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Biodiversity of Thar Desert in Rajasthan, India

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ABSTRACT: 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.

KEYWORDS-flora, fauna, biodiversity, Thar, Rajasthan

I.INTRODUCTION

The Thar, one of the most populated deserts in the world, has long been perceived as a barren wasteland. However, a recent study by IIT-Jodhpur shows that this arid ecosystem harbours remarkable biodiversity, containing four distinct ecoregions. The study used community science, specifically crowdsourced bird data from the online resource eBird, to assess the biota and delineate the ecoregions.

The roughly 3.85 lakh sq km Thar Desert accounts for about 9 per cent of India's land area and 2.12 per cent of its fauna — 682 species of flora and 1,195 species of fauna.

Eastern Thar, comprising nine districts, is marked by the Aravalli region and the eastern agro-industrial region. [1,2,3]

The Thar Desert is undoubtedly the most inhospitable ecoregion in the Indo-Pacific region; yet still, it supports a human population density of over 80 people per km², making it the most densely populated desert in the world. At the same time, the desert supports a relatively rich biodiversity with several large mammals, notably the blue bull, blackbuck, and Indian gazelle or chinkara. They were once the prey for lions and cheetah, which reportedly lived in the southern parts of the ecoregion until the turn of the last century. This ecoregion lies to the west of the Aravalli Mountain Range in the northwestern Indian States of Gujarat, Rajasthan, extending across the border to the Punjab and Sind regions of Pakistan. It is considered to be the 9th largest subtropical desert. About 5,000 years ago, this desert was the site of Mohenjo Daro and Harappa, ancient cities that supported a civilization contemporaneous with ancient Egypt, Mesopotamia, and Minoan Crete.

The climate is defined by the extremes. Winter temperatures approach freezing, while summer temperatures soar over 50°C. Rainfall is limited to 100-500 mm from July to September but is mostly unpredictable and erratic.

About a tenth of the ecoregion are sand dunes, while the rest is craggy rock formations and compacted salt-lake bottoms. Unlike other large deserts, there are no oases or artesian wells that provide relief.

The Thar Desert, also known as the Great Indian Desert, is an arid region in the north-western part of the Indian subcontinent that covers an area of 200,000 km² (77,000 sq mi) in India and Pakistan. It is the world's 18th-largest desert, and the world's 9th-largest hot subtropical desert.

About 85% of the Thar Desert is in India, and about 15% is in Pakistan.^[3] The Thar Desert is about 4.56% of the total geographical area of India. More than 60% of the desert lies in the Indian state of Rajasthan; the portion in India also extends into Gujarat, Punjab, and Haryana. The portion in Pakistan extends into the provinces of Sindh^[4] and Punjab (the portion in the latter province is referred to as the Cholistan Desert). The Indo-Gangetic Plain lies to the north, west and northeast of the Thar desert, the Rann of Kutch lies to its south, and the Aravalli Range borders the desert to the east.

The most recent paleontological discovery in 2020 from the Thar Desert in India, dating back to 167 million years ago, pertains to a herbivorous dinosaur group known as dicraeosaurids.[4,5,6] This discovery marks the first of its kind to be unearthed in India and is also the oldest specimen of the group ever recorded in the global fossil record.^[5]

II.DISCUSSION

The northeastern part of the Thar Desert lies between the Aravalli Hills. The desert stretches to Punjab and Haryana in the north, to the Great Rann of Kutch along the coast, and to the alluvial plains of the Indus River in the west and northwest. Much of the desert area is covered by huge, shifting sand dunes that receive sediments from the alluvial plains and the coast. The sand is highly mobile due to the strong winds that rise each year before the onset of the monsoon. The Luni River is the only river in the desert.^[16] Rainfall is 100 to 500 mm (4 to 20 in) per year, almost all of it between June and September.^[3]



Saltwater lakes within the Thar Desert include the Sambhar, Kuchaman, Didwana, Pachpadra, and Phalodi in Rajasthan and Kharaghoda in Gujarat. These lakes receive and collect rainwater during monsoon and evaporate during the dry season. The salt comes from the weathering of rocks in the region.^[17]

Lithic tools belonging to the prehistoric Aterian culture of the Maghreb have been discovered in Middle Paleolithic deposits in the Thar Desert.^[18]

The climate is arid and subtropical. Average temperature varies with season, and extremes can range from near-freezing in the winter to more than 50 °C in the summer months. Average annual rainfall ranges from 100 to 500 mm, and occurs during the short July-to-September southwest monsoon.^[1]

The desert has both a very dry part (the Marusthali region in the west) and a semidesert part (in the east) that has fewer sand dunes and slightly more precipitation.^[19]

The vegetation is unsurprisingly influenced by the extreme climate. The sparse vegetation consists of plants adapted to growing in dry conditions, known as xerophilous plants. These include several kinds of grass and scrub-type vegetation of low trees of *Acacia*, *Prosopis*, *Tamarix*, and *Zizyphus*. These trees have small leaves with a thick waxy surface to reduce evapotranspiration and save water in hot and dry environments.

Despite the extreme climate, over 40 species of mammals live here. Most have evolved and adapted to survive in these extreme conditions. In addition to the larger antelopes and gazelles, there are several smaller species, ranging from the very small antelope rat with long hind legs to carnivores such as grey mongoose, the aggressive ratel or honey badger, desert fox, striped hyena, jungle cat, Indian desert wild cat, and caracal. [7,8,9]

The caracal is a medium-sized wild cat that has distinctively large tapering ears with long tufts of hair that exaggerate their length. Adapted to desert conditions, the caracal can survive long periods without drinking water. Their hunting strategy includes jumping about 3 m into the air to catch birds in flight by batting them with their paws. Years ago in India and Iran, caracals were tamed and trained to hunt birds.

Among the 141 birds known in this ecoregion, the great Indian bustard is a globally threatened species whose populations in this ecoregion have rebounded in recent years.

Grazing by livestock such as sheep and goats is intensive. This affects soil fertility, exacerbates erosion, and destroys the native vegetation. Together with recent climatic changes, these pressures combine to degrade and destroy the fragile desert ecosystems. Nonetheless, the ecoregion has large protected areas where adequate management and protection can be administered to mitigate the widespread threats.

Thus, the priority conservation actions are to 1) improve land-use zoning to mitigate ad hoc and uncontrolled agricultural practices, especially with the availability of irrigation water; 2) control livestock grazing and minimize its impact on the desert ecosystem, and 3) continue to support the conservation effort in the protected areas.

III.RESULTS

The soil of the Thar Desert remains dry for much of the year, so it is prone to wind erosion. High-velocity winds blow soil from the desert, depositing some of it on neighboring fertile lands, and causing sand dunes within the desert to shift. To counteract this problem, sand dunes are stabilised by first erecting micro windbreak barriers with scrub material and then by afforestation of the treated dunes—planting the seedlings of shrubs (such as phog, senna, and castor oil plant) and trees (such as gum acacia, *Prosopis juliflora*, and lebbek tree). The 649-km-long Indira Gandhi Canal brings fresh water to the Thar Desert.^[3] It was built to halt any spreading of the desert into fertile areas.[10,11,12]

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;^[20] it includes 44 villages.^[21] Its diverse fauna includes the great Indian bustard (*Chiotis 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.^[22]

Some wildlife species that are fast vanishing in other parts of India are found in the desert in large numbers, including the blackbuck (*Antelope 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.

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.

The natural vegetation of this dry area is classified as northwestern thorn scrub forest (i.e. small, loosely-scattered patches of greenery).^{[28][29]} The densities and sizes of these green patches increase from west to east, following an increase in rainfall. The primary vegetation of the Thar Desert is composed of trees, shrubs, and perennial herb species, including:^[30]

- Trees and shrubs: *Aerva javanica*, *Balanites roxburghii*, *Calotropis procera*, *Capparis decidua*, *Clerodendrum multiflorum*, *Commiphora mukul*, *Cordia sinensis*, *Crotalaria burhia*, *Euphorbia caducifolia*, *Euphorbia neriifolia*, *Grewia tenax*, *Leptadenia pyrotechnica*, *Lycium barbarum*, *Maytenus emarginata*, *Mimosa hamata*, *Suaeda fruticosa*, *Vachellia jacquemontii*, *Ziziphus nummularia* and *Z. zizyphus*.
- 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, *Eragmopagan* 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*.^[31]

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.[13,14,15]

Crowded housing conditions are common in some areas.

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.

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.[16,17,18]

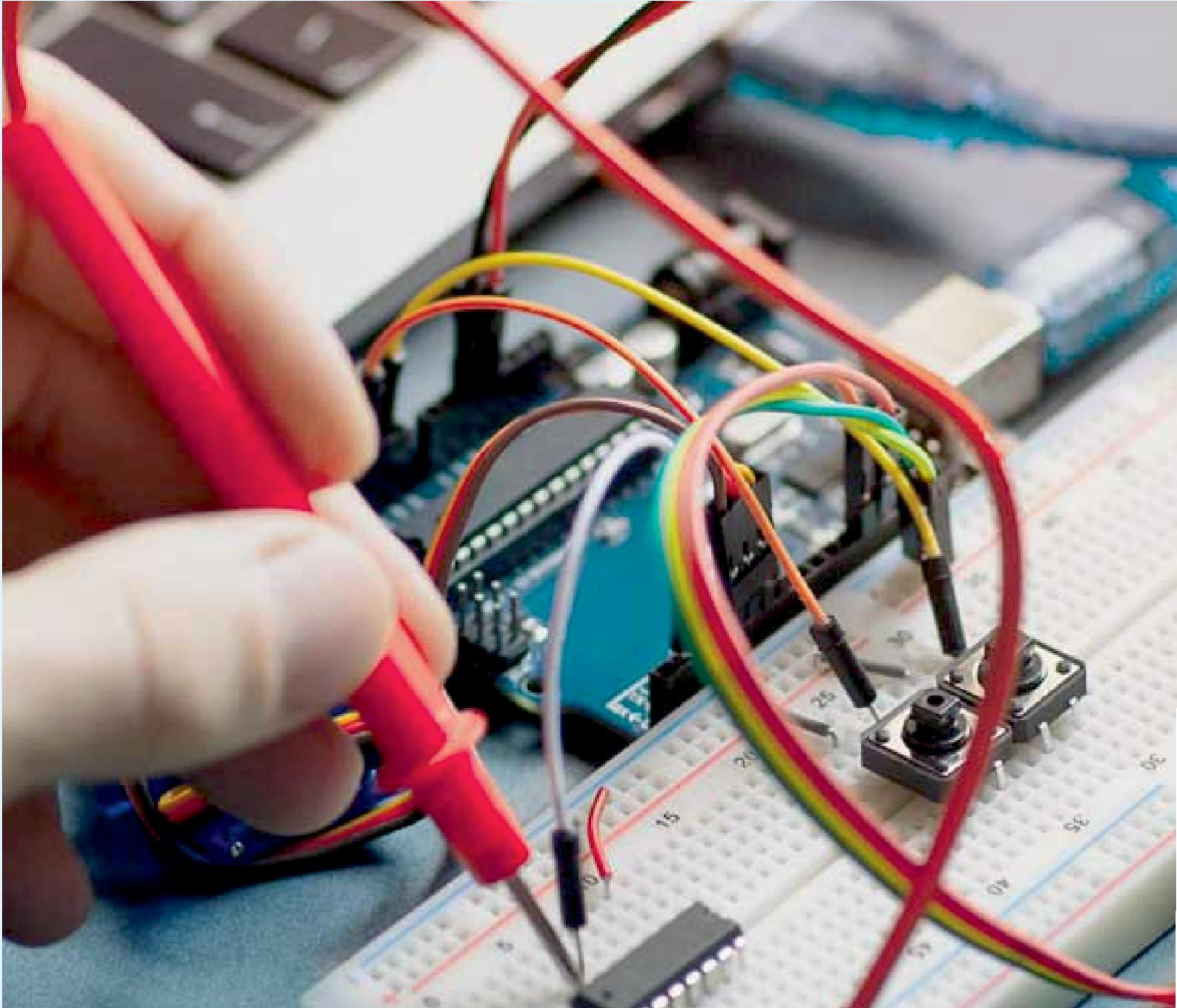


IV.CONCLUSION

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 km².^[21] In India, the inhabitants comprise Hindus, Jains, Sikhs, and Muslims. In Pakistan, inhabitants include both Muslims and Hindus.^[32] About 40% of the total population of Rajasthan lives in the Thar Desert.^[33] The main occupations of the inhabitants are agriculture and animal husbandry.[19] 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.[20]

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