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Sacred groves of thar desert: A case study of Kolu Pabuji Oran of western Rajasthan and its biodiversity profiling

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Abstract
Sacred groves (orans) are an age old conservation practices of natural resources adapted by visionary locals of desert of Rajasthan since time immortal, in order to survive extremes of harsh climate during the prolonged period of famines. The practice of leaving a considerable fraction of land for grazing grounds has been a key practice of almost all villages of western Rajasthan. These groves play not only an important role in community based conservation of biodiversity but also provides food security to combat poverty in the harshest periods of prolonged droughts, when the economy of Rajasthan is largely livestock based. The floral and faunal biodiversity profiling of Kolu Pabuji Oran has been inventoried to highlight the importance of such community managed village commons and their role in biodiversity conservation in present context.

Keywords: biodiversity, sacred groves, Oran, Thar Desert, Rajasthan

1. Introduction
Sacred Groves are considered as "Sacred Natural Sites" (IUCN) (Oviedo *et al.*, 2005) [15]. These are the relic forest patches preserved in the name of religion and culture and extend from Asia, Africa, and Europe to America mostly in Africa and Asia. In India, Groves are present from North-east Himalayan region, Western and Eastern Ghats, Coastal region, Central Indian Plateau and Western desert (Malhotra *et al.*, 2001) [12]. Indian sacred groves have pre-Vedic origin. They are associated with indigenous / tribal communities who believe in divinity of nature and natural resources. There are more than a lakh such sacred groves in the country, have different names in different states, such as Devrai, Devban, Devbhumi, Gumpa etc. In Rajasthan, they are called Oran. Oran is derived from the Sanskrit word *aranya*, meaning forest. They are patches of jungle preserved in the name of local deities or saints.

2. Materials and Methods
The present study was conducted in Jodhpur's largest and most revered Oran, i.e., Kolu Pabuji's Oran. It is located in Lohawat Block in north of Jodhpur district. During the present course of study, the Kolu Pabuji's Oran was taken for biodiversity assessment. This oran is located around the world famous temple of local deity Pabuji.

History of Oran
The Pabuji is a very famous folk-deity of Rajasthan. He was born in a house of Dhadal Rathore of village Kolu and lived in the 14th century. The historical Pabuji was a mediaeval Rajput prince; he is now widely worshipped as a deity by Rabari herdsmen (mainly sheep-goat and camel rearing community) and others throughout the Rajasthan countryside; and he is served by priests of Nayak community. This deity is highly worshiped by locals' communities in entire Rajasthan, Gujarat, Madhya Pradesh and many other areas where livestock dependent communities used to live. Bhopa community in Rajasthan is considered to be priest singers of Pabuji. They depict the life story of Pabuji on canvas and recite it to the public through religious songs. This religiously painted canvas is called *Phad* and has a high reverence among the locals. The *Phad* is a 30 feet long sheet on which are painted (or sewn) miniature scenes depicting the life of Pabuji on which his epics are narrated. The area close to Pabuji temple in Kolu village of Block Lohawat has been treated as sacred land by locals since the 14th Century, the time when Warrior Pabuji started preaching the locals and treated many aliments on the livestock from his divine powers. The area, where Pabuji used to work, organized public courts and addressed gatherings have been treated as Oran and worshiped after his journey to the heavenly abode. This area is largely a flat plain and has few small sand dunes on the distal ends in west and south directions. A rapid assessment of the biodiversity of this area has been done by a team of subject experts and ecological important groups were identified and inventorization was carried out.

Boundaries
The Kolu Pabuji Oran is situated in Lohawat Block of Jodhpur district extends between 26° 53' N to 26° 57' N latitude and 72° 15' E to 72° 19' E longitude. It is located 25 km west of Phalodi town and 145 km north to the district head quarter and well connected by road. The Mega Highway (from Shergarh to Phalodi), bisects the entire Oran is almost equally half. The area of entire Oran is roughly 29 sq. km. in size and support rich natural vegetation and wildlife.

Geology, Rock and Soil

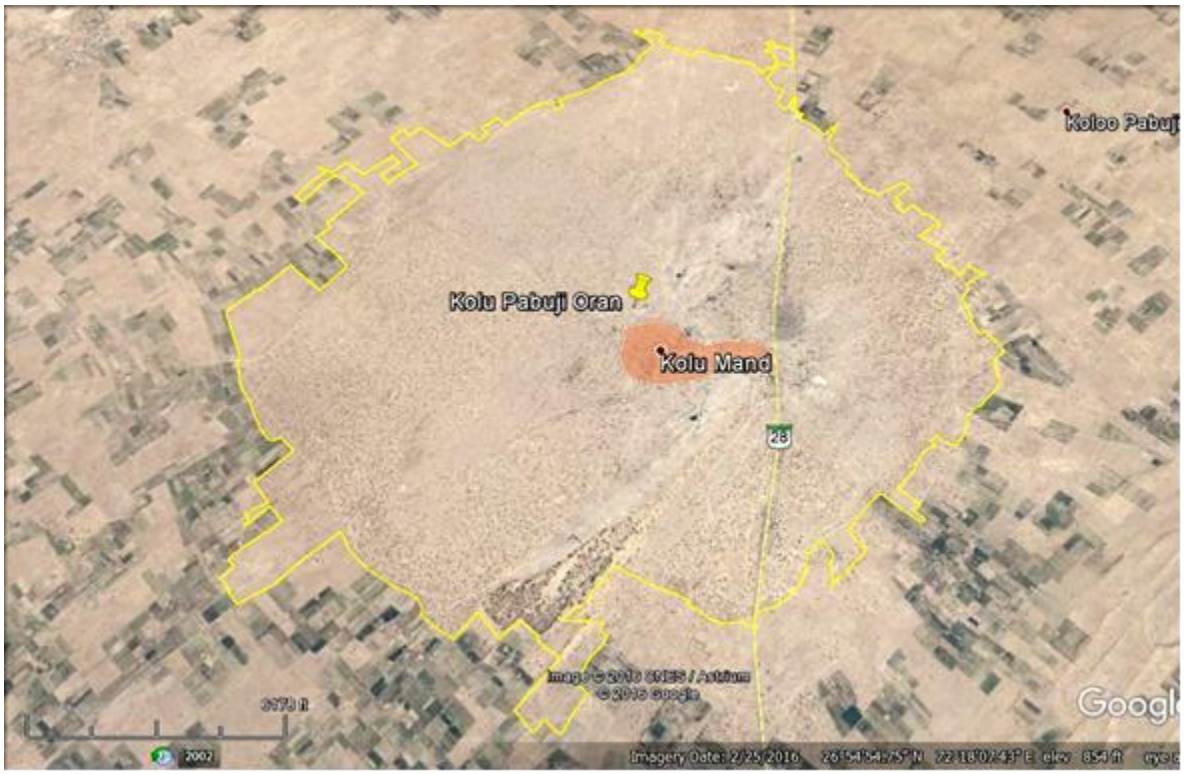
Dominant landform of the Oran is an old gravelly plain. The soil characteristic of Oran is having almost all type of soil, including sandy, loamy and gravelly.

Terrain

The terrain of the entire Oran village is very smooth slope towards eastern side; there are 6 seasonal water bodies which stores rainwater from the catchment of the Oran. Thus these water sources provide an alternate source of water supply for the local fauna.

Climate

The climate of Kolu Pabuji Oran is hot and arid. Year long dry season is interfered by brief span of monsoon, from late June to September. Although the average rainfall is around 250 mm, it fluctuates greatly. Temperatures are extreme from March to October, except when the monsoonal rain produces thick clouds to lower it slightly. In the months of April, May and June, high temperatures routinely exceed 47 degrees Celsius. During the monsoon season, average temperatures decrease slightly. However, the area's generally low humidity rises, which adds to the perception of the heat. The climate is characterized by very hot summer (temperature rising up to 50°C), relatively cold winter (temperature dropping below 0°C), and large diurnal temperature range. This total rainfall is spread over around 15 rain days. Rainfall pattern is scarce and erratic.



Location map of Kolu Pabuji Oran, Jodhpur

Fig 1: (Kolu Village and Pabuji Temple in Orange Colour)

3. Results and Discussion

The Thar Desert is a vast tract covering over 4000 sq. km in the north-western part of the Indian subcontinent and it stretches from the western fringes of Aravalli Mountains to the Indus River. However, western Rajasthan is sharing two types of bio-geographic zone, i.e., Desert Biogeographic zone (3A) and Semi arid Biogeographic Zone (4B) (Rodgers *et al*. 2002) [17]. The entire Jodhpur district falls under these two bio-geographic zones. This is directly reflecting in the type of vegetation available in the entire area, which is having affinity to desert as well as semi arid type of vegetation classification.

It is believed that the sacred grove conservation tradition in India began around the same time as the start of settled agriculture (Hughes and Chandran 1998) [8]. The motivation behind keeping patches of forest may have been the ecological services that such patches provide. These include soil conservation, maintaining watersheds and provision of forest products. The communities may have protected groves in honour of pagan gods, animistic deities or ancestral spirits (Kosambi 1962, Kothari 2000) [11, 1]. In India, many of these original gods, deities and spirits underwent transformation over the years into mainstream gods and goddesses, although the tradition of conserving patches of forest has been maintained until today (Chandrakanth *et al.* 2004) [4]. Traditional forest conservation practices are seen in current society in various forms. 'Oran' or 'Devbani' refers to a common preserved sections of forests protected in the name of some god or goddess by each of the villages of their own specific needs. Thus they are dedicated to one or more deities worshipped by the community and can therefore be termed as sacred forests. Orans are related to religious practices followed since time immemorial and serve to conserve natural

resources. People do not harm these areas mainly because of socio-religious traditions and fear of the unknown, believing that anyone who cuts or uses an axe in a sacred grove may be harmed by the presiding deity. The area under an Oran can vary from a few square meters to several hundred hectares. These common property resources (Jodhha, 1992) play a crucial role in people's survival, economy and conservation of biodiversity in rural areas of the Thar Desert. Scared grove known as Oran in Thar Desert of Rajasthan are the natural forest patch, worshipped and conserved by indigenous communities on religious grounds and thus play a significant role not only *w.r.t.* biodiversity conservations, but also deals with food security and climate change. Orans are not well classified and defined in the revenue records they simply fall under "Culturable Waste Land" category. These account for about 9% of the desert area in Rajasthan while the area under an Oran can vary from a few square meters to several hundred hectares (Mukhopadhyay, 2008) [14]. Hunting, felling of trees and agricultural practices are usually strictly prohibited in the holy land of the Orans from ancient period (Gadgil and Vartek, 1994; Robbins, 1998) [5]. However, native people collect wild fruits, vegetable, gum and green grass and dry wood without cutting of the green trees and shrubs. The people believe that any kind of disturbance will crucially affect the local deities, causing diseases, natural calamities or failure of crops. Many accounts emphasize the threat of divine retribution, and cautionary tales of divine punishment by blinding and paralysis are common (Gadgil and Vartek, 1994, Gadgil and Guha, 1995) [5, 6].

One such oran is situated in Thar desert of Western Rajasthan, named Kolu Pabuji Oran**.** The area is a repository of a good biodiversity since its long time and people conserved this area along with the biodiversity with great reverence. As in any sacred site world over, damaging any form of life in this Oran is a taboo for locals. A documentation of economically important plants and animals were prepared during the survey and also verified from various scientific documents and consultation with subject experts.

Biodiversity Profile of Kolu Pabuji Oran

Economic importance of plant products

Table 1

Category	Example products
Community products	Timber, fruits, nuts, fodder, traditional medicines
Women's products	Medicinal plants, fruits, vegetables, colour yielding dyes, gums, essential oils, resins, berries, roots and herbs
Indigenous/traditional products	Medicinal plants, seeds, resins

Important Floral Wealth

The Kolu Pabuji Oran is sharing two types of bio-geographic zone, i.e., Desert Bio-geographic zone (3A) (Rodgers *et al.*, 2002) [17]. This is directly reflecting in the type of vegetation available in the entire area, which is having affinity to desert as well as semi-arid type of vegetation classification. The vegetation of entire area comes under xerophytic category and characterized by thorny bushes and sparse trees. The important trees are Kumtha (*Acacia Senegal*), Kair (*Capparis decidua*), Khejari (*Prosopis cineraria*), Peelu or Jaal (*Salvadora persica* and *Salvadora oleoides*) and Rohida (*Tecomella undulata*) (Table 2).

The vegetation of the major part of the region can be described as thorn forest type (Champion and Seth, 1968). It is sparse, consisting mainly of stunted, thorny or prickly shrubs and few scattered trees. Though there are perennial, herbaceous, drought-resistant plants, they are limited in species richness. The ephemerals appear in rainy season, complete their life cycle and vanish in winters, giving a barren look to the landscape, with only few perennial thorny bushes and trees dominant the landscape of this region.

The scrub is dominated by shrubs such as Kair (*Capparis decidua*), Jhadi ber (*Ziziphus nummularia*), and some other species including Kankeda (*Maytenus emarginata*), Khejari (*Prosopis cineraria*), Murawali (*Lycium barbarum*) and occasionally Deshi Babul (*Acacia Senegal*). Though hundreds of floral species (all plant species, including herb, shrub and trees) have been described from the area (Bhandari, 1990), some are of immense economic importance to the local communities. They include Khejri (*Prosopis cineraria*), Kumtha (*Acacia senegale*), Desi Babul (*Acacia nilotica*), Kankera (*Maytenus emarginata*), Rohida (*Tecomella undulata*), Hingoti (*Balanaitis egyptiaca*), Muravli (*Lycium barbarum*), Kair (*Capparis decidua*), Jhari Ber (*Zizyphus nummularia*), Bordi (*Zizyphus mauritiana*), Meethi Jaal or Peelu (*Salvadora persica*), Khari Jaal (*Salvadora oleoides*), only Gymnosperm plant of Thar Desert, *i.e*., Unt Phog (*Ephedra foliata*), Aak (*Calotropis procera*) and Lana (*Haloxylon salicornicum*) (Bhandari 1990). The local communities also use Kheimp (*Laptadenia pyrotechnica*) to thatch their houses, huts and to make ropes.

Among all, the dominant species in this Oran include Khejri (*Prosopis cineraria*), Kair (*Capparis decidua*), Jhari Ber (*Zizyphus nummularia*), Bordi (*Zizyphus mauritiana*) and Piloo (*Salvadora oleoidis*). Others include Kheimp (*Leptadenia pyrotechnica*), Bhui (*Aerva pseudotomentosa*), Shinia (*Crotalaria* burhia), Dhamasa (*Fagonia cretica*), Biyani (*Tephrosia purpurea*), Gokhru or Kanti (*Tribulus terrestris*) and many grass species like Dhaman (*Cenchrus ciliaris*) and Bhurat (*Cenchrus setigerus* and *Cenchrus biflorus).*

Table 2: Economic Important Floral wealth Orans of Jodhpur

Nature of species	Name	Used as
Trees	*Albizia lebbeck*	Most of the trees are used for collection of leaves, fruits, flowers, fuel wood and fallen timber
	Acacia tortilis	
	A. nilotica	
	A. senegal	
	Azadirachta indica	
	Mimusops hexandra	

	Prosopis cineraria	
	P. juliflora	
	Salvadora oleoides	
	Salvadora persica	
	Tecomella undulata	
Small trees and shrubs	*Calligonum polygonoides*	Many of the shrubs are used for fuel wood and fodder
	Capparis decidua	
	Acacia jacquemontii	
	Balanites roxburghii	
	Ziziphus nummularia	
	Calotropis procera	
	Crotolaria burhia	
	Aerva tomentosa	
	Clerodendrum phlomidis	
	Leptadenia pyrotechnica	
	Lycium barbarum	
	Grewia populifolia	
	Commiphora mukul	
	Euphorbia nerifolia	
	Cordia rothii	
Herbs and grasses	*Ephedra foliata*	Most of them are used as fodder for animals. However, some have miscellaneous uses for medicine, thatching material, extraction of perfume, as vegetables, and for extraction of gums and resins
	Asparagus racemosus	
	Corchorus spp.	
	Arnibia spp.	
	Euphorbia hirta	
	Sida cordifolia	
	Sueda fruticosa	
	Heliotropium spp.	
	Eleusine compressa	
	Dactyloctenium scindicum	
	Cenchrus biflorus	
	Cenchrus ciliaris	
	Cenchrus setigerus	
	Cynodon dactylon	
	Desmostachya bipinnata	
	Dichanthium annulatum	
	Lasiurus hirsutus	
	Panicum antidotale	
	Panicum turgidum	
	Phragmites spp.	
	P. turgidum	
	P. antidotale	

Faunal Diversity

The Kolu Pabuji Oran and its adjoining landscapes are famous for its conservation success story. The area harbours all species of large wildlife present in western Rajasthan, i.e., Chinkara (*Gazella bennettii*) and Bluebull/Nilgai/Rojara (*Boselaphus tragocamelus*), Desert fox (*Vulpes vulpes pussilla*). All herbivores are dependent on the wild plants for food. The rare and elusive Desert Cat (*Felis sylvestris ornata*) was also reported by locals. Among others, Desert Hare (*Lepus nigricolis dayanus*) is a subspecies of Black-naped Hare, Long-eared Hedgehog (*Hemiechinus auritus*) and some Gerbils are commonly seen animals in the region. The recent increase in the sightings of Wild Pigs (*Sus scrofa*) is worth mentioning, they destroy crops during monsoon in adjoining agriculture fields.

Along with these, 2 species of amphibian (frogs and toads), 18 species of lizards and 11 species of snakes (reptiles) (Table 3), 91 species of birds (Table 4) and 32 species of mammals (Table 5) were also documented.

Table 3: Herpetofauna (Amphibia and reptilia) of Kolu Pabuji Oran, Jodhpur

S. No	Common Name	Species Name
Frogs and Toad		
1.	Asian common toad,	*Duttaphrynus melanostictus*
2.	Indian skipper frog or Skittering frog	*Euphlyctis cyanophlyctis*
Lizards		
1	Rajasthan Sand Gecko	*Crossobamon orientalis* Blanford, 1875
2	Keeled Rock Gecko	*Cyrtopodion scabrum* (Heyden, 1827)

3	Spotted Indian House Gecko	*Hemidactylus brookii* Gray, 1845
4	Yellow-Bellied House Gecko	*Hemidactylus flaviviridis* Ruppell, 1835
5	Bark Gecko	*Hemidactylus leschenaultia* Dumeril & Bibron, 1836
6	Rajasthan Sand Gecko	*Crossobamon orientalis* Blanford, 1875
7	Keeled Rock Gecko	*Cyrtopodion scabrum* (Heyden, 1827)
8	Spotted Indian House Gecko	*Hemidactylus brookii* Gray, 1845
9	Yellow-Bellied House Gecko	*Hemidactylus flaviviridis* Ruppell, 1835
10	Bark Gecko	*Hemidactylus leschenaultii* Dumeril & Bibron, 1836
11	Indian Garden Lizard	*Calotes versicolor* (Daudin,1802)
12	Brilliant Agama	*Trapelus agilis* Olivier, 1807
13	Spiny-Tailed Lizard	*Sara hardwickii* Hardwicke & Gray, 1827
14	Indian Sand Skink	*Ophiomorus raithmai* Anderson & Leviton, 1966
15	Indian-Fringe Toed Lacertid Lizard	*Acanthodactylus cantoris* Günther, 1864
16	Small Scaled Lacerta	*Ophisops microlepis* Blanford, 1870
17	Snake-Eyed Lacerta	*Ophisops jerdoni* Blyth, 1853
18	Common Indian Monitor	*Varanus bengalensis* (Linnaeus, 1758)
Snakes		
1	Brahminy Worm Snake	*Ramphotyhlops braminus*
2	Russell's boa	*Gongylophis conicus*
3	Indian rat snake	*Ptyas mucosa*
4	Glossy-bellied racer	*Coluber ventromaculatus*
5	Black-headed Royal Snake	*Spalerosophis atriceps*
6	Red spotted royal snake	*Spalerosophis arenarius*
7	Russel kukri Snake	*Oligodon taeniolatus*
8	Leith's sand snake	*Psammophis leithii*
9	Common krait	*Bungarus caeruleus*
10	Spectacled cobra	*Naja naja*
11	Saw scale Viper	*Echis carinatus*

Table 4: Birds of Kolu Pabuji Oran, Jodhpur

Family: Podicipedidae
1. Little Grebe *Tachybaptus ruficollis*
Family: Phlacrocoracidae
2. Little Cormorant *Phalacrocorax niger*
Family: Ardeidae
3. Little Egret *Egretta garzetta*
4. Indian Pond Heron *Ardeola grayii*
5. Cattle Egret *Bubulcus ibis*
Family: Threskiornithidae
6. Red-naped Ibis *Pseudibis papillosa*
Family: Anatidae
7. Indian Spot-billed Duck *Anas poecilorhyncha*
8. Northern Shoveller *Anas clypeata*
9. Common Teal *Anas crecca*
Family: Accipitridae
10. Black-shouldered Kite *Elanus caeruleus*
11. Black Kite *Milvus migrans*
12. Black-eared Kite *Milvus (migrans) lineatus*
13. Shikra *Accipiter badius*
14. Eurasian Griffon
15. Long-billed Vulture
16. Egyptian Vulture *Neophron percnopterus*
17. Long-legged Buzzard *Buteo rufinus*
18. Steppe Eagle *Aquilla nipalensis*
Family: Falconidae
19. Eurasian Kestrel *Falco tinnunculus*
Family: Phasianidae
20. Gray Francolin *Francolinus pondicerianus*
21. Indian Peafowl *Pavo cristatus*
Family: Gruidae
22. Demoiselle Crane *Grus virgo*
Family: Rallidae
23. Eurasian Moorhen *Gallinula chloropus*
24. Eurasian Coot *Fulica atra*
Family: Charadriidae
25. Little-ringed Plover *Charadrius dubius*
26. Red-wattled Lapwing *Vanellus indicus*
Family: Scolopacidae
27. Common Sandpiper *Actitis hypoleucos*
28. Ruff *Philomachus pugnax*
Family: Recurvirostridae
29. Black-winged Stilt *Himantopus himantopus*
Family: Burhinidae
30. Indian Stone Curlew *Burhinus oedicnemus*
Family: Columbidae
31. Rock Pigeon *Columba livia*
32. Red Collared-Dove *Streptopelia tranquebarica*
33. Eurasian Collared-Dove *Streptopelia decaocto*
34. Laughing Dove *Streptopelia senegalensis*
Family: Pteroclidae
35. Chestnut-bellied Sandgrouse *Pterocles exustus*
Family: Psittaculidae
36. Rose-ringed Parakeet *Psittacula krameri*
Family: Cuculidae
37. Greater Coucal *Centropus sinensis*
Family: Strigidae
38. Spotted Owlet *Athene brama*
Family: Tytonidae
39. Barn Owl *Tyto alba*
Family: Apodidae
40. Little Swift/House Swift *Apus affinis*
Family: Alcedinidae
41. White-breasted Kingfisher *Halcyon smyrnensis*
Family: Meropidae

42. Small Bee-eater *Merops orientalis*
43. Blue-cheeked Bee-eater *Merops persicus*
Family: Coraciidae
44. Indian Roller *Coracias benghalensis*
45. Eurasian Roller *Coracias garrulous*
Family: Upupidae
46. Eurasian Hoopoe *Upupa epops*
Family: Alaudidae
47. Ashy-crowned Sparrow-Lark *Eremopterix griseus*
48. Rufous-tailed Lark *Ammomanes phoenicura*
49. Indian Bushlark *Mirafra erythroptera*
50. Crested Lark *Galerida cristata*
Family: Hirundinidae
51. Plain Martin *Riparia paludicola*
52. Dusky Crag Martin *Ptyonoprogne concolor*
53. Streak-throated Swallow *Hirundo fluvicola*
Family: Motacillidae
54. White Wagtail *Motacilla alba*
55. White-browed Wagtail *Motacilla maderaspatensis*
56. Citrine Wagtail *Motacilla citreola*
57. Gray Wagtail *Motacilla cinerea*
58. Paddy-field Pipit *Anthus rufulus*
59. Long-tailed Pipit *Anthus similis*
60. Tawny Pipit *Anthus campestris*
Family: Tephrodornithidae
61. Common Woodshrike *Tephrodornis pondicerianus*
Family: Pycnonotidae
62. White-eared Bulbul *Pycnonotus leucotis*
63. Red-vented Bulbul *Pycnonotus cafer*
Family: Laniidae
64. Isabelline Shrike/Rufous-tailed Shrike *Lanius isabellinus*
65. Long-tailed Shrike/Rufous-backed Shrike *Lanius schach*
66. Southern Grey Shrike *Lanius meridionalis*
Family: Muscicapidae
67. Indian Robin *Saxicoloides fulicata*
68. Black Redstart *Phoenicurus ochruros*
69. Pied Bushchat *Saxicola caprata*
70. Common Stonechat *Saxicola torquatus*
71. Indian Chat/ Brown Rock Chat *Cercomela fusca*
72. Desert Wheatear *Oenanthe deserti*
73. Variable Wheatear *Oenanthe picata*
Family: Leiothrichidae
74. Common Babbler *Turdoides caudate*
75. Large Gray Babbler *Turdoides malcolmi*
Family: Sylviidae
76. Common Lesser Whitethroat *Sylvia curruca*
77. Asian Desert Warbler *Sylvia nana*
Family: Cisticolidae
78. Plain Prinia *Prinia inornata*
Family: Phylloscopidae
79. Common Chiffchaff *Phylloscopus collybita*
Family: Nectariniidae
80. Purple Sunbird *Nectarinia asiatica*
Family: Estrildidae
81. Indian Silverbill *Lonchura malabarica*
Family: Passeridae
82. House Sparrow *Passer domesticus*
83. Chestnut-shouldered Petronia *Petronia xanthocollis*
Family: Sturnidae
84. Brahminy Starling *Sturnus pagodarum*
85. Rosy Starling *Sturnus roseus*
86. European Starling *Sturnus vulgaris*
87. Common Myna *Acridotheres tristis*
88. Bank Myna *Acridotheres ginginianus*
Family: Dicruridae
89. Black Drongo *Dicrurus macrocercus*
Family: Corvidae
90. House Crow *Corvus splendens*
91. Raven *Corvus corax*

Table 5: Mammals of Kolu Pabuji Oran and surrounding area

S. No	Scientific Name and Family	Common Name]
Order: Rodentia		
1.	*Hystrix indica*	Porcupine
Family: Sciuridae		
2.	*Funambulus pennanti*	Five Striped or Northern Palm Squirrel
Family: Muridae		
3.	*Tatera indica*	Indian Gerbil
4	*Meriones hurrianae*	Indian Desert Jird
5	*Gerbillus gleadowi*	Little Indian Hairy-footed Gerbil
6	*Gerbillus nanus indus*	Pygmy Gerbil
7	*Rattus rattus*	House Rat or Black Rat
8	*Millardia gleadowi*	Sand-coloured Rat
9	*Mus musculus*	House Mouse
10	*M. platythrix*	Spiny Field Mouse
11	*M. booduga*	Little Indian Field Mouse
12	*Golunda ellioti*	Indian Bush Rat
13	*Nesokia indica*	Short-tailed Bandicoot Rat
Order: Eulipotyphla Family: Erinaceidae		
15	*Hemiechinus collaris*	Collared or Desert Hedgehog
16	*Paraechinus micropus*	Indian Hedgehog
Family: Soricidae		
17	*Suncus murinus*	House Shrew
Order: Lagomorpha Family: Leporidae		
19	*Lepus nigricollis dayanus*	Indian Hare/Black – naped hare
Order: Carnivora Family: Herpestidae		
20	*Herpestes auropunctatus*	Small Indian Mongoose
21	*Herpestes edwardsii*	Grey Mongoose
Order: Chiroptera Family: Rhinopomatidae		
22	*Rhinopoma microphyllum*	Greater Mouse-tailed Bat
23	*Tephozous nudiventris*	Tomb bat
23	*Rhinopoma hardwickei*	Lesser Mouse-tailed Bat
Order: Carnivora Family: Canidae		
26	*Vulpes vulpes pussilla*	Desert fox
27	*Vulpes bengalensis*	Indian fox
Family: Felidae		
29	*Felis silvestris ornata*	Desert cat
Order: Artiodactyla Family: Suidae		
30	*Sus scrofa*	Wild boar
Family: Bovidae		
31	*Boselaphus tragocamelus*	Nilgai
32	*Gazella bennettii*	Indian gazelle

4. Conclusive Remarks and Suggestion

As these traditional establishments are undergoing new

pressures accompanied by climate change, so it becomes the dire demand of the time to identify threats and plan as per. However, a single management approach can-not be universally followed due to variation of local ecology of area and different threats dependent upon spatial and temporal variation. Initially, inventorization of Orans, in order to formulate laws and regulations, is a key step, which should include systematic collection of disaggregated land and economic data, in order to account the participation and benefits for specific groups by participatory assessment and evaluation. Apart from state owned authoritarian management, emphasis for alternative view of community centric conservation practices should be seeked for.

The Convention of Biodiversity 2002 as well as National Biodiversity Act (2002) highlight the importance of community level management practices and carved a way to create Panchayat level Biodiversity Management Committees (BMC). Section 41 of Biological Diversity Act, 2002 and Rule 23 of Rajasthan Biological Diversity Rules, (2010) provide for formation of Biodiversity Management Committee at the level of every local body i.e. Gram Panchayat, Panchayat Samiti and Zila Parishad for the purpose of promoting conservation, sustainable use and documentation of biological diversity including preservation of habitats, conservation of land races, folk varieties and cultivars, domestic stocks and breeds of animals and micro-organisms and chronicling of knowledge relating to biological diversity within their area of jurisdiction. Each sacred grove should have one such committee and a separate management plan be prepared which include altogether prospectus of Ecology- Agriculture-Livelihood, with a unified perception to conserve biodiversity along with provision of livelihood to the dependent local communities, those involve with Sacred Grooves. The role of women can not be neglected, since they play the key role in maintenance and preservation of traditional resources, hence, they should be provided with equal opportunities during decision making and resources sharing. Introduction of alternative livelihood programs, implementation of people led initiatives for biodiversity conservation and lively hood generation in order to improve agriculture and livestock productivity, facilitation of soil and water conservation practices in order to improve food security, initiation of community led initiative programmes such as, dairy, handicraft and seed bank development by maintaining nurseries.

Summing up, in order to safeguard our age old heritage environmental entities, focus on grassland and gene pool conservation system and community participation to be emphasised. Conservation activities should largely focus on strengthening the existing conservation practices of the villagers. Initiatives like prevention of cattle grazing, restriction on manure collection, removal of invasive plants like *Juliflora* species, can be taken as a precaution to safeguard saving them biota and ecological activities. These preventive measure would play e definite role in carbon crediting apart from this ecotourism can be developed in future depending upon local condition and requirement. Restoration activities may include, plantation of native species, seed bank development in form of nurseries establishment for rare endemic plants.

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