96)

We conducted our study during February and we observe group of 10 langur. And we get below result.

Hanuman langurs are usually active during morning and evening. Both on the ground and in trees. a favourite resting position is to sit on its sub caudal pods, with the tail hanging limp or stretched on the ground behind, the hind legs stretched out in front and raised, resting on some support. (Rashid Ali, at al 2019). But we conducted our study in February, and in winter the hanuman langur was also active during midday. Because of favourable weather condition.

The major activity that found in hanuman langur was sitting. They spent more time in sitting (56.00 ± 5.38), Eating was a second major activity was found in hanuman langur. At the morning and evening the hanuman langur is more active in eating ($29.00 \pm 5.88\%$) and a minimum eating during afternoon ($2.35 \pm 1.14\%$), Because at Afternoon they prefer to rest. Langurs in the forested environments spend 30 to 60% of their activity in feeding (Yoshiba, 1967). Of the total daily activity, feeding at Simla was 40% (Sugiyama, 1976) and at Singer 30% (Oppenhimer, 1973; 1977). The hanuman langur is social animal and they groom each other. The grooming was maximum during afternoon ($27.55 \pm 3.09\%$) and minimum during morning and evening ($5.35 \pm 2.27\%$). In hanuman langur walking activity is minimum because they get food from the tourist and from surrounding plants. ($9.14 \pm 3.61\%$). They spend little time in sleeping ($10.83\% \pm 2.71\%$) during day time because they are a diurnal animal. The locomotion of hanuman langur is dependent on availability of food.

In *Macaca radiata*, the general pattern appears to be the same as in *Macaca mulata.* Rahman and Parthasarathy (1969) studied in this species about 50% of the time is spent in sleeping and grooming, 40% in feeding and 10% in locomotion. While daily activity budget of *Presbytis thomasi* of north Sumatra showed that resting in the most common activity (54 to 66%) followed by feeding

(24 to 40%) and movement (6 to 9%). Parallel results were obtained by Post (1981) for yellow baboons, by Harding (1976) and Rose (1977) for *Papio Anubis.*

There are 5 different categories to observe event, drinking, climbing, jumping, running, fighting.

The drinking event ($3.21 \pm 1.80\%$) seen in langur during afternoon. They spent minimum time in fighting ($0.83 \pm 0.80\%$). The jumping activity was seen maximum in the morning ($7.08 \pm 2.85\%$) and minimum in the afternoon ($0.98 \pm 0.73\%$). and the climbing event was ($4.04 \pm 1.64\%$) during morning and during afternoon ($2.34 \pm 1.22\%$). The running event that found in hanuman langur was only ($1.86 \pm 1.87\%$).

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