

# STATUS OF THE BIODIVERSITY OF CHADVA RAKHAL, KACHCHH, GUJARAT

March 2021



*Prepared by*



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*Report on the*  
**Status of the Biodiversity of Chadva Rakhal,  
Kachchh district, Gujarat**

**March 2021**

*Submitted to*

**Maharaoshri Pragmulji III & Maharani Priti Devi  
of Kutch  
Bhuj, Kachchh**

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## Foreword

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The preservation of Chadva Rakhhal spans five generations of a single family who have passionately committed their time and personal resources to maintain the area as a place of wildlife and nature conservation, to the point that today and for the past two decades, Chadva Rakhhal has become a much-loved area of wilderness for the people of Kachchh.

In recognition of the ecological value that these long-term commitments have achieved, the National Biodiversity Authority (NBA), MOEFCC, Govt. of India and UNDP has identified Chadva Rakhhal as a potential OECM (Other Effective Area-based Conservation Measures), which is granted to areas that do not currently have official conservation status but which are *“governed and managed in ways that achieve positive and sustained long-term outcomes for the in-situ conservation of biodiversity, with associated ecosystem functions and services and where applicable, cultural, spiritual, socio—economic, and other locally relevant values”*.

The evidence documented in this report describes Chadva Rakhhal as a tropical thorn forest which supports a rich and healthy repository of biodiversity, typical of Kachchh’s hot, arid eco-region. The report concludes that the area is deserving of immediate conservation status due to the presence of endangered flora and fauna and it could be managed either as a Reserve Forest or Community Reserve or as a Biodiversity Heritage Site (BHS).

As the crisis of climate change unfolds in ways difficult to predict and comprehend, protecting such areas has never been so important. Our need to adapt, create and embrace new and innovative conservation models is crucial. A privately managed eco-system is a concept that is currently not well understood in the Indian landscape yet has tremendous potential in helping India achieve its Aichi Target-11 and National Biodiversity Target-6.

With joint participation between the Trust that manages Chadva Rakhhal and the Forest Department of Kachchh, myriad resources can be drawn upon to enable visionary projects such as crocodile or caracal breeding programmes, a Natural History museum or education as well as interpretation centre, sustainable tourism ventures and community initiatives. The success of this would not just be for the benefit of Chadva Rakhhal or Kachchh but would help pave the way for others to pursue similar conservation models across India.

Recognizing the role of private players will be a key to India achieving conservation success in the future.

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# Status of the Biodiversity of Chadva Rakhal, Kachchh district, Gujarat

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## Introduction

Biodiversity refers to the variety of species and ecosystems on Earth and their processes. Biodiversity maintains the link with human societies on ecological, economical, cultural and spiritual levels. Its benefits are, however, compromised by the anthropogenic activities which, in conjunction with population growth, results in the rapid deterioration of ecosystems that subsequently leads to decline in the number of species and their genetic diversity (Prescott *et al.*, 2000). Therefore, conservation of biodiversity is a global responsibility and it is a prerequisite for every nation to establish new ways to conserve and manage biological diversity in a sustainable manner.

Biodiversity and wildlife conservation refers to the development of habitats in a rational and scientific manner, allowing the entire biodiversity and genetic resources to sustain and flourish for the welfare of human society and maintenance of inherent ecological balance in a geographical region for the long-term. Natural systems of the planet support human life by providing energy, food, water and other resources. Human interactions with nature have shaped humanity in an intricate manner and the future of humans cannot be separated from that of other life forms and ecosystems with which we share the planet.

Diminishing biological diversity has consequences for the environment far more profound than any other because the loss is irreversible. During the last few decades, there has been a massive decline as well as an alteration of wildlife habitats and wild populations, mainly due to tremendous increase in human and livestock populations, destruction or modification of habitats for the development of agriculture, ever increasing resource dependency on forests, development of infrastructure facilities, mining, industrialization and urbanization, etc. Human activities like agricultural expansion, road construction, urbanization and other developmental activities are envisaged as major threats to biodiversity that have resulted in extinction of species at a rate 1000 to 10,000 times faster than in ancient times (Wilson, 1988). Thus, conservation of biodiversity is a prerequisite, and the most effective and efficient mechanism is needed to further check deterioration and degradation of habitats as well as implementing innovative strategies that conserve and sustain wildlife and biodiversity in to the future.

The Kachchh district of Gujarat (22° 41' 11" to 24° 41' 47" N latitude, and between 68° 9' 46" to 71° 54' 47" E longitude) is located along the western part of the state that falls under its arid tract and is classified as 3B Desert - Kachchh Province under Desert Biogeographic Zone (Rodger and Panwar, 1988). Being a dryland, distribution of rainfall is meagre and erratic and droughts are very frequent. In spite of the arid region, Kachchh district supports a total of 988 higher plant species and a large area is covered by wetlands. As per the forest classification of Champian and Seth (1968), forests of the district are classified as "Northern Tropical Thorn Forest". The thorn forest and savanna are the two dominant habitats present in Kachchh. These vegetation types exist in the form of a mosaic in undulating hilly tracts and plain areas. Thus, the climatic scenario of Kachchh supports Rakhals (forests), Vidis (grasslands/savannah) and coastal marshes. All these habitats support a variety of floral and faunal species. Thus, the district possesses a unique desert

biodiversity. Manmade and natural water harvesting structures add another dimension to the wetland scenario of Kachchh, increasing the biodiversity of the region. Furthermore, the strategic location of Kachchh along the western route of the Central Asian Flyway is a gateway facilitating migratory birds to enter India through the district.

Among the many rakhals and vidis lies Chadva Rakhhal; a private forest owned and protected by the erstwhile rulers of Kachchh, located near Samatra Village, about 17 km from Bhuj in the Kachchh district.

The past rulers of the Kachchh State (1147-1948) designated about 44 Rakhals, which were maintained as forest and grazing reserves and could not be used for commercial purposes. Post independence in 1947, Chadva Rakhhal became the private property of the ruling family. The present inheritors are Their Highnesses Maharao Pragmulji III and Maharani Priti Devi of Kutch. Chadva Rakhhal is spread over 5,179 ha area, with a huge reservoir known as Pragsar Lake. The lake encompasses an area of approximately 80 ha (36.94 ha as per the Survey of India topographical maps and 79.67 ha as per Satellite imagery, 1997-98), and supports many fish species, birds and a considerable population of Mugger Crocodiles (over 100 crocodiles).





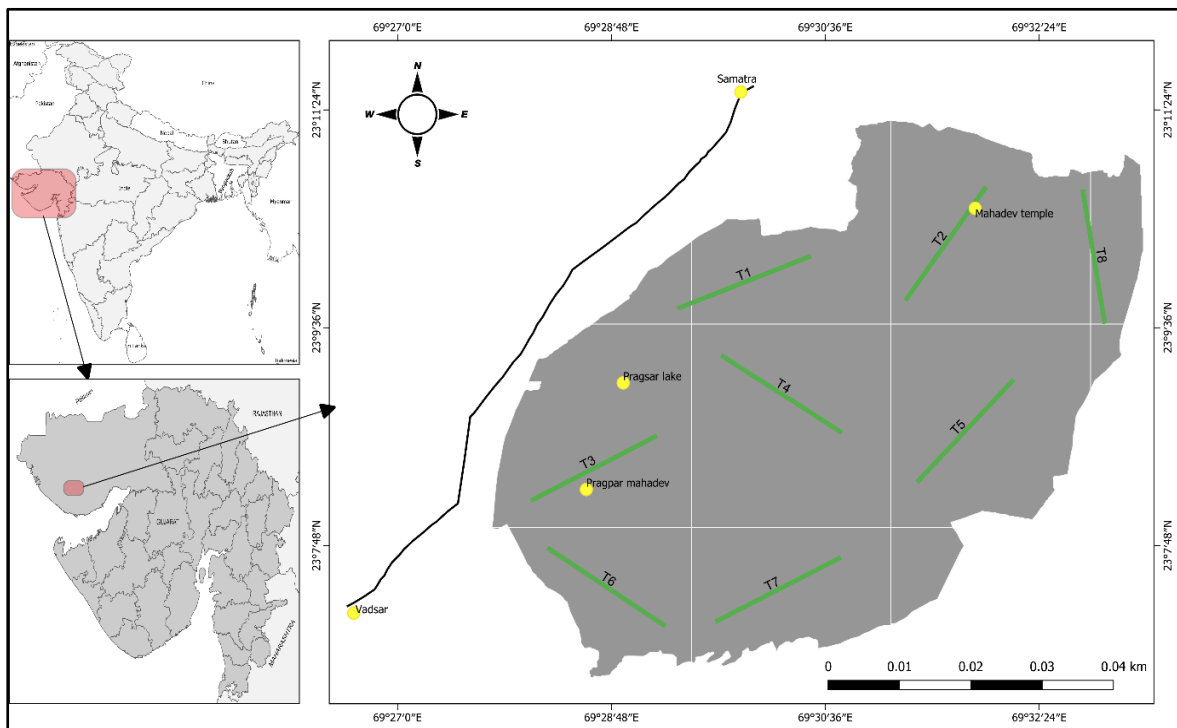
## Aims and Objectives

- 1 Collection of Secondary Information related to the biodiversity of Chadva Rakhhal.
- 2 Rapid survey of the flora (herb, shrub & trees) of Chadva Rakhhal.
- 3 Rapid survey of the fauna (herpetofauna, bird, mammal, butterfly) of Chadva Rakhhal.
- 4 Preparation of a detailed checklist of the biodiversity of Chadva Rakhhal with conservation status.
- 5 Documentation of the status of biodiversity and its conservation significance.



## Study Area

Chadva Rakhal, spread over 5,179 ha area (Figure 1), is located in the Bhuj Taluka of Kachchh district ( $23^{\circ} 9'7.92''\text{N}$  and  $69^{\circ}28'38.99''\text{E}$ ). The area is dominated by an undulating terrain of tropical thorn forests and scrub forests, predominantly of *Prosopis juliflora*. The study area is bestowed with major terrestrial ecosystems like tropical thorn forests, scrub savannahs, grasslands and interspersed with dryland farming (arid agro-ecosystem). The area is interspersed with hills and riverine areas dominated by scrub forests. The altitudinal elevation ranges between 100 and 280 m above MSL. The study area has few seasonal rivers, rivulets and streams. The detail of the project site and its environmental setting is given in Table 1.



**Figure 1: Sampling Map and Location of Chadva Rakhal, Bhuj, Kachchh**

## Climate

The study area falls in the arid tract of Kachchh, thus experiencing a tropical monsoon climate with extreme weather conditions. The winter season starts from November and ends in February with temperatures going down to the average minimum of  $7^{\circ}\text{C}$  in January, while summer extends from March till June with the maximum temperature varying from  $42\text{-}46^{\circ}\text{C}$ . The estimated average annual rainfall of the Kachchh district is 358 mm and is highly erratic, leading to protracted droughts which are a common phenomenon. The rainfall in the area is from the SW monsoon. The evapo-transpiration rates are very high with 2.25 m in a year. Wind velocity is generally light to moderate during summer and winter, however, sometimes wind speed increases during the summer season.



**Table 1****An Overview of the location and Environmental Setting of Chadva Rakhal, Kachchh**

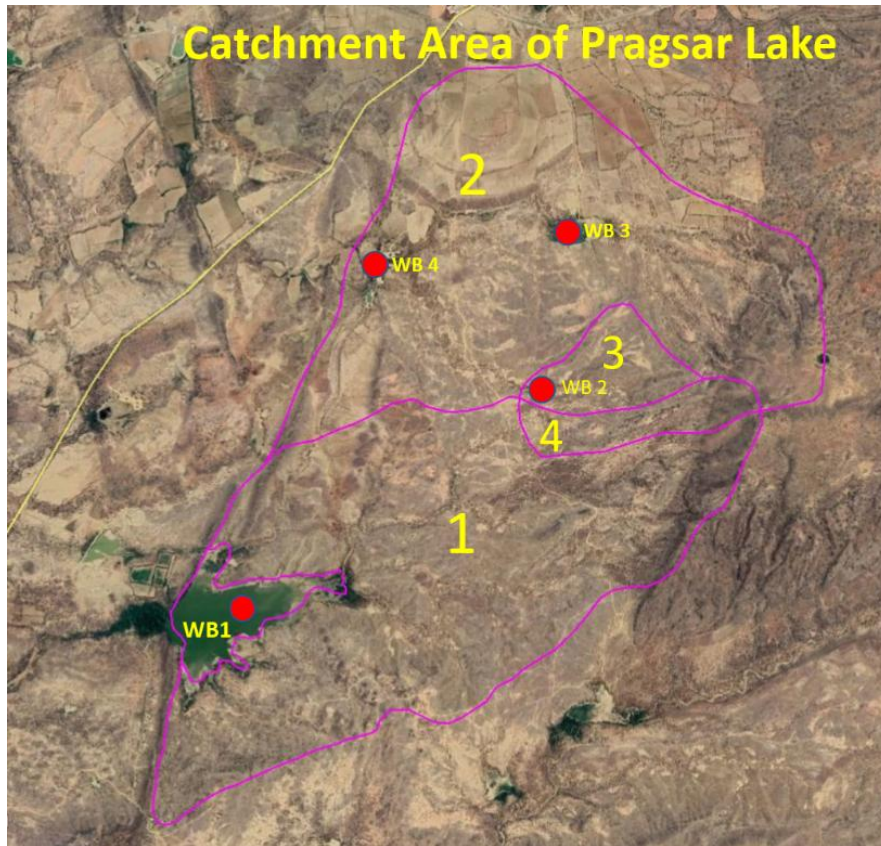
S. No.	Particulars	Details
1	Location details	Chadva Rakhal, Taluka: Bhuj, District: Kachchh, Gujarat
2	Geographical Location	Latitude: 23° 9'7.92"N
		Longitude: 69°28'38.99"E
3	Area	5179 Ha
4	Elevation (MSL)	100 to 280 m
5	Climatic conditions	Annual Max. Temp : 45°C Annual Min. Temp : 7°C Relative Humidity : Max: 80; Min: 40 Annual Average Rainfall : 358 mm
6	Nearest Highway	SH-42 (1 km towards North) SH-47 (2.40 km towards South)
7	Nearest Railway Station	Bhuj 15 km
8	Nearest Air Port	Bhuj (15 km)
9	Nearest Village	Samatra (2 km towards North direction)
10	Nearest Town	Bhuj (15 km, North-east Direction)
11	Seismic Zone	Zone-V as per IS:1893 (Part-1) 2002

**Geohydrology of Chadva Rakhal**

Chadva Rakhal can be divided into two major watersheds, i.e. direct watersheds (WS No. 1 in Figure 2) and diverted watersheds (WS No. 2, Figure 2). The entire system comprises four water bodies. WB 1 is Pragsar Lake, while another three, i.e. WB 2, WB 3 and WB 4 are small and located in the upper to middle reaches of the watershed. All three of these small water bodies are built in diverted watershed areas. The location and purpose of these small water bodies is to develop connectivity among different micro watersheds, collection and retaining run-off water during the rainy season. Additionally, these waterbodies provide drinking water through the dry season and minimize the load on the main water body (Pragsar Lake).

In order to understand catchment hydrology, the reverse calculation approach has been adopted. The total storage capacity of Pragsar Lake i.e. 1.4 MCM is considered the base for potential run-off harvesting and is a mechanism for drought coping. The run-off estimation from direct as well as diverted catchments clearly shows that direct catchment alone cannot fulfil the storage water requirement (Table 2). Therefore, the diversion of

catchment is necessary for water demand. Cumulative water run-off from both catchments is about 1.54 MCM, i.e. about 65% of the received rainfall.



**Figure 2: Watershed Areas of Chadva Rakhhal**

Furthermore, in order to fulfill demand during lean and drought periods, a waterbody should have a water column which is more than the evaporation rate of the area. Pragsar Lake has approximately 8m average water column, enabling it to store water during a drought year, as the district sees an average of 2.25 m water column loss as evaporation loss.

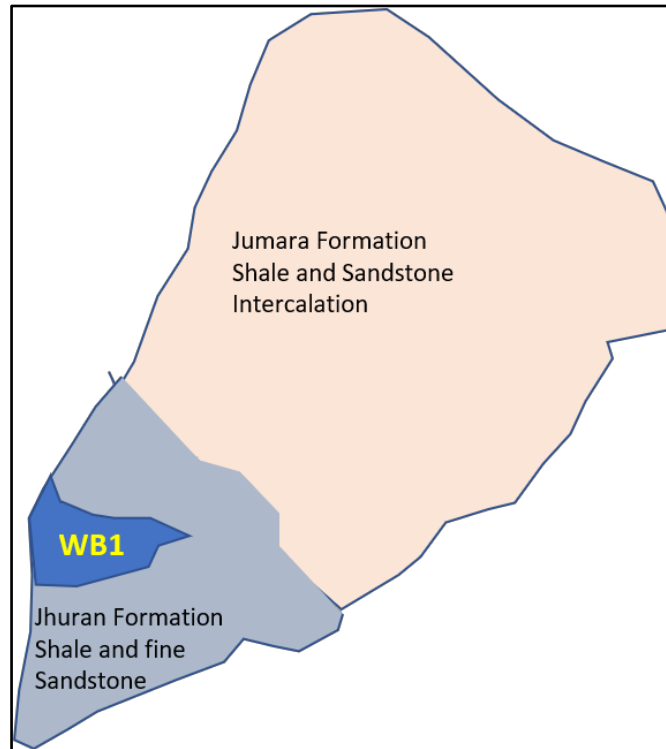
**Table 2: Surface Hydrology of Chadva Rakhhal Watershed**

Sl No.	Catchment Hydrology	Area	Remark
1	Direct Catchment	552 Ha.	
2	Diverted Catchment	475 Ha.	Two Small Waterbodies
3	Total Catchment	1027 Ha.	
4	Total Available Water by Rainfall	3389100 Cum.	Assuming 330 MM AAR
5	Effective rain water volume to generate runoff	2372370 Cum.	Assuming 30% negligible rainfall
6	Runoff Water (catchment Yield)	1542040 Cum.	@65% Runoff



Concerning the geological formation, the entire watershed area represents shale and sandstone intercalation strata of Jumara and Jhuran formations of Mid to upper Jurassic age (Figure 3). Both the formation and rock type have very low permeability and therefore, large surface water bodies are the most effective techniques for water harvesting.

Based on the above hydrological description, it is concluded that the diversion of the catchment area, the selection of the water body embankment site and taking two years of evaporation losses into consideration are three important planning considerations for a drought-resilient system.



**Figure 3: Geology of Watershed areas of Chadva Rakhal**

### **Historical Background of the Chadva Rakhal**

The history of how Chadva Rakhal evolved to become one of the most untouched and enchanting pockets of wilderness that remains in Kutch today, spans five generations of Rao rulership and protection which commenced during the reign of HH Rao Pragmulji II (1860-1875). Official documentation of the area is by no means extensive, but we are able to track the evolution of what began as an experimental watershed project, to a favoured preserve for *shikar*, and finally as a privately managed estate advocating wildlife and environmental conservancy. Information about the Rakhal draws upon state records, anecdotal documentation and recent personal communication with HH Maharao Pragmulji III. In addition to tracing the history of Chadva Rakhal, this section aims to convey the extent of the ruling family's long-standing passion and dedication in the field of wildlife and conservation, and how much their commitment and personal love for Chadva Rakhal has allowed it to become an important and recognised area of refuge for wildlife, and a place of peace and natural beauty for the people of Kutch.

Pragmulji II was an enlightened and progressive ruler, whose knowledge and appreciation of the cultural arts led him to become an elected member of the Royal Asiatic Society. The period of his reign saw the formalisation of administrative and judicial systems, as well as an early system of forestry, including the large-scale introduction of date palms. Before his demise in 1875, Pragmulji II had been working on the creation of a Natural History Museum in Bhuj '*and had made some progress in collecting specimens*' with the aid of the '*enthusiastic naturalist*', Hugh Palin who was residing in the Province and therefore '*able to devote his time and energy to the collection and classification of specimens*'. While it appeared that the museum was unable to come to fruition, Palin's observations and descriptions were some of the earliest contributions to the Administration's catalogue of Kutch's flora and fauna, to which many ornithologists and naturalists would add – at the invitation of the Raos - over the decades that followed.

Scarcity in Kutch was felt severely in the early 1860s as the failures of successive monsoons brought drought and famine upon the land and people, prompting Pragmulji II to develop various watershed projects: sinking of wells, building of tanks and the bunding of riverheads and streams to create reservoirs. In a letter to Colonel H W Trevelyan, dated 15 Dec 1861, Pragmulji II expressed his interest to '*restore what appears to be a large tank*' to which the surveyor, Seikh Kasim's estimated costs would be a '*Lac of Korees*'. The old lake, known then as *Asura Sar* and also *Abu Bhang*, lay in a circular valley in the Chadva Hills, near the underground *Bileshwar Temple* devoted to Lord Shiva. This project resulted in the construction of Kutch's first experimental masonry dam, submerging an area of 100+ acres. It was inaugurated in 1870 with the name *Prayagsar*, known today as Pragsar Lake. Adjacent to the lake, Pragmulji II conceived a tropical and shaded garden with tall and fruiting trees, an otherwise near impossible feat in such an arid region.

During the lengthy reign of HH Rao Khengarji III (1875-1942), around 44 *rakhals* comprising a collective area of approx 300 square miles were formally designated and protected as grass preserves, producing fodder for the Darbari animals or fodder sold as revenue. While there were no tracts in Kutch that could be called 'Forest Reserves', any trees growing within the *rakhals* were protected, and the Rao took a personal interest in planting trees throughout the state.

An area of 12792 acres, which encompassed the Pragsar Lake and Garden, was maintained as Chadva Rakhhal. It became one of Khengarji's favourite shikar grounds and was the selected location for his experiments with breeding Guinea Fowl that he had imported from Somalia. He was an avid birder, who discovered the only known breeding grounds of the flamingo in India, located in the Great Rann of Kutch. Khengarji III added the Camp House and other related structures at Chadva Rakhhal, which remain in ruin today due to the damage suffered during the 2001 earthquake. In 1883, he created a nursery on the Chadva tank. It was also this year that his proposition for a specific *Conservator of Forest* for Kutch was initiated.

Conservatism ran into Vijayarajji's brief rulership between 1942 and 1948. He introduced the coucal (crow-phenant) in to the Rakhhal which is now found throughout Kutch. Irrigation remained the chief concern of the region, and during those six years 22 dams



were constructed, including the famous Vijaysagar reservoir, which lies to the south of the Chadva hill range. India's famed ornithologist, Dr Salim Ali was encouraged by Vijayarajji to compile the handbook *Birds of Kutch* (1948), in which Ali commends the '*solicitous care*' and '*sympathetic auspices*' of the Kutch rulers, with regards to their love of birds and bird conservation. He notes that it was Vijayarajji's '*personal interest that made possible the ornithological survey of Kutch State (1943-44) which added considerably to our knowledge of this interesting strip of country*' and he highlights the ecological changes of the past four decades that were of concern to Vijayarajji. Chadva Rakhhal finds '*special mention*' in Ali's book, an area he declares is '*for all practical purposes a wild-life sanctuary*'. His descriptions detail '*a fairly extensive tract of sparsely-scrubbed stony hummock country, with two large bunded tanks (Pragsar and Pharsar) in the catchment basins, and patches of babool and scrub jungle... Besides Nilgai, Pig, Chinkara and Hare in abundance, it holds a large population of partridges, both Grey and Black.*' A platform named *Salim Ali's Perch* lies in his honour at the site of his favourite viewing spot overlooking the Pragsar Lake.

At the time of independence drastic changes were abound for the ruling classes of India. 1948 witnessed the demise of Vijayarajji just months before the Kutch administration was transferred to the Central Government. In accordance with the customs prevailing within the family, Chadva Rakhhal was granted to the 12 year-old Yuvraj; the current Maharao Pragmulji III. In the seven decades that have passed, up to the present day, Chadva Rakhhal has been nurtured by Their Highnesses Maharao Pragmulji III and Maharani Priti Devi of Kutch as '*an area protected for the well-being of the forest and all of its creatures*'.

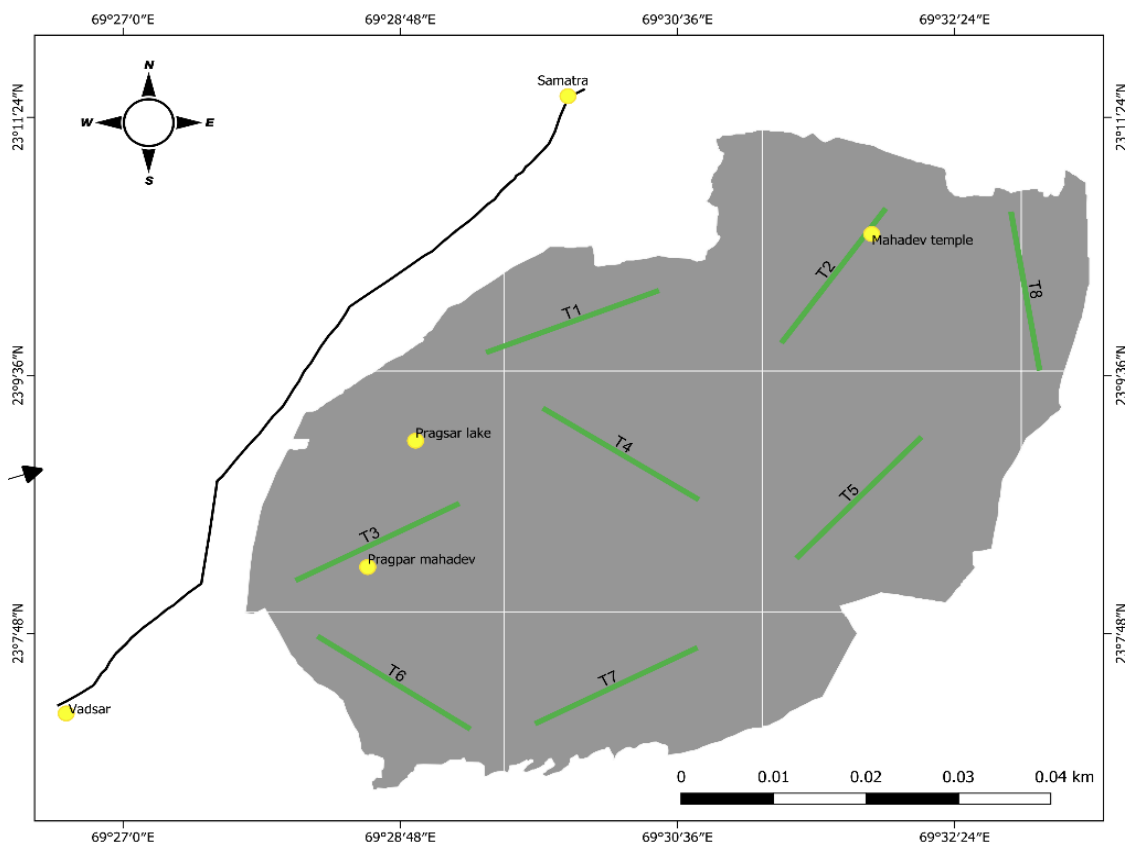
In the years immediately post-independence, particularly after Kutch merged with the state of Gujarat, many land tracts were taken over as agricultural and industrial belts. Places such as Chadva Rakhhal became isolated refuges where wildlife could exist. For the Maharao and Maharani, their Rakhhal was a place of peace and tranquility in which they walked regularly to watch birds and spot one of the 200+ crocodiles that are estimated to inhabit Pragsar Lake, always in anticipation of a rare sighting of caracal or panther. Pragmulji III undertook various projects to sustain the beauty and sanctity of the area, including annual reforestation, the creation of Priti Talai, and maintaining motorable tracks to increase accessibility throughout the Rakhhal for pilgrims visiting the Mahadev (Bileshwar) Temple. He regulated the grazing rights of the Maldhari community in such a way as to allow the grasslands to regenerate each year and thus maintain a healthy ecological balance where wildlife and pastoralism could co-exist.

When the earthquake of 2001 brought complete devastation to the region, The Maharao and Maharani decided to open the Chadva Rakhhal to the public and offer a '*breathing space*' to the people of Bhuj and beyond. It became an immediate destination for nature lovers who valued its pristine, untouched wilderness. Its popularity has grown steadily over the past two decades. In order to secure the long-term protection, sanctity and management of Chadva Rakhhal, HH Maharaoshi Pragmulji III and HH Maharani Priti Devi of Kutch have created a trust called *Maharao Pragmulji Nature Conservation Trust*, a name and premise that honors the creation, preservation and spirit of Chadva Rakhhal.

## Study Approach and Methodology

- 1. Reconnaissance Survey:** A reconnaissance survey in and around Chadva Rakhal was conducted during October 2020. The survey was conducted to identify various habitats within the study area, and to fix sampling locations for intensive field surveys where data collection on various aspects would achieve the objectives of the present study.

**Sample Locations:** In order to assess the biodiversity status of the study area, 8 locations (Grids/Transects) (Figure 4) representing different habitats present within the study were selected at random and sampled.



**Figure 4: Sampling Location of Chadva Rakhal for Biodiversity Survey**

**Distribution of Sample Locations:** Since the site is predominated by Tropical Thorn Forests, *Prosopis* dominant (wasteland with *Prosopis* thickets) and Scrub Land, a maximum of 8 locations (T1 to T8) were sampled in this area (Figure 4).

The approach and methodology applied for assessing the terrestrial biodiversity of the study area is described in the respective sections below.

- 2. Intensive Survey**

Intensive field surveys were conducted between November and December 2020 for data collection on the existing flora and fauna within the core and buffer zone of the study area.



**2.1. Terrestrial Biodiversity:** A micro level approach involved mainly field based primary data collection on faunal diversity in the core and buffer zones of the study area. The various groups of faunal species including mammals, birds, reptiles and amphibians were surveyed using standard methods in habitats such as forest, wetland, scrubland, grassland, human habitation, fallowland and agriculture land, etc.

**2.1.1. Floral Status:** Floral species existing in the study area were randomly surveyed in all the representative habitats including wetland, forest, grassland, scrubland and wastelands within Chadva Rakhal. Quantitative data on floristic diversity were collected using Standard Quadrant Sampling Methods as followed by Mueller-Dombois and Ellenberg (1967).

#### **2.1.2. Faunal Status**

**2.1.2.1. Herpetofauna (Amphibian and Reptile):** Intensive search methods were used along the edges of water bodies including pond, lake, riverine areas and streams to record the amphibian species. The status of herpetofauna was monitored and assessed using standard methods (Campbell and Christman, 1982; Corn and Bury, 1990).

**2.1.2.2. Birds:** Intensive avifaunal surveys were carried out in both terrestrial and aquatic habitats located within Chadva Rakhal. Total count or flock count methods (Bhupathy, 1991; Steinkamp *et al.*, 2003) were used to assess the aquatic birds and Point centre count method/perambulation techniques (Hutto *et al.*, 1986; Bibly *et al.*, 1992) were applied to record and assess the status of terrestrial bird species.

**2.1.2.3. Mammals:** The status and distribution of different mammal species in various habitats were quantified by direct (walking along the Line transect) (Burnham *et al.*, 1980; Rodger, 1991). Indirect surveys of mammalian fauna were also conducted using standard methods (Thompson *et al.*, 1989; Henke and Knowlton, 1995; Allen *et al.*, 1996).

**3. Secondary Data Collection:** Secondary information related to the study was collected from various sources including published research articles, technical reports, books, NGOs, Govt. Departments, etc.

**4. Land Use and Land Cover Assessment:** A reconnaissance field survey was undertaken to get acquainted with the general land cover pattern of the area. The variation and tonal patterns observed in the ground truthing were recorded on the existing images. Field observations were carried out along the core and buffer areas for ground truthing to understand the patterns and characters using satellite image. Various features identified in the ground truthing were correlated with the image element and GPS observations were obtained for various land cover by superimposing over the satellite image.

This imagery classification was supported by ground truthing through fieldwork as it is important to check and collect most of the ground information required for mapping.

## Results and Discussion

### Habitat Diversity in the Study Area

Kachchh falls under the Hot Arid Eco-region with Desert and Saline Soils (Singh and Nair, 2012). Based on the Survey of India Topo sheet (1:50,000), the Buffer Zone (10 km radius) of the study area is dominated by two major habitat types: scrubland and agricultural land (agro-ecosystem). Along with these major habitat types, wastelands are also interspersed with these habitat types. The majority of the area is dominated by undulating terrain, interspersed by hilly tracts, seasonal rivers and rivulets. The scrub forest and wasteland are dominated by *Prosopis juliflora* scrub (PS) and Open Scrub Forest characterised by the presence of medium-sized wild tree species viz. *Acacia nilotica*, *A. senegal*, *Salvadora persica*, *S. oleoides*, etc. and thorny shrub vegetation cover.

As the study area receives meagre rainfall, an annual average of around 358 mm, most of the water bodies which exist in the close vicinity of the area (except Pragsar Lake) dry out during the onset of the summer season. Only a few seasonal streams and minor rivulets criss-cross the buffer area, where the water flow is generally restricted to rainy days only, staying dry during the remaining 8 to 9 months of the year. There are many man-made tanks within and beyond the periphery of the study area. For the purpose of the present study, the study area has been delineated into five major habitat types according to the nature of vegetation existing in the area.



Thorn Scrub Forest



Tropical Thorn Forest



Prosopis dominant area



Pragsar lake and adjoining landscape



**Mixed Thorn Forest:** Approximately 30% of Chadva Rakhai is covered by mixed thorn forest, which is mainly distributed on the hilly and undulating terrains of the Rakhai. The forests distributed within the Rakhai are arid and semi-arid scrub forest dominated with xerophytic vegetation.

**Open Scrub Land:** Mainly small patches of waste lands (Gauchar lands, cultivable waste) with wild species of scrub vegetation with scattered tree species present in the area. These patches are not true and designated forest areas.

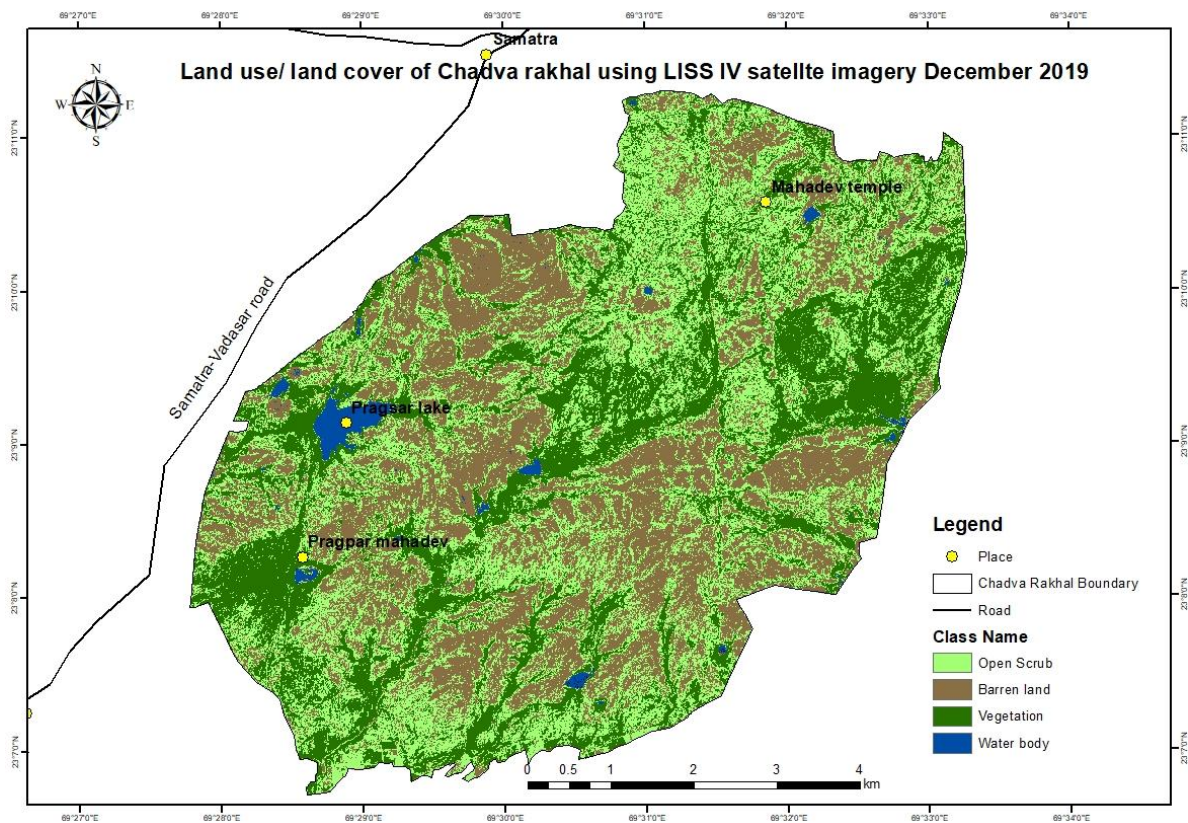
**Prosopis Scrub:** All categories of wasteland, which includes permanent fallow land, dominated by an invasive alien species known as *Prosopis juliflora* (Gando baval).

**Agro-ecosystem:** The peripheral areas are currently under intensive agricultural use (irrigated lands, un-irrigated lands/rain fed agriculture) with surrounding hedge vegetation (locally known as Wadis). The cultivation area is very small compared to other habitats present in the study area.

**Stream Beds:** This includes the area along the banks of seasonal rivers, rivulets, streams and small nallahs.

**Wetlands:** The study area encompasses four water bodies. Pragsar Lake is an important wetland which supports Mugger Crocodiles and many wetland birds. In addition, the other check dams and tanks located at Chadva Rakhai support good populations of aquatic and terrestrial birds in the area.

The Land Use and Land Cover (LULC) of Chadva Rakhai are shown in Figure 5.



**Figure 5: Land Use and Land Cover of the Study Area**

### Status of Floral Diversity

Based on the present survey, a total of 253 plant species were recorded at Chadva Rakhal. These belong to 194 genera and 74 families (Figure 6). The life forms of the plant species were dominated by 114 species of herbs, followed by 63 species of shrubs, 44 species of trees, 23 species of grasses and 9 species of climbers (Annexure I and Figure 7). The overall Shannon-wiener species diversity index ( $H'$ ) of the plants was recorded to be 2.36 ( $H'$ ) which showed that the areas have a medium level of species diversity while the species richness index was recorded at 3.66 (Table 3). The species dominance of the area was recorded at 0.17 and species evenness was recorded at 0.56 which highlighted that more than 50 percent of species similarities between different locations within the area.

The area of Chadva Rakhal is 5179 Ha (51.79 km<sup>2</sup>), which is only 0.11 per cent of the total geographical area of the Kachchh district (45,652 km<sup>2</sup>). However, the area supports 253 plant species out of 988 species (Patel *et al.*, 2011) reported from Kachchh. The species recorded from Chadva Rakhal is 26 per cent of the plant species reported from Kachchh, which indicates the importance of the area with reference to diverse floral species. Among the flora of Chadva Rakhal, *Commiphora wightii* is the only endangered species found in the area, along with more than 70 species of medicinally important plant species present in the area.

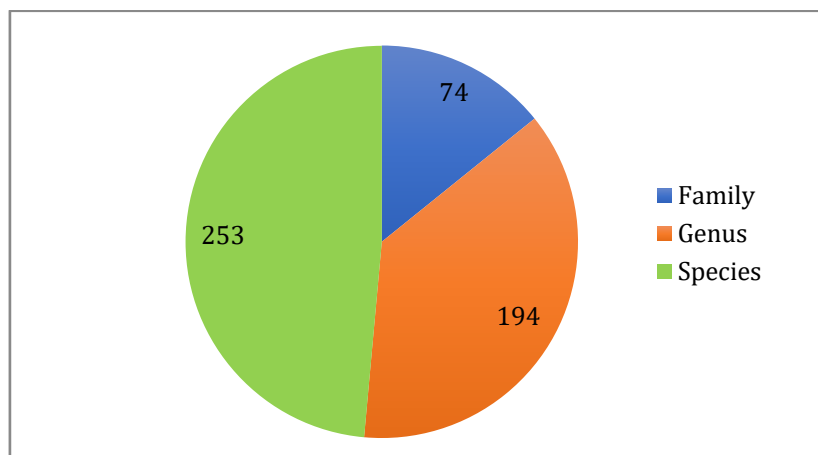


Figure 6: Taxonomic diversity of plants recorded from Chadva Rakhal

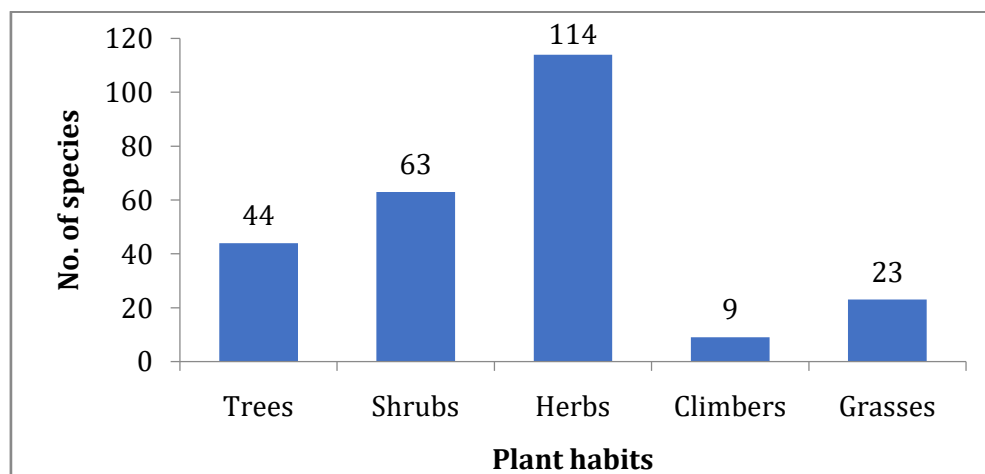


Figure 7: Species richness of different plant types recorded from Chadva Rakhal

**Table 3: Species Diversity status of Flora at Chadva Rakhal**  
(Estimated based on transect and quadrat sampling data)

Diversity Characteristics	T1	T2	T3	T4	T5	T6	T7	T8	Overall
Species	25	18	19	26	23	18	15	22	86
Individuals	183	88	125	529	410	245	156	326	2062
Dominance_D	0.09	0.10	0.41	0.34	0.10	0.16	0.12	0.08	0.17
Simpson_1-D	0.91	0.90	0.59	0.66	0.90	0.84	0.88	0.92	0.83
Shannon_H	2.84	2.57	1.68	1.79	2.67	2.26	2.33	2.74	2.36
Evenness_e^H/S	0.68	0.72	0.28	0.23	0.63	0.53	0.69	0.70	0.56
Margalef	4.61	3.80	3.73	3.99	3.66	3.09	2.77	3.63	3.66

**Phytosociology:** The phytosociological analysis of the area found that the frequencies of 7 species viz. *Acacia tortalis*, *Asparagus racemosus*, *Cyperus glomeratus*, *Melanocenthrus jacquemontii*, *Peristrophe bicalyculata* and *Sida rhombifolia* were more than 50% (Table 4) with highest frequency recorded of *Grewa tenex* (75%). Similarly, the species like *Indigofera cordifolia* and *Aristida adensonensis* were the most abundant plant species in the area, while the density of *Aristida adensonensis* (59.13 individuals/unit area) was highest among recorded species followed by *Indigofera cordifolia*, *Dactyloctenium aegypticum* while more than 50% of species have a density less than one individual/unit area (Table 4).

**Table 4: Phytosociology of Chadva Rakhal, Kachchh**

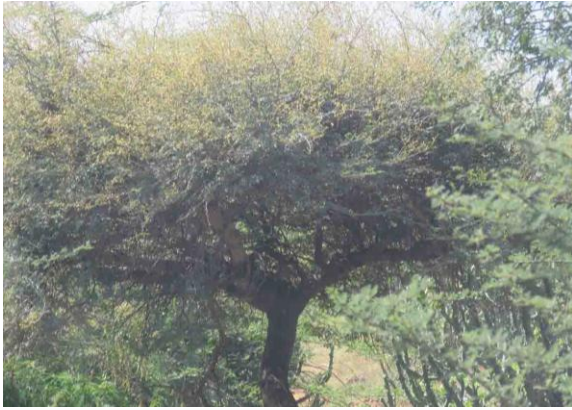
Sl. No	Estimated species	Frequency	Abundance	Density
1	<i>Acacia leucophloa</i>	12.50	3.00	0.38
2	<i>Acacia nilotica</i>	25.00	2.00	0.50
3	<i>Acacia senegal</i>	12.50	9.00	1.13
4	<i>Acacia tortalis</i>	50.00	0.25	0.13
5	<i>Apluda mutica</i>	12.50	22.00	2.75
6	<i>Aristida adensonensis</i>	37.50	157.67	59.13
7	<i>Asparagus racemosus</i>	50.00	0.75	0.38
8	<i>Asparagus sprengeri</i>	12.50	16.00	2.00
9	<i>Balanites aegyptiaca</i>	25.00	1.00	0.25
10	<i>Bidens pilosa</i>	12.50	3.00	0.38
11	<i>Blumea lacera</i>	12.50	5.00	0.63
12	<i>Blumea obliqua</i>	25.00	2.00	0.50
13	<i>Boerhavia diffusa</i>	12.50	4.00	0.50
14	<i>Boerhavia erecta</i>	12.50	2.00	0.25



Sl. No	Estimated species	Frequency	Abundance	Density
15	<i>Brachiaria ramosa</i>	25.00	8.00	2.00
16	<i>Capparis decidua</i>	12.50	7.00	0.88
17	<i>Cardiospermum halicacabum</i>	12.50	2.00	0.25
18	<i>Celosia argentea</i>	12.50	2.00	0.25
19	<i>Cenchrus ciliaris</i>	12.50	9.00	1.13
20	<i>Chloris barbata</i>	25.00	51.50	12.88
21	<i>Cleome viscosa</i>	25.00	1.50	0.38
22	<i>Commelina benghalensis</i>	12.50	1.00	0.13
23	<i>Commelina diffusa</i>	12.50	7.00	0.88
24	<i>Commiphora wightii</i>	37.50	2.67	1.00
25	<i>Convolvulus microphyllus</i>	12.50	10.00	1.25
26	<i>Corchorus depressus</i>	25.00	30.50	7.63
27	<i>Corchorus olitorius</i>	12.50	15.00	1.88
28	<i>Cordia gharaf</i>	25.00	9.00	2.25
29	<i>Cyperus glomeratus</i>	50.00	3.00	1.50
30	<i>Cyperus rotundus</i>	12.50	23.00	2.88
31	<i>Dactyloctenium aegypticum</i>	25.00	74.00	18.50
32	<i>Dactyloctenium scindicum</i>	12.50	20.00	2.50
33	<i>Dichanthium annulatum</i>	25.00	17.50	4.38
34	<i>Digera muricata</i>	37.50	16.00	6.00
35	<i>Digitaria ciliaris</i>	12.50	6.00	0.75
36	<i>Diptera canthusprostatus</i>	12.50	6.00	0.75
37	<i>Echinochloa colonum</i>	12.50	22.00	2.75
38	<i>Eleusine indica</i>	12.50	28.00	3.50
39	<i>Eragrostis ciliaris</i>	12.50	32.00	4.00
40	<i>Eragrostis japonica</i>	12.50	5.00	0.63
41	<i>Eragrostis tenella</i>	12.50	84.00	10.50
42	<i>Eragrostis tremula</i>	12.50	23.00	2.88
43	<i>Euphorbia caducifolia</i>	12.50	38.00	4.75
44	<i>Euphorbia thymifolia</i>	12.50	3.00	0.38
45	<i>Evolvulus alsinoides</i>	12.50	6.00	0.75
46	<i>Fagonia schweienfurthii</i>	25.00	1.50	0.38
47	<i>Goniogyna hirta</i>	12.50	48.00	6.00
48	<i>Grewia tenax</i>	75.00	0.83	0.63
49	<i>Grewia villosa</i>	12.50	28.00	3.50
50	<i>Hibiscus microphylla</i>	12.50	1.00	0.13
51	<i>Indigofera cordifolia</i>	12.50	164.00	20.50

Sl. No	Estimated species	Frequency	Abundance	Density
52	<i>Indigofera oblongifolia</i>	12.50	3.00	0.38
53	<i>Ipomoea sepiaria</i>	25.00	1.00	0.25
54	<i>Justicia procumbens</i>	25.00	8.00	2.00
55	<i>Launaea resedifolia</i>	37.50	1.33	0.50
56	<i>Leucas cephalotes</i>	12.50	6.00	0.75
57	<i>Melanocenthrus jacquemontii</i>	62.50	20.40	12.75
58	<i>Merremia tridentata</i>	37.50	0.67	0.25
59	<i>Oligochaeta ramosa</i>	12.50	8.00	1.00
60	<i>Passiflora edulis</i>	12.50	1.00	0.13
61	<i>Pavonia arabica</i>	37.50	3.33	1.25
62	<i>Pedaliium murex</i>	12.50	2.00	0.25
63	<i>Pentanema indicum</i>	12.50	3.00	0.38
64	<i>Pentatropis capensis</i>	12.50	2.00	0.25
65	<i>Peristrophe bicalyculata</i>	50.00	11.75	5.88
66	<i>Physalis minima</i>	12.50	28.00	3.50
67	<i>Polycarpaea corymbosa</i>	37.50	0.33	0.13
68	<i>Portulaca meridiana</i>	12.50	3.00	0.38
69	<i>Portulaca tuberosa</i>	12.50	12.00	1.50
70	<i>Prosopis juliflora</i>	12.50	44.00	5.50
71	<i>Pulicaria wightiana</i>	12.50	2.00	0.25
72	<i>Pupalia lappacea</i>	12.50	11.00	1.38
73	<i>Rostilaria vahlii</i>	25.00	6.00	1.50
74	<i>Salvadora oleoides</i>	25.00	4.50	1.13
75	<i>Sida acuta</i>	12.50	7.00	0.88
76	<i>Sida cordata</i>	12.50	3.00	0.38
77	<i>Sida cordifolia</i>	25.00	1.50	0.38
78	<i>Sida rhombifolia</i>	50.00	1.00	0.50
79	<i>Solanum incanum</i>	25.00	1.00	0.25
80	<i>Solanum nigrum</i>	12.50	3.00	0.38
81	<i>Sonchus oleraceus</i>	12.50	35.00	4.38
82	<i>Sporobolus helvolus</i>	12.50	20.00	2.50
83	<i>Triumfetta rhomboidea</i>	25.00	0.50	0.13
84	<i>Vernonia cinerea</i>	12.50	47.00	5.88
85	<i>Xanthium strumarium</i>	12.50	3.00	0.38
86	<i>Zizyphus nummularia</i>	12.50	3.00	0.38





*Acacia leucophloea*



*Blepharis edulis*



*Commelina benghalensis*



*Leptadenia pyrotechnica*



*Thespesia populnea*



*Xanthium strumarium*



*Commiphora wightii*





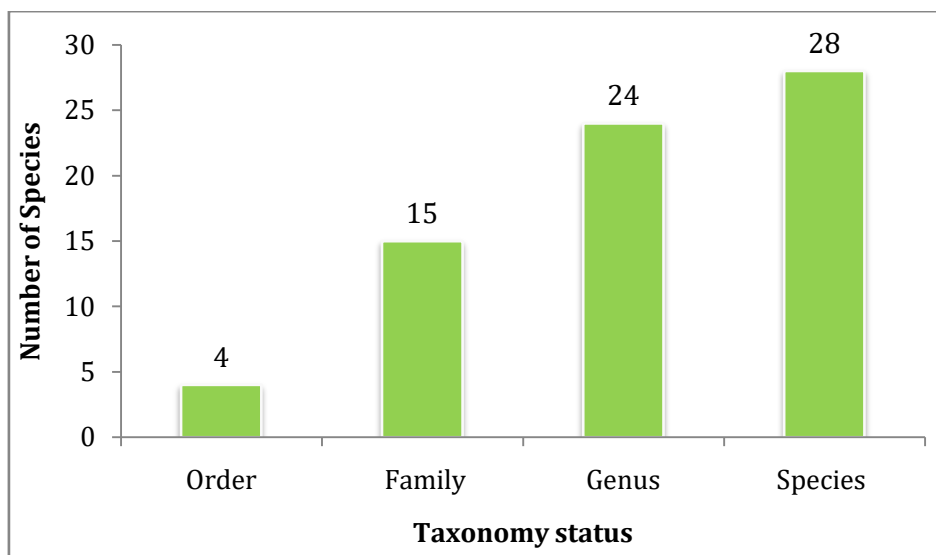
## Status of Faunal Diversity

Based on the field investigations and secondary data, a total of 296 species of fauna which include 28 species of herpetofauna, 242 species of avifauna and 26 species of mammals were recorded/reported from the study area. Brief highlights of the various groups of fauna reported from the study area are described in sub-sections below.

**Insects:** Among the invertebrate species, insects are the most common group. Though, the detailed accounts of insect fauna of the Kachchh district has not been available, the present survey recorded 8 species of butterfly, 2-3 species of dragonfly, some species of grasshoppers, mantis, coleopteran, bees and wasps.

**Herpetofauna:** The herpetofauna of Chadva Rakhal was represented by 28 species that belong to 4 orders, 15 families and 24 genera (Figure 8 and Annexure 2). The list of herpetofauna includes 3 species of amphibians and 25 species of reptiles. Among the recorded herpetofaunal species, one species falls under the Schedule-I, while 4 species are under Schedule-II and 8 species are under Schedule-IV of the Indian Wildlife (Protection) Act, 1972 (Amendment, 2002). Furthermore, as per the IUCN (2020) redlist of threatened species category, 2 out of a total 28 species of herpetofauna are listed under Vulnerable (Vu) category while the other recorded species are categorized as Least Concerned (Lc) species.

Pragsar Lake located within the Chadva Rakhal is famous for the presence of Mugger Crocodiles which is one among the Schedule-I species of herpetofauna. It is interesting to note that the population of Mugger Crocodiles which Pragsar Lake supports is equivalent to the population of crocodiles present in the entire Kachchh district.



**Figure 8: Taxonomic Diversity of Herpetofauna of Chadva Rakhal**

Photo Plate: Butterflies



Common Evening Brown



Lemon Pansy



Yellow Pansy



Pioneer



Small Orange Tip



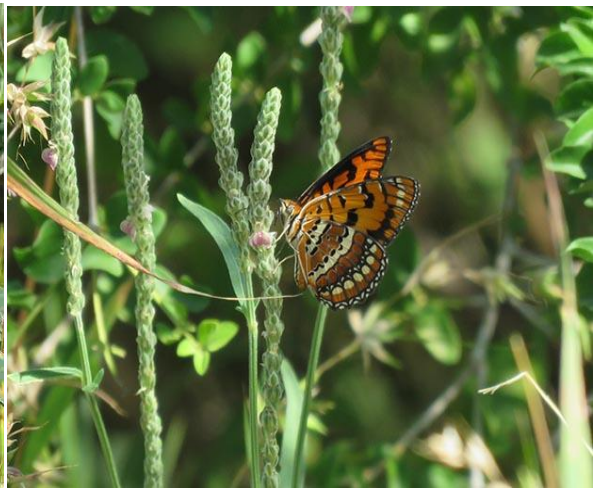
Striped Tiger



Photo Plate: Butterflies & Other Insects



Yellow Orange Tip (female)



Plain Tiger



Grasshopper sp.



Grasshopper sp.



Cricket sp.



Cricket sp.



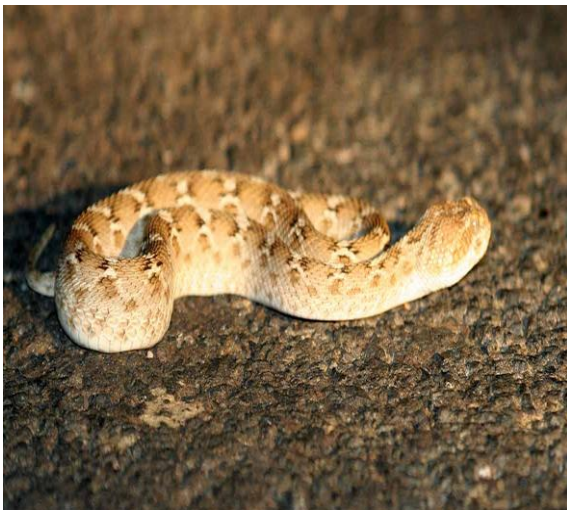
Photo Plate: Herpetofauna



Skittering Frog



Common Indian Toad



Saw-scaled Viper (JB)



Common Indian Trinket Snake

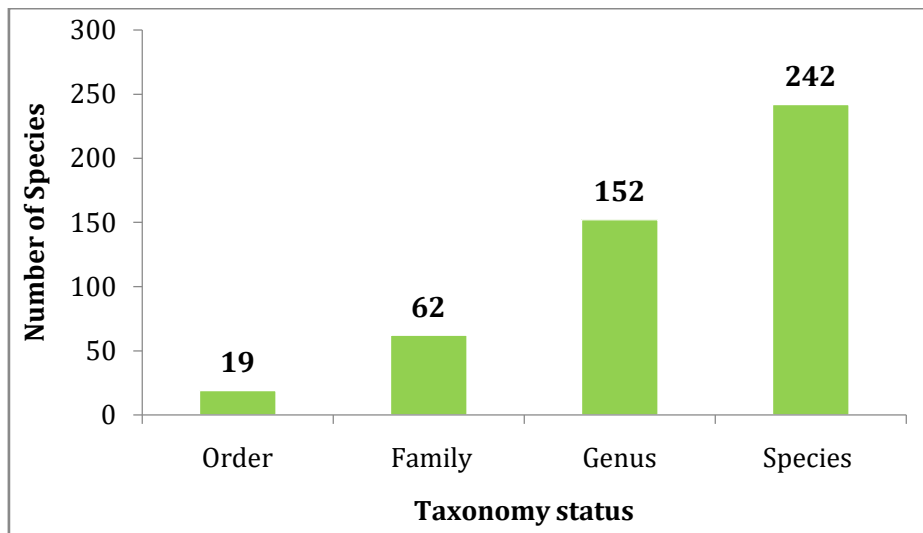


Mugger Crocodile

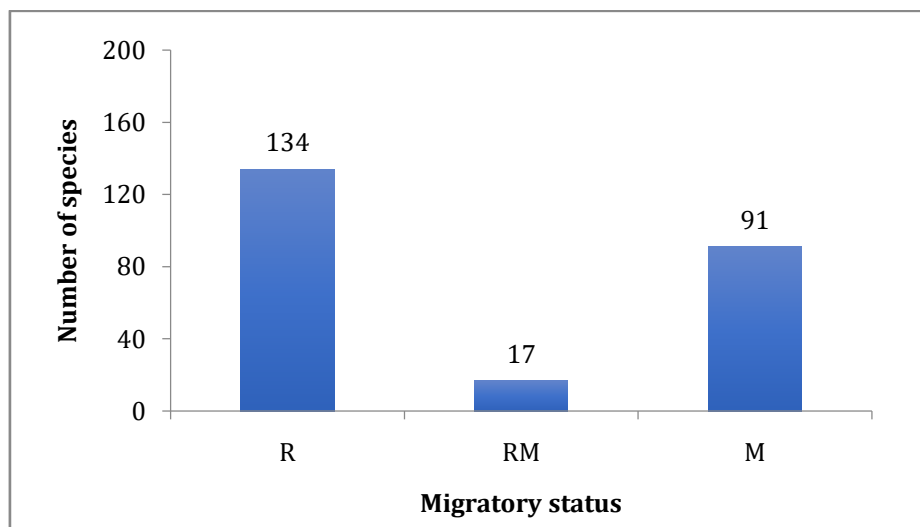


Indian Flapshell Turtle

**Avifauna:** A total of 242 species of birds were recorded from the study area. They belong to 19 orders, 62 families and 152 genera (Figure 9 & Annexure 3). Among the recorded species, 91 species were migratory, 17 species were resident migratory, while the remaining 134 were resident species (Figure 10). The analysis on foraging guild showed a higher number of insectivorous birds (78 species), followed by granivorous birds, omnivorous birds, carnivorous birds, piscivorous birds, frugivorous birds and only one species of nectarivorous bird (Figure 11) in the Rakhal. Among the bird species reported from the study area, 20 species recorded are categorized under Schedule-I while, 218 species are categorized under Schedule-IV and 1 species is categorized under Schedule-V of the Indian Wildlife (Protection) Act, 1972 (Figure 12). As per the IUCN (2018) redlist category, 223 species are categorized as Least Concerned (LC), 10 species are near threatened (NT), 6 species falls under vulnerable (VU) categories, while one species falls under endangered (EN) and two species are critically endangered (CR). The overall Shannon-wiener species diversity Index ( $H'$ ) recorded was 2.69 ( $H'$ ) which is shown in Table 5.



**Figure 9: Taxonomic diversity of avi-fauna in the study area**



**Figure 10: Status of migratory avi-fauna of Chadva Rakhal**

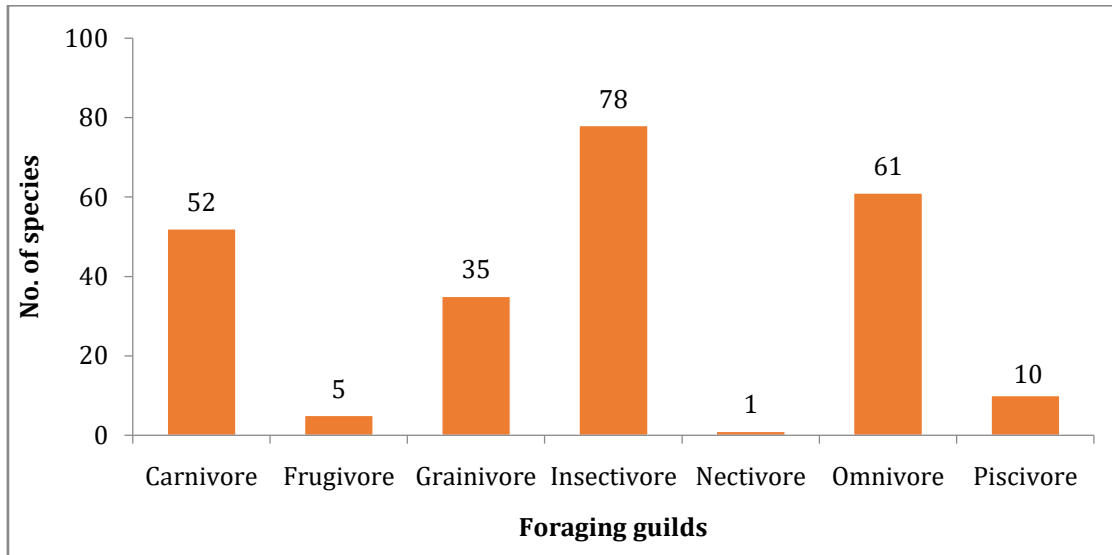


Figure 11: Foraging guilds of avi-fauna at Chadva Rakhal

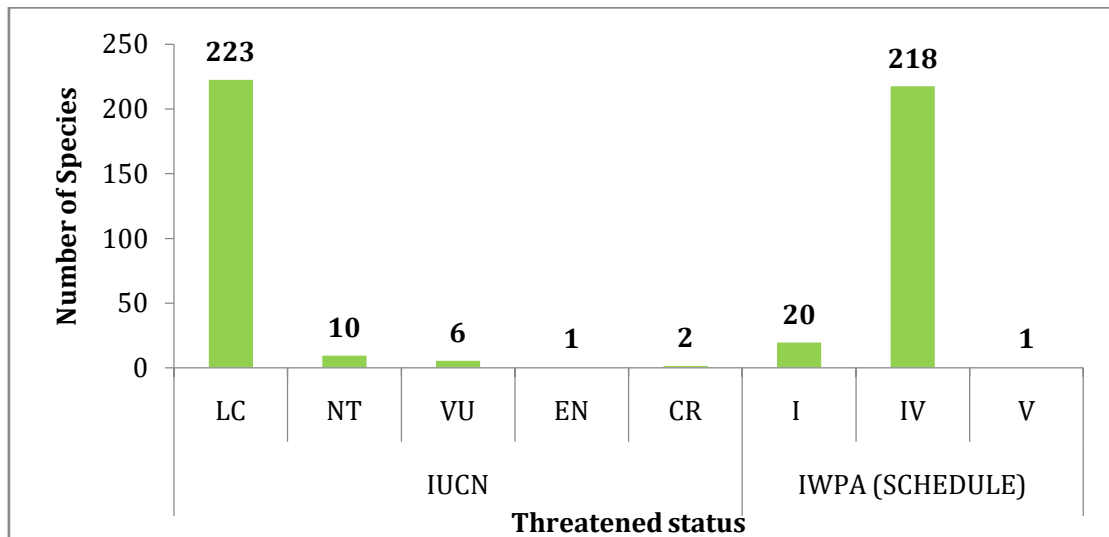


Figure 12: Conservation status of avi-fauna reported at Chadva Rakhal

Table 5: Avifauna Diversity of the Study Area (Estimated based on transect data)

Diversity Characteristics	Surveyed Transects								Overall Area
	T1	T2	T3	T4	T5	T6	T7	T8	
Species	18	20	25	25	38	35	39	37	46
Individuals	595	72	109	100	178	215	197	200	1666
Dominance_D	0.85	0.07	0.07	0.06	0.07	0.07	0.08	0.06	0.17
Shannon_H	0.47	2.78	2.90	2.93	3.09	3.08	3.10	3.19	2.69
Simpson_1-D	0.15	0.93	0.93	0.94	0.93	0.93	0.92	0.94	0.83
Evenness_e^H/S	0.09	0.81	0.72	0.75	0.58	0.62	0.57	0.66	0.60
Margalef	2.66	4.44	5.12	5.21	7.14	6.33	7.19	6.80	5.61



Photo Plate: Avifauna



Short-toed Snake Eagle



Shikra (PC: J.K. Tiwari)



Sirkeer Malkoha (PC: J.K. Tiwari)



Yellow Wagtail



Rock Bush Quail (PC: J.K. Tiwari)



Painted Sandgrouse (M and F) (PC: J.K. Tiwari)



Photo Plate: Avifauna



Yellow-crowned Woodpecker (PC: J.K. Tiwari)



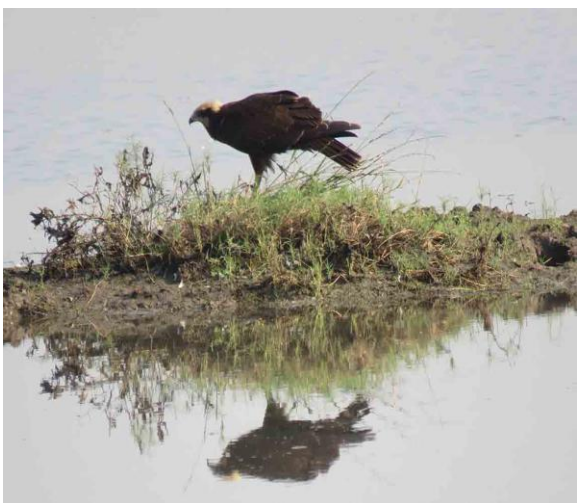
Indian Roller



Eurasian Eagle Owl (PC: J.K. Tiwari)



Grey Francolin



Eurasian Marsh Harrier



Knob-billed Duck (PC: J.K. Tiwari)

**Mammal:** A total of 26 mammalian species belonging to 6 orders and 14 families (Annexure 4 and Figure 13) were recorded based on direct and indirect observations in the Rakhal area. Among the 6 orders of mammals reported from the Rakhal, 11 species belong to order Carnivora, followed by 7 species under Rodentia, three species under Artiodactyla and the remaining 3 orders had a single species each.

Among the recorded mammal species, 5 species fall under Schedule-I, followed by 4 species under Schedule-II, 3 species under Schedule-III, 4 species under Schedule-IV and 4 species are under Schedule-V of the Indian Wildlife (Protection) Act, 1972. Concerning the conservation status as per IWPA, 1972, 20% of the species found at Chadva Rakhal belong to Schedule-I category. Thus, the protection and management of this Rakhal is very important for the conservation of threatened species.

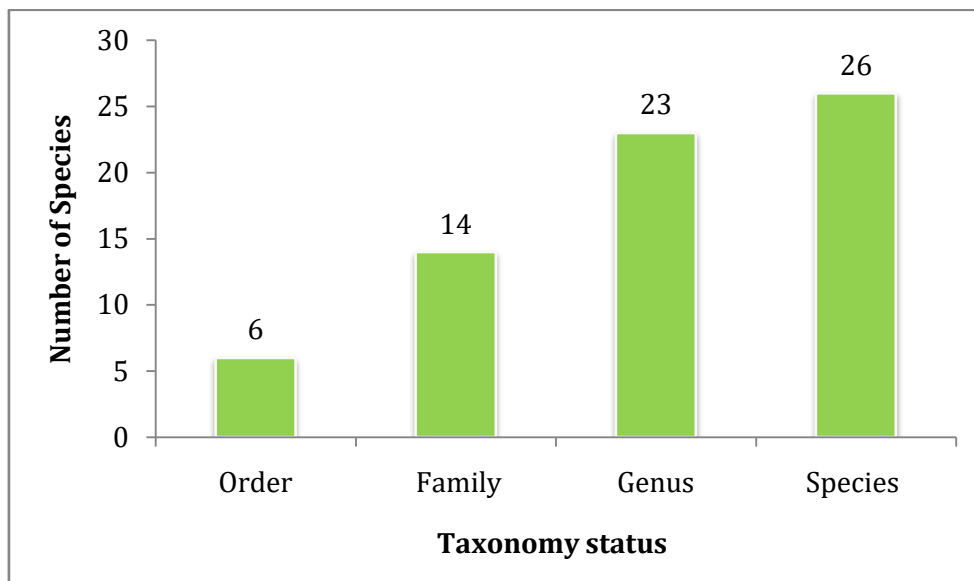


Figure 13: Taxonomic diversity of mammals of Chadva Rakhal



Common Leopard Pugmark



Indian Flying Fox



**Photo Plate: Mammals**



Indian Hare (PC: J.K. Tiwari)



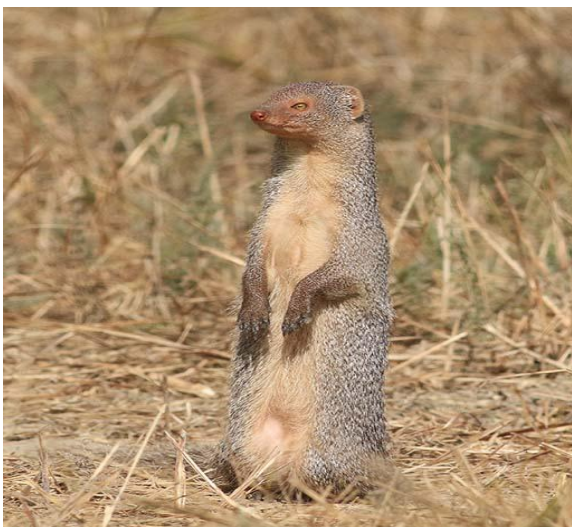
Blue bull (PC: J.K. Tiwari)



Desert Gerbil (PC: J.K. Tiwari)



Long-eared Hedgehog (PC: J.K. Tiwari)



Grey Mongoose (PC: J.K. Tiwari)



Jungle Cat (mother and cub) (PC: J.K. Tiwari)

## Conclusion and Recommendations

1. The overall forest type of Chadva Rakhhal is Tropical Thorn Forest as per Champian and Seth (1968) while diverse macro and micro habitats including thorn forest, scrubland, patches of savannah grassland, wetland, lake, river, rivulet, streams, rocks and crevices, hills, hillocks, canal, etc are found.
2. These diverse ecosystems provide natural habitats (foraging, breeding, nesting, grazing, etc.) for a diverse variety of flora and fauna within the Rakhhal, which have existed there over thousands of years.
3. The floral species diversity recorded at Chadva Rakhhal is about 26% and 14% of floral species reported from Kachchh district and Gujarat state respectively. The plant species diversity of the Rakhhal is 0.5 percent of India.
4. Among the vertebrate fauna, the recorded/reported herpetofauna of Chadva Rakhhal is about 75% of the reported herpetofaunal species of the district and 2.82% of the herpetofaunal species reported from India.
5. The avi-fauna recorded/reported from Chadva Rakhhal is more than 60% of the reported avifauna of the district (375 species), and about 40% and 18% of the Gujarat state (610 species) and India (1349 species) respectively.
6. Among the recorded/reported avi-faunal species, 93 species were migratory birds which are equal to 38.43% of the total reported birds of the Rakhhal. The migratory avifauna reported from the Rakhhal is about 20% of the migratory species that visit India.
7. The mammal species diversity recorded/reported from Chadva Rakhhal is also more than 60% of the mammal species of the district and 6.34% of the mammal species of India.
8. Based on reported floral and faunal species, 10 threatened species, including two endangered and 8 vulnerable species, as per the IUCN redlist of threatened species (2020) are found at Chadva Rakhhal. Similarly, 26 species reported from the Rakhhal are categorised as Schedule-I species in the Wildlife (Protection) Act, 1972.
9. In addition to the wild biodiversity of the Rakhhal, the area has socio-cultural importance as for centuries it has been used by the local Maldhari community as grazing/gauchar land, supporting thousands of livestock and livelihoods.
10. In the recent past, a considerable area of the Rakhhal has become infested with *Prosopis juliflora*, an alien invasive species.
11. Being situated in the arid-biogeographic zone, Chadva Rakhhal is a hot-spot for bio-diversity, with a rich repository of wild flora and fauna, genetic diversity and its regional socio-cultural significance.



12. Thus, based on the above observation, looking at the rich biodiversity of the Rakhhal, its long-term conservation and management is of vital importance for the survival of a large number of species and sustainable utilization of biological resources of the area.
13. For enhanced scientific management of the Rakhhal, it should be managed as a Reserve Forest or Community Reserve. The Rakhhal also qualifies for designation as a Biodiversity Heritage Site (BHS), as per Biological Diversity Act, 2002.
14. Chadva Rakhhal has been open to the public as an eco-tourism site of Kachchh district for two decades, and was once an important birding base of the well-known ornithologist of India, Dr. Salim Ali. Due to the long-term care and protection of this area by five generations of a single family, the site can be further developed as a site for promoting wildlife conservation and eco-tourism, with joint participation of both the Maharao Pragmulji Nature Conservation Trust and the Forest Department.





## Reference

- Ali, S (1945), *The Birds of Kutch*, Published for the Government of Kutch by Oxford University Press
- Ali, S. (2002) Book of Indian Birds. Bombay Natural History Society and Oxford University Press. Thirteenth Edn.Pp. 326.
- Annual Report of the Administration of the Bombay Presidency for the year, 1860-1861*, Public Open Library.
- Anon (1972) The Wildlife Protection Act. 1972. Amended 1991.Natraj Publication, Dehra Dun. 154 p.
- Bhandari, M. M. (1990) Flora of the Indian Desert. Scientific publishers. Jodhpur, Rajasthan. 435 PP.
- Bhupathy, S. (1991) Population and Resource Utilisattion of Waterfowl in Keoladeo National Park, Bharatpur. Ph.D. Thesis, Rajasthan University, Jaipur.
- Bibby, C.J., N.D., Burgerss and D.A. Hill (1992) *Bird Census techniques*, Academic Press, London.
- BirdLife International (2012) *Pavo cristatus*. The IUCN Red List of Threatened Species 2012: e.T22679435A40098247. <http://dx.doi.org/10.2305/IUCN.UK.2012.1.RLTS.T22679435A40098247.en>
- Daniel J.C. (2002) The Book of Indian Reptiles and Amphibians. Bombay Natural History Society and Oxford university press. pp. 238.
- del Hoyo, J.; Elliott, A.; Sargatal, J. (1994) *Handbook of the Birds of the World, vol. 2: New World Vultures to Guinea fowl*. Lynx Edicions, Barcelona, Spain.
- Desai, A. H. (2007) India Guide Gujarat. India Guide Publications. p. 325. ISBN 978-0-9789517-0-2.
- Dieni, J.S. and Jones, S.L. (2002) A field test of the area search method for measuring breeding birds population, *J. Field Ornithology*, 73: 253-257.
- Ferguson-Lees, J. and Christie, D.A. (2001) Raptors of the world. Christopher Helm, London.
- Gajera, N. B., Mahato, A. K. R. and Vijay Kumar, V. (2013) Status, Distribution and Diversity of Birds in mining environment of Kachchh, Gujarat. *International Journal of Biodiversity*, <http://dx.doi.org/10.1155/2013/471618>
- Gazeteer of the Bombay Presidency for the year, 1880*, Public Open Library
- Grimmett, R., Inskipp, C. & Inskipp, T. (2006) Birds of the Indian Subcontinent. Oxford University Press. New Delhi. Pp. 384.
- Groombridge, B. (1982) *The IUCN Amphibia-Reptilia Red Data Book, Part 1: Testudines, Crocodylia, Rhynocephalia*. IUCN, Gland, Switzerland.

- Habibi, K. (2001) Afghanistan. In: D. P. Mallon and S. C. Kingswood (eds), *Antelopes. Part 4: North Africa, the Middle East, and Asia*, pp. 119-121. IUCN, Gland, Switzerland.
- Habibi, K. 2001. Pakistan. In: D. P. Mallon and S. C. Kingswood (eds), *Antelopes. Part 4: North Africa, the Middle East, and Asia*, pp. 122-128. IUCN, Gland, Switzerland.
- Hemami, M. R. and Groves, C. P. (2001) Iran. In: D. P. Mallon and S. C. Kingswood (eds), *Antelopes. Part 4: North Africa, the Middle East, and Asia. Global Survey and Regional Action Plans*, pp. 114-118. IUCN, Gland, Switzerland.
- Hutto, R.L., S.M. Pletsechel and P. Hendrick (1986) A fixed radius point count method for non breeding season use. *The Auk*. 103: 593-602.
- IUCN (2015) *Red List of Threatened Species*. Species Survival Commission (SSC) IUCN, Gland, Switzerland.
- Mallon, D.P. (2008) *Gazella bennettii*. *The IUCN Red List of Threatened Species 2008*: <http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T8978.A12945880.en>
- Meena, R.L. and Kumar, S. (2012) Management Plan for GIR Protected Areas, Vol.-1; Gujarat Forest Department, Gujarat, India.
- Mehta, Lyla (2005), *The Politics and Poetry of Water; The Naturalisation of Scarcity in Western India*, United Nations, ISBN13: 9788125028697
- Mueller-Dombois, D and H. Ellensberg (1967) *Aims and Methods of Vegetation Ecology*. John Wiley & Sons, New York. 545.p.
- Nikunj B. Gajera, Mahato, A.K.Roy and V. Vijay Kumar (2012) Birds in the arid and semi-arid forests of Kachchh: its status, diversity and composition. *International Journal of Research in Zoology*, 2(4):23-27
- Nikunj B. Gajera, Mahato, A.K.Roy and V. Vijay Kumar (2014) Habitat Preference and Social Composition of Antelopes in Arid Region of Kachchh, Gujarat, India. *Asian Journal of Conservation Biology* 3(2): 164-169.
- Palin, H (1878), *Birds of Cutch*, Education Society's Press, Byculla
- Prater. S. H. (2005). *The Book of Indian Animals*. Bombay Natural History Society and Oxford University press 12<sup>th</sup>Edn. pp. 316.
- Report on the Administration of The Cutch State, 1883-1884; 1904-1914*, Cutch Durbari Press
- Rodgers, W.A. (1991) *Technique for Wildlife Census in India, A field Manual*. Technical Manual. TM2. Wildlife Institute of India, Dehra Dun. India.81pp.
- Sale, J.B. and K. Berkmuller (1988) *Manual of Wildlife Techniques for India*. FAO, United Nation's India Establishment of Wildlife Institute of India Dehra Dun.
- Shah, G. L. (1978) *Flora of Gujarat State*. University Press, Sardar Patel University. Vallabh Vidyanagar.174 PP.
- Singh, H.S. (2001) *National Heritage of Gujarat*. GEER foundation, Gandhinagar. 262.Pp.

**Annexure 1: Checklist of Plant species of Chadva Rakhal, Bhuj-Kachchh**

S.No.	Scientific name	Local Name	Habit
	<b>Acanthaceae</b>		
1	<i>Andrographis paniculata</i>	Kariyatu	H
2	<i>Barleria prionitis</i>	Kadha Aserio	S
3	<i>Blepharis maderaspatensis</i>	-	H
4	<i>Dipteracanthus prostratus</i>		H
5	<i>Hygrophila auriculata</i>	Kantaro Akaro	H
6	<i>Justicia procumbens</i>	Kari Andhedi	H
7	<i>Peristrophe bicalyculata</i>	Lasi Adhedi, Kari Adhedi	H
8	<i>Rostilaria vahlii</i>	-	H
9	<i>Ruellia tuberosa</i>	Tutadi, Tituli, Sisodi	H
	<b>Aizoaceae</b>		
10	<i>Trianthema portulacastrum</i>	Akanthi, Mitha Gokharu	H
	<b>Amaranthaceae</b>		
11	<i>Achyranthes aspera</i>	Agado, Kandhero	H
12	<i>Aerva persica</i>	Bou, Bour	H
13	<i>Amaranthus lividus</i>	Tandaljo	H
14	<i>Amaranthus viridis</i>	Adbau Rajgaro, Rajgaro	H
15	<i>Celosia argentea</i>	Lampadi	H
16	<i>Digera muricata</i>	-	H
17	<i>Pupalia lappacea</i>	Gadar Bhurat	H
	<b>Anacardiaceae</b>		
18	<i>Mangifera indica</i>	Ambo, Keri Jo Zad	T
	<b>Apocynaceae</b>		
19	<i>Catharanthus pusillus</i>	Ubhi Shingani	H
20	<i>Nerium indicum</i>	Lal Karen	S
21	<i>Plumeria rubra</i>	Khad Champo	S
22	<i>Thevetia peruviana</i>	Piri Karen	S
	<b>Aristolochiaceae</b>		
23	<i>Aristolochia bracteolata</i>	Kidamari	H
	<b>Asclepiadaceae</b>		
24	<i>Calotropis gigantea</i>	Dhoro Akado	S
25	<i>Calotropis procera</i>	Akado, Aak	S
26	<i>Hemidesmus indicus</i>	Dudheli	S
27	<i>Leptadenia pyrotechnica</i>	Khaserio, Asario	S
28	<i>Leptadenia reticulata</i>	Khip	S
29	<i>Pentatropis capensis</i>	Dhodhiyal, Dhodh Val	S
30	<i>Pentatropis spiralis</i>	-	S
31	<i>Pergularia daemia</i>	Dudhariyal, Dudhar Val	C
32	<i>Tylophora indica</i>	-	S
	<b>Astraceae</b>		



S.No.	Scientific name	Local Name	Habit
33	<i>Bidens pilosa</i>	Uti Gan, Vado Kandho	H
34	<i>Blumea obliqua</i>	-	H
35	<i>Blumea lacera</i>	-	H
	<b>Balanitaceae</b>		
36	<i>Balanites aegyptiaca</i>	Hingor, Hingod	T
	<b>Bignoniaceae</b>		
37	<i>Tecoma capensis</i>		S
38	<i>Tecomella undulata</i>	Ragat Rohido	T
	<b>Bomacaceae</b>		
39	<i>Adansonia digitata</i>	Rukh, Gorakh Ambli	T
	<b>Boraginaceae</b>		
40	<i>Cordia gharaf</i>	Liyar, Desi Gunda	S
41	<i>Cordia monoica</i>	Gunderi, Gundi	T
42	<i>Heliotropium indicum</i>	Agio Kharsan, Morandhi	H
43	<i>Heliotropium ovalifolium</i>	Ogiar	H
44	<i>Trichodesma indicum</i>	Vilayati Bhangro	H
	<b>Brassicaceae</b>		
45	<i>Lepidium sativum</i>	Tran Kantho, Tran Ga	H
	<b>Bryophyllaceae</b>		
46	<i>Briophyllum calycimum</i>	Breynia Retusa (Dennst.) Alst.	H
	<b>Burseraceae</b>		
47	<i>Commiphora wightii</i>	Gugal	T
	<b>Cactaceae</b>		
48	<i>Opuntia elatior</i>	Nag Phan	H
	<b>Capparaceae</b>		
49	<i>Capparis decidua</i>	Kerado, Kar Jo Zad	S
50	<i>Maerua oblongifolia</i>	-	S
	<b>Carryophyllaceae</b>		
51	<i>Polycarpaea corymbosa</i>	Jangalisoa, Rupa phali	H
	<b>Cassuriniaceae</b>		
52	<i>Casuarina equisetifolia</i>	Saru	T
	<b>Ceasalpiniaceae</b>		
53	<i>Bauhinia purpurea</i>	Kanchaner	H
54	<i>Cassia auriculata</i>	Avar	S
55	<i>Cassia fistula</i>	Garmaro	T
56	<i>Cassia italica</i>	Mindhiavar, Pat Mindhiavar	H
57	<i>Delonix elata</i>	Gul Mahor	T
58	<i>Senna alexandrina</i>	-	H
	<b>Celastraceae</b>		
59	<i>Maytenus emarginata</i>	Vikalo, Vigo	T
	<b>Chenopodiaceae</b>		
60	<i>Chenopodium album</i>	Chir, Chir Ji Bhaji	H

S.No.	Scientific name	Local Name	Habit
	<b>Cleomaceae</b>		
61	<i>Cleome viscosa</i>	Beddhro, Prlobidhro, Badhod	H
	<b>Combretaceae</b>		
62	<i>Terminalia arjuna</i>	Arjun Sadad	T
63	<i>Terminalia catappa</i>	Deshi Badam	T
64	<i>Thespesia populnea</i>	Paras Pimplo	T
	<b>Commelinaceae</b>		
65	<i>Commelina benghalensis</i>	Sishmuliu	H
66	<i>Commelina diffusa</i>	-	H
67	<i>Tradescantia pallida</i>	Satodo	H
	<b>Compositae</b>		
68	<i>Ageratum conyzoides</i>	Makand Mari	H
69	<i>Dicoma tomentosa</i>	-	H
70	<i>Echinops echinatus</i>	Lut, Shulio, Utkanto	H
71	<i>Eclipta prostrata</i>	Bhangro	H
72	<i>Launaea resedifolia</i>	Dhariyai Gurval	H
73	<i>Oligochaeta ramosa</i>	Kandhari, Nilikandhari	H
74	<i>Pluchea lanceolata</i>	-	H
75	<i>Pulicaria angustifolia</i>	-	H
76	<i>Pulicaria wightiana</i>	Son Fuladi	H
77	<i>Sonchus oleraceus</i>	Zambho Gudpatri	H
78	<i>Sphaeranthus senegalensis</i>	Gorakh Mundi, Bhurandi	H
79	<i>Tridax procumbens</i>	-	H
80	<i>Vernonia cinerea</i>	Sadodi, Kadu Kariyato	H
81	<i>Xanthium strumarium</i>	Kantaru Zadvu, Gokhru	H
	<b>Convolvulaceae</b>		
82	<i>Convolvulus microphyllus</i>	Mankhani, Makhan Val	H
83	<i>Evolvulus alsinoides</i>	-	H
84	<i>Ipomoea aquatica</i>	Nari Val, Pani Ji Val	H
85	<i>Ipomoea nil</i>	Trikhuni Potiyar, Kari Potiyar	S
86	<i>Ipomoea pes-tigridis</i>	Fotiyal, Fotiyar	S
87	<i>Ipomoea sepiaria</i>	Hanuman Val, Gandha Val	S
88	<i>Lotus garcini</i>	Adbau Gisodi, Vad Gisodi	H
89	<i>Merremia aegyptia</i>	Bhinigario	S
90	<i>Merremia gangetica</i>	Undarkani	S
91	<i>Merremia tridentata</i>	-	S
92	<i>Rivea hypocrateriformis</i>	Fang Val	C
	<b>Cucurbitaceae</b>		
93	<i>Bryonia laciniosa</i>	Bridelia retusa (L.) Spr.	S
94	<i>Citrullus colocynthis</i>	Truja Val, Tru Val, Tru Deda	C
95	<i>Coccinia grandis</i>	Tindora, Ghiloda	C
96	<i>Ctenolepis cerasiformis</i>	Dod Val, Aankh Futamna	C

S.No.	Scientific name	Local Name	Habit
97	<i>Cucumis callosus</i>	Kotimbdavel, Nindhatru	C
98	<i>Cucumis prophetarum</i>	Indriyal, Kandhari Indriyan	C
99	<i>Luffa acutangula</i>	Adbau Gisodi, Vad Gisodi	S
100	<i>Momordica denudata</i>	Karels	S
101	<i>Mukia maderespatensis</i>	Ankhfutmani	C
102	<i>Passiflora edulis</i>	Krishna Kamal	S
	<b>Cuscutaceae</b>		
103	<i>Cuscutareflexa</i>	Makani, Makaniyal, Makan Val	C
	<b>Cyperaceae</b>		
104	<i>Cyperus glomeratus</i>	-	G
105	<i>Cyperus rotundus</i>	Kaluro, Mutha, Moth	G
	<b>Euphorbiaceae</b>		
106	<i>Acalypha indica</i>	Dadar Jo Zad	H
107	<i>Euphorbia caducifolia</i>	-	S
108	<i>Euphorbia thymifolia L.</i>	Pat Dudhi, Sir Val,	H
109	<i>Euphorbia tirucalli</i>	Kharsani Thor	S
110	<i>Jatropha gossypifolia</i>	Ratan Jyot	S
111	<i>Phyllanthus fraternus</i>	Pat Amari, Amari	H
112	<i>Ricinus communis</i>	Arenda, Divala	S
	<b>Fabaceae</b>		
113	<i>Alysicarpus monilifer</i>	-	H
114	<i>Butea monosperma</i>	Kesudijo Zad, Khkhar	T
115	<i>Clitoria ternatea</i>	Gaeni, Kari Koagi Val	S
116	<i>Crotalaria burhia</i>	Khirasani, Khadasan	H
117	<i>Derris indica</i>	Karanj Jo Zad	T
118	<i>Goniogyna hirta</i>	Undarkani	H
119	<i>Indigofera cordifolia</i>	Gadar Gari, Ridha Gari	H
120	<i>Indigofera oblongifolia</i>	Zeel, Zeel Jo Zad	S
121	<i>Indigofera tinctoria</i>	Nili Gari, Gudi	S
122	<i>Pithecellobium dulce</i>	Goras Amali	T
123	<i>Sesbania grandiflora</i>	Ikkadi, Gadedjo Zad	S
124	<i>Sesbania sesban</i>	Ekad	S
125	<i>Tamarindus indica</i>	Ambali Jo Zad, Ambali	T
126	<i>Taverniera cuneifolia</i>	Lai	H
127	<i>Tephrosia purpurea</i>	Sarpankho	T
128	<i>Zornia gibbosa</i>	Bepani	H
	<b>Gentianaceae</b>		
129	<i>Enicostema axillare</i>	Mame Cho, Mamej	H
	<b>Lamiaceae</b>		
130	<i>Leucas aspera</i>	Dodi Ji Val, Doda	H
131	<i>Leucas cephalotes</i>	Gumu	H
132	<i>Leucas longifolia</i>	Piri Sadedi, Zamar Val	H



S.No.	Scientific name	Local Name	Habit
133	<i>Leucas urticaefolia</i>	Kubado, Kubado Gumu	H
134	<i>Ocimum basilicum</i>	Maruo, Maruvo	H
135	<i>Ocimum canum</i>	Tak Marvo	H
136	<i>Ocimum sanctum</i>	Tulsi	H
137	<i>Plectranthus amboinicus</i>	-	H
138	<i>Vitex negundo</i>	Nagat, Nigod	T
	<b>Liliaceae</b>		
139	<i>Aloe barbandensis</i>	Kunvar, Kunvar Pathu	H
140	<i>Asparagus dumosus</i>	-	S
141	<i>Asparagus racemosus</i>	Avar Kanti, Satvari	S
142	<i>Urginea indica</i>	Dungaro, Pen Kando	H
	<b>Lythraceae</b>		
143	<i>Bergia capensis</i>	Rapatri	H
144	<i>Lawsonia inermis</i>	Mandhi, Rang Mandi	S
	<b>Malvaceae</b>		
145	<i>Abutilon indicum</i>	Khapato, Dabaliar	S
146	<i>Abutilon pannosum</i>	Dabaliar, Dabali Jo Zad	S
147	<i>Hibiscus rosa-sinensis</i>	Jasund	s
148	<i>Pavonia arabica</i>	Rato Balbuwaro	H
149	<i>Pavonia ceratocarpa</i>	Sugandh Bala	H
150	<i>Sida acuta</i>	Adbau Balbuwaro	H
151	<i>Sida cordata</i>	Pat Balbuwaro	H
152	<i>Sida cordifolia</i>	Barabovaro,	H
153	<i>Sida ovata</i>	-	H
154	<i>Sida rhombifolia</i>	Khetrau Balbuwaro	H
	<b>Meliaceae</b>		
155	<i>Azadirachta indica</i>	Limbdo, Neem	T
156	<i>Melia azedarach</i>	Irani Nim, Rato Nim	T
	<b>Menispermiaceae</b>		
157	<i>Cissampelos pareira</i>	Venivel, Karandhiu	S
158	<i>Tinospora cordifolia</i>	Guddaval, Gadu	S
	<b>Mimosaceae</b>		
159	<i>Acacia leucophloea</i>	Hirmo, Haramu	T
160	<i>Acacia nilotica</i>	Deshi Baval, Bavar	T
161	<i>Acacia senegal</i>	Gorad, Kumbhatt	T
162	<i>Acacia tortalis</i>	Israil Baval	T
163	<i>Albizia lebbeck</i>	Sanas Lezo Zad	T
164	<i>Mimosa pudica</i>	Risamani, Lajamani	H
165	<i>Parkinsonia aculeata</i>	Vilayti Bavar	T
166	<i>Prosopis cineraria</i>	Kandhi, Khajdo, Kando	T
167	<i>Prosopis juliflora (Sw) DC.</i>	Gando Baval	T
	<b>Molluginaceae</b>		

S.No.	Scientific name	Local Name	Habit
168	<i>Glinus lotoides</i>	Aso Okharad	H
169	<i>Mollugo pentaphylla</i>	-	H
	<b>Moraceae</b>		
170	<i>Ficus amplissima</i>	Pipar, Pipar Jo Zad	T
171	<i>Ficus benghalensis</i>	Vad	T
172	<i>Ficus microcarpa</i>	Nandhi Pipar	T
173	<i>Ficus religiosa</i>	Piparo, Piparejo Zad	T
174	<i>Morus alba</i>	Setut Jo Zad	S
	<b>Moringaceae</b>		
175	<i>Moringa concanensis</i>	Kharo Saragvo	T
176	<i>Moringa oleifera</i>	Mithe Saragve Jo Zad	T
	<b>Mussaceae</b>		
177	<i>Musa paradisiaca</i>	Kera, Ker	S
	<b>Myrtaceae</b>		
178	<i>Eucalyptus globulus</i>	Nilgiri	T
179	<i>Eugenia jambolana</i>	Thor	S
180	<i>Syzygium cumini</i>	Jambude Jo Zad	T
	<b>Nyctaginaceae</b>		
181	<i>Boerhavia diffusa</i>	Rafadi, Rafadiaul, Rati	H
182	<i>Boerhavia erecta</i>	Punnarva, Dhokariyar	H
	<b>Nympheaceae</b>		
183	<i>Nelumbo nucifera</i>	Kamal, Kum	H
	<b>Oleaceae</b>		
184	<i>Jasminum multiflorum</i>	Chameli	S
	<b>Papavaraceae</b>		
185	<i>Argemone mexicana</i>	Darudi, Uzar Kandho	H
	<b>Pedaliaceae</b>		
186	<i>Pedaliium murex</i>	Ubhera Gokhru	H
	<b>Periplocaceae</b>		
187	<i>Periploca aphylla</i>	-	S
	<b>Plumbaginaceae</b>		
188	<i>Plumbago zeylanica</i>	Vara Val, Gadar Zipto	S
	<b>Poaceae</b>		
189	<i>Apluda mutica</i>	Bhungario Ga, Fulari Ga	G
190	<i>Aristida adensonensis</i>	Jandhar Lambha Ga	G
191	<i>Brachiaria ramosa (L.) Stapf</i>	-	G
192	<i>Cenchrus biflorus</i>	Dhaman Gha, Anajaniyo	G
193	<i>Cenchrus ciliaris</i>	Dhaman Gha, Anajaniyo	G
194	<i>Chloris barbata</i>	Rusad Gha, Punjaniu Ga	G
195	<i>Cymbopogon martinii</i>	Rosha Gha	G
196	<i>Cynodon dactylon</i>	Chhabbar Gha	G
197	<i>Dactyloctenium aegypticum</i>	-	G

S.No.	Scientific name	Local Name	Habit
198	<i>Dactyloctenium scindicum</i>	Chund Gha, Sano Madanu	G
199	<i>Dendrocalamus strictus</i>	Nakor Vanz, Vang	H
200	<i>Dichanthium annulatum</i>	Dunuhigha, Jinjavo	G
201	<i>Digitaria ciliaris</i>	Lolar	G
202	<i>Echinochloa colonum</i>	Sanvadh Sau, Samu	G
203	<i>Eleusine indica</i>	Adbau Madanu	G
204	<i>Eragrostis ciliaris (L.)</i>	Chichani Gha, Pat Chamaria	G
205	<i>Eragrostis japonica</i>	-	G
206	<i>Eragrostis tenella</i>	-	G
207	<i>Melanocenchrus jacquemontii</i>	Vekar	G
208	<i>Sporobolus helvolus</i>	Khevai	G
209	<i>Sporobolus marginatus</i>	Khevai Ga	G
210	<i>Vetiveria zizanioides</i>	Varejo Ga, Khasjo Ga	G
	<b>Polygalaceae</b>		
211	<i>Polygala erioptera</i>	Patsan	H
	<b>Portulacaceae</b>		
212	<i>Portulaca meridiana L.</i>	Zinaki Luni	H
213	<i>Portulaca tuberosa</i>	Assi Luni, Rasad Luni	H
	<b>Primulaceae</b>		
214	<i>Anagallis arvensis</i>	Khet Fuli, Kali Fuladi	H
	<b>Punicaceae</b>		
215	<i>Punica granatum</i>	Dadam	S
	<b>Rhamnaceae</b>		
216	<i>Zizyphus mauritiana</i>	-	S
217	<i>Zizyphus nummularia</i>	Pat Lani	T
	<b>Rubiaceae</b>		
218	<i>Oldenlandia corymbosa</i>	-	H
	<b>Rutaceae</b>		
219	<i>Aegle marmelos</i>	Bili Patra, Bili, Bili Jo Zad	T
220	<i>Limonia acidissima</i>	Gandharo Gumu	H
	<b>Salvadoraceae</b>		
221	<i>Salvadora oleoides</i>	-	T
222	<i>Salvadora persica</i>	-	T
	<b>Sapindaceae</b>		
223	<i>Cardiospermum halicacabum</i>	Bkan Fofti, Tridhari Val	H
	<b>Sapotaceae</b>		
224	<i>Manilkara hexandra</i>	Ran Jo Zad	T
225	<i>Mimus opselengi</i>	Mursal Jo Zad	T
	<b>Scrophulariaceae</b>		
226	<i>Bacopa monnieri</i>	Kadvi Naveri, Naveri	H
227	<i>Lindenbergia muraria</i>	Kotha	H
	<b>Solanaceae</b>		



S.No.	Scientific name	Local Name	Habit
228	<i>Datura metel</i>	Dhaturo	S
229	<i>Lycium barbarum</i>	Garothi, Gerati, Gerothi	H
230	<i>Physalis minima</i>	Fofati, Fad, Fotaji Val	H
231	<i>Solanum incanum</i>	Ubhi Ringni	H
232	<i>Solanum nigrum</i>	Kamperu	H
233	<i>Solanum surattense</i>	Jangali Ringani, Pat Ringani	H
234	<i>Withania somnifera</i>	Aswgandha	S
	<b>Sterculiaceae</b>		
235	<i>Sterculia urens</i>	Kadai, Kadio, Kadayo	T
	<b>Tamaricaceae</b>		
236	<i>Tamarix aphylla</i>		S
	<b>Tilliaceae</b>		
237	<i>Corchorus depressus</i>	Mundheri, Munderi	H
238	<i>Corchorus olitorius</i>	Kag Gisoda, Gunpat	H
239	<i>Corchorus trilocularis</i>	Ubhi Mundheri	H
240	<i>Grewia tenax</i>	Gangati, Gangi, Gangni	S
241	<i>Grewia villosa</i>	Luo, Luejo Zad	S
242	<i>Triumfetta rhomboidea</i>	Bhurati, Zepati	S
	<b>Typhaceae</b>		
243	<i>Typha angustata</i>	Gha Bajariu	H
	<b>Ulamceae</b>		
244	<i>Holoptelea integrifolia</i>	Charal Jo Zad	S
	<b>Verbenaceae</b>		
245	<i>Clerodendrum phlomidis</i>	Tankaro, Arani	S
246	<i>Gmelina arborea</i>	Latkesarjo Zad	S
247	<i>Phyla nodiflora</i>	Rato Ukharar, Ratval	H
248	<i>Premna resinosa</i>	Nidhi Kundher	S
	<b>Violaceae</b>		
249	<i>Viola cinerea var stocksii</i>	Vekario	H
	<b>Vitaceae</b>		
250	<i>Cissus quadrangulare</i>	Sandhiyal, Sandhaval	S
	<b>Zygophyllaceae</b>		
251	<i>Fagonia schweienfurthii</i>	Dhramau, Dhamaso	H
252	<i>Tribulus terrestris</i>	Undh Fuli, Aagiya Kharsan	H
253	<i>Zygophyllum simplex</i>	Pat Lani	H

## Annexure 2

## Checklist of Herpetofauna Recorded of Chadva Rakhal, Kachchh

Sl. No.	Order/Family/Sci. Name	Common Name	IUCN 2020	IWMP 1972
	<b>Order: Anura, Family: Bufonidae</b>			
1	<i>Bufo melanostictus</i>	Common Indian Toad	LC	Sch IV
	<b>Order: Anura, Family: Dicroglossidae</b>			
2	<i>Euphlyctis cyanophlyctis</i>	Skittering Frog	LC	Sch IV
3	<i>Tomoptera breviceps</i>	Indian Burrowing Frog	DD	Sch IV
	<b>Order: Squamata, Family: Agamidae</b>			
4	<i>Calotes versicolor</i>	Indian Garden Lizard	DD	-
5	<i>Sitana ponticeriana</i>	Fan-Throated Lizard	LC	-
	<b>Order: Squamata, Family: Scincidae</b>			
6	<i>Mabuya carinata</i>	Common Keeled Grass Skink*	LC	-
7	<i>Mabuya macularius</i>	Eastern Bronze Skink*	LC	-
	<b>Order: Squamata, Family: Varanidae</b>			
8	<i>Varanus bengalensis</i>	Monitor Lizard	LC	Sch II
	<b>Order: Squamata, Family: Colubridae</b>			
9	<i>Ptyas mucosa</i>	Indian Rat Snake*	LC	Sch II
10	<i>Xenochrophis piscator</i>	Checkered Keelback*	LC	Sch IV
11	<i>Coelognathus helena</i>	Common Indian Trinket Snake	LC	Sch IV
12	<i>Lycodon aulicus</i>	Common Wolf Snake*	LC	-
13	<i>Fowlea piscator</i>	Checkered Keelback*	LC	-
14	<i>Boiga forsteni</i>	Forsten's Cat Snake*	LC	-
	<b>Order: Squamata, Family: Elapidae</b>			
15	<i>Naja naja</i>	Spectacled Cobra*	LC	Sch II
16	<i>Bungarus caeruleus</i>	Common Krait*	LC	-
	<b>Order: Squamata, Family: Viperidae</b>			
17	<i>Echiscarinatus</i>	Saw-scaled Viper*	LC	-
	<b>Order: Squamata, Family: Boidae</b>			
18	<i>Eryx johnii</i>	Red Sand Boa*	LC	-
19	<i>Eryx jaculus</i>	Sand Boa*	LC	-
	<b>Order: Squamata, Family: Chamaeleonidae</b>			
20	<i>Chamaeleo zeylanicus</i>	Indian Chameleon*	LC	-
	<b>Order: Squamata, Family: Gekkonidae</b>			
21	<i>Hemidactylus brookii</i>	Spotted Indian House Gecko*	LC	Sch-IV
22	<i>Hemidactylus leschenaultii</i>	Bark Gecko*	LC	Sch-IV
23	<i>Hemidactylus triedrus</i>	Termite Hill Gecko*		-
	<b>Order: Squamata, Family: Eublepharidae</b>			
24	<i>Eublepharis fuscus</i>	Western Indian Leopard Gecko*	LC	-
	<b>Order: Squamata, Family: Lacertidae</b>			
25	<i>Ophisops elegans</i>	Snake-eyed Lizard*	LC	-
	<b>Order: Crocodylia, Family: Crocodylidae</b>			
26	<i>Crocodylus palustris</i>	Marsh Crocodile	VU	Sch II
	<b>Order: Testudines, Family: Trionychidae</b>			
27	<i>Lissemys punctata</i>	Indian Flapshell Turtle	LC	Sch I
28	<i>Geochelone elegans</i>	Star Tortoise*	VU	Sch IV

LC= Least Concern, DD= Data Deficient, VU= Vulnerable \*= Other Sources

## Annexure 3

## Checklist of Avifauna Recorded/Reported of Chadva Rakhal, Bhuj-Kachchh

S. No.	Species Name	Species	MS	FS	IUCN 2018	WPA 1972	Habitat type
<b>Order: Accipitriformes, Family: Accipitridae</b>							
1	<i>Haliasturindus</i>	Brahminy Kite*	R	C	LC	Sch I	T
2	<i>Elanus caeruleus</i>	Black-winged Kite#	R	C	LC	Sch I	T
3	<i>Pandion haliaetus</i>	Osprey*	R	C	LC	Sch I	A
4	<i>Pernis ptilorhynchus</i>	Oriental Honey-buzzard*	R	C	LC	Sch I	T
5	<i>Gyps bengalensis</i>	White-rumped Vulture*	R	C	CR	Sch I	T
6	<i>Gyps indicus</i>	Indian Vulture*	R	C	CR	Sch I	T
7	<i>Gyps himalayensis</i>	Himalayan Griffon*	M	C	NT	Sch I	T
8	<i>Circaetus gallicus</i>	Short-toed Snake Eagle*	R	C	LC	Sch I	T
9	<i>Circus aeruginosus</i>	Eurasian Marsh Harrier*	M	C	LC	Sch I	T
10	<i>Circus macrourus</i>	Pallid Harrier*	M	C	NT	Sch I	T
11	<i>Circus pygargus</i>	Montagu's Harrier*	M	C	LC	Sch I	T
12	<i>Accipiter badius</i>	Shikra*	R	C	LC	Sch I	T
13	<i>Buteo sturteesa</i>	White-eyed Buzzard*	R	C	LC	Sch I	T
14	<i>Clanga clanga</i>	Greater Spotted Eagle*	M	C	VU	Sch I	T
15	<i>Hieraaetus fasciatus</i>	Bonelli's Eagle*	M	C	LC	Sch I	T
16	<i>Aquila nipalensis</i>	Steppe Eagle#	M	C	EN	Sch I	T
17	<i>Hieraaetus pennatus</i>	Booted Eagle*	M	C	LC	Sch I	T
18	<i>Aquila rapax</i>	Tawny Eagle*	R	C	LC	Sch I	T
<b>Order: Anseriformes, Family: Anatidae</b>							
19	<i>Dendrocygna javanica</i>	Lesser Whistling-duck *	R	O	LC	Sch IV	A
20	<i>Sarkidiornis melanotos</i>	Knob-billed Duck*	R	O	LC	Sch IV	A
21	<i>Tadorna ferruginea</i>	Ruddy Shelduck*	M	O	LC	Sch IV	A
22	<i>Nettapus coromandelianus</i>	Cotton Pygmy-goose*	M	O	LC	Sch IV	A
23	<i>Mareca strepera</i>	Gadwall*	M	O	LC	Sch IV	A
24	<i>Mareca penelope</i>	Eurasian Wigeon*	M	O	LC	Sch IV	A
25	<i>Anas platyrhynchos</i>	Mallard*	RM	O	LC	Sch IV	A
26	<i>Anas poecilorhyncha</i>	Indian Spot-billed Duck*	R	O	LC	Sch IV	A
27	<i>Anas clypeata</i>	Northern Shoveler*	M	O	LC	Sch IV	A
28	<i>Anas acuta</i>	Northern Pintail*	M	O	LC	Sch IV	A
29	<i>Spatula querquedula</i>	Garganey*	M	G	LC	Sch IV	A
30	<i>Anas crecca</i>	Common Teal*	M	G	LC	Sch IV	A



S. No.	Species Name	Species	MS	FS	IUCN 2018	WPA 1972	Habitat type
31	<i>Aythya ferina</i>	Common Pochard*	M	O	VU	Sch IV	A
32	<i>Anser anser</i>	Greylag Goose*	M	I	LC	Sch IV	A
33	<i>Tadorna tadorna</i>	Common Shelduck*	M	O	LC	Sch IV	A
34	<i>Marmaronetta angustirostris</i>	Marbled Duck*	M	O	VU	Sch IV	A
35	<i>Netta rufina</i>	Red-crested Pochard*	M	O	LC	Sch IV	A
36	<i>Aythya nyroca</i>	Ferruginous Pochard*	M	O	NT	Sch IV	A
37	<i>Aythya fuligula</i>	Tufted Duck*	M	O	LC	Sch IV	A
	<b>Order: Apodiformes, Family: Apodidae</b>						
38	<i>Tachymarptis melba</i>	Alpine Swift*	M	I	LC		T
	<b>Order: Bucerotiformes, Family: Upupidae</b>						
39	<i>Upupa epops</i>	Common Hoopoe*	RM	I	LC	Sch IV	T
	<b>Order: Caprimulgiformes, Family: Caprimulgidae</b>						
40	<i>Caprimulgus europaeus</i>	Eurasian Nightjar*	M	I	LC	Sch IV	T
41	<i>Caprimulgus asiaticus</i>	Indian Nightjar*	R	I	LC	Sch IV	T
	<b>Order: Caprimulgiformes, Family: Apodidae</b>						
42	<i>Apus affinis</i>	House Swift*	R	I	LC	Sch IV	T
	<b>Order: Caprimulgiformes, Family: Caprimulgidae</b>						
43	<i>Caprimulgus affinis</i>	Savanna Nightjar*	R	I	LC	Sch IV	T
	<b>Order: Charadriiformes, Family: Turnicidae</b>						
44	<i>Turnix sylvaticus</i>	Small Buttonquail*	R	C	LC		T
45	<i>Turnix tanki</i>	Yellow-legged Buttonquail*	R	C	LC	Sch IV	T
46	<i>Turnix suscitator</i>	Barred Buttonquail*	R	C	LC	Sch IV	T
	<b>Order: Charadriiformes, Family: Burhinidae</b>						
47	<i>Burhinus oedicnemus</i>	Indian Thick-knee*	R	O	LC	Sch IV	T
	<b>Order: Charadriiformes, Family: Jacanidae</b>						
48	<i>Hydrophasianus chirurgus</i>	Pheasant-tailed Jacana*	R	O	LC	Sch IV	A
49	<i>Metopidius indicus</i>	Bronze-winged Jacana*	R	O	LC	Sch IV	A
	<b>Order: Charadriiformes, Family: Recurvirostridae</b>						
50	<i>Himantopus himantopus</i>	Black-winged Stilt*	R	O	LC	Sch IV	A
51	<i>Recurvirostra avosetta</i>	Pied Avocet*	M	O	LC	Sch IV	A
	<b>Order: Charadriiformes, Family: Charadriidae</b>						
52	<i>Vanellus malabaricus</i>	Yellow-wattled Lapwing*	R	O	LC	Sch IV	T
53	<i>Vanellus indicus</i>	Red-wattled Lapwing*	R	O	LC	Sch IV	T
54	<i>Charadrius hiaticula</i>	Common Ringed Plover*	R	O	LC	Sch IV	A

S. No.	Species Name	Species	MS	FS	IUCN 2018	WPA 1972	Habitat type
55	<i>Charadrius dubius</i>	Little Ringed Plover*	RM	O	LC	Sch IV	A
56	<i>Charadrius alexandrinus</i>	Kentish Plover*	RM	O	LC	Sch IV	A
	<b>Order: Charadriiformes, Family: Rostratulidae</b>						
57	<i>Rostratula benghalensis</i>	Greater Painted-snipe*	RM	O	LC	Sch IV	A
	<b>Order: Charadriiformes, Family: Scolopacidae</b>						
58	<i>Philomachus pugnax</i>	Ruff*	M	O	LC	Sch IV	A
59	<i>Gallinago stenura</i>	Pin-tailed Snipe*	M	O	LC	Sch IV	A
60	<i>Gallinago gallinago</i>	Common Snipe*	M	O	LC	Sch IV	A
61	<i>Limosa limosa</i>	Black-tailed Godwit*	M	O	NT	Sch IV	A
62	<i>Limosa lapponica</i>	Bar-tailed Godwit*	M	O	LC	Sch IV	A
63	<i>Numenius phaeopus</i>	Whimbrel*	M	O	LC	Sch IV	A
64	<i>Numenius arquata</i>	Eurasian Curlew*	M	O	NT	Sch IV	A
65	<i>Tringa totanus</i>	Common Redshank*	M	O	LC	Sch IV	A
66	<i>Tringa stagnatilis</i>	Marsh Sandpiper*	M	O	LC	Sch IV	A
67	<i>Tringa nebularia</i>	Common Greenshank*	M	O	LC	Sch IV	A
68	<i>Tringa ochropus</i>	Green Sandpiper*	M	O	LC	Sch IV	A
69	<i>Tringa glareola</i>	Wood Sandpiper*	M	O	LC	Sch IV	A
70	<i>Xenus cinereus</i>	Terek Sandpiper*	M	O	LC	Sch IV	A
71	<i>Actitis hypoleucos</i>	Common Sandpiper*	M	O	LC	Sch IV	A
72	<i>Calidris temminckii</i>	Temminck's Stint*	M	O	LC	Sch IV	A
73	<i>Calidris alba</i>	Sanderling*	M	O	LC	Sch IV	A
74	<i>Calidris alpina</i>	Dunlin*	M	O	LC	Sch IV	A
	<b>Order: Charadriiformes, Family: Glareolidae</b>						
75	<i>Cursorius coromandelicus</i>	Indian Courser*	R	I	LC	Sch IV	T
76	<i>Glareola pratincola</i>	Collared Pratincole*	M	I	LC	Sch IV	T
77	<i>Glareo lalactea</i>	Little Pratincole*	M	I	LC	Sch IV	T
	<b>Order: Charadriiformes, Family: Laridae</b>						
78	<i>Hydroprogne caspia</i>	Caspian Tern*	R	P	LC	Sch IV	A
79	<i>Sterna aurantia</i>	River Tern*	R	P	VU	Sch IV	A
80	<i>Chlidonia shybrida</i>	Whiskered Tern*	R	P	LC	Sch IV	A
	<b>Order: Columbiformes, Family: Columbidae</b>						
81	<i>Columba livia</i>	Blue Rock Pigeon*	R	G	LC	Sch IV	T
82	<i>Streptopelia decaocto</i>	Eurasian Collared Dove*	R	G	LC	Sch IV	T
83	<i>Streptopelia tranquebarica</i>	Red Collared Dove*	R	G	LC	Sch IV	T
84	<i>Streptopelia</i>	Laughing Dove*	R	G	LC	Sch IV	T

S. No.	Species Name	Species	MS	FS	IUCN 2018	WPA 1972	Habitat type
	<i>senegalensis</i>						
	<b>Order: Coraciiformes, Family: Coraciidae</b>						
85	<i>Coracias benghalensis</i>	Indian Roller*	R	I	LC	Sch IV	T
86	<i>Coracias garrulus</i>	European Roller*	M	I	LC	Sch IV	T
	<b>Order: Coraciiformes, Family: Alcedinidae</b>						
87	<i>Halcyon smyrnensis</i>	White-throated Kingfisher*	R	P	LC	Sch IV	A
88	<i>Alcedo atthis</i>	Common Kingfisher*	R	P	LC	Sch IV	A
89	<i>Ceryle rudis</i>	Pied Kingfisher*	R	P	LC	Sch IV	A
	<b>Order: Coraciiformes, Family: Meropidae</b>						
90	<i>Merops orientalis</i>	Green Bee-eater*	R	I	LC	Sch IV	T
91	<i>Merops persicus</i>	Blue-cheeked Bee-eater*	M	I	LC	Sch IV	T
	<b>Order: Cuculiformes, Family: Cuculidae</b>						
92	<i>Cuculus canorus</i>	Pied-crested Cuckoo*	M	F	LC	Sch IV	T
93	<i>Cacomantis passerines</i>	Grey-bellied Cuckoo*	M	F	LC	Sch IV	T
94	<i>Eudynamys scolopaceus</i>	Asian Koel*	R	F	LC	Sch IV	T
95	<i>Taccocua leschenaultii</i>	Sirkeer Malkoha*	R	F	LC	Sch IV	T
96	<i>Centropus sinensis</i>	Greater Coucal*	R	O	LC	Sch IV	T
97	<i>Clamator jacobinus</i>	Pied Cuckoo*	M	O	LC	Sch IV	T
98	<i>Phaenicophaeus leschenaultii</i>	Sirkeer Cuckoo*	M	O	LC	Sch IV	T
	<b>Order: Falconiformes, Family: Falconidae</b>						
99	<i>Falco naumanni</i>	Lesser Kestrel*	M	C	LC	Sch IV	T
100	<i>Falco chicquera</i>	Red-necked Falcon*	R	C	NT	Sch I	T
	<b>Order: Galliformes, Family: Phasianidae</b>						
101	<i>Francolinus francolinus</i>	Black Francolin*	R	G	LC	Sch IV	T
102	<i>Francolinus pondicerianus</i>	Grey Francolin*	R	G	LC	Sch IV	T
103	<i>Coturnix coturnix</i>	Common Quail*	M	G	LC	Sch IV	T
104	<i>Coturnix coromandelica</i>	Rain Quail*	R	G	LC	Sch IV	T
105	<i>Perdica asiatica</i>	Jungle Bush Quail*	R	G	LC	Sch IV	T
106	<i>Perdica argoondah</i>	Rock Bush Quail*	R	G	LC	Sch IV	T
107	<i>Pavo cristatus</i>	Indian Peafowl*	R	O	LC	Sch I	T
	<b>Order: Galliformes, Family: Rallidae</b>						
108	<i>Gallinula chloropus</i>	Common Moorhen*	R	O	LC	Sch IV	A
109	<i>Fulica atra</i>	Eurasian Coot*	R	O	LC	Sch IV	A
110	<i>Porphyrio porphyrio</i>	Purple Swamphen*	R	O	LC	Sch IV	A



S. No.	Species Name	Species	MS	FS	IUCN 2018	WPA 1972	Habitat type
111	<i>Amaurornis phoenicurus</i>	White-breasted Waterhen*	M	O	LC	Sch IV	A
	<b>Order: Gruiformes, Family: Gruidae</b>						
112	<i>Grus virgo</i>	Demoiselle Crane*	M	O	LC	Sch IV	T
113	<i>Grus grus</i>	Common Crane*	M	O	LC	Sch IV	T
	<b>Order: Passeriformes, Family: Vangidae</b>						
114	<i>Tephrodornis pondicerianus</i>	Common Woodshrike*	R	I	LC	Sch IV	T
	<b>Order: Passeriformes, Family: Aegithinidae</b>						
115	<i>Aegithina nigrolutea</i>	Marshall's Lora*	R	I	LC	Sch IV	T
	<b>Order: Passeriformes, Family: Campephagidae</b>						
116	<i>Pericrocotus erythropygius</i>	White-bellied Minivet*	R	I	LC	Sch IV	T
117	<i>Pericrocotus cinnamomeus</i>	Small Minivet*	R	I	LC	Sch IV	T
	<b>Order: Passeriformes, Family: Laniidae</b>						
118	<i>Lanius collurio</i>	Red-backed Shrike*	M	C	LC	Sch IV	T
119	<i>Lanius isabellinus</i>	Isabelline Shrike*	M	C	LC	Sch IV	T
120	<i>Lanius phoenicuroides</i>	Red-tailed Shrike*	M	C	LC	Sch IV	T
121	<i>Lanius vittatus</i>	Bay-backed Shrike*	R	C	LC	Sch IV	T
122	<i>Lanius schach</i>	Long-tailed Shrike*	R	C	LC	Sch IV	T
123	<i>Lanius meridionalis</i>	Southern Grey Shrike*	R	C	LC	Sch IV	T
	<b>Order: Passeriformes, Family: Dicruridae</b>						
124	<i>Dicrurus macrocercus</i>	Black Drongo*	R	I	LC	Sch IV	T
	<b>Order: Passeriformes, Family: Oriolidae</b>						
125	<i>Oriolus kundoo</i>	Indian Golden Oriole*	M	I	LC	Sch IV	T
	<b>Order: Passeriformes, Family: Monarchidae</b>						
126	<i>Terpsiphone paradisi</i>	Asian Paradise-Flycatcher*	M	I	LC	Sch IV	T
	<b>Order: Passeriformes, Family: Corvidae</b>						
127	<i>Corvus splendens</i>	House Crow*	R	C	LC	Sch V	T
	<b>Order: Passeriformes, Family: Paridae</b>						
128	<i>Machlolophus nuchalis</i>	White-naped Tit*	R	I	VU		T
	<b>Order: Passeriformes, Family: Hirundinidae</b>						
129	<i>Hirundo concolor</i>	Dusky Crag Martin*	M	I	LC	Sch IV	T
130	<i>Hirundo fluvicola</i>	Streak-throated Swallow*	R	I	LC	Sch IV	T
131	<i>Hirundo smithii</i>	Wire-tailed Swallow*	R	I	LC	Sch IV	T

S. No.	Species Name	Species	MS	FS	IUCN 2018	WPA 1972	Habitat type
132	<i>Hirundo rustica</i>	Barn Swallow*	R	I	LC	Sch IV	T
133	<i>Hirundo daurica</i>	Red-rumped Swallow*	RM	I	LC	Sch IV	T
<b>Order: Passeriformes, Family: Alaudidae</b>							
134	<i>Mirafra cantillans</i>	Singing Bushlark*	R	G	LC	Sch IV	T
135	<i>Mirafra erythroptera</i>	Indian Bushlark*	R	G	LC	Sch IV	T
136	<i>Calandrella brachydactyla</i>	Greater Short-toed Lark*	M	G	LC	Sch IV	T
137	<i>Galerida cristata</i>	Crested Lark#	R	I	LC	Sch IV	T
138	<i>Ammomanes phoenicurus</i>	Rufous-tailed Lark#	R	G	LC	Sch IV	T
139	<i>Alauda larufescens</i>	Lesser Short-toed Lark*	R	G	LC	Sch IV	T
140	<i>Alauda laraytal</i>	Sand Lark*	R	G	LC	Sch IV	T
141	<i>Eremopterix grisea</i>	Ashy-crowned Sparrow Lark*	R	G	LC	Sch IV	T
<b>Order: Passeriformes, Family: Pycnonotidae</b>							
142	<i>Pycnonotus leucotis</i>	White-eared Bulbul*	R	I	LC	Sch IV	T
143	<i>Pycnonotus cafer</i>	Red-vented Bulbul *	R	I	LC	Sch IV	T
<b>Order: Passeriformes, Family: Cisticolidae</b>							
144	<i>Prinia hodgsonii</i>	Grey-breasted Prinia*	R	I	LC	Sch IV	T
145	<i>Prinia gracilis</i>	Graceful Prinia*	R	I	LC	Sch IV	T
146	<i>Prinia sylvatica</i>	Jungle Prinia*	R	I	LC	Sch IV	T
147	<i>Prinia inornata</i>	Plain Prinia*	R	I	LC	Sch IV	T
148	<i>Prinia buchanani</i>	Rufous-fronted Prinia*	R	I	LC	Sch IV	T
149	<i>Cisticola juncidis</i>	Zitting Cisticola*	R	I	LC	Sch IV	T
150	<i>Orthotomus sutorius</i>	Common Tailorbird*	R	I	LC	Sch IV	T
<b>Order: Passeriformes, Family: Acrocephalidae</b>							
151	<i>Acrocephalus stentoreus</i>	Clamorous Reed Warbler*	M	I	LC	Sch IV	T
152	<i>Acrocephalus agricola</i>	Paddyfield Warbler*	M	I	LC	Sch IV	T
153	<i>Acrocephalus dumetorum</i>	Blyth's Reed Warbler*	M	I	LC	Sch IV	T
154	<i>Iduna caligata</i>	Booted Warbler*	M	I	LC	Sch IV	T
<b>Order: Passeriformes, Family: Sylviidae</b>							
155	<i>Sylvia curruca</i>	Lesser Whitethroat*	M	I	LC	Sch IV	T
156	<i>Curruca communis</i>	Common Whitethroat*	R	I	LC	Sch IV	T
<b>Order: Passeriformes, Family: Leiothrichidae</b>							
157	<i>Turdoides caudates</i>	Common Babbler*	R	I	LC	Sch IV	T
158	<i>Turdoides malcolmi</i>	Large Grey Babbler*	R	I	LC	Sch IV	T
<b>Order: Passeriformes, Family: Sturnidae</b>							
159	<i>Acridotheres ginginianus</i>	Bank Myna*	R	O	LC	Sch IV	T

S. No.	Species Name	Species	MS	FS	IUCN 2018	WPA 1972	Habitat type
160	<i>Acridotheres tristis</i>	Common Myna*	R	O	LC	Sch IV	T
161	<i>Sturnus pagodarum</i>	Brahminy Starling*	R	O	LC	Sch IV	T
162	<i>Sturnus roseus</i>	Rosy Starling*	M	O	LC	Sch IV	T
	<b>Order: Passeriformes, Family: Turdidae</b>						
163	<i>Turdus unicolor</i>	Tickell's Thrush*	M	I	LC	Sch IV	T
	<b>Order: Passeriformes, Family: Muscicapidae</b>						
164	<i>Luscinia svecica</i>	Bluethroat*	R	I	LC	Sch IV	T
165	<i>Larvivora brunnea</i>	Indian Blue Robin*	M	I	LC	Sch IV	T
166	<i>Cercotrichas galactotes</i>	Rufous-tailed Scrub Robin*	M	I	LC	Sch IV	T
167	<i>Copsychus saularis</i>	Oriental Magpie Robin*	R	I	LC	Sch IV	T
168	<i>Saxicola loide sfulicata</i>	Indian Robin*	R	I	LC	Sch IV	T
169	<i>Phoenicurus ochruros</i>	Black Redstart*	M	I	LC	Sch IV	T
170	<i>Saxicola macrorhynchus</i>	Stoliczka's Bushchat*	M	I	VU	Sch IV	T
171	<i>Saxicola rubicola</i>	Common Stonechat*	M	I	LC	Sch IV	T
172	<i>Saxicola caprata</i>	Pied Bushchat*	M	I	LC	Sch IV	T
173	<i>Oenanthe isabellina</i>	Isabelline Wheatear*	M	I	LC	Sch IV	T
174	<i>Oenanthe picata</i>	Variable Wheatear*	RM	I	LC	Sch IV	T
175	<i>Cercomela fusca</i>	Brown Rock Chat*	R	I	LC	Sch IV	T
176	<i>Monticola solitarius</i>	Blue Rock Thrush*	M	I	LC	Sch IV	T
177	<i>Monticola saxatilis</i>	Rufous-tailed Rock Thrush*	R	I	LC	Sch IV	T
178	<i>Muscicapa striata</i>	Spotted Flycatcher*	RM	I	LC	Sch IV	T
179	<i>Muscicapa dauurica</i>	Asian Brown Flycatcher*	M	I	LC	Sch IV	T
180	<i>Muscicapa muttui</i>	Brown-breasted Flycatcher*	M	I	LC	Sch IV	T
181	<i>Ficedula parva</i>	Red-breasted Flycatcher*	R	I	LC	Sch IV	T
182	<i>Cyornis tickelliae</i>	Tickell's Blue Flycatcher*	R	I	LC	Sch IV	T
183	<i>Culicica paceylonensis</i>	Grey-headed Canary Flycatcher*	R	I	LC	Sch IV	T
184	<i>Zoothera citrina</i>	Orange-headed Thrush*	R	I	LC	Sch IV	T
	<b>Order: Passeriformes, Family: Nectariniidae</b>						
185	<i>Cinnyris asiaticus</i>	Purple Sunbird*	R	N	LC	Sch IV	T
	<b>Order: Passeriformes, Family: Passeridae</b>						
186	<i>Passer domesticus</i>	House Sparrow*	R	G	LC	Sch IV	T
187	<i>Petronia xanthocollis</i>	Chestnut-shouldered Petronia*	R	G	LC	Sch IV	T
	<b>Order: Passeriformes, Family: Ploceidae</b>						
188	<i>Ploceus manyar</i>	Streaked Weaver*	R	G	LC	Sch IV	T
189	<i>Ploceus philippinus</i>	Baya Weaver*	R	I	LC	Sch IV	T
	<b>Order: Passeriformes, Family: Estrildidae</b>						



S. No.	Species Name	Species	MS	FS	IUCN 2018	WPA 1972	Habitat type
190	<i>Lonchura malabarica</i>	Indian Silverbill*	R	I	LC	Sch IV	T
191	<i>Lonchura punctulata</i>	Scaly-breasted Munia*	R	I	LC	Sch IV	T
<b>Order: Passeriformes, Family: Motacillidae</b>							
192	<i>Motacilla flava</i>	Yellow Wagtail*	M	I	LC	Sch IV	T
193	<i>Motacilla citreola</i>	Citrine Wagtail*	RM	I	LC	Sch IV	T
194	<i>Motacilla cinerea</i>	Grey Wagtail*	RM	I	LC	Sch IV	T
195	<i>Motacilla alba</i>	White Wagtail*	M	I	LC	Sch IV	T
196	<i>Motacilla maderaspatensis</i>	White-browed Wagtail*	R	I	LC	Sch IV	T
197	<i>Anthus rufulus</i>	Paddyfield Pipit*	R	G	LC	Sch IV	T
198	<i>Anthus campestris</i>	Tawny Pipit*	R	G	LC	Sch IV	T
199	<i>Anthus godlewski</i>	Blyth's Pipit*	RM	G	LC	Sch IV	T
200	<i>Anthus similis</i>	Long-billed Pipit*	R	G	LC	Sch IV	T
201	<i>Anthus trivialis</i>	Tree Pipit*	R	G	LC	Sch IV	T
202	<i>Anthus spinoletta</i>	Water Pipit*	M	G	LC	Sch IV	T
<b>Order: Passeriformes, Family: Fringillidae</b>							
203	<i>Carpodacus erythrinus</i>	Common Rosefinch*	M	G	LC	Sch IV	T
<b>Order: Passeriformes, Family: Emberizidae</b>							
204	<i>Emberiza striolata</i>	Striolated Bunting*	R	G	LC	Sch IV	T
205	<i>Emberiza buchanani</i>	Grey-necked Bunting*	M	G	LC	Sch IV	T
206	<i>Emberiza melanocephala</i>	Black-headed Bunting*	M	G	LC	Sch IV	T
207	<i>Emberiza bruniceps</i>	Red-headed Bunting*	M	G	LC	Sch IV	T
<b>Order: Pelecaniformes, Family: Ciconiidae</b>							
208	<i>Mycteria leucocephala</i>	Painted Stork*	R	C	NT	Sch IV	A
209	<i>Anastomus oscitans</i>	Asian Openbill*	RM	C	LC	Sch IV	A
<b>Order: Pelecaniformes, Family: Threskiornithidae</b>							
210	<i>Threskiornis melanocephalus</i>	Black-headed Ibis*	R	C	NT	Sch IV	A
211	<i>Pseudibis papillosa</i>	Black Ibis*	R	C	LC	Sch IV	A
212	<i>Plegadis falcinellus</i>	Glossy Ibis*	M	C	LC	Sch IV	A
<b>Order: Pelecaniformes, Family: Ardeidae</b>							
213	<i>Ixobrychus sinensis</i>	Yellow Bittern*	R	C	LC	Sch IV	A
214	<i>Ixobrychus cinnamomeus</i>	Cinnamon Bittern*	R	C	LC	Sch IV	A
215	<i>Butorides striata</i>	Striated Heron*	R	C	LC	Sch IV	A
216	<i>Nycticorax nycticorax</i>	Black-crowned Night Heron*	R	C	LC	Sch IV	A
217	<i>Ardeola grayii</i>	Indian Pond Heron*	R	C	LC	Sch IV	A

S. No.	Species Name	Species	MS	FS	IUCN 2018	WPA 1972	Habitat type
218	<i>Ardea cinerea</i>	Grey Heron*	RM	C	LC	Sch IV	A
219	<i>Ardea purpurea</i>	Purple Heron*	R	C	LC	Sch IV	A
220	<i>Bubulcus ibis</i>	Cattle Egret*	R	C	LC	Sch IV	A
221	<i>Casmerodius albus</i>	Great Egret*	R	C	LC	Sch IV	A
222	<i>Mesophoyx intermedia</i>	Intermediate Egret*	R	C	LC	Sch IV	A
223	<i>Egretta garzetta</i>	Little Egret*	R	C	LC	Sch IV	A
224	<i>Egretta gularis</i>	Western Reef Egret*	R	C	LC	Sch IV	A
<b>Order: Pelecaniformes, Family: Pelecanidae</b>							
225	<i>Pelecanus onocrotalus</i>	Great White Pelican*	M	C	LC	Sch IV	A
226	<i>Pelecanus crispus</i>	Dalmatian Pelican*	M	C	NT	Sch IV	A
<b>Order: Pelecaniformes, Family: Anhingidae</b>							
227	<i>Anhinga melanogaster</i>	Darter*	RM	P	NT	Sch IV	A
<b>Order: Pelecaniformes, Family: Phalacrocoracidae</b>							
228	<i>Phalacrocorax niger</i>	Little Cormorant*	RM	P	LC	Sch IV	A
229	<i>Phalacrocorax fuscicollis</i>	Indian Cormorant*	M	P	LC	Sch IV	A
230	<i>Phalacrocorax carbo</i>	Great Cormorant*	R	P	LC	Sch IV	A
<b>Order: Phoenicopteriformes, Family: Podicipedidae</b>							
231	<i>Tachybaptus ruficollis</i>	Little Grebe*	R	O	LC	Sch IV	A
232	<i>Podiceps grisegena</i>	Red-necked Grebe*	M	O	LC	Sch IV	A
<b>Order: Phoenicopteriformes, Family: Phoenicopteridae</b>							
233	<i>Phoenicopus ruber</i>	Greater Flamingo*	RM	O	LC	Sch IV	A
<b>Order: Piciformes, Family: Picidae</b>							
234	<i>Jynx torquilla</i>	Eurasian Wryneck*	R	I	LC	Sch IV	T
235	<i>Leiopicus mahrattensis</i>	Yellow-crowned Woodpecker*	R	I	LC	Sch IV	T
236	<i>Dinopium benghalense</i>	Lesser Golden Back*	R	I	LC	Sch IV	T
<b>Order: Psittaciformes, Family: Psittacidae</b>							
237	<i>Psittacula krameri</i>	Rose-ringed Parakeet*	R	F	LC	Sch IV	T
<b>Order: Pterocliiformes, Family: Pteroclididae</b>							
238	<i>Pterocles exustus</i>	Chestnut-bellied Sandgrouse*	R	G	LC	Sch IV	T
239	<i>Pterocles Indicus</i>	Painted Sandgrouse*	RM	G	LC	Sch IV	T
<b>Order: Strigiformes, Family: Strigidae</b>							
240	<i>Otus brucei</i>	Pallid Scops Owl*	M	C	LC	Sch IV	T
241	<i>Athene brama</i>	Spotted Owlet*	R	C	LC	Sch IV	T
242	<i>Bubo bubo</i>	Eurasian Eagle Owl*	R	C	LC	Sch IV	T

LC= Least Concern, DD= Data Deficient, NT= Near Threatened, VU= Vulnerable, FG= Foraging Guild- C= Carnivore, F= Frugivore, G= Granivore, I= Insectivore, N= Nectivore, O= Omnivore, P= Piscivore, MG= Migratory Status- R= Resident, M= Migratory, RM= Resident migratory, \*= Other Sources, #= Not in Previous checklist but sighted

**Annexure 4**  
**Checklist of Mammals Recorded/reported of Chadva Rakhal, Bhuj-Kachchh**

S. No.	Order/Family/Scientific Name	Species	IUCN 2018	IWMP 1972
	<b>Order: Artiodactyla, Family: Bovidae</b>			
1	<i>Boselaphus tragocamelus</i>	Blue bull	LC	Sch III
2	<i>Gazella gazelle bennettii</i>	Chinkara*	LC	Sch I
	<b>Order: Artiodactyla, Family: Suidae</b>			
3	<i>Sus scrofa</i>	Wild Boar	LC	Sch III
	<b>Order: Carnivora, Family: Felidae</b>			
4	<i>Felis chaus</i>	Jungle cat	LC	Sch II
5	<i>Felils caracal</i>	Caracal* (last recorded in 1995)	LC	Sch I
6	<i>Panthera pardus</i>	Common Leopard	VU	Sch I
	<b>Order: Carnivora, Family: Canidae</b>			
7	<i>Canis aureus</i>	Golden Jackal*	LC	Sch II
8	<i>Vulpes bengalensis</i>	Indian Fox	LC	Sch III
9	<i>Canis lupus</i>	Indian Wolf* (last recorded in 1990)	LC	Sch I
	<b>Order: Carnivora, Family: Hyaenidae</b>			
10	<i>Hyaena hyaena</i>	Striped Hyena*	NT	Sch III
	<b>Order: Carnivora, Family: Mustelidae</b>			
11	<i>Mellivora capensis</i>	Honey Badger*	LC	Sch I
	<b>Order: Carnivora, Family: Viverridae</b>			
12	<i>Viverricula indica</i>	Small Indian Civet*	LC	Sch II
	<b>Order: Carnivora, Family: Herpestidae</b>			
13	<i>Herpestes edwardsii</i>	Grey Mongoose	LC	Sch IV
14	<i>Herpestes javanicus</i>	Small Indian Mongoose*	LC	Sch II
	<b>Order: Lagomorpha, Family: Leporidae</b>			
15	<i>Lepus nigricollis</i>	Indian Hare	LC	Sch IV
	<b>Order: Rodentia, Family: Hystricidae</b>			
16	<i>Hystrix indica</i>	Indian Porcupine	LC	Sch IV
	<b>Order: Rodentia, Family: Muridae</b>			
17	<i>Meriones hurrianae</i>	Desert Gerbil	LC	Sch V
18	<i>Tatera indica</i>	Indian Gerbil	LC	Sch V
19	<i>Mus booduga</i>	Indian Field Mouse*	LC	-
20	<i>Rattus rattus</i>	House Rat*	LC	Sch V
21	<i>Bandicota bengalensis</i>	Indian Mole Rat*	LC	-
22	<i>Bandicota indica</i>	Bandicoot Rat*	LC	-
	<b>Order: Rodentia, Family: Sciuridae</b>			
23	<i>Funambulus pennantii</i>	Five-striped Squirrel	LC	-
	<b>Order: Eulipotyphla, Family: Erinaceidae</b>			
24	<i>Hemiechinus auritus</i>	Long-eared Hedgehog*	LC	Sch IV
25	<i>Paraechinus micropus</i>	Indian Hedgehog*	LC	Sch V
	<b>Order: Chiroptera, Family: Pteropodidae</b>			
26	<i>Pteropus giganteus</i>	Indian Flying Fox*	LC	-

LC= Least Concern, DD= Data Deficient, NT= Near Threatened, VU= Vulnerable, \*= Other Sources



What we are doing to the forests of the world is but a mirror reflection of what we are doing to ourselves and to one another.

Mahatma Gandhi

