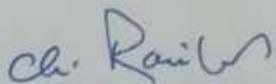


# ECOLOGY AND BIODIVERSITY STUDY REPORT & WILDLIFE CONSERVATION PLAN

For

The Proposed Laying 20" Pipeline of about 31 km length from Offshore Platform, through Mouth of the Goutami River to ONGC Onshore Plant at Mallavaram Village, Thallarevu Mandal, East Godavari District, Andhra Pradesh.

Submitted by

  
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## 1.0 INTRODUCTION

**Oil & Natural Gas Corporation Limited (ONGC)** is a Maharatna company Public Sector Undertaking (PSU) of the Government of India, under the administrative control of the Ministry of Petroleum and Natural Gas. It is India's largest oil and gas exploration and production company. It produces around 70% of India's crude oil (equivalent to around 30% of the country's total demand) and around 62% of its natural gas. With a market capitalization of over INR 2 trillion, it is the India's first largest publicly-traded companies. It is the largest crude oil and natural gas company in India, contributing around 70 per cent to Indian domestic production. Crude oil is the raw material used by downstream companies like IOC, BPCL and HPCL to produce petroleum products like Petrol, Diesel, Kerosene, Naphtha and Cooking Gas-LPG.

ONGC is the Top Energy Company in India, ranked 11<sup>th</sup> globally as per Platts Top 250 Global Energy Rankings, 2017. It is the only public sector Indian company to feature in Fortune's 'Most Admired Energy Companies' list. ONGC ranks 18<sup>th</sup> in 'Oil and Gas operations' and 183<sup>rd</sup> overall in Forbes Global 2000. Acclaimed for its Corporate Governance practices, transparency international has ranked ONGC 26<sup>th</sup> among the biggest publicly traded global giants. It is most valued and largest E&P Company in the world, and one of the highest profit-making and dividend-paying enterprise.

ONGC *Videsh* is a wholly owned subsidiary of Oil and Natural Gas Corporation Limited (ONGC), the National Oil Company of India, and is India's largest international oil and gas Company. ONGC *Videsh* has participation in 41 projects in 20 countries namely Azerbaijan, Bangladesh, Brazil, Colombia, Iraq, Israel, Iran, Kazakhstan, Libya, Mozambique, Myanmar, Namibia, Russia, South Sudan, Sudan, Syria, United Arab Emirates, Venezuela, Vietnam and New Zealand. ONGC *Videsh* maintains a balanced portfolio of 15 producing, 4 discovered/under development, 18 exploratory and 4 pipeline projects. The Company currently operates/ jointly operates 21 projects. ONGC *Videsh* had total oil & gas reserves (2P) of about 711 Million Metric Ton of Oil Equivalent (MMTOE) as on April 1<sup>st</sup>, 2018.

Now, ONGC proposes to lay 20" pipeline (about 31 km length) to transport gas from Offshore Platform, through Mouth of the Goutami River to ONGC onshore plant at Mallavaram Village, Thallarevu Mandal, East Godavari District, Andhra Pradesh.

### 1.1 Background and Importance of the Project

The Indian hydrocarbon industry is currently passing through a challenging phase with the share of natural gas, the third largest contributor to the national energy basket, projected to increase at a rate faster than any other energy source. In order to meet the ever-increasing national energy requirements and to reduce the burden of hydro carbon imports on the national exchequer, Oil & Natural Gas Corporation Limited (ONGC) is currently involved with the exploration in several deep-sea fields off the east coast of India.



## 1.2 Objective of the Study

- Primary Survey of Ecology and Biodiversity of the core area extending up to 500m on either side of the proposed pipeline route and the buffer zone extending up to 10km in order to gather baseline data relating to flora and fauna with special reference to RET and Schedule I species.
- To assess the impacts of project activities on fauna, flora and wildlife in the study area during different phases of the project.
- To prepare management and conservation plan in consultation with the State Forest and Wildlife Department for habitat improvement, resource augmentation and reduction of potential threats using modern technologies.

## 2.0 SALIENT FEATURES OF THE PROJECT

### 2.1 Name and Address of the Proponent

**M/s. Oil & Natural Gas Corporation Limited (ONGC),**  
Easter offshore Asset,  
2<sup>nd</sup> Floor, Subhadra Arcade,  
Bhanugudi Junction, Kakinada,  
Andhra Pradesh-533 003.  
Telefax: (0884)-2374104

### 2.2 Project Location & Nature of the Project

The proposed 20" pipeline (about 31 km length) route from offshore Central Process Platform (CPP) location around 10 km of the east coast to onshore Gas Terminal (OGT) at Mallavaram comprises of offshore laying (about 9 km) at depth of 1-2 m by post lay trenching method, laying along the river (about 11 km) at depth 2-7 m (below the scour depth) by dredging method, after entering through the river mouth cutting sand dunes and onshore involving shore pull in shore approaches / near shore location & laying (about 11 km) buried at depth 2 m below surface by trenching method.

It has major River crossings by Horizontal Directional Drilling (HDD) at two different locations, crossing of Mangroves area and road (at OGT) by HDD with 15 m depth. The environmental setting of the proposed pipeline project is given in **Table-1**.

**TABLE-1**  
**ENVIRONMENTAL SETTING OF THE PROPOSED PIPELINE PROJECT**

Sr. No.	Particulars	Description
1	Pipeline Length	About 31 km
2	Location	From offshore platform, through mouth of the Gautama river to ONGC onshore plant at Mallavaram village, East Godavari district, Andhra Pradesh.
3	Topo sheet No.	65 L/1, L/2, L/5 & L/6
4	Current status of land	Proposed pipeline is passing through various land uses such as sea bed, salt pans, river crossing, private land, forest land and aquaculture ponds
5	Elevation above MSL	0-6 meters AMSL
6	Nearest Town	Yanam - 7.9 km, West
7	Nearest City	Kakinada - 27.0 km, NNW



Sr. No.	Particulars	Description
8	Nearest highway	NH-214 - 6.8 km, WNW
9	Nearest railway station	Kakinada - 27.0 km, NNW
10	Nearest airport	Rajahmundry - 65.5 km, NW
11	Places of Archaeological importance	Nil
12	Protected areas as per Wildlife Protection Act, 1972 (Tiger reserve, Elephant reserve, Wildlife sanctuaries, National park, Conservation reserve and community reserve)	<ul style="list-style-type: none"> <li>• Coringa Wildlife Sanctuary- 2.32 Km, East from nearest pipeline point</li> <li>• Sacramento shoal (Karukutippa) 2.5 km, East, from nearest pipeline point</li> </ul>
13	Reserve Forests within 10-km radius	<p><b>From Nearest Pipeline Point:</b></p> <ul style="list-style-type: none"> <li>• Coringa Extension reserve forest &amp; Coringa Wildlife Sanctuary - 2.32 Km, East</li> <li>• Bairavapalakam reserve forest - 2.5 km, East</li> <li>• Ratikaluva reserve forest - 0.28 km, East</li> <li>• Masanitippa reserve forest - 0.3 km, East</li> <li>• Balusatippa reserve forest and mangroves - 2.28 km, East</li> <li>• Kottapallem reserve forest - 0.6 km, West</li> <li>• Kandikuppa reserve forest - 2.0 km, West</li> </ul>
14	Rivers/Lakes	<ul style="list-style-type: none"> <li>• Passing through Bay of Bengal to Godavari River</li> <li>• Passing through Godavari river and aquaculture ponds within 500 m either sides of pipeline route</li> <li>• Goutami Godavari River (Paaya, (PART) passing through</li> </ul>
15	Seismic Zone	Seismically, this area is categorized under zone-III as per IS-1893 (Part-1)-2002, which is a stable zone.
16	CRZ	CRZ-I: Passing through Mangroves, Low water line, Muds, Salt pans falling within 500 m either sides of pipeline route
17	Other Industries within 15 km radius	<ul style="list-style-type: none"> <li>• Reliance Industries Onshore Gas Terminal Gadimoga 1.4 km NNE</li> <li>• ONGC Onshore HPHT Assets</li> <li>• Yanam Steel</li> <li>• Shanti Ceramics</li> </ul>

Note: All distances mentioned above are aerial distances

Source: Toposheets, Google image and field visits

### 3.0 ECOLOGY & BIODIVERSITY STUDY

The core area is defined as the stretch of 1000 m wide (500m on each side of the proposed pipeline) 31 Km long proposed laying 20" pipeline from the offshore platform, through the mouth of the Goutami River to ONGC onshore plant at Mallavaram Village, Tallarevu Mandal, East Godavari District, Andhra Pradesh.

The total area is about 31 Sq.km but the onshore length is only 10km and hence the terrestrial area including the marshy areas and aquaculture ponds. The length of the pipeline that passing through Masanitippa reserve forest, Ratikalva section boundary of reserved forest is 1.17 km river portion and the forest area involved is about 2.45ha (10 m buffer either side of 1.17 km pipeline. For the purpose of EIA, a buffer zone of 10 km radius around the pipeline is considered as the study area. The study area is rich in ecosystem diversity. It ranges from marine to estuarine and fresh water ecosystems passing through large marshy areas, mangrove forests, mud flats, aquaculture ponds, sand dunes, salt pans, croplands, plantations and built up areas. As such there is a fair amount of biodiversity, mainly



because of the rich deltaic soils, availability of water and coastal climate. The forests in the study area represented by the Mangroves of Godavari Estuary. The East Godavari River Estuarine Ecosystem (EGREE) is famous for the Coringa Wildlife Sanctuary (CWLS). **The nearest distance between the boundary of the CWLS and the pipeline is 2.32 km.** In view of the location of the CWLS within a distance of 10 km from the pipeline, pipeline falls in eco-sensitive zone, as ESZ of CWLS has not been declared and hence 10 km is the default ESZ. In view of the National importance of the pipeline and the justifiable need to for the gas pipeline, the ONGC after a careful investigation of three alternatives chosen the one under consideration based on the merits.

### 3.1 Methodology

Extensive survey of literature on Flora, Fauna, Ecology and biodiversity of the Godavari River Estuarine Ecosystem (EGREE) in general and Coringa Wildlife Sanctuary in particular was carried out during April and May 2019. There is abundant of valuable and reliable scientific information in the form of records, reports and scientific documents. Based on the knowledge and information gained through desk-top studies, primary survey of flora and fauna of the project site including the buffer zone was undertaken during May 2019 by Prof.K.B.Reddy, Retired Professor of Ecology and Environmental Sciences and QCI-NABET Accredited Functional Area Expert in Ecology, Biodiversity and Soil conservation(Category A). The report was prepared based on what was seen during the filed survey and what was on record and in consultation with forest & wildlife officials.

### 3.2 Field Surveys & Ecological Assessment

#### Vegetation and Flora of the Core Area (500m on either side of the Pipeline)

The pipeline takes off from the offshore Central Processing Platform (CPP) in Bay of Bengal, passes through the Gautami Godavari River, aquaculture ponds, marshy areas, mud flats and a few patches of degraded forests where the mangroves are mostly replaced by *Prosopis juliflora*. Since the project impacts either in the sea or in the Gautami Godavari River are temporary and limited to construction (laying of pipeline) and as no tree or vegetation is going to be lost, the area is not considered for detailed survey of Biodiversity. The onshore vegetation comprises of saline mud flats, marshy areas, Mangrove forests and cultivated plants and commercial plantations, especially Coconut. Among the Mangroves, both *Avicennia alba* and *Avicennia officinalis* are most abundant dominant. *Prosopis juliflora* has invaded those areas where gaps were created either on account of the fall of *Avicennia* trees or felling of the same. Beyond the influence of estuarine and marine water, all common cultivated fruit trees, avenue trees and commercial plantations Coconut were very common and widespread. It may be stated that the nearly threatened (IUCN) mangrove species (*Ceriops decandra*) which is found in the Coringa Wildlife Sanctuary (CWLS) has not been reported it was absent in the core area. A common list of Mangroves and Mangrove Associates found in the core areas (1000m wide band along the pipe line) as well as in the buffer zone of 10 km is given in the Table 2 since most species except *Ceriops decandra* are common to core area and the buffer zone. But the impact of the pipeline shall be limited to a maximum of 10m width. A map of the study area indicating the route of the proposed pipeline, CWLS,



Reserve forests and water bodies in the 5 km, 10 km and 15 Km buffer zone is given in **Figure-1**.

### **Vegetation and Flora of the Buffer Zone**

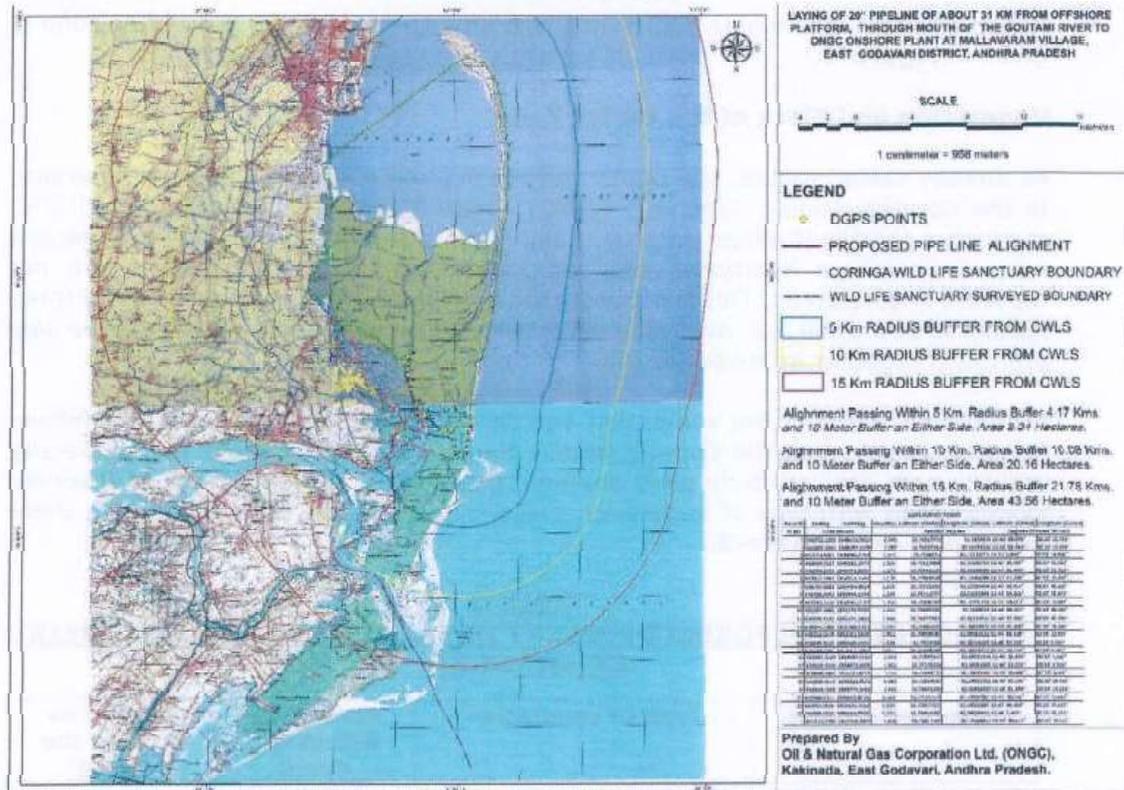
As already stated earlier, the buffer zone is rich in habitat / Ecosystem diversity. In the Coringa Wildlife Sanctuary (CWLS) there is one nearly threatened (IUCN) mangrove species (*Ceriops decandra*) and there are three rare species (*Sonneratia alba*, *Scyphiphora hydrophyllacea* and *Xylocarpus moluccensis*) which are not reported in core areas. This is probably the only place (CWLS) in India where three species of *Avicennia*, i.e. *Avicennia officinalis*, *Avicennia marina*, and *Avicennia alba* are found together in mixed forests.

A brief description of the vegetation and flora of the different blocks shall follow. Needless to say, that the Coringa Wildlife Sanctuary (CWLS) is rich in Biodiversity and the area revived fairly good amount of scientific attention. A list of reserved forests along with type of vegetation present in the buffer zone along with there extent is given in **Table-2**.

**TABLE-2**  
**LIST OF RESERVE FORESTS PRESENT IN THE BUFFER ZONE AND THEIR EXTENT IN HA**

Reserved Forests	Type of vegetation	Area in ha within the CWLS	Area in ha outside the CWLS
Coringa Extension RF	Mangrove swamp	18,808	-
Coringa RF	Mangrove swamp	4,272	-
Bhairavapalem RF	Mangrove swamp	1,015	-
Kandikuppa RF	Casuarina plantation	-	3,984
Kottapalem RF	Mainly aquaculture Ponds	-	66
Masantitippa RF	-	-	546
Balusutippa RF	Mangrove swamp	-	1300
Masanitippa RF	Mangrove swamp	-	546
Ratikaluva RF	Mangrove swamp	-	1762
Matlatippa	-	-	389
	<b>Sub Total</b>	<b>24,095</b>	<b>8,047</b>
	<b>Total</b>		<b>32,142</b>

Source: Atlas of Mangrove Wetlands of India: Part 2 Andhra Pradesh, T. Ravishankar and others. M. S. Swaminathan Research Foundation, Chennai, India, March 2004



**FIGURE-1**  
**STUDY AREA MAP OF THE PROPOSED PIPELINE ROUTE, CWLS, RESERVE FORESTS AND WATER BODIES IN THE 5 KM, 10 KM AND 15 KM BUFFER ZONE**

A common list of Mangroves and Mangrove Associates found in the core areas (1000 m wide band along the pipe line) as well as in the buffer zone of 10 km is given in the **Table-3**. However, only part of CWLS falls in the 10km buffer zone and the shortest distance between the pipeline and the CWLS is 2.35km.

The vegetation and flora of different areas is slightly different depending on topography, salinity and land use as revealed by the following details:

Occasionally inundated areas support species like *Excoecaria agallocha* and *Lumnitzera racemose* and generally they are of short stature. *Suaeda maritima*, *Suaeda nudiflora* and *Aeluropus lagopoides* are common in this area.

**Casuarina Plantations:** The Casuarina plantations raised by the Forest Department along the coast are seen in the Hope Island, along the shore near Masanitippa and in Kandikuppa R.F. near Sacramento lighthouse.

**Invasion by *Prosopis juliflora*:** Invasion of *Prosopis juliflora*, an eury species with wide ecological amplitude was quite common in the high tidal mud flats where inundation is rare. Invasion could also be seen even near the river mouth and degraded forests.



**Coringa Reserve Forest (RF):** The Mangrove vegetation in this R.F. is dense. The total area as per the forest department is about 4,242 ha, out of which 2,951 ha is with dense mangroves. *Avicennia marina* and *Excoecaria agallocha* are the dominant species. *Acanthus ilicifolius* and *Myriostachya wightiana* are found in thick patches along the creeks of Coringa River near Ramannapalem and Matlapalem creeks. Associated species like *Thespesia populneooides*, *Hibiscus tiliaceus* and *Clerodendrum inerme* are present. *Suaeda maritima* and *Suaeda nudiflora* are common in the degraded and partially degraded areas. In the elevated areas where the soil is highly saline *Salicornia brachiata* is seen. Shrubs namely *Acanthus ilicifolius* and *Dalbergia spinosa* and climbers like *Ipomoea tuba*, *Sarcolobus carinatus*, *Caesalpinia crista*, and *Derris trifoliata* are also recorded. *Lumnitzera racemosa*, *Excoecaria agallocha* and *Avicennia marina* are found in the up-land areas. The soil of this R.F. is clayey.

The mangrove zonation near Coringa River mouth and Matlapalem canal are distinct. *Avicennia alba* is seen as pure stands near Kakinada Bay side (Coring River and Matlapalem canal mouths). The next zone towards landward side is with pure stands of *Sonneratia apetala*. After this the vegetation is mixed with pure stands of *Excoecaria agallocha*, *Lumnitzera racemosa*, *Aegiceras corniculatum* and *Avicennia marina*. The other mangrove species *Rhizophora apiculata*, *Xylocarpus moluccensis*, *Bruguiera cylindrica*, *Bruguiera gymnorrhiza* and *Ceriops decandra* are almost absent.

**Coringa Extension R.F:** The Coringa extension R.F. as per the records of Forest department is 19,467 ha. As Kakinada Bay falls under this R.F. more than 50% of the area is under water bodies. The vegetation along the Matlapalem creek and Gaderu creek are thick. *Excoecaria agallocha* is the dominant species and *Avicennia marina* is sub dominant. The average height of the vegetation is about 4.5m. In the eastern side of Gaderu River, species namely *Bruguiera gymnorrhiza*, *Bruguiera cylindrica*, *Rhizophora apiculata*, *Rhizophora mucronata* and *Xylocarpus molluccensis* are recorded. These species are either rare or absent in the Matlapalem canal area. Near the Gaderu River mouth *Sonneratia alba* is recorded. *Acanthus ilicifolius*, *Myriostachya wightiana*, *Fimbristylis ferruginea* are recorded. In the degraded areas *Suaeda nudiflora*, *Suaeda maritima* and *Salicornia brachiata* are recorded. *Sesuvium portulacastrum* is abundant in this R.F along with *Bruguiera cylindrica* near Gaderu side. The soil of this R.F. is clayey in the Gaderu riverside and sandy clay near the Bay side.

**Bhairavapalem R.F:** It is named after the village Bhairavapalem that is situated near the Godavari River mouth and occupies an area of 971 ha. In Bhairavapalem R.F. almost all the species are recorded except *Scyphiphora hydrophyllacca*. In this R.F. *Excoecaria agallocha*, *Avicennia marina*, *Avicennia officinalis* and *Aegiceras corniculatum* are abundant. *Rhizophora apiculata*, *Rhizophora mucronata*, *Xylocarpus moluccensis*, *Sonneratia apetala*, *Bruguiera gymnorrhiza* and *Bruguiera cylindrica* are seen along the creeks. *Suaeda* spp. is noticed in the degraded areas. The other species namely *Derris trifoliata*, *Sarcolobus carinatus*, *Clerodendrum inerme* and *Dalbergia spinosa* are also recorded. The soil of this R. F. is clayey along the Gaderu River and is sandy clay towards the seaside.

**Rathikalava R.F:** The total area under this R.F. is 2,043 ha of which 805 ha is with dense mangroves. As per the GIS data, the water spread area (Godavari Rivcr) accounts for 724 ha. Degraded and partially degraded mangroves account for 214



ha. *Rhizophora apiculata*, *Rhizophora mucronata*, *Xylocarpus molluccensis*, *Bruguiera gymnorrhiza*, *Avicennia marina*, *Avicennia officinalis* and *Excoecaria agallocha* occur in this R.F. Trees of *Rhizophora*, *Bruguiera* are seen along the creeks reaching a height of about 4 to 6 m. Large trees of *Avicennia officinalis* are found in the R.F. *Tamarix troupii*, a mangrove associate is recorded in this R.F along with *Thespesia populneoides*, *Hibiscus tiliaceus* and *Clerodendrum inerme*. Species of *Suaeda* and *Salicornia* occur in the degraded areas. Stunted *Excoecaria agallocha*, *Lumnitzera racemosa* are also found in the degraded areas. *Prosopis* invasion along the Saleru canal is noticed which are cut and sold by the villagers for tobacco curing during December and January every year. In spite of this practice, this species is fast making inroads into mangrove areas posing a severe threat to mangroves. The soil is clayey.

**Masanitippa R.F:** It is named after the village Masanitippa. This R.F. extends to an area of 1,089.5 Ha. Out of this, 814 ha is covered with dense mangroves. The species composition and the vegetation pattern in this R.F. are similar to Rathikalava R.F. *Rhizophora apiculata* and *Rhizophora mucronata* of about 5m height are seen along the creeks. *Avicennia marina* and *Excoecaria agallocha* are the dominant species in this R.F. *Sonneratia apetala*, *Bruguiera gymnorrhiza*, *Ceriops decandra*, *Lumnitzera racemosa* and *Bruguiera cyhndrica* are also recorded in these R.F. Large areas of mangroves are occurring outside the R.F. towards the Bay of Bengal, which is under severe erosion due to oceanic currents and tides. *Prosopis* thickets are also noticed in this area. The soil of this R.F. is clayey.

**Matlatippa R.F:** It is fairly dense mangrove vegetation is found on the eastern side. The western side is elevated and also there are no creeks to facilitate tidal flow. According to Forest department the mangroves are spread in 445 ha of which 210 Ha is with vegetation. The remaining areas are with degraded mangroves and water bodies. Grazing by cattle and goat are observed in this R.F. Species like *Sonneratia apetala*, *Rhizophora apiculata*, *Bruguiera gymnorrhiza*, *Avicennia marina*, *Avicennia officinalis*, *Avicennia alba*, *Lumnitzera racemosa*, *Ceriops decandra* and *Xylocarpus moluccensis* are recorded in this R.F. Climbers like *Derris trifoliata*, *Sarcolobus carinatus*, grasses like *Porteresia coarctata*, *Myriostachya wightiana* and shrubs like *Dalbergia spinosa* and *Acanthus ilicifolius* are recorded. The soil of this RF. is clayey.

**Balusutippa RF:** It is named after the village Balusutippa. The extent of mangroves under this R.F. is about 475 Ha of which 427 ha is under mangrove vegetation. Large trees of *Avicennia officinalis*, *Avicennia marina*, *Rhizophora apiculata*, *Rhizophora mucronata*, *Bruguiera gymnorrhiza*, *Xylocarpus moluccensis* and *Ceriops decandra* are recorded in this R.F. Large area of mangroves are seen outside this RF. along the Gowthami Godavari River. Soil of this R.F. is clayey.

**Kothapalem RF.** This is also named after the village Kothapalem. Through the mangrove extent in this R.F. is only 50.8 Ha. The species diversity is rich and the vegetation is fairly dense. A rare and endemic species namely *Scyphiphora hydrophyllacea* (Rubiaceae) is recorded near the Sacramento lighthouse. They are about 2 m in height. Along the entire East coast this species occurs only in this R.F. Other plants namely *Excoecaria agallocha*, *Lumnitzera racemosa*, *Rhizophora apiculata*, *Rhizophora mucronata*, *Xylocarpus moluccensis*, *Bruguiera gymnorrhiza*, *Avicennia marina* and *Avicennia officinalis* are recorded. Trees of these species are about 4-5 m in height. Climbers namely, *Derris trifoliata* and *Sarcolobus carinatus*

are recorded. Shrubs like *Dalbergia spinosa*, *Clerodendrum inerme* and the halophytic herbs such as *Suaeda* and *Salicornia* are also recorded. The nearby aqua ponds and habitation are constant sources of threat to the mangrove ecosystem in this area. The soil is clayey.

**Kandikuppa RF.** This R.F is about 3,802 Ha of which healthy mangroves occur in 425 Ha. Large areas of Casuarina plantations along the shore, is also a part of this R.F. Vegetation in this R. F. is relatively healthy and also rich in diversity. Species namely *Rhizophora apiculata*, *Bruguiera gymnorrhiza*, *Ceriops decandra* and *Xylocarpus molluccensis* are found in the RF. *Excoecaria agallocha*, *Avicennia marina*, *Avicennia officinalis* and *Lumnitzera racemosa* are also recorded in this R.F. The vegetation in this RF is disturbed due to the human pressure from the nearby villages namely Molletimogga, Kothapalem, Pandi and Pora. The soil is clayey in the land ward side and it is sandy clay near the seaward side.

The mangroves of Godavari are dense when compared to Krishna mangroves. The species composition is also high. *Excoecaria agallocha* and *Avicennia marina* contribute to about 90% of area of mangroves of the Godavari estuarine complex.

A comprehensive list of all Mangroves and Mangrove associates found in the study area is given in **Table-3**. The Sanctuary in the estuary of River Godavari has rich mangrove vegetation. There are 35 species of plants belonging to twenty four families as shown in **Table-3**. The plant species that are commonly found are:

*Avicennia officinalis*, *Avicennia marina*, *Avicennia alba*, *Excoecaria agallocha*, *Rhizophora mucronata*, *Ceriops decandra*, *Bruguiera gymnorrhiza*, *Lumnitzera racemosa*, *Sonneratia apetala*, *Rhizophora conjugata*, *Aegiceras corniculatum*, *Thespesia populneoides* and *Hibiscus tiliaceus*. Apart from the tree species, some of the shrubs found in the sanctuary are *Dalbergia spinosa*, *Derris trifoliata*. Herbs like *Sesuvium portulacastrum*, *Suaeda maritima*, *Suaeda monoica* and *Salicornia brachiata* and grasses like *Aleuropus lagopoides*, *Porteresia coarctata* and *Myriostachya wightiana* are found in the sanctuary.

**TABLE-3**  
**LIST OF MANGROVES AND MANGROVE ASSOCIATES FOUND IN THE STUDY AREA**

Scientific name	Family	Vernacular name	Habit	IUCN
<b>Mangroves</b>				
<i>Acanthus ilicifolius</i>	Acnathaceae	Allchi	Shrub	LC
<i>Aegiceras corniculatum</i>	Myrsinaceae	Guggilam	Tree	LC
<i>Avicennia alba</i>	Avicenniaceae	Elavamada	Tree	LC
<i>Avicennia marina</i>	Avicenniaceae	Tellamada	Tree	LC
<i>Avicennia officinalis</i>	Avicenniaceae	Nallamada	Tree	LC
<i>Bruguiera cylindrica</i>	Rhizophoraceae	Urudu	Tree	LC
<i>Bruguiera gymnorrhiza</i>	Rhizophoraceae	Kandriga	Tree	LC
<i>Ceriops decandra</i> *	Rhizophoraceae	Togara	Tree	NT
<i>Excoecaria agallocha</i>	Euhorbiaceae	Thilla	Tree	LC
<i>Lumnitzera racemosa</i>	Combretaceae	Thanduga	Tree	LC
<i>Rhizophora apiculata</i>	Rhizophoraceae	Ponna	Tree	LC
<i>Rhizophora mucronata</i>	Rhizophoraceae	Ponna	Tree	LC
<i>Scyphiphora hydrophyllacea</i>	Rubiaceae	Narathanduga	Tree	LC



Scientific name	Family	Vernacular name	Habit	IUCN
<i>Sonneratia alba</i>	Sonneratiaceae	Pedda Kalinga	Tree	LC
<i>Sonneratia apetala</i>	Sonneratiaceae	Kalinga tree	Tree	LC
<i>Xylocarpus moluccensis</i>	Meliaceae	Senuga Tree	Tree	LC
<b>Mangrove Associates</b>				
<i>Aeluropus lagopoides</i>	Poaceae	Vuppu gaddi	Grass	LC
<i>Caesalpinia crista</i>	Caesalpinaceae	Rachis Vine	Climber	LC
<i>Clerodendrum inerme</i>	Verbanaceae	Pisingi	Small tree	LC
<i>Dalbergia spinosa</i>	Fabaceae	Chillinga	Shrub	LC
<i>Derris trifoliata</i>	Fabaceae	Nallatheega	Vine	LC
<i>Fimbristylis ferruginea</i>	Cyperaceae	Tunga	Sedge	LC
<i>Hibiscus tiliaceus</i>	Malvaceae	Attakanara	Small tree	LC
<i>Ipomoea pes-caprae</i>	Convolvulaceae	Morning glory	Vine	LC
<i>Ipomoea tuba</i>	Convolvulaceae	Tellateega	Vine	LC
<i>Myriostachya wightiana</i>	Poaceae	Dhaba gaddi	Grass	LC
<i>Porteresia coarctata</i>	Poaceae	Yellugaddi	Grass	LC
<i>Salicornia brachiata</i>	Chenopodiaceae	Koyalu	Herb	LC
<i>Sarcolobus carinatus</i>	Asclepiadaceae	Balaboddutheega	Vine	LC
<i>Sesuvium portulacastrum</i>	Aizoaceae	Vangaredukura	Herb	LC
<i>Suaeda maritima</i>	Chenopodiaceae	Elakura	Herb	LC
<i>Suaeda nudiflora</i>	Chenopodiaceae	Elakura	Herb	LC
<i>Tamarix troupii</i>	Tamariaceae	Palivelu	Tree	LC
<i>Thespesia poulneoides</i>	Malvaceae	Ganguravi	Tree	LC
<i>Halophila beccarii</i>	Hydrocharitaceae	Ocean Turf Grass	Herb	LC
<i>Halophila ovalis</i>	Hydrocharitaceae	Ocean Turf Grass	Herb	LC

\* denotes that the species is restricted to Coringa Wildlife Sanctuary (CWLS) only

A list of plants found in areas beyond the influence of sea are given in **Table-4**. A noteworthy feature is the presence of all the three species of *Annona* (*Annona squamosa*, *Annona reticulata* and *Annona muricata*) in the buffer zone. It may be noted that two exotic trees, namely *Terminalia mantaly* and *Conocarpus lancifolius* are now widely grown as avenue trees. List of plant species found in the sandy areas and on the bunds of the fish ponds is given in **Table-5**. It may be noted that most of them are mat forming or profusely branching prostrate or erect herbs and sedges.

**TABLE-4**  
**LIST OF TREES, SHRUBS AND PERENNIAL CLIMBERS FOUND IN THE BUFFER ZONE WHICH IS BEYOND THE INFLUENCE OF SEA AND ESTUARINE SYSTEM**

Scientific name	Common / Local name	Family
<i>Abrus precatorius</i>	Gurivinda	Fabaceae
<i>Acacia nilotica</i>	Nallathumma	Mimosaceae
<i>Aegle marmelos</i>	Velaga	Rutaceae
<i>Albizia lebeck</i>	Siris	Mimosaceae
<i>Alstonia scholaris</i>	Yedaakulapaala	Apocynaceae
<i>Anacardium occidentale</i>	Cashew nut	Anacardiaceae
<i>Annona muricata</i>	Lakshamanaphalam	Annonaceae
<i>Annona reticulata</i>	Raamaphalam	Annonaceae
<i>Annona squamosa</i>	Seetaphalam	Annonaceae
<i>Anthocephalus indica</i>	Kadamba	Rubiaceae
<i>Artocarpus heterophyllus</i>	Jack fruit	Moraceae



Scientific name	Common / Local name	Family
<i>Azadirachta indica</i>	Vepa	Meliaceae
<i>Bauhinia purpurea</i>	Kanchanam	Caesalpinaceae
<i>Bauhinia racemosa</i>	Aarechettu	Caesalpinaceae
<i>Borassus flabellifer</i>	Taadi	Arecaceae
<i>Caesalpinia pulcherrima</i>	PydiTangedu	Caesalpinaceae
<i>Caesalpinia sappan</i>	Gatcha	Caesalpinaceae
<i>Callistemon citrinus</i>	Bottle brush tree	Myrtaceae
<i>Calotropis gigantea</i>	Telle jilledu	Asclepiadaceae
<i>Calotropis procera</i>	jilledu	Asclepiadaceae
<i>Cassia fistula</i>	Rela	Caesalpinaceae
<i>Cassia siamea</i>	Seema Tangedu	Caesalpinaceae
<i>Casuarina equisetifolia</i>	Sarvi	Casuarinaceae
<i>Chromolaena odorata</i>	Siamm weed	Asteraceae
<i>Clerodendrum inerme</i>	Indian Privet	Verbenaceae
<i>Cocos nucifera</i>	Kobbari	Arecaceae
<i>Conocarpus lancifolius</i>	Conocarous	Combretaceae
<i>Dalbergia sissoo</i>	Sissoo	Fabaceae
<i>Delonix elata</i>	Sunkesula	Caesalpinaceae
<i>Delonix regia</i>	YerraSunkesula	Caesalpinaceae
<i>Dendrocalamus strictus</i>	Bamboo	Poaceae
<i>Elaeis guineensis</i>	Oil Palm	Arecaceae
<i>Eucalyptus clones</i>	Eucalyptus	Myrtaceae
<i>Eucalyptus hybrid</i>	Eucalyptus	Myrtaceae
<i>Ficus benghalensis</i>	Banyan tree	Moraceae
<i>Ficus benjaminia</i>	Weeping Fig	Moraceae
<i>Ficus hispida</i>	Hairy fig	Moraceae
<i>Ficus racemosa</i>	Cluster fig	Moraceae
<i>Ficus religiosa</i>	Raavi	Moraceae
<i>Ipomoea carnea</i>	Rubber vine	Convolvulaceae
<i>Ipomoea pescapre</i>	Morning glory	Convolvulaceae
<i>Jacaranda acutifolia</i>	Jacaranda	Bignoniaceae
<i>Jatropha glandulifera</i>	Adaviaamudamu	Euphorbiaceae
<i>Jatropha gossypifolia</i>	Adaviaamudamu	Euphorbiaceae
<i>Lantana camara</i>	Lantana	Verbenaceae
<i>Leptadenia reticulata</i>	Kalasa	Asclepiadaceae.
<i>Leucaena leucocephala</i>	Subabul	Mimosaceae
<i>Mangifera indica</i>	Mango / Maamidi	Anacardiaceae
<i>Manilkara zapota</i>	Sapota	Sapotaceae
<i>Michelia champaca</i>	ChettuSampenga	Magnoliaceae
<i>Moringa pterigosperma</i>	Munaga	Moringaceae
<i>Muntingia calabura</i>	Jamaica Cherry	Muntingiaceae
<i>Musa paradisiaca</i>	Arati	Musaceae
<i>Nerium odorum</i>	Ganneru	Apocynaceae
<i>Pandanus fascicularis</i>	Mogali	Pandanaceae
<i>Peltaphorum pterocarpum</i>	Copper pod	Caesalpinaceae
<i>Pergularia daemia</i>	Dustapateega	Asclepiadaceae
<i>Phoenix sylvestris</i>	Eetha	Arecaceae
<i>Phyllanthus reticulatus</i>	Purugudu	Euphorbiaceae
<i>Pithecellobium dulce</i>	Seema chinta	Mimosaceae
<i>Polyalthia pendula</i>	Ashoka	Annonaceae
<i>Pongamia pinnata</i>	Gaanuga	Fabaceae
<i>Pisidium guava</i>	Jaama	Mytaceae
<i>Prosopis juliflora</i>	English thumma	Mimosaceae
<i>Samanea saman</i>	Rain tree	Mimosaceae



Scientific name	Common / Local name	Family
<i>Spathodia companulata</i>	Flame of the forest	Bignoniaceae
<i>Syzigium cumini</i>	Neredu	Myrtaceae
<i>Tamarindus indica</i>	Chinta	Caesalpiniaceae
<i>Tectona grandis</i>	Teak	Verbenaceae
<i>Terminalia arjuna</i>	Tellamaddi	Combretaceae
<i>Terminalia catappa</i>	Baadam	Combretaceae
<i>Terminalia mantaly</i>	Madagascar almond	Combretaceae
<i>Theobroma cacao</i>	Cocoa plant	Malvaceae
<i>Thespesia populnea</i>	Ganga raavi	Malvaceae
<i>Vanilla planifolia</i>	Vanilla	Orchidaceae

**TABLE-5**  
**LIST OF PLANT SPECIES FOUND IN THE SANDY AREAS AND ON THE BUNDS OF THE FISH PONDS**

Scientific name	Common / local name	Family
<i>Aeluropus lagopoides</i>	Mangrove grass	Poaceae
<i>Allmania nodiflora</i>	Gurugukoora	Amaranthaceae
<i>Ammania baccifera</i>	Blistering Ammania	Lythraceae
<i>Canavalia lineata</i>	Beach Bean	Fabaceae
<i>Canavalia maritima</i>	Beach Bean	Fabaceae
<i>Corchorus depressus</i>	Cham grass	Tiliaceae
<i>Crotalaria burhia</i>	Burhia Rattle pod	Fabaceae
<i>Crotalaria laburnifolia</i>	Wild Sun hemp	Fabaceae
<i>Crotalaria medicaginea</i>	Rattle weed	Fabaceae
<i>Crotalaria nana</i>	Tiny rattle pod	Fabaceae
<i>Crotalaria verrucosa</i>	Blue Rattle Pod	Fabaceae
<i>Cyperus arenarius</i>	Nut sedge	Cyperaceae
<i>Cyperus pedunculatus</i>	Beach Star	Cyperaceae
<i>Cyperus stoloniferus</i>	Papyrus sedge	Cyperaceae
<i>Desmodium paniculatum</i>	Narrow leaf desmodium	Fabaceae
<i>Eclipta prostrata</i>	Galagara	Asteraceae
<i>Enicostemma hyssopifolium</i>	Nelagolimidi	Gentianaceae
<i>Euphorbia rosea</i>	Rosy Spurge	Euphorbiaceae
<i>Euphorbia tirucalli</i>	Pencil Tree	Euphorbiaceae
<i>Fimbristylis quinquangularis</i>	Grass like Fimbry	Cyperaceae
<i>Fimbristylis spathacea</i>	Hurricane grass	Cyperaceae
<i>Gisekia pharnaceoides</i>	Sand herbage	Gisekiaceae
<i>Glinus oppositifolius</i>	Jima	Molluginaceae
<i>Heliotropium currasavicum</i>	Hliotropium	Boraginaceae
<i>Heylandia latebrosa</i>	Heylandia	Fabaceae
<i>Indigofera aspalanthoides</i>	Shivanil	Fabaceae
<i>Indigofera cordifolia</i>	PaparuAlumu	Fabaceae
<i>Indigofera uniflora</i>	One flower Indigo	Fabaceae
<i>Ipomoea aquatica</i>	Swamp Morning glory	Convolvulaceae
<i>Ipomoea pes-caprae</i>	Morning glory	Convolvulaceae
<i>Ipomoea repens</i>	Morning glory	Convolvulaceae
<i>Launaea sarmentosa</i>	Beach launaea	Asteraceae
<i>Mollugo cerviana</i>	Carpet weed	Molluginaceae
<i>Mollugo disticha</i>	Carpet weed	Molluginaceae
<i>Ocimum tenuiflorum</i>	Tulasi	Lamiaceae
<i>Osbeckia zeylanica</i>	Burada Alli	Melastomataceae
<i>Paspalum vaginatum</i>	Seashore vaginatum	Poaceae



Scientific name	Common / local name	Family
<i>Perotis indica</i>	Indian Comet grass	Poaceae
<i>Phaseolus trilobus</i>	Pilli pesara	Fabaceae
<i>Phyllanthus rotundifolius</i>	Nelavemu	Phyllanthaceae
<i>Polycarpaea corymbosa</i>	Old Man's Cap	Caryophyllaceae
<i>Pulicaria angustifolia</i>	Gaddi chemanti	Asteraceae
<i>Rothia indica</i>	Nucha kura	Fabaceae
<i>Sesuvium portulacastrum</i>	Ambati Madu	Aizoaceae
<i>Spermacoce articularis</i>	Jointed Button weed	Rubiaceae
<i>Spermacoce sticta</i>	Shrubby False button weed	Rubiaceae
<i>Sporobolus virginicus</i>	Salt couch grass	Poaceae
<i>Taverniera cuneifolia</i>	Wedge leaf taverniera	Fabaceae
<i>Tephrosia spinosa</i>	Mulla vempali	Fabaceae
<i>Tephrosia strigosa</i>	Bristly Tephrosia	Fabaceae
<i>Trachys muricata</i>	Salt grass	Poaceae
<i>Trianthema triquetra</i>	Horse purslane	Aizoaceae
<i>Vigna luteola</i>	Hairy Pod Cowpea	Fabaceae
<i>Xyrisindica</i>	Yellow eyed grass	Xyridaceae
<i>Zornia gibbosa</i>	Grass like Zornia	Fabaceae
<i>Zoysia matrella</i>	Manila grass	Poaceae

### 3.3 Fauna of the Study Area

Coringa Wildlife Sanctuary (CWLS) is a part of the East Godavari River Estuarine Ecosystem (EEGREE). Coringa Wildlife Sanctuary and Godavari estuary is an IBA, according to IBA Criteria it is given the final code No.IN215.

#### 3.3.1 Site Description

Coringa Wildlife Sanctuary is located 20 km south of the port city Kakinada, on the Kakinada-Yanam state highway, nestling on the deltaic branches of Gouthami and Godavari rivers at Kakinada Bay. It has extensive marshes and mangroves. During monsoon, the mudflats get submerged under 5 m of water. These large mudflats, which are subjected to cyclic influx and efflux of tidal water, play a vital role in attracting a large number of waders to this region. About 50% of the area is the backwaters which include a sand bar of about 20 km, running north-south (Rao et al. 1996). Two rivers, namely the Coringa and Gaderu, and their deltaic branches intersect the entire region, along with other water channels draining into them or directly into the sea. This forms about 33,570 ha of marsh vegetation. The Sanctuary is part of the estuary of River Godavari, and supports a rich growth of mangrove vegetation with halophytes such as *Excoecaria agallocha*, *Rhizophora mucronata*, *Avicennia officinalis*, *Lumnitzera racemosa*, *Ceriops decandra*, *Sonneratia apetala* and *Aegiceras corniculatus*. According to Raja Sekhar et al. (2002), 24 species are representative of the vegetation structure of Godavari Estuary.

#### 3.3.2 Key Biodiversity

**AVIFAUNA:** Rao et al. (1996) have identified 236 species of birds from this Sanctuary. However, they have reported species that are not likely to be present, such as Yellow-throated Bulbul *Pycnonotus xantholaemus*, Wood Snipe *Gallinago maricata* and Sociable Lapwing *Vanellus gregarius*. Nevertheless, Coringa is an extremely interesting area for waders and mangrove birds, and should be



designated as an IBA (Aasheesh Pittie pers. comm. 2001). More than 20,000 waders use this area in a year. The area needs detailed investigation on its bird life. Oriental White-backed Vulture *Gyps bengalensis* and Long-billed Vulture *G. indicus* (both considered Critical due to the sharp decline in their population: BirdLife International 2001) are found here. Among the near threatened species, Painted Stork *Mycteria leucocephala*, Oriental White Ibis *Threskiornis melanocephala*, and Ferruginous Pochard *Aythya nyroca* are found in Coringa. Rao et al. (1996) have reported 17 species of ducks, and 37 species of waders of Family Charadriidae. Even though some species need to be confirmed, the site still holds a very high diversity of water birds.

**Other Key Fauna:** A fair population of Fishing Cat (*Prionailurus viverrinus* or *Felis viverrina*), Golden Jackal (*Canis aureus*), Olive Ridley Sea Turtle (*Lepidochelys olivacea*) and Marsh Crocodile (*Crocodylus palustris*) are present in Coringa. This IBA has a large breeding population of otters. In fact, the entire estuarine mangrove forest of Godavari river is a stronghold of otters, mainly Smooth Indian Otter *Lutra perspicillata* (Nagulu et al. 1991, 1999). The sighting of otters in this IBA is very common, and the group size ranges from 2 to 12, indicating healthy breeding populations (S. A. Hussain in litt. 2003).

Thus, the sanctuary possesses a wide variety of birds, because of the feed available in the backwaters of the mangrove forest. During low tide, some of the areas are exposed (elevated mud flats) having small fishes, shrimps and molluscs. These attract avifauna for feeding. Some critically endangered species like the white-backed vulture and the long billed vulture are present in the sanctuary. The painted stork, Oriental white ibis, ferruginous pochard found in the sanctuary are near threatened species, and spot-billed pelican is a vulnerable species. Significant populations of waders and mangrove birds are also present. Altogether, 236 species of birds have been reported by Rao et al (1996) during the winter season. About 120 species of birds have been reported from the surrounding areas and they are also common to the CWLS. Among them some of the commonly found birds in the sanctuary are: little egret, cattle egret, pied kingfisher, small blue kingfisher, black-capped kingfisher, pond heron, reef heron, grey heron, night heron, little stint, sandpiper, redshank, red-wattled lapwing, crow pheasant, flamingos, sea gulls, purple heron, brahmini kite, openbill stork, and little cormorant.

A comprehensive list of all birds reported / recorded in CWLS during the whole year is given in **Table-6**.

#### **Mammals of the Coringa Wildlife Sanctuary (CWLS)**

Apart from the avian fauna, the sanctuary has a fair population of golden jackal, fishing cat, and a healthy breeding population of smooth-coated otter. CWLS is famous for two mammalian species, namely the Smooth Indian Otter *Lutra perspicillata* and the fishing cat (*Prionailurus viverrinus*). Both are in Schedule I of the Wildlife (Protection) Act and they are in the VU (vulnerable) category of the IUCN Red List. Other than these two, rest of the mammals are fairly common and widespread. Prominent among them is the Golden Jackal (*Canis aureus*). Rodents and Bats are quite common.



**TABLE-6**  
**LIST OF BIRDS REPORTED / RECORDED FROM THE CORINGA WILDLIFE SANCTUARY**

Scientific name	Common name	Family	IUCN/ WPA
<i>Accipiter badius</i>	Shikra	Accipitridae	LC / IV
<i>Accipiter nisus melaschistos</i>	Sparrow-Hawk	Accipitridae	LC / IV
<i>Acridotheres ginginianus</i>	Bank Myna	Sturnidae	LC / IV
<i>Acridotheres tristis</i>	Common Myna	Sturnidae	LC / IV
<i>Acrocephalus dumetorum</i>	Blyth's Reed Warbler	Muscicapidae	LC / IV
<i>Acrocephalus stentoreus</i>	Indian Great Reed Warbler	Muscicapidae	LC / IV
<i>Aegithinia tiphia</i>	Central Indian Iora	Campephagidae	LC / IV
<i>Alauda gulgula</i>	Indian Small Skylark	Alaudidae	LC / IV
<i>Alcedo atthis</i>	Small Blue Kingfisher	Alcedinidae	LC / IV
<i>Amaurornis akool</i>	Brown Crake	Rallidae	LC / IV
<i>Amaurornis phoenicurus</i>	Indian White-breasted Waterhen	Rallidae	LC / IV
<i>Anas acuta</i>	Pintail	Anatidae	LC / IV
<i>Anas clypeata</i>	Shoveller	Anatidae	LC / IV
<i>Anas crecca</i>	Common Teal	Anatidae	LC / IV
<i>Anas penelope</i>	Wigeon	Anatidae	LC / IV
<i>Anas poecilorhyncha</i>	Spot bill Duck	Anatidae	LC / IV
<i>Anas querquedula</i>	Garganey	Anatidae	LC / IV
<i>Anas strepera</i>	Gadwall	Anatidae	LC / IV
<i>Anastomus oscitans</i>	Openbill Stork	Ciconiidae	LC / IV
<i>Anser indicus</i>	Barheaded Goose	Anatidae	LC / IV
<i>Anthus novaeseelandiae</i>	Paddy-field Pipit	Motacillidae	LC / IV
<i>Anthus trivialis</i>	Tree Pipit	Motacillidae	LC / IV
<i>Apus affinis</i>	House Swift	Apodidae	LC / IV
<i>Aquila rapaxvindhiana</i>	Tawny Eagle	Accipitridae	LC / IV
<i>Ardea alba</i>	Large Egret	Ardeidae	LC / IV
<i>Ardea cinerea</i>	Grey Heron	Ardeidae	LC / IV
<i>Ardea purpurea</i>	Purple Heron	Ardeidae	LC / IV
<i>Ardea striatus</i>	Little Green Heron	Ardeidae	LC / IV
<i>Ardeola grayii</i>	Pond Heron	Ardeidae	LC / IV
<i>Artamus fuscus</i>	Ashy Swallow-Shrike	Artamidae	LC / IV
<i>Athene brama</i>	Spotted Owlet	Strigidae	LC / IV
<i>Aviceda leuphotes</i>	Black-crested Baza	Accipitridae	LC / IV
<i>Aythya ferina</i>	Common Pochard	Anatidae	LC / IV
<i>Aythya fuligula</i>	Tufted duck	Anatidae	LC / IV
<i>Aythya nyroca</i>	White-eyed Pochard	Anatidae	NT/ I
<i>Bubo</i>	Indian Great Horned Owl	Strigidae	LC / IV
<i>Bubo zeylonensis</i>	Brown Fish Owl	Strigidae	LC / IV
<i>Bubulcus ibis</i>	Cattle Egret	Ardeidae	LC / IV
<i>Calandrella cinerea</i>	Short-Toed Lark	Alaudidae	LC / IV
<i>Calidris alba</i>	Sanderling	Charadriidae	LC / IV
<i>Calidris alpina</i>	Dunlin	Charadriidae	LC / IV
<i>Calidris canuta</i>	Knot	Charadriidae	LC / IV
<i>Calidris minuta</i>	Little Stint	Charadriidae	LC / IV
<i>Calidris temminckii</i>	Temminck's Stint	Charadriidae	LC / IV
<i>Calidris tenuirostris</i>	Eastern Knot	Charadriidae	LC / IV
<i>Calidris testacea</i>	Curlew-Sandpiper	Charadriidae	LC / IV
<i>Caprimulgus indicus</i>	Indian Jungle Nightjar	Caprimulgidae	LC / IV
<i>Centropus sinensis</i>	Crow Pheasant	Cuculidae	LC / IV
<i>Ceryle rudis</i>	Lesser Pied Kingfisher	Alcedinidae	LC / IV



Scientific name	Common name	Family	IUCN/ WPA
<i>Charadrius dubius</i>	Little Ringed Plover	Charadriidae	LC /IV
<i>Charadrius hiaticula</i>	Ringed Plover	Charadriidae	LC /IV
<i>Charadrius leschenaultii</i>	Large Sand Plover	Charadriidae	LC /IV
<i>Charadrius mongolus</i>	Lesser Sand Plover	Charadriidae	LC /IV
<i>Charadrius placidus</i>	Long-billed Ringed Plover	Charadriidae	LC /IV
<i>Chidonias hybrida</i>	Whiskered Tern	Laridae	LC /IV
<i>Ciconia episcopus</i>	White-necked Stork	Ciconiidae	LC / IV
<i>Circus aeruginosus</i>	Marsh Harrier	Accipitridae	LC / IV
<i>Circus macrourus</i>	Pale Harrier	Accipitridae	LC / IV
<i>Circus melanoleucos</i>	Pied Harrier	Accipitridae	LC / IV
<i>Cisticola juncidis</i>	Streaked Fantail Warbler	Muscicapidae	LC /IV
<i>Coccomantis jacobinus</i>	Pied Crested Cuckoo	Cuculidae	LC /IV
<i>Coccomantis passerinus</i>	Indian Plaintive Cuckoo	Cuculidae	LC /IV
<i>Columba livia</i>	Blue Rock Pigeon	Columbidae	LC /IV
<i>Copsychus saularis</i>	Magpie-Robin	Muscicapidae	LC /IV
<i>Coracina novaehollandiae</i>	Large Cuckoo-Shrike	Campephagidae	LC /IV
<i>Corvus macrorhynchos</i>	Jungle Crow	Corvidae	LC /IV
<i>Corvus splendens</i>	House Crow	Corvidae	LC /IV
<i>Coturnix coromandelica</i>	Rain Quail	Phasianidae	LC / IV
<i>Coturnix</i>	Grey Quail	Phasianidae	LC / IV
<i>Cursorius coromandelicus</i>	Indian Courser	Glareolidae	LC /IV
<i>Cypsiurus parvus</i>	Palm Swift	Apodidae	LC /IV
<i>Dendrocitta vagabunda</i>	Southeastern Treepie	Corvidae	LC /IV
<i>Dendrocygna bicolor</i>	Large Whistling Teal	Anatidae	LC / IV
<i>Dendrocygna javanica</i>	Lesser Whistling Teal	Anatidae	LC / IV
<i>Dicaeum agile</i>	Thickbilled Flowerpecker	Dicaeidae	LC /IV
<i>Dicaeum erythrorhynchos</i>	Tickell's Flowerpecker	Dicaeidae	LC /IV
<i>Dicrurus adsimilis</i>	Black Drongo	Dicruridae	LC /IV
<i>Dicrurus caeruleus</i>	White-bellied Drongo	Dicruridae	LC /IV
<i>Dinopium bengalense</i>	Lesser Golden-backed Woodpecker	Picidae	LC /IV
<i>Dromas ardeola</i>	Crab Plover	Dromadidae	LC /IV
<i>Egretta garzetta</i>	Little Egret	Ardeidae	LC / IV
<i>Egretta gularis</i>	Indian Reef Heron	Ardeidae	LC / IV
<i>Egretta intermedia</i>	Smaller Egret	Ardeidae	LC / IV
<i>Elanus caeruleus</i>	Black-winged Kite	Accipitridae	LC / IV
<i>Ermeopterix grisea</i>	Ashy-crowned Finch-Lark	Alaudidae	LC /IV
<i>Eudynamis scolopacea</i>	Koel	Cuculidae	LC /IV
<i>Falco tinnunculus</i>	European Kestrel	Falconidae	LC / IV
<i>Francolinus pondicerianus</i>	Grey Partridge	Phasianidae	LC / IV
<i>Fulica atra</i>	Coot	Rallidae	LC /IV
<i>Gallicrex cinerea</i>	Watercock	Rallidae	LC /IV
<i>Gallinaga media</i>	Great Snipe	Charadriidae	LC /IV
<i>Gallinaga nemoricola</i>	Wood Snipe	Charadriidae	LC /IV
<i>Gallinaga solitaria</i>	Solitary Snipe	Charadriidae	LC /IV
<i>Gallinaga stenura</i>	Pintail Snipe	Charadriidae	LC /IV
<i>Gallinaga gallinago</i>	Common Snipe	Charadriidae	LC /IV
<i>Gallinula chloropus</i>	Indian Moorhen	Rallidae	LC /IV
<i>Galloperdix lunulata</i>	Painted Spurfowl	Phasianidae	LC / IV
<i>Galloperdix spadicea</i>	Red Spurfowl	Phasianidae	LC / IV
<i>Gelochelidon nolotica</i>	Gull-billed Tern	Laridae	LC /IV
<i>Glareola lactea</i>	Small Indian Pratincole	Glareolidae	LC /IV
<i>Glareola maldivarum</i>	Oriental Pratincole	Glareolidae	LC /IV
<i>Glareola pratincola</i>	Collared Pratincole	Glareolidae	LC /IV



Scientific name	Common name	Family	IUCN/ WPA
<i>Gyps bengalensis</i>	Indian White-backed Vulture	Accipitridae	CR /I
<i>Gyps indicus</i>	Indian Long-billed Vulture	Accipitridae	CR /I
<i>Halcyon pileata</i>	Blackcapped Kingfisher	Alcedinidae	LC /IV
<i>Halcyon smyrnensis</i>	White-breasted Kingfisher	Alcedinidae	LC /IV
<i>Haliaeetus leucogaster</i>	Whitebellied Sea Eagle	Accipitridae	LC / IV
<i>Himantopus</i>	Blackwinged Stilt	Recurvirostridae	LC /IV
<i>Hippolais caligata</i>	Booted Warbler	Muscicapidae	LC /IV
<i>Hirundo concolor</i>	Dusky Crag Martin	Hirundinidae	LC /IV
<i>Hirundo daurica</i>	Indian Striated Swallow	Hirundinidae	LC /IV
<i>Hirundo rustica</i>	Swallow	Hirundinidae	LC /IV
<i>Hirundo smithii</i>	Wire-tailed Swallow	Hirundinidae	LC /IV
<i>Hydrophasianus chirurgus</i>	Pheasant-tailed Jacana	Jacanidae	LC /IV
<i>Hydroprogne caspia</i>	Caspian Tern	Laridae	LC /IV
<i>Ictinaetus malayensis</i>	Black Eagle	Accipitridae	LC / IV
<i>Ixobrychus cinnamomeus</i>	Chestnut Bittern	Ardeidae	LC / IV
<i>Ixobrychus flavicollis</i>	Black Bittern	Ardeidae	LC / IV
<i>Ixobrychus sinensis</i>	Yellow Bittern	Ardeidae	LC / IV
<i>Ixobrychus minutus</i>	Little Bittern	Ardeidae	LC / IV
<i>Lanius excubitor</i>	Indian Grey Shrike	Laniidae	LC /IV
<i>Lanius schach</i>	Rufous-backed Shrike	Laniidae	LC /IV
<i>Lanius vittatus</i>	Indian Baybacked Shrike	Laniidae	LC /IV
<i>Larus argentatus</i>	Herring Gull	Laridae	LC /IV
<i>Larus brunnicephalus</i>	Brownheaded Gull	Laridae	LC /IV
<i>Larus fuscus</i>	Lesser Blackbacked Gull	Laridae	LC /IV
<i>Larus ichthyaetus</i>	Great Blackheaded Gull	Laridae	LC /IV
<i>Limosa lapponica</i>	Bar-tailed Godwit	Charadriidae	LC /IV
<i>Limosa</i>	Black-tailed Godwit	Charadriidae	LC /IV
<i>Lonchura malabarica</i>	Whitethroated Munia	Ploceidae	LC /IV
<i>Lonchura malacca</i>	Blackheaded Munia	Ploceidae	LC /IV
<i>Lonchura punctulata</i>	Spotted Munia	Ploceidae	LC /IV
<i>Lonchura striata</i>	Whitebacked Munia	Ploceidae	LC /IV
<i>Megalaima haemacephala</i>	Crimson-breasted Barbet	Capitonidae	LC /IV
<i>Megalaima viridis</i>	Small Green Barbet	Capitonidae	LC /IV
<i>Megalaima zeylanica</i>	Large Green Barbet	Capitonidae	LC /IV
<i>Merops orientalis</i>	Small Green Bee-eater	Meropidae	LC /IV
<i>Merops philippinus</i>	Bluetailed Bee-eater	Meropidae	LC /IV
<i>Mettopidius indicus</i>	Bronzewinged Jacana	Jacanidae	LC /IV
<i>Milvus migrans</i>	Pariah Kite	Accipitridae	LC / IV
<i>Mirafra assamicaaffinis</i>	Madras Bush lark	Alaudidae	LC /IV
<i>Mirafra erythroptera</i>	Red-winged Bush-Lark	Alaudidae	LC /IV
<i>Monticola saxatilis</i>	Rock Thrush	Muscicapidae	LC /IV
<i>Motacilla alba</i>	Indian White Wagtail	Motacillidae	LC /IV
<i>Motacilla caspica</i>	Grey Wagtail	Motacillidae	LC /IV
<i>Motacilla cireola</i>	Yellow-headed Wagtail	Motacillidae	LC /IV
<i>Motacilla flava</i>	Yellow Wagtail	Motacillidae	LC /IV
<i>Motacilla maderaspatensis</i>	Large Pied Wagtail	Motacillidae	LC /IV
<i>Muscicapa parva</i>	Redbreasted Flycatcher	Muscicapidae	LC /IV
<i>Muscicapa thalassina</i>	Verditer Flycatcher	Muscicapidae	LC /IV
<i>Muscicapa tickelliae</i>	Tickell's Blue Flycatcher	Muscicapidae	LC /IV
<i>Mycteria leucocephala</i>	Painted Stork	Ciconiidae	VU /I
<i>Nectarinia asiatica</i>	Purple Sunbird	Nectariniidae	LC /IV
<i>Nectarinia zeylonica</i>	Purplerumped Sunbird	Nectariniidae	LC /IV
<i>Neophron percnopterus</i>	Egyptian Vulture	Accipitridae	LC / IV
<i>Netta rufina</i>	Red-crested Pochard	Anatidae	LC / IV



Scientific name	Common name	Family	IUCN/ WPA
<i>Netta puscromandelianus</i>	Cotton Teal	Anatidae	LC / IV
<i>Numenius arquata</i>	Curlew	Charadriidae	LC / IV
<i>Numenius phaeopus</i>	Whimbrel	Charadriidae	LC / IV
<i>Nycticorax</i>	Night Heron	Ardeidae	LC / IV
<i>Oriolus</i>	Golden Oriole	Oriolidae	LC / IV
<i>Orthotomus sutorius</i>	Tailorbird	Muscicapidae	LC / IV
<i>Pandion haliaetus</i>	Osprey	Accipitridae	LC / IV
<i>Passer domesticus</i>	House Sparrow	Ploceidae	LC / IV
<i>Pavo cristatus</i>	Indian Peafowl	Phasianidae	LC / I
<i>Pedicula asiatica</i>	Jungle Bush Quail	Phasianidae	LC / IV
<i>Peregrinus japonensis</i>	Peregrine Falcon	Falconidae	LC / IV
<i>Pericrocotus cinnamomeus</i>	Small Minivet	Campephagidae	LC / IV
<i>Pernis ptilorhynchus</i>	Crested Honey Buzzard	Accipitridae	LC / IV
<i>Phalacrocorax fuscicollis</i>	Indian Shag	Phalacrocoracidae	LC / IV
<i>Phalacrocorax niger</i>	Little Cormorant	Phalacrocoracidae	LC / IV
<i>Philomachus pugnax</i>	Ruff and Reeve	Charadriidae	LC / IV
<i>Phoenicurus</i>	Redstart	Muscicapidae	LC / IV
<i>Phylloscopus collybita</i>	Chiffchaff	Muscicapidae	LC / IV
<i>Phylloscopus griseolus</i>	Olivaceous Leaf Warbler	Muscicapidae	LC / IV
<i>Phylloscopus trochiloides</i>	Bright Green Leaf Warbler	Muscicapidae	LC / IV
<i>Pitta brachyura</i>	Indian Pitta	Pittidae	LC / IV
<i>Platalea leucorodia</i>	Spoonbill	Threskiornithidae	LC / IV
<i>Plegadis falcinellus</i>	Glossy Ibis	Threskiornithidae	LC / IV
<i>Ploceus philippinus</i>	Baya Weaver	Ploceidae	LC / IV
<i>Pluvialis apricaria</i>	Golden Plover	Charadriidae	LC / IV
<i>Pluvialis dominica fulva</i>	Eastern Golden Plover	Charadriidae	LC / IV
<i>Porphyrio</i>	Purple Moorhen	Rallidae	LC / IV
<i>Porzana fusca</i>	Ruddy Crake	Rallidae	LC / IV
<i>Porzana parva</i>	Little Crake	Rallidae	LC / IV
<i>Prinia buchanani</i>	Rufousfronted Wren-Warbler	Muscicapidae	LC / IV
<i>Prinia socialis</i>	Ashy Wren-Warbler	Muscicapidae	LC / IV
<i>Prinia subflava</i>	Plain Wren-Warbler	Muscicapidae	LC / IV
<i>Prinia sylvatica</i>	Jungle Wren-Warbler	Muscicapidae	LC / IV
<i>Pseudibis papillosa</i>	Black Ibis	Threskiornithidae	LC / IV
<i>Psittacula krameri</i>	Rose-ringed Parakeet	Psittacidae	LC / IV
<i>Pycnonotus cafer</i>	Redvented Bulbul	Pycnonotidae	LC / IV
<i>Pycnonotus xantholaemus</i>	Yellowthroated Bulbul	Pycnonotidae	LC / IV
<i>Pycnonotus jacosus</i>	Redwhiskered Bulbul	Pycnonotidae	LC / IV
<i>Rallus aquaticus</i>	Water Rail	Rallidae	LC / IV
<i>Recurvirostra avosetta</i>	Avocet	Recurvirostridae	LC / IV
<i>Rhipidura aureola</i>	White browed Fantail Flycatcher	Muscicapidae	LC / IV
<i>Rhopodytes viridirostris</i>	Small Greenbilled Malkoha	Cuculidae	LC / IV
<i>Rostratula bengalensis</i>	Painted Snipe	Rostratulidae	LC / IV
<i>Sarkidiornis melanotos</i>	Nakta	Anatidae	LC / IV
<i>Saxicola caprata</i>	Pied Bush Chat	Muscicapidae	LC / IV
<i>Scolopax rusticola</i>	Woodcock	Charadriidae	LC / IV
<i>Sterna acuticauda</i>	Blackbellied Tern	Laridae	LC / IV
<i>Sterna albifrons</i>	Little Tern	Laridae	LC / IV
<i>Sterna aurantia</i>	Indian River Tern	Laridae	LC / IV
<i>Sterna hirundo</i>	Common Tern	Laridae	LC / IV
<i>Streptopelia senegalensis</i>	Little Brown Dove	Columbidae	LC / IV
<i>Strptopelia chinensis</i>	Spotted Dove	Columbidae	LC / IV
<i>Sturnus contra</i>	Pied Myna	Sturnidae	LC / IV



Scientific name	Common name	Family	IUCN/ WPA
<i>Sturnus pagodarum</i>	Brahminy Myna	Sturnidae	LC /IV
<i>Tachybaptus ruficollis</i>	Little Grebe	Podicepsidae	LC / IV
<i>Tadorna ferruginea</i>	Ruddy Shelduck	Anatidae	LC / IV
<i>Tephrodornis pondicerianus</i>	Wood Shrike	Campephagidae	LC /IV
<i>Terpsiphone paradisi</i>	Paradise Flycatcher	Muscicapidae	LC /IV
<i>Threskiornis melanocephalus</i>	Oriental White Ibis / Black-headed Ibis	Threskiornithidae	NT /I
<i>Tockus birostris</i>	Grey Hornbill	Bucerotidae	LC /IV
<i>Tringa erythropis</i>	Spotted Redshank	Charadriidae	LC /IV
<i>Tringa glareola</i>	Wood Sandpiper	Charadriidae	LC /IV
<i>Tringa guttiter</i>	Spotted Green Shank	Charadriidae	LC /IV
<i>Tringa hypoleucos</i>	Common Sandpiper	Charadriidae	LC /IV
<i>Tringa nebularia</i>	Green Shank	Charadriidae	LC /IV
<i>Tringa ochropus</i>	Green Sandpiper	Charadriidae	LC /IV
<i>Tringa stagnatilis</i>	Marsh Sandpiper	Charadriidae	LC /IV
<i>Tringa terek</i>	Terek Sandpiper	Charadriidae	LC /IV
<i>Tringa totanus</i>	Common Redshank	Charadriidae	LC /IV
<i>Turdoides affinis</i>	Whiteheaded Babbler	Muscicapidae	LC /IV
<i>Turdoides caudatus</i>	Common Babbler	Muscicapidae	LC /IV
<i>Turdoides malcolmi</i>	Large Grey Babbler	Muscicapidae	LC /IV
<i>Turnix suscitator</i>	Indian Bustard-Quail	Turnicidae	LC /IV
<i>Upupa epops</i>	Indian Hoopoe	Upupidae	LC /IV
<i>Vanellus gregarius</i>	Sociable Lapwing	Charadriidae	LC /IV
<i>Vanellus indicus</i>	Redwattled Lapwing	Charadriidae	LC /IV
<i>Vanellus malabaricus</i>	Yellow-wattled Lapwing	Charadriidae	LC /IV
<i>Zosterops palpebrosa</i>	Indian White-eye	Zosteropidae	LC /IV

Sources:

List of Birds reported / recorded from the Coringa Wildlife Sanctuary (based Rao, V. V., Anjaneyulu, M., Nagulu, V., Srinivasulu, C. and Satyanarayana, D. (1996) Waterfowl status at Coringa Wildlife Sanctuary, Andhra Pradesh. *Pavo* 34 (1 & 2): 71-86. Birds which are not found outside the CWLS are indicated by \*

> Important Bird Areas (IBAs) in India (2016) ENVIS Centre on Wildlife & Protected Areas

[http://wilenvis.nic.in/Database/IBA\\_8463.aspx](http://wilenvis.nic.in/Database/IBA_8463.aspx)

> List of threatened birds with IBA site codes (Important Bird Areas in India - Andhra Pradesh)

<http://ibcn.in/wp-content/uploads/2011/12/13-136-168-Andhra-Pradesh.pdf>

A list of Mammals found in the CWLS area is given in **Table-7**. A list of reptiles reported / recorded from the buffer zone, mainly from the CWLS is given in **Table-8**.

**TABLE-7**  
**LIST OF MAMMALS REPORTED / RECORDED FROM THE CORINGA WILDLIFE SANCTUARY**

Scientific Name	Common Name	IUCN / WPA
<i>Bandicotabengalensis</i>	Bandicoot Rat	LC / V
<i>Canis aureus</i>	Golden Jackal	LC / II
<i>Funambulus palmarum</i>	Squirrel	LC / V
<i>Herpestes edwardsi</i>	Indian Grey Mongoose	LC / IV
<i>Lutra perspicillata</i>	Smooth Indian Otter	VU / I
<i>Macaca mulatta</i>	Monkey	LC / II
<i>Mus booduga</i>	Indian Field Mouse	LC / V
<i>Prionailurus viverrinus</i>	Fishing Cat	VU / I
<i>Rattus</i>	Black Rat	LC / V
<i>Rousettus leschenaulti</i>	Indian Fulvous Fruit- Bat	LC / V



Scientific Name	Common Name	IUCN / WPA
<i>Sus scrofa</i>	Wild pig	LC /III
<i>Vulpes bengalensis</i>	Indian Fox	LC / II

List of Reptiles reported / recorded from the Coringa Wildlife Sanctuary and its surroundings is given in **Table-8**.

**TABLE-8**  
**LIST OF REPTILES REPORTED / RECORDED FROM THE CORINGA WILDLIFE SANCTUARY**

Scientific name	Common name	IUCN /WPA
<i>Ahaetulla nasuta</i>	Tree snake	LC/II
<i>Amphiesma stolatum</i>	Striped keelback	LC/II
<i>Atretium schistosum</i>	Olive keelback / Water Snake	LC /IV
<i>Bungarus caeruleus</i>	Indian krait	LC/II
<i>Bungarus fasciatus</i>	Banded krait	LC/II
<i>Calotes versicolor</i>	Garden lizard	LC /IV
<i>Crocodylus palustris</i>	Marsh crocodile	VU/I
<i>Daboia russelii</i>	Russell's viper	LC/II
<i>Enhydrina schistosa</i>	Hook nosed sea snake	LC /IV
<i>Enhydria</i>	Smooth water snake / Mud snake	LC/II
<i>Eretmochelys imbricata</i>	Hawksbill sea Turtle	CR /I
<i>Eutropis carinata</i>	Skink	LC /IV
<i>Gongylophis conicus</i>	Common Sandboa	LC/II
<i>Hemidactylus frenatus</i>	House gecko / Wall lizard	LC /IV
<i>Lepidochelys olivacea</i>	Olive Ridley sea turtle	VU/I
<i>Lissemys punctata</i>	Flapshell turtle	LC/II
<i>Lycodon aulicus</i>	Wolf snake	LC/II
<i>Naja</i>	Cobra	LC/II
<i>Pelamis platura</i>	Yellow sea snake	LC /IV
<i>Ptyas mucosa</i>	Rat snake / Daman	LC/II
<i>Sitana ponticeriana</i>	Fan-throated lizard	LC /IV
<i>Sphenomorphus dussumieri</i>	Snake skink	LC /IV
<i>Varanus bengalensis</i>	Monitor lizard	LC/I

### 3.4 Fishes / Fisheries and Fishing in the study area

Fishing activity is carried out at large scale due to presence of Gautami-Godavari River by non-motorized, motorized and mechanized crafts in this sector. Mangroves play an important role in coastal fisheries production. They support breeding and feeding of a variety of fishes, prawn and crabs, thereby enhance the potential of adjacent coastal waters.

The prawn seed and juvenile resources of the Godavari mangrove ecosystem profoundly influence the artisanal fishery around CWLS. But indiscriminate prawn seed collection in recent years has depleted fishery resources, leading to a ban on prawn seed collection and fishing curbs during the breeding season.

National Bureau of Fish Genetic Resources (NBFGR), Lucknow compiled a list of Threatened Freshwater Fishes of India in 2010. As many as 120 freshwater fish species are included under the EN and VU categories by the IUCN but none of them is endemic or limited to EGGREE. Just a dozen of fishes is included in Schedule-I

part 2(A) of Wildlife (Protection) Act, 1972 and none of them is reported from the study area. Similarly, only 6 Indian Freshwater Fishes are included in the IUCN Red List and none of them is reported from the study area. Though there is great concern about the growing demand and over exploitation of Hilsa Fish (*Tenualosailisha*) from the EGREE, the species is neither endemic nor restricted to India. It is not in the LC category of the IUCN.

Krishnan and Mishra (2001) summarized our knowledge of the distribution of 312 species of freshwater to marine elements of fishes belonging to 189 genera accommodated in 88 families. It is based on approximately 1400 samples collected from different localities of Godavari estuarine system by various survey parties from 1992 to 1995 and incorporation of information available in literature [Day, 1875-78 (1888); Koumans, 1941, 1953; Munro, 1955; de Beaufort and Briggs, 1962; Babu Rao 1962, 1973, 1976; Rao, 1971, 1972, 1974, 1976; Fischer and Whitehead, 1974; Fisher and Bianchi, 1984; Talwar and Kacker, 1984; Smith and Heemstra) 986; Whitehead et al., 1988; Venkateswarlu, 1990; Talwar and Jhingran, 1991; Barman, 1993, Mohapatra and Venkateswarlu, 1995 and Talwar) 995].

New locality records of occurrence in Godavari estuarine system has been affected for 74 species, thus enhancing information available in literature from 240 species to 314 species. Information available on *Argyrosomus argentatus* and *Cottogobius skapuri* are inconclusive.

Reproduction of the entire list may not be relevant to the project under consideration mainly because the threat to fishes to due to overfishing, pesticides, pollution and introduction of fast-growing, highly competitive exotic species. A short list of fishes recorded by many workers is given in **Table-9**. *Wallago attu* is the only RET (NT category of the IUCN) species recorded.

**TABLE-9**  
**LIST OF FISHES EITHER CAUGHT OR REPORTED / RECORDED FROM THE STUDY AREA**

Scientific name	Common / Local name	Family
<i>Alectis indicus</i>	Indian Threadfish	Carangidae
<i>Ambassis gymnocephalus</i>	Bald glassy	Ambassidae
<i>Ambassis interrupta</i>	Long-spined glass fish	Ambassidae
<i>Anabas cobojus</i>	Gangetic Koi	Anabantidae
<i>Anabas olegolepis</i>	Climbing Bass	Anabantidae
<i>Anabas testudineus</i>	Climbing Perch	Anabantidae
<i>Bagarius</i>	Devil Catfish	Sisoridae
<i>Bathygobius fuscus</i>	Dusky frillgoby	Gobiidae
<i>Butis</i>	Duckbill sleeper	Eleotrididae
<i>Butis melanostigma</i>	Blackspot Sleeper	Eleotrididae
<i>Callionymus filamentosus</i>	Blotchfin dragnet	Callionymidae
<i>Callionymus sagitta</i>	Arrow dragonet	Callionymidae
<i>Carangoides oblongus</i>	Coachwhip trevally	Carangidae
<i>Caranx ignobilis</i>	Giant trevally	Carangidae
<i>Catla</i>	Catla	Cyprinidae
<i>Cirrhinus cirrhosus</i>	Mrigal Carp	Cyprinidae
<i>Cirrhinus mrigala</i>	Mrigala	Cyprinidae



Scientific name	Common / Local name	Family
<i>Cirrhinus reba</i>	Reba carp	Cyprinidae
<i>Clarias batrachus</i>	Climbing perch	Clariidae
<i>Coilia dussumieri</i>	Goldspotted grenadier anchovy	Engraulidae
<i>Cynoglossus lida</i>	Tongue fish	Cynoglossidae
<i>Cynoglossus lingua</i>	Long tongue sole	Cynoglossidae
<i>Cynoglossus puncticeps</i>	Tongue fish	Cynoglossidae
<i>Danio devario</i>	Giant danio	Cyprinidae
<i>Etroplus maculatus</i>	Banded pearlspot	Cichlidae
<i>Etroplus suratensis</i>	Duvvenachapa	Cichlidae
<i>Glossogobius giuris</i>	Bar-eyed goby	Gobiidae
<i>Glossogobius bioaltus</i>	Flat-headed goby	Gobiidae
<i>Heteropneustes fossilis</i>	Stinging catfish	Heteropneustidae
<i>Hilsa kelee</i>	Kelee shad	Clupeidae
<i>Kurtus indicus</i>	Indian hump head	Kurtidae
<i>Labeo boga</i>	Boga labeo	Cyprinidae
<i>Labeo calbasu</i>	Calbasu	Cyprinidae
<i>Labeo fimbriatus</i>	Fringe lipped carp	Cyprinidae
<i>Labeo rohita</i>	Rohu	Cyprinidae
<i>Lactarius</i>	Big-jawed jumper / Kutuppu	Lactariidae
<i>Lates calcarifer</i>	Pandugappa	Centropomidae
<i>Leiognathus fasciatus</i>	Sahala / Tellamaga	Leiognathidae
<i>Liza macrolepis</i>	Goldspot Mullet	Mugilidae
<i>Liza pasia</i>	Katta chapa	Mugilidae
<i>Liza tade</i>	Katta chapa	Mugilidae
<i>Iisha elongate</i>	Dichholla	Pristigasteridae
<i>Mastacembelus armatus</i>	Tire track Spiny eel	Mastacembelidae
<i>Megalaspis cordyla</i>	Hardtail scad	Carangidae
<i>Megalops cyprinoides</i>	Kattuchapa	Carangidae
<i>Mugil cephalus</i>	Kalumupamu	Mugilidae
<i>Mugil parsia</i>	Koyyanga	Mugilidae
<i>Mystus aor</i>	Sugujella / Yerrajella	Bagridae
<i>Mystus cavasius</i>	Tangara	Bagridae
<i>Mystus gulio</i>	Kannenga	Bagridae
<i>Mystus tengana</i>	Jalla	Bagridae
<i>Mystus vittatus</i>	Suguella	Bagridae
<i>Nandus nandus</i>	Mottled nandus	Nandidae
<i>Notopterus notopterus</i>	Bronze featherback	Notopteridae
<i>Omobranchus ferox</i>	Gossamer blenny	Cichlidae
<i>Omobranchus punctatus</i>	Muzzled blenny	Cichlidae
<i>Omobranchus zebra</i>	Zebra blenny	Cichlidae
<i>Ompok pabda</i>	Pabda Fish / Leothari	Siluridae
<i>Ompok binaculatus</i>	Pava / Pabo	Siluridae
<i>Ophiocephalus gachua</i>	Dwarf Snake head Fish	Channidae
<i>Ophiocephalus marulius</i>	Bullseye snakehead.	Channidae
<i>Ophiocephalus punctatus</i>	Snakehead	Channidae
<i>Ophiocephalus striatus</i>	Striped snakehead	Channidae
<i>Pampus chinensis</i>	Chanduva	Stromateidae
<i>Pangasius pangasius</i>	Pangas Catfish	Pangasiidae
<i>Periophthalmus argentilineatus</i>	Mud skipper	Gobiidae
<i>Platax orbicularis</i>	Kahisnadava	Platacidae
<i>Polynemus indicus</i>	Tapsee	Polynemidae
<i>Polynemus paradiseus</i>	Paradise threadfin	Polynemidae
<i>Puntius ticto</i>	Two-spot Barb	Cyprinidae
<i>Raconda russeliana</i>	Russell's Smooth-back Herring	Clupeidae



Scientific name	Common / Local name	Family
<i>Sardinella fimbriata</i>	Fringescale sardinella	Clupeidae
<i>Scomberoides tala</i>	Tolupara	Carangidae
<i>Silonia childreni</i>	Vaanjo	Schilbeidae
<i>Stolephorus indicus</i>	Nattu	Engraulididae
<i>Tenualosa ilisha</i>	Hilsa fish	Clupeidae
<i>Tetradon fluviatilis</i>	Green pufferfish	Tetradontidae
<i>Wallago attu*</i>	Shark Catfish (NT)	Siluridae

The area under consideration is famous for cultured Prawns. A list of Prawns cultivated / captured is given in **Table-10**.

**TABLE-10**  
**LIST OF PRAWNS GROWN IN THE AQUACULTURE FARMS AND CAPTURED FROM THE ESTUARY**

Scientific name	Common / Local name	Family
<i>Acetes indicus</i>	CoyyaPottu	Penaeidae
<i>Metapenaeus affinis</i>	Kayabonga / Royya	Penaeidae
<i>Metapenaeus brevicornis</i>	Yellow prawn / poovalin	Penaeidae
<i>Metapenaeus dobsoni</i>	ChenkiRoyya	Penaeidae
<i>Metapenaeus monoceros</i>	Bonga Royya/ Kalandan	Penaeidae
<i>Palaemon tempes</i>	SingidiRoyya	Palaemonidae
<i>Parapenaeopsis hardvicki</i>		Penaeidae
<i>Parapenaeopsis sculptilis</i>	GullaRoyya	Penaeidae
<i>Parapenaeopsis stylifera</i>		Penaeidae
<i>Penaeus indicus</i>	YelliRoyya / TellaRoyya	Penaeidae
<i>Penaeus merguensis</i>	Banana Prawn	Penaeidae
<i>Penaeus monodon</i>	Tiger Prawn	Penaeidae
<i>Penaeus semisulcatus</i>	EGREEN Tiger Prawn	Penaeidae
<i>Solenocera indica</i>	YerriRoyya	Penaeidae

#### **4.0 ENVIRONMENTAL IMPACTS**

Most likely environmental impacts of the project capable of influencing the Biodiversity of the study area:

##### **Predicted impacts of the Project on the Ecology, Biodiversity and Wildlife of the study area:**

The study area comprises of the pipeline route with a distance of 500 m on either side (was taken as the core area) and an area of 10 Km radius from the pipeline was taken as the buffer zone. Detailed primary survey of flora and fauna of the study areas was carried out a highly competent NABET Accredited team keeping in view of the standards terms of reference. Baseline data collected indicates the following:

1. Presence of the Coringa wildlife sanctuary (CWS), an Eco sensitive protected wildlife habitat and a Mangrove forest at a distance of 2.35 km away from the pipeline nearest point. The same had been verified by the officials of the Forest and Wildlife department, Government of Andhra Pradesh during 2019.



2. CWS is rich in Mangrove, Estuarine and Marine Biodiversity which is well documented and all species are recorded and reported.
3. A list of Schedule I species reported from CWS and their IUCN status is shown in **Table-11**.

**TABLE-11**  
**LIST OF RARE OR ENDANGERED OR THREATENED (RET) AND SCHEDULE I SPECIES REPORTED FROM THE CWS**

Scientific name	Common name	IUCN Status	WPA Schedule
<i>Lutra perspicillata</i>	Smooth Indian Otter	VU	I
<i>Prionailurus viverrinus</i>	Fishing Cat	VU	I
<i>Aythya nyroca</i>	White-eyed Poachard	NT	I
<i>Gyps bengalensis</i>	Indian White-backed Vulture	CR	I
<i>Gyps indicus</i>	Indian Long-billed Vulture	CR	I
<i>Mycteria leucocephala</i>	Painted Stork	VU	I
<i>Pavo cristatus</i>	Indian Peafowl	LC	I
<i>Threskiornis melanocephalus</i>	Oriental White Ibis / Black-headed Ibis	NT	I
<i>Crocodylus palustris</i>	Marsh crocodile	VU	I
<i>Eretmochelys imbricata</i>	Hawksbill sea Turtle	CR	I
<i>Lepidochelys olivacea</i>	Olive Ridley sea turtle	VU	I
<i>Varanus bengalensis</i>	Monitor lizard	LC	I

CR=Critically Endangered; LC= Least Concern; NT=Near Threatened; VU = Vulnerable

**Principles of Impact Assessment and Impacts:**

Prior to establishment of the project additional impact on the existing environment and habitat need to be examined and analysed. If the environment and habitat have the capacity to assimilate or absorb additional impacts due to the project and or if the overall adverse effect of impacts can be neutralized with suitable remediation plan / technology, the project can be established in the proposed site. With respect to biodiversity, according to International Association for Impact Assessment (IAIA), the project can be established if there is no net loss of biodiversity. The following are the results of the study of the impacts of the project on the existing environment and habitat:

1. The main threat to wildlife is shrinkage or fragmentation of habitat or both. But this pipeline project is not going to either reduce or modify or break the habitat by fragmentation.
2. It is a gas transport pipeline. There are no manufacturing facilities hence, no discharge of effluents and as there is no stack there is no air pollution
3. The adverse impacts during laying of the pipeline, if any, are very minor, short-lived and easily reversible once the disturbances related to laying of pipeline is over.
4. The fishing activities may get affected during the period of laying of pipeline. But the impacts are negligible when compared with overfishing and natural calamities like Cyclones.



5. The fishermen will be compensated as per the directives of District Collector, East Godavari District.
6. The Bay of Bengal and the Guathami Godavari River through which the pipeline passes have the capacity to absorb and assimilate the envisaged impacts.
7. The nearest distance between the pipeline and the CWS is 2.35 Km. In case of worst-case scenario such as an unlikely pipeline burst or explosion and fire, which as per Qunatitativie Risk Analysis conducted is low, the impact shall be not be felt beyond 250m from the point of fire or explosion. Hence it is not going to pose any threat to the wildlife of CWS even under the worst circumstances.
8. No forest or Mangroves are going to be lost on account of the pipeline, as the pipeline will be laid as Horizontal Directional Drilling (HDD) Technology in the Mangrove area.
9. There are similar pipelines and offshore gas storage and distribution facilities in the area.
10. There are no reports or records of any pipeline burst or explosion in any part of these gas pipes that are now extending from the East Coast to the West Coast of India.
11. The adverse impacts associated with the traditional practices of excavation, trenching, drilling, dredging associated with the laying of the pipeline, are eliminated by using HDD technology at River/Nala and Mangrove Areas.
12. During the construction of pipeline and operations, some Mollusks, Crabs and other small mud dwelling fauna are likely to get buried and it can't be totally avoided. According to the research findings (Ref: Fauna of Godavari Estuary-Andhra Pradesh, Estuarine Ecosystem Series 4, published by the ZSI in 2001, there are no invertebrate species of great conservation value).
13. There are rare, endangered and threatened (RET) species of Birds, Reptiles, Mammals as shown in Table-11 and also one Mangrove (*Cerriops decandra*) in the buffer zone of the proposed project but the project is incapable of posing even a slightest additional risk to them
14. The overall impact of the proposed project at any point of time is not going to pose any additional threat to the Schedule I species either directly or indirectly since they are not found within a distance of 1 Km on either side of the pipeline.
15. Further, all the Schedule I species have been reported only from the CWS and the ONGC is not authorized to undertake even a survey or monitoring without the consent of competent authority. Hence, any plan for conservation of any species is beyond the jurisdiction of the project proponent.
16. The adverse impacts if any are limited to the construction period only.

Beyond these minor and purely temporary adverse impacts, there shall be no direct or indirect adverse impacts. Under any circumstances there shall be no Net Loss of Biodiversity. The proposed activity is fully compatible with the National and International objectives of wildlife conservation. The list of Plants observed within 10 m wide stretch of Proposed pipeline route (Onshore) are given in Table-**Table-12**. The impacts are listed at **Table-13**.



**TABLE-12**  
**LIST OF PLANTS THAT WERE FOUND WITHIN THE 10 M WIDE STRETCH OF PIPELINE ON THE SHORE**

Scientific name	Family	Vernacular Name	Habit	IUCN
<b>Mangroves</b>				
<i>Acanthus ilicifolius</i>	Acanathaceae	Allchi	Shrub	LC
<i>Avicennia alba</i>	Avicenniaceae	Elavamada	Tree	LC
<i>Avicennia marina</i>	Avicenniaceae	Tellamada	Tree	LC
<i>Avicennia officinalis</i>	Avicenniaceae	Nallamada	Tree	LC
<i>Bruquiera gymnorhiza</i>	Rhizophoraceae	Kandriga	Tree	LC
<i>Excoecaria agallocha</i>	Euhorbiaceae	Thilla	Tree	LC
<b>Mangrove Associates</b>				
<i>Aeluropus lagopoides</i>	Poaceae	Vuppu gaddi	Grass	LC
<i>Caesalpinia crista</i>	Caesalpiniaceae	Rachis vine	Climber	LC
<i>Clerodendrum inerme</i>	Verbanaceae	Pisingi	Small tree	LC
<i>Dalbergia spinosa</i>	Fabaceae	Chillinga	Shrub	LC
<i>Derris trifoliata</i>	Fabaceae	Nallatheega	Vine	LC
<i>Fimbristylis ferruginea</i>	Cyperaceae	Tunga	Sedge	LC
<i>Ipomoea pes-caprae</i>	Convolvulaceae	Morning glory	Vine	LC
<i>Ipomoea tuba</i>	Convolvulaceae	Tellateega	Vine	LC
<i>Myriostachya wightiana</i>	Poaceae	Dhaba gaddi	Grass	LC
<i>Porteresia coarctata</i>	Poaceae	Yellugaddi	Grass	LC
<i>Salicornia brachiata</i>	Chenopodiaceae	Koyalu	Herb	LC
<i>Sarcolobus carinatus</i>	Asclepiadaceae	Balaboddutheega	Vine	LC
<i>Sesuvium portulacastrum</i>	Aizoaceae	vangaredukura	Herb	LC
<i>Suaeda maritima</i>	Chenopodiaceae	Elakura	Herb	LC
<i>Suaedanudiflora</i>	Chenopodiaceae	Elakura	Herb	LC
<b>Invasive species</b>				
<i>Prosopis juliflora</i>	Mimosaceae	English thumma	Thorny bush	Invasive

**TABLE-13**  
**DETAILS OF PROJECT IMPACT STATEMENT**

Sr.No.	Environmental Impact	Yes / No
1	Shrinkage of habitat	No
2	Fragmentation of habitat	No
3	Degradation or degradation of habitat	No
4	Pollution of water bodies	No
5	Air pollution	No
6	Long lasting severe adverse impacts	No
7	Adversely impacting the managements plants under implementation	No
8	Sustaining the Ecology and biodiversity of the area	Yes
9	Posing an additional threat to any RET species	No

Thus, the project is not going to be a threat either to the CWLS or the RET flora or fauna of the study area either directly or indirectly.



## 5.0 CONSERVATION OF BIODIVERSITY

### 5.1 Conservation of Godavari River Estuarine Ecosystem

According to a detailed survey carried out by Mr. T Rajasekhar (2019) and others, among the RET animals that are most likely to be present within the 1000m wide buffer zone along the pipeline are the Olive Ridley turtles (*Lepidochelys olivacea*). There are reports of sporadic nesting / breeding activity during the winter season from October to January on the sand dunes / sand bars on either side of the Godavari and Gautami Godavari Rivers. But there are no mass nesting grounds in the East Godavari River Estuarine Ecosystem (EGREE). The major (60% of total) threat to the hatching of Olive Ridley eggs in the area is due to inundation on account of high tides and cyclones. Rest is due to poaching, predation of eggs by locals, dogs and birds. As the proposed pipeline is passing through the River, it is not going to disturb or unsettle the Olive Ridley Turtle nesting grounds (which are always located in sandy beaches). However, the project proponent is going to take care to ensure that no pipeline activity is carried out during the breeding season (October to January) within a distance of 1 Km from the nesting areas. No lighting or illumination shall be used during the breeding season. The project proponent will join hands with the Andhra Pradesh Forest Department (APFD) for protection of Olive Ridley Turtle Nests under the Ridley Sea Turtle Conservation Project.

In the worst case, some Molluscs are likely to get buried under debris during the time of pipe laying. Beyond these minor and purely temporary adverse impacts and the ecosystem is endowed with the capacity return to normal conditions once the disturbances are over on account of homeostatic (self-control) regulatory mechanisms. These shall be no long lasting or recurring direct or indirect adverse impacts. Under any circumstances there shall be no Net Loss of Biodiversity. The proposed activity is fully compatible with the National and International objectives of wildlife conservation.

As revealed by the baseline data, the area is rich in Ecosystem and species diversity. It is a home for some of the rare, endangered or threatened (RET) species as shown in **Figure-2**. The Mangrove Forests and the Coringa Wildlife Sanctuary have immense protective and productive functions. Hence, their conservation is given due consideration and importance both by the National and International organizations including voluntary agencies. The M.S. Swaminathan Research Foundation (MSSRF), and supported by the Ministry of Environment, Forests and Climate Change, Government of India (GoI), Government of Andhra Pradesh (GoAP), UNDP-GEF (Global Environment Facility), EGREE Foundation and Nature Protects if She is Protected, Organization have joined hands together for Mainstreaming Coastal and Marine Biodiversity Conservation into Production Sectors in East Godavari River Estuarine Ecosystem Region (Ref: **Figure-3**).

	
<p><b>Yellow Mangrove (<i>Ceriops decandra</i>), found in Kandikuppa R.F besides the CWLS</b></p>	<p><b>Fishing Cat (<i>Prionailurus viverrinus</i>)</b></p>
	
<p><b>Smooth Indian Otter (<i>Lutra perspicillata</i>)</b></p>	<p><b>White Ibis (<i>Threskiornis melanocephalus</i>)</b></p>
	
<p><b>Indian White Backed Vulture (<i>Gyps bengalensis</i>) &amp; Lower row</b></p>	<p><b>Indian Long-billed Vulture (<i>Gyps indicus</i>)</b></p>

**FIGURE-2(A)**

**PICTURES OF THE RARE / ENDANGERED / THREATENED (RET) FLORA AND FAUNA REPORTED / RECORDED FROM THE CWLS**

	
<p><b>Hawksbill sea Turtle (<i>Eretmochelys imbricata</i>)</b></p>	<p><b>Olive Ridley sea turtle (<i>Lepidochelys olivacea</i>)</b></p>
	
<p><b>Marsh Crocodile (<i>Crocodylus palustris</i>)</b></p>	<p><b>Shark Catfish (<i>Wallago attu</i>)</b></p>

**FIGURE-2(B)**  
**PICTURES OF THE RARE / ENDANGERED / THREATENED (RET) FLORA AND FAUNA REPORTED / RECORDED FROM THE CWLS**



**FIGURE-3**

**PHOTO SHOWING THE TITLE OF THE PROJECT AND THE AGENCIES INVOLVED IN THE OVERALL DEVELOPMENT OF THE FORESTS, WILDLIFE AND GENETIC DIVERSITY AND THE WELFARE OF THE PEOPLE DEPENDENT ON THEM**

The objectives of the multi-agency project are not just preservation of the wildlife but to translate the ecological benefits into social and economic benefits by mainstreaming Coastal and Marine Biodiversity Conservation into Production Sectors. Sustainable production of fish and fisheries, the mainstay of life in the area; integration of wildlife conservation with habitat improvement; enhancement of floristic diversity by introducing the Mangroves from the other regions of India; protection of genetic diversity.

## **5.2 Role of the Project Proponent**

All the RET species listed (**Figure-2**) with the exception of Olive Ridley Sea Turtles and Shark Catfish are mainly limited to the CWLS. Their conservation is given due consideration and importance by the National/ International organizations including voluntary agencies

Project proponent is prepared for protection of flora and fauna of CWLS and around it in the project area. For protecting the sporadic nest grounds within a distance of 500 m on either side of the pipeline on either side of the mouth of the Gauthami Godavari River, the project proponent is prepared to provide nest guards (similar to tree guards) for protection of Olive Ridley Turtle Nests and fund forest Department for activites like deploying watchmen and engaging the services of voluntary organizations for protection of nests, eggs and hatchlings till they find their way in to the Bay of Bengal. All these activities shall be undertaken in



association with the Andhra Pradesh Forest Department (APFD) as a part of the Ridley Sea Turtle Conservation Project

In view of the ongoing scientific efforts under the direct supervision of MSSRF with the support of the State and Central Governments; international organizations like the UNDP and GEF, the project proponent, ONGC, is ready to support the efforts made by State and Central Governments for the ecological conservation of Coringa Wild Life Sanctruaty and around it.

## 6.0 **WILDLIFE CONSERVATION PLAN**

### 6.1 **Coringa Wildlife Sanctuary (CWLS)**

#### **The Coringa Wildlife Sanctuary is being managd under approved management plan for the period from 2013-14 to 2022-23**

The 'Coringa Wildlife Sanctuary' is situated in the East Godavari District of Andhra Pradesh, India. Characterized by tidal/Mangrove forests of the Godavari estuary, having specific biological and geological characteristics, it is the second - largest mangrove formation in India. Flora and Fauna of this sanctuary along with the habitat constitute a unique ecosystem, besides being highly sensitive and fragile zone, this sanctuary also acts as a prolific zone for shrimp, shell, fin-fish etc. Flora and Fauna occurring in the mangrove forests have the special ability to tolerate various degrees of salinity. During favorable and suitable conditions, the mangroves form an extensive productive eco-system of dense forests in the coast and function as reservoirs for several species of plants and animals associated with each other.

Coringa Wildlife Sanctuary is confined to the tidal forest area in the estuarine areas of Godavari and Bay of Bengal. Coringa sanctuary comprises of Reserve Forests of Coringa, Coringa extension and Bhiravapalem, extending over an area of 23,570 ha. It has got a unique ecosystem, characteristic of Tidal Forests that exist at the estuarine area, along with the special habitat that hosts various Fauna and multifarious organisms. The area was declared as Coringa Wildlife Sanctuary under section 26A of the Wildlife Protection Act, 1972 (Central Act No. 53 of 1972) vide G.O.Ms.No.45 EFS & Technology (For.III) 13<sup>th</sup> April 1998.

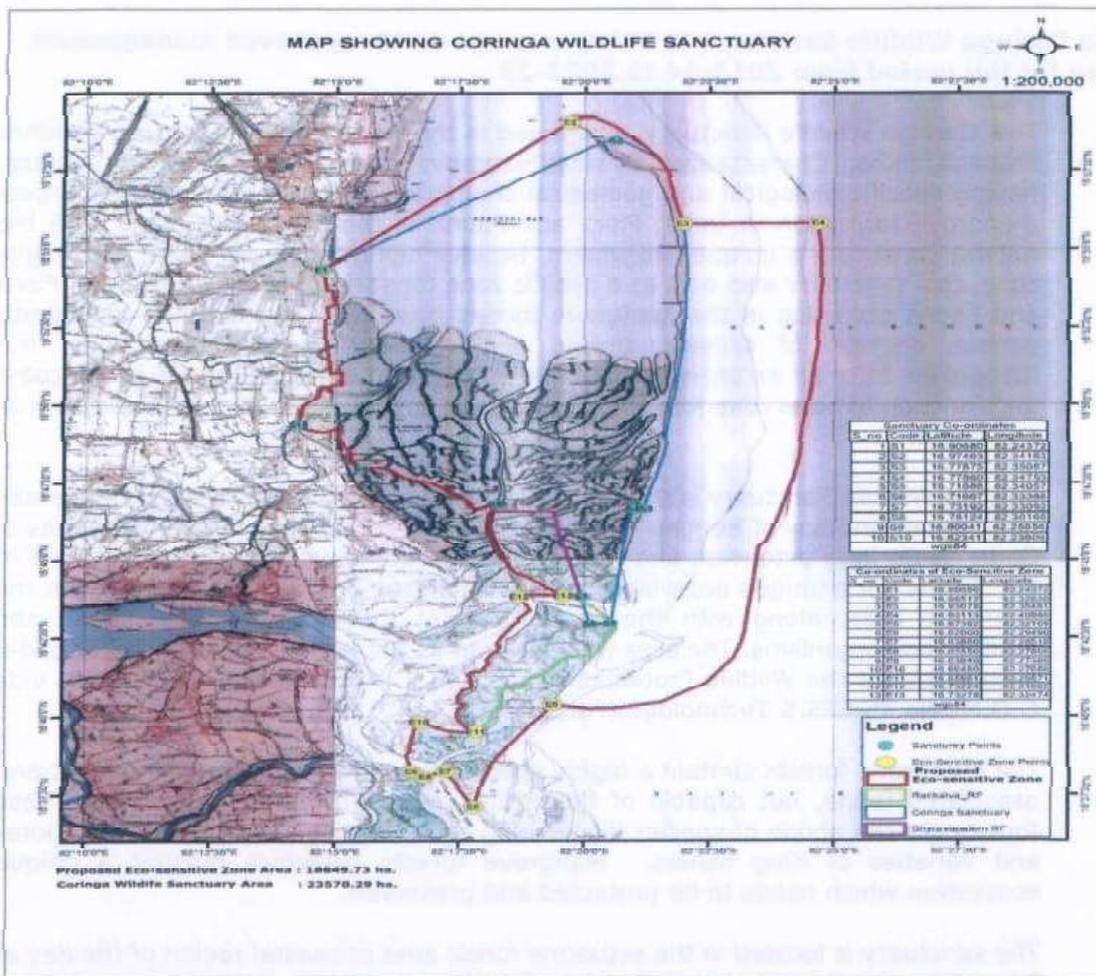
The mangrove forests contain a highly specialised community of plant species and associated fauna, not capable of flourishing under any other situations. These forests are the abode of species like Fishing cats, Dugongs, Otters, Brahmini kites and varieties of King fishers. Mangrove forests therefore present a unique ecosystem which needs to be protected and preserved.

The sanctuary is located in the estuarine forest area of coastal region of the Bay of Bengal (in the East Godavari District of Andhra Pradesh). Here, Godavari River (CORINGA) joins the back-waters of Bay of Bengal. Between this area and the sea, Hope Island blocks the direct connection between the sea and Godavari waters. As a result about 40% area of this sanctuary is only sea back-waters. Rest of the area is riddled with creeks and gets inundated with tidal waters. The peculiar nature of the soil and saline water allows only "MADA" (Avicennia) type of vegetation to come up in the area.



Mangroves are a highly productive ecosystem which cycle it's own vegetation and also transports the nutrients received from the land to the sea which are important for the near shore fish population which is commercially highly valuable. Mangroves play an important role in building up and extension of coastal soils through accumulation of sediments and protecting the shores. This vegetation acts as a very good natural coastal belt protecting the area behind it from cyclones etc.

This good cover of mangrove vegetation with it's habitat provides good nesting ground for the propagation of Salt water crocodiles. The canopy of trees and the ecosystem provides a habitat system congenial for special Birds, Mammals and insects. The Sea coast of the sanctuary is the home of Sea-turtles.





"Coringa Wildlife Sanctuary" is declared under sec. 18 of the Wildlife Protection Act 1972 (Central Act No. LIII of 1972) in 1978 through G. O. Ms. No. 484 Forests and Rural Development (For.III) Department dated 5-7-1978 and was notified in the East Godavari District Gazette No. 8 Dated 22-8-1978 and under section 26-A of wildlife protection Act, 1972 (Central Act No. 53 of 1972) in 1998 through G.O.Ms.No.45, Environment, Forests, Science and Technology Department (For.III) dated 13-4-1998 and was notified in the Andhra Pradesh state Gazette vide notification No. 199 dated 24-04-1998 (Annexure-1A). The sanctuary comes under IUCN category V.

## 6.2 Constitution and the Extent of area

The block wise forest area of Godavari Delta and the Sanctuary is presented in Table-14.

**TABLE-14**  
**BLOCK WISE FOREST AREA OF GODAVARI DELTA AND THE SANCTUARY**

Sr. No.	Name of R.F	Area (ha)	Area of CWLS
1	Coringa R.F.	4242.00	3156.54
2	Coringa Extension	19474.12	19441.70
3	Bhyravapalem	972.05	972.05
4	Masanitippa	1089.00	-
5	Kandikuppa R.F.	3484.00	-
6	Matlatippa	445.00	-
7	Ratikalva	2040.00	-
8	Balusutippa	476.00	-
<b>Total</b>		<b>32222.17</b>	<b>23570.29</b>

## 6.3 Area

Mangrove forests of Godavari delta extend over 32222.17 ha (322.22 Sq. Km.). Out of this, 235.70 Sq.Km of reserve Forest of Tallarevu and I.Polavaram mandals has been declared as a sanctuary under the Management control of Wildlife Management Division, Rajahmundry. The block-wise details are furnished in Table -1. All the above Reserve Forests are notified under section 16 of Madras Forest Act and Sec.15 of A.P. Forest Act 1967 and their position is intact. The entire sanctuary is covered by Coringa Reserve Forests, Coringa Extension Reserve Forests and Bhyravapalem Reserve Forests. Out of the total area of the sanctuary, vegetation cover occupies 11718.20 ha (49.71%) and water body is 11851.80 ha (50.28%) [GIS Lab A.P.F.D Statistics-2007 (IRS LISS-III)].



- i. Coringa Reserve Forest: Notified as Reserve Forest in G.O.Ms. No. 202 Revenue Dept. Dated 12-5-1888 to take effect from 15-6-1888.
- ii. Coringa Extensive Reserve Forest: Notified as Reserve Forest vide Fort Saint George Gazette No.36, Dated 5-2-1921. Notification copy of Coringa Extension.
- iii. Bhyravapalem Reserve Forest: Notified as Reserve Forest in G. O. Ms. No. 103-Forest and Rural Development (For.III), Dated 24-4-1974. Notification copy of Bhyravapalem Reserve Forest.

#### **6.4 Approach and Access:**

The name of Coringa Wildlife Sanctuary is drawn from Coringa Village which is accessible by road from Kakinada town. Kakinada town is connected by train with major cities like Hyderabad, Chennai, Kolkata, Visakhapatnam, Vijayawada etc. Samalkot junction is the nearest railway junction in South Central railway. The Kakinada town is also approachable by sea, as it is a major port. One can also reach Rajahmundry by air and then reach Kakinada by road or train (Distance 70 km.) The Sanctuary can be reached by Road up to Ramannapalem village. But the sanctuary can be seen only through boat or launch as the sanctuary is a wetland, connected with streams and creeks originated from the river Godavari and the tidal waves of Bay of Bengal.

#### **6.5 Statement of Significance**

Coringa Wildlife Sanctuary is an important wetland as it covers the major portion of mangrove forests in the delta of the Godavari river. The coastal and marine environment of this region plays a vital role in human welfare by its immense biological and mineral resources and the life-supporting systems it provides. The area is a major habitat and breeding ground for several species of fish, prawns and holds one of the sizeable populations of fishing cats in India. The mangrove forests are the first line of defense against the tropical cyclones which frequent the area. Hope Island, which is a part of the Coringa Wildlife Sanctuary plays an important role in preventing the sea waves reaching the Kakinada Port and the city protects the port area. Coringa Wildlife Sanctuary and its adjoining landscape in Andhra Pradesh plays a crucial role in regional, economic and livelihood development besides providing various ecosystem services, essential as life-supporting system for the East Godavari region.

#### **6.6 Geomorphology Physical Features**

Coringa does not show any major topographical features, except for the Kakinada coast, which is largely a low-lying area. The lower part of the delta is made of a series of sand ridges interpreted to be ancient beach ridge forms, due to the high waves and detritus. Geomorphology of Coringa matter brought by the river Goutami-Godavari from its drainage basin. Fractures have controlled the drainage and truncated some of the river courses. Geomorphology of this area is classified as mudflat, mangrove swamp, sandy beach and Sandy Island.



### **River dominated allochthonous type**

Characteristic of coast at low tidal range setting: In this case, freshwater discharged by Godavari River and sediment leads to the rapid deposition of terrigenous sands, silts and clay to form "pro-delta" sediments. The delta geometry consists of multiple branching distributaries leading to form elongate, finger-like protrusions. The result is the formation of highly crenulated coastline with shallow bays and lagoons.

### **Tide dominated geomorphologic setting**

Observed near Coringa sanctuary, along Matlapalem and Ramannapalem creeks. These tides are responsible for the dispersion of the sediments brought to the coast by the Godavari River, forming elongate sand bodies. Wave power is often quite low because of frictional attenuation over broad inter-tidal shoals. They also protrude seaward along the promontories, which separate the tidal channels.

### **Composite river and tide dominated geomorphologic setting**

Observed near Bhairavapalem, represented by a combination of high wave energy and high river discharge. Sand debauched by the river is rapidly redistributed by waves along the shore to form extensive sand sheets. Much sand deposited on the inner continental shelf during lower sea level is reworked landward during marine transgression and subsequent sea-level still stands. The result is a coastal plain dominated by sand beach ridges, narrow discontinuous lagoons with an alluvial plain to landward.

### **Soil**

The entire area in the mainland is plain as a table top but riddled with a network of streams and creeks. However, the Hope Island which is also known as "Godavari Sandspit" is a nice sandy seashore. The deltaic region mostly contains black cotton soil with deep extensions in sub surfaces. The soils are moderately drained. The texture of the soil is 'silt clay' with 50-65% of clay. The dominant clay mineral is steatite. These soils are low in organic carbon, which ranges from 0.3-0.5% indicating rapid mineralization. The sediments are of silt clay in nature, where silt levels increased in the direction of Gautami-Godavari Estuary and clay characterized. The Gaderu/seaward channels with a strong neritic incursion had higher salinity (>20%) compared to Coringa and/or the estuary. Most of the sediments in mangroves are characterized by mud Clay of mud and sandy mud. Sand content in Mangrove sediments is generally less than 10%, silt is predominant in mangrove areas and those areas which contain silt content more than 50% are characterized by dense Mangrove vegetation. Though the clay content ranges from 15 to 90%, yet the majority of the sediments contain 30 to 50% clay only. Tidal channels and creeks of the Mangroves are characterised by Sandy mud, and sandy sediments. However, in some places clayey sandy silt and sandy clay sediments are found in which sand content is more and ranges between 3 to 89%, 3 to 90% and 10 to 76% whereas silt content ranges from 1 to 52% and clay content ranges from 4 to 84%.



Soils in the mangrove belt are characterized by high salt and water content. Generally, these soils are highly slushy muddy and very sticky with less oxygen component and are clayey with abundant Hydrogen Sulphide. They are drained soils, often semi-fluid and poorly consolidated, and in parts with abundant humus which is called mangrove peat, a fibrous soil composed largely of remains of roots and other woody structures and silt brought in, from the sea by the tidal action, which contains shells and other debris. The alluvium deposited, helps in building large quantities of algae, which form major food resource for the fauna of the mangroves. These mudflats and soil in mangroves, which have formed through several biological processes, form various niches for different organisms to thrive, thus making the mangroves a unique ecosystem.

### **Lagoon**

Lagoon sediments are mainly muddy sand and sandy in nature. The average content of sand is about 33.9% and content varies between 6 to 80%. The silt content varies between 10 to 37% and the average content of silt is about 21.3%. The clay varies between 5 to 82% and the average content of clay is 44.8%.

### **Terrain**

Coringa mangroves are bordered on the northern side of Kakinada Bay and on the western side mainland formed of deltaic and flood plains. The coastal strip north of Kakinada consists of windblown sand and sand dunes which succeed landward by laterites, sandstones and khondalites. The southeastern part has marshy islands known as Hope Island.

### **Shoreline Changes – Sandspit Formation**

A sandspit has formed near Kakinada Bay over a period of 100 years. Based on British Admiralty charts, Hydrographic Survey of India charts and field investigations, (Reddy and Prasad, 1982) have presented the possible reasons for the sand spit formation and growth (Map).

Godavari River was discharging into Coringa Bay (present Kakinada Bay). During 1848-1851, the major confluence of Godavari River shifted its course from Coringa Bay to about 5 miles south-east. Dam construction at Dowleswaram (1846-1852) and deforestation in Godavari basin during this period could have reduced the flushing capacity of the river and increased sediment transport, which ultimately resulted in silting up of Coringa creeks. Silting up of Coringa creeks caused the opening of the major branch of Godavari River in the open sea near Hope Island. The increased sediment input resulted in the formation of a shoal in 1851 (Sacramento shoal). Littoral currents (flowing north) tend to deposit the littoral drift material, while tidal currents (perpendicular to shore) tend to remove the deposited material. Since tidal currents were weak (due to large area of bay mouth), littoral currents dominated the deposition of littoral drift materials and the shoal developed into a sand spit and started growing northward along the direction of the littoral current. With an increased growth rate of sandspit northward, the bay entrance (between Sandspit and mainland) became reduced during 1893-1970. Reduced bay entrance caused strong tidal currents that carried littoral drift materials into the bay and the spit deflected in North-West direction. The strong ebb currents from



bay removed materials and caused deepening of the bay and thus the sand spit has attained a quasi-equilibrium state.

As an estimate 9.2 km length of Andhra Pradesh coast is affected by erosion. Erosion of coastline is noticed along the Bay of Bengal at Uppada, Vishakhapatnam, Bheemunipatnam and on the northern side of the Godavari River, i.e., from the Godavari River mouth to the tip of Hope Island. Elongation and enlargement of Hope Island in the north and northwest directions are remarkably visible from the increase in the length of sand spit in the last century.

## 6.7 Water Sources

### Drainage Directions

The river Godavari after traversing a distance of 1,400 km divides into two branches – the Gautami (major branch) and the Vasista (minor branch) at the township of Dowleswaram about 60 km from the mouth of the sea. The sanctuary area can be described as a part of the Godavari Estuarine Delta Complex. The Godavari river channels in the estuary zone are funnel-shaped and are wrapped by numerous tidal creeks. These creeks are separated by extensive tidal-flat surfaces. Small channels/creeks are detected in the dense mangrove forest using satellite. Mudflats with mangrove forests are more extensive along the estuarine part of *Gautami river*. The *Gautami branch of Godavari flows South-East and opens into the Bay of Bengal at two places, namely Bhyravapalem and Kothapalem villages*. The *Gautami Godavari is connected to Kakinada Bay by two major streams namely, the Coringa River at Yanam and the Gaderu River at Bhyravapalem*. There are many other major streams and creeks such as Chollangi creek, Matlapalem canal and many other creeks which ultimately join either the Kakinada Bay in its Southern part within the sanctuary or join the two main rivers i.e. Coringa and Gaderu, which cut across the entire sanctuary and ultimately join the sea. The tidal effect is felt up to 48 km in the major branch and about 40 km in the minor branch with mean tidal differences between the high and low tide being 134 and 53cm respectively. In between these two estuarine mouths, a swampy backwater area exists, covering an area of 15,000 ha. Further, major branch the *Goutami is connected by a multitude of tidal creeks interspersing the mangrove swamps on its eastern end and some of these connect to the shallow coast of Bay of Bengal near the township of Kakinada*.

### The Major Rivers in the Sanctuary:

#### i) *Coringa River:*

This is a small river starting on the Western side of Yanam town cutting across the four easterly delta regions line to the west of the sanctuary and enters the sanctuary area near Coringa village in the eastern side of the sanctuary and travel towards the easterly direction and joins the Kakinada Bay.

#### ii) *Gaderu River:*

This river arises about 5 km. down to Yanam town near Bhyravapalem village. It enters the sanctuary area at the southern tip near Bhyravapalem and divides the



sanctuary area into two parts, travelling towards North and ultimately joining the Kakinada Bay.

## 6.8 Biodiversity

The Coringa WLS is rich in bio-diversity, principal components being phytoplankton, zooplankton, macrophytes and aquatic avifauna. The bio-diversity of this Wetland comprises of Phytoplankton:137 species; Zooplankton: 81 species; 138 fish species, 34 species of crabs, 110 species of molluscs, 12 Prawn species, 269 bird species (including water/terrestrial/migratory/ local migratory/local residents etc.). The major plant invasive alien species includes *Prosopis Juliflora*.

### Mammals

Nine species of mammals have been recorded. Of which the endangered species like the Fishing Cat – *Prionailurus viverinus*, Indian Smooth coated Otters – *Lutrogale perspicillata* were sighted during the field visits.

### Birds

There were around 257 species of birds identified from the Coringa Wildlife Sanctuary. About 120 species of resident and migratory birds (Egrets, Cormorants, etc.) depend on this area for breeding and nesting. Coringa WLS is an extremely essential area for waders and mangrove birds and has been designated as an IBA. This area is reported to have been used by about 20,000 waders in a year and species such as Oriental White-backed Vulture (*Gyps bengalensis*) and Long-billed Vulture (*G. indicus*) are also found here. Among the near threatened species, Painted stork *Mycteria leucocephala*, Oriental White Ibis (*Threskiornis melanocephala*) and Ferruginous Pochard (*Aythya nyroca*) were also reported from Coringa Wildlife.

### Reptiles

There are about 25 reptiles have been identified in and around Coringa Wildlife Sanctuary. Sea Turtles (5), Snakes (16), and Lizards (4) etc., are the reptiles found in the sanctuary. Olive Ridley Sea Turtles *Lepidochelys olivacea* which is listed under "schedule I" of IWPA 1972 and "Vulnerable" as per the IUCN Red List.

### Flora

Mangrove vegetation in the Godavari estuary is tropical inter-tidal forest composed of halo-tolerant plant species. They are often located in muddy, anoxic soils, lagoons and river deltas where their complex of aerial roots provides support and gas exchange. Mangroves are viviparous and propagate by their ability to quickly establish under the parental tree or float away and colonize a new area. Mangrove vegetation consists of *Excoecaria agallocha*.

### Ecosystem Services

- ✓ Supports livelihoods for the fishing community
- ✓ Provides essential products and services such as oxygen, food, water and medicinal to humans.
- ✓ Regulation of water regimes and stream flows.



- ✓ Ground water recharge
- ✓ Nutrient recycling
- ✓ Buffer communities against floods and cyclones
- ✓ Support a variety of life forms through extensive food webs
- ✓ Habitat to diverse flora and fauna, including resident and migratory species.
- ✓ Habitat for migratory species such as water birds and fish
- ✓ Provide recreational Opportunities
- ✓ Enhance landscape aesthetics
- ✓ Stabilize local climate.
- ✓ Sink for sediments
- ✓ Cultural and religious values
- ✓ Medicinal Plants

### **Socioeconomics and Livelihoods**

Fishing is normally the primary livelihood of local communities residing along the coast. However, seasonality plays a major role in determining the availability of fish catch.

### **Importance of Mangroves**

#### **Ecosystem Service Provided by Mangroves of East Godavari Coastal Region**

##### Provisioning services:

- i) **Food:** Mangroves here are permanent or temporary habitats for many aquatic animals such as fin fish, shell fish, crustaceans and are hatching and nursery grounds for many marine fish. It is estimated that up to 80percent of regional fish catches are directly or indirectly dependent on mangroves.
- ii) **Timber and fuel wood:** The villagers of this region mostly use the timber of Mangrove flora to build houses and make furniture, rafters, fences, bridges, poles, boats and as fuel wood.
- iii) **Medicines:** There were a few traditional uses for mangroves and associates like *Caesalpinia bonduc* (L.) Roxb., *Clerodendron inerme*, *Dalbergia spinosa* Roxb. *Derris trifoliata* Lour. and *Hibiscus tiliaceus*. The bark of *Ceriops decandra* is prepared traditionally to enhance the durability of the fishing nets. The barks of many species produce gums and tannins, which are still used for curing leather and strengthening fishnets.
- iv) **Other non-timber forest products (NTFPs):**The breathing roots of *Sonneratia* species are used to make corks and fish floats. Mangrove plants are sources of sodium, and the ash of some species, such as *Avicennia*, is used as soap.
- v) **Enrichment of Coastal Sea:** The coastal vegetation like Algae, seaweeds and mangroves play a significant role in enriching the coastal sea. They transport the dissolved organic matter, nutrients etc., besides serving as a nursery area for the larvae and juvenile marine animals and thus support the benthic population of the sea.



- vi) **Fawning ground for commercially valued fish, crabs etc.:** These forests are the home ground for a variety of commercially important fish, prawns, crabs and other species in their early stages, thus providing a big economic source to the country in general and state in particular.

Relating services:

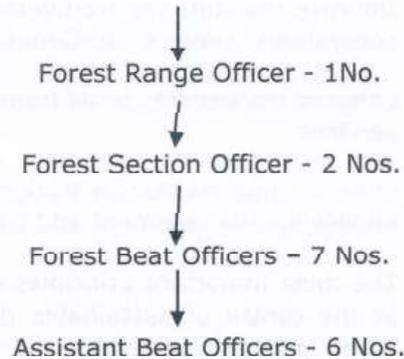
- i) **Protecting the shoreline:** Mangroves in this region acting as physical buffers between the elements and the shore and can absorb 70-90 percent of the energy of the waves, depending on their ecological condition. The mangroves of Coringa serves as a big barrier, safeguarding the Kakinada town. The opportunity cost of saving a life by retaining mangroves and it was assessed to be Rs. 11.7 million per life saved.
- ii) **Carbon sequestration:** Mangroves are important carbon sinks. They sequester about millions of tonnes of carbon per year. A 20-year-old plantation of mangroves has a carbon burial rate of 580 grams per square meter per year.
- iii) **Promoting accretion:** Mangroves function much like a living grove to build up sediment, stabilizing the ground and fixing mud banks. It is estimated that there is an annual sedimentation rate ranging between 1 and 8 millimeters in mangrove areas that are expanding in land area. Therefore, they prevent erosion.
- iv) **Flood attenuation:** Mangrove habitats function as gigantic sponges to trap and slowly release surface water. A one-acre wetland can typically store about three acre-feet of water.
- v) **Trapping pollutants:** Mangrove roots that help trap sediments also function as filters to sift out pollutants reaching the sea from inland waters.
- vi) **Support for fauna:** The canopy of mangrove trees provides an essential terrestrial habitat for fauna which prefer arboreal life. Mangrove soils are soft; mud mixed with sand and contains fauna which is not found in sandy and rocky shores. These forests are the abode of species like fishing cats, Otters, Wolves, and Rhesus Monkeys etc., Apart from these residential species a number of birds are attached to these forests since they provide food for them in the form of fish, crabs, micro organisms, mud skippers etc.

## 6.9 Administrative Setup

Coringa Wildlife Sanctuary is under the administrative control of Andhra Pradesh Forest department and comes under the Jurisdiction of Wildlife Management Division, Rajahmundry.

The Forest department organization structure is in place.

Divisional Forest Officer (IFS) - 1 No.



At present 1 Divisional Forest Officer, 1 Forest Range officer, 1 Forest Section Officers are present. Out of 7 Nos sanctioned posts of F.B.Os, 2 posts are vacant and Out of 6 Nos sanctioned posts of A.B.Os, 5 posts are vacant. So human resource needs to be supplemented.

**Vision:**

“By 2023, Biodiversity of Coringa Wildlife Sanctuary (CWLS) and its surroundings is valued, conserved, restored and wisely used, maintaining a healthy mangrove, estuarine and Bay ecosystem services and sustaining benefits essential for people living in the region”.

**Goal:**

Take effective and urgent action through “Conservation and restoration of ecological integrity and to ensure that by 2023 the Godavari Riverine, Estuarine, Coastal, Marine and Mangrove ecosystems of Coringa Wildlife Sanctuary are resilient and continue to provide essential services, thereby securing the variety of life in the region, and contributing to human well-being and poverty eradication”.

To ensure this, pressures on biodiversity are reduced, ecosystems are restored, biological resources are sustainably used and benefits arising out of utilization of genetic resources are shared in a fair and equitable manner; adequate financial resources are provided, capacities are enhanced, biodiversity issues and values mainstreamed, appropriate policies are effectively implemented and decision-making is based on sound science and the precautionary approach.

**Strategic Goals and Objectives**

To reach the above broad goal the following strategic goals and objectives are defined

**Strategic Goals**

**Strategic Goal A:** Address the underlying causes of biodiversity loss by mainstreaming Biodiversity

**Strategic Goal B:** Reduce the direct pressures on biodiversity and promote sustainable use.



- Strategic Goal C:** Improve the status of biodiversity by safeguarding ecosystems, species and Genetic diversity.
- Strategic Goal D:** Enhance the benefits to all from diversity and ecosystem services.
- Strategic Goal E:** Enhance implementation through participatory planning, knowledge management and capacity building.
- Principles:** The most important principles are that human beings are at the centre of sustainable development concerns. The other relevant principles on which the objectives are premised include: right to development; precautionary approach; economic efficiency; entities with 'incomparable' value; equity; public trust doctrine; decentralization; integration; preventive actions; and environmental offsetting. These principles, which have an established genealogy, provide the necessary overall guidance for implementation of objectives which are broad-based and relate to current perceptions of key threats and constraints to biodiversity conservation. These may accordingly evolve over time. The objectives are to be realized through various strategic interventions by different public authorities at central, state and local government levels. They are also to form the basis of diverse partnerships.

### **Objectives:**

1. Protecting critical habitats of Coringa sanctuary both on the land-ward and the sea-ward sides including the Bay and benthic habitats.
2. To improve natural resource base and to endorse harmony, synergy and linkages between conservation and management of biological diversity by empowering local communities, improving livelihoods by adopting sustainable practices that increase long term food security and reduce poverty while ensuring equity, transparency and accountability through society and community.
3. Enhance the capacities of communities and sector institutions for effective implementation of biodiversity-friendly sector plans.

### **Problems in Achieving Objectives:**

*Inadequacy in addressing the biodiversity related issues from a landscape/seascape level perspective.*

### **SWOT ANALYSIS:**

#### **Strengths:**



- Mangrove area of Godavari region is rich in flora and fauna diversity that generates significant ecological and economic benefits such as shoreline protection, sustaining livelihoods and carbon sink services.
- Diverse physiographical and ecological features constituting the desired habitat conditions for various species to exist.

**Weakness:**

- Acting of anthropogenic pressures of highest degree on the Bay and Mangrove areas from adjoining villages.

**Opportunities:**

- Availability of excellent scenic and suitable sites for various Eco-tourism activities.
- Strong political will for development of the communities through various Rural Development Schemes.
- A structured national and international support programme (UNDP/GEF/GoI/GoAP) in ongoing programmes with well established institutional arrangements.

**Threats:**

**Natural threats:**

- Cyclones, gales and occasional tsunamis are the natural threats to the mangrove ecosystem.
- Accretion of large amount of sand due to tidal wave actions and growth of sand spit towards the port.
- Invasive alien species; weeds such as *Prosopis juliflora*, which often occupy deforested mangrove areas and restrict the re-growth of mangroves

**Human threats:**

- Habitat degradation/conversion by clearance of mangrove forests for development projects, land reclamation for shrimp farming and aquaculture and diversion of inland freshwaters.
- Over exploitation, destructive fishing practices and consumption of coastal and marine resources.
- Chemical contamination by aqua farms, Urban and Industrial effluent discharges in to mangrove forest areas.
- Oil pollution from oil leaks, oil and natural gas explorations by ships / motor boats.



## **Other Challenges**

### **Coastal and offshore developments**

- Dredging & Disposal
- Power plant cooling water intake and outfall
- Desalination plants – Brine disposal
- Deep sea mining and oil prospecting
- Deep sea Drilling Projects
- Barotrauma” – Impact of Human generated noise on marine life
- Oxygen Minimum Zones (OMZ)

### **Overexploitation of coastal & marine resources**

- Environmental degradation
- Low levels of investment in alternative coastal livelihood programs
- Mariculture
- Tourism

### **Coastal Governance**

- Lack of institutional coordination
- Lack of Monitoring, Control and Surveillance (MCS) of Fishing operations
- Illegal, unregulated and unreported (IUU) catches

### **Challenges faced from maritime traffic:**

- Noise
- Abrasion from grounding
- Scarring from anchoring and propeller turbulence

### **Challenges from the Aquaculture**

- Introduction of non-native species, and Leaching of toxic anti-foulants into coastal waters.
- Declining water quality.
- Release of dead and diseased fish.
- Losses of shrimps and other crustaceans.
- Human health issues

### **Challenges - Oil & Gas sector:**

- Oil and gas exploration and production
- Noise & Vibration
- Physical destruction
- Operational discharges and emissions
- Drill cuttings and Drill fluids
- Water discharges
- Air emissions
- Solid waste discharge



- Oil spill
- Impact on Fishery/ Fishery related livelihoods
- Light pollution near rigs -serious threat to nesting behavior and hatchling survival
- Human health
- Social pressures and other secondary impacts

### **Challenges – Fisheries**

- Destruction of mangrove, wetlands, and other sensitive aquatic habitat by aquaculture projects.
- Conversion of agricultural land to ponds.
- Water pollution resulting from pond effluents.
- Excessive use of drugs, antibiotics, and other chemicals for aquatic animal disease control.
- Inefficient utilization of fish meal and other natural resources for fish and shrimp production.
- Salinization of land and water by effluents, seepage, and sediment from brackish water ponds.
- Excessive use of ground water and other freshwater supplies for filling ponds.
- Spread of aquatic animal diseases from culture of organisms to native populations.
- Negative effects on biodiversity caused by escape of non-native species introduced for aquaculture, destruction of birds and other predators.
- Conflicts with other resource users and disruption of nearby communities.

### **6.10 Eco-Development Committees**

The aim of the eco development activities is to provide a package of site specific ecologically friendly measures to enhance alternative income generating activities and judicious use of bio-mass resources by the local people there by help relieve pressure on the resources of protected areas. This component aims at 3 distinct outputs.

1. Eco development through protection, regeneration and increase productivity of Forest resources through joint forest management.
2. Improvement and diversification of Non-forest related activities like Agriculture, Horticulture.
3. Activities connected with other line Departments like live stock improvement use of alternate energy sources.

Due to implementation of the above activities the success achieved in bringing a change in the attitude of the people towards mangroves and their active participation in the conservation of mangrove is only a beginning of an era and this is to be nurtured and sustained in future. The success would not have been achieved but for the cooperation and coordination of M. S. Swaminathan Research Foundation, Kakinada (NGO) which motivated the people and acted as an interface between people and Forest Department. All the Eco development Committees



have started which is and it is the first step in the direction of a committed partnership between the Government and local community.

### **6.11 Community based Eco-Tourism (CBET)**

More than 75% of the state population are living in rural areas, where in the absence of worthwhile income generation opportunities, people have to largely live on subsistence agriculture, fishing sale proceeds of NTFP collected from the forests and occasional labour provided by various government departments. This concept of 'Community Based Eco-tourism' would go a long way in providing better income generation options to the rural people. This would also mean less dependence upon the natural resources in as far as it amounts to removal of produce from these areas. There would be, moreover, greater incentive in conservation of local traditions, culture, heritage and environs, as these would be seen as aiding in local economy rather than an impediment to it.

Community Based Eco-tourism (CBET) is a responsible tourism that, besides being ecologically and culturally sensitive, helps the local communities in realizing the social and economic benefits. Basically, it is an involvement of local communities in the eco-tourism that would support their livelihood needs and consequently create their direct stake in conservation of local culture, ecology and environment.

### **6.12 Need for Community-based Ecotourism**

One of the major and viable options to address the above issue is to adopt "Community Based Eco-Tourism" (C.B.E.T) model, as it offers the following benefits both to the community, natural resources and the protected areas. There will be benefits for an individual or family: Accommodation based in local homes (Homesteads) will channel revenue directly to the families and will also acquire managerial skills.

### **6.13 Benefits to the Local Community**

C.B.E.T will generate direct revenue for community members, in addition to upgrading housing standards while avoiding huge public infrastructure expenses.

Community-based Ecotourism projects are increasingly seen as providing an *incentive for people to manage the wild lands and wildlife in a sustainable way*, since the economic benefits distributed to communities depend on this wise management. Many nature tourism projects assume that nature tourism can be a powerful force for conservation by providing benefits to local people. But, meeting such conservation objectives requires careful project design so that benefits are appropriately targeted and, in fact, act as an incentive.

### **6.14 Criteria for Sustainable Community-Based Eco-tourism**

A.P. Forest Department ensured the following for sustainable Community Based Eco- Tourism to support economic development of local communities:

- i. Local participation
- ii. Empowerment of local people



- iii. Participation in the project cycle
- iv. Creating stakeholders
- v. Linking benefits to conservation
- vi. Distributing benefits
- vii. Involving community leaders
- viii. Using change agents
- ix. Understanding site-specific conditions
- x. Monitoring and evaluating progress

## 6.15 Proposed Activities

### Mangrove Restoration

Nearly an area of 1694.85 ha has already been regenerated within the sanctuary area from 1987 to 2019. The standard method of Fishbone channelling shall be adopted for regeneration. It has been observed in all the planted areas earlier, many of the natural fish nursery ponds have disappeared as they have not been given due importance at the time of designing itself. Simulation or restoration of mangrove ecology shall be based on nature's design. It is recommended to explore possibilities to restore all-natural breeding ponds of the fish the ceased to exist and other invertebrates. Care should be taken while regenerating the areas such that all-natural aquatic ponds are protected and the courses of water inflows into them shall be maintained.

The areas outside the sanctuary adjacent to the western border wherever possible should also be taken up for plantation to maintain the cushioning effect for the sanctuary. All the encroached abandoned aquaculture farms shall be brought under the mangrove plantations.

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### Methodology and Techniques

Restoration of the mangroves shall be done only when the salinity of the degraded area is brought down. In order to reduce the salinity, fishbone type canals are to be dug and tidal flushing and draining of stagnant water is facilitated. This results in brining the salinity levels to 60 ppt in summer to fresh water level during monsoon seasons. After a buffer period of three months, the nursery shall be raised, mangrove saplings are planted along the trapezoid shaped canals in the degraded areas. Canals are designed like fishbone in order to facilitate easy inflow and outflow of tidal water. The main canals shall be dug at an angle of 45° to the natural creek, while the side canals are dug at an angle of 30° to the main canal. This needs a preplanning of marking canals using Pegs and chalk powder. The canal dimensions shall be determined as per the contour levels and the tidal amplitude



of the degraded area chosen for restoration; the canals are to be dug in a trapezoidal shape in order to plant the saplings at the mid level of the canal. This is to ensure that the plants receive tidal water, but at the same time they are not submerged. Geomorphology and hydrology in mangrove restoration based on the contour survey and hydrology study, the canal depths and dimensions shall be fixed, corresponding to the topography and tidal amplitude of the selected restoration site. The topography study reveals whether the areas lying close to the bunds of creeks /rivers or elevated (levee) compared to the areas inside. The levees are formed due to the deposition of silt during floods. Secondly, the soil subsided in the clear-felled area due to changes in bulk density, making the topography saucer-shaped. As a result, tidal water entering during the highest of the high tides stagnates in the saucer shaped area due to the elevation of the edges. The temperature and the salinity of the stagnant water increases and shoots up to 114 ppt during summer. This phenomenon prevents natural regeneration of the mangroves and thus enhances the process of degradation. The area gets flooded only during the monsoon period and cyclones and storms.

The **dimensions** of the canals were determined based on the contour levels and tidal amplitude. The top width of the main canal can be between 3.0 m and 2 m and the respective bottom width could be between 1.0m and 0.4m depth. The dimensions of the side canals shall be 1.2 m top width, 0.3 m bottom width and 0.40m depth. The distance between the two side canals at the maximum 12.5m during the first year of plantation. The planting of mangrove saplings shall be done 2 m apart along the canals at about 20 cm down the slope. In the subsequent years, distance between side canals will be reduced up to 8 m in order to ensure dense canopy. In case the canals are dug closely the dimension of the side canals shall be reduced accordingly to 1.25m top-width, 0.2m bottom width and 0.4 m deep.

Mangroves namely ***Aegiceras cornicularum*, *Bruguiera gymnorhiza*, *Rhizophora apiculata*, *Rhizophora mucronata* and *Xylocarpus moluccensis*** shall also be planted to ensure genetic diversity. Eight-month-old mangrove saplings raised in the nursery may be used for planting. The mangrove saplings shall be planted along the slopes (20-25cm from the top) of the canals with an escapement of 2 m.

#### **Desilting:**

The bunds formed by the deposition of the excavated soil during canal digging will silt the canals during the monsoon seasons. The silted canals have to be de-silted before the onset of summer, because during summer the tidal amplitude is generally low. Tidal flushing is very important during summer because the soil salinity will shoot up due to high temperature and cause damage to the roots of the seedlings. Such seedlings will be replanted in the following monsoon season. The survival percentage is measured in the initial period for better monitoring. Initially the growth rate was slow and after 2 to 3 years the seedling growth rate was faster. The natural regeneration of the seedlings also occurs simultaneously. After four years, the planted saplings start bearing fruits, which will regenerate, and the density of the area will increase.



The trenches are silted with the flow of water during high tides resulting in decrease of the depth of the channels. Hence, if the channels are not de-silted, the flow of the water will be reduced and consequently with lack of fresh water the young seedlings may tend to damage. So the desilting the channels is necessary in the interest of the plantations. Hence, it is proposed to take up desilting of channels in the old channels with 0.15cm depth restricting to 40% area of the total areas.

#### **Removal of Exotic Species like Prosopis Juliflora and Other Thorny Species:**

Exotic species like *Prosopis juliflora* are coming up sparsely along the creeks in the Sanctuary. Its occurrence and increase is an unhealthy for the regeneration of mangroves. Hence, it is proposed for removal of the species is proposed during plan period.

#### **Enrichment planting in Mangroves:**

Still small pockets of unplanted areas are available for regeneration and they may be taken during planting season in the plan period. Certain areas damaged and needs for rechannelling. Hence, it is proposed to take up Enrichment planting in the gap areas during the plan period.

#### **Conservation of Sea Turtles (Olive Ridley)**

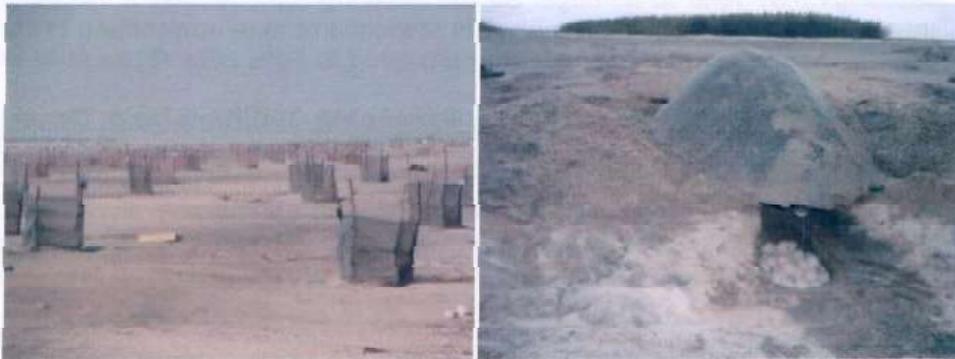
##### **Protection of Turtle nests:**

The lifespan of sea turtles has been speculated at 80 years. It takes decades for sea turtles to reach sexual maturity. After mating at sea, adult female sea turtles return to land to nest at night. Generally, females return to the same beach where they were hatched. This can take place every two to four years in maturity.

The mature nesting female hauls herself onto the beach and finds suitable sand on which to create a nest. Using her hind flippers, she digs a circular hole 40 to 50 centimetres (16 to 20 in) deep. After the hole is dug, the female then starts filling the nest with a clutch of soft-shelled eggs one by one until she has deposited around 50 to 200 eggs, depending on the species. Some species have been reported to lay 250 eggs, such as the hawksbill. After laying, she re-fills the nest with sand, re-sculpting and smoothing the surface until it is relatively undetectable visually. The whole process takes thirty to sixty minutes. She then returns to the ocean, leaving the eggs untended.

The hatchling's gender depends on the sand temperature. Lighter sands maintain higher temperatures, which decreases incubation time and results in more female hatchlings. Incubation takes about two months. The eggs in one nest hatch together over a very short period of time. When ready, hatchlings tear their shells apart with their snout and dig through the sand. Once they reach the surface, they instinctively head towards the sea. Only a very small proportion of each hatch (usually 0.01%) succeeds.

Every year Olive ridley sea turtles visit the coastal districts and lay eggs during the month of December to March and proceeds up to June of succeeding year. Young turtles come out of the hatched eggs and join the sea. The main predators are Jackals, Foxes, Wild boars which feed on eggs. Monitoring the hatching of sea turtles was taken up in and around the Coringa Wildlife Sanctuary during the plan period.



#### **Conservation of Major Bird Congregation sites:**

Around 257 species of birds identified from the Coringa Wildlife Sanctuary. About 120 species of resident and migratory birds (Egrets, Cormorants, etc) depend on this area for breeding and nesting. Coringa WLS is an extremely essential area for waders and mangrove birds, and has been designated as an IBA. This area is reported to have been used by about 20,000 waders in a year and species such as Oriental White-backed Vulture (*Gyps bengalensis*) and Long-billed Vulture (*G.indicus*) are also found here. Among the near threatened species, Painted stork *Mycteria leucocephala*, Oriental White Ibis (*Threskiornis melanocephala*) and Ferruginous Pochard (*Aythya nyroca*) were also reported from Coringa Wildlife Sanctuary. Hence, there is proposal for Conservation of Major Bird Congregation sites inside the Sanctuary during the plan period.

#### **Research and Monitoring:**

Research and monitoring are very significant in strengthening wildlife management. Qualitative and quantitative inventory of floral and faunal diversity studies on their habitat requirements, ecological aspects, dynamics of change etc., are essential for better management of the Protected Areas (PAs) as well as non-PAs. The management of Coringa wildlife sanctuary firmly believes that scientific research, monitoring and training are key tools for successful wildlife management. At the most fundamental level, scientific research helps generate baseline data on key floral and faunal elements and this in turn feeds into a longterm data base.



Research approach shall generate necessary information pertaining to the following research priorities of the P.A.

- A) P.A. Management:
- i. Zonation and PA boundary with reference to the types and extent of various eco-systems, and animal ranges
  - ii. Impacts of PA management
  - iii. Impacts and control of forest fire
  - iv. Fragile eco-systems or habitats
  - v. Key species requiring attention
  - vi. Connectivity with surrounding areas
  - vii. Population relocation initiatives
  - viii. Community based eco-tourism
- B) PA-People Interactions:
- i. Impacts of legal or customary human uses such as grazing and NWFP collection
  - ii. Illegal human activities: encroachment, poaching
  - iii. Injuries or death to human, livestock and crop depredation by wildlife.
- C) Village Eco-development:
- i. Structure and dynamics of local communities; cultural heritage and institutions; traditional knowledge systems
  - ii. Socio-economic: tenure rights, participatory processes in traditional organizations, access to, use and management of resources
  - iii. Income generation opportunities: subsistence employment opportunities
- D) Need for data collection:
- Data that provide a baseline for monitoring conservation action.
  - Data on the social and economic values of biodiversity and protected areas.
  - Data supporting policy and conservation programmes.
  - Data on genetic resources, including medicinal plants and wild ancestors of domesticated species
  - Data on species that could serve as indicators of ecosystem health.
  - Data on 'Keystone' and "Flagship" species and habitats.
  - Data on alien or exotic species, potential threats to indigenous biodiversity.
  - Data on biodiversity known to be threatened.
  - Data on threats to biodiversity.
  - Data on potential rates of biodiversity loss.
  - Data on species and habitat distribution.
  - Data on biodiversity function and ecosystem species provided.
  - Data on landscape infrastructure and pattern.

#### Monitoring of Mammals in Mangroves:

#### Conservation and monitoring of Otters

#### **Indian Smooth-Coated Otter (*Lutrogale perspicillata*)**

Smooth otters are named for their shorter, smoother coats, as compared the similar-sized sympatric *Lutrogale sp.* Sources reveal that this species occur in



variety of habitats from Mangroves of freshwater wetlands. Among all Asian otters this is the one, occurs to be most common through most of its ranges.

#### **Legal Status:**

Indian Smooth-Coated Otters are the semi-aquatic members of the family Mustelidae and is the most common of Asian otters. These otters are the indicators of healthy aquatic environments. Indian Smooth-Coated Otters are included in Schedule II (Part II) of the Indian Wildlife (Protection) Act of 1972 and covered under Part-A of Schedule I of the Export (Trade) Control Order, 1988.



#### **Research needs**

- a. Geographical range, present distribution and population densities.
- b. Behavior, ecology, food and habitat requirements.
- c. Habitat and resource requirement.
- d. The size and configuration of suitable habitats necessary to maintain viable population.
- e. Direct and indirect influences of otters as predators in aquatic ecosystems, including the interactions of otters with fisheries and aquaculture.
- f. Fish populations and their limitations, effects on otters, interaction with human fisheries.
- g. Habitat use and requirements (incl. mangrove & other coastal, dams), habitat change & effects on populations.
- h. Role in ecosystems.

#### **Conservation and monitoring of Fishing cat**

About twice the size of a typical house cat, the fishing cat (*Prionailurus viverrinus*) is a feline with a powerful build and stocky legs. The size of an adult ranges from 57-78 cm and weighs between 5-16 kg. The fishing cat is an adept swimmer and enters water frequently to prey on fish as its name suggests. It is known to even dive to catch fish. Wetlands are the favourite habitats of the fishing cat. In India, fishing cats are mainly found in the mangrove forests of the Sundarbans (W.B), Bhitarkanika (Orissa), Coringa (A.P.), on the foothills of the Himalayas along the Ganga and Brahmaputra river valleys and in the Western Ghats.



The fishing cat is listed as Endangered in the IUCN Red List, which means that it faces a high threat of extinction in the wild. The Convention on International Trade in Endangered Species (CITES) lists the fishing cat on Appendix II part of Article IV of CITES, which governs international trade in this species. In India, the fishing cat is included in Schedule I of the Indian Wildlife (Protection) Act, 1972 and thereby protected from hunting.

#### **Research Needs:**

1. Distribution and conservation status involving the compilation of all current and historical data on fishing cat occurrence throughout the region.
2. Detailed ecological study of fishing cats in their natural habitat.
3. Live capture to screen animals for the presence of several emerging zoonotic diseases. Avian influenza, SARS, and other diseases are now significant health concerns for wildlife.
4. Education and outreach. Using presentations, posters, and other tools to raise awareness of wetland dependency by fishing cats to encourage more sustainable use of wetland landscapes upon which they depend.
5. Survey for presence through scat collection and analysis.

#### **Estuarine Crocodile (*Crocodylus porosus*) Conservation Programme**

The Estuarine Crocodile (*Crocodylus porosus*) is the largest of all crocodylians and the largest reptile in the world with unconfirmed reports of individuals up to an impressive eight to ten meters in length, although a maximum of five to six metres is more usual. Also known as Saltie, Saltwater Crocodile or Indo-Pacific Crocodile, and it is the largest of all living reptiles, as well as the largest terrestrial and riparian predator in the world. They have the broadest distribution, ranging from the eastern coast of India, throughout most of Southeast Asia, stretching south to northern Australia, and historically ranging as far west as off the eastern coast of Africa and as far east as waters off the coast of Japan.

Crocodylians have a very important role in maintaining the ecological balance in tropical/subtropical waters and beyond. They don't compete much with fishermen but actually, help them by eating carnivorous "trash" fish. Crocodiles have reigned as key predators in wetland and marine environments for millions of years. The presence of crocodiles in a river actually increases the yield of fish, which by itself justifies the veneration village societies have for the beasts in some countries. Included under Schedule -I of Wildlife (Protection) Act, 1972, and endangered as per Red Data Book categories of IUCN, and also included in Appendix-I of CITES.

#### **Objectives:**

1. To rehabilitate the Estuarine Crocodile in its former range of distribution from where it was persecuted due to non-addressing of man-animal conflict in time.
2. To design and implement awareness raising and information campaigns to enhance the local knowledge of crocodiles and the need for crocodile and wetland conservation and to increase local participation in and acceptance of Estuarine crocodile conservation activities.
3. To implement basic crocodile protection activities.



### **Survey of Fishes, Invertebrates and Amphibians for Providing Supplements to the Otters/Fishing Cats:**

It is proposed to conduct a survey of invertebrates and amphibians and fish varieties in the sanctuary area. This survey will be useful to know about the availability food to the existing Otters and Fishing cats in the sanctuary.

### **Development of Eco-tourism Infrastructure at Coringa Wildlife Sanctuary:**

The following activities are proposed under this component.

- Development and Maintenance of Infrastructure in Eco tourism zone
- Development of interpretation centre of International Standard at Coringa Wildlife Sanctuary.
- Providing trainings to local communities on hospitality, eco tourism management
- Procurement of boats and maintenance of existing boats
- Engaging a livelihood expert to assist in Livelihood generation activities
- Development of Fish Nurseries and Seed Banks

### **Development of Interpretation Centre of International Standard at Coringa**

Because of development of Eco-Tourism in Coringa Sanctuary a greater number of visitors are coming to visit the sanctuary. For creating awareness among the visitors, school children and college students on the conservation of flora and fauna, more particularly on the Mangrove Forests EEC building was constructed at Coringa. It is proposed to develop this interpretation centre with international standard during the plan period.

### **Establishment of Floating Jetty and Other Visitors Amenities**

Chollangi is located in Coringa Wildlife Sanctuary which is very near to Kakinada. Already infrastructure is developed i.e., board walk, boating, sitting places, etc., It is observed that a large number of visitors mainly students are visiting this place to have an understanding about mangrove eco-system, flora and fauna of mangrove forest and also wetland bird species. In the interest of creating better facilities for the visitors, it is proposed to establish floating jetty and other amenities like construct Pagodas, seating benches etc., during the plan period.

### **Installation of sewage Treatment plans in habitations around CWLS**

#### **Wastewater treatment:**

Water pollution is caused by domestic sewage and industrial sewage. The term *sullage* is applied to waste water which does not contain human excreta. The basic objectives of treatment of waste water are Industrial or municipal to bring the quality of water to an allowable level as prescribed by environmental laws.

#### **Aims of Wastewater Treatment:**



1. Removal the suspended particulars matter.
2. Reduce the organic matter through decomposition by bacteria into inorganic compounds.
3. Produce an effluent free from pathogens and which can be disposed of without any rise to environment and health.

The following activities are proposed under this component:

- Construction of drainages and toilets in adjoining villages
- Construction of STPS across inlet drains
- Promotion of organic agriculture in wetland catchment
- Development of water, sanitation and health infrastructure for local communities.
- Installation of sewage treatment plants
- Promoting apiculture activities

#### **Alternate livelihood Generation activities in villages around CWLS**

The following activities are proposed under this component.

- Training for Palmyrah products making and providing handholding
- Other livelihood activities like providing fish drying kilns, smoke bins, making products from jackfruit etc.
- Providing dollar lights
- Establishing RO plants
- Conducting trainings, workshops, exposure visits for locals
- Supply of TEDS and improvement of fishing nets.
- Promoting apiculture activities.

#### **Office support**

The following activities are proposed under this component.

- Capacity building training programs to staff
- Improvements to staff quarters, Forest Rest House and Cottages at Coringa
- Maintenance of Interpretation Centre and EEC
- Engaging Data entry operators, clerical assistances for maintenance of office records.

During 2012 UNDP-GEF scheme was established in Coringa Wildlife Sanctuary. This scheme will be implemented for a period of 5 years. The UNDP-GEF intervention aims to mainstream biodiversity conservation into the production sectors of EGREE through (1) Cross-sectoral planning in the East Godavari River Estuarine Ecosystem (EGREE) that mainstreams biodiversity conservation considerations, 2) Enhanced capacity of sector institutions for implementing biodiversity-friendly sector plans 3) Improved community livelihoods and sustainable natural resource use.

The following developmental activities are taken up during 2015 in Coringa Wildlife Sanctuary under UNDP Scheme.



Sr. No.	Item of work
1	Estimate for repairs to tailoring machines at Coringa and Matlapalem during 2015
2	Conducting World Wetland Day celebration at Z.P.P High School Coringa on 02-02-2015
3	Protection and Development of Sea turtles at Yellayyapeta during 2015
4	Desilting work in Coringa Wildlife Sanctuary during 2015
5	Protection and Development of Sea turtles at Hope Island during 2015
6	Training, awareness programme to I.A.S Officers and their supporting staff on 05-04-2015
7	Protection and Development of Sea turtles at Kandhikuppa during 2015
8	Facilitating inspection of Midterm evaluation team of UNDP on 20-02-2015
9	Providing Uniform to Boat helpers at Chollangi CBET during 2015
10	Repairs and replacement of Gouthami boat at Coringa WLS
11	Repairs and painting to Wooden bridge at Chollangi CBET during 2015
12	Repairs & replacements of 40 HP Mariner Engine at Coringa WLS during 2015
13	Painting to Wooden bridge at Old light House during 2015
14	Construction of New Wooden bridge at the right side of (310 mtrs) part 1 chollangi CBET during 2015
15	Construction of New Wooden bridge at the right side of (310 mtrs) part 2 chollangi CBET during 2015
16	Construction of New Wooden bridge at the right side of (285 mtrs) part 3 chollangi CBET during 2015
17	Facilitating inspection of Midterm evaluation team of UNDP on 20-02-2015 & 21.2.2015
18	Providing Uniform to Base camp workers in Coringa Wildlife Sanctuary during 2015
19	Improvement works to Forest Guest house at Coringa during 2015
20	Improvement works to Shopping complex at Kobbarichettupeta
21	Distributing Fishing nets to EDC members at Matlapalem
22	Distributing Fishing nets to EDC members at Kotthuru
23	Distributing Fishing nets to EDC members at Bhyravapalem

## 7.0 WILDLIFE CONSERVATION PLAN- SCHEME PROPOSAL

The project has minimal effect on the ecology/environment in the buffer zone of 10 Km. It is not going to pose any threat either to the CWLS or the RET flora or fauna of the study area either directly or indirectly.

Project proponent is prepared for protection of flora and fauna in CWLS and around the project area. ONGC, is ready to support the efforts made by State and Central Governments for the ecological conservation of Coringa Wild Life Sanctuary and around it.

A Wildlife Conservation Plan of Rs. 800 lakhs for the Coringa Wild Life Sanctuary and its surroundings has been prepared in consultation with District Forest Wildlife Authorities for a period of 10 Years. ONGC undertakes to extend the financial support and the funds shall be earmarked in the budgets.



The plan proposed is for a duration of ten years and the amount indicated is suggestive. The items can be modified based on the needs. After approval of the proposed plan Forest authorities may constitute a committee with suitable members along with ONGC representatives as one of the members for review of the proposal, annual plans, periodic review of implementation, modification or review of the plans and timely release of funds.

**Financial Outlay:**

A detailed financial outlay has been proposed in annexure where a total of Rs. 800 lakhs (Rs. Eight Crore only) spread over ten years have been allocated for various activities. A detailed year wise expenditure plan is also included.

**Fund Providers:**

The Project proponents or Oil and Natural Gas Corporation limited (ONGC), Kakinada would be responsible for providing all funds towards the implementation, monitoring, evaluation and review of this Wildlife Conservation Plan.

**Placement of Funds:**

Funds estimated to be spent in the plan period of 10 years shall be placed with Prl.CCF (WL) & Chief Wildlife Warden ,AP and designated as "Wildlife Conservation Plan, Coringa WLS, ONGC Funds" Prl.CCF (WL) & Chief Wildlife Warden would then release it to DFO(WL), Rajamahendravaram according to the expenditure plan. It shall be ensured that "Wildlife Conservation Plan, Coringa WLS, ONGC Funds" are not utilised for any purposes other than those mentioned in this Wildlife Conservation Plan under any circumstances whatsoever. In case there is any particular work which can be conveniently handled by the user agency, the funds for the same can be left with the project authorities with the consent of CF, Rajamahendravaram.

**Monitoring Committee:**

A committee shall be formed under Chairmanship of DFO/DCF (WL) Rajamahendravaram. Other members of committee would be FRO, Coringa WLS and one representatives of User Agency.

Main responsibilities of Monitoring Committee would be as follows:

This committee shall monitor the implementation of this Wildlife Conservation Plan and the disbursement of the funds.

- The committee will look after proper documentation of outcomes of this plan implementation.
- The committee would also review the progress of the recommended measures at-least twice every year and take action to correct the course, if required.
- The committee would also need to send an annual report to the Chief Wildlife Warden, Andhra Pradesh.

**Review Authority:**

Principal Chief Conservator of Forests (WL) & Chief Wild Life Warden of Andhra Pradesh State would be the Reviewing Authority. The Monitoring Committee would present its annual report to Principal Chief Conservator of Forests (WL) & Chief Wildlife Warden through Conservator of Forests, Rajahmundry circle, Rajamahendravaram.



**Outcome Documentation:**

Proper documentation of wildlife conservation plan implementation shall be done by forest department and that document need to be shared with project authorities.

**TABLE-15**

**Proposed Wildlife Conservation Plan – scheme proposal for development of Coringa Wildlife Sanctuary of Wildlife Management Division, Rajamahendravaram for a period of 10 years**

Sl. No.	Item of work	Estimated Amount (in Lakhs)
<b>I</b>	<b>Habitat improvement</b>	
1	Weed removal in Mangroves	10.00
2	Enrichment planting in Mangroves	25.00
<b>II</b>	<b>Conservation activities</b>	
3	Marine turtle conservation programme at Hope Island.	50.00
4	Improvement of Bird congregation sites at Bhyravapalem and Hope Island and its maintenance.	10.00
<b>III</b>	<b>Research activities</b>	
5	Procurement of Camera traps/DSLR camera/Binoculars/GPS/Compass etc., and its maintenance for monitoring of mammals in mangroves.	30.00
6	Service charges to Research Scientist for inventory on Flora and Fauna and data collection through camera trapping exercise, producing research documents and reports etc., for 12 months in a year for 5 years	30.40
<b>IV</b>	<b>Habitat protection activities</b>	



7	Procurement of vehicles for inspection purpose of DFO and Forest Range Officer and its maintenance.	50.00
8	Maintenance of existing boats for inspection purpose	40.00
9	Construction of boundary pillars	10.00
V	<b>Wildlife rescue operation</b>	
10	Procurement of Rescue Van, Darting equipment, trap cages etc., and its maintenance	40.00
VI	<b>Development of Eco-tourism infrastructure at Coringa WL Sanctuary</b>	
11	Establishment of interpretation centre with International Standard at Chollangi of Coringa Wildlife Sanctuary and its maintenance.	70.00
12	Improvement works to existing interpretation centre at Coringa	25.00
13	Establishment of floating jetty and its maintenance	30.00
14	Construction/Maintenance of board walk	35.00
15	Improvement of visitor's facilities at CBET, Chollangi.	30.00
VII	<b>Publicity and Awareness creation</b>	
16	Conducting awareness camps/Green school programme	30.00
17	Conducting works shops / Training to Staff members.	20.00
18	Publicity material like hoardings, sign boards, caps, keychains, etc.	15.60
19	Establishing display boards in prominent locations and along the boardwalk at Chollangi.	25.00



20	Conducting Bird festival/ fishing cat day/ otter day/ world wet land day/ Forest Day/ Wildlife week celebration.	25.00
VIII	<b>Eco-Development/Livelihood Generation activities.</b>	
21	Installation of Sewage Treatment Plants in habitations around Coringa Wildlife Sanctuary (20 EDCs @ 2 per village).	40.00
22	Distribution of TEDs to the fisherman community for conserving sea turtles.	20.00
23	Alternate Livelihood Generation Activities in Villages around Coringa WLS	40.00
IX	<b>Office support</b>	
24	Service charges to Unit- A clerical assistance for Assisting in Accounts (1 no for 12 months)	30.00
25	Service charges to Computer operator (1 no for 12 months)	45.00
26	Administrative expenditure (3 %) like stationery, Travelling allowance, CA audit fee and other Misc. items.	24.00
	<b>Total:</b>	<b>800.00</b>

**Note: Detailed break-up of above plan attached at Annexure-A**

*Ch. Ravi Kumar*

Chief General Manager(Civil)  
I/c MS & HSE,KG-DWN-98/2  
EOA, ONGC KAKINADA

RAVI KUMAR CHACHAM  
Chief General Manager (Civil)  
EOA, ONGC, KAKINADA

*[Signature]*  
Divisional Forest Officer  
Wildlife Management  
Rajamahendravaram

*[Signature]*  
19/08/2020

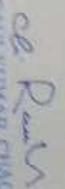


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Sl. No.	Item of work	Rate (Rs. In Lakhs)	Qty	2020-21		2021-22		2022-23		2023-24		2024-25		2025-26		2026-27		2027-28		2028-29		2029-30		Total		
				Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy
17	Subjects and Accounts creation	0.5	6	3.00	6	3.00	6	3.00	6	3.00	6	3.00	6	3.00	6	3.00	6	3.00	6	3.00	6	3.00	6	3.00	60	30.00
18	Printing of work book (Printing to Staff members)	0.5	4	2.00	4	2.00	4	2.00	4	2.00	4	2.00	4	2.00	4	2.00	4	2.00	4	2.00	4	2.00	4	2.00	40	20.00
19	Printing of work book (Printing to Staff members) like notebook, sign boards, caps, uniforms, etc.	0.25	4	1.00	4	1.00	4	1.00	4	1.00	4	1.00	4	1.00	4	1.00	4	1.00	4	1.00	4	1.00	4	1.00	40	20.00
20	Establishing display boards in prominent locations and along the boardwalk at Chollangi	0.25	10	2.50	10	2.50	10	2.50	10	2.50	10	2.50	10	2.50	10	2.50	10	2.50	10	2.50	10	2.50	10	2.50	100	25.00
21	Conducting Bird festival/ singing car day/ other day/ work wet land day/ Forest Day/ Wildlife week celebration	5	5	2.50	5	2.50	5	2.50	5	2.50	5	2.50	5	2.50	5	2.50	5	2.50	5	2.50	5	2.50	5	2.50	50	25.00
VIII	Eco-Development/Levelhood Generation activities.																									
21	Installation of Sewage Treatment Plants in habitats around Coringa Wildlife Sanctuary (20 ETPs @ 2 per village).	2.00	2	4.00	2	4.00	2	4.00	2	4.00	2	4.00	2	4.00	2	4.00	2	4.00	2	4.00	2	4.00	2	4.00	20	40.00
22	Distribution of TEDs to the fishermen community for conserving sea turtles.	0.2	10	2.00	10	2.00	10	2.00	10	2.00	10	2.00	10	2.00	10	2.00	10	2.00	10	2.00	10	2.00	10	2.00	100	20.00
23	Assigner Levelhood Generation Activities in villages around Coringa WLS		2	4.00	2	4.00	2	4.00	2	4.00	2	4.00	2	4.00	2	4.00	2	4.00	2	4.00	2	4.00	2	4.00	20	40.00
IX	Office support																									
24	Service charges to Unit- A clerical assistance for Assisting in Accounts (1 no for 12 months)	0.1683	1	2.02	1	2.17	1	2.33	1	2.51	1	2.72	1	2.99	1	3.29	1	3.62	1	3.98	1	4.38	1	4.85	1	30.00
25	Service charges to Computer operator (1 no for 12 months)	0.2284	1	2.74	1	3.01	1	3.32	1	3.65	1	4.01	1	4.41	1	4.85	1	5.38	1	5.98	1	6.28	1	7.14	1	45.00
26	Administrative expenditure (3%) like stationery, Traveling allowance, CA audit fee and other Misc. items.			3.55		2.38		2.17		2.17		2.25		2.65		2.39		2.23		2.24		1.98		1.98	1	24.00
	<b>Total:</b>			<b>83.50</b>		<b>143.00</b>		<b>97.00</b>		<b>78.00</b>		<b>69.50</b>		<b>69.50</b>		<b>70.50</b>		<b>64.50</b>		<b>63.50</b>		<b>61.00</b>		<b>61.00</b>	<b>1</b>	<b>800.00</b>

  
**RAVI KUMAR CHINNIAM**  
 Chief General Manager (Civil)  
 ED, O&G, KARNATAKA

Divisional Forest Officer,  
 Wildlife Management,  
 Rajamahendravaram.

Unit cost for Conservation of Sea Turtles at Hope Island

Sl. No	Item of work	Qty	Rate	Per	Amount in Rs.
1	Wages to unskilled labour for protection to turtles 5 months	5 nos. x 150 days	367	Day	275250
2	Hospitality charges for protection helpers.	5 nos x 150 days.	75	Day	56250
3	Construction of hatchery.		Actuals		20000
4	Communication and supervision charges.	10 camps	7500	Camp	75000
5	Preparation of INSITU hatchery.	300 nos	100	each	30000
6	Misc. expenditure such as Torch lights, Dry Cells, Kerosine lamps, Cycles etc.		Actuals		43500
Total :					500000

Abstract for 2020-21

500000  
500000

1 Hope Island

Total :

*Ch. Ravinder*

RAVI KUMAR CHACHAM  
Chief General Manager (Civil)  
EOA, ONGC, KAKIRADA

*Rajamahendravaram*  
Divisional Forest Officer,  
Wildlife Management,  
Rajamahendravaram

DATA SHEET FOR ENRICHMENT MANGROVE PLANTATING IN CORINGA WILDLIFE SANCTUARY OF WILDLIFE MANAGEMENT DIVISION, RAJAMAHENDRAVARAM DURING THE YEAR 2020-21

Sl. No.	Name of the work	FSR Item No	Qty.	Rate as per FSR 2020-21	30% area allowance	Rate as per FSR 2019-20	Total per amount per Ha.
1	2	3	4	5	6	6	7
	<b>Chanelling</b>						
A	<b>Advance operations:</b>						
1	Survey of Plantation area	5.1.4	1	22.00	6.60	28.60	28.60
2	Clearance of bushy growth at the feeder canals for Mangrove plantation.	2.1.24	1	604.00	181.20	785.20	785.20
3	Alignment of field channels for Mangrove plantations	2.2.5	1	566.69	176.01	742.70	742.70
4	Digging of field channels Earthwork Excavation in clayey soils in wet and slushy condition (at 144.00 cum per ha.)	As per RSSR	144	139.55	41.87	181.42 cum	26133.76
5	Transport of labour and labour amenities.	2.3.17	144		18.13	18.13	2619.72
	<b>Planting</b>						
6	Planting Bag Plants for mangrove plantations	2.5.8	800	165.57	49.67	215.24 nos	1721.92
7	Transportation of mangrove seedlings (Nursery to Boating point upto 2 km transport of mangrove Bag plants 10 x 17.5 cm size upto 5 km	2.4.4	800	78.88	0.00	78.88 nos	631.84
8	Transportation of mangrove Seedlings (Boat point to planting site) by kavadi loads	2.4.5	800	130.13	0.00	130.13 nos	1641.84
9	Contingencies and other misc expenditure.				Ls.	Ls.	1295.51
	<b>Total:</b>						35000.00

Quantity of Earthwork excavation per Ha.

1) DIMENSIONS PROPOSED  
Field channels

$2.00 \times 0.40 \times 0.15 \times 800$  Rmt  
2

144 cum  
144 cum

*Ch. Ravin*

**RAVI KUMAR CHACHAM**  
Chief General Manager (Civil)  
EOA, ONGC, KAKINADA

Jvs\*

Divisional Forest Officer,  
Wildlife Management,  
Rajamahendravaram

*(9.7)*  
*1/10/2020*

**Data Sheet**

**Calculation of Wage rates**

Sl. No.	Unit	Base Rate	T.A./ Food	EPF (13%)	ESI (3.25)	Service Charge (5%)	G.S.T (18%)	Remuneration as per for the year 2022-23	Remarks
1	Data Entry Operator (Rs. 630 p.d x 26 days)	16360	0	1950	532	491	3484	22837	As per SSB
1	Research Scientist Unit-A Class cleric assistance	20800	5000	1950	676	624	5729	36779	As per SSB
2	(Rs. 460 p.d x 26 days) Unit-B Class watch and ward	11960	0	1555	389	359	2567	16830	As per SSB wage rate
3	(Rs. 367 p.d x 26 days)	9542	0	1240	310	286	2048	13427	As per SSB wage rate

832

Divisional Forest Officer,  
Wildlife Management,  
Pajamathendravaram.

*Ch. Ravi Kumar*  
**RAVI KUMAR CHACHAM**  
Chief General Manager (Civil)  
EOA, ONGC, KARNATAKA

JWS\*