Ecological Status near thermal power plant and jetty in Abdasa Taluka, Dist– Kutch Gujarat India

Abstract

The thermal power plant has major impact of hot water discharge in to nearby creek or into sea on its ecosystem. The baseline for avian biodiversity, marine ecosystem and terrestrial ecosystem has to be assessed before discharging the hot water into sea. We have assessed the terrestrial as well as marine ecosystem for baseline scenario near the thermal power plant in Abdasa taluka, Kutch Gujarat. In the present study, we have focused on terrestrial baseline status of ecological system of surrounding. The findings state that area is not rich in biodiversity but mangrove biodiversity and density may be affected due to the thermal power plant activities.

Keywords: Avian biodiversity, mangrove, hot water discharge, impact, endangered species, thermal power plant

Introduction

The area in question has one thermal power plant running by Sanghi Industries Limited and one Jetty (walkway accessing the centre of an enclosed water body or structure that projects from the land out into water) structure built in 1994–1995 which is mainly used to Cement and other solid cargo handling by Sanghi Industries Limited. Sanghi Industries Limited is among leading cement manufacturers from Western India.

Water bodies should have the biological and chemical characteristics expected under sustainable conditions. The degree of departure of current vegetation from the potential natural vegetation, or potential natural community has detrimental impact on ecological system of the area. Before detailing the study area, a cursory understanding of the state scenario is important. Biodiversity of this region is largely related to the Thar Desert. Fossiliferous Limestone was found (Nummulites) which were mainly Marine deposits (coin–shaped) in this area. Due to unfavourable meteorological conditions and diverse habitat, a rapid snapshot survey for biological reconnaissance was conducted in this case. Secondly, the activity rhythms of different species differ on a diurnal scale. For instance the rodents dwelling in the sandy tracts of the buffer zone were seen despite being ubiquitous, but leave unmistakable sole imprints of the hind paws on the sand. Such indirect species specific evidences of the animals’ occupancy of the habitat have been considered. With desertic conditions, coastal vicinity, open scrub forest and slight undulating terrain in this region provides a unique ecosystem. The adverse climate and edaphic conditions intermixed with saline open plains and mangrove forests along the coast have turned this desert into an ideal dwelling place for wildlife and birds. Though forest areas are open, scrubby and along the coast they are of saline nature, some of the most endangered and threatened species of animals and birds survive in this area. As the district lies in poor rainfall area it lacks the richer mammalian life, but has the two form of wildlife are terrestrial and avifauna (Figure 1&2).

Figure 1 Jetty Structure.

Figure 2 Thermal power plant.
Methodology
An ecological survey of the study area was conducted particularly with reference to listing of species and assessment of the existing baseline ecological conditions in the study area. Total 8 hotspots/villages has been identified in the study area are listed in Table 1. The methodology adopted for the survey is depicted in Table 2.

| SNo | Name of Village/Spots | Remarks |
|-----|-----------------------|---------|
| 1   | Akari                 | A small village nearest to project site, about 22 families residing in the village, very few agriculture fields are there to grow the crops which are rain dependent. |
| 2   | Moti Ber              | The locals in these village practicing agriculture and milk. The Moti Ber village is the biggest in the area having more than 600 families. |
| 3   | Nani Ber              | Village having 40 families practicing the agriculture. |
| 4   | Navavas               | Village having 40 families practicing the agriculture. |
| 5   | Thumdi                | Small village practicing agriculture and milk |
| 6   | Golay RF              | Open jungle of Prosopis juliflora and Acacia nilotica on SW with scattered agriculture fields. |
| 7   | Walawadi              | A very small village of 22 families, some agriculture fields |
| 8   | West Mangrove Forest  | Mangrove Forest in coastal area on SE direction. |

Table 2 Mode of data collection and parameters considered during the survey

| #   | Aspect        | Data                      | Mode of Data Collection | Parameters Monitored                                                                 | Remarks |
|-----|---------------|---------------------------|-------------------------|-------------------------------------------------------------------------------------|---------|
| 1   | Terrestrial   | Primary data collection   | By Field Survey         | 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. 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. | 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     | Secondary data collection | Kutchh SF Division under SF Circle Bhuj, 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. | The literature was collected from various authentic sources. |
3. Evaluation of Ecological sensitivity

| Aspect | Data | Mode of Data Collection | Parameters Monitored                                                                 | Remarks |
|--------|------|-------------------------|-------------------------------------------------------------------------------------|---------|
|        |      | 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,                                                              |         |
|        |      |                         | Natural lakes and Swamps, Breeding ground of Migratory and Residential birds.        |         |

Results and discussion

Kutch bhuj district is forefront in agriculture field. The crops like groundnut, till, bajri etc. are taken in monsoon. The agriculture is rain dependent. No means of major surface water available for crop irrigation. The area falls under agro-climatic zone XIII as per IASRI http://www.iasri.res.in/agridata/12data/chapter1/db2012tb1_2.pdf.

Floral diversity of the study area

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. The tree species, herbs, shrubs, climbers and major crops, were documented during this base line study.21-24

Trees: The dominant trees in the study area are Mangifera indica L. (Mango trees) Azadirachta indica (Neem), Plumeria rubra L. (Champa), Babool (Acacia nilotica), Casuarina equisetifolia L. (Casuarina), Dalbergia sisoo L. (Shisham), etc. Total 34 species of trees belong to 17 families are enumerated from the study area (Table 3).

Table 3 List of trees in the study area

| S.No. | Family and Scientific name | Vernacular name |
|-------|---------------------------|-----------------|
| 1     | Anacardiaceae             |                 |
| 1/1   | Mangifera indica L        | Keri            |
| 2     | Annonaceae                |                 |
| 2/1   | Polyalthia longifolia L   | Asopalav        |
| 4     | Apocynaceae               |                 |
| 3/1   | Plumeria rubra L          | Champa          |
| 4/2   | Tamarindus indica L       | Imli            |
| 5     | Burseraceae               |                 |
| 5/1   | Commiphora wightii L      | Guggal          |
| 6     | Casuarinaceae             |                 |
| 6/1   | Casuarina equisetifolia L | Sharu           |
| 7     | Caricaceae                |                 |
| 7/1   | Carica papaya L           | Papaya          |
Table 4 List of shrubs in the study area

| S.No. | Family and Scientific name          | Vernacular name |
|-------|-------------------------------------|-----------------|
| 1     | Apocynaceae                         |                 |
| 1/1   | Thevetia peruviana                  | Pili Kaner      |
| 2     | Asclepiadaceae                      |                 |
| 2/1   | Calotropis procera                  | Akoda           |
| 3     | Bignoniaceae                        |                 |
| 3/1   | Tecoma stans (L.) H.B. & K.         | Peilafol        |
| 4     | Cactaceae                           |                 |
| 4/1   | Cereus peruvianus                   | Cactus          |
| 5/2   | Opuntia elatior Mill.              | Fafdo thor       |
| 5     | Capparaceae                         |                 |
| 6/1   | Capparis decidua (Forsk) Edgew      | Kerdo           |
| 6     | Compositae                          |                 |
| 7/1   | Xanthium strumarium L.              | Gokhru          |
| 7     | Lythraceae                          |                 |
| 8/1   | Lawsonia inermis                    | Mehandi         |
| 8     | Euphorbiaceae                       |                 |
| 9/1   | Ricinus communis L.                 | Divel           |
| 10/2  | Euphorbia nivula Buch.-Ham.         | Thor            |
| 11/3  | Jatropha curcas L.                  | Ratanjot        |
| 9     | Malvaceae                           |                 |
| 12/1  | Abelmoschus manihot L.              | Jungli Bindi    |
| 13/2  | Hibiscus rosa sinensis L.           | Jasund          |
| 10    | Musaceae                            |                 |
| 14/1  | Musa paradisiaca L.                 | Kela            |

Shrubs and Herbs: Total 20 shrub species belong to 15 families are enumerated from the study area. The dominant shrub community in this area was represented by *Prosopis juliflora*, *Calotropis procera*, *Cereus peruvianus*, *Xanthium strumarium L.*, *Abelmoschus manihot L.*, *Hibiscus rosa sinensis L.*, etc. The shrubs observed in the study area are given in the Table 4 and herbs encountered in the study area are listed in Table 5.

Table 5 List of herbs in the study area

| S.No. | Family and Scientific name          | Vernacular name |
|-------|-------------------------------------|-----------------|
| 1     | Asphodelaceae                       |                 |
| 1/1   | Aloe barbendis Mill.                | Kunvarapato     |
| 2/2   | Aloe vera                           | Kuwar Pathu     |
| 2     | Asteraceae                          |                 |
| 3/1   | Tridax procumbens L.                | Bhangro         |
| 4/2   | Eclipta prostrata                   | Bhangro         |
| 5/3   | Echinops echinatus Raxb.            | Shulio          |
| 6/4   | Lacunae procumbens (Raxb.)          | Moti Bhonpatri  |
| 3     | Convolvulaceae                      |                 |
| 7/1   | Cressa cretica L.                   | Palio, Rudanti  |
| 8/2   | Ipomoea pes-carprae (L)             | Dariani vel     |
| 9/3   | Ipomoea aquatica Forsk.             | Nalini Bhaija   |
| 10/4  | Ipomoea obscura Ker                 | Vad fudradi     |
| 4     | Lamiaceae (Labiatae)                |                 |
| 11/1  | Ocimum sanctum L.                   | Tulsi           |
| 5     | Malvaceae                           |                 |
| 12/1  | Abutilon indicum L.                 | Khapat, Dabalai |
| 6     | Menyanthaceae                       |                 |
| 13/1  | Nyphodes indicum (Raxb.)            | Kumudini        |
| 7     | Nyctaginaceae                       |                 |
| 14/1  | Boerhavia diffusa L.                | Satodi          |
| 8     | Papilionaceae                       |                 |
| 15/1  | Crotalaria medicaginea Lam          | Ran methi       |
| 9     | Solanaceae                          |                 |
| 16/1  | Datura metel                        | Dhatura         |
| 17/2  | Solanum nigrum L.                   | Piludi          |
| 10    | Zygophyllaceae                      |                 |
| 18/1  | Tribulus terrestris L.              | Gokhru          |
Mangrove: Some part of the study area falls coastal area which is declared as mangrove forest (10.68%), there is *Avecenia marina* was observed during the study. Four species of mangrove were encountered from the study area were terrestrial mangrove (Table 6).

| S.No. | Scientific name       | Common name    | Family       |
|-------|-----------------------|----------------|--------------|
| 1.    | *Avecenia marina*     | Grey Mangrove  | Verbenaceae  |
| 2.    | *Salvadora persica*   | Toothbrush Tree| Salvadoraceae|
| 3.    | *Salvadora oleoides*  | Toothbrush Tree-Big | Salvadoraceae|
| 4.    | *Sonneratia apetala*  | Blume Mangrove | Lythraceae   |

**Cultivated plants in the study area**

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 rain is the major source of irrigation in this area. The general crop patterns practiced in the study area were: Juwar (*Sorghum vulgare*), Ground nut (*Arachis hypogaea*) and during monsoon, Wheat (*Triticum aestivum*) during winter and during summer only Ground nut (*Mumpha*li) were practiced in this region.

**Major horticultural crops:** Plantation of Chikku (*Manilkara zapota*), Kela (*Musa sp*.) Papaya (*Carica papaya*), Amla (*Phyllanthus emblica*), Mango trees (*Mangifera indica*) 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. Chikku, Aam, Amla, Limboo and Papaiyo were developed by client in the premises.

**Major vegetable corps:** The major vegetables grown in the study area were:

i. Bhindi (*Abelmoschus esceletus*),

ii. Brinjal (*Rangana Solanum melongena*),

iii. Cabbage (*Brassica oeraceae*),

iv. Tomato (*Lycopersicon lycopersicum*),

v. Guvar (*Cyamopsis tetragonoloba*),

vi. Val (*Lablab purpureus*),

vii. Turia (*Luffia acutangula*),

viii. Karea (*Momordica charanta*),

ix. Drum stick (*Sargya*) (*Moringa oleifera*),

x. Aml (Tamarindus indica)

xi. Chloi (*Vigna unguiculata*)

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

**REET Species in the study area**

Among the enumerated flora in the study area, none of them were assigned any threat category by Red data book of Indian Plants.15–19,21–24

**Faunal biodiversity of the 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. The common birds observed in the study area are *Accipiter badius*, *Halycon coronamanda*, *Anhinga melanogaster*, *Apus apus*, *Egretta garzetta*, *Columbia livia*, *Spretopelia orientalis*, *Anthus campestris*, *Motacilla cinerea*, *Motacilla flava*, *Nectarinia asiatica*, *Philacocorax juscicollis*, *Pycnonotus cafer*, *Limosa limosa*, *Platalea ajaja*, etc. listed in Table 7. 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.

**Butterflies from the study area:** Butterflies from three families observed during the present study are documented in the table below (Table 8).

**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 below (Table 9).

**Mammals**

Common Mongoose (*Herpestes edwardsii*), Jungle cat were observed which are protected under schedule II and Nilgai (*Boselaphus tragocamelus*) is Schedule–III animal as per Wildlife Protection Act 1972. The Squirrel, Indian Porcupine, Hare etc. are protected under schedule IV. The Common House Rat (*Rattus rattus*) is protected under schedule V (Table 10).

**Insect**

There is no significant faunal assemblage here except for some insects like Honey Bees (*Apis sp.*) and Gum leaf Grasshopper (*Gonaeoa australasiae*).

**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. Although, the study area have no major river or any lake, a very few fishes were observed. Some part of study area fall coastal zone, hence marine fishes reported, no fisher man or fishing activity found in the study area (Table 11), (Figure 3–5).

**REET faunal species**

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*), Indian chameleon, Rat snake, Indian Krait and Indian Monitor are provided protection as per Schedule–II of Wild life Protection Act, (1972). Among mammals; Common Mongoose (*Herpestes edwardsii*), Indian Monitor, Jungle cat are a schedule–II animals. Nilgai (*Boselaphus tragocamelus*) is protected as Schedule–III animal and hares and 5 striped squirrels are included in schedule IV of Wild Life Protection act 1972.
## Table 7: Systematic lists of birds in the study area with status

| #  | Family             | Scientific Name                        | Vernacular Name | Common Name       | Status |
|----|--------------------|----------------------------------------|-----------------|-------------------|--------|
| 1  | Accipitridae       | Accipiter badius (Gmelin, 1788)         | Shakro          | Shikra            | R      |
| 2  | Elanus coroneus    | Desfontaines, 1789                     | Kapasi/Laudharo | Black-winged Kite | R      |
| 3  | Alcedinidae        | Halcyon coromanda (Latham, 1790)        | Kalkalio        | Ruddy Kingfisher  | R      |
| 4  | Halcyon simnensis  | Linnaeus, 1758                         | Moto Kalkalio   | White-throated Kingfisher | R      |
| 5  | Anhingidae         | Anhinga melanogaster (Pennant, 1769)   | Jalbhi          | Darter            | R      |
| 6  | Apodidae           | Apus apus (Linnaeus, 1758)              | Ababil          | Common Swift      | R      |
| 7  | Apus affinis       | (JE Gray, 1830)                        | Moto Ababil     | Little Swift      | R      |
| 8  | Ardeidae           | Bubulcus ibis (Linnaeus, 1758)          | Dhorbaglo       | Cattle Egret      | R      |
| 9  | Egretta garzetta   | (Linnaeus, 1766)                       | Baglo           | Little Egret      | R      |
| 10 | Mesopohya intermedia | (Wagler, 1827)     | Vachedholo baqlo | Intermediate Egret | R      |
| 11 | Caprimulgidae      | Caprimulgus asiaticus (Latham, 1790)   | Sonar           | Nightjar          | R      |
| 12 | Charadridae        | Vanellus indicus (Boddaert, 1783)      | Titodi          | Lapwing           | R      |
| 13 | Ciconiidae         | Ciconia ciconia (Linnaeus, 1758)       | Badho           | White Stork       | V      |
| 14 | Euphipphyrhynchos  | Linnaeus, 1790                         | Dhonk           | Black necked Stork| R      |
| 15 | Mycteria leucocephala | (Pennant, 1769) | Dhonk          | Painted Stork     | R      |
| 16 | Columbidae         | Columba livia (Gmelin, 1789)            | Kabutar         | Rock Pigeon       | R      |
| 17 | Streptopelia deacocta | Frivaldszky, 1838 | Holdi          | Eurasian Collared-Dove | R      |
| 18 | Streptopelia orientals | (Latham, 1790) | Holdi          | Rufous Turtle Dove | R      |
| 19 | Coraciidae         | Coracias benghalensis (Linnaeus, 1758) | Deshi Neelkanth | Indian Roller     | R      |
| 20 | Corvidae           | Corvus splendens (Vieillot, 1817)      | Kagdo           | Crow              | R      |
| 21 | Cuculidae          | Centropus sinensis (Stephens, 1815)    | Hoco            | Coucal            | R      |
| 22 | Surniculus lugubris | (Horsfield, 1821) | Kalyakoshi     | Drongo Cuckoo     | R      |
| 23 | Dicruridae         | Dicrurina macrocercus (Vieillot, 1816) | Kado kosi      | Black drongo      | R      |
| 24 | Fringillidae       | Carduelis carduelis (Linnaeus, 1758)   | Tapusiyu       | Goldfinch         | R      |
| 25 | Glareolidae        | Cursorius coromandelus (Gmelin, 1789)  | Rangodhlo       | Curser            | R      |
| 26 | Gruidae            | Antigone antigone (Linnaeus, 1758)     | Kunj            | Crane             | R      |
| 27 | Laridae            | Larus brunicephalus (Jerdon, 1840)     | Gull            | Gull brown headed | R      |
| 28 | Sterna albigans    | (Pallas, 1764)                         | Nana vagbagli   | Little Tern       | R      |
| 29 | Leiothrichidae     | Turdoides caudate (Dumont, 1823)       | Babbler         | Common Babbler    | R      |
| 30 | Megalaimidae       | Megalaima haemacephala (Statius Muller, 1776) | Kansaro         | Coppersmith barbet | R      |
| 31 | Meropidae          | Merops leschenaultia (Vieillot, 1817)  | Tarklo          | Chestnut-headed Bee-eater | R      |
| 32 | Motacilidae        | Anthus campestris (Linnaeus, 1758)     | Pidi dhanchidi  | Tawny Pipit       | R      |
| 33 | Anthus spinocollis | Linnaeus, 1758                         | Panini Dhanchidi | Water Pipit      | W      |
| 34 | Motacilla cinerea  | (Turnstall, 1771)                      | Diwalayu        | Grey Wagtail      | W      |
| 35 | Motacilla flava    | (Linnaeus, 1758)                       | Pilo Divaliyo   | Yellow Wagtail    | S      |
| 36 | Muscicapidae       | Ficedula parva (Bechstein, 1792)       | Chatki ma khimar | Red breasted Flycatcher | R      |
| 37 | Muscicota striata  | (Pallas, 1764)                         | Nana Chikyu     | Spotted Flycatcher | S      |
| 38 | Nectarinidae       | Nectarinio asiatica (Latham, 1790)     | Jamdali Sunbird | Purple Sunbird    | R      |
| 39 | Nectarinio minima  | Sykes, 1832                           | Motu Durryu     | Crimson-backed Sunbird | R      |
| 40 | Paridae            | Cyanistes caeruleus (Linnaeus, 1758)   | Chikyu          | Blue Tit          | R      |
| 41 | Parus major        | Linnaeus, 1758                         | Tikdi           | Great Tit         | R      |
Table Continued......

| #  | Family                  | Scientific Name                         | Vernacular Name | Common Name     | Status |
|----|-------------------------|----------------------------------------|-----------------|-----------------|--------|
| 42 | Passeridae              | Passer domesticus (Rafinesque, 1815)   | Chakli          | Sparrow         | R      |

43. **Phalacrocoracidae**  
   *Phalacrocorax fuscicolis* (Stephens, 1826)  
   Pani Kagdo  
   Cormorant  
   R

44. **Phasianidae**  
   *Francolinus pondicerianus* (Gmelin, 1789)  
   Titar  
   Gery Francolin  
   R

45. **Phoenicopteridae**  
   *Phoenicopterus minor* (Geoffroy Saint-Hilaire, 1798)  
   Nano Surkahb  
   Lesser Flamingo  
   R

46. **Picidae**  
   *Picus viridis* (Linnaeus, 1768)  
   Lakkadkhod  
   Green Woodpecker  
   R

47. **Picidae**  
   *Picus philippinus* (Linnaeus, 1766)  
   Sugari  
   Baya weaver  
   R

48. **Ploceidae**  
   *Ploceus philippinus* (Linnaeus, 1766)  
   Batumdi  
   Sandgrouse  
   V

49. **Pycnonotidae**  
   *Pycnonotus sinensis* (Temminck, 1825)  
   Bulbul  
   Bulbul  
   R

50. **Rallidae**  
   *Amaurornis phoenicurus* (Pennant, 1769)  
   Safed charati  
   White-breasted Waterhen  
   R

51. **Rallidae**  
   *Amaurornis phoenicurus* (Pennant, 1769)  
   Safed charati  
   White-breasted Waterhen  
   R

52. **Rallidae**  
   *Gallinula chloropus* (Brisson, 1760)  
   Jalmurgi  
   Moorhen  
   R

53. **Scolopacidae**  
   *Actitis hypoleucos* (Linnaeus, 1768)  
   Nani tutwari  
   Sandpiper  
   W

54. **Striidae**  
   *Athene noctua* (Scopoli, 1769)  
   Nani ghuwad  
   Little Owl  
   R

55. **Sturnidae**  
   *Acridotheres tristis* (Latham, 1790)  
   Ghoda kabar  
   Bank Myna  
   R

56. **Threskiornithidae**  
   *Platalea leucorodia* (Linnaeus, 1768)  
   Chamchichanch  
   Eurasian Spoonbill  
   OP

57. **Threskiornithidae**  
   *Platalea ajaja* (Linnaeus, 1768)  
   Guli chamchichanch  
   Spoonbill  
   O

58. **Threskiornithidae**  
   *Platalea ajaja* (Linnaeus, 1768)  
   Guli chamchichanch  
   Spoonbill  
   O

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   *Platalea ajaja* (Linnaeus, 1768)  
   Guli chamchichanch  
   Spoonbill  
   O

60. **Threskiornithidae**  
   *Platalea ajaja* (Linnaeus, 1768)  
   Guli chamchichanch  
   Spoonbill  
   O

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   *Platalea ajaja* (Linnaeus, 1768)  
   Guli chamchichanch  
   Spoonbill  
   O

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   *Platalea ajaja* (Linnaeus, 1768)  
   Guli chamchichanch  
   Spoonbill  
   O

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   Spoonbill  
   O

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   Spoonbill  
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   Spoonbill  
   O

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   *Platalea ajaja* (Linnaeus, 1768)  
   Guli chamchichanch  
   Spoonbill  
   O

R= Resident; O= occurs most of the year; P= Spring or autumn passage; W= Winter only; V= Vagrant; S= Summer only.

Table 8 Butterflies in the study area

| Scientific Name and Family | Common Name | Relative Abundance |
|----------------------------|-------------|--------------------|
| **Family Asclepiadaceae**  |             |                    |
| Danaus genutia Cramer      | Striped Tiger | Common             |
| **Family Papilionidae**    |             |                    |
| Papilio polytes            | Common Mormon | Common             |
| **Family Pieridae**        |             |                    |
| Eurema hecabe              | Common Grass yellow | Very Common |
| Ixias Marianne             | White orange tip | Common             |
| **Family: Nymphalidae**    |             |                    |
| Danaus chrysippus          | Plain Tiger | Common             |
| Phalantha phalantha        | Common Leopard | Fairy Common     |
| Hypolimnas misippus        | Danaid egg fly | Common             |
| Mycalesis perseus          | Common bush brown | Uncommon         |
| Cymhio cardui Linnaeus     | Painted Lady | Uncommon           |
| Junonia hirta Fabricius    | Yellow pansy | Common             |
| Junonia arithia Linnaeus   | Blue pansy  | Fairly Common      |

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Table 9 Reptiles and amphibian in the study area

| S.No. | Family        | Common Name          | Scientific name                                           | Schedule as IWPA, 1972 |
|-------|---------------|----------------------|-----------------------------------------------------------|------------------------|
| 1     | Agamidae      | Common Garden Lizard | Calotes versicolor (Cuvier, 1817)                        | Not listed             |
| 2     |                | Fan-Throated Lizard  | Stana panticerana (Cuvier, 1817)                         | Not listed             |
| 3     | Bufonidae     | Toad                 | Bufo bufo (Gray 1825)                                    | Not listed             |
| 4     | Chamaeleonidae | Indian chameleon     | Chameleon calcaratus (Rafinesque, 1815)                  | Schedule II            |
| 5     | Colubridae    | Common Rat Snake     | Ptyas mucosus (Linnaeus, 1758)                           | Schedule II            |
| 6     | Elapidae      | Common Indian Krait* | Bungarus caeruleus (Schneider, 1801)                     | Schedule II            |
| 7     |                | Indian Cobra*        | Naja naja (Linnaeus, 1758)                               | Schedule II            |
| 8     | Gekkonidae    | House Gecko          | Hemidactylus flaviviridis (Ruppell, 1835)                | Not listed             |
| 9     | Scincidae     | Brahminy Skink       | Mabuya carinata (Schneider, 1801)                        | Not listed             |
| 10    | Varanidae     | Indian Monitor       | Varanus bengalensis (Daudin, 1802)                       | Schedule II            |

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

Table 10 Mammals in study area

| S.No. | Family        | Common Name          | Scientific name                                           | Status as per IWPA 1972 |
|-------|---------------|----------------------|-----------------------------------------------------------|------------------------|
| 1     | Antilopinae   | Nilgai (Blue Bull)   | Boselaphus tragocamelus (Pallas, 1766)                    | Schedule-III           |
| 2     | Felidae       | Common Jungle Cat    | Felis chaus (Schreber, 1777)                              | Schedule II            |
| 3     | Herpestidae   | Common Mongoose      | Herpestes edwardsii (É. Geoffroy Saint-Hilaire, 1818)    | Schedule II            |
| 4     | Hystricidae   | Indian Porcupine     | Hystrix indica (Kerr, 1792)                               | Schedule IV            |
| 5     | Leporidae     | Hare                 | Lepus nigricollis (F. Cuvier, 1823)                       | Schedule IV            |
| 6     | Muridae       | Common House Rat     | Rattus rattus (Linnaeus 1758)                             | Schedule V             |
| 7     | Sciuridae     | 5 striped Palm Squirrel | Funambulus pennanti (Wroughton, 1905)                   | Schedule IV            |
| 8     |                | Grey Musk Shrew      | Suncus murinus (Linnaeus 1766)                           | -                      |

Table 11 List of fishes reported from the study area

| S.No. | Family        | Common name          | Scientific name                                           |
|-------|---------------|----------------------|-----------------------------------------------------------|
| 1     | Carangidae    | Seer Fish            | Caranx atropus                                            |
| 2     | Clupeidae     | Hilsa                | Tenualosa ilisha                                         |
| 3     | Oxudercidae   | Mud Skipper          | Gobius bodarti                                            |
| 4     | Polynemidae   | Thread Fin           | Polynemus indicus                                         |
| 5     |                | Indian Salmon*       | Eleutheronema tetradactylum                               |
| 6     | Sapridae      | Long Spine Sea-bream*| Argyrops spinifer                                        |

*not seen directly.

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Figure 3 Spotting during primary survey.

Figure 4 Mangrove in the study area.
Conclusion

The area in question has one thermal power plant running by Sanghi Industries Limited and one Jetty (walkway accessing the centre of an enclosed water body or structure that projects from the land out into water) structure built in 1994–1995 which is mainly used to cement and other solid cargo handling by Sanghi Industries Limited. Sanghi Industries Limited is among leading cement manufacturers from Western India. Total 34 species of trees belong to 17 families are enumerated from the study area. The dominant trees in the study area are Mangifera indica L. (Mango trees) Azadirachta indica (Neem), Plumeria rubra L. (Champa), Babool (Acacia nilotica), Casuarina equisetifolia L. (Casuarina), Dalbergia sisoo L. (Shisham), etc. Total 21 shrub species belong to 15 families are enumerated from the study area. The dominant shrub community in this area was represented by Proxopis juliflora, Calotropis procera, Cereus peruvianus, Xanthium strumarium L., Abelmoschus manihot L., Hibiscus rosa sinensis L., etc. Some part of the study area falls coastal area which is declared as mangrove forest (10.68%), there is Aveccenia marina was observed during the study. Four species of mangrove were encountered from the study area were terrestrial mangrove. The common birds observed in the study area are Accipiter badius, Halcyon coronanda, Anhinga melanogaster, Apus apus, Egretta garzetta, Columba liva, Streptopelia orientalis, Anthus campestris, Motacilla cinerea, Motacilla flava, Nectarinia asiatica, Phalacrocorax fuscicollis, Pycnonotus cafer, Limosa limosa, Platidea aijia, etc. Common Mongoose (Herpestes edwardsii), Jungle cat were observed which are protected under schedule II and Nilgai (Boselaphus tragocamelus) is Schedule–III animal as per Wildlife Protection Act 1972. The Squirrel, Indian Porcupine, Hare etc. are protected under schedule IV. There is no significant faunal assemblage here except for some insects like Honey Bees (Apis sp.) and Gum leaf Grasshopper (Goniaea australasiae). The study represent that the area in question is not rich in biodiversity, although the marine ecosystem needs to be affected by hot water discharge into sea. Therefore, an urgent need for marine ecosystem management plans to be implemented during operation phase.

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Conflict of interest

Author declares that there is no conflict of interest.

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