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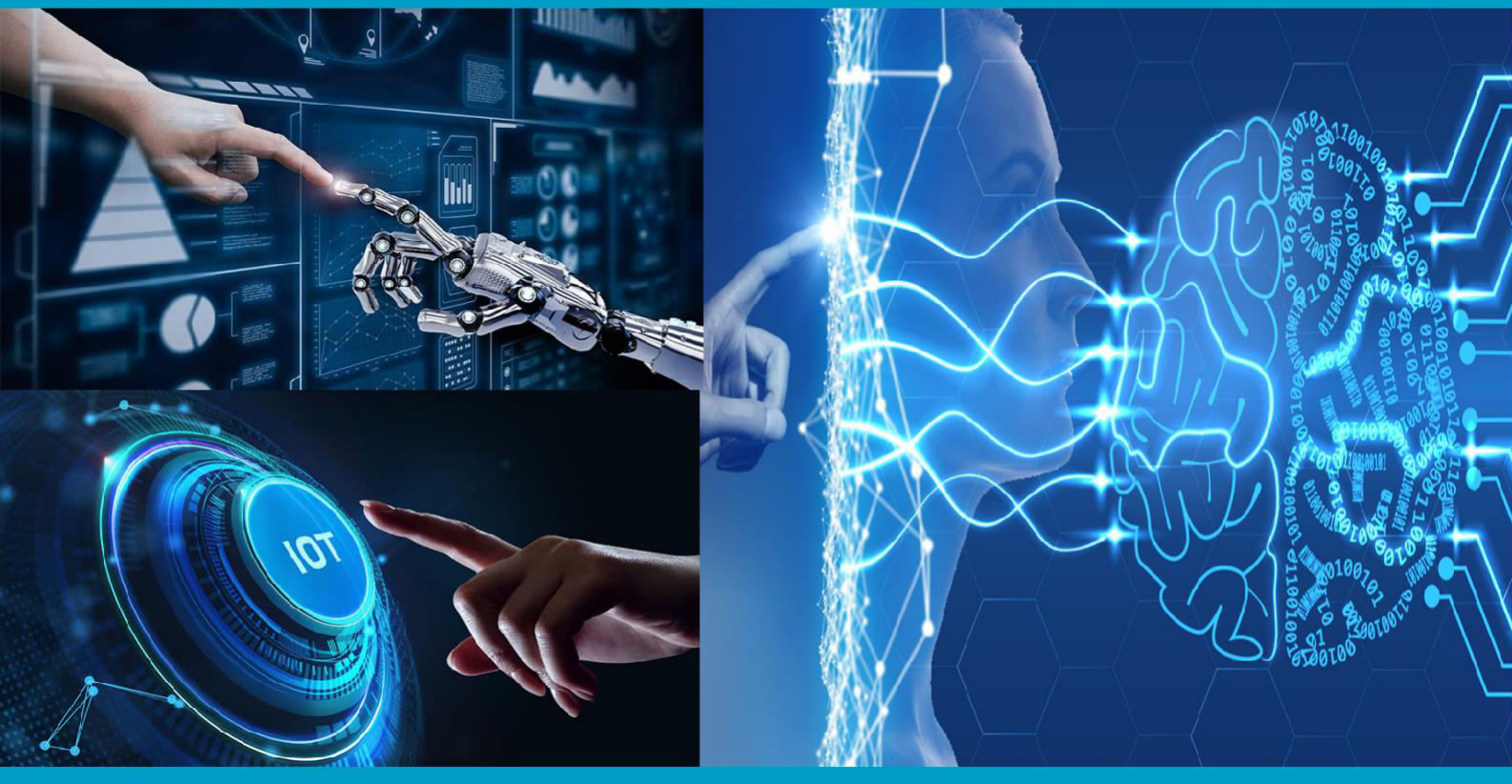

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Biodiversity of Indian Thar Desert and Their Conservation Strategies

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ABSTRACT: Biodiversity of Thar desert in Rajasthan, India, includes all organisms, species, and populations. Due to harsh climate in deserts, only some of the most unusual plants and animals can survive in such regions. Most of them are succulents, which mean that they store water.The great wealth of plant and animal life in Thar desert area are also an important source of local livelihoods. Many of the wild plants are an important source of food for local communities. Mushrooms, medicinal plants, honey, fruits, berries, leaves, young roots and shoots of many edible wild plants provide valuable nourishment and constitute an important food reserve especially during droughts which is a characteristic feature .The desert biodiversity can be maintained and exploited sustainably by introducing community based resource management practices and establishment of ample protected areas for conserving threatened flora and fauna.In order to mitigate the problem of biodiversity loss in these areas, efforts are required to provide alternate sources of energy to the rural communities such as solar, wind, biogas, etc. to reduce pressure on already fragile natural habitats which will lead to conserving biodiversity in Thar desert ecosystem.

KEYWORDS: biodiversity, thar, desert, ecosystem, plants, fauna, conservation, habitats, natural

I. INTRODUCTION

Thar desert receives less than 13 inches of rain each year, and summer temperatures can exceed 120°F! Winter temperatures can drop into the 20s.Plants that live in Thar desert must be specialized to deal with high temperatures and very little water. This typically means cacti. Cacti don't have true leaves; rather, they have spines, which help protect them from being eaten. The chloroplasts, or specialized cells that perform photosynthesis (or derive energy from the sun) of cacti have been modified to store water. [1,2] Also, these plants have a shallow root system that can rapidly absorb water during the rare times of rain. The animals found in Thar desert ecosystem are also highly specialized to this unique environment. Animals that have evolved to live in the desert are called xerocoles. The main reasons these organisms can survive in Thar desert is because they don't sweat and can retain water. Camels can survive in temperatures up to 120°F without breaking a sweat! However, these large mammals are a rarity. Most animals found in hot deserts are much smaller, such as rodents, rabbits and coyotes. You'll notice that these animals all have very large ears;[3,4] this helps them evaporate off heat and keep them cool. You'll also find numerous insects, mainly scorpions, ants and beetles, and reptiles, such as snakes, tortoise and lizards. Birds, such as the roadrunner and hawks, are also found in deserts.[5,6]

Thar Desert conjure up specific ideas about topography: typically, that they are dry and sandy dunes or rock, or a mixture of both. This means a high rate of water loss through plant reclamation (called transpiration) and through evaporation. These two aspects are combined into something called evapotranspiration.

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Map of the Thar Desert ecoregion

This is the amount of water that the landscape would lose when available .For Thar desert, evapotranspiration ratio exceeds average annual rainfall by anything from 2:1 to 33:1. The higher the ratio, the less available moisture there is. The coarse nature of the soil means most moisture seeps through the top soil rapidly.[7,8] Thar desert may receive far more than the "average" in one year and not experience any rainfall the year before and the year after. Thar desert will differ depending on their climate and location and their overall aridity can influence many things, not least of all the ecology, food chain, plant and animal types. High evaporation leaves behind higher salt levels, affecting further which plants can grow and the individual size and the numbers of herbivores that may feed on them and, in turn, carnivores. Some experience vast temperature fluctuations, especially hot deserts which may reach unbearable heat during the day and extreme cold at night. This is because the rock and sand absorb heat during the day and releases it at night. There may also be an extreme variation between warm and cool seasons, including extreme winds and storms due to the mixing of cold and warm air.[9,10]

Typical botany include succulents such as cacti which do not have leaves like other species, but spines to protect the fleshy body of chloroplasts adapted to store water, and shallow roots to quickly absorb the little moisture that makes it into the topsoil before evaporating away or soaking through. Similar specialization is also true of fauna which have high water retention, do not have the capability to perspire, and tend to be cold-blooded and small. Larger animals and mammals are rare although this is not always the case. Camels survive well in deserts because of their high water retention and survive quite happily in temperatures up to 48C / 120F. Thar Desert is one biome type that researchers and conservationists do not want to expand all the while ensuring that the deserts we presently have do not disappear. The major reason for this is that Thar Desert desert is of low agricultural quality, low biodiversity, and an extreme environment.[11,12] Climate change presents a risk of desertification of present marginal landscapes. We know this occurs from paleoenvironmental data . As Thar Desert are the most extreme environments on the planet, they are prone to the most change. Radiation is intense - both in terms of how much deserts receive and how much they reflect back into the environment. The expansion of Thar Desert can directly impact global average temperatures further, increasing water evaporation in adjacent areas. Even though the plant and animal species that exist in hot Thar Desert are well-adapted to those environments, we know from studies that such organisms are treading a fine line over environmental tolerance; some are even at their limits.[13,14]

As well as biodiversity and their cultural significance, Thar Desert is also useful economically due to their unique geological profiles or their environmental formation processes. The desert biome is one of the most important. This makes the Thar Desert an important place for mineral resources and for local and global economy. The reason this is the case is how water leaches through the ground or through evaporation so quickly that mineral deposits are left behind. Borates occurred in high density in Thar Desert . This special kind of salt is used to manufacture glass, enamel

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and other ceramics, and in the pharmaceutical and agrichemical industries. Salts have also proven a great resource for the Thar desert although today its lithium resources have also taken prominence on the world stage as battery development increases for better power storage and production in the new generation of electric cars . No other desert has as much abundant salt as this desert. Thar desert is also a source of lead and zinc, uranium, gold and silver. As far as non-metal resources are concerned, it is also home to clay, beryllium, pumice (where there was past volcanic activity), nitrates and lithium. It is also no great surprise that some of our most abundant oil deposits are found in Thar desert. Oil is not unique to dry environments though and the most important process is the presence of organic material and the right chemical conditions.[15,16]

II. DISCUSSION

Thar desert is vital in many ways ecologically. Water is vital to life and although they lack this necessary resource, their unique ecosystems provide survival and resources for the plant and animal species that live there . Deserts carry out vital planetary environmental functions too. Most of these species have adapted to the uniquely harsh environments of this hot desert. Often, these species do not exist in other types of environment. For that reason alone, it's necessary to conserve desert spaces and to avoid encroaching on them unnecessarily or altering them for other purposes. They are home to various livestock such as camels, goats, and antelope that provide food and livelihood for people. [17,18]Desert shrubs and trees that produce fruit such as dates, figs, and olives are important food crops .Many are not aware that thar desert is a net carbon sink, providing some relief from the increase in greenhouse gases. Finally, Thar desert due to their location, are important sources of generating renewable energy. It is no coincidence that the world's solar arrays are located in the hottest places on the planet. Smaller solar panels convert light into energy. They harness the heat and use mirrors to reflect and divert into the array, to generate much more energy per square foot. Thar desert is also useful sources of wind power. There are always desert winds, but at certain times of the year wind is much higher which can also generate energy.[19,20]

The Thar Desert, seventh largest desert in the world, harbors several species that have adapted themselves to survive in the harsh desert conditions. The floral diversity includes 682 species (63 introduced species), belonging to 352 genera and 87 families. The degree of endemism of plant species in the Thar Desert is 6.4 percent, which is relatively higher than the degree of endemism in the world famous Sahara desert. The faunal diversity represents 755 invertebrate and 440 vertebrate species, including 140 bird and 41 mammalian species and the only known population of the Asiatic wild ass. It is highlighted that sustainable use and management of this biodiversity is necessary to support human and livestock needs besides conservation. The strategy should be such that it is supported by public.[21,22]

There are several protected areas in the Thar Desert

In India:

The Desert National Park, in Rajasthan, covers 3,162 km2 (1,221 sq mi) and represents the Thar Desert ecosystem; it includes 44 villages. Its diverse fauna includes the great Indian bustard (*Chirotis nigricaps*), blackbuck, chinkara, fox, Bengal fox, wolf, and caracal. Seashells and massive fossilized tree trunks in this park record the geological history of the desert.

The Tal Chhapar Sanctuary covers 7 km2 (2.7 sq mi) and is an Important Bird Area.[21] It is located in the Churu District, 210 km (130 mi) from Jaipur, in the Shekhawati region of Rajasthan. This sanctuary is home to large populations of blackbuck, fox, caracal, partridge, and sand grouse.The Sundha Mata Conservation Reserve covers 117.49 km2 (45.36 sq mi) and is located in the Jalore District of Rajasthan.[23,24]

In Pakistan:

The Nara Desert Wildlife Sanctuary covers 6,300 km2 (2,400 sq mi);[23] it is located in is located in Mirpurkhas District. It contains the largest population of the endangered mugger crocodile in Pakistan.The Rann of Kutch Wildlife Sanctuary located in Badin District is an Important Bird Area and Ramsar Site, with 30 species of mammals, 112 bird

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species, 20 reptiles, and 22 important plant species.The Lal Suhanra Biosphere Reserve and National Park is a UNESCO declared biosphere reserve, which covers 65,791 hectares (254.02 sq mi) the Cholistan region of the Greater Thar Desert.

Some wildlife species that are fast vanishing in other parts of India are found in the desert in large numbers, including the blackbuck (*Antilope cervicapra*), chinkara (*Gazella bennettii*),and Indian wild ass (*Equus hemionus khur*) in the Rann of Kutch. This may be partly because they are well adapted to this environment: they are smaller than similar animals that live in other environments, and they are mainly nocturnal. It may also be because grasslands in this region have not been transformed into cropland as fast as in other regions, and because a local community, the Bishnois, has made special efforts to protect them.[25,26]

Other mammals in the Thar Desert include a subspecies of red fox (*Vulpes vulpes pusilla*) and the caracal, and a number of reptiles dwell there too.

The region is a haven for 141 species of migratory and resident desert birds, including harriers, falcons, buzzards, kestrels, vultures, short-toed eagles (*Circaetus gallicus*), tawny eagles (*Aquila rapax*), greater spotted eagles (*Aquila clanga*), and laggar falcons (*Falco jugger*).

The Indian peafowl is a resident breeder in the Thar region. The peacock is designated as the national bird of India and the provincial bird of the Punjab (Pakistan). It can be seen sitting on khejri or pipal trees in villages or Deblina.[27,28]

The natural vegetation of this dry area is classified as northwestern thorn scrub forest occurring in small clumps scattered more or less openly. Density and size of patches increase from west to east following the increase in rainfall. The natural vegetation of the Thar Desert is composed of these tree, shrub, and herb species:

- Trees and shrubs: *Vachellia jacquemontii*, *Balanites roxburghii*, *Ziziphus zizyphus*, *Ziziphus nummularia*, *Calotropis procera*, *Suaeda fruticosa*, *Crotalaria burhia*, *Aerva javanica*, *Clerodendrum multiflorum*, *Leptadenia pyrotechnica*, *Lycium barbarum*, *Grewia tenax*, *Commiphora mukul*, *Euphorbia caducifolia*, *Euphorbia neriifolia*, *Cordia sinensis*, *Maytenus emarginata*, *Capparis decidua*, *Mimosa hamata*
- Herbs and grasses: *Ochthochloa compressa*, *Dactyloctenium scindicum*, *Cenchrus biflorus*, *Cenchrus setiger*, *Lasiurus scindicus*, *Cynodon dactylon*, *Panicum turgidum*, *Panicum antidotale*, *Dichanthium annulatum*, *Sporobolus marginatus*, *Saccharum spontaneum*, *Cenchrus ciliaris*, *Desmostachya bipinnata*, *Eragrostis* species, *Ergamopagan* species, *Phragmites* species, *Tribulus terrestris*, *Typha* species, *Sorghum halepense*, *Citrullus colocynthis*

The endemic floral species include *Calligonum polygonoides*, *Prosopis cineraria*, *Acacia nilotica*, *Tamarix aphylla*, and *Cenchrus biflorus*.

III. RESULTS AND CONCLUSIONS

The Thar people are the natives of the area. The Thar Desert is the most widely populated desert in the world, with a population density of 83 people per km^2. In India, the inhabitants comprise Hindus, Jains, Sikhs, and Muslims. In Pakistan, inhabitants include both Muslims and Hindus. About 40% of the total population of Rajasthan lives in the Thar Desert. The main occupations of the inhabitants are agriculture and animal husbandry. A colourful culture, rich in tradition, prevails in this desert.[29] The people have a great passion for folk music and folk poetry.Jodhpur, the largest city in the region, lies in the scrub forest zone at the desert's perimeter. Bikaner and Jaisalmer are the largest cities located entirely in the desert. In the true desert areas, the only sources of water for animals or humans are small, scattered ponds - some that are natural (*tobas*) and some that are human-made (*johads*). The persistence of water scarcity heavily influences life in all areas of the Thar, prompting many inhabitants to adopt a nomadic lifestyle. Most of the permanent human settlements are located near the two seasonal streams of the Karon-Jhar hills. Potable groundwater is also rare in the Thar Desert. Much of it tastes sour due to dissolved minerals. Potable water is mostly available only deep underground. When wells are dug that happen to yield sweet tasting water, people tend to settle near them, but such wells are difficult and dangerous to dig, sometimes claiming the lives of the well-diggers.

The Thar is one of the most heavily populated desert areas in the world with the main occupations of its inhabitants being agriculture and animal husbandry.

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Agricultural production is mainly from kharif crops, which are grown in the summer season and seeded in June and July. These are then harvested in September and October and include bajra, pulses such as guar, jowar (*Sorghum vulgare*), maize (*zea mays*), sesame and groundnuts.

The Thar region of Rajasthan is a major opium production and consumption area. *P. cineraria* wood is reported to contain high calorific value and provide high-quality fuel wood. The lopped branches are good as fencing material. Its roots also encourage nitrogen fixation, which produces higher crop yields. Desert safaris on camels have become increasingly popular around Jaisalmer. Domestic and international tourists frequent the desert seeking adventure on camels for one to several days. This ecotourism industry ranges from cheaper backpacker treks to plush Arabian night-style campsites replete with banquets and cultural performances. During the treks, tourists are able to view the fragile and beautiful ecosystem of the Thar Desert. This form of tourism provides income to many operators and camel owners in Jaisalmer, as well as employment for many camel trekkers in the desert villages nearby. People from various parts of the world come to see the Pushkar ka Mela (Pushkar Fair) and oases.[30]

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