

## **Research Paper on Faunal Diversity in Shekhawati Region of Rajasthan**

**Deepa Verma**

*Assistant Professor in Zoology  
Government Science college, Sikar (Raj)*

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### **ABSTRACT**

*The Shekhawati region boasts a significant level of biodiversity, which serves as a compelling draw for researchers, scientists, and biologists. The fauna present within the study area exhibits pronounced adaptations to desert conditions and is not uniformly distributed across the study site. The study was conducted between 2012 and 2013, during which data on Nilgai was observed. The desert region is home to a total of 120 avian species, comprising both migratory and resident birds.*

*The foliage of arid region flora is frequently diminished to spiny and thorny structures in order to mitigate transpiration and conserve water. The Shekhawati region is situated in the northeastern part of Rajasthan and encompasses a mere 8% of the state's total area. The climatic conditions of the region are characterised by extremes, with notably high temperatures during summer and correspondingly low temperatures during winter. The area is situated within a semi-arid climate zone, characterised by infrequent and inadequate precipitation, resulting in limited floral variety. The summer season in the region is characterised by a notable increase in wind velocity, which often results in the occurrence of sand storms as a frequent phenomenon in the area. The prevalence of sand dunes is prominent throughout the region, particularly in the northwestern quadrant. The aforementioned region, which is a constituent of the Indian Thar Desert, manifests a limited range of mammalian biodiversity. Over the past thirty years, there has been a significant decline in the population of large mammals in the Shekhawati region. This can be attributed to human interference in the natural habitats of these mammals, as people engage in activities that benefit themselves.*

*The Shekhawati region exhibits a diverse range of mammals, comprising of 40 distinct species that are classified into 20 families and 31 genera. The aforementioned geographic area encompasses 9% of the total mammalian diversity found in India and 58.8% of the Thar region. In the survey of mammalian species, both direct and indirect methods were employed. Direct methods included the line transect method, while indirect methods involved identifying signs of the species. The transformation of arid terrain into irrigated farming is having an impact on the biodiversity landscape of the area. The disappearance of desert-adapted mammals is occurring at a rapid pace as a result of human interference and destructive actions.*

### **KEYWORDS:**

*Fauna, Flora, Thar Desert, Mammals, Birds, Xerophytic Plants. Biodiversity, Conservation.*

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### **I. INTRODUCTION**

The biotic components of an ecosystem, namely flora and fauna, exhibit a restricted distribution pattern across distinct physiographic regions of the land, and their survival and growth are contingent upon the prevailing climatic conditions of the respective physiographic regions. The state of Rajasthan, located in the northwestern region of India, boasts a vast expanse of land and is considered the largest state in the country. The region is characterised by an arid and semi-arid climate, which provides a suitable habitat for a diverse range of flora and fauna. Rajasthan harbours certain endangered species of flora and fauna within its habitat. The decline of natural habitats of flora and fauna resulting in the loss of biodiversity is attributed to climate change and anthropogenic pressures. The Rajasthan State has designated certain flora and fauna, namely *Gazella bennettii*, *Ardeotis nigriceps*, *Tecomella undulate*, and *Prosopis cineraria* L., as state symbols with the aim of preserving and enhancing their populations as a means of conserving biodiversity.

This study examines the population dynamics, ecology, breeding biology, and pest status of Nilgai in the Shekhawati region of the Thar Desert. Additionally, observations were made on the flora and fauna of the area. The Shekhawati region boasts a significant level of biodiversity, thereby drawing the attention of researchers, scientists, and biologists. Despite the prevalence of desert terrain and limited forest coverage, Rajasthan boasts a diverse and abundant array of flora and fauna. According to Champion's classification in 1936, the vegetation in the area is categorised as Northern Desert Thorn Forest. These are found in discrete clusters dispersed in a relatively unobstructed configuration. The spatial distribution of patches exhibits a positive correlation with both density and size as one moves from the western to the eastern regions, which can be attributed to the corresponding increase in precipitation levels.

The topographically undulating region of 'Vagad' is situated in the southernmost part of Rajasthan, adjacent to the state of Gujarat. Except for Mount Abu, Vagad is the most humid area in Rajasthan and also has the highest forest cover. The Mewar region, which encompasses the cities of Udaipur and Chittaurgarh, is situated to the north of Vagad. The Hadoti region is situated towards the southeastern part of the geographical expanse, bordering the state of Madhya Pradesh. The region of Dhundhar is situated to the north of Hadoti and Mewar, and is notable for being the location of the state capital of Jaipur. The region of Mewat, situated in the easternmost part of Rajasthan, shares borders with the states of Haryana and Uttar Pradesh. Each of these regions exhibits a unique collection of flora and fauna that is specific to the area. The Thar Desert located in the state of Rajasthan comprises a mere 6% of the total land area of the country. In this particular region characterised by challenging weather patterns, a total of 68 mammalian species out of 428, representing approximately 15.8%, have managed to persist.

According to Chakarborthy et al. (2005), a total of 8 orders, 23 families, 45 genera, and 66 species have been documented in the Thar desert of Rajasthan. According to Alfred and Agarwal's (1995) findings, a total of 68 species from 9 different orders inhabit the Thar Desert. The Thar ecosystem is currently undergoing an ecological transformation. The aforementioned alteration has predominantly been instigated by the formidable Indira Gandhi Canal, and to a lesser extent, by worldwide climatic fluctuations. The Indira Gandhi Canal water is predominantly utilised for potable purposes in the Churu and Jhunjhunu districts. The implementation of Canal irrigation has resulted in the observation of shadow effects on flora. As a consequence, 42 plant species in the irrigated area have expanded their distribution to non-irrigated areas. The unregulated mining activities in the Aravalli mountain range, as well as in smaller hillocks located in the Jhunjhunu and Sikar districts, have been observed to have a negative impact on the diversity of flora and fauna in the region. The alteration of floral composition is expected to have a significant impact on the faunal composition of the area. Several mesic species of small mammals have been observed to be extending their range towards the Thar region (Parkash, 1995). Additionally, a number of aquatic bird species have recently been observed to have migrated to the Thar area (Soni, 1994; Idris et al. 2009). The current census of mammalian and avian species will facilitate future population monitoring efforts. In comparison to other districts within the Thar Desert, the Shekhawati region exhibits a relatively lower abundance of carnivorous species and large mammalian diversity. The tropical dry and deciduous forest encompasses a vast area extending from the eastern to the southeastern region of the state. This forest type comprises several distinct forests, such as the Dry Teak, Salar, Bamboo, Dhokra, Palash, Khair, Babul, and Mixed Deciduous Forest.

Rajasthan's fauna is characterised by a diverse array of species. The taxa encompass a variety of organisms, including mammals, reptiles, and avian species exhibiting vivid hues. The prevalent fauna in this region comprises of antelopes and gazelles, specifically the Blackbuck and Chinkara species. The species known as Nilgai (*Boselaphus tragocamelus*) is frequently observed inhabiting expansive grasslands and the lower elevations of the Aravalli mountain range.

The felid family is considered to be the most significant species that contributes a distinctive dimension to the fauna of Rajasthan. Remarkably, this location is among the most favourable habitats for large felines. They have imbued the wildlife in Rajasthan with a distinct charm by seeking refuge in the remnants of temples, relaxing in the bodies of water, and concealing themselves amidst tall grasses. This region is home to a variety of feline species including Indian tigers, leopards, panthers, jungle cats, and caracals. Several of these species are currently classified as endangered and are being conserved within national parks.

The tiger holds dominion over the terrestrial realm, whereas the crocodiles and ghariyals reign supreme in the aquatic domain. Additional reptilian species found in the region comprise of the Indian python, also known as aajar, the Indian chameleon, and the garden lizard. The common mongoose and Indian mongoose are predominantly observed in regions characterised by arid and dry climatic conditions.

## **II. REVIEW OF LITERATURE**

The Line Transects Method, as described by Rodger (1988, 1991), involved the implementation of one square kilometre line transects in various locations within the study area. Observations were conducted by means of walking along the roadside, both on foot and by vehicle. The data collection was conducted during the early morning and late evening periods. The observation of various mammalian species within specific habitats was recorded. Several species of large mammals, such as *Semnopithecus entellus*, *Macaca mulata*, *Boselaphus tragocamelus*, *Antelope cervicapra*, and *Gazella gazelle*, are capable of tolerating the presence of humans and facilitating close-range observations in open fields, dense forests, and hilly regions. The utilisation of 8x40 Olympus binoculars for the purpose of mammal observation was also noted. Photographs were captured utilising the Cannon Supershot and HP 945 digital camera. The water source method was utilised to observe mammals during both daytime and nighttime in the summer season. This was due to the fact that temperatures during this time period reach their peak, resulting in a water crisis. As a result, mammals tend to congregate near

water bodies in search of water. Indirect methods were employed during a field visit to the area for the purpose of identifying mammalian species. The presence of animals in a given area was determined through the careful observation and photographic documentation of various indicators, including animal signs such as pellets, scats, quills, kills, and burrows. The inhabitants of rural areas also assisted us in identifying the presence or absence of mammals through the submission of photographic evidence and pictorial reference materials that are representative of the local fauna.

The taxonomic classification of a perplexing and arduous assemblage of mammals was validated through the submission of photographic evidence to authorities in the field of wildlife biology. Several agricultural and forestry practises have the potential to facilitate climate mitigation efforts while simultaneously enhancing the well-being of rural communities. Collaborative and effective utilisation of resources has the potential to yield significant benefits.

According to EPA (2008), yam holds significant importance as a staple crop in the Northern and Upper West regions. Among these crops, millet exhibits the lowest susceptibility to yield fluctuations induced by climate, with sorghum and maize following closely behind. As a result, all three crops are crucial for ensuring food security. The productivity of rice and cotton exhibits a significantly broader range of variation on an annual basis. During the dry season, certain farmers cultivate vegetables in irrigated plots and gardens.

The Line Transects Method, as described by Rodger (1988, 1991), involved the use of 1 square kilometre line transects in various locations within the study area. Observations were conducted by traversing the roadside on foot or by vehicle. The data collection was conducted during the early morning and late evening periods. The observation of distinct mammalian taxa within specific ecological niches was recorded. Several species of large mammals, such as *Semnopithecus entellus*, *Macaca mulata*, *Boselaphus tragocamelus*, *Antelope cervicapra*, and *Gazella gazelle*, are capable of tolerating the presence of humans. This allows for close observations to be made in various environments, including open fields, dense forests, and hilly regions. The utilisation of 8x40 Olympus binoculars was also employed for the purpose of observing mammals. Photographs were captured utilising the Cannon Supershot and HP 945 digital camera. The water source method was utilised to observe mammals during both daytime and nighttime in the summer season. This was due to the fact that temperatures reached their peak during this time, leading to water scarcity and causing mammals to congregate near water bodies in search of hydration. Indirect methods were employed during a field visit to the area for the purpose of identifying mammalian species. The presence of animals in a given area was determined through the meticulous observation and photographic documentation of various indicators, including but not limited to animal signs such as pellets, scats, quills, kills, and burrows. The rural populace also aided in the identification of mammals through the submission of photographs and pictorial guides, which facilitated the recognition of species that are commonly present or absent in the region.

The taxonomic classification of a perplexing and challenging assemblage of mammals was verified through the submission of photographic evidence to authorities in the field of wildlife biology. Several agricultural and forestry practises have the potential to facilitate climate mitigation while simultaneously enhancing the well-being of rural communities. Collaborative and effective utilisation of resources has the potential to yield significant benefits.

Cereal-based cropping systems prevail in semiarid regions, such as the northern savannah zone in Ghana, where traditional agricultural practises involve intercropping of two or more crops in a single field. According to Stanturf et al. (2011), intercropping is a strategy that mitigates the potential risk of crop failure due to drought or flooding, while also distributing the labour requirements over an extended period. According to scholarly sources, the Upper East and Upper West regions predominantly cultivate millet and sorghum as their primary grain staples, while the Northern Region relies on maize, millet, and sorghum as significant staples (Dietz et al., 2004; Gyasi et al., 2008).

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### **III. MATERIALS AND METHODS**

The Shekhawati region, situated in the northeastern part of Rajasthan within the Thar desert of India, is located between 02° to 29°24' north-east latitude and 73°27' E longitude, at an elevation ranging from approximately 50 to 76°40'N, and approximately 73 to 320 metres above sea level. The aforementioned region spans across a total area of 27,529.44 square kilometres and shares borders with Hanumangarh district to the north, Hissar to the northeast, Bhiwani, Rohtak, and Mahendragarh districts of Haryana to the southeast, Jaipur and Nagaur to the south, and Bikaner district to the west. Limited research has been conducted regarding the survey of extant mammalian species within the Shekhawati region of the Thar desert. Chakraborty et al. (2005)

conducted a survey on the diversity of mammals in the Thar desert on a district level. The current investigation is predominantly founded upon our field observations spanning a period of six years, commencing from May 2008 and concluding in March 2014. The area was partitioned into three distinct sections according to their ecophysiological characteristics. The first of these sections pertains to the middle-eastern portion of the Shekhawati region, which is classified as a flat agricultural zone.

The southeastern portion of the Shekhawati region is characterised by the Arawali mountain range, as well as its foothills and small hilly areas.

The northwestern portion of the Shekhawati region is situated in the Thar desertic area. Throughout all four seasons, the mammals inhabiting the region were subject to year-round monitoring. Throughout the study period, at least one site was visited on a monthly basis for the purpose of documenting the mammals present and their corresponding parameters. The study area was surveyed at a total of 84 sites. The field survey of mammalian species employed both direct and indirect methods. The aforementioned techniques were employed.

The Shekhawati region, situated in the North-Eastern part of Rajasthan within the Indian Thar desert, is geographically positioned between 27° 24' to 29° 02' N latitude and 73° 4' to 76° 5' E longitude, at an elevation of approximately 320 metres above sea level. The aforementioned region spans across a total area of 27,529.44 square kilometres and shares borders with Hanumangarh district to the north, Hissar to the northeast, Bhiwani, Rohtak, and Mahendragarh districts of Haryana to the southeast, Jaipur and Nagaur to the south, and Bikaner district to the west. The region is frequently affected by cross winds, dust, and sand storms, leading to yearly alterations in the topographical features of the sandy ecosystems (Joshi & Sharma, 1964).

#### **IV. RESULTS**

The study area harbours a collective of 40 mammalian species. The aforementioned entities are classified into 8 distinct orders, 20 families, and 31 genera. In India, the order Chiroptera comprises 110 species, of which 18 have been documented in the Thar desert of Rajasthan, while only eight are found in the Shekhawati region.

The orders Pholidota and Lagomorpha are characterised by their relatively diminutive size, as they comprise only one species each within the region. The study area exhibits a maximum of six families in the order Chiroptera, whereas the order Rodentia, comprising 14 species, is the largest, constituting 35% of the total mammalian population (refer to Table 2 and Figure 1). The study region exhibited a notable distribution of various mammalian species, with chinkara, mongoose, and hares being predominantly present in the desertic crop area of the north-western part of the region. Conversely, jackals, foxes, and jungle cats were predominantly observed in the community lands, hilly areas, and near water bodies. The blue bull, desert cat, and various small rodents exhibited widespread distribution across diverse ecological settings. It is noteworthy that two primate species were observed in the vicinity of Shakambari and Lohargarh, Kirdoli, and other southeastern areas of the Shekhawati region. Table-1. The study area under investigation yielded a total of 40 mammalian species. Of these, six species were classified under Schedule I, while one species was categorised under Schedule III. Additionally, five species were listed under Schedule II, six species under Schedule IV, and thirteen species under Schedule V of the Wildlife (Protection) Act of 1972. The remaining species' status was not specified.

Table 1: Checklist of Mammals of the Shekhawati region

A	B	C	D	E	F
<b>Order – Insectivora</b>					
<b>Family – Erinaceidae</b>					
1.	Indian Hedgehog	<i>Paraechinus micropus</i>	–	C	O
<b>Family – Soricidae</b>					
2.	Grey Musk Shrew	<i>Suncus murinus</i>	–	VC	O
<b>Order – Chiroptera</b>					
<b>Family – Pteropodidae</b>					
3.	Flying Fox	<i>Pteropus giganteus</i>	V	C	F
<b>Family – Megadermatidae</b>					
4.	Greater False Vambire Bat	<i>Megaderma lyra</i>	–	VR	C
<b>Family – Rhinolophidae</b>					
5.	Blyth's Horse shoe Bat	<i>Rhinolophus lepidus</i>	–	R	I
<b>Family – Rhinopomatidae</b>					
6.	Greater mouse-tailed Bat	<i>Rhinopoma microphyllum</i>	–	C	I
7.	Lesser mouse-tailed Bat	<i>Rhinopoma hardwickei</i>	–	C	I
<b>Family – Emballonuridae</b>					
8.	Egyptian tomb bat	<i>Taphozous perforatus</i>	–	R	I
<b>Family – Vespertilionidae</b>					
9.	Common Pipistrellus	<i>Pipistrellus pipistrellus</i>	–	C	I
10.	Asiatic Yellow House Bat	<i>Scotophilus heathi</i>	–	C	I
<b>Order – Primates</b>					
<b>Family – Cercopithecidae</b>					
11.	Hanuman Langur	<i>Semnopithecus entellus</i>	II	R	H
12.	Rhesus Macaque	<i>Macaca mulata</i>	II	R	H
<b>Order – Carnivora</b>					
<b>Family – Canidae</b>					
13.	Jackal	<i>Canis aureus</i>	II	R	C
14.	Desert Fox	<i>Vulpes vulpes</i>	I	C	C
<b>Family – Viverridae</b>					
15.	Small Indian Civet	<i>Viverricula indica</i>	II	VR	O
<b>Family – Herpestidae</b>					
16.	Small Indian Mongoose	<i>Herpestes javanicus</i>	IV	R	C
17.	Grey Indian Mongoose	<i>H. edwardsi</i>	IV	C	C
18.	Ruddy Mongoose	<i>H. smithi</i>	IV	R	C
<b>Family – Felidae</b>					
19.	Desert Cat	<i>Felis silvestris</i>	I	R	C
20.	Jungle Cat	<i>F. chaus</i>	II	VR	C
<b>Family – Ursidae</b>					
21.	Sloth Bear	<i>Melursus ursinus</i>	I	–	O
<b>Order – Artiodactyla</b>					
<b>Family – Bovidae</b>					
22.	Nilgai	<i>Boselaphus tragocamelus</i>	III	VC	H
23.	Black buck	<i>Antelope cervicapra</i>	I	C	H
24.	Indian Gazelle	<i>Gazella gazella</i>	I	C	H
<b>Order – Pholidota</b>					
<b>Family – Manidae</b>					
25.	Indian Pangolin	<i>Manis crassicaudata</i>	I	VR	I
<b>Order – Logomorpha</b>					
<b>Family – Leporidae</b>					
26.	Desert Hare	<i>Lepus nigricollis</i>	IV	R	H
<b>Order – Rodentia</b>					
<b>Family – Sciuridae</b>					
27.	Five Striped Palm Squirrel	<i>Funambulus pennanti</i>	IV	VC	H,G
<b>Family – Muridae</b>					
28.	House Rat	<i>Rattus rattus</i>	V	VC	O
29.	Kutch Rat	<i>Cremnomys cutchicus</i>	V	C	O
30.	House Mouse	<i>Mus musculus</i>	V	VC	O
31.	Phillips' mouse	<i>Mus phillipsi</i>	V	R	O
32.	Flat-haired Mouse	<i>Mus platythrix</i>	V	R	O
33.	Sadhu Mouse	<i>Mus saxicola</i>	V	R	O
34.	Bush Rat	<i>Golunda ellioti</i>	V	C	O
35.	Metad	<i>Millardia meltada</i>	V	R	O
36.	Indian desert Gerbil	<i>Meriones hurrianae</i>	V	VC	O
37.	Indian Gerbil	<i>Tatera indica</i>	V	VC	O
38.	Hairy-footed Gerbil	<i>Gerbillus leadowi</i>	V	R	O
39.	Baluchistan Gerbil	<i>Gerbillus nanus</i>	V	R	O
<b>Family – Hystricidae</b>					
40.	Indian Porcupine	<i>Hystrix indica</i>	IV	R	O

The Shekhawati region of Rajasthan exhibits a broad range of habitats due to significant variations in climatic, edaphic, physiographic, topographic, and geological features. The biota present in the study region exhibits pronounced arid adaptations and is not uniformly distributed across the study terrain. The population growth and distribution of flora and fauna are significantly influenced by the climatic conditions prevailing in a given region. Singh (2007) describes the region as possessing a significant number of animals, diverse tree species, and various habitats, thereby constituting a distinctive ecological zone. The region in question may be categorised as a Sub-humid area, utilising climatological data and the presence of reptilian species as determining factors. The area is a sanctuary for a diverse array of avian fauna, encompassing 120 varieties of migratory and non-migratory desert birds. Various species of raptors, including eagles, harriers, falcons, buzzards, kestrels, and vultures, can be observed. The avian species observed in the study include *Circaetus gallicus*, *Aquila rapax*, *Aquila clanga*, *Falco jugger*, and various species of kestrels. Dubey and Shyoran (2011) identified a total of 130 species, which were classified into 92 genera, 33 families, and 15 orders during the study period.

**Table 2: Order and Family-wise distribution of genera and species of mammals in the Shekhawati region.**

S.No.	Orders	Family	Genera	No. of species	% of the Species
1.	Insectivora	2	2	2	5
2.	Chiroptera	6	6	8	20
3.	Primates	1	2	2	5
4.	Pholidota	1	1	1	2.5
5.	Carnivora	5	6	9	22.5
6.	Artiodactyla	1	3	3	7.5
7.	Lagomorpha	1	1	1	2.5
8.	Rodentia	3	10	14	35
Total	8	20	31	40	100

## V. CONCLUSIONS

This communication presents significant insights into the endangered flora and fauna of Rajasthan and their potential conservation through their designation as state symbols, contributing to the preservation of global biodiversity.

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