



Biodiversity Indices and Its Conservation in the Thar Desert of Rajasthan.

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Abstract:

Overall biodiversity assessment resulted in 379 species of higher plants, 09 species of lower plant, 49 species of butterflies, 11 of spiders, 04 species of amphibians, 20 species of reptile, 142 species of birds and 26 species of mammals were reported in the region of Thar Desert. Overall scenario of various species in Thar Desert showed presence of many threatened species, which included flora like *Tecomella undulata*, *Leptadenia pyrotechnica*, *Prosopis cineraria*, *Salvadora persica*, *Ziziphus nummularia*, *Acacia nilotica*, *Crotolaria juncea*, *Capparis deciduas*, *Calotropis procera*, *Calligonum polygonides*, and fauna such as, Indian Starred Tortoise, Common Indian Monitor Lizard, Indian Garden Lizard in reptilian, Indian White-backed Vulture, Egyptian Vulture, Grey partridge, Brahminy myna, Redvented Bulbul, Peacock in Avifauna and Indian Black Buck, Chinkara, Common Mongoose and Desert Cat. In addition, the indigenous knowledge revealed that few species that was very abundant 25 years back showed a decline in their population due to various anthropogenic threats that included illegal cutting, lopping, over-grazing, browsing, hunting, and encroachment of forest land for agriculture. These threats especially habitat loss and habitat fragmentation resulted either into loss of various faunal species from the ecosystem or local extinction of few species for e.g. population of Indian White-backed Vulture had crashed drastically, which is known for its scavenging habit in the ecosystem and important link in the food chain. All this information on biodiversity, disturbances and threatened species were brought into GIS domain through normalization and scaling according to weightage and finally deriving critical areas within the Rotu and outside area for conservation on priority. The conservation action plan involved selection of Focal Target like ecological system, ecological communities and species for which threats were identified and conservation action to mitigate the threats were framed. This was followed by identification of indicators that would help in future monitoring of the conservation action taken up for each of the focal targets. Further, conservation actions for the villages inside and outside, identification of what need to be done in terms of research and monitoring along with systematic monitoring protocol for specific sites, species, disturbance and interventions are also outlined

Key Words: Biodiversity, Leptadenia, Lizard, White-backed Vulture, *Ziziphus*

Introduction:

Rajasthan is the largest state of the country and it is located in the north-western part of the country. It has a geographical area of 342,239 sq. km which constitutes 10.41% area of the country's geographical area. It lies between latitude 23⁰3' to 30⁰12' N and longitude 69⁰30' to 78⁰17' E and shares international border with Pakistan in the west. The temperature in the state ranges from sub-zero to 50⁰C. The average rainfall ranges from 480 mm to 750 mm being as low as 150 mm in arid region and 1,000 mm in south-eastern plateau. The population of the state is 68.62 million (Census 2011) which constitutes 5.67% of the country's population, of this 75.11% is rural and 24.89% urban population. Population density is 201 people per sq km. Rajasthan have the second largest livestock population of the country, which is 56.66 million (Livestock Census 2007). Rajasthan is characterized with tropical climatic conditions. It has distinct physiography on account of the existence of oldest mountain ranges *i.e.* Aravalli. The demarcation line along axis of Aravalli divides the whole state into two major watersheds, *i.e.* the Ganga basin in eastern side and Luni basin in western side. Floral and faunal study is the variety and variability of life on Earth. This includes all the plants and animals that live and grow on the Earth, all the habitats in which they survive, and all the natural processes of which they are related. The earth supports an

incredible array of biodiversity. Unfortunately, the earth's biodiversity is disappearing, with an estimated 1,000 species per year becoming extinct. Conserving biodiversity is especially crucial in developing countries where people's livelihoods are directly dependent on natural resources. Any strategy to slow the loss of biodiversity and to enhance its contribution to development must integrate three essential elements: conservation of biodiversity, sustainable use of its components and the equitable sharing of benefits. This would need on priority to know the actual biodiversity surviving in an area. To assess the floral & faunal status of the Western/ Eastern Thar Desert largely to come up with information that would aid in developing a more systematic biodiversity conservation plan and mainly to work towards a larger biodiversity conservation unit. There is a lack of food and fodder in the RCR so blackbuck and gazelles are migrating to the surrounding villages. One of the reason of this migration is the fear of feral dogs also. As a result, at present, the population of blackbucks is scattered around 20 kms of RCR and near by villages. In these villages, there are several ancient water bodies present like ponds, talab, nadies, annicut and khallies etc. Some of these villages are Ramsar, Dugoli, Kashipura, Gugariyali, Khari-Roja, Tanwara, Chhapara, Jareli etc. In these villages sacred grove, gaucher land, pasture land, oran, agor land and tal (catchment area of nadies and talab) is also present in small amount for fulfilling their need of food and fodder. The closed area is predominantly undulating area, natural water holes or nadies are scarce and perennial water bodies are rare. Rotu Village pond-Charlai, Ramsar village pond and Kashipura village pond are major source of drinking water for wild animals and livestock. Artificial khallies as a source of water are maintained by local people in summer season. Thus it becomes very imperative to gain knowledge on the biodiversity and its distribution of this ecologically and geologically significant Rotu and Outside area located in the Eastern part of Thar Desert. The approach adopted was an integrated method that included ecological, social, cultural factors to the biodiversity in addition to biological factors. The methodology was thus a combination of all these components that focused on biodiversity prevailing in the landscapes and to assess changes in composition and structure of forest vegetation or natural resource due to disturbance caused by various factors.

According to Gupta and Prakash (1975), the origin of the Indian Desert lies with geotectonic and climatic changes during the upheaval of Himalaya and several glaciation epochs. It is delimited by the irrigated Indus plains in the west, the Aravalli hill ranges in the east, Rann of Kutch in the south and the plains of Punjab and Haryana in north and northeast, lying between 22°30' N and 32°05' N latitudes and 68°05' E to 75°45' E longitudes. This has an elevation of about 350-450 m above sea level at the Aravalli range in the east, about 100 m in south and west and about 20 m in Rann of Kutch. The Great Indian Desert comprises in parts of four states of India viz. 3 districts of Punjab i.e. Ferozpur, Sangrur and Bathinda; 4 districts of Haryana i.e. Sirsa, Hissar, Bhiwani and Mahendragarh; 12 districts of Rajasthan i.e. Sri Ganganagar, Hanumangarh, Churu, Jhunjhunu, Sikar, Nagaur, Bikaner, Jaisalmer, Jodhpur, Pali, Barmer, and Jalore; 10 districts of Gujarat i.e. Ahmedabad, Banaskantha, Junagarh, Jamnagar, Kutch, Mahesana, Patan, Porbandar, Rajkot and Surendranagar. The extreme of cold and heat is a special feature of desert climate. There is a wide range of temperature not only between summer and winter but also between day and night. The temperature ranges from freezing point in winter to about 50°C at some places in summer. Since the Thar Desert is beyond the full force of both the south-west monsoon rising from Arabian sea and north-east monsoon rising from the Bay of Bengal, the rainfall is erratic and scanty in this region. The winter rains are rare and drought occur quite frequently. The monsoon remains active from last June to September and the average rainfall is 450 mm in Eastern Rajasthan, 100 mm in Western Rajasthan, 300-500 mm in Gujarat and 200-450 mm in Punjab and Haryana desert. The maximum rainfall is received during the months of July and August, but rainfall may be irregular or scanty or there may be no rains. The relative humidity remains comparatively low. During summer, the winds are generally violent (with 130 km velocity per hour), hot and scorching (loo) laden with dust (vortices of dust). As a result, the shifting of sand dunes is very common in the desert. During winter, the velocity of wind remains considerably low, 4-10 km per hour. With the exception of few plant species, the quick shifting of sand dunes does not allow the plants to settle. Since the light intensity is too high and the relative humidity drops down almost to zero, the evaporation in the desert is excessive during summer season. This desert too has the conventional feature of miles and miles of sand under the burning eye of the Sun, however, the beauty of the desert perhaps lies in the colorful people who inhabit the land along with all the different kinds of animals encountered there. There are small hillocks and gravel plains that are found all over and the biodiversity of this desert is very rich.

This Rotu and outside area is unique as it forms the distribution limit for many of species that has moved from Himalayas, Indo-Malayan and African regions. All these necessitates an in depth biodiversity assessment that could lead to preparing a comprehensive conservation plan for Rotu and outside area, which is presently not

available. With the increasing pressure for exploiting all sorts of natural resources and land for development, it is very imperative to collate/gain knowledge on the biodiversity and its distribution within this ecologically important and sensitive area, unique with its respective landscape diversity and location in the Thar Desert.

Materials & Methods:

Flaoural and faunal assessment was carried out using well accepted scientific methods like plots, point count, area search, perambulation, opportunistic survey in addition to line, belt and vehicle transect. The entire area of the Rotu and outside area was divided into 30" x 30" (c. > 800m x 800m) grids. Based on the extent of each vegetation / forest types, five per cent of the area or the total grids in the specific vegetation type was sampled in three different seasons for the biodiversity (flora and fauna) assessment. The assessment of biodiversity was carried out for two years, in order to capture the between year variation also.

At every 200 m intervals along the transects, plots were laid to quantify vegetation (Mueller-Dombois and Ellenberg 1967 and Kershaw 1973). The plots were of varying size with 15 m radius plots for trees, 8 m radius for shrubs, climbers and recruitment (gbh < 20 cm and height >50 cm) class of tree species and five plots of 1m x 1m for herbs, grass and regeneration class of tree and shrub (< 50 cm height) species, with smaller plots nested within the larger plot. For all trees (>20 cm gbh at 1.3 m height) information on gbh, height, cutting/lopping signs if any and phenology at the time of sampling was recorded. Sampling of lower plants (Pteridophytes, Bryophytes and Mushrooms) was done following the Belt Transect method, along the transect within 10m width, which included the opportunistic sampling using 1m X 1m plots, where ever the plants were encountered. In addition to the plot study, the threatened floral species were also searched along the entire length of the transect within a width of 10 – 15 m (belt-transect). Along these transects whenever a targeted species was located a species specific plot (vary in size according to the plant form) was used to enumerate and record the abundance, phenology, regeneration, associated species, macro & micro habitat parameters (habitats, terrain, slope, substrate, soil type, soil moisture, ground cover, canopy cover and other related environmental information) and site specific threats. In addition using the plant specimen or the photograph of the species, the indigenous knowledge was also documented through interviews of the local villagers and tribes as described in the section on secondary data collection.

Indirect Count: Presence and relative abundance of most of the small and large mammals was evaluated using methods that rely on indirect evidence such as animal burrows/holes, dung, pellets, scats, feeding signs, tracks, nests, digging and antler thrashing. This was done using transects following Rodgers (1991). The passive track counts (Thommpson *et al.* 1989, Allen *et al.* 1996, Mohon *et al.* 1998, Edwards *et al.* 2000), and scat counts (Henke and Knowlton 1995) helped in determining the relative abundance. Further, the camera traps were also used to inventorize the nocturnal, shy and elusive species, for establishing its presence in the area. Along the forest muddy roads and forest trails, if existing in each grid, track plots, which are small platforms, made of sand usually extending to the width of the road or the trail and length of 1 – 2 m was laid to record the tracks of the carnivores. In the case of threatened animal species irrespective of the group, data on the habitat was collected.

Study Areas:

1.1 The Western Thar Desert :

The Western Thar Desert region has extremities of temperature, high velocity of wind and very low humidity. The Thar Desert is located at the crossing where the Palearctic, Oriental and Saharan elements of biodiversity are found (Baqri and Kankane 2002). The Thar is also known for its great civilization in Ghaggar and the Indus river basin. It occupies about 9% of India's geographical area and covers 208,751 sq. km in Rajasthan alone (Rahmani 1997a).

1.2 The Eastern Part of Thar Desert :

Eastern part of Thar Desearth is situated between 26°25' and 27°40' North Latitude 73°10' and 75°15' East Longitude. It is situated amidst seven districts namely Bikaner, Churu, Sikar, Jaipur, Ajmer, Pali and Jodhpur. Nagaur is the fifth largest district in Rajasthan with a vast terrain spreading over 17,718 sq km. Its geographical spread is a good combine of plain, hills, sand mounds and as such it is a part of the great Indian. The climate of this area is conspicuous by extreme dryness, large variations of temperature and highly variable rainfall. The

mercury keeps on rising intensely from March till June. These are the hottest months. The maximum temperature recorded is 47⁰ C with 0⁰ C as the lowest recorded temperature. The average temperature of the district is 23.5⁰ C. The average rainfall in the district is 36.16 cm and 51.5 percentage humidity. STATECOL (Ludwig and Reynolds, 1988) was used to calculate species richness and species evenness. Diversity was calculated at community level using Shannon Weiner index (Shannon and Weaver 1963).

1.3 Rotu Conservation Reserve (RCR):

The Rotu conservation reserve (RCR) was intensive study site, situated sixty five kilometers northeast of Nagaur city. The government of Rajasthan declared this area as closed area on 29th May, 2012. The closed area is a preferred habitat of the blackbuck. The area is spread over 72.86 hectares as core sector. The closed area lies at 27°23'41.08" N 74°9' 57.42" E at an altitude of 337 m above MSL. The area around RCR is mainly with open glassland, plain area or tal surrounded by an agricultural landscape. The closed area is monitored by the wildlife wing of Rajasthan State Forest department.

Results & Discussion:

Although there is clearly a need to assess biological diversity in selected areas (Noss 1990), its value would be enhanced if this were combined with consideration of landscape condition and quality (Majer and Beeston 1996). Landscape harbours all grades of biological hierarchy, from ecosystem level to species and genes that are targeted for biodiversity inventories and conservation (Noss and Harris 1986). Landscape may also include agriculture, forested, protected and ecologically sensitive areas, which interact considerably (Forman and Gordon 1986) and upon which humans have a major influence (Naveh and Lieberman 1990). It is also now well accepted that the assessment of biodiversity needs to be taken-up in a very systematic manner on all such regions that are sensitive repositories of biotic natural resources, so as to plan a systematic conservation strategy for future. Planning for development of natural resources without endangering the environment is a crucial issue, the world is facing today (Khorram and John 1991). Assessment of local biodiversity incorporates two related issues. The first concerns the intrinsic diversity of an area *i.e.* the area with higher diversity may be deemed more important than the one with lower diversity. The second concern is the assessment of the contribution of any given area to the overall diversity of a larger geographic region such as district, state, country, continent or ultimately, the world overall. From this perspective some areas with lower intrinsic diversity may be more important than others with high diversity. Further, as fossil records indicate that in the absence of humans, species persist for an average of one million years (May *et al.* 1995); however, human impacts have now elevated the natural rate of species extinction by at least a thousand times (Pimm *et al.* 1995). Though, the primary threat for most of the terrestrial and freshwater species is the destruction of their habitats (Baillie *et al.* 2004), protected areas have emerged as one of the world's most important and effective tools for safeguarding biodiversity (Burner *et al.* 2001), because they protect these species. Further, as the first ever global gap analysis of terrestrial vertebrate species covered by protected areas found that at least 1400 species are not represented in any protected areas (Rodrigues *et al.* 2004); it becomes imperative to expand the assessment beyond the Rotu and outside area.

This is highly crucial, as one would know what would have been the status of biodiversity in the areas we are working and above all it could serve as a model when we try to restore the degraded community land. In addition from the biodiversity conservation point of view, and the biodiversity value of the Eastern Thar Desert, it was felt that this study would be an initial effort to bridge the large gap in information available on this Rotu and outside area. This data can aid in bringing out a more comprehensive biodiversity conservation plan for these areas and also serve as a base for comparing the areas adjoining the PA, Community protected forest, Sacred groves, Reserved forest and Agriculture ecosystems. The eastern part of desert extends to the Ferozpur, Sangrur and Bhatinda districts of Punjab in the north and to the Mahendragarh and Hissar districts of Haryana in the northeast. The major part of the Thar is occupied either by dry open grassland or by grassland interspersed with trees and thorny bushes. Nearly 58 % of the Thar is covered with sand dunes and interdunal valleys. Many shifting dunes which have stabilized are covered with *Capparis decidua*, *Calotropis procera*, *Calligonum polygonoides*, *Acacia senegal*, *Prosopis cineraria*, *Aerva javanica*, *Aristida adescensionis* and other psammophytic species (Shetty 1994). There are several saline depressions in the Thar with characteristic halophytic vegetation. The major grasses and sedges are *Eleusine compressa*, *Eragrostis ciliaris* and *Dactyloctenium aegyptium*. The most famous saline

depressions are Talchapar, Didwana, Pachpadra, Lunkaransar and Kuchaman. The mammalian fauna of the Thar Desert is diverse with nearly 68 species, which constitute about 18% of the total Indian mammal fauna. Two major carnivores, the Asiatic Lion, *Panthera leo persica* and the Asiatic Cheetah, *Acinonyx jubatus venaticus* have become extinct during the last 100 years, and the Wild Ass, *Equus hemionus khur* has become extinct in Rajasthan during the last four decades but has been recently resighted. Except for Chinkara, *Gazella bennetti* and in some areas Blackbuck, *Antelope cervicapra*, the status of all the larger mammals is unsatisfactory and a few like Caracal, *Felis caracal* are highly endangered. Out of the mammalian fauna of the 68 species, 29 species are listed in the Indian Wildlife (Protection) Act, and hence, need protection, though to a varying degree. Chinkara and Blackbuck are considered sacred by the Bishnoi community and hence are present in large numbers around the Bishnoi villages. The Nilgai, *Boselephus tragocamelus* has a wide distribution in Rajasthan but in the Thar Desert, like the Blackbuck, it is not seen in the extreme arid areas where surface water is not available for most part of the year. However, with the development of canals and agriculture fields, both the Blackbuck and Nilgai are likely to spread. The Thar Desert or Great Indian Desert is the world's tenth largest desert and forms a significant portion of western India and covers an area of about 2,78,330 sq km, of which 1,96,150 sq km (70%) is in Rajasthan, 62,180 sq km (23%) in Gujarat (Krishnan 1977) and about 20,000 sq km (7%) in Punjab and Haryana states. The desert continues into Pakistan as the Cholistan Desert. It is one of the smallest deserts of the world but exhibits a wide variety of habitats and a high biodiversity, due to the juxtaposition of Palaearctic, Oriental and Saharan elements (Prakash 1963). The entire desert in the Indian subcontinent (India and Pakistan) covers an area of nearly half of the Arabian desert and 1/7th of the Sahara desert. This is the most thickly populated desert in the world by having an average density of 133 persons per sq km as against 6-9 persons in other deserts (Baqri and Kankane 2001). The livestock population is also very high and is still increasing, i.e. 46-226 per sq km in different districts. Due to the hostile environment, the Thar desert is considered a fragile ecosystem in which the minor factors may create imbalance in the ecosystem. Despite all these factors, the Thar exhibits wide variety of habitat and biodiversity.

In Rotu area there is a lack of food and fodder in the RCR so blackbuck and gazelles are migrating to the surrounding villages. One of the reason of this migration is the fear of feral dogs also. As a result, at present, the population of blackbucks is scattered around 20 kms of RCR and near by villages. In these villages, there are several ancient water bodies like ponds, talab, nadies, annicut and khallies etc. present. Some of these villages are Ramsar, Dugoli, Kashipura, Gugariyali, Khari-Roja, Tanwara, Chhapara, Ajabpura, Chawli, Dhatiyad, Mangrasar, Dhanani, Manglod, Dugastau, Khinyala etc. In these villages sacred grove, gaucher land, pasture land and tal (catchment area of nadies and talab) is also present in small amount for fulfilling their need of food and fodder. The closed area is predominantly undulating area, natural water holes or *nadies* are scarce and perennial water bodies are rare. Rotu Village pond-Charlai, Ramsar village pond and Kashipura village pond are major source of drinking water for wild animals and livestock. Artificial *khallies* as a source of water are maintained by local people in summer season. To fulfill the requirement of potable water for human population of this area, the water works department is maintaining water supply through pipeline from Matasukh mines R.O. Plant. The major parts of this area are agriculture fields interspersed with scrubland. Here the vegetation is dominated by *Maytenus emarginata*, *Ziziphus nummularia*, *Acacia nilotica*, *Prosopis juliflora* and *Cappris decidua*. The *Prosopis cineraria* trees are widely scattered in this study site. The *Crotalaria burhia* was abundant in this study site. The groundflora mainly comprises of *Eleusine compressa*, *Cypers arenarius*, *Heliotropium strigosum* and *lyceum barbarium*. The harvested land is mainly supported by *Crotalaria burhia* and *Ziziphus nummularia* as associates, however, *Ziziphus nummularia* is lopped by the end of December for the purpose of fodder. Though the harvest is completed by the month of December, the crop residues form food resource for blackbuck. Fallow lands of 2-3 years are mainly comprises of old dry *Crotalaria burhia* along with grasses such as *Cymbopogon*, *Lasiurus indicus* and *Tephrosia purpurea*. During monsoon, large area in put under cultivation for crops such as Bajra (*Pennisetum typhoides*), moth (*Phaseolus aconitifolia*), Guar (*Cyamopsis tetragonoloba*), mung (*Vigna radiata*), Til (*Sesamum indicum*) and in some pockets Jwar. Apart from ungulates like Indian gazelle (*Gazella bennetti*), Blackbuck (*Antelope cervicapra*) and Bluebull (*Boselaphaus tragocamelus*) are found in the closed area and agricultural landscapes are still supporting Indian Porcupine (*Hystirix indica*), Indian Fox (*Vulpes bengalensis*), Desert Fox (*Vulpes vulpes pussila*), Feral Dogs (*Canis famaliaris*). Among birds, Indian Peafowl (*Pavo cristatus*) numbers are abundant. The livestock comprised of buffalo, cows, camels, goats and sheeps. The Bishnois keep less goats and sheep, however, the shepherd community

(Raika) mainly keep sheep but a very few goats. As such biotic competition also exists in the study area. The livestock populations are also sharing the habitats occupied by the ungulates.

Faunal Diversity of the Thar Region

The fauna of any area depends on the characteristics of the habitat. contrary to the general belief, the Indian Desert fairly abounds in animal life, though most of the animals except birds and a few diurnal mammals (such as antelopes, gazelles, *etc.*) are not easily visible to the casual observer. They may dwell into proper niches, such as burrows, long tunnels, under stones, on plant leaves and roots, in ponds, puddles and larger reservoirs and lakes, *etc.* almost all the major phyla of both the vertebrates and the invertebrates are found here, ranging from the tiny, microscopic Protozoa to Mammals. Most of them are nocturnal because they go inside their burrows during day time. Flashy footpads or special systems to conserve the water are special adaptations. Both Flora and Fauna species in the Thar region constitute an invaluable stock of rare and resistant germ plasma which are too valuable from biological point of view. Though the vertebrates are now more or less adequately known taxonomically, the same is not true for invertebrates and perhaps 2-3 times or more of the existing fauna still remains to be explored. Roonwal (1983) made an initial attempt to put together all the information about the known fauna of the Indian desert and reported nearly 1,100 species from the arid districts of Rajasthan. A multiauthored compendium 'Faunal Diversity in the Thar Desert: Gaps in Research' edited by Ghosh, Baqri and Prakash (1996) reports about 2,043 species from single celled animal Protozoa to Mammalia. of these, 619 species are of vertebrates and the rest are invertebrates. This faunal diversity comes to about 2.12 % of total Indian fauna, though the Thar occupies about 9 % of the country. Some species of Reptiles, Birds and Mammals which are characteristic fauna of Thar Desert are shown in Table 1.

Table 1 :- Some characteristic fauna of Desert Ecosystem.

Reptiles	Birds	Mammals
Desert Monitor (<i>Varanus griseus</i>)	Great Indian Bustard (<i>Ardeotis nigriceps</i> Vigors, 1831)	Asiatic Lion (<i>Panthera leo persica</i> Meyer, 1826)
Spiny tailed lizard (<i>Uromastyx hardwickii</i> Gray, 1827)	Houbara Bustard (<i>Chlamydotis undulate</i> Jacquin, 1984)	Indian wild Ass (<i>Equus inager</i> Boddaert, 1785)
Central Asian Cobra <i>Naja naja oxiana</i> (Eichwald, 1831)	Demoiselle Crane (<i>Grus virgo</i> (Linnaeus, 1758))	Caracal (<i>Caracal caracal</i> Schreber, 1776)
	Imperial/Black-bellied Sandgrouse <i>Pterocles orientalis</i>	Desert cat (<i>Felis sylvestris</i> Schreber, 1775)
	White-browed Bushchat (<i>Saxicola macrorhynchus</i> Stoliczka, 1872)	Desert Fox (<i>Vulpes vulpes pusilla</i>)
	Cream-coloured Courser (<i>Cursorius cursor</i> Latham, 1787)	Chinkara (<i>Gazella bennetti</i> (Sykes, 1831))
		Scaly Anteater (<i>Manis crassicaudata</i> Gray, 1827)
		Wolf (<i>Canis lupus pallipes</i> Sykes, 1831)

Surprisingly, serious attempts have not been made to assess the threats to the invertebrate fauna in the changing scenario, though they become the first victim of any habitat destruction. However, significant work has been done on the vertebrate species in the Thar region. The following species of Reptiles, Aves and Mammals are threatened as shown in Table 2, 3 and 4.

Table 2 :- Threatened Reptiles of the Thar Desert.

Order	Family	Genus	Species	Common Name
Squamata	Elapidae	<i>Naja</i>	<i>naja naja</i>	Common cobra
Squamata	Elapidae	<i>Naja</i>	<i>naja oxiana</i>	Central Asian cobra
Squamata	Colubridae	<i>Ptyas</i>	<i>mucosus</i>	Rat snake
Squamata	Agamidae	<i>Uromastix</i>	<i>hardwickii</i>	Spiny tailed lizard
Squamata	Varanidae	<i>Varanus</i>	<i>griseus</i>	Desert Monitor
Squamata	Varanidae	<i>Varanus</i>	<i>bengalensis</i>	Indian monitor

Table 3 :- Threatened Aves of the Thar Desert.

Order	Family	Genus	Species	Common Name
Galliformes	Phasianidae	<i>Pavo</i>	<i>cristatus</i>	Indian Peafowl
Galliformes	Phasianidae	<i>Galloperdix</i>	<i>lunulata</i>	Painted Spurrowl
Galliformes	Gruidae	<i>Grus</i>	<i>virgo</i>	Demoiselle Crane
Galliformes	Gruidae	<i>Grus</i>	<i>grus</i>	Common Crane
Galliformes	Otididae	<i>Ardeotis</i>	<i>nigriceps</i>	Great Indian Bustard
Galliformes	Otididae	<i>Chlamydotis</i>	<i>undulata</i>	Houbara Bustard
Charadriiformes	Glareolidae	<i>Cursorius</i>	<i>Courser</i>	Cream-coloured Courser
Passeriformes	Musicapidae	<i>Saxicola</i>	<i>macrorhynchus</i>	Stoliczka's Bushchat

Table 4 :- Threatened Mammals of the Thar Desert.

Order	Family	Genus	Species	Common Name
Carnivore	Felidae	<i>Panther</i>	<i>pardus</i>	Leopard
Carnivore	Felidae	<i>Felis</i>	<i>chaus</i>	Jungle cat
Carnivore	Felidae	<i>Felis</i>	<i>sylvestris</i>	Desert cat
Carnivore	Felidae	<i>Caracal</i>	<i>caracal</i>	Caracal
Carnivore	Hyaenidae	<i>Hyaena</i>	<i>hyaena</i>	Striped Hyaena
Carnivore	Canidae	<i>Canis</i>	<i>lupus</i>	Wolf
Carnivore	Canidae	<i>Vulpes</i>	<i>vulpes pusilla</i>	Desert Fox
Carnivore	Canidae	<i>Vulpes</i>	<i>bengalensis</i>	Indian Fox
Carnivora	Mustelidae	<i>Mellivora</i>	<i>capensis</i>	Ratel/Honey badger
Perissodactyla	Equidae	<i>Equus</i>	<i>onager</i>	Wild ass/khur
Artiodactyla	Bovidae	<i>Gazella</i>	<i>bennettii</i>	Chinkara
Artiodactyla	Bovidae	<i>Antilope</i>	<i>cervicapra</i>	Blackbuck
Pholidota	Manidae	<i>Manis</i>	<i>crassicaudata</i>	Indian Pangolin

2. Overall status of floral species

The overall status of floral species was derived by inclusion of all species that were noted only in the secondary information, species that was recorded exclusively or only through our field surveys and the common species found in both field and secondary data. Further the percent of species added based on our study to the floral group are given in the following sections.

2.1 Lower Plants

The combination of both the primary and the secondary data on lower plants of Rotu and outside area resulted in a total of 4 species of Pteridophytes. The same for Bryophytes is 3, algae is 2 and mushrooms 1 species (Table.5)

Table 5: Overall Taxonomic Status of Lower Plants (Primary & Secondary Information) in Thar Desart.

Group	Total No.of Species
Pteridophytes	04
Bryophyte	02
Mushroom	01
Algae	02

2.2 Higher Plants: The overall total 379 species were present in Thar Desart areas (Table 6).

Table 6: Overall Taxonomic Status of Higher Plants (Primary & Secondary Information) in Thar Desert.

Total No. of Families	Total No. of Species
78	379

3. Over all status of fauna:

Over all status of faunal found in Thar Desart which is derived from combination of both the secondary data that already exists and the data collected through our field surveys as part of this study.

3.1 Mollusca : The overall status of mollusca reported based on the primary information. A maximum of 06 species was documented from Thar Desert areas. (Table 7).

Table 7: Overall Taxonomic Status of mollusca (Primary & Secondary Information) in the Thar Desert areas.

Total No. of Families	Total No. of Genus	Total No. of Species
05	05	06

3.2 Arthropoda : The overall status of faunal including butterflies and spiders reported based on the primary information. A maximum of 132 species was documented from Thar Desrt areas (Table 8).

Table 8: Overall Taxonomic Status of Arthropoda (Primary & Secondary Information) in the Thar Desart area

Total No. of Families	Total No. of Genus	Total No. of Species
34	91	132

3.3 Butterflies:

The overall status of butterflies reported based on the primary information. A maximum of 49 species was documented from Thar Desart areas. (Table 9)

Table 9: Overall Taxonomic Status of Butterflies (Primary & Secondary Information) in the Thar Desert Areas.

Total No. of Families	Total No. of Genus	Total No. of Species
05	28	49

3.4 Spiders:

The overall status of the spiders, we had recorded 11 species in Thar Desert areas. (Table 10)

Table 10: Overall Taxonomic Status of Spiders (Primary & Secondary Information) in the Thar Desert area.

Total No. of Families	Total No. of Genus	Total No. of Species
06	10	11

3.5 Herpetofauna:

The overall status of the herpetofauna is recorded in the Thar Desert areas, the details of which are given below. Which belong to herpetofauna 24 species belonging to 21 genera and 12 families.(Table 11).

Table 11. Overall Taxonomic Status of Herpetofauna (Primary & Secondary Information) in the Thar Desert areas.

Groups	Family	Genera	Species
Amphibians	2	3	4
Reptiles	11	18	20
Total	12	21	24

3.6 Birds :

Among the birds the overall status was calculated in the similar manner by combining both the primary and secondary data. The overall status of birds after inclusion of the data collected till now to the existing information was 142 species of 89 genera and 33 families (Table 11).

Table 11: Overall Taxonomic Status of Birds (Primary & Secondary Information) in Thar Desert area.

Groups	Family	Genera	Species
Birds	33	89	142

3.7 Mammals:

The overall status of mammals in Thar Desert area was 26 species, which belonged to 22 genera and 12 families. (Table 12).

Table 12: Overall Taxonomic Status of Mammals (Primary & Secondary Information) the Thar Desert Area.

Groups	Family	Genera	Species
Mammals	12	22	26

Conservation values of the floral & faunal species in the Thar Desert Region:

This study was taken to assess the biodiversity (Faunal & Floral) of Thar Desert which is spread over in the Eastern & Western Thar Desert region largely to come up with information that would aid in developing a more systematic biodiversity conservation plan and mainly to work towards a larger biodiversity conservation unit. There is a lack of food and fodder in the Thar Desert so blackbuck and gazelles are migrating to the surrounding villages. One of the reasons of this migration is the fear of feral dogs also. As a result, at present, the population of blackbucks is scattered around 20 kms of RCR and near by villages. In these villages, there are several ancient water bodies like ponds, talab, nadies, annicut and khallies etc. present. Some of these villages are Ramsar, Dugoli, Kashipura, Gugariyali, Khari-Roja, Tanwara, Chhapara, Ajabpura, Chawli, Dhatiyad, Mangrasar, Dhanani, Manglod, Dugastau, Khinyala, Silanwad, Dhigasari, Gorav, Sandas, Kanota, Khara Manjara, Khabriyana, Mundiya, Bagsara Athuna, Akoda, Jareli etc. In these villages sacred grove, gaucher land, pasture land and tal (catchment area of nadies and talab) is also present in small amount for fulfilling their need of food and fodder. The closed area is predominantly undulating area, natural water holes or nadies are scarce and perennial water bodies are rare. Rotu Village pond-Charlai, Ramsar village pond and Kashipura village pond are major source of drinking water for wild animals and livestock. Artificial khallies as a source of water are maintained by local people in summer season.

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