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Mammalian Diversity in Thar Desert Habitat of Tharparkar District, Sindh, Pakistan

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Abstract.- We studied the mammalian fauna in the desert lands of Tharparkar district during the period April 1, 2013 to April 10, 2013. An attempt has been made to assess the current conservation status of the mammals occurring in part of Thar Desert in Pakistan. Thirty five (35) species were recorded from different habitats of the district. Majority of species belonged to order Rodentia followed by Carnivora. The rodents dominated the mammalian fauna, being represented by 15 species. *Gerbillus gleodowi* and *Meriones hurrianae* were the most dominant and abundant, followed by *Tatera indica* and *Mus* species. Among the 10 species of Carnivores, majority are rare in distribution; either endangered or near threatened. Of the Ungulates Indian wild ass *(Equus hemionus*) is near extinction in the Rann of Kutch (Pakistan part). Striped hyaena *(Hyaena hyaena*), chinkara or Indian gazelle (*Gazella bennettii*), and nilgai or bluebull (*Boselaphus tragocamelus*) are species of concern which need protection for extended conservation status. Some of the potential threats and expected environmental impacts due to energy exploration activities in Thar Coal Power Project blocks are discussed.

Keywords: Biodiversity, conservation status, mammals.

INTRODUCTION

The Thar Desert of Pakistan has resulted from geo-tectonic and climatic changes in the past, more than hundred thousand years ago (Wadia, 1960; Ahmed, 1969). It has also been claimed and argued by many historians that the Thar Desert is even older since towards west, it almost continues into Sahara Desert through Middle Eastern deserts. As a consequence, its flora and fauna is a mixture of palaearctic and Indo-Malayan elements (Prakash, 1974), a very interesting phenomenon from bio-geographic point of view. The abundant distribution of certain animals like blackbuck (*Antelope cervicapra*), Indian gazelle, blue bull, wild-boar (*Sus scrofa*) and many other animals was, in the recent past, so high that it will be worthy of investigation as to how such large populations were sustained and how did they withstand the climatic vagaries, extremes of temperature and paucity of water (Yousaf, 1988). The distinctive soft sand undulating regions of Thar Desert and gravel desert plains around Nagarparkar, near the Rann of Kutch, contain remaining population of the caracal or the desert lynx *(Felis caracal*) and the only remnant population of the Indian wild ass in Pakistan.

Before the turn of the last century large mammals like lion (*Panthera leo*), cheetah (*Acinonyx jubatus*) and the desert lynx were fairly common in the southern part of the desert. Even up to 1930s very large herds of blackbuck, nilgai, and wild boar were found in many desert areas (Prakash, 1988). Tiger (*Panthera tigris*) and panther (*Panthera pardus*) occurred in fair numbers in the rocky habitat. However, at present their populations have dwindled to a point of extinction, the lion and cheetah are already lost from the desert. The only mammals of conservation importance surviving in remote parts of the desert are the Indian gazelle and the desert hare (*Lepus nigricollis*). Even the predatory carnivores like the jackal (*Canis aureus*), wolf (*Canis lupus*), desert cat (*Felis lybica*), desert fox (*Vulpes vulpes*) and the Indian wild ass in the Rann of Kutch have succumbed to the greed of the man for their pelts (Prakash, 1975a). However to a greater extent, the nilgai or the blue bull is exception to this situation.

The undulating sand tracts of Thar Desert are the home of quite a specialized animal forms and probably, the last haven of many a vanishing

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species. The Thar Desert contains highly diversified mammalian fauna (Siddiqi, 1961, 1969; Ahmad and Ghalib, 1979; Roberts, 1997). Most of the species have not been studied in depth from conservation point of view. Ahmad (1992) briefly described the conservation status of ungulates in Pakistan, including regions of Thar Desert. Accordingly most of them are now rare with the exception of wild boar whereas all other species (*e.g*. Indian wild ass; nilgai; blackbuck and Indian gazelle) are generally on the decline in their habitat. In the deserts it is the only wild mammalian fauna that can reflect variation in geographical distribution and environmental changes through time. Most of the species found in Thar Desert during prehistoric and historic times are to be found even today and they represent a biological continuity (Prakash, 1958, 1974; Nath, 1968; Misra, 1988).

Of all variety of mammals, the rodents are numerically the most abundant species of desert lands around the world, and in Thar Desert too (Prakash, 1975b). Rodents constitute one of the largest mammalian groups in the Thar Desert of Pakistan, both in total number and in the number of species represented (Akhtar, 1958-60; Ellerman, 1961; Siddiqui, 1961, 1969; Mirza, 1969; Roberts, 1997). Some of the rodent species recorded in Tharparkar district have been studied by various workers. Khokhar and Rizvi (1991) recorded outbreak of Indian hairy- footed gerbil, *Gerbillus gleadowi* in Tharparkar district. Ghalib *et al*. (2008) and Rafique *et al*. (2010) reported mammalian fauna, including rodents, of Chagai and Nara deserts, respectively.

Rodents impact on the desert vegetation by gnawing, debarking, cutting and feeding is very serious. The crops and rangelands cannot attain their optimum productivity without a rodent control programme. Khokhar and Rizvi (1991) estimated rodent damage caused to millet and guar in four talukas of Tharparkar district which amounted to productivity loss of 13,748 and 1995 m tons respectively. Khan (2012) reviewed bio-economic impacts of vertebrate pests on crops with special reference to rodent pests in Pakistan. The rodents, therefore, are regarded to be the most potent enemies of man in the desert (Prakash, 1974, 1975a). Based on the frequency of their occurrence in large numbers in various habitats of Rajashtan Desert, 60% Indian desert jird *Meriones hurrianae* have been collected from the sandy habitat, 17% from stony plains and the rest from ruderal habitat (Prakash and Ghosh, 1975; Prakash, 1962, 1981).

The study was conducted during the period April 1, 2013 to April 10, 2013 with the objective of determining the diversity and conservation status of mammals in Thar district of Sindh.

MATERIALS AND METHODS

Study area

In Pakistan, the Thar Desert covers eastern Sindh, having tropical desert climate (Fig. 1). This desert land is an undulating vast plain of soft sand. In certain localities *e.g*. Nagarparkar outcrops of hills and large stony plains form a part of its topography. The only hills of Tharparkar desert, named Karoonjhar, are in the extreme south-east corner of Nagarparkar Taluka. These hills are spread over approximately 20 km in length and attain a maximum height of 300 m. Tharparkar district is one of the major parts of the Thar Desert with a total area of 22,000 km^2. A large proportion of farmers in the Thar Desert depend on animal husbandry for their livelihood. Agriculture is not a dependable proposition in this area. The months of April to June are the hottest ones (av. max. 42.4°C; av. min. 20.7°C) while December to February are the coldest months (av. max. 29.5°C; av. min. 7.6°C). Annual rainfall varies from 1 to 76 mm. The natural vegetation of this dry area is classified as Northern Desert Thorn Forest, occurring in clumps scattered more or less openly. Trees dominate with *Acacia* species such as *Acacia jacquemontii* (Desert acacia), *Acacia leucophloea* (White bark acacia) *and Acacia senegal* (Gum Arabic). Other tree species include *Albizia lebbeck* (Flee tree), *Azadirachta indica* (Neem), *Prosopis cineraria* (Kandi), *Salvadora oleoides* (Salvadora), *Tamarix articulate* (Tamarisk), *Tecomella undulate* (Iron wood), *Anogeissus rotundifolia* (Indrokh) and *Ziziphus mauritiana* (Indian plum). Prominent shrubs include *Calotropis procera* (Milk weed), *Ziziphus nummularia* (Ziziphus), *Euphorbia neriifolia* (Euphorbia), *Commiphora wightii* (Indian Bdellium)

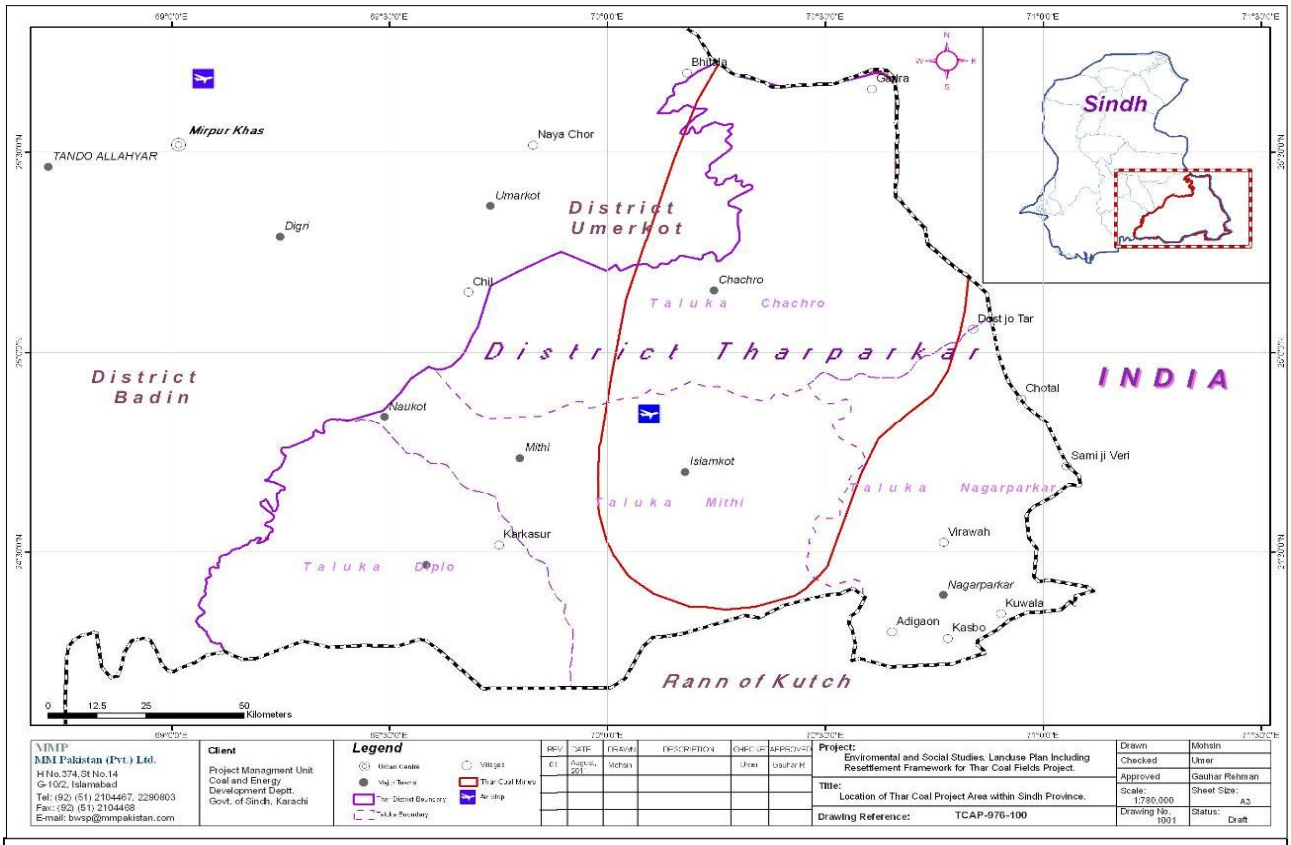

Fig. 1. Location map of the study area; Tharparkar District.

and *Capparis decidua* (Caperberry). Grasses and herbs of grazing importance include *Dactyloctenium scindicum* (Crow foot grass), *Cenchrus* biflorus (Indian sandbur), *Cynodon dactylon* (Bermuda grass), *Panicum turgidum* (Desert grass), *Desmostachya bipinnata* (Deep root grass), *Sehima nervosa* (White grass), *Citrulus colocynthis* (Bitter apple) and *Tribulus terestris* (Puncture vine).

Sampling procedure

Four Talukas / Tehsils (Mithi, Diplo, Chachro and Nagarparkar) of Tharparkar district (22,000 km^2) were sampled to record, identify and assess species richness of mammals in the area. Sampling of small mammals was conducted in the interior of a quadrate (500x500m) which was established 500m away from the metalled road (on both sides alternatively) and similarly along gravel roads in the interior of the desert. Such quadrates were established 15-20km apace. Altogether, 82 quadrates were established at different locations in the study area.

For small mammal assessment (rodents, hedgehogs, mongoose etc.), burrows, burrow systems and colonies were recorded in different habitats. In some areas (Mithi and Nagarparkar) rodents were recorded at night through spotlighting. Medium-sized and large mammals were recorded through signs such as foot prints, scats and dens, also by gathering information from locals, hunters and game watchers of the Department of Wildlife, Sindh. In certain cases (*e.g*. chinkara and nilgai) direct observations were made using field binocular. All species were arranged according to taxonomic classification and their IUCN conservation status determined (Sheikh and Molur, 2005; IUCN, 2015).

RESULTS AND DISCUSSION

Survey results are summarized in Table I. Thirty five (35) species of mammals were recorded. Among these, 15 species belonged to Rodentia; two insectivores; two chiropterans; one lagomorph, 10 carnivores; four ungulates; and one Pholidota. The order Rodentia dominated the mammalian fauna of Thar Desert, followed by Carnivora, covering four talukas of Tharparkar district.

Nilgai, striped hyaena and wild ass were recorded only from Nagarparkar taluka. In the upper desert half of Nagarparkar, hyaena is absent as it was recorded only from lower hilly area. Locals and game watchers were of the opinion that there may be 40-50 hyaenas in Karoonjhar Hills cluster and adjoining areas (*e.g*. Ranpur, Mokrio, Dighano, Worawo, Churio, Janagaam, Wadhra, Deansee, Khaar Sar and Daidwero hills). Human dislike towards striped hyaena is the single most threat to its survival. Wanton and needless killing by livestock owners is the major cause of reduction in the numbers over its distribution range in Nagarparkar. Currently, there is no management plan for the conservation of striped hyaena in Karoonjhar Hills.

Nilgai is distributed in areas of Ranpur, Cheetra Sar, Bartala, Kasbo, Bako, Veeka Sar, Soora Chand etc. These areas are thickly vegetated with mesquit (*Prosopis juliflora*). During this field study, at Cheetra Sar 6-8 male nilgai were observed. According to Sindh Wildlife Department field workers there may be 175-200 animals in these areas. With this size, the nilgai has potential chances of establishing permanent breeding grounds in Nagarparkar.

Wild boar is being reported for the first time from Nagarparkar and shares the nilgai habitat. In Diplo, chinkara habitat was sampled. In Union Council Mar Norer ($24^{o}51^{'}08.3^{"}$ N and $69^{o}51^{'}07.8^{"}$E) six chinkara were spotted resting under the shades of *Salvadora oleoides tree*. In Diplo, union councils of Mar Norer and Mar Amer, and in Chhachhro, union council of Chilhar are the potential habitats of chinkara. Wildlife Department Office of Tharparkar district has estimated around 100 animals in 0.3 km^2 area in the two union councils of Diplo. Illegal hunting and cutting of *Kandi* are the main threats to the survival of chinkara in Thar Desert. *Kandi* provides feed and shelter to this animal. If permanent protection is provided to chinkara in Thar Desert they could rapidly recover in great numbers. This could only be possible by strict enforcement of law and with the best cooperation of Desert Rangers, and local communities. These three mammal species have already created human-wildlife conflicts because they cause economic losses to farmers and livestock owners (Prakash, 1988).

The studies conducted in the deserts of India and Pakistan have indicated that rodents are dominant part of the mammalian fauna (Prakash *et al*., 1971; Roberts, 1997; Ghalib *et al*., 2008; Rafique *et al*., 2010). Among the species, the gerbils are the most abundant and dominant rodent fauna. The hairy-footed gerbil prefers sand dunes and they are fairly abundant in the 100 mm rainfall zone of the desert. This makes them able to live in shallow, simple burrow systems from which it can find its way out even when these are buried under the blowing sand (Prakash, 1975 b). Indian desert jird populations were not found over the loose, shifting sand dunes; they prefer sandy plains and inter-dunal flats where they make extensive and deep burrow systems. Antelope rat, *Tatera indica* has a marked preference for the ruderal habitat and crop fields. In the sandy habitat, Indian desert jird was found to be the most common rodent while hairy-footed gerbil populations were found to be the next in the order of abundance in this habitat. In the gravel plains of Nagarparkar Indian desert jird and Antelope rats were fairly distributed while other species were found in low numbers. The rodents' role in the intensification of desertic conditions may be comprehended from the fact that a single species, viz., Indian desert jird, is able to excavate about 61,400 kg of stabilized soil per/km^2 per day during summer and deposit it outside its burrow openings in a loose formation (Prakash, 1962). This dug-up sandy soil is easily blown away by the strong desert winds. The rodents, thus, are a prime biotic factor for soil erosion in desert lands.

Pakistan Mammal's Red List Assessment made in 2005 (Sheikh and Molur, 2005) indicated that majority of small rodent mammals recorded in Tharparkar district are of least concern except that

Table I.- Mammalian Fauna and their Conservation Status in Thar Desert, Sindh, Pakistan.

Sr. No.	Order	Family	Common name	Zoological name	Conservation status (IUCN 2015.1)	Local population status
1	Insectivora	Erinaceidae	Long eared hedgehog	1. *Hemiechinus collaris*	Least Concern	Fair
		Soricidae	House shrew	2. *Suncus murinus*	Least Concern	Fair
2	Carnivora	Felidae	Caracal desert lynx	3. *Felis caracal*	Least Concern	Rare
			Jungle cat	4. *Felis chaus*	Least Concern	Rare
			Indian desert wild cat	5. *Felis silvestris*	Not Evaluated	Rare
		Herpestidae	Grey mongoose	6. *Herpestes edwardsi*	Least Concern	Fair
			Small Indian mongoose	7. *Herpestes javanicus*	Least Concern	Fair
		Canidae	Asiatic jackal	8. *Canis aureus*	Least Concern	Rare
			Indian desert fox	9. *Vulpes vulpes*	Not Evaluated	Fair
			Bengal fox	10. *Vulpes bengalensis*	Least Concern	Rare
		Hyaenidae	Striped hyaena	11. *Hyaena hyaena*	Near Threatened	Rare
		Mustelidae	Ratel or honey badger	12. *Mellivora capensis*	Least Concern	Rare
3	Chiroptera	Rhinopo matidae	Mouse-tailed bat	13. *Rhinopoma microphyllum*	Least Concern	Fair
		Vespertilionidae	Lesser house bat	14. *Scotophilus heathii*	Least Concern	Fair
4	Pholidota	Manidae	Indian pangolin	15. *Manis crassicaudata*	Endangered	Rare
5	Artiodactyla	Bovidae	Chinkara	16. *Gazella bennettii*	Least Concern	Rare
			Nilgai or bluebull	17. *Boselaphus tragocamelus*	Least Concern	Fair
		Suidae	Indian wild boar	18. *Sus scrofa*	Least Concern	Rare
6	Perissodactyla	Equidae	Indian wild ass	19. *Equus hemionus*	Endangered	Rare
7	Lagomorpha	Leporidae	Indian or desert hare	20. *Lepus nigricollis*	Least Concern	Common
8	Rodentia	Sciuridae	Northern palm squirrel	21. *Funambulus pennantii*	Least Concern	Common
		Hystricidae	Indian crested porcupine	22. *Hystrix indica*	Least Concern	Fair
		Muridae	Soft furred field rat	23. *Millardia meltada*	Least Concern	Fair
			Indian desert jird	24. *Meriones hurrianae*	Least Concern	Abundant
			House mouse	25. *Mus musculus*	Least Concern	Fair
			Short tailed mole rat	26. *Nesokia indica*	Least Concern	Rare
			Indian hairy-footed gerbil	27. *Gerbillus gleadowi*	Least Concern	Abundant
			Balochistan gerbil	28. *Gerbillus nanus*	Least Concern	Fair
			Little Indian field mouse	29. *Mus booduga*	Least Concern	Common
			Sand-colored rat	30. *Milardia gleadowi*	Least Concern	Common
			Roof rat	31. *Rattus rattus*	Least Concern	Common
			Indian gerbil	32. *Tatera indica*	Least Concern	Common
			Grey spiny mouse	33. *Mus saxicola*	Least Concern	Common
			Kutch rock rat	34. *Cremnomys cutchicus*	Least Concern	Rare
			India bush rat	35. *Golunda ellioti*	Least Concern	Fair

Balochistan gerbil and Cutch rock rat that may be struggling at the local level. Rodents distributed in the desert are able to withstand the climatic vagaries; extremes of temperature and paucity of water by adapting to nocturnalism, metabolic water generation and by behavioral adjustment. According to IUCN Red List of Threatened Species (2015), two species of the recorded mammals of the surveyed area (Asiatic wild ass and Indian pangolin) are Endangered, one species (Striped hyena) is Near Threatened, 30 species have Least Concern status whereas two species have not been evaluated for IUCN Red List (Table I).

Apparently, there are no physical and biological threats to small rodent mammals in the study area except drought. Indian pangolin or scaly-anteater is, of course, one species which remains under pressure due to illegal hunting for formulation of local medicines or export of its scales. Ungulates and carnivores of Thar Desert are under great pressure because of habitat destruction and illegal hunting. Ecological transformation of vast areas (inter-dunal flats/valleys) is a potential threat, due to bringing land areas under cultivation. The major threat to artiodactyls survival in the desert is the transformation of grasslands into crop lands. The wildlife are, therefore, pushed towards bare sand dunes where there is very little to feed upon; as a result the large herbivores (nilgai and chinkara) turn to agricultural crops attaining a pest status thus giving rise to human-wildlife conflicts.

For many decades the livestock (cattle, sheep, goats etc.) numbers have registered a linear increase in the Tharparkar district. The Thar Desert has been and is being overgrazed by increasing numbers of livestock. The net result is ecological havoc of several dimensions with further deterioration of ecosystems; the forces of desertification intensify their destructive activities and cause loss of wildlife in a considerable way. The most important ecological implication of over grazing would be a possible threat to the stability of the desert ecosystem. More the intensive grazing, barer the soil surface, eventually, more loss of the top soil through wind and water erosion. The impact of over grazing would be most pronounced in top forage species such as *Ziziphus nummularia, Salvadora oleoides, Prosopis cineraria* etc. The utilization of shoot apex during grazing adversely affects herbage production for *Cenchrus ciliaris, C. setigerus* and *C. biflora* grass lands, a favourable habitat for the survival of desert hare. The livestock often compete with the wild herbivores which thrive in desert lands for common feed resources. The last hazard of overgrazing that needs to be emphasized is the serious threat that domestic livestock pose to the health of wild ungulates because of sharing common grazing grounds and water holes.

The increasing human population is a serious stress particularly on the vegetation of the Thar Desert. The trees and shrubs, and their roots are indiscriminately removed by the rural population for fuel, top, feed, thorn, fencing and construction of thatched hutments. The desert people have developed peculiar food habits. All the available air-dried seeds and pods of trees are used as delicacies. The seeds of *Acacia senegal*, the fruits of *Capparis decidua*, the pods of *Prosopis cineraria* and fruits of *Ziziphus nummularia* are harvested in bulk. The seeds of some grasses are mixed with millet for making *Chapatis* during the drought years. The intensity with which seed collection is made for direct human consumption throughout the Thar Desert seriously affects the natural process of regeneration of desirable plant species. Climate change is having a grave impact on Tharparkar, with frequent droughts which result in large scale destruction of vegetation cover and wildlife.

Massive development of energy projects and services sector in Thar Coal Power Project Areas will put serious impacts on ecology of area and, along with; will bring many socio-economic changes in urban and rural communities. One of these will be the destruction of wildlife habitat by bringing vast areas under power plants, gas exploration, coal mining, road networks, transmission lines and urbanization. As a consequence, the quality of air and water will deteriorate due to the presence of chemical pollutants and contaminants.

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