A fish landing site in Doddandu wa, a typical Shri Lankan fishing village.

Shri Lanka

by

Hemantha Dassanayake
National Aquatic Resources Agency
Crow Island, Colombo 15, Shri Lanka

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56. GENERAL *FACTS*

The marine fishery is very important to Shri Lanka. According to the 1988 census, 65 per cent of the animal protein consumed in Shri Lanka is from fish. The fisheries industry employs 96,000 persons, partly employs ten thousand and gives indirect employment to a further five thousand people. Nearly two per cent of Shri Lanka's Gross Domestic Product **(GDP),** conies from the fisheries sector (1988). Coastal fisheries supply over 90 per cent of the total marine fish production.

Urbanization and industrialization have caused several undesirable effects on the marine environment, such as pollution, over-exploitation of resources and habitat degradation. These are studied in this paper.

56.1 Location and territory

Shri Lanka is an Indian Ocean island situated between latitudes 5°51 and 9° 51 N and longitudes 79° 41 and 81° 51E. The country has a 1760 km-long coastline that is serrated by a number of estuaries, lagoons and river basins. Shri Lanka's land area is 65,610 km². Its maritime boundaries are as follows (Figure 36):

Fig. 36. Territory of Shri Lanka (including Maritime Zone)

- **The territorial sea,** extending to a distance of twelve nautical miles from the coast of the main island.
- **The contiguous zone,** which extends a further twelve nautical miles from the outer limits of the territorial sea.
- **The Exclusive Economic Zone (EEZ),** which extends 200 nautical miles from the coasts (and includes the territorial and the contiguous zones).
- **The Internal Waters,** for which a demarcation is necessary in the Gulf of Mannar and the Palk Strait, where the above zones overlap with India's nautical zones.

Shri Lanka has three morphological zones, peneplains or erosional levels

- The first coastal peneplain is from sea level to 120 m.
- The second peneplain is from 300 m to 760 m.
- The third peneplain is from 900 m to 2440 m.

The second and third peneptains, called the Central Highlands, are only about one-fourth the country's total land area.

56.2 Climate

There are four seasons during the year :

- The Southwest Monsoon period (May to September): During this period, there is heavy rainfall, but it is normally confined to the southwestern region.

- The Inter-Monsoon period (October to November): The Inter Tropical Convergent Zone (ITCZ) lies in the latitudes of Shri Lanka. Convectional thunderstorms in the afternoons are common during this period and low pressure zones originating from the Bay of Bengal sometimes develop into cyclonic storms.

- The Northeast Monsoon period (December to February): Heavy rains occur in the north, east and northeast slopes of the central hills.

- The Inter-Monsoon period (March to April): Again, as the island lies within the ITCZ, convectional afternoon thundershowers occur. But the depressional activity is low compared to the October-November Inter-Monsoon period.

Based on the mean annual rainfall, three major climatic zones are identified :

Zone	*Mean annual rainfall*
Dry Zone	1900 mm
Intermediate Zone	1900 - 2500 mm
Wet Zone	2500 - 5500 mm

The Mannar, Kalpitiya and Yala areas experience the lowest rainfall, that is, less than 1000 m. The highest rainfall is in the Watawala-Ginigathena area of the central massif region.

Drastic seasonal temperature changes are not experienced in Shri Lanka. Temperature variations due to elevation are more usual. The mean annual temperature in the coastal plain is 26 - 28°C and in highlands it is 15 - 19°C. The temperature in Nuwara Eliya, however, sometimes falls to 0°C. In the east and the northeast regions, temperatures sometimes rise as high as 37°C.

56.3 Oceanography

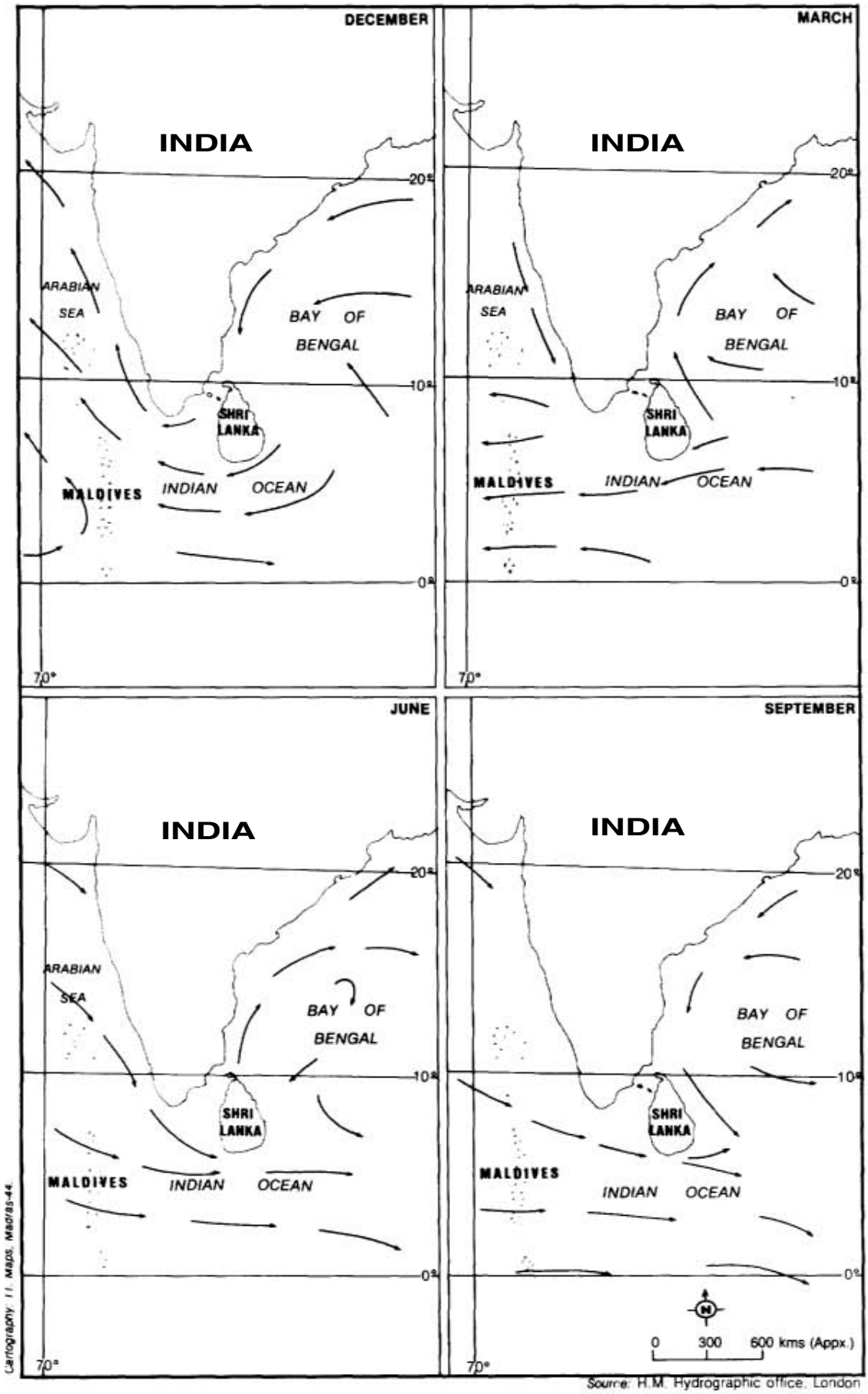
The continental shelf of Shri Lanka is about 28,000 km^2 in extent. The shelf is narrowest (6 km) in south Shri Lanka and widens towards the north. In the northwest (beyond Kalpitiya), it joins up with India's continental shelf.

The highest waves occur during the Southwest Monsoon when the effective fetch is about 800 km (between Maldives and Shri Lanka). During the Northeast Monsoon, the wind blows across the Bay of Bengal. The energy of the waves is relatively low during this period, as well as during the inter-monsoonal periods.

Currents coming from the Bay of Bengal, the Arabian Sea and the equatorial region meet in the area where Shri Lanka is situated. Figure 37 (on facing page) shows the current patterns around the island during the year. The strongest current hits the southern coastline during October-January.

Tidal cycle periods last for approximately twelve hours. The maximum tidal range is 75 cm in spring tide and 25 cm in neap tide. The amplitude of the tide is highest in the Colombo area and lowest around Delft (off Jaffna) and Trincomalee.

Fig. 37 Surface currents around Shri Lanka



56.4 Population

Shri Lanka's population was estimated to be 16.6 million at the end of 1986. Fortysix per cent, of the country 's population lives in the coastal districts. With an annual increase of 1.6 per cent, the population is expected to grow to 20.6 millions by the year 2000.

57. *MARINE HABITATS*

57.1 *Mangroves*

Mangroves are found all along the sheltered coasts of Shri Lanka. An estimate of the present mangrove areas in the island, excluding the disturbed northern part of the island, has been made using remote sensing and reveals the extent tabulated alongside.

District	*Extent (ha)*
Colombo	9
Gampaha	723
Puttalam	2970
Tnncomalee	1070
Batticaloa	1520
Amparai	53
Iota]	6345

A rough estimate of Shri Lanka's total mangrove area would be 10,000-13,000 ha.

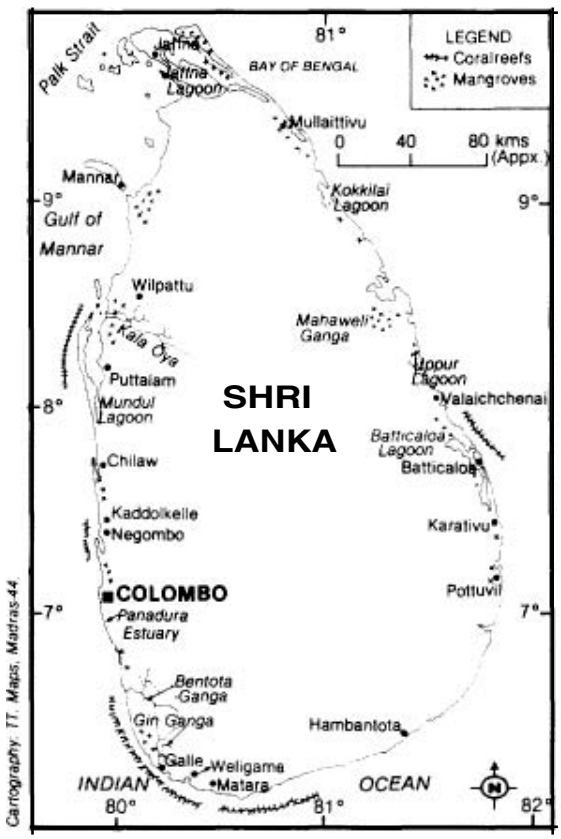
M. D. Amarasingha (1988) found 21 free mangrove species and 17 mangrove-associated species in the island.

Many present activities threaten the future of the mangrove habitats (see Figure 38). Protection of specific mangrove areas is, therefore, necessary. Traditional uses of mangrove can, however, be allowed up to a certain extent. Only degraded mangrove habitats should be used for development activities.

The mangroves situated within the authority of the Coast Conservation Department are legally protected. Mangroves found in the wildlife reserves, *e.g.* Wilpattu and Kokkilai Lagoon, come under the Wildlife Conservation Department. Mãngroves on government land are managed by the Chief Government representative (the Government Agent, GA) of the particular area. The GA has the authority to release the lands for various activities.

The National Mangrove Committee of the National Resource, Energy and Science Authority of Shri Lanka includes several conservation-oriented state orgnizations. The objectives of the committee are to co-ordinate the research and management of Shri Lanka's mangrove resources. As a result of proposals made by the National Aquatic Resource Agency (NARA), Kaddolkelle (Negombo), area has been identified as a mangrove reserve.

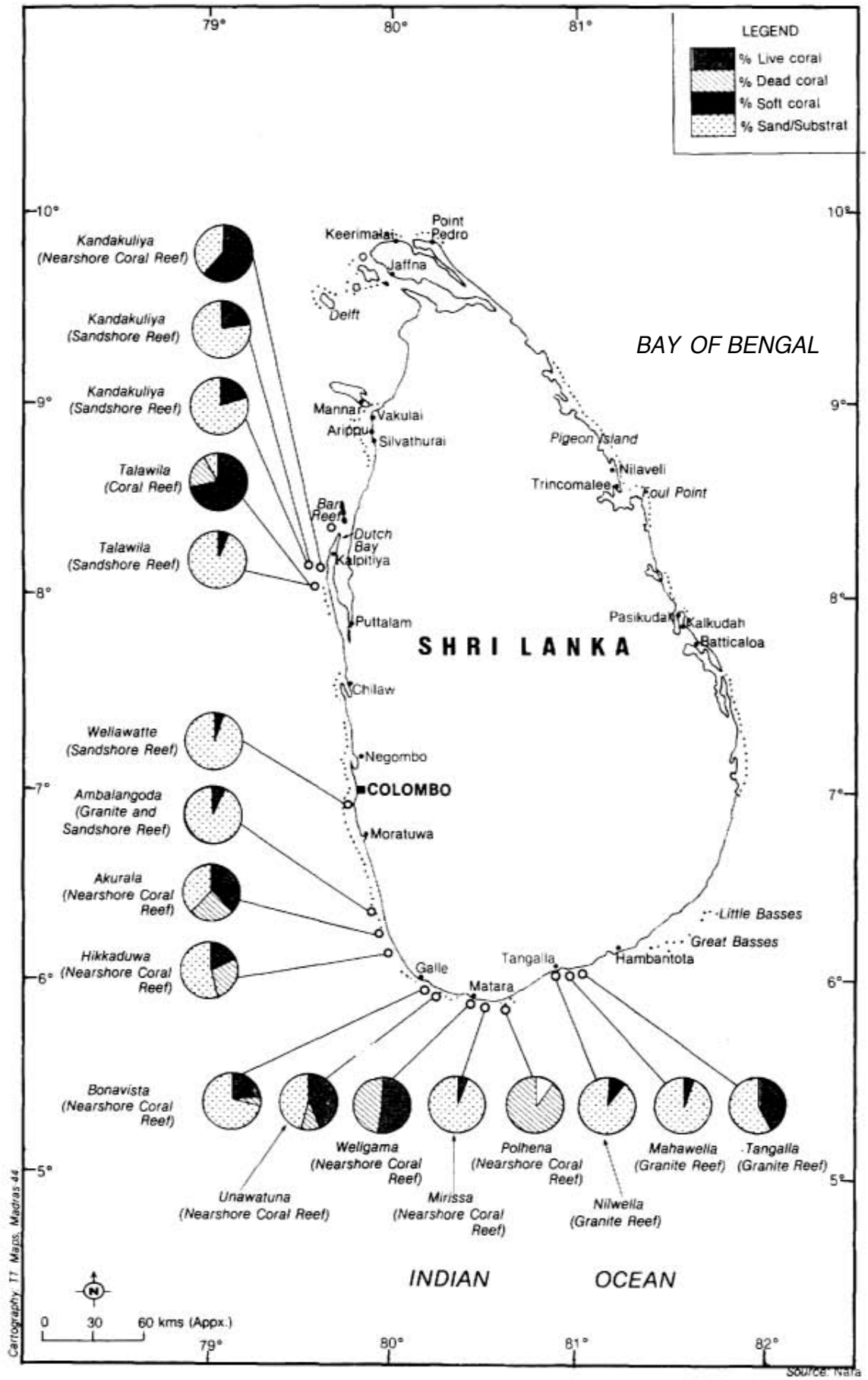
Fig. 38. Location of coral reefs and mangroves of Shri Lanka



57.2 *Coral reefs*

Coral reefs are located in relatively undisturbed shallow areas which do not receive large river discharges of freshwater. Figure 39 (on facing page) shows the condition of the coral reefs.

Fig. 39. Condition of the coral reefs of Shri Lanka



The total extent of the coral reefs has still not been estimated. However, some available figures are given alongside.

Area	*Extent*
Trincomalee	2 km^2
Hikkaduwa reef	1.6 kin^2
Sallidnor	1km^2

The available information on the linear extent of the coral reefs is as follows:

District	*Reel*	*Linear extent (Km)*
Mannar	Vakulai	4
	Arippu	
	Silvathurai	2
Jaifna	Point Pedro-Keerimalai	0
Trincomalee	Foul Point	6
	Coral Point	2
Mullaitivu u	Nilaveli	1-2
	Pigeon Island	2-3
Battioaloa	Thennadi Bat	8
	Palavi Point	
	Palavi Bat	
	Elephant Point	4
	Vandeloos Bay	
	Pasikudah	
	Kalkudah	

One hundred and seventyone (171) coral species, belonging to *65* genera, have been recorded in Shri Lanka.

Coral reefs help to prevent coastal erosion. They are also valuable for scientific and educational purposes, as well as for tourism and recreation.

Corals are extracted and used for construction and lime extraction, as well as for ornamental purposes. Such fishery activities as angling, dynamiting, spear-fishing and, anchoring of fishing boats, apart from pollution due to land-based activities, all threaten the reefs.

Hikkaduwa and Bar Reef have been declared Marine Sanctuaries by the Department of Wildlife Conservation, while the Polhena Reef has been identified as a suitable site for a marine park. A Hikkaduwa Reef management plan is, in fact, being formulated under the Coastal Reef Management Project (CRMP), funded by USAID. A Bar Reef Management Plan is being developed by NARA, with the assistance of SAREC.

To prevent the coral reefs from further depletion, a comprehensive management plan must be formulated. Furthermore, legal provisions already available for regulation/prevention of destructive activities should be strictly enforced.

57.3 Seagrass beds

Seagrass beds are found in the open sea as well as in river basins, estuaries and lagoons. From Jaffna Lagoon to Dutch Bay, from Mannar to Rameswaram island in India, the seagrass beds are extensive. In the southwestern part of the island, smaller seagrass beds are found on the leeward side of the coral reefs. Seagrass bed areas in Shri Lanka have not, however, been precisely determined, but twelve species of seagrass, belonging to nine genera, have been identified.

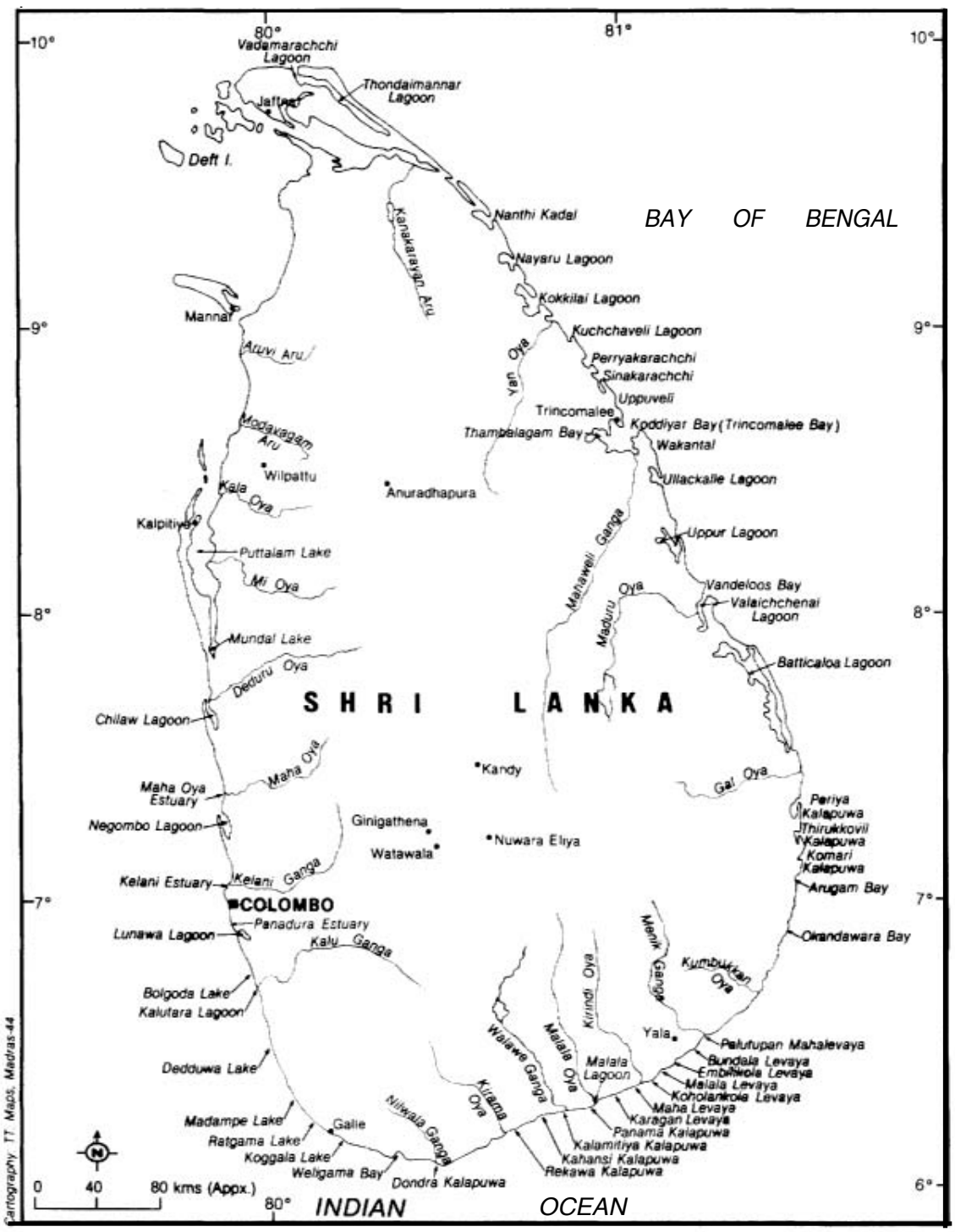
Seagrasses are very sensitive to turbid water caused by pollution and sediments. Bottom trawling and dragnetting also cause damage to seagrass bed communities. The collection of Polychaet worms (feed for brood shrimp) also affects the seagrass beds negatively. The beds are also the only habitats for the endangered *seacow/Dugong dugong*.

57.4 Estuaries and lagoons

Semi-enclosed brackishwater coastal waterbodies having a permanent free connection with the sea are termed estuaries in this report. Coastal waterbodies separated, or temporarily connected to the sea, are called lagoons. Two types of estuaries are found in Shri Lanka: the basin and the riv erine types.

Estuaries and lagoons are distributed all along the national coastline (see Figure 40). There are some 45 basin estuaries and 40 lagoons in Shri Lanka. Their total area is estimated at 40,000 ha. The major urban centres on the coast are all associated with estuaries.

Fig. 40. River basins, estuaries and lagoons in Shri Lanka



Puttalam estuary is one of the principal estuarine systems in Shri Lanka. It sustains a thriving commercial fishery, which gives a livelihood to a large number of people engaged in fishery-related activities.

The estuaries and lagoons are used as harbours, waste disposal sites and for recreation, education, sandmining and aquaculture purposes. They also serve as fishing grounds.

Waste disposal, aquaculture and mechanized fishing boats are the major causes for the degradation of the estuary (e.g. Kelani) and lagoon (e.g. Lunawa) environments.

Decreases in salinity due to the discharge of freshwater diverted from irrigation work has been responsible for the depletion of fish and shrimp catches in the Kalamitiya and Rekawa lagoons.

According to the definition of 'coastal zone' in the Coastal Zone Management Plan (1986), parts of the estuaries and lagoons come under the Coast Conservation Department's jurisdiction. The destructive activities can, therefore, be regulated up to a certain extent.

58. LAND-BASED ACTIVITIES AFFECTING THE MARINE ENVIRONMENT

58.1 *Domestic wastes*

Densely populated human settlements are the primary cause of organic pollution of both inland and marine waters. Lack of waste water treatment facilities, is a common problem. Properly planned sewage systems have not yet been devised in Shri Lanka, except in the Colombo Municipality area.

In Colombo, sewage is screened for larger particles and floaing matter, then pumped directly into the ocean without treatment. The Colombo sewerage system consists of two ocean outfalls located in Wellawatte (southern outfall), and Modera (northern outfall), (Figure 41, see facing page). The Dehiwela, Mt. Lavinia (Galkissa) and Kolonnawa sewerage systems are planned to be connected to the Colombo ocean outfall system.

The Shri Lanka Sewerage Project Report (1981) proposes the construction of ocean outfalls for the diposal of waste from the Galle and Negombo Municipalities.

The details of the Colombo South (Wellawatte) and North (Modera) ocean outfalls are given in the table alongside.

	Wellawatte (Colombo South)	Modpro *(Colombo North)*
Commissioned	April 1986	December 1986
Placed in service	December 1986	January 1987
Length of outfall	1273 m	1860 m
Discharge capacity	2.4 m^3	2.9 m^3
Discharge volume 1990	43,908 m3/day	51,943 m^3/day

58.2 Industrial wastes

There are approximately 60,000 industrial establishments in Shri Lanka, ranging from large-scale industries to repair shops and small mining and quarrying operations. Most of the industries are in the Greater Colombo area (Figure 41, see facing page). In 1989, an industrial pollution survey was made, covering almost eight thousand units. Of these, three thousand were considered non-polluting, while the rest had polluting potential. Of the latter, three hundred were high-level polluters.