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ECOLOGICAL STATUS AROUND VICTOR PORT, RAJULA TALUKA, DISTRICT AMRELI IN THE STATE OF GUJARAT

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Abstract: Ecology and biodiversity is an asset of the environment. Here in this study, the ecological status *i.e.* terrestrial and aquatic in and around Victor Port (near to Pipavav Port) in District Amreli (Gujarat) has been presented. The creek Adopat on which the nearby villages are dependent for fishing activity is major area of interest. Sometimes dolphins have been observed in this creek, which are highly intelligent marine mammals and are part of the family of toothed whales that includes orcas and pilot whales. Some of the animals observed in the study area are protected under schedule I and II have to be protected and not disturbed at all, for the same, the conservation plan should be implemented for entire life of the project as per suggestions in conservation and from forest officials.

Keywords: Biodiversity, Conservation, Dolphin, Ecology, Mangrove.

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INTRODUCTION

Ecology is the scientific study of the relations that living organisms have with respect to each other and their natural environment. Producer, consumer and decomposer govern whole cycle of ecology. Plant and animal both are interdependent to each other. Producer is necessary for each consumer. Plant plays their role in ecology as producer. Plant, animals and microorganism together with the environment in which they live make an independent unit called the Ecosystem. Mainly two types of Vegetation cover are on the earth surface. The description of Victor Port is given below:

a. Land side Infrastructure

- Total land side area approximately 66566 sq. m.
- Total Storage area of 29531 sq.m.
- Port internal road 1.5 km
- Parking Area 5500 sq.m.

b. Marine Infrastructure

- Litage Jetty of 295 m long with dredged draft of -4.0 m CD.

- 81 m long RO-RO berth 25 m with wide Ro-Ro ramp.
- Approach channel 6.82 Km long and 70 m wide.
- Dredging in approach channel, turning circle and berth pockets up to -4 m CD.
- Turning circle and Navigational aids.

Rajula is a Municipality city in district of Amreli, Gujarat. The Rajula Municipality has population of 38,489 of which 19,687 are males while 18,802 are females as per report released by Census India 2011. As per census 2011, the population of children with age of 0-6 is 5012 which is 13.02% of total population of Rajula (M). In Rajula Municipality, female sex ratio is of 955 against state average of 919. Moreover Child Sex Ratio in Rajula is around 912 compared to Gujarat state average of 890. Literacy rate of Rajula city is 78.98% higher than state average of 78.03%. In Rajula, Male literacy is around 86.46 % while female literacy rate is 71.19%. Agariya people reside in Victor Village and Siyalbet village. The Agariya are one of the Scheduled Tribes of India. Agariyas

also reside around, Chanch Bander, Pipavav and Devaka. They are employed at the saltpans of Gujarat Heavy Chemicals Limited (GHCL). They complain that they are not receiving any profits from their employers. GHCL has stopped the provident funds for about 300 workers. The fishermen in Jaffrabad live in the land allotted to them by the GMB. It could be seen that most of the land had been washed away by the sea. The fishermen's houses are presently located in such a way that the sea threatens to swallow them any moment now. The fishermen here do not have a fishing jetty.

EXPERIMENTAL

The baseline study was conducted for the evaluation of the floral and faunal biodiversity of the terrestrial as well as aquatic environment of the study area (10 Km radius from the port area) and it comprises of total 12 villages falls in Dist-Amreli.

Field Study Period: The ecological survey has been conducted for one season. The ground truthing has been conducted on 17th October to 22nd October 2016.

Survey Sites: Project site and its periphery covering 12 villages.

Core Zone: At the project site.

Buffer Zone: Around the project site in 10 Km radius.

Coordinates of Victor Port: 20°58'19" N; 71°33'32" E

The primary objective of survey was to describe the floral and faunal communities within the study area along with marine ecological status. The sampling plots for floral

inventory were selected randomly in the suitable habitats (Anderson, 1867; Jain and Rao, 1983; Dixit, 1984; Wilson and Reeder, 2005; Kumar, 2013; Kumar *et al.*, 2013). The methodology adopted for faunal survey involve random survey, opportunistic observations, diurnal bird observation, active search for reptiles, faunal habitat assessment, active search for scats and foot prints, animal call, and review of previous studies. The aim was to set baselines in order to monitor and identify trends after the commissioning of the cargo handling activity. Emphasis has been placed on presence of endemic species, threatened species if any present in the study area. The qualitative study has been carried out only. The listed of villages covered for survey is presented in Table 1 and the detailed method and parameters covered for the said study has been highlighted in Table 2. Desktop literature review was conducted to identify the representative spectrum of threatened species, population and ecological communities listed by IUCN, WCMC, ZSI, BSI and Indian Wild life Protection Act, 1972 (Bentham and Hooker, 1862-1883; Hunter, 1879; Dixit, 1984; Ghosh *et al.*, 2004; Lushington, 1915; Wilson and Reeder, 1993; BirdLife International, 2000; BirdLife International, 2004a, b; Wilson and Reeder, 2005; BirdLife International, 2010; Kumar and Srivastava, 2012; Kumar, 2013; Kumar *et al.*, 2013; Kumar and Aggarwal, 2013a,b). The status of individual species was assessed using the revised IUCN/SSC category system (WCMC, 1988; IUCN, 1994; WCMC, 2000; IUCN, 2001, 2003, 2008, 2010).

Table 1. List of Villages for Baseline study

S.No.	Name of Village
1.	Project Site
2.	Bherai
3.	Jholapur
4.	Kathivadar
5.	Rampara
6.	Victor
7.	Siyalbet
8.	Chach
9.	Kadiyali
10.	Datardi
11.	Ningala
12.	Visaliya
13.	Nava Devka

Table 2. Mode of Data collection and Parameters Considered During the Survey

#	Aspect	Data	Mode of Data Collection	Parameters Monitored	Remarks
1.	Terrestrial Ecology	Primary data collection	By Field Survey (Hutto <i>et al.</i> , 1986; Thommpson <i>et al.</i> , 1989; Welsh <i>et al.</i> , 1991; Allen <i>et al.</i> , 1996; Misra, 2013)	<p>For Floral diversity, Vegetation measurements: Tree, Shrub, Herbs, Grasses, Climbers, Cultivated plants in the study area, Floristic composition of the study area, Medicinal plants of the study area, Status of the forest, their category in the study area, Rare and endangered flora in the study area. Endemic plants in the study area.</p> <p>For Fauna in the study area: -Reptiles, -Amphibians, -Birds, -Fresh water fishes -Mammals, -Butterflies. Rare and Endangered fauna in the study area, Endemic fauna in the study area, Wild life and their conservation importance in the study area.</p>	Random survey, opportunistic observations, diurnal bird observation, active search for reptiles, faunal habitat assessment, active search for microhabitat, scats, foot prints, animal call, pug marks, debarking sign, Nesting, Claws, Dung, etc. and information from local villagers.
2.		Secondary data collection	<ul style="list-style-type: none"> • Amreli SF Division under Rajkot SF Circle. • Data of Fisheries department. • Literature like research papers, books published by research/academic Institutions. • Reports (Research reports, previous EIA reports etc.) 	Interpretation of secondary data for Ecological Sensitive Areas such as national forests, wild life sanctuaries, lakes, ravines, hills, hillocks and reserve forest, vegetation, type, importance etc.	Bentham and Hooker, 1862-1883; Hunter, 1879; Dixit, 1984; Ghosh <i>et al.</i> , 2004; Lushington, 1915; Wilson and Reeder, 1993; BirdLife International, 2000; BirdLife International, 2004a, b; Wilson and Reeder, 2005; BirdLife International, 2010; Kumar and Srivastava, 2012; Kumar, 2013; Kumar <i>et al.</i> , 2013; Kumar and Aggarwal, 2013a,b). The status of individual species was assessed using the revised IUCN/SSC category system (WCMC, 1988; IUCN, 1994; WCMC, 2000; IUCN, 2001, 2003,

					2008, 2010.
3	Aquatic Ecology	Primary	<ul style="list-style-type: none"> Guidelines of APHA for water sample collection Physical/ Virtual identification at site/direct sighting of fresh water or marine life. Confirmation from fisherman, local villagers, professionals, etc. 	<p>Fresh Water Life:</p> <ul style="list-style-type: none"> Algae Anthozoa Cephalopod Fishes Gastropod Invertebrates Molluscs Reptiles Snails Water birds <p>Marine Life:</p> <ul style="list-style-type: none"> Anthozoa Arthropods Cephalopod Cetaceans Cnidarians Coral reef Echinoderms Gastropod Hemichordates Lophophorates Molluscs Reptiles Sea Turtles Seabirds Seawater Fishes Shellfishes Sponges Worms <p>Planktonic Life: (Phyto/Zoo)</p> <ul style="list-style-type: none"> Total genera Major genera Taxonomy Nanoplanktonic Flagellates Cnidarians Rotifera, Chaetognatha, Polychaeta Copepods Cladocerans, Krill Insect Larvae Tunicates 	<p>Endangered, threatened and the most common fresh water and marine species.</p> <p>By using Lackey's drops method and light microscope Physical/virtual identification Verification by authentic agency (BSI, ZSI, FRI, NIO, etc.)</p>
		Secondary	Published Records	Importance, food chain, food web, dependency, indicator, etc.	Incorporation in report along with its importance
4.	Evaluation of Ecological sensitivity	Secondary	Review and Discussion	Wild life importance, Floral Endemicity, Faunal Endemicity, State of Terrestrial vegetation, State of wet land vegetation, Mangrove vegetation, Conservation importance, Legal status (National park, Wild life sanctuary, Reserve forest, Wetlands, Agricultural	-

				lands) Lakes /reservoirs/dam, etc.	
5.	Green Belt development	Primary	Guidelines for developing green belts, Central Pollution Control Board (CPCB), New Delhi, Programme Objective Series: PROBES/75/1999-2000, pp. 195. Phytoremediation of particulate matter from ambient Environment through Dust capturing Plant Species. Central Pollution Control Board (CPCB), New Delhi, 2007. Greenbelts for Pollution Abatement (Concepts, Design, Applications) by S.A. Abbasi and E.I. Khan 2000.	List of trees, shrubs, ornamental, Budgetary outlay along with green belt map for 3 tier development.	-
6.	Ecological Impact Assessment	Primary & Secondary	Review and Discussion	Scoring Matrix	Impact assessment, its mitigation plan, conservation plan and budgetary outlay.

RESULTS AND DISCUSSION

Amreli district is forefront in agriculture field. The crops like cotton, groundnut till, Bajri etc. are taken in monsoon. In winter the crops like wheat, Jira, Grains, Onion, Garlic, vegetables are taken. In summer, the groundnut, mug (green beans) Bajri, etc. are taken. The area for the present biological baseline study falls under 12 villages. The area falls under **agro-climatic zone XIII** as per IASRI http://www.iasri.res.in/agridata/12data/chapter1/db2012tb1_2.pdf.

The district Amreli is drained by Shetrunji River and Dhatarwadi River flowing towards south. The main tributaries of this river are Sotali, Vadi, Thebi and Shell. Dhatarwadi River has number of tributaries on its way. The river Surajwadi is one of the major tributaries which meets river Dhatarwadi just upstream of dam. The average rainfall in the Dhatarwadi river basin is 565 mm.

As per CGWB (2012), the Depth to water level of the area was:

- Pre-monsoon (1.68 to 34.85 mbgl)

- Past Monsoon (1.55 to 37.50 mbgl)
Long term water level trend in 10 yrs. (2003-2012)
- Pre monsoon: Rise (0.010 to 2.01m/yr)
Fall (0.11 to 2.74m/yr)
- Post monsoon: Rise (0.011 to 2.56m/yr)
Fall (0.01 to 2.21m /yr)

The plantation on road side and domesticated plants in villages were scattered. There is moist deciduous forest falling in the study area. The study area belongs to plain, undulating, fallow land and some grazing land; the thick vegetation cover observed in the south to west with scrub. The major trees were *Salvadora persica* (Pilu), Limdo (*Azadirachta indica*) Khejri (*Prosopis cineraria*), Desi Baval (*Acacia nilotica*) and few shrubs of Gando Baval (*Prosopis juliflora*) as dominant vegetation. The people were engaged in mustard cultivation during the study period. The crop is depending on rain, as there is no other means of water for irrigation except Shretrunji River. Some part of the study area has bore/tube wells; the water table is 2 m to 35 m bgl.

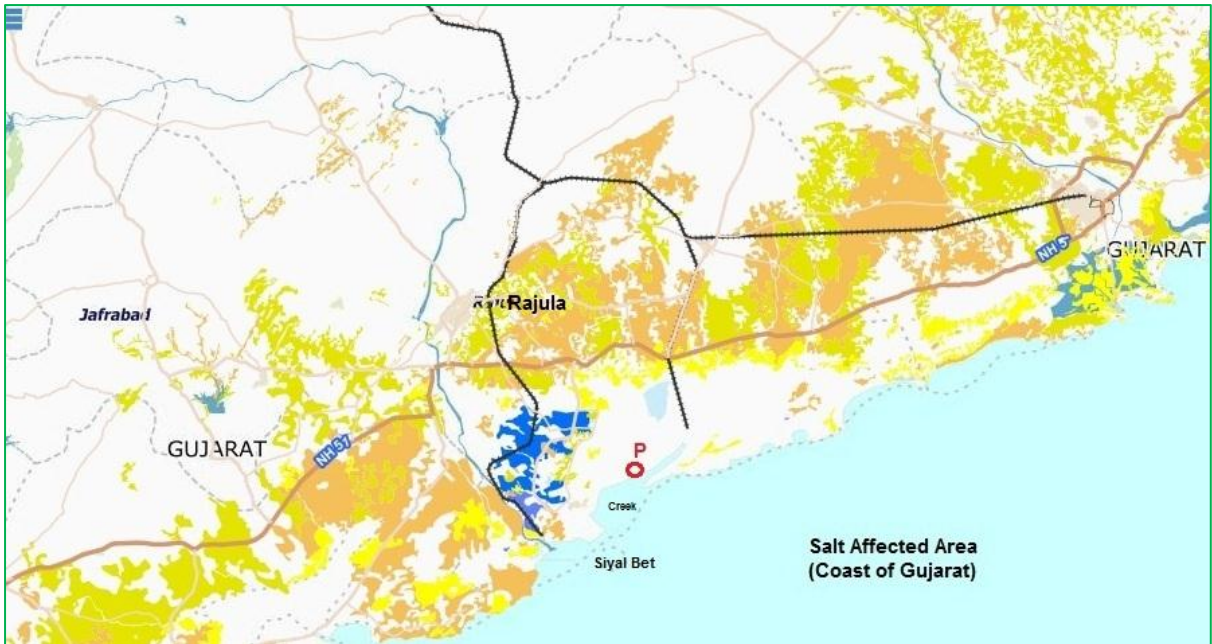


Figure 1. Salt Affected area of Coast of Gujarat nearby Rajula taluka



Figure 2. River Dhatrawadi Drainage



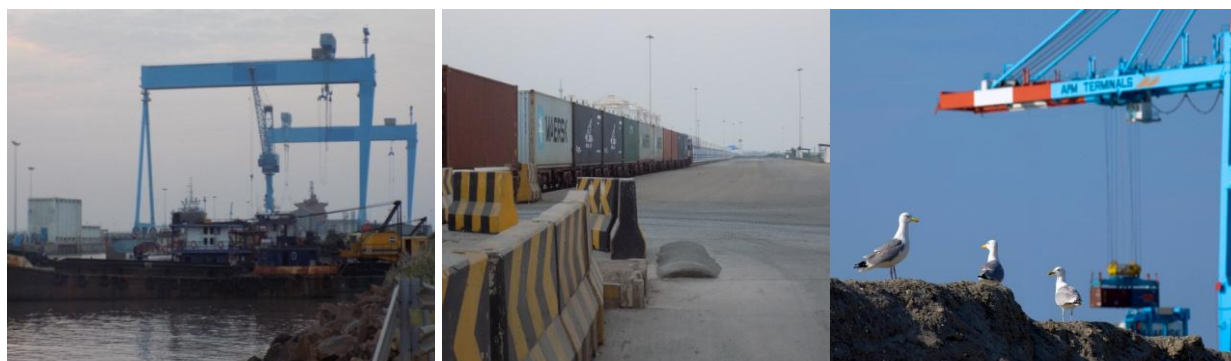


Figure 3. View of Pipavav Port



Figure 4. Saltpans in Study area

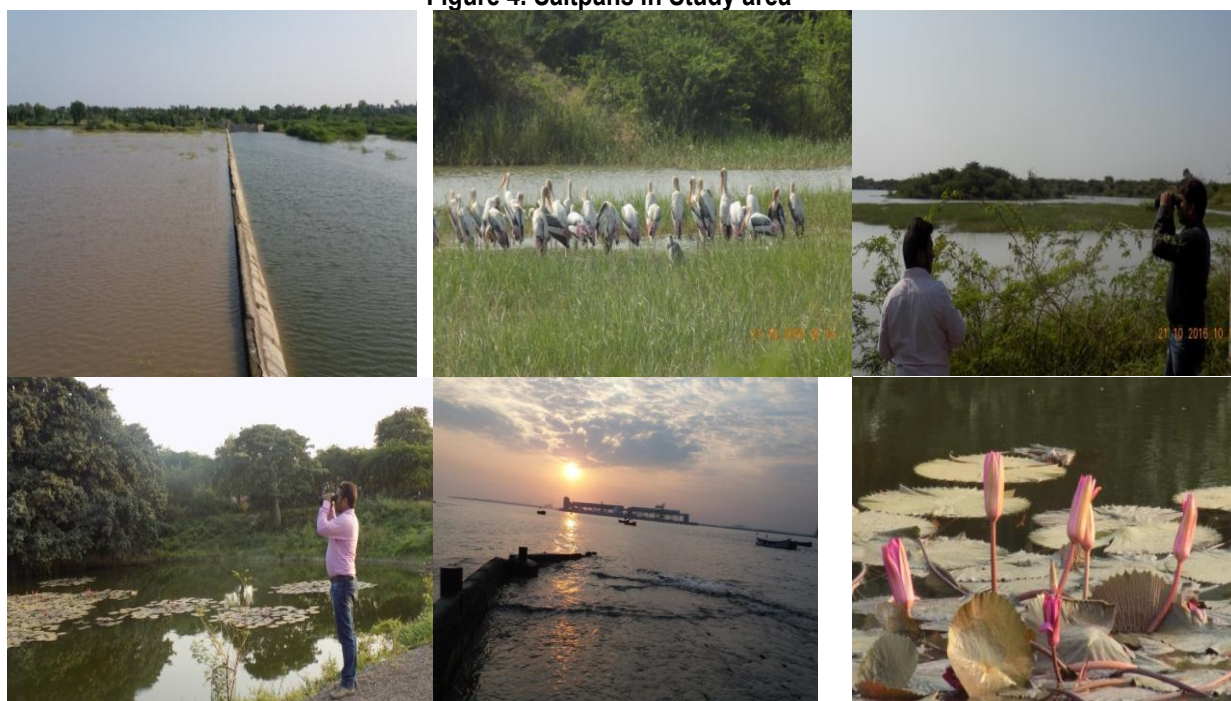


Figure 5. Aquatic Habitat of the Study Area



Figure 6. Vegetable spotted in the study area



Figure 7. Indirect Sightings



Figure 8. Marine Sampling



Figure 9. Bumla (Bombay Duck) Production at Siyalbet



Figure 10. Nesting



Figure 11. *Typha domingensis* (Cattail)



Figure 12. Glimpses of Local information and Confirmation from villagers

Floral Diversity of the Area

The objective of this floral inventory of the study area is to provide necessary information on floristic structure in the study area for formulating effective management and conservation measures. The climatic, edaphic and biotic variations with their complex interrelationship and composition of species, which are adapted to these variations, have resulted in different vegetation cover, characteristic of each region (Ohasi, 1975). The tree species, herbs, shrubs, climbers and major crops, were documented during this base line study (Jain, 1968; 1991).

Trees: The dominant trees in the study area are *Azadirachta indica* (Neem), *Khejari* (*Prosopis cineraria*), *Babool* (*Acacia nilotica*), *Mangifera indica* (Aam). Total 28 species of trees belong to 16 families are enumerated from the study area.

The word mangrove finds its origin from the Portuguese and English words Mangué and 'Grove' respectively, and indicates mangrove plants as well as a group of trees. Mangroves not only imply a type of specialised tree, but

also an ecosystem that predominantly consists of mangrove trees. The large groups of mangroves and other plants that live in the tropical and subtropical intertidal zones may additionally be called mangrove forests or simply, mangal. The number of mangrove species and associated plants vary across different parts of the world. They are most prolific around Southeast Asia, and most live within the Tropic of Cancer and Tropic of Capricorn. Yet, there are a few species to be found even in the cooler, temperate climates. But whether in the hot, humid marshes or far away from the tropical sun, mangroves across the globe have one similarity. They have a remarkable ability to adapt and survive in their suffocating, saltladen environment. The mangrove (marine and terrestrial) encountered during study period in study area is enlisted in Table 4.

Shrubs: Total 21 shrub species belong to 16 families are enumerated from the study area. The dominant shrub community in this area was represented by *Prosopis juliflora* (Gando Baval), *Calotropis procera*, (Akoda), etc.

Herbs: Total 20 herbaceous species belongs to 12 family (agricultural crops not included) were recorded from the study area enlisted in table 8.

Table 3. Trees in the Study area

S.No.	Family and Scientific name	Vernacular name
1	Anacardiaceae	
1/1	<i>Mangifera indica</i> L.	Aam
2	Annonaceae	
2/1	<i>Polyalthia longifolia</i>	Asopalav
3	Ebenaceae	
3/1	<i>Diospyros cordifolia</i> Roxb.	Dheki
4	Apocynaceae	
4/1	<i>Plumeria rubra</i> L.	Champa
5/2	<i>Tamarindus indica</i>	Imli
5	Casuarinaceae	
6/1	<i>Casuarina equisetifolia</i> L.	Sharu
6	Caricaceae	
7/1	<i>Carica papaya</i> L.	Papaya
7	Fabaceae	
8/1	<i>Dalbergia sisoo</i>	Sisso
9/2	<i>Delonix regia</i> (Boj)	Gulmohar
10/3	<i>Parkinsonia aculeate</i> L.	Rambaval
11/4	<i>Peltophorum pterocarpum</i> (DC.)	Tamrafal
12/5	<i>Albizia lebbek</i> L.	Sirid
8	Leguminosae	
13/1	<i>Derris indica</i> (Lam.)	Karanj
9	Meliaceae	
14/1	<i>Azadirachta indica</i> A.Juss	Limdo
10	Mimosaceae	
15/1	<i>Acacia nilotica</i>	Desi Baval
16/2	<i>Leucaena leucocephala</i> (Lam.) De	Pardesi Baval
17/3	<i>Pithecellobium dulce</i> (Roxb.) Bth.	Jungle jalebi
18/4	<i>Prosopis cineraria</i> (L.)	Khejari
19/5	<i>Acacia senegal</i> (L.) Willd,	Baval
11	Moraceae	
20/1	<i>Ficus benghalensis</i> L.	Bargad
21/2	<i>Ficus religiosa</i> L.	Pipal
12	Moringaceae	
22/1	<i>Moringa oleifera</i> Lam	Sargavo
13	Myrtaceae	
23/1	<i>Eucalyptus citriodora</i> Hk.	Nilgari
24/2	<i>Syzygium cumini</i>	Jambu
14	Rhamnaceae	
25/1	<i>Zizyphus mauritiana</i>	Bor
26/2	<i>Zizyphus xylopyrus</i>	Jungli Bor
15	Salvadoraceae	
27/1	<i>Salvadora persica</i> L.	Piludo
16	Sapotaceae	
28/1	<i>Manilkara zapota</i> L. van Royen	Chikoo

Table 4. List of Mangrove/s encountered in the study area

S.No.	Scientific name	Common name	Family
Marine			
1.	<i>Avecenia marina</i>	Grey Mangrove	Verbenaceae
2.	<i>Avecenia officinalis</i>	Indian Mangrove	Verbenaceae
3.	<i>Avicennia alba</i>	-	Verbenaceae
4.	<i>Avicennia germinans</i>	Black Mangrove	Verbenaceae
5.	<i>Laguncularia racemosa</i>	White Mangrove	Combretaceae

6.	<i>Rhizophora mangle</i>	Red Mangrove	Rhizophoraceae
7.	<i>Rhizophora mucronata</i>	-	Rhizophoraceae
Terrestrial			
8.	<i>Salvadora persica</i>	Toothbrush Tree	Salvadoraceae
9.	<i>Salvadora oleoides</i> Decne.	Toothbrush Tree-Big	Salvadoraceae
10.	<i>Sonneratia apetala</i>	Blume Mangrove	Lythraceae
11.	<i>Sonneratia alba</i>	Mangrove Apple	Lythraceae

Table 5. Status of Mangrove (Area in sq. km.) in Saurashtra Coast

Region	Mangrove Area Under different density classes (sq. km.)			
	Dense	Sparse	Total	Potential Area
Amreli	0.09	1.47	1.56	1.32
Junagarh	0.0	1.64	1.64	0.03
Porbandar	0.35	0.86	1.21	0.01
Total	0.44	3.97	4.41	1.33

Source: Patel et al., 2014 (AARS) <http://www.geoinfo.ait.ac.th/ajg/index.php/journal/article/viewFile/112/83>

Table 6. Medicinally Important Plants Observed in the Study Area

S.No.	Scientific Name	Vernacular Name
1.	<i>Acacia nilotica</i>	Baval
2.	<i>Aloe vera</i>	Kumarpathu
3.	<i>Azadirachta indica</i>	Limdo
4.	<i>Calotropis gigantea</i>	Akado
5.	<i>Calotropis procera</i>	Akado
6.	<i>Capparis decidua</i>	Kerdo
7.	<i>Carica papaya</i>	Papaya
8.	<i>Cassia auriculata</i>	Aval
9.	<i>Cuscuta reflexa</i>	Akashvel
10.	<i>Datura metel</i>	Dhatura
11.	<i>Dichostachys cinerea</i>	Mordhundiya
12.	<i>Euphorbia nivulia</i>	Thor
13.	<i>Ficus bengalensis</i>	Vad
14.	<i>Ficus religiosa</i>	Paipal
15.	<i>Ipomoea fistulosa</i>	Nasarmo
16.	<i>Lawsonia interims</i>	Mendhi

Table 7. List of Shrubs in the Study Area

S.No.	Family and Scientific name	Vernacular name
1	Apocynaceae	
1/1	<i>Thevetia peruviana</i>	Pili Kaner
2	Asclepiadaceae	
2/1	<i>Calotropis procera</i>	Akoda
3	Bignoniaceae	
3/1	<i>Tecoma stans</i> (L.) H.B. & K.	Peilafol
4	Cactaceae	
4/1	<i>Cereus peruvianus</i>	Cactus
5/2	<i>Opuntia elatior</i> Mill.	Fafdo thor
5	Capparaceae	
6/1	<i>Capparis decidua</i> (Forsk) Edgew	Kerdo
6	Compositae	
7/1	<i>Xanthium strumarium</i> L.	Gokhru
7	Convolvulaceae	
8/1	<i>Ipomoea fistulosa</i>	Besharm
8	Euphorbiaceae	
9/1	<i>Ricinus communis</i> L.	Divel
10/2	<i>Euphorbia nivulia</i> Buch.-Ham	Thor
11/3	<i>Jatropha curcus</i> L.	Ratanjot
9	Malvaceae	
12/1	<i>Abelmoschus manihot</i> L.	Jungli Bindi

13/2	<i>Hibiscus rosa sinensis</i> L.	Jasund
10	Musaceae	
14/1	<i>Musa paradisiaca</i> L.	Kela
11	Mimosaceae	
15/1	<i>Prosopis juliflora</i>	Gando baval
12	Nyctaginaceae	
16/1	<i>Bougainvillea spectabilis</i> Willd.	Bougainvelia
13	Rhamnaceae	
17/1	<i>Zizyphus nummularia</i>	Jharbera
18/2	<i>Zizyphus nummularia</i> (Burm.f.) W. &	Chanibor
14	Punicaceae	
19/1	<i>Punica granatum</i>	Anar
15	Rutaceae	
20/1	<i>Citrus limon</i>	Neebu
16	Lythraceae	
21/1	<i>Lawsonia inermis</i>	Mehandi

Table 8. List of Herbaceous species observed in the Study area

S.No.	Family and Scientific name	Vernacular name
1	Asphodelaceae	
1/1	<i>Aloe barbensis</i> Mill.	Kunvarapato
2	Asteraceae	
2/1	<i>Tridax procumbens</i> L.	Bhangro
3/2	<i>Eclipta prostrata</i>	Bhangro
4/3	<i>Echinops echinatus</i> Roxb	Shulio
5/4	<i>Lacunae procumbens</i> (Roxb)	Moti Bhonpatri
3	Convolvulaceae	
6/1	<i>Cressa cretica</i> L.	Palio, Rudanti
7/2	<i>Ipomoea pes-carprae</i> (L)	Dariani vel
8/3	<i>Ipomoea aquatica</i> Forsk.	Nalini Bhaji
9/4	<i>Ipomoea obscura</i> Ker	Vad fudradi
4	Lamiaceae (Labiatae)	
10/1	<i>Ocimum sanctum</i> L.	Tulsi
5	Malvaceae	
11/1	<i>Abutilon indicum</i> L.	Khapat, Dabaliar
6	Menyanthaceae	
12/1	<i>Nyphoides indicum</i> (Roxb.)	Kumudini
7	Nyctaginaceae	
13/1	<i>Boerhavia diffusa</i> L.	Satodi
8	Papilionaceae	
14/1	<i>Cortalaria medicaginea</i> Lam	Ran methi
9	Poaceae (Gramineae)	
15/1	<i>Saccharum munja</i>	Munja
16/2	<i>Pennisetum typhoides</i> (Burm.)	Bajri
10	Pontederiaceae	
17/1	<i>Eichhornia crassipes</i> (Mart.)	Jalkumbhi
11	Solanaceae	
18/1	<i>Datura metel</i>	Dhatura
19/2	<i>Solanum nigrum</i> L.	Piludi
12	Zygophyllaceae	
20/1	<i>Tribulus terrestris</i> L	Gokhru

Dominant Climbers in the Study Area:
Cuscuta chinensis (Amarbel), *Ipomea aquatica* Forsk. (Nadinivel), *Coccinia Grandis* (Ghiloda), *Mukia maderaspatana* (L) M.Roem

(Chanakchibhdi), *Mucuna prurita* Hk. f (Kavach, Koyli) were observed in the entire study area.

Cultivated Plants in the Study Area

The prevalent cropping systems of this area are the cumulative results of past and present decisions by individuals; these decisions are usually based on experience, tradition, expected profit, personal preferences and resources, and so on. The crop occupying the highest percentage of the sown area of this region is taken as the major crop and all other possible alternative crops which are sown in this region either as substitutes of the base crop in the same season or as the crops which fit in the rotation in the subsequent season, are considered as minor crop. It is observed that, the different parts of the study area were practicing different crop pattern based on the season and availability of irrigation facility. The general crop patterns practiced in the study area were Bajri (*Pennisetum typhoides*), Juwar (*Sorghum vulgare*) Ground nut (*Arachis hypogaea*) and cotton (*Gossypiumm harbaceum*) during monsoon, Onion (*Allium cepa*), Garlic (*Allium sativum*) Wheat (*Triticum aestivum*) and tomato (*Lycopersicon lycopersicum*), during winter and during summer only Ground nut (*Unadanu Mumphali*) were practiced in this region.

a. Major Crops: Major crops in the study area include Cotton (*Gossypiumm harbaceum*) and Onion (*Allium cepa*). But after monsoon Ground nut (*Arachis hypogaea*) Bajri (*Pennisetum typhoides*), Juwar (*Sorghum vulgare*) and cotton (*Gosypiumm harbacaum*) are the main crops.

b. Minor Crops: Minor crops practiced in this region after monsoon were Jeeru (*Cuminum cyminum*), and Mirchi, (*Capsicum annum*).

c. Major Horticultural Crops: Plantation of Chikku (*Manilkara zapota*), Kela (*Musa sp.*) Papaya (*Carica papaya*) and Dadam (*Punica granatum*) were observed at some localities. Mango trees (*Mangifera indica*) and Tamarindus trees (*Tamarindus indica*) were observed adjacent to the residential area and also along the road side at almost all villages.

d. Major Vegetable Corps: The major vegetables grown in the study area were:

- Bhindi (*Abelmoschus escelentus*),
- Brinjal, (*Ringana Solanum melongena*),

- Cabbage (*Brassica oeraceae*),
- Tomato (*Lycopersicon lycopersicum*),
- Guvar (*Cyamopsis tetragonoloba*),
- Val (*Lablab purpureus*),
- Turia (*Luffa acutangula*),
- Karela (*Momordica charantia*),
- Drum stick (*Sargva*) (*Moringa oleifera*),
- Amli (*Tamarindus indica*)
- Chloi (*Vigna unguilata*)

e. Pulses: The pulses cultivated in this region were Mag (*Vigna acontifolia*), Tuver (*Cajanus cajan*).

Rare and Endangered Flora in the Study Area:

The IUCN Red List is the world's most comprehensive inventory of the global conservation status of plant and animal species. It uses a set of criteria to evaluate the extinction risk of thousands of species and subspecies. These criteria are relevant to all species and all regions of the world. With its strong scientific base, the IUCN Red List is recognized as the most authoritative guide to the status of biological diversity. Out of 17000 species of higher plants known to occur in India, nearly 614 higher plant species were evaluated by IUCN. Among them 247 species are under threatened category (IUCN, 2008).

Among the enumerated flora in the study area, none of them were assigned any threat category by Red data book of Indian Plants (Jain and Sastry, 1984; Nayar and Sastry, 1987; 1988; 1990; Oldfield *et al.*, 1998; Kholia and Bhakuni, 2009) and Red list of threatened Vascular plants (IUCN, 2010).

Endemic Plants of the Study Area: De Candolle (1855), Swiss botanist, first used the concept of Endemic, which is defined as an area of a taxonomic unit, especially a species which has a restricted distribution or habitat, isolated from its surrounding region through geographical, ecological or temporal barriers. Out of 17000 species of known flowering plants of India nearly 5000 species are said to be endemic. Nearly 58 genera and 1932 taxa are found to be endemic to peninsular India (Nayar, 1980; Ahmedullah and Nayar, 1986; 1987; Jain 1992; Nayar, 1996; Vijaya Shankar *et al.*, 2005; Nautiyal *et al.*, 2009a, b; Shendage *et al.*,

2010). Among recorded plant species none can be assigned the status of endemic plant of this region.

Status of the Forest, Their Category in Study Area: No any reserve or protected forest except patches of *Prosopis juliflora* was observed in the study area. Tree community (Species-area) curves based on phytosociology fitted to the data may show unnatural shapes, with levelling-off or even decrease in sampling sizes higher than average. This distortion can be explained by the subjective, preferential method of field sampling used in phytosociology. When making releves in species-poor vegetation, one probably tends to use larger plots in order to include more species. The reason for this may be that a higher number of species gives a higher probability of including presumed diagnostic species, so that the releve can be more easily classified in the Braun-Blanquet classification system. This may has at least two consequences: in phytosociological data bases species-poor vegetation types are underrepresented or releves are artificially biased towards higher species richness; the suitability of phytosociological data for species richness estimation is severely limited.

Faunal Biodiversity of Study Area

For the documentation of the faunal biodiversity of the study area with respect to birds, reptiles, amphibians, and butterfly species, a baseline survey had been conducted.

Birds: The sighting of bird species was very lass during the study period. The most

commonly spotted bird species of this area were; Cattle Egret, Intermediate Egret, Red-wattled Lapwing, Rock Pigeon, Eurasian Collared-Dove, Chestnut-headed Bee-eater, Bank Myna and Common Myna. Water birds are very common as creek and sea shore line is the major part falls under study area. The Indian Peafowl was observed which is listed as schedule –I as per IWPA, 1972 and others listed as schedule IV as per IWPA, 1972. Total 1,224 bird species reliably recorded from India, together with their status categories. In total there are 1219 extant native species including migrants and vagrants (but excluding 3 species now known to be extinct in the country and 2 introduced species). There are 923 breeding species (911 residents, plus 12 suspected residents). IUCN evaluated 1254 bird species from India and categorized 77 species as threatened (13 species as critically endangered, 10 species as Endangered and 54 species as Vulnerable). No one sighted birds were evaluated as near threatened by IUCN, 2010 and BirdLife International, 2010. A taxon is Near Threatened, when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable categories, but is close to qualifying or is likely to qualify for a threatened category in the near future. List of schedule -1 as per Wild life Protection Act 1972, species is given in the Table 9. Systematic account of the birds in the study area with the status of occurrence is given in the Table 10.

Table 9. Bird(s) protected under Schedule –I of WLP 1972

Species	As IWPA 1972	IUCN	CITES
Indian Peafowl (<i>Pavo cristatus</i>)	Schedule I	Least Concern ver 3.1	Not listed



Figure 13. Peacock Spotted in Study Area

Table 10. Systematic Lists of Birds in the Study Area with Status

S.No.	Scientific Name	Local Name	Common Name	Schedule	Status
1.	<i>Accipiter badius</i>	Shakro	Shikra	Schedule IV	R

2.	<i>Acridotheres ginginianus</i>	Ghoda kabar	Bank Myna	Schedule IV	R
3.	<i>Actitis hypoleucos</i>	Nani tutwari	Sandpiper	Schedule IV	W
4.	<i>Alauda arvensis</i>	Khari chakli	Sky Lark	Schedule IV	R
5.	<i>Amaurornis phoenicurus</i>	Safed chatari	White-breasted Water hen	Schedule IV	R
6.	<i>Anthus campestris</i>	Pidi dhanchidi	Pipit	Schedule IV	R
7.	<i>Anthus spinoletta</i>	Panini Dhanchidi	Water Pipit	Schedule IV	W
8.	<i>Apus affinis</i>	Moto Ababil	Little Swift	Schedule IV	R
9.	<i>Apus apus</i>	Ababil	Common Swift	Schedule IV	R
10.	<i>Aquila clanga</i>	Kaljango	Spotted Eagle	Vulnerable	R
11.	<i>Aquila heliaca</i>	Shahi Garud	Imperial Eagle	Vulnerable	R
12.	<i>Ardeola grayii</i>	Khokhadbaglo	Heron	Schedule IV	R
13.	<i>Arihinga melanogaster</i>	Jalbhiil	Darter	Schedule IV	R
14.	<i>Athene noctua</i>	Nani ghuwad	Little Owl	Schedule IV	R
15.	<i>Bubulcus ibis</i>	Dhorbaglo	Cattle Egret	Schedule IV	R
16.	<i>Caprimulgus asiaticus</i>	Sonara	Nightjar	Schedule IV	R
17.	<i>Carduelis carduelis</i>	Tapusiyu	Goldfinch	Schedule IV	R
18.	<i>Centropus sinensis</i>	Hoco	Coucal	LC	R
19.	<i>Ciconia ciconia</i>	Badho	White Stork	Schedule IV	V
20.	<i>Circus aeruginosus</i>	Panpatai	Harrier Marsh	LC	R
21.	<i>Circus macrourus</i>	Panpatai	Pallid Harrier	NT	R
22.	<i>Circus pygargus</i>	Panpatai	Harrier Montagu's	LC	R
23.	<i>Columba livia</i>	Kabutar	Rock Pigeon	LC	R
24.	<i>Coracias benghalensis</i>	Deshi Neelkanth	Indian Roller	LC	R
25.	<i>Courser coromandelicus</i>	Rangodhlo	Courseer	LC	R
26.	<i>Covus splendens</i>	Kagdo	Crow	Schedule IV	R
27.	<i>Cursorius coromandelicus</i>	Rangodhlo	Courseer	LC	R
28.	<i>Cyanistes caeruleus</i>	Chikyu	Blue Tit	Schedule IV	R
29.	<i>Dendrocygna bicolor</i>	Nani bawk	Duck	Schedule IV	R
30.	<i>Dicrurus macrocercus</i>	Kado kosi	Black drongo	Schedule IV	R
31.	<i>Egretta garzetta</i>	Baglo	Little Egret	Schedule IV	R
32.	<i>Egretta gularis</i>	Karobaglo	Black Egret	LC	R
33.	<i>Elanus caeruleus</i>	Kapasi/Laudharo	Black-winged Kite	Schedule IV	R
34.	<i>Ephippiorhynchus asiaticus</i>	Dhonk	Black necked Stork	Schedule IV	R
35.	<i>Ficedula paiva</i>	Chatki ma khimar	Flycatcher	Schedule IV	R
36.	<i>Fulica atra</i>	Dasadi	Common Coot	Schedule IV	R
37.	<i>Gallinula chloropus</i>	Jalmurgi	Moorhen	LC	R
38.	<i>Grus grus</i>	Kunj	Crane	Schedule IV	R
39.	<i>Grus virgo</i>	Kunj	Demoiselle Crane	LC	R
40.	<i>Halcyon coromanda</i>	Kalkalio	White breasted	Schedule IV	R
41.	<i>Halcyon smyrnensis</i>	Moto Kalkalio	White-throated Kingfisher	Schedule IV	R
42.	<i>Lanius excubitor</i>	Dhori lefaddi	Great Grey Shrike	Schedule IV	VW
43.	<i>Larus brunnicephalus</i>	Gull	Gull brown headed	LC	R
44.	<i>Limosa limosa</i>	Motagadero	Black Tailed Godwit	NT	R
45.	<i>Megalaima haemacephala</i>	Kansaro	Coppersmith	Schedule IV	R
46.	<i>Merops leschenaulti</i>	Tarklo	Chestnut-headed Bee-eater	LC	R
47.	<i>Mesophoyx intermedia</i>	Vachetdholo baqlo	Intermediate Egret	Schedule IV	R
48.	<i>Motacilla cinerea</i>	Diwaliyo	Grey Wagtail	Schedule IV	W
49.	<i>Motacilla flava</i>	Pilo Diwaliyo	Yellow Wagtail	Schedule IV	SB
50.	<i>Muscicapa striata</i>	Nanu Chikyu	Spotted Flycatcher	Schedule IV	SB
51.	<i>Mycteria leucocephala</i>	Dhonk	Painted Stork	Schedule IV	R
52.	<i>Nectarinia asiatica</i>	Jāmbālī Sunbird	Purple Sunbird	Schedule IV	R
53.	<i>Nectarinia minima</i>	Motu Duriyu	Crimson-backed Sunbird	Schedule IV	R
54.	<i>Parus major</i>	Tikdi	Great Tit	Schedule IV	R

55.	<i>Passer domesticus</i>	Chakli	Sparrow	LC	R
56.	<i>Pavo cristatus</i>	Mor	Indian Peafowl	Schedule I	R
57.	<i>Pelecanus crispus</i>	Pen	Pelican	Schedule IV	R
58.	<i>Pelecanus onocrotaius</i>	Gulabi Pen	Pelican	Schedule IV	R
59.	<i>Pellomeum palustris</i>	Babbler	Marsh Babbler	Schedule IV	R
60.	<i>Phalacrocorax fuscicollis</i>	Vichetkajio	Cormorant Indian	Schedule IV	R
61.	<i>Phalacrocorax niger</i>	Nanokajio	Little Cormorant	Schedule IV	R
62.	<i>Phalacrocorax fuscicollis</i>	Pani Kagdo	Cormorant	Schedule IV	R
63.	<i>Philomachus pugnax</i>	Tilio	Ruff	LC	R
64.	<i>Phoenicopterus minor</i>	Nano Surkabh	Flamingo	Schedule IV	R
65.	<i>Picus viridis</i>	Lakkadhod	Green Woodpecker	Schedule IV	R
66.	<i>Platalea leucorodia</i>	Chamchichanch	Eurasian Spoonbill	Schedule IV	OP
67.	<i>Platalea ajaja</i>	Gulabi chamchichanch	Spoonbill	Schedule IV	O
68.	<i>Ploceus philippinus</i>	Sugari	Baya weaver	Schedule IV	R
69.	<i>Psittacula krameri</i>	Popat	Rose-ringed Parakeet	Schedule IV	V
70.	<i>Pterocies exustus</i>	Batumdi	Sandgrouse	Schedule IV	V
71.	<i>Pycnonotus cafer</i>	Bulbul	Bulbul	Schedule IV	R
72.	<i>Rostratula benghalensis</i>	Kuriyari	Greater Painted-snipe	Schedule IV	O
73.	<i>Sterna albifms</i>	Nana vabagli	Little Tern	LC	R
74.	<i>Streptopelia decaocto</i>	Holdi	Eurasian Collared-Dove	Schedule IV	R
75.	<i>Streptopelia orientaii</i>	Holdi	Rufous Turtle Dove	Schedule IV	R
76.	<i>Surniculus lugubris</i>	Kaliyakoshi	Drongo Cuckoo	Schedule IV	R
77.	<i>Tachybaptus ruficollis</i>	Dubki	Little Grebe	Schedule IV	R
78.	<i>Thalassarche melanophris</i>	Ebi	Seagull	Schedule IV	W
79.	<i>Throskiornis melanocephalus</i>	Dhorikankansar	Black headed ibis	Schedule IV	R
80.	<i>Turdoides caudatus</i>	Lelu	Common Babbler	Schedule IV	R
81.	<i>Vanellus indicus</i>	Titodi	Lapwing	Schedule IV	R

Note: Key to Status

R	Resident	VS	Vagrant summer
V	Vagrant	VP	Vagrant passage
S	Summer only	PB	Passage and breeds
W	Winter only	PW	Passage and winter
P	Spring or autumn passage	E	Escape
O	Occurs most years	-	

Butterflies from the study area: Butterflies from three families observed during the present study are documented in the table 11.

Herpetofauna: In amphibian group, the toads were sighted during the study period. The reptile, Common Garden Lizard, House Gecko and Fan-Throated Lizard, Common rat Snake and were observed in the region is given in the table 12.

Mammals: The wild mammals observed other than the domesticated ones are given in the table 13. Common Mongoose (*Herpestes edwardsii*) and Monkey (*Macaca mulatta*) were observed which are protected under schedule II and Spotted deer (*Axix axix*), Nilgai (*Boselaphus tragocamelus*) is Schedule-III animal as per Wildlife Protection Act 1972. The Squirrel and hare are protected under schedule IV. The bat (*Rousettus leschenaulti*) and

Common House Rat (*Rattus rattus*) are protected under schedule V. As per secondary information from local villagers and fishermen, Irrawaddy Dolphin (*Orcaella brevirostris*) was observed by them in the sea during fishing activity. This happens rarely and may be due to sea/coastal area and major creek falls in this study area. Dolphin is protected under schedule-I as per WLPA, 1972 and Vulnerable A2cde ver 3.1 as per IUCN red list. For the trading prohibition, CITES has listed Dolphin (*Orcaella brevirostris*) in Appendix I. Irrawaddy dolphins prefer coastal areas associated with the muddy, brackish waters at river mouths, ranging offshore as far as the extent of the freshwater plume – often only a few km but more than 10 km at the Pipavav Port. In creek and mangrove channels, the species is most often observed at channel confluences and

divergences and downstream of sharp meanders. They have been seen in the same area as finless porpoises in coastal waters of Arabian Sea.

Table 11. Butterflies in the Study Area

Scientific Name and Family	Common Name	Relative Abundance
Family Asclepiadaceae		
<i>Danaus genutia</i> Cramer	Striped Tiger	Common
Family Papilionidae		
<i>Papilio polytes</i>	Common Mormon	Common
Family Pieridae		
<i>Eurema hecabe</i>	Common Grass yellow	Very Common
<i>Ixias Marianne</i>	White orange tip	Common
Family: Nymphalidae		
<i>Danaus chrysippus</i>	Plain Tiger	Common
<i>Phalantha phalantha</i>	Common Leopard	Fairy Common
<i>Hypolimnana misippus</i>	Danaid Egg Fly	Common
<i>Mycalesis perseus</i>	Common Bush Brown	Uncommon
<i>Cynthia cardui</i> Linnaeus	Painted Lady	Uncommon
<i>Junonia hierta</i> Fabricius	Yellow Pansy	Common
<i>Junonia orithya</i> Linnaeus	Blue Pansy	Fairy Common

Table 12. Reptiles and Amphibian in the Study Area

S.No.	Common Name	Scientific name	Schedule as IWPA, 1972
1.	Toad	<i>Bufo bufo</i>	Not listed
2.	Common Indian Krait*	<i>Bungarus caeruleus</i> (Schneider)	Schedule II
3.	Indian chameleon	<i>Chameleon calcaratus</i>	Schedule II
4.	Common Garden Lizard	<i>Calotes versicolor</i>	Not listed
5.	Fan-Throated Lizard	<i>Sitana ponticeriana</i>	Not listed
6.	House Gecko	<i>Hemidactylus flaviviridis</i>	Not listed
7.	Brahminy Skink	<i>Mabuya carinata</i> (Schneider)	Not listed
8.	Common Rat Snake	<i>Ptyas mucosus</i> (Linn)	Schedule II
9.	Indian Cobra*	<i>Naja naja</i> (L)	Schedule II

*Not sighted but included as per the secondary information from the villagers.

Table 13. Mammals in Study Area

S.No.	Common Name	Scientific name	Status as per IWPA 1972
1.	3 striped Palm Squirrel	<i>Funambulus palmarum</i> (L)	Schedule IV
2.	5 striped Palm Squirrel	<i>Funambulus pennanii</i>	Schedule IV
3.	Bat	<i>Rousettus leschenaulti</i>	Schedule V
5.	Common House Rat	<i>Rattus rattus</i>	Schedule V
4.	Common Mongoose	<i>Herpestes edwardsii</i>	Schedule II
6.	Hare	<i>Lepus nigricollis dayanus</i>	Schedule IV
7.	Monkey	<i>Macaca mulatta</i>	Schedule II
8.	Nilgai (Blue Bull)	<i>Boselaphus tragocamelus</i>	Schedule-III
9.	Spotted deer	<i>Axix axix</i>	Schedule-III

Due to presence of creek and water body in the study area variety of birds flock during winter season. Sighting of flamingo, pelican, kunj, etc. in the study area has been reported. The study area does not have any national park, wild life sanctuary, tiger or elephant reserve, biosphere reserve, migratory corridors of wild animals. There is no marine national park in the study area. The listed faunal taxon has been crosschecked with Red Data Book of Indian

Animals (Zoological Survey of India). No endangered resident faunal species has been found in the area. Asiatic Lion (*Panthera leo persica*) sometimes wander in the study area from the Gir Sanctuary as there are sparse and some patches of *Prosopis juliflora* which connected to Gir Sanctuary and one major river i.e. Datarvadi river drain from North to South which attract wild animal for water and prey.

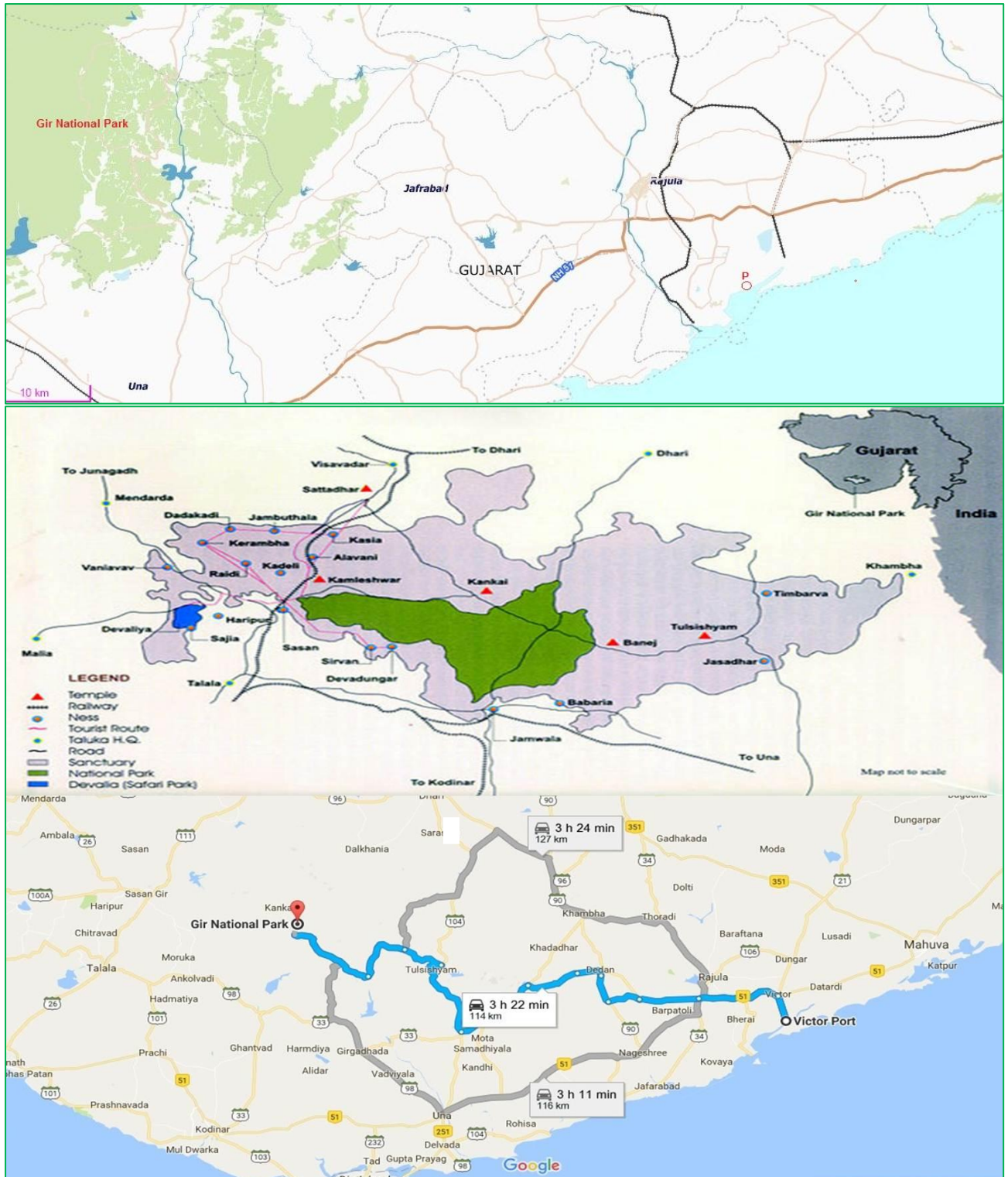


Figure 14. Map showing the Location of Gir Sanctuary/National Park

Domestic Animals

The domestic animals viz. Dog, cow, buffalo, goat, sheep and chicken observed in the study

area are listed in the table below. Some people of this area practicing poultry farming and some are sheep and goat farming.

Table 14. Domestic Animals in Study area

S.No.	English/Hindi Name	Scientific Name
1.	Buffalo/ Bhains	<i>Bulbalus bulbalis</i>
2.	Cat/billi	<i>Felis catus</i>
3.	Chicken/Murga	<i>Gallus gallus domesticus</i>

4.	Cow/Gai	<i>Bos primigenius</i>
5.	Dog/Kutta	<i>Canis lupus familiaris</i>
6.	Goat/Bakri	<i>Capra aegagrus hircus</i>

Fisheries

Gujarat is the second largest fish producing States in the country only next to West Bengal. Among all the maritime States, Gujarat accounts for a significant share insofar as marine fish production in the country is concerned and stands as the largest marine fish producer. During the year 2008-2009, the total fish production (marine and inland) in the State touched 6.36 Lakhs tons worth Rs.1701.10 Crores. The marine fish production constituted around 92% of the total fish production of the State. Jafarabad in an important fishing center famous for BUMLA. The production of BUMLA is about 25000 M.T per year. Local fishermen population is about 17892, population of Shiyal bet is 4100, and population of church is 687. Fishing ground and other Facilities Jafarabad is well located on south of Saurashtra region. Nearby fishermen also comes to Jafarabad from Chanch and Shiyal Bet. The main catch in this zone is Bombay duck, i.e. Bumla during working season, it can be seen that Jafarabad is covered with fish drying activity of Bumla fish. Jafarabad is connected by coastal and state highway with Una-Vernal, Rajula-Rajkot and Bhavanagar Fishing vessels and activities. Bombay duck is available in plenty mainly in South Gujarat coast. They are caught in dol net or bag net which is essentially bag net of conical shape. The fishery statistics available for the year 2008-09 suggest that nearly 74% of the fish is consumed within the State (per capita fish consumption being 9 kg per annum) and the

remaining 26% is marked outside State, which also includes foreign export. Utilization of fish produced in the State is meant for fresh fish consumption including dried fish, fish meal, fish manure and fish and maws. The marine fish production of Gujarat has reached a substantial level from 5.3 Lakh tons in 1991-1992 to as high as 6.4 Lakh tons in 2001-2002. As per the district-wise fish production figures available for the year 2008-2009, out of the 12 coastal districts, Junagadh is the major fish producing district accounting for 40% of the total fish production in the State, followed by Valsad, Kutch, Probandar, Amreli, and Jamnagar. The increase in the fishing activities resulting increases in catch and consequently in exports of marine products has been highlighted. The present status of fishing activities at Jafarabad increased with number of boats clearly indicates requirement of additional landing facilities. Shiyal bet's fishermen are also attracted towards Jafarabad, as they have no direct landing to unload their catch. South Gujarat and Victor – Chanch fishermen are also attracted towards Jafarabad for their fishing activities. As a matter of fact due to lack of landing facility, the harbour is congested and overcrowded resulting in unhygienic condition in the harbour as well as on nearby land. The channel is also congested and therefore landing of fish by fishing vessel delays for hours resulting in less export. The details of Fisherman population at Port Jafarabad and Shiyal Bet are presented in Table 19.

Table 15. List of Fishes Reported from the Area

S.No.	Common name	Scientific name
1.	Indian Conger Eel	<i>Conger cinereus</i>
2.	Milk Fish	<i>Chanos chanos</i>
3.	Blue Spot Grey Mullet	<i>Valamugil seheli</i>
4.	Grey Mullet	<i>Mugil cephalus</i>
5.	Mullet	<i>Mugil dussumieri</i>
6.	Spade fish	<i>Ephippus orbis</i>
7.	Japanese Thread-fin bream	<i>Nemipterus japonicus</i>
8.	Long Spine Sea-bream	<i>Argyrops spinifer</i>
9.	Indian Salmon	<i>Eleutheronema tetradactylum</i>
10.	Bombay Duck (Bumla)	<i>Horpodon neherius</i>
11.	Jew Fish	<i>Pseudoscioena sp.</i>
12.		<i>Pristopomas sp.*</i>

13.		<i>Diacanthus sp.*</i>
14.	Thread Fin	<i>Polynemus indicus</i>
15.	Mud Skipper	<i>Bolephthalmus</i>
16.	Indian shed (Chaksi)	<i>Hilsha ilisha</i>
17.	Seer fish (Chapri)	<i>Caranax atropus</i>
18.	Prawn	<i>Penaeus indicus</i>
19.	Rock Porch	<i>Otolitoides brunneus</i>
20.	Golden Anchovy (Mendeli)	<i>Coilia dussumieri</i>
21.	Pomfret	<i>Pampus Chinensis</i>
22.	Ribbon fish	<i>Trichiurus savala</i>
23.	Leather Jacket	<i>Chorinemus lysan</i>

*not seen directly.

Table 16. Details of Fishing Activities in Amreli District

S.No.	Particulars	Rajula	Jafrabad	Khamba
1.	No. of fishing villages	5	5	5
2.	No. of fishing landing centers	4	4	4
3.	Fisherman population	1179	-	-
4.	No. of active fishermen (mechanized)	1882	3132	2638
5.	Fish production (MT/year)	2706	3038	3842
6.	Mechanized boats	47	117	134
7.	Non- Mechanized boats	74	90	87

Source: District Statistical Hand Book – Amreli

Table 17. District-Wise Marine Fish Production in Gujarat (2008-2009)

S. No.	District	Marine Fish Production (Tons)
1.	Valsad	79,721
2.	Navsari	30,048
3.	Surat	8,882
4.	Bharuch	1,638
5.	Aanad	2,016
6.	Rajkot	1,744
7.	Kachahh	71,995
8.	Jamanagar	37,957
9.	Junagadh	2, 47,559
10.	Porbandar	74,003
11.	Amreli	49,753
12.	Bhavanagar	3820
TOTAL		6,09,136

Source: Directorate of Fisheries, Govt. of Gujarat and Assistant Commissioner of Fisheries, Amreli

Table 18. Data of Fish Catch (Amreli District)

S.No.	Name of fish Fish	Catch Recorded in Amreli District	
		2009 (Tons)	2010 (Tons)
1.	White Pomfret	33.39	29.36
2.	Black Pomfret	0.00	0.00
3.	Bombay Duck	785.54	373.83
4.	Thread fin	0.00	0.00
5.	Jelly fish	0.00	0.00
6.	Hilsa	499.24	262.76
7.	Clupeids	250.39	97.86
8.	Coppia	6.51	34.64
9.	Shark	215.82	138.15
10.	Mullet	106.57	67.87
11.	Catfish	62.56	0.00
12.	Eel	0.00	0.00
13.	Leather Jacket	0.00	0.00
14.	Seer Fish	30.68	5.69

15.	Indian Salmon	0.00	0.00
16.	Ribbon Fish	0.00	0.00
17.	Silver Fish	3.8	0.00
18.	Parch	0.00	0.00
19.	Shrimp	921.40	1058.4
20.	Prawns (Medium)	5.53	300.24
21.	Prawns (Jumba)	0.15	0.00
22.	Lobster	1.85	7.42
23.	Crab	115.40	139.33
24.	Levta	196.67	191.83
25.	Miscellaneous fish	296.77	330.81
Total		3532.27	3038.19

Table 19. Fishermen Population near Port Jafarabad and Shiyal Bet

Name of Center	Children					
	Male	Female	Male	Female	Total	Active
Jafarabad	3233	3435	5486	5768	17892	879
Shiyal bet	699	706	1381	1316	4102	299
Total	3932	4141	6867	7054	21944	1178

Source: Fisheries Department 2011.

Jafrabad Fishing Center (Dist. Amreli)

Jafrabad is an important fishing center in Amreli District of Saurashtra Region in Gujarat State. The seacoast of Jafrabad is the main fishing catch ground of Bombay duck (BUMLA) and so Jafrabad is famous for this Bumla since so many years. Bumla is marketed only after drying and henceforth nearby area of Jafrabad Port is occupied by fish drying platforms with erected poles of wooden and concrete pillars having intermediate strings for hanging and drying the fish. As such drying area required will be more. 275-290 mechanized boats of Jafrabad, also known as Doll Netter are active

in this region. Also fisherman from South Gujarat, Shiyal bet and Chanch are attracted towards Jafrabad and as such imparts increase in activities. At Jafrabad, other than 290 Doll netters, there are 20 Nos. of non-mechanized boats. Jafrabad being a well-known port/harbour from the historical time has played a vital role in the fishery activities of Gujarat and has showed very important contribution in the development of fishery sector of Gujarat. Significant data of fish catch as the time-series data is presented below which highlights the fishery potential of very high value.

Table 20. Jafrabad Fish Landing Trend

Year	Name of Fish	Catch in Tons	Percentage
2006-2007	Bumla	19191	55.09
	Mendali	647	1.86
	Dhoma/Kutto	8823	25.33
	Other	6177	17.73
	Total	34838	100.00
2007-2008	Bumla	7261	40.63
	Mendali	682	3.82
	Dhoma/Kutto	5759	32.00
	Other	4209	23.55
	Total	17871	100.00
2008-09	Bumla	11300	40.63
	Mendali	682	3.36
	Dhoma/Kutto	10266	35.64
	Other	6663	22.81
	Total	29211	100.00

Source: Fisheries Department, 2011.

In Gujarat, some of the important fish varieties are found that includes Pomfret, Jew

Fish, Bombay duck, Shrimp, Lobster, Squid, Cuttle fish, Silver bar, Hilsa, Shark, Catfish,

Mulletts etc. However, over the years, due to chemical pollution and constant fishing activity, fish availability from the shore has been decreasing constantly. According to experts in the field, availability of fish has reduced significantly on the southern part of the coastal belt. The fish availability has gone far deep in to the sea up to 12-25 nautical miles, prompting the fishermen to sail deep into the sea till 150 nautical miles.

Rare and Endangered Fauna of Study Area:

Some of the sighted fauna was given protection by the Indian Wild Life (Protection) Act, 1972 by including them in different schedules. Among the birds in the study area, Pea fowl (*Pavo cristatus*) is included in schedule I of Wild life protection Act (1972), while many other birds are included in schedule IV. Among the reptiles, Indian Cobra (*Naja naja*) is provided protection as per Schedule-II of Wildlife Protection Act, (1972). Among mammals; there is a habitat for Dolphin in 10 radius in Sea water as 50% study area falls under sea which is rarely seen in the study area, the Dolphin is protected under schedule-I while Common Mongoose (*Herpestes edwardsi*), Monkey are a schedule –II animals. Nilgai (*Boselaphus tragocamelus*) is protected as Schedule-III animal and hares and 3/5 striped squirrels are included in schedule IV of Wild Life Protection act 1972. None of the sighted animal species can be assigned endemic species category of the study area.

CONCLUSION

Spatial extent and distribution of vegetation types can be linked to the human induced changes and biodiversity characterization. None of the sighted animal species can be assigned endemic species category of the study area. Some of the animal observed in the study area is protected under schedule I and II have to be protected and not disturbed at all, for the same, the conservation plan should be implemented for entire life of the project as per suggestions in conservation and from forest officials. The monitoring of the same should be complied half yearly basis.

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