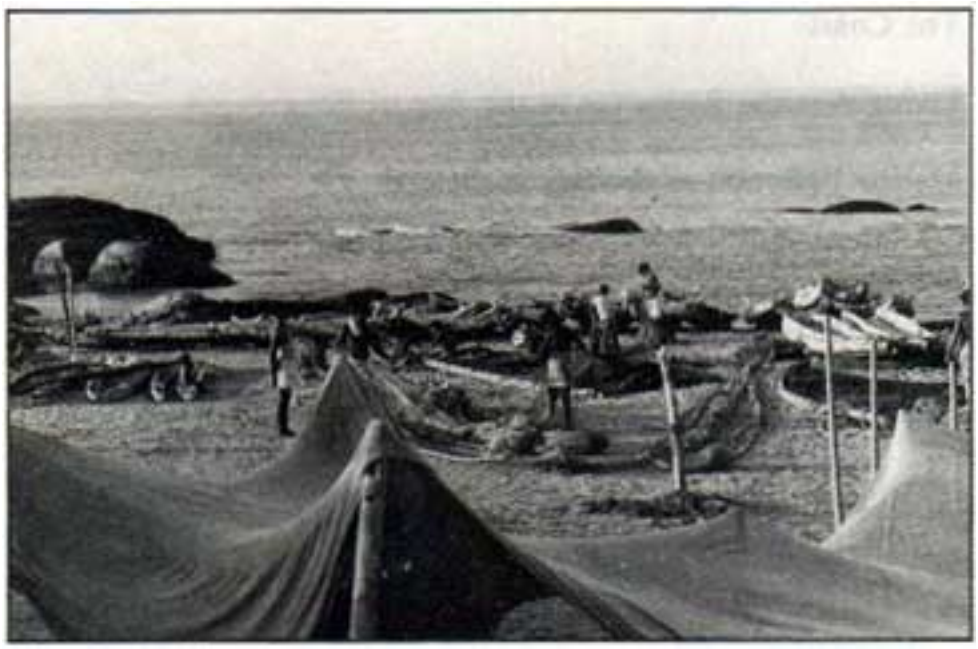
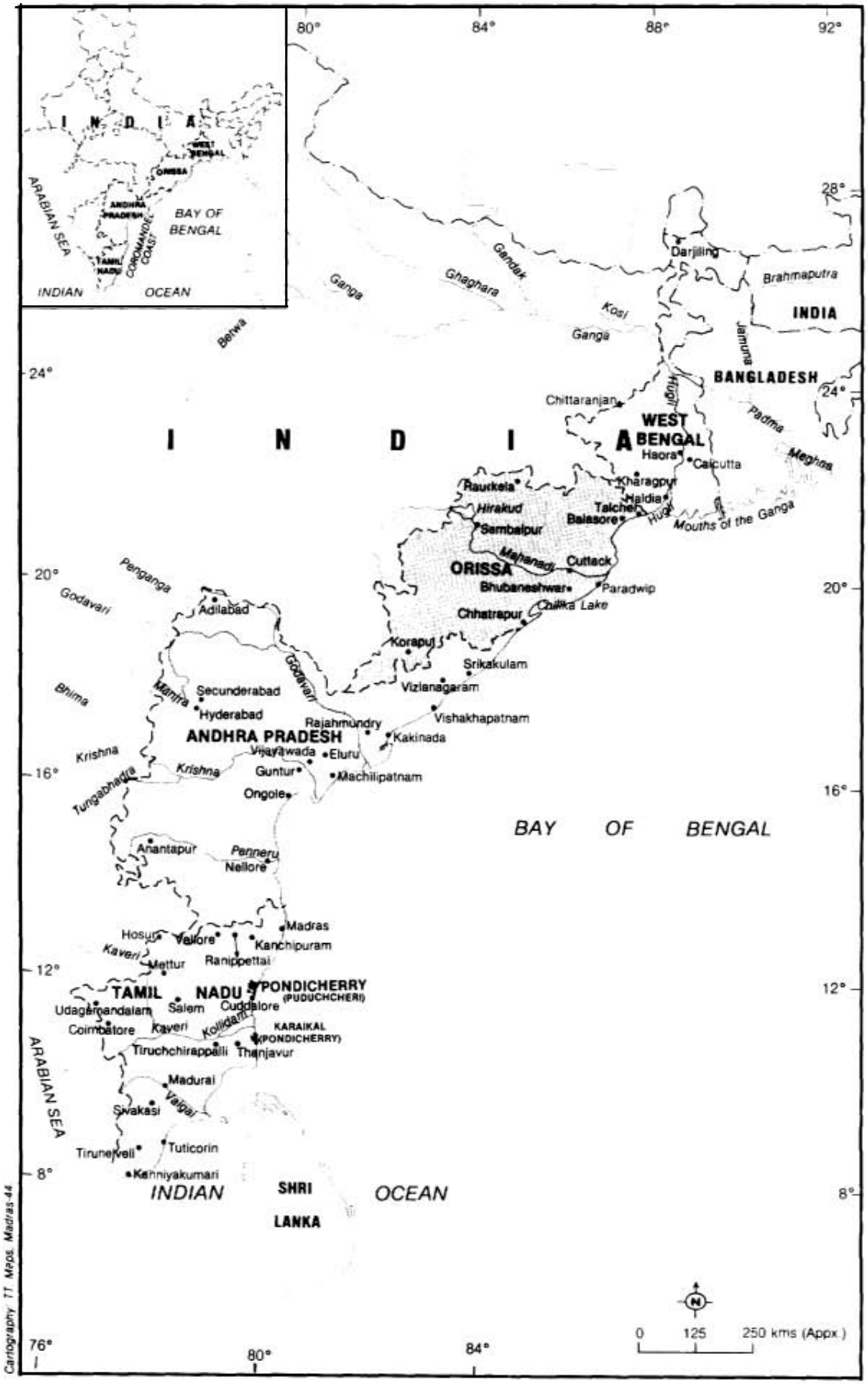


Fishermen dry their nets allalong the beaches of the Indian East Coast where traditional craft, like the kattumaram, *occupy much of the rest of the space.*

The Indian East Coast

Based on
A Desk Review
by
The Central Inland Capture Fisheries Research Institute,
Barrackpore, West Bengal

Fig. 26.Map showing the states, major rivers and important Cities of the Indian east coast



36. *THE COAST*

The east coast of India, extending from the international border of India and Bangladesh in the northeast to Kanniyakumari in the south, is *2,545* km long, covers 21 districts in the states of West Bengal, Orissa, Andhra Pradesh and Tamil Nadu and has a population of approximately 128 million. Five major and five minor ports are situated along the coast, handling a billion tonnes of goods every year. The beaches, like those at Digha, Pun, Gopalpur, Waltair, Madras and Covelong, attract tourists from all over the world, as do the scores of well-known centres of historical and religious significance along the western and northern edges of the Bay of Bengal.

The Bay of Bengal is one of the two northern embayments of the Indian Ocean, flanked by the Indian peninsular and Shri Lanka in the west and the Andaman and Nicobar Islands and Myanmar in the east. It is over 2 million km^2 in extent and acts as the recipient of two mighty rivers of the subcontintent, *viz,* the Ganga and the Brahmaputra. The other major Indian rivers that drain into the Bay of Bengal are the Mahanadi in the north, the Godavani and Krishna in the central region and the Kaveri in the south. There are also a number of minor rivers flowing through the various geological formations of the Indian subcontinent and draining into the Bay. Four states and one Union Territory (U.T.), *viz.* West Bengal (157 km), Orissa (476 km), Andhra Pradesh (974 km) and Tamil Nadu and Pondicherry U.T. (938 km) share the eastern coastline and cover continental shelf areas of 20,000, 25,000, 31,000 and 35,000 km^2, respectively (see Figure 26 on previous page). The total area of the EEZ (Exclusive Economic Zone) of India in the Bay of Bengal is *515,500* km2.

The climate of the region is subtropical to tropical and is characterized by high temperatures and medium rainfall. Virtually all the rain falls during the Southwest Monsoon (June to September), causing a drastic fall in salinity in the Bay of Bengal. Further meteorological data are given in the table below.

Meteorological parameters of the coastal states of the Bay of Bengal

	West Bengal		*Orissa*	*Andhra Pradesh*	*Tamil Nadu*
	Kakdwip coast	**Contai-Digha coast**			
Salinity *(ppt)*	15-27	20-30	18-35	18-33	31
Temp (°C)	25-35	22-37	10-43	20-30	27-30
Relative humidity (%)	80-92	Upto 70	61-81	60-75	—
Total rain fall (mm/year)	1722	2000	995-1914	1000-1500	900
Wind velocity (km/hr)	—	3.0-16.6	7.7-17.7 (70-120 in stormy weather)	—	5-10(100-200 in stormy weather)

The average values of salinity in the Bay of Bengal are rather low and range between 30 and 34 ppt (parts per thousand). The low salinity is mainly due to the diluting effects of the river systems of the subcontinent, discharging an estimated at 71,645 km3 of water into the bay. The discharge and drainage area and the total suspended and chemical load entering the Bay of Bengal from the six major east coast rivers are given in the table below.

Discharge and drainage area. Total suspended and chemical load entering the Bay of Bengal from six major Indian rivers

River	*Discharge* (km^3/y)	*Drainage area* ($km^2 x 10^3$)	*Load*		
			Chemical	*Sediment*	*Total*
Ganga	493	750	84	329	413
Brahmaputra	510	580	51	597	648
Krishna	30	251	0.4	4	14.4
Godavari	90	310	17	170	187
Kaveri	21	88	3.5	0.04	3.54
Mahanadi	67	42	9.6	I.9	11.5

Source: Chakrapani and Subramanian (1990)

Due to the substantial discharge of water into the bay, it can be classified as an estuary. Besides, there is an annual addition of freshwater, approximately 3000 km³, from precipitation and runoff.

The annual surface temperature varies within a narrow range of 27 to 29°C. In general, the shelf waters along the bay are nearly isothermal. The termocline, whenever found, is usually below 50-55 m and, in some cases, even below 100 to 125 m.

While circulation of water in the Bay of Bengal is, as a rule, much influenced by the monsoon winds, coastal configuration governs the water movements nearer the shores. The surface drift on the east coast during February to July is in a northeasterly direction and this turns southwesterly from September to December in the northern and southern parts of the coast. Occurrence of upwelling in the bay is less frequent and, consequently, nutrients are not present in high concentrations in the water.

The coast is endowed with extensive areas of estuaries, brackishwater lagoons, mangroves, coral reefs and seaweed beds. These coastal habitats are dynamic, rich in species and individuals and have a high production. Hence, they have great ecological, social and economic significance. These areas are important for the marine fisheries, serving as they do as nurseries for many species of fish and shellfish.

The coastal habitats are threatened by domestic, agricultural and industrial pollution as well as deforestation. Increasing transport of goods along the rivers also causes problems in the marine habitats, which are often sensitive to siltation and reduced light penetration. It is evident that many coastal areas need a higher degree of protection than they get today.

Several surveys of mangroves have been made on this coast. Some are shown in the table set alongside. Detailed information regarding the marine habitats is presented in the respective chapters on the states.

Various survey estimates of the mangrove forests of the Indian east coast and the Andaman and Nicobar Islands

Area	Sidhu 1963 (km²)	Blasco 1977 (km²)	Govt. of India 1987 (km²)
Tamil Nadu	26	5	150
Andhra Pradesh	184	100	200
Orissa	120	50	150
West Bengal	4189	2000	4200
Andaman and Nicobar Islands	1152	1000	1190
Tolal	5671	3165	5890

A brief profile of the four states is given in Appendix XX.

37. *LIVING AQUA TIC RESOURCES IN THE BA Y OF BENGAL*

During the Southwest Monsoon months, the seawaters by the Bay of Bengal coast attain optimum conditions for the growth of phytoplankton, due to upwelling which brings nutrients to the surface. A fall in temperature (from 31-32°C to 23-25°C) and salinity (from 30 to 21 ppt) also occurs during this period. Integral mean concentrations (IMC) of chlorophyll-a and phaeopigments increase from inshore to offshore. For POC (particulate organic carbon), however, the integral mean concentrations decrease (see table below).

Mean concentrations of chlorophyll-a, phaeopigments and POC in the Bay of Bengal

Parameter	Inshore	Offshore	Entire area
Chl.a			
Surface (mg/m³)	0.58 (0.020 - 5.717)	0.27 (0.007 - 2.159)	0.397
Column (mg/m²)	12.465 (1.108-50.545)	10.739 (1.280-28.448)	11.45
IMC (mg/m³)	0.61	0.261	0.402
Phaeopigments			
Surface (mg/m³)	0.098 (0 - 0.444)	0.083 (0 - 0.598)	0.09
Column (mg/m²)	3.726 (0.191 - 10,964)	4.850 (0.446 - 18.538)	4.396
IMC (mg/m³)	0.14	0.105	0.119
Poc			
Surface (mg/m³)	442	375	402
Column (g/m²)	11.524 (1.233 -33.534)	17.856 (2.574 - 46.101)	15.256
IMC (mg/m³)	404	344	372

(After Rudhakrishnan *et al,* 1982)

(Range is parentheses. Integral mean concentration (IMC) = $1/2\ di\ (d_i\text{-}d_{i-1}(a_{i-i}+a_i)$ where 'd' is the depth at which the concentrationts 'a')

The particulate organic carbon values are comparatively high because of higher surface primary production. The average rate of carbon synthesis of surface water for the Exclusive Economic Zone of the east coast is 15 mg C/m³/day, which is equivalent to almost 160 g C per m²and year. Recent figures of the rate of carbon synthesis in the northern Baltic proper in Europe amounted to 200 g C per m² and year (Swedish Environmental Protection Agency, report number 3989, in Swedish). In spite of lower temperatures and a shorter vegetation period, the production in the Baltic proper is very high due to the large input of nutrients from human sources.

Benthic biomass distribution is shown in Figures 27 a and 27 b below.

Fig. 27 a. Distribution of macrobenthic biomass

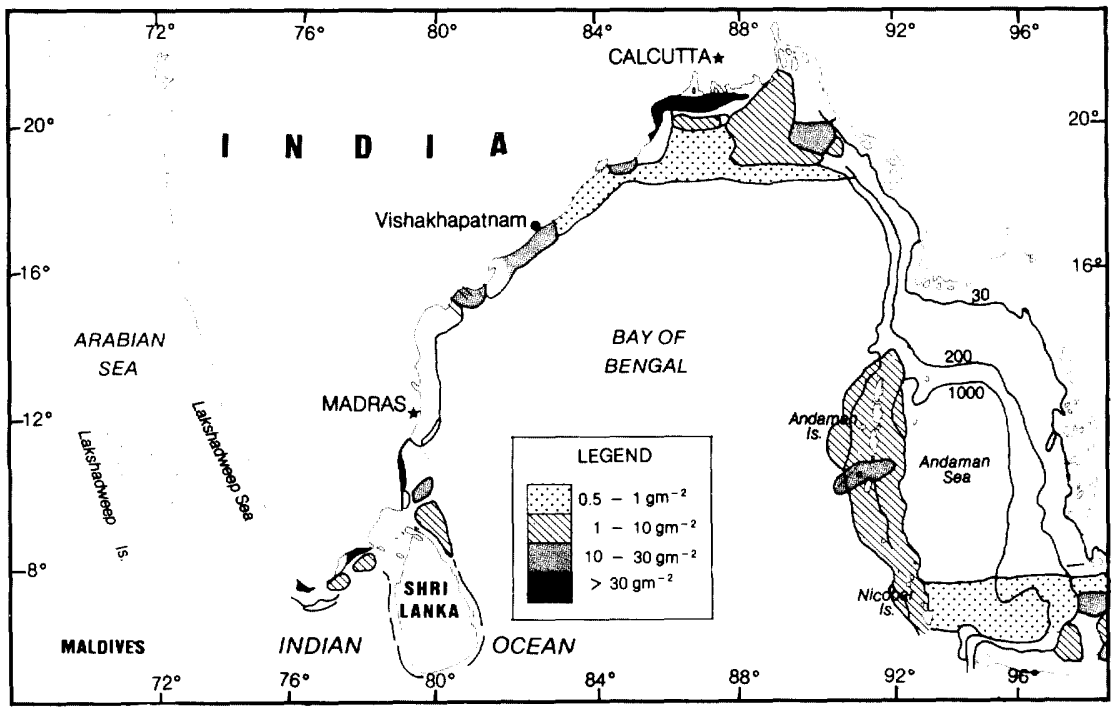
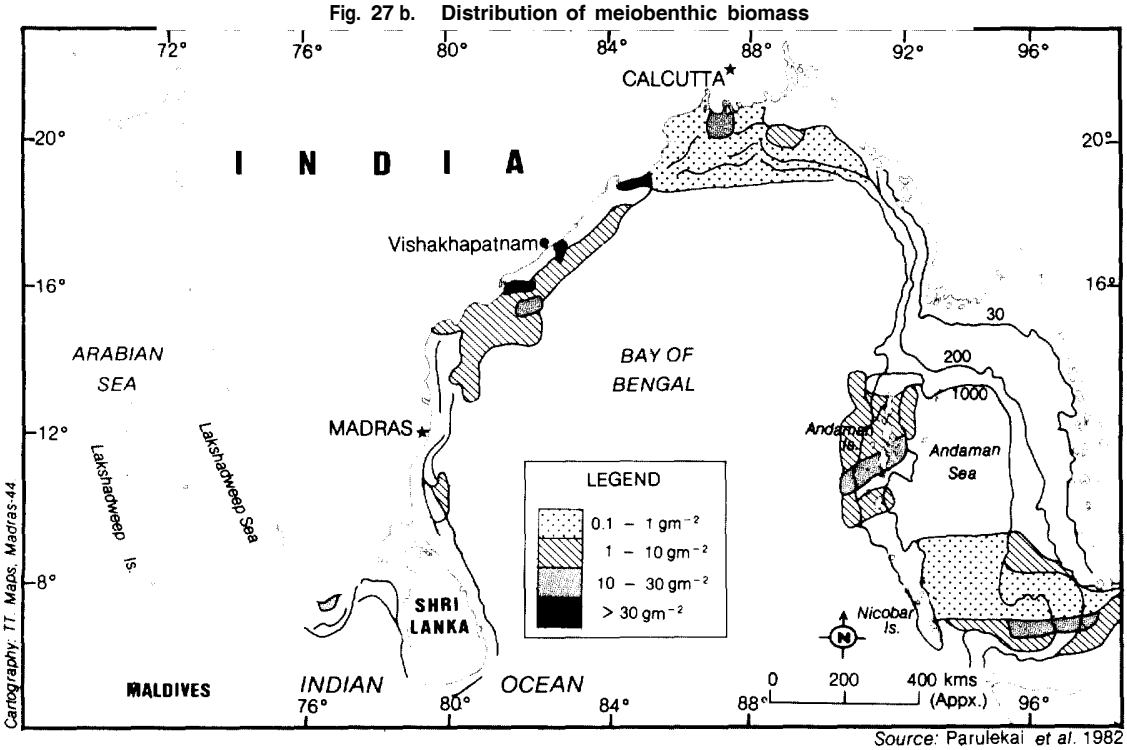


Fig. 27 b. Distribution of meiobenthic biomass



The Bay of Bengal supports a rich marine fishery, which chiefly consists of fish and crustaceans, besides other biological resources like molluscs, corals, sponges, echinoderms and seaweeds. An average of almost 200,000 t of pelagic fish and some 270,000 t of demersal fish and shrimp are landed annually (see table alongside).

The major groups are silverbellies, anchovies, other sardines, catfish, elasmobranchs, croakers, ribbonfish, pomfrets, H*ilsa,* shad, carangids, perch, Bombay Duck and shrimp. Fisheries statistics are given in the table below.

Statewise marine fish catch (in t) from the Bay of Bengal during 1987-1990

Stare or territories	*1987-88*	*1989*	*1990*
West Bengal	61,800	96,900 (13,400)	123,000(17,000)
Orissa	57,000	82,455 (4557)	52,832(2750)
Andhra Pradesh	139,399	124,944 (18,162)	135,121 (17,979)
Tamil Nadu	219,000	293,129 (11,734)	306,733 (19,402)
Pondicherry	20,241	32,187 (2686)	35,26! (3571)
Andamans	10,951	15,036 (213)	13,770 (240)

Note Marine fish landings for West Bengal include landings at Digha and Sankarpur

Source: Fishing Chimes, 11(3): 63 (June, 1991)

Figures in brackets indicate catches of marine shrimp (Out of total)

Fisheries **statistics along the Bay of Bengal coast**

State	*No. offishing villages*	*No. of landing centres*	*Area of brackish water bodies (ha)*	*Marine fishermen*	*Potential brackish water aquaculture area (ha)*	*Area under brackishwater farming (ha)*
West Bengal	652	47	210,000	404,000	300,000	30,000
Orissa	329	62	574,000	521,439	15,330	1500
Andhra Pradesh	409	379	64,000	605,796	17,000	1000
Tami! Nadu	442	343	56,000	520,903	80,000	100
Pondicherry	45	28	negligible	27,865	480	—
Andatmans	43	54	115,000	2225	37,900	—

Source: Govt. of India (1988).

In certain areas, especially West Bengal, there seems to be a potential for increased fishing efforts. (See table below on benthic biomass, annual production, exploited and potential yield from the continental shelf.)

Benthic biomass, annual production, exploited and potential yield from continental shelf

Region	*Mean biomass (g/m^2)*	*Annual carbon production mean ($g\ C/m^2yr$)*	*Annual biomass prod. (tons/yr)*	*Potential yield (kg/ha)*	*Exploited catch (kg/ha)*
Tamil Nadu	1191	2.139	$0.8x10^6$	238	159
Pondicherry	1.13	0.352	$8.3x10^3$	22	58
Andhra Pradesh	3.42	1.066	$0.2x10^6$	68	152
Orissa	7.34	1.760	$0.3x10^6$	147	52
West Bengal	45.49	11.853	$2x10^6$	909	35
Andamans	7.62	1.273	$0,2x10^6$	158	3

Source : Parulekat *et al,* 1982.

38. MARINE *POLLUTION IN THE BA V OF BENGAL*

The exponential growth of population, the rapid pace of industrialization and urbanization, and the increasing use of fertilizers and pesticides in agriculture are mainly responsible for pollution along the Bay of Bengal coast. The main sources of pollutants are

- Domestic wastes
- Industrial wastes from textile mills, chemical plants and pharmaceutical, plastic, detergent, food processing, jute and tyre factories etc.
- Pesticides and insecticides used in agriculture and healthcare, including chlorinated hydrocarbons like DDT, BHC, Endrin and Dieldrin and organophosphates such as Malathion, Parathion, Diazinon etc.
- Petrochemical substances, from oil exploration, refineries, oil tankers, ships, fishing vessels etc.
- Radioactive wastes, from nuclear power stations.
- Heated effluents discharged from thermal (coal-based) power stations.

38.1 *Heavy metals*

Industrial activities are the main cause of heavy metal pollution. River runoff is the natural source of metals in ocean waters. Some metals are toxic in nature, *e.g.* cadmium, mercury and arsenic. Since sediments act as reservoirs of metals, the river mouth sediments of the Ganga, Kaveri, Krishna, Godavari and Mahanadi show a sudden increase of metal concentrations, compared to inter-riverine coastal sediments. The quantity of heavy metals, such as zinc, copper, nickel, chromium, mercury, cadmium, cobalt, lead and arsenic, discharged into the Bay are considerable. Some figures of heavy metals in sediments and in fish are shown in the tables below. It should be pointed out that the concentrations of metals in sediments do not necessarily correspond to the concentrations, in the water. When analyzing sediment concentrations it is important to know the water content and the organic content of the sediment samples.

Heavy metals in sediments of various estuaries of India's east coast and in the Bay of Bengal (in ppm)

Source of sediments	*Manganese*	*Nickel*	*Copper*	*Zinc*	*Chromium*	*Lead*	*Cadmium*
1. Kaveri estuary							
a, bed	1310	379	33	75	229	38	1.8
b. sediment	1968	379	55	347	246	38	3.4
2. Ganges estuary	732	49	44	151	98	32	—
3. Krishna estuary	6978	149	69	1482	174	4*	
4. Godavani estuary	1294	91	119	—	128	5*	
5. Narmada estuary	077	81	136	140	—	—	—
6. Tapi estuary	1125	70	128	125	—	—	—
7. Southeast coast of Indta	337	—	17	62	138	53	2.7
8. Bay of Bengal	529	64	26	—	84	—	—
For comparison							
9. Baltic Sea, Europe (average pee-industrial sediments)	600	41	46	115	51	19	0.3

Sources : (1) Subramanian *et al.,* 1989; (2) Subramanian *et al.,* 1988; (3) Ramesh and Subramanian. 1988; (4) Biksharn and Subramani, 1988; (5) Subramanian *et al.,* 1985: (6) Borole *etal.,* 1982; (7) Subrarnanian and Mohanachandran, 1990; (8) Sarin *et al., 1979.*
- Subrarnanian *et al.,* 1985.

Ranges and average concentrations of some toxic heavy metals (ppm wet weight) in different body parts of fish from the northern Indian Ocean

Body parts	*Mercury*		*Cadmium*		*Lead*	
	Ranges	*Average*	*Range*	*Average*	*Range*	*Average*
Muscle	ND-0.36	0.07	ND-3.24	0.59	ND-3.43	1.11
Liver	ND0.04	0.01	1.2-87.3	20.18	1.17-62	3.80
Gill	ND-0.03	0.016	ND-0.7	60.42	1-7.0	3.14
Heart	ND-0.08	0.026	ND-1.91	0.54	1-3.4	.36
Kidney	ND-0.04	0.015	0.38-36.69	9.00	l-69.46	8.61
Gonads	ND-0.03	0.015	ND-8.06	1.25	1-4.76	.36

ND. — Nondetectable

Source : Kureishy, 1985

Samples of herring *(Clupea harengus)* liver (for Hg muscle) collected from the southern Baltic Sea during 1980-1988 showed the following, very approximate concentrations (wet weight): 0.02 ppm mercury, 0.03 ppm cadmium and 0.07 ppm lead (HELCOM,l990). When comparing the metal concentrations in fish tissue, it is essential to know the size/age and species of fish. The herring, a small and shortlived species, naturally have lower concentrations of metals than larger, more long-lived species such as tuna. However, the concentrations of cadmium and lead indicated in the table above seem remarkably high, despite the fact that information regarding species, sampling, analyses etc, is not available. The WHO-limit for mercury in fish meat used for human consumption

is 0.5 ppm (wet weight). Since bioaccumulation of metals occurs, high concentrations in sediments and water should be taken as a serious warning. The Tamil Nadu section of this survey contains further complementary information on heavy metals.

38.2 Pesticides and insecticides

About 78,000 t of pesticides and insecticides are used in India every year at present, of which approximately one third is by Andhra Pradesh. It is estimated that about 25 per cent of these substances finally reach the sea (Qasim and Sengupta, 1992) and 0.1 per cent of the total quantity used is bioaccumulated in marine biota.

The major cause of pesticide hazard is faulty application and negligence on the part of the farmer in adopting simple precautionary measures. Added to this is a lack of knowledge about proper dosage.

Kannan et *al.* (1992) have studied the persistence of organochlorine residues in foodstuffs and their implications on human dietary exposure. There has been a high level of food contamination with HCH, DDT, Aldrin and Dieldrin throughout India. Dairy produce and livestock meat are the products most contaminated. Concentrations of organochlorine compounds in a few dairy products were above the maximum residue limits set by the FAO/WHO as well as by the Indian Ministry of Health. The average daily intake of HCH and DDT was estimated to be 115 and 48 micrograms/person respectively: this is higher than quantities observed in most developed nations. The dietary intakes of Aldrin and Dieldrin also exceeded the acceptable daily intake recommended by the FAO/WHO.

Pesticide residues are also found in shrimps, bivalves, gastropods, molluscs and fish. Commercially valuable fish are often contaminated by pesticides. Big shipments of contaminated shrimps have, in fact, been returned from Japan and Europe. The concentration (in micrograms/gram wet weight) of persistent organochlorine residues in mussels ***(Perna verdis)*** at different places along the Indian coast are tabulated below.

Concentration in (micrograms/gram wet weight) of persistent organochlorine residues in mussels (Perna verdis) from the Indian coasts

Sampling location	*Sampling date*	*Fat %*	*HCHs*				*DDTs*					
			αE-HCH	β–HCH	d - H C H	E - HCH	opDDE	ppDDD	opDDT	ppDDT	EDDT	PCBs
Ennore estuary mouth, Madras	21.8.1988	0.33	1.40	3.80	0.50	5.70	3.80	6.20	<0.50	5.80	16.00	7.10
Kasimedu-Royapuram Fishing Harbour, Madras	30.8.1988	0 41	1.90	1.70	0.70	4.30	17.00	11.00	co.50	5.10	33.00	5.80
Pondicherry Harbour	21.8.1988	0.60	5.20	2.30	1.10	8.60	4.20	4.90	<0.50	6.50	16.00	1.80
Cuddalore Habour	21.8.1988	0.32	2.20	0.50	2.50	5.20	2.30	1.40	<0.50	1.50	5.20	<1.00
Vellar Estuary, Porto Novo	17.2.1989	I.80	6.00	8.40	I.20	16.00	2.00	0.90	0.59	1.00	4.50	2 00
Nagapattinam Harbour	28.8.1988	0.29	3.40	3.20	0.80	1.40	1.10	0.70	40.50	0.90	2.80	2.00
Calicut	1.12.1988	3.80	3.30	1.40	0.90	5.60	2.50	3.00	9.20	co.50	6.00	5.70
Suratkal	6.5.1989	3.50	6.00	1.70	2.00	9.70	12.00	25.00	2.30	<0.50	39.00	4.20
Goa Harbour	25.2.1989	2.10	3.20	I.00	0'0	4.90	4.10	11.00	5.60	16.00	37.00	4.00

Source : Ramesh et al., 1990

If a comparision is made with the consumption of pesticides from different places in the world, the Indian figures are comparatively low (see table below left). The second table below shows some pesticide concentrations in paddy fields in different countries. The pesticides now used in Western countries are, however, in general more easily degradable and, hence, more harmless. The use of persistent chlorinated pesticides has been banned in most Western countries, but their use persists in developing countries like India, due to their low cost, easy availability, long-lasting effects and easy usage.

Pesticide consumption in Orissa as compared to other countries and states of India

Name of the country or state in India	*Year*	*Pesticides consumed (g/ha)*
Japan	1973.74	10,790
Europe	1973-74	1890
U.S.A.	1973-74	1490
Africa	1973.74	127
India	1987-88	538
Haryana	1983	500
Punjab	1983	600
Andhra Pradesh	1983	700
Assam	1983	100
Orissa	1988-89	290

Source: Mitra. 1990

Mean concentration of HCH and DDT in paddy soils from various countries

Locallity	*Survey year*	*Concentration (ng/g)*	
		HCH	*DDT*
Japan	1974	34.0	not analyzed
USA	1972	not analyzed	80.0
Indonesia	1982	8.9	1.2
Taiwan	1981	1.9	12.0
Malaysia	1981	5.3	5.3
S. India	1988-89	18.0	2.7
Vellar watershed (TN)	1988	120.0	1.9

Source; Ramesh et *al.* (1991)

APPENDIX XIX

Institutions engaged in environmental research, monitoring and enforcement

The following organizations are engaged in studies of the marine environment in India :

Dept. of Agricultural Engineering, Indian Institute of Technology, Kharagpur 721 302, West Bengal.

Dept. of Marin Science, Calcutta University, 35 B C Road, Calcutta 700 019, West Bengal.

Centre for Environmental Studies, Dept. of Civil Engineering, Jadavpur University, Calcutta 700 032, West Bengal.

Dept. of Chemistry, Vishvabharati, Santiniketan 731 235, West Bengal.

School of Basic Medical Sciences, Mahatma Gandhi University, Gandhinagar, Kottayam 686 008, Kerala.

Centre for Earth Science Studies, P B No. 7250, Akkulam, Thiruvananthapuram 695 031, Kerala.

Central Salt and Marine Chemical Research Institute, Bhavnagar 364 002, Gujarat.

Dept. of Geology, Aligarh Muslim University, Aligarh, Uttar Pradesh.

Port Trust, Calcutta, West Bengal.

Central Soil Salinity Research Institute, Canning, West Bengal.

Zoological Survey of India, Calcutta.

Central Institute of Brackishwater Aquaculture, Kakdwip, West Bengal.

Sundarbans Development Board, Govt. of West Bengal, Calcutta, West Bengal.

River Research Institute, Mohanpur, Nadia, West Bengal.

Dept. of Forest, Govt. of West Bengal, Alipur, West Bengal.

Central Water Pollution Control Board, Salt Lake, Calcutta, West Bengal

Dept. of State Fisheries, West Bengal, 8 Lindsay Street, Calcutta.

APPENDIX XX

Profiles of major Indian states on the Bay of Bengal coast

WEST BENGAL

Length of coastline	157 km
District (population in millions)	24 Parganas, North and South (10.7); Calcutta (4.4); and Midnapore (8.4).
Drainage systems	1. Hugli estuary (Haldia, Rupnarayan and Damodar). 2. Rasulpur (Other estuaries are not much polluted).
Major industries	Pulp and paper, textile, chemicals, pharmaceuticals, plastic, food, leather, jute, tyre, fertilizer, oil refineries. distilleries etc.
Ecologically sensitive areas	1. Tiger reserve project. 2. Crocodile breeding and rearing project. 3. Sajinakhali bird sanctuary. 4. Mangrove forest of Sundarbans.
Places of special interest	1. Beaches of Digha, Bakkhali and Sagar Island. 2. Pilgrim centre at Sagar Island.
Major ports	Calcutta and Haldia
Fishing activities	1. No. of fishing villages — 652 2. Marine fishermen — 404,000 3. Fish landing centres — 47 4. Area under brackishwater farming (ha) — 30,000 5. No. of craft Traditional — 4601 Mechanized — 1582 6. Fishing harbours — Sankarpur and Raichawk.

ORISSA

Length of coastline	476 km
Districts (population in millions)	Balasore (2.3), Cuttack (4.6), Puri (2.9) and Ganjam (2.7).
Drainage systems	1. Subarnarekha 2. Jamir 3. Burnabaiang 4. Baitarani (Dhamara) 5. Brahmani (Maipura) 6. Mahanadi 7. Baranel 8. Devi 9. Bhargavi and Daya 10. Rusikulya
Major industries	Chemical, pharmaceutical, leather, rubber, plastic, metal products, food products, textile. electrical machinery etc.
Ecologically sensitive areas	1. Chilika, the largest brackishwater lake in Asia 2. Bhitarkanika Wild Life Sanctuary. 3. Mangrove forests of Brahmani and Baitarani delta. 4. Bird sanctuary of Nalbasa Island. 5. Danghmal crocodile project. 6. Satbhya turtle rookery.
Places of special interest	1. The beaches of Astarange, Konarak, Puri, Aryapalli and Gopalpur. 2. Sun Temple at Konarak and the Lord Jagannath Temple at Puri. 3. Pilgrimage centres of Aredi on the river bank of Baitarani. 4. Dhamara tourist resort. 5. Baliapal Agni Rocket Launching Station.
Major ports	Paradwip and Aryapalli near Gopalpur.
Fishing activities	1. No. of fishing villages — 329 2. Marine fishermen — 521,439 3. Fish landing centres — 62 4. Area under brackishwater farming (ha) 1500 5. No. of craft Traditional – 10,579 Mechanized — 674 6. Fishing harbour — Dhamara

ANDHRA PRADESH

Length of coastline	476 km
Districts (population in millions)	Srikakulam (2.0), Vishakhapatnam (2.6). East Godavari (3.8). West Godavari (2.9). Krishna (3.0), Guntur (3.4) and Prakasam (2.3).
Drainage systems	1. Navpada 2. Vamsdhra 3. Nagavai 4. Peddagedda 5. Kandivalasa 6. Nelhmaria 7. Gosiani 8. Narayagida 9. Sarada 10. Varaha 11. Tandava 12. Eluru 13. Godavari 14. Krishna 15. Gundlakamma 16. Musi 17. Palleru 18. Manneru 19. Penneru 20. Upputeru 21. Swarnamukhi 22. Kalangi through Pulicat Lake.
Major industries	Paper and pulp. textile, chemical, pharmaceutical, tanneries, fertilizers, rubber, electrical products, battery, salt production centres at Ramchandrapuram, Machilipatnam and Tekkali.
Ecologically sensitive areas	1. Mangrove forest areas at Nizampatnam, Pandipora, Machilipatnam and Coringa Island.
Places of special interest	1. Sriharikota Satellite Launching Station. 2. Pilgrim centres at Kollapatnam and Antarvedi.
Major ports	Vishakhapatnam, Kakinada, Machilipatnam, Bheemunipatnam, Narsapur, Krishnapatnam, Vadarevu and Kalingapatnam.
Fishing activities	1. No. of fishing villages — 409 2. Marine fishermen — 606,796 3. Fish landing centres — 379 4. Area under brackishwater farming (ha) — 1000 5. No. of craft Traditional — 57,458 Mechanized — 1009 6. Fishing harbours — Vishakhapatnam, Kakinada, Nizampatnam and Bharanapada.

TAMIL NADU

Length of coastline	938 km
Districts (population in millions)	Madras (3.3). South Arcot (4.2), Chidambaram (1.4), Thanjavur (4.0). Pudukkottai (1.2), Ramanathapuram (1.0) and Kanniyakumari (1.4).
Drainage systems	1. Arni 2. Cooum 3. Adyar 4. Palar 5. Ponnaiyar 6. Chunnambar 7. Uppar 8. Pannaiyar 9. Godilam 10. Vellar 11. Kollidam (Coleroon) 12. Kaveri 13. Varshalee 14. Manimuttar 15. Vaigai 16. Vaippar 17. Chittar
Major industries	Paper and pulp, wood products, food products, transport equipment, tannery, metal products, fertilizers, chemical, engineering, thermal power, salt production centres at Vedaranniyam, Marakkanam and Tuticorin.
Ecologically sensitive areas	1. Mangrove forest area at Pichavaram near Parangipettai (Porto Novo). 2. Bird sanctuary and wild life and forest conservation zone near Point Calimere. 3. Oyster beds near Point Calimere. 4. Coral reef near Mandapam. 5. Shell fishing area within Tuticorin harbour. 6. Sanctuary for coastal fauna at Kurusadai Island. 7, Sponge beds at Manoli and Putti Islands. 8. Windowpane shell fisheries at Point Calimere.
Places of special interest	1. Beaches in Madras, Kovalam and Pondicherry. 2. Atomic power station at Kalpakkam. 3. Offshore oil exploitation near Madras and Kaveri delta, Palk Bay. 4. Shrines'at Mamallapuram. Rameshwaram, Tiruchendur and Kanniyakumari.
Major ports	Madras, Tuticorin, Cuddalore and Nagapattinam
Fishing activity	1. No. of fishing villages — 449 2. Marine fishermen — 520,903 3. Fish landing centres — 343 4. Area under brackishwater farming (ha) 100 5. No. of craft Traditional — 39,367 Mechanized — 2514 6. Fishing harbours Cuddalore, Tuticorin, Madras, Nagapattinam and Pazhaiyar.