



*A traditional nava coming in to beach on the Andhra Pradesh coast.*

# Andhra Pradesh, Indian East Coast

by

V Sree Krishna

*Consultant-Environment/BOBP*

## Marine Habitats

Mangroves

Algae

## Fisheries

## Marine Pollution

Industries

Agriculture

Exploitation of natural resources

## References

## Appendices

Institutions engaged in environmental research, monitoring and enforcement

Legislation against threats to the marine environment.

Other publications on the marine environment.

## 47. MARINE HABITATS

### 47.1 Mangroves

The total mangrove area in India has been estimated at 6740 km<sup>2</sup>. Of this, Andhra Pradesh has about 9 per cent, an area of 582 km<sup>2</sup>.

The greater part of the mangrove forests in Andhra Pradesh are in the Krishna and Godavari River estuaries (see Figure 32 on next page). To protect these unique forests, the Andhra Pradesh Government has formed two sanctuaries. The Coringa Wildlife Sanctuary in East Godavari District, was established in 1978, while the Krishna Sanctuary in Nagayalanka, Vijayawada, was inaugurated more recently.

The mangroves of Andhra Pradesh are mainly *Aucennia*. A clear felling system is being practised, on a 25-year rotation basis in Coringa, and every 15 years in Kandikuppu (both in East Godavari). The Krishna mangroves are also managed on a 25-year rotation felling system.

Before the abolition of private estates came into force, and the subsequent grouping of the region's mangroves into forest blocks (see table alongside), most of the mangrove areas in East Godavari were under the control of private estate owners, who heavily exploited them. The mangrove areas were further degraded by indiscriminate felling and grazing.

In 1977, a severe tidal wave in Divi Taluq destroyed the mature mangrove forests in the Krishna estuary. However, the area has been well protected since and there is profuse regeneration. At present, these areas have a healthy young mangrove crop, which is no longer endangered by any sort of mangrove-related exploitation.

Brackishwater farming has become very popular among private entrepreneurs in Andhra Pradesh, and around 50 per cent of the developed area has been a consequence of clearing mangroves for the construction of ponds. The World Bank is supporting the development of brackishwater aquaculture in the state. To minimize the negative effects of the mangrove felling on the ecosystem, extensive environmental studies have been carried out. Further, to receive support from the World Bank, mangrove afforestation is a prerequisite.

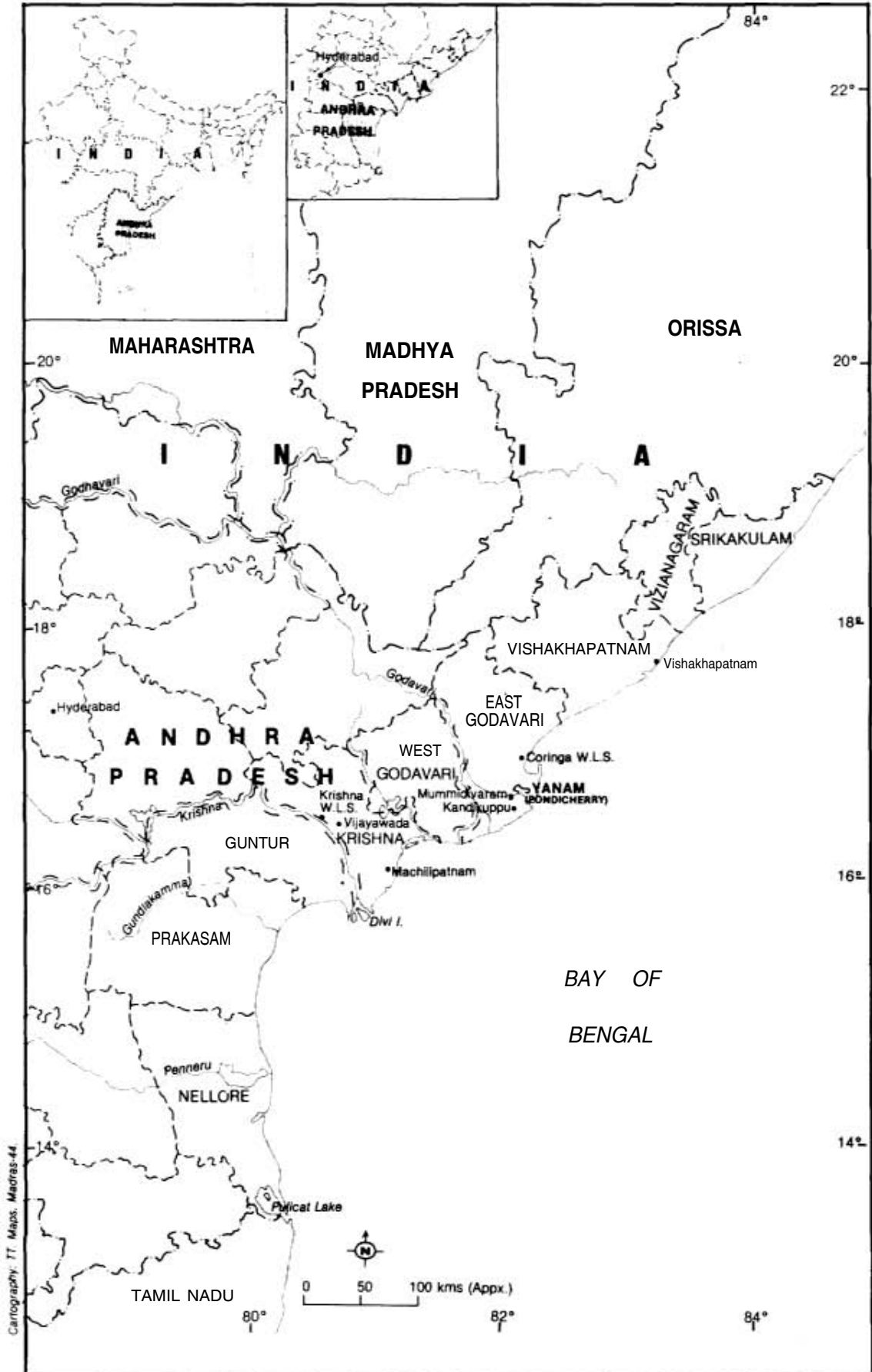
Mangrove afforestation on the seaward side of saline embankments would provide greater long-term stability than the more common

#### Areas notified as mangrove forest blocks

District	Name of the forest block	Area in ha	
East Godavari	Kakinada Tq.	Kegita R.F.	467
		Coringa R.F.	4242
		Coringa Exr. R.F.	19,467
		Kothapalem R.F.	51
	Mummidivaram Tq.	Masonithippa R.F.	1090
		Balusuthippa R.F.	415
		Muori R.F.	147
		Rathukaiva R.F.	2043
		Kandikuppu R.F.	3802
		Mattatippa R.F.	445
Kothapalem Ext. R.F.		61	
Bhairavapalem R.F.		971	
		33,261	
Krishna	Nachugunta R.F.		6065
			875
	Sorlagondi R.F.	2508	
	Sorlagondi Ext. R.F.	2691	
	Yelichilla Dibba R.F.	3714	
	Yelichilla Dibba Ext. R.F.	610	
		16,463	

Source : Andhra Pradesh Shore Areas Dev. Authority Report, 1988

Fig. 32. Marine habitats of mangroves and algae in Andhra Pradesh



engineering solutions, such as brick or stone pitching (World Bank project preparation report in West Bengal, Orissa and Andhra Pradesh, 1991 EIA). It has been suggested that the perimeter cyclone embankments of the prawn farms in Andhra Pradesh be afforested with *Excocaria agallocha* and *Ceriops decandra* on the upper (less frequently inundated) reaches and with *Brugueria gymnorhiza* or *Avicennia marina* on the lower reaches of the dykes. Seedlings can be either purchased from the Forest Department nurseries or collected from the wild. An initial planting density of 6000 seedlings per hectare is suggested at a cost of 2,400 Rs./ha. Labour would cost a further 6,800 Rs./ha, resulting in a total afforestation cost of 9,200 Rs./ha.

Other mangrove areas, known to have existed earlier, namely Upputeruin in West Godavari District near Machilipatnam, were opened up for various purposes by the Andhra Pradesh Government in the early 1960's and are, thus, no longer under mangrove acreage. Some former mangrove areas that no longer contain any mangroves due to sand-bar formation have been brought under casuarina.

## **47.2 Algae**

Surveys made by the National Institute of Oceanography show that there are 522 species of marine algae along the Indian coast, of which eighty are found in Andhra Pradesh. These include 43 Rhodophytes, rich in iron and manganese.

Detailed surveys have shown that two commercially important genera, namely *Gelidium* and *Gracilaria*, are found in the Pulicat Lake and off the coast of Vishakhapatnam.

## **48. FISHERIES**

Exploratory surveys at different depth levels estimate fish stocks at approximately 300,000 t in Andhra Pradesh.

Against this estimated availability of fishery resources, the current level of exploitation is less than 50 per cent in the case of all varieties of fish, except for crustaceans, where it is about 80 per cent.

Andhra Pradesh is one of the leading fish producing states of India and is especially strong in culture fisheries. The state is endowed with vast resources of inland, brackishwater and marine fisheries. It produces 140,000 t of freshwater fish and 120,000 t of marine fish per year, out of which nearly 20,000 t is shrimp.

Fish culture has been popular with fish farmers in the coastal districts from 1980 onwards. The production averages seven tonnes per hectare per crop, with a net profit of 25,000 Rs\*/year, against Rs. 10,000 in agriculture. Some progressive farmers and entrepreneurs have produced as much as twelve tonnes per hectare, thus reaping profits of up to Rs. 50,000.

Of late, brackishwater prawn culture has gathered momentum. About 10,000 ha are already under extensive culture, producing 400-500 kg/ha/crop. There is potential to produce upto 2-3 t/ha/crop, which would mean returns of about 150,000 Rs/ha/crop. The Andhra Pradesh Government leases brackishwater lands to farmers and entrepreneurs on a 15-year lease. Approximately 17,000 ha more are to be leased shortly.

---

\* US \$ 1 = IRs. 32 appx.

## 49. MARINE POLLUTION

### 49.1 Industries

The location of the main industries in the coastal districts of Andhra Pradesh are shown in Figure 33 (facing page).

Over 30 per cent of all industries (large and medium) in Andhra Pradesh are located in the nine coastal districts (see tables below and Figure 33 on facing page).

#### Categorywise large and medium industries in Andhra Pradesh

Sr No.	Category of industries	No. of units	Capital investment (Rs. '00,000)	Employment number	Per capita investment on employment (Rs. '00,000)	Units in coastal districts
1.	Food & Agro processing industries	139	65787	43071	1.52	19
2.	Leather Industries	6	534	883	0.60	1
3.	Chemical & allied industries	113	86969	29234	2.97	26
4.	Drugs & Pharmaceutical industries	29	9173	2474	3.70	3
5.	Paper, pulp & other forest-based industries	29	32055	17058	1.87	16
6.	Textile industries	75	29281	37213	0.78	19
	Jute-based industries	11	3249	17596	0.18	11
0.	Cement industries	34	133043	12666	10.50	7
9.	Mineral-based ceramic industries (other than cement)	27	45392	176591	0.25	2
10.	Engineering industries	127	139428	69051	2.01	21
11.	Electrical industries	20	195679	19417	10.07	6
12.	Electronic industries	22	12494	12366	1.01	2
		632	753090	437684	1.72	193

#### Categorywise distribution of large and medium industries in the coastal districts of Andhra Pradesh

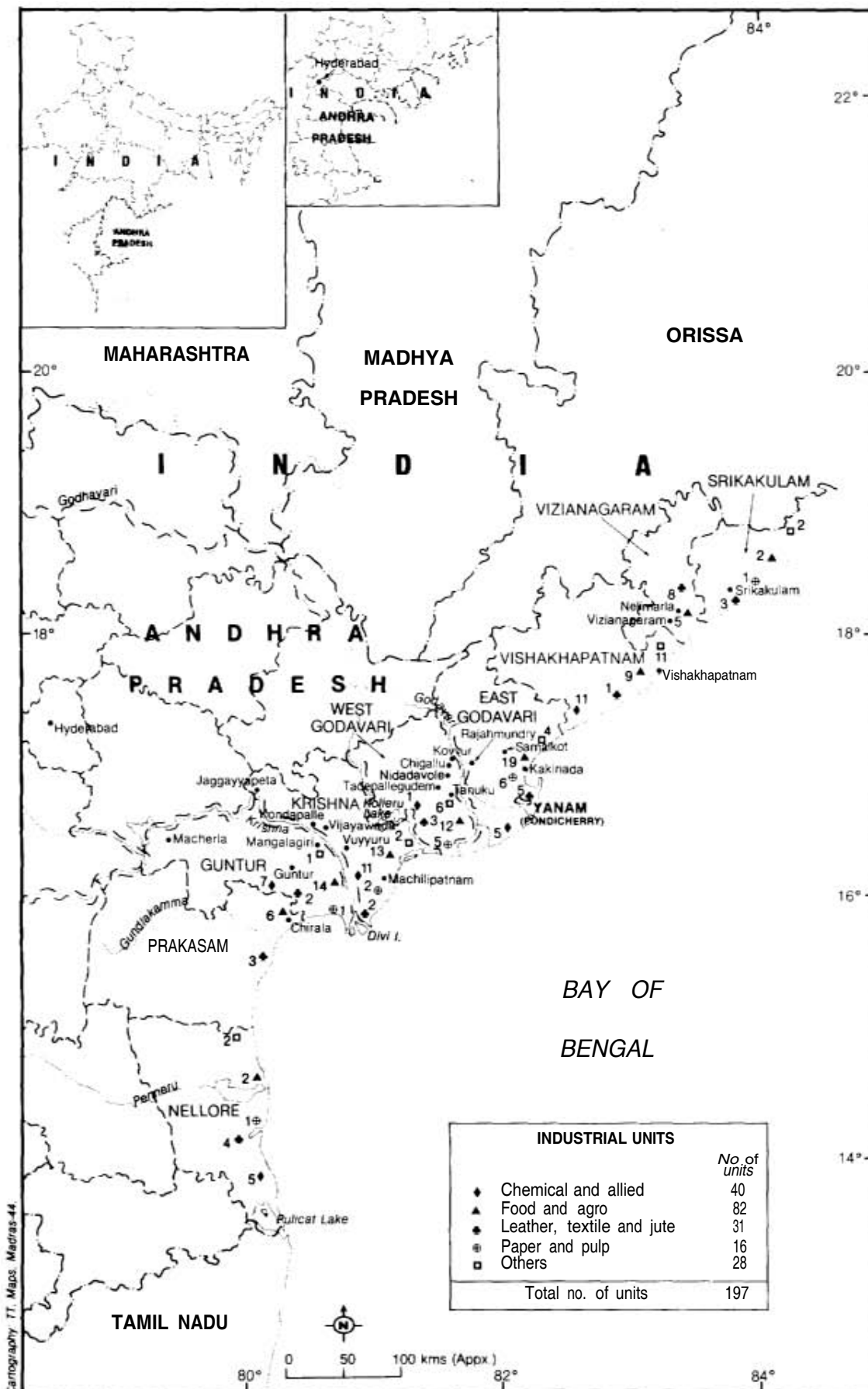
District	Food & Agro	Leather	Chemical & Allied products	Drugs/Pharmaceuticals	Paper & pulp	Textile	Jute	Cement	Mineral based	Engng.	Electrical	Electronic	Total no. of units
Srikakulam	2		2		1	-	3	-	-	-	-	-	8
Vizianagaram	5	1	-		-	1	6	-	-	-	-	-	13
Vishakhapatnam	8	-	11		-	-	1	1	-	1	3	-	31
East Godavari	16	-	3	2	6	5	-	-	-	4	1	-	37
West Godavari	12	-	6		5	2	1	-	-	1	-	-	27
Krishna	13	-	2	-	2	2	-	2	1	5	-	1	28
Guntur	14	-	1	-	1	2	-	4	-	3	-	-	25
Prakasam		-	-		-	3	-	-	-	-	-	-	10
Nellore	2	-	1	1	1	4	-	-	1	1	2	1	14
Total	79	1	26	3	16	19	11	7	2	21	6	2	193

Of the industries established in the coastal districts, around half are in the central zone and a quarter each are in the northern and southern parts of the state (see Figure 33 on facing page). The Godavari, Krishna and Gondalakama River estuarine marine ecosystems are, consequently, more affected by industrial pollution than the coastal areas of north and south Andhra Pradesh.

#### VISHAKHAPATNAM DISTRICT

Among the three coastal districts in the north, the present status of marine environmental pollution is most alarming in Vishakhapatnam, where alone there are 31 medium and large industries concentrated.

Fig. 33. Industries in Andhra Pradesh coastal districts



Cartography: T. Maps, Madras-44

Among the food and agriculture industries in this district, except for two sugar mills the rest are in marine products processing. Organic pollution is the potential environmental threat this group of industries poses.

There are eleven chemical and allied industries also causing pollution. The majority of the pollutants are heavy metals, such as cadmium, copper, lead, mercury, nickel, zinc and iron ore, and are from the steel, fertilizer and metal alloy industries. The fertilizer industries also contribute ammonia and sulphur pollution.

Since Vishakhapatnam District possesses a major fishing harbour and port, where oil transportation etc. are inevitable, high concentrations of hydrocarbons are found contaminating the surrounding marine environment.

There are no paper and pulp industries in the district, but there is a jute mill of 33,439 t capacity.

High sulphur concentrations have been registered in the sea outside Vishakhapatnam due to the siting in the district of a large zinc plant, other industrial plants, as well as an oil refinery.

The shipyard here, among the world's biggest, also contaminates the marine ecosystem due to regular vessel movements, draining of waste oil, the painting of vessels etc.

The Port authorities in Vishakhapatnam have, however, established an environmental wing which monitors the environmental impact. By using oil skimmers, oil is removed from seawater.

#### SRIKAKULAM DISTRICT

This district, like the other northern district of Andhra Pradesh, Vizianagaram, is fortunately still in a healthy environmental state. But a recently established alkali-based chemical industry will, no doubt, cause some marine environmental pollution.

A paper mill established in 1983 has also been polluting the area's marine environment with chlorinated organic compounds.

#### VIZIANAGARAM DISTRICT

There are no chemical industries in this district and the only threat to the marine environment here is a major tannery established in 1977 and which produces finished leathers.

Of the food and agro-based industries in the district, two are sugar mills; the others produce vegetable oils.

#### EAST GODAVARI DISTRICT

Two major fertilizer factories, one established in 1990 with a capacity of 1,000,000 tpa and the other in 1988 with a capacity of 300,000 tpa, use hydrogen from petroleum and nitrogen from natural gas to produce di-ammonium phosphate.

The effluent treatment ponds of these two units are scheduled to be located near residential areas in Kakinada town. A recommendation has been made that fish and crustaceans be introduced into the treated effluents as bio-indicators and observed for periods of at least 76 hours. If the indications are favourable, the treated effluents are to be discharged through pipelines into the deeper sea, instead of into the shallow waters of Kakinada Bay.

Pulp and paper mills in the district release chlorinated hydrocarbon effluents into the Godavari River.

A natural gas project is under consideration on the east Godavari shoreline. This might cause thermal pollution.



## WEST GODAVARI DISTRICT

Among the six chemical industries, only three are hazardous — one established in 1964 and producing superphosphate and sulphuric acid, another established in 1978, and producing hydrazine and hydrate, and a third established in 1982 and producing liquid BHC, BHCWDP, BHC-dust and liquid pesticide formulations.

The first is at Nidadavole, 10 km from the Godavari River, the other two are in Koovur on the Godavari's banks. The latter are **about** 80-100 km from the Bay of Bengal. Their effluents are, therefore, further degraded when they reach the sea. No damage to marine life has been documented.

The Godavari River, the largest of the peninsular rivers, provides raw water to a major paper mill in the district, located about 200 km from the Bay of Bengal. The processing of paper and boards produces enormous quantities of factory waste here.

Investigations into metal pollution in the Godavari River here reveal that at the discharge point, and upto about 1 km downstream, iron, manganese and zinc are in high concentrations. Upstream from the factory, the metal concentrations are below the detection limits of the analysis method.

A considerable drop in pH values and an appreciable increase in organic matter, hardness and calcium levels have been noticed after the entry of wastes into the river. Diatoms were more diversified in unaffected water, whereas Cyanophyceae were more prevalent both qualitatively and quantitatively in the polluted areas.

Iron was the most dominant heavy metal (see table below), while zinc and manganese occupied second and third positions in order of dominance. Cadmium was recorded in very low concentrations, with a maximum of 0.5 micrograms/l in the effluents.

### Two-year averages of various heavy metals and physiochemical factors in the Godavari River

Name of factor	Station II			Station III			Effluents		
Cd microgram/litre	0.25	±	0.13	0.21	±	0.53	2.80	±	1.58
Cr microgram/litre	47.91	±	18.87	34.16	±	18.86	65.83	±	37.52
Pb microgram/litre	29.58	±	12.67	13.12	±	8.57	44.58	±	18.64
Co microgram/litre	15.00	±	8.84	8.75	±	9.91	26.25	±	10.95
Ni microgram/litre	28.73	±	9.41	19.58	±	7.50	47.50	±	11.13
Zn microgram/litre	233.41	±	363.17	198.75	±	313.16	395.83	±	539.22
Cu microgram/litre	37.50	±	17.75	26.25	±	17.89	66.30	±	39.06
hIn microgram/litre	157.91	±	111.74	78.33	±	96.39	282.50	±	119.71
Fe microgram/litre	388.33	±	137.54	272.50	±	133.32	579.16	±	212.60
pH	7.65	±	0.21	7.90	±	0.18	6.90	±	0.10
CO <sub>3</sub> mg/litre	3.26	±	4.57	11.70	±	6.60	3.15	±	5.94
Organic mg/litre matter	16.68	±	14.31	7.12	±	6.80	57.79	±	26.87
Hardness mg/litre	2ao.w	±	86.80	179.30	±	43.60	523.30	±	150.20
Ca mg/litre	59.50	±	21.90	33.70	±	12.40	131.80	±	44.20
Mg mg/litre	32.70	±	16.10	21.50	±	15.00	47.20	±	30.60

## GUNTUR DISTRICT

The Central Government's zinc factory established in 1971 has been exploring for lead in the Bandalamothu areas. The ore mining operations have been causing significant marine environment

pollution due to the runoff of certain heavy metals, such as lead and zinc. Since mining has been going on for twenty years, lead and zinc have accumulated and constitute a potential threat to the environment.

## PRAKASAM AND NELLORE DISTRICTS

These southern districts are free from hazardous contamination.

### *49.2 Agriculture*

About 250,000 t of pesticides were produced in India in the period 1976-80. Today, about 78,000 t of insecticides and pesticides are used in India every year. Andhra Pradesh alone uses some 26,000 t of these pesticides each year (EIA, 1991). With increased food production the need of the hour, pesticides application in Andhra Pradesh will only further increase.

The pesticides used in Andhra Pradesh are mainly DDT, CHC, chlordane, heptachlor toxaphene, aldrin, dieldrin and endrin. These are all toxic to fish and other biological communities.

The Godavari, Krishna and Gondalakama River estuarine marine ecosystems are highly affected by pesticide contamination. Such contamination is comparatively less in the coastal areas north and south of this part of the Andhra Pradesh coast.

It is documented that mangroves accumulate pesticide residues. A proposed estuarine wetland management project, where mangrove species are to be planted in and around the low-lying, run-off areas affected by pesticide contamination, is therefore proposed.

The speed of pesticide and insecticide degradation, and the role of possible micro-organisms within the coastal marine environment are being investigated by the National Environmental Engineering Research Institute (NEERI) in Andhra Pradesh.

Studies on species versus community reactions are also essential to curb the insecticide and pesticide pollution problem.

The 'Phycological aspects of different river ecology' are being studied in freshwater rivers, which are the carriers of insecticides and pesticides, by several pollution-controlling organizations and research institutions in Andhra Pradesh, such as Osmania University, Andhra University and Nagarjuna University.

The Kolleru Lake, situated between the Godavari and Krishna estuaries, is a freshwater lake which receives occasional intrusions of saltwater. The intensive use of pesticides and nutrients in the drainage area and a diminished inflow of freshwater due to aquaculture constructions are probable causes for damage to the lake's fisheries. The lake has become eutrophicated with weeds and algal flora growing in an uncontrollable manner. Even its air-breathing fish stocks have been reduced. This lake is a potential subject for study to assess the amount of pesticide biomagnification in the foodweb.

### *49.3 Exploitation of natural resources*

'Oil and natural gas findings in Andhra's shore areas have opened up wide industrial opportunities. The surveys so far carried out indicate a high potential for oil and natural gas reserves.

The total area available for exploration and exploitation of hydrocarbons in the Krishna-Godavari basin is of the order of 15,000 km<sup>2</sup> on land and 21,000 km<sup>2</sup> in the sea, upto a depth of 200 metres. The gas composition indicates a high methane content. Environmental Impact Assessments need, however, to be conducted if this resource is to be exploited.

Exploration of chromite deposits at Kondapalle (Krishna District), bauxite deposits in Vishakhapatnam, Vizianagaram and Srikakulam Districts, mica pegmatite deposits in Nellore District and graphite mining in Vizianagaram District also have the potential to endanger the environment.

## **50. REFERENCES**

***Masterplan for the Andhra Pradesh Shore Areas Development Authority.*** Vol. 1, 1988, Finance and Planning Dept., Govt. of Andhra Pradesh.

***Masterplan for the Andhra Pradesh Shore Areas Development Authority.*** Vol. 2, 1988, Finance and Planning Dept., Govt. of Andhra Pradesh.

***World Bank appraisal of shrimpfarming in West Bengal, Orissa and Andhra Pradesh,*** 1991. Environmental Impact Assessment of Aquaculture Development. Final report for the environmental assessment of the World Bank-supported inland fisheries and brackishwater aquaculture projects for West Bengal, Orissa and Andhra Pradesh. Prepared by Mark Hardin. *et al.*

## APPENDIX XXIV

### Institutions engaged in environmental research, monitoring and enforcement

#### GOVERNMENT

**Aadhra Pradesh Government Fisheries Department,**

Commissionerate of Andhra Pradesh Fisheries, Tank Bund Road, Hyderabad

**Andhra Pradesh Fisheries Training Institute,**

Kakinada, East Godavari District, Andhra Pradesh.

**Andhra Pradesh Training Institute,**

Machilipatnam. Krishna District, Andhra Pradesh.

**Andhra Pradesh Pollution Control Board,**

Hyderabad, Andhra Pradesh

**Andhra Pradesh Shore Areas Development Authority,**

Hyderabad, Andhra Pradesh.

**Control Institute of Fisheries Education (CIFE),**

Beach Road, Kakinada, East Godavari District, Andhra Pradesh

**Central Institute of Fisheries Technology (GIFT),**

Kakinada, East Godavari District, Andhra Pradesh.

**Central Marine Fisheries Institute (CMFRI),**

Kakinada. East Godavari District, Andhra Pradesh.

**Commissionerate of Industries,**

Andhra Pradesh, Hyderabad, Andhra Pradesh.

**Director of Ports,**

Kakinada, Andhra Pradesh.

- Fishing harbour, Kakinada
- Fishing harbour, Vishakhapatnam
- Fishing harbour, Nizampatnam
- Fishing harbour, Krishnapatnam
- Fishing harbour, Machilipatnam

**Department of Forest,**

Hyderabad, Andhra Pradesh.

**Department of Salt,**

Office of the Assistant Commissioner of Salt, Kakinada, East Godavari District, Andhra Pradesh

**Fisheries Survey of India (FSI),**

Vishakhapatnam, Andhra Pradesh.

**National Environmental Engineering Research Institute (NEERI),**

Hyderabad, Andhra Pradesh.

**National Remote Sensing Agency (NRSA).**

Hyderabad. Andhra Pradesh.

**Zoological Survey of India (ZSI),**

Madras, Tamil Nadu.

#### UNIVERSITIES

**Andhra Pradesh Agriculture University,**

Beach Road, Kakinada. East Godavari District, Andhra Pradesh

**Andhra University,**

Waltair. Vishakhapatnam

- Department of Marine Biology
- Department of Zoology (School of Life Sciences)
- Department of Environmental Sciences

**Nagarjuna University,**

Department of Life Sciences, Guntur, Andhra Pradesh.

**Osmania University,**

Hyderabad, Andhra Pradesh.

- Department of Zoology
- Department of Botany

## APPENDIX XXV

### Legislation against threats to the marine environment

C.F.V.S. Coastal Zone Management Act, 1972. Sect. 304 (a).

Art 48 A (Part IV), Constitution of India.

Art 51 A (g) (part IV-A), which runs as :

'It shall be the duty of every citizen of India, to protect and improve the natural environment including forests, lakes, rivers and wild life, and to have compassion for living creatures.'

By virtue of Art 31 A.

The three lists (Seventh Schedule, Art 246) are :

I. Union List - Entries 52, 53, 54, 55, 57

II. State List - Entries 6, 7, 14, 18, 21, 24, 25

III. Concurrent List - Entries 17A, 17B, 20

Entries Nos. 6 and 7 of the State List.

Section 19 of the Water (Prevention and Control of Pollution) Act 1974.

Section 33

## APPENDIX XXVI

### Other publications on the marine environment

*Aquatic Environment Monitoring Report - No. 27.*

*Directory of Large and Medium Industries in Andhra Pradesh*, 1990. Published by The All India Manufacturers' Organization. Andhra Pradesh State Board, 6-3-540/8. 1st Floor, Punjagutta Road, Hyderabad 500 482. Andhra Pradesh.

*Masterplan for Kolleru Lake Development*. An integrated ecological approach. Office of the Kolleru Lake Development, Kaikalur 1987.

NATARAJAN, R. *et. al.* 1991. Coastal Zone Management Ocean Data Centre, Anna University, Madras 600 025.

SUDHAKAR, G. *et. al.* 1991. *Metal pollution and its impact on algae in flowing waters in India*. Dept. of Botany, Osmania University, Hyderabad, Andhra Pradesh.