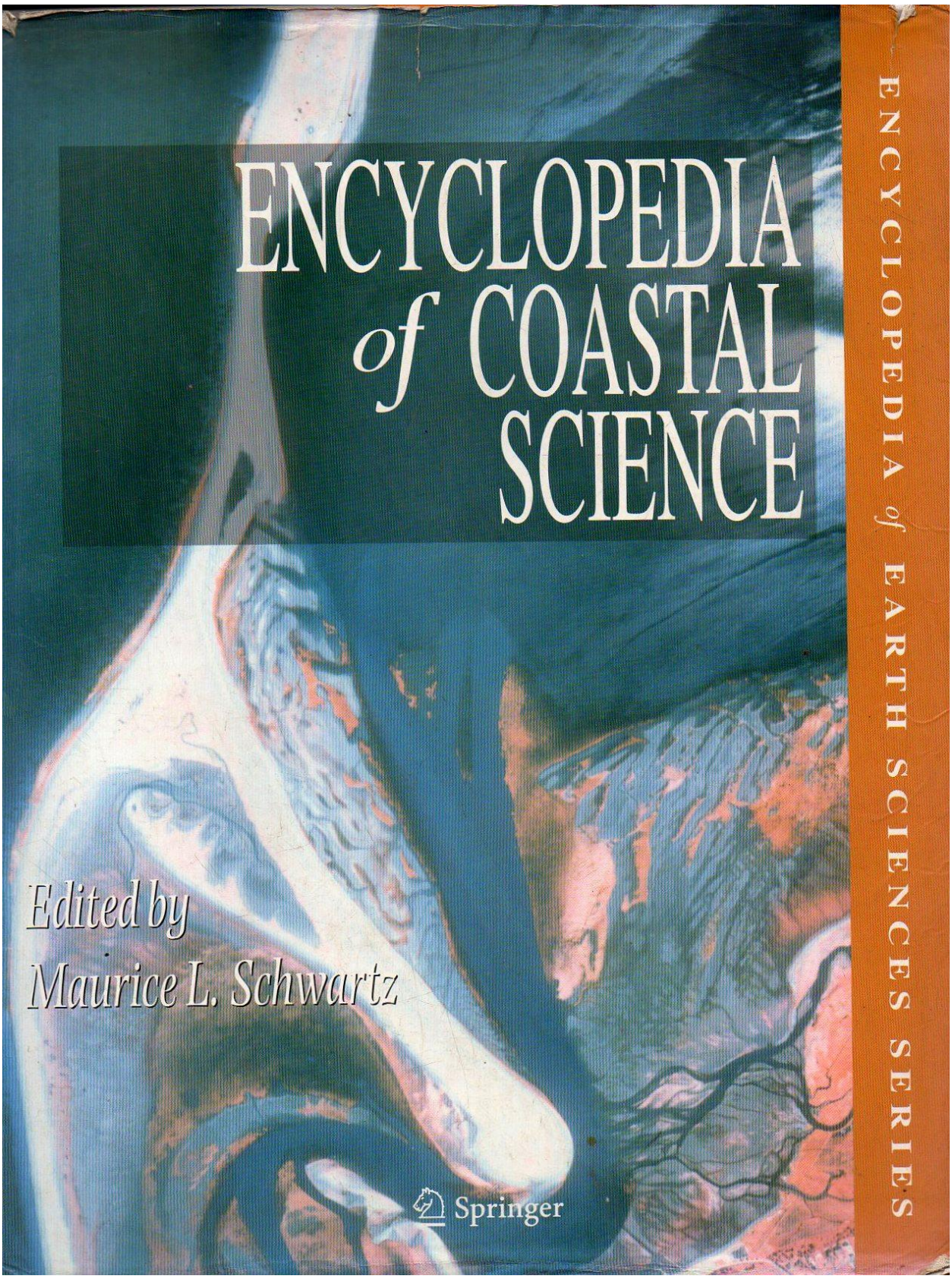

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Institutions of database networking and capacity building and training on coral reefs have been identified. With the establishment of the National Mangrove Committee (NATMANCOM), attempts are being made to protect, conserve, and restore the mangrove habitats. Mangrove regions in the country have been categorized presently under the Ecologically Sensitive Zone; vide CRZ Act of the country. As per the CRZ Act, no development in the mangroves or in the vicinity is allowed prior to an environmental impact assessment (EIA) and clearance from the Ministry of Environment and Forests (MoEF), Government of India. Few of the mangrove regions in the country have been conserved as Biosphere reserves for germplasm and wildlife sanctuaries.

Shrimp culture activities

The aquaculture industry is growing at a faster rate than many of the sectors of the coastal zone in India. Socially, its product is seen as a currency. However, if aquaculture expansion is not regulated, its long-term consequences will be felt in the quality of water bodies. In fact some adverse effects of shrimp culture are already seen along the east coast of India, particularly along the coast of Andhra Pradesh.

Sandy shores

Mining of beach sand is a widespread activity in many of the coastal areas. Though sand is an important constituent of construction activities, it has to be borne in mind that it is these sand deposits that provide the natural protection to the coast from erosion. Storms, waves, currents, and wind temporarily displace vast quantities of beach sand that is then held in storage as sand bars. These sand bars then become the protectors of the coasts against those forces, which finally return the sand to the beach. Thus, removal of sand from any part of the beach can aggravate the erosion and recession of the beach front altogether.

For the above reasons and also for the sustainable management of the coastal resources, many countries are now developing Coastal Zone Management (CZM) strategies, and some have already begun to adopt such programs. The CZM has to manage, develop, and conserve natural resources and, while doing so, it has to integrate the concerns of all relevant sectors of the society, economy, and prosperity.

A major thrust in implementing the CRZ notification is in the conservation of coastal resources, to achieve their sustainability, and long-term protection of its natural assets. The criterion for sustainable use is that the resource shall not be harvested, extracted, or utilized in excess of the quantity that can be produced or regenerated over the same period. It is important to learn the acceptable limits of coastal environmental degra-dation and the limits of sustainability of coastal resources. Hence, in order to achieve the goals set forth in the notification, it is imperative to have first-hand-information on the present land use practices and availability of the resources in the coastal zone. Contribution No.3897 of NIO, Goa.

Baban Ingole

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Cross-references

Aquaculture
Bioconstruction
Coastal Lakes and Lagoons
Coral Reef Coasts
Estuaries
Human Impact on Coasts
Indian Ocean Coasts, Coastal Geomorphology
Indian Ocean Islands, Coastal Ecology and Geomorphology
Mangroves, Ecology
Mangroves, Geomorphology
Muddy Coasts
Vegetated Coasts
Wetlands

INDIAN OCEAN COASTS, COASTAL GEOMORPHOLOGY

The coastal geomorphology of the Indian Ocean coast, with special reference to coasts of Pakistan, India, SriLanka, Bangladesh, and Myanmar, is mainly governed by the processes associated with monsoons.

Pakistan

The coastline of Pakistan, from the Iranian border on the west to the Indian border on the east is about 990 km long. This coastline is one of the active tectonic regions. The coast here is associated with a narrow continental shelf, except off Indus delta. The coast of Pakistan is divided into the Makran coast, Las Bela coast, Karachi coast, and Indus Delta coast.

The Makran coast, with approximately 473 km length, from the Iranian border to Ras Malan, consists of long sandy beaches associated with either wide coastal plains or valleys landward. These plains and valleys are interrupted by uplifted marine terraces at places. Also the Makran hill ranges, which lie about 32 km from the coast, become part of the coast at Ras Malan with massive headlands. Spits and bars are common seasonal morphologic units along sandy beaches. At places, well-developed beach ridges are seen. Dasht is the only river which brings a small quantity of sediment from land to the Arabian Sea along this coast.

The Las Bela coast, with about 260 km length, extends from Ras Malan to Ras Muari. The Ras Malan range is made up of sandstone and shelly limestone and presents gorges and cliffs as high as 600 m, which drop directly to the sea. Followed by this, on the east, is the Las Bela plain. The coast here consists of a series of beach ridges, sand dunes, bars, tidal flats, and lagoons with mangroves (Bird and Schwartz, 1985). Between the Ras Malan ranges and the Las Bela main valley notable mud volcanoes are present, the largest among them is called Chandragup (Snead, 1964). On the eastern side of the Las Bela valley, promontories of limestone are present. Here marine terraces at different elevations have wave cut sea caves and blow holes (Snead, 1966). Along this coast, the Hab River joins the Arabian Sea at its mouth compound bars, shallow lagoons, and sandy beaches are present.

The Karachi coast, about 48 km in length from Ras Muari to Clifton beach, consists of low rocky cliffs and sandy beaches of almost equal length. Marine terraces, sea caves, and arches are common in the sandstone and shale rocks. Sandy barrier beaches, spits (the longest one 15 km in length), shallow lagoons, tidal flats, and salt evaporation ponds are common along the sandy beaches.

The Indus delta coast is about 200 km long with uniform landforms namely large tidal channels with mudflats in between, barrier bars and spits with hooks, and beaches, and a few small mangrove shrubs. The sand bars and delta channels are dynamic in nature as they change their morphology due to tidal currents, waves and channel floods. The coastal area in this region is very flat and therefore up to 6.5 km from the coastline it is submerged during high tide. The river Indus brings a large quantity of sediment from land to sea and joins the Arabian Sea along this coast.

India

Most of the early literature on Indian coastal geomorphology was essentially of a descriptive nature based on the nature, location, and relationships of the landforms and sea level. Ahmad's (1972) was possibly the first and only book on coastal geomorphology of India, and contains data collected from large-scale maps and inferences drawn on the nature of the coasts. In addition, there are some isolated studies by Vaidyanathan (1987), Baba and Thomas (1999). The Space Application Centre (SAC, 1992) has carried out a comprehensive study on the coast using LANDSAT and IRS data. The information on Indian coastal geomorphology presented in this article is based on these and many more isolated published studies.

India has about a 7,500-km long coastline. The coastline of India has been undergoing morphological changes throughout the geological past. The sea level fluctuated during the period of last 6,000 years and recorded marked regression during the period between 5,000 and 3,000 years before present (Rajendran *et al.*, 1989). The present coastal geomorphology of India has evolved largely in the background of the post-glacial transgression over the preexisting topography of the coast and offshore (Baba and Thomas, 1999).

The major rivers that cut across the coast and bring large quantities of water and sediment to the coast from Indian continent are the Ganges, Brahmaputra, Krishna, Godavari, and Cauvery on the east coast, and the Narmada and Tapti on the northwest coast. In addition, there are about 100 smaller rivers, these also supply considerable quantities of water and sediment. While larger rivers have well-developed deltas and estuarine systems, almost all the small rivers have estuarine mouths with extensive mud flats and salt marshes and some of them with estuarine islands.

The continental shelf of India is very wide on the west coast with about 340 km in the north, tapering to less than 60 km in the south. The shelf is narrow along the east coast. The coastline on the west receives southerly winds that bring high waves during the monsoons (June–September). The east coast generally becomes active during the cyclones of the northeast monsoon period (October–November). The tidal range varies significantly from north to south. It is around 11 m at the northwest, 4.5 m at the northeast and around 1 m at the south.

Considering geomorphic characteristics, the Indian coast is divided into two categories, namely coasts on the west coast of India and coasts on the east coast of India. The coast on the west coast of India differs from the east in that there are practically no deltas on the west coast. The coastline here is modified by headlands, bays, and lagoons at irregular intervals. There is distinct evidence of the effect of neotectonics in some sections (Vaidyanathan, 1987). The east coast on the contrary is known for the number of deltas especially along the northern portion, West Bengal and Orissa coast. Deltas in the southern portion have helped in recognizing ancient channels, ancient beach ridges, former confluences, and strandlines.

West coast of India

Though there are a large numbers of small rivers bringing enormous quantity of sediment to the Arabian Sea along the west coast, deltas are not formed, possibly due to the high-energy condition of the coast. Beach morphological changes along the west coast are controlled by the southwest monsoon. The maximum morphological changes occur during early monsoons (June–August). During this period most of the material is transported to the offshore and some alongshore. Most of the material appears to be returned again during the fairweather season.

The west coast of India is further divided into the Gujarat coast, Maharashtra, Goa and northern Karnataka coast, and southern Karnataka and Kerala coast based on their geomorphological distinctions. The coastal area of Gujarat is the largest in the country with about 28,500 km^2. The coast in Gujarat, from west to east, varies from a deltaic coast, the irregular drowned prograded coast, the straightened coast, the spits and cuspate foreland complex, and the mudflat coast. The Gujarat coast is further divided, from west to east, into five regions, namely Rann of Kutch, the Gulf of Kutch, the Saurashtra coast, the Gulf of Khambat, and the South Gujarat coast, based on coastal geomorphic characteristics.

The Rann of Kutch remains saline desert for the larger part of the year and is further divided into the Great Rann and the Little Rann. On the west of the Great Rann of Kutch is the area of the lower Indus deltaic plain which is characterized by tidal creeks and mangroves. The coastline in the Gulf of Kutch has extensive mudflats and is highly indented with a number of cliffed rocky islands (Baba and Thomas, 1999). Migration, joining of different creeks, reorientation of tidal current ridges, and regression of the sea are seen and are related to tectonically activated lineaments. The coast here is fringed by coral reefs and mangroves. Algae, salt marsh, dunes, and salt pans are very common. The Saurashtra coast has numerous cliffs, islands, tidal flats, estuaries, embayments, sandy beaches, dunes, spits, bars, bays, marshes, and raised beaches at some places. The coast, in Gulf of Khambat is indented by estuaries and consists of mudflats, dunes, and beaches. Here mudflats are seen at different levels and paleo-mudflats have been related to regression. The south Gujarat coast is relatively uniform and is indented by a series of creeks, estuaries, marshes, and mudflats. The Gujarat coast, from Great Rann to the south Gujarat coast, presents evidence for both emergent and submergent coasts.

The Maharashtra, Goa, and northern Karnataka coasts are characterized by pocket beaches flanked by rocky cliffs, estuaries, bays, and at some places mangroves. Beaches in southern Goa and some places along northern Karnataka, however, are long and linear in nature with sand dunes. The Mandovi and Zuari estuarine system in Goa is the largest in this part of the coast. Mudflats are found mainly along estuaries and creeks. Rocky promontories on the Maharashtra coast are made up of Deccan basalts whereas in the south they are mainly of granite gneisses. A number of raised platforms can be seen all along the coast. There are a few islands along the southern parts of this coast near Karwar. This coastal stretch is typical of a cliffy coastline with raised platforms and strong evidence of a submergent coast. The beaches in Goa and northern Karnataka are well-studied and classified as stable beaches with seasonal morphological changes and annual cyclicity (Nayak, 1993).

The southern coast of Karnataka is characterized by long linear beaches, estuaries, spits, mudflats, shallow lagoons, islands, and a few patches of mangroves. Satellite image studies revealed northward shifting of the mouth of estuaries along this coast (SAC, 1992). Beach erosion is severe in some areas along this stretch. The Kerala coast is known for the presence of laterite cliffs, rocky promontories, offshore stacks, long beaches, dunes, estuaries, lagoons, spits, and bars. Using Landsat images, three sets of sand dunes have been identified. The mud banks are unique transient nearshore features appearing during monsoons (Mathew and Baba, 1995) at Kerala. They are unique phenomenon occurring at particular locations along the Kerala coast during the southwest monsoon season, which act as natural barriers to coastal erosion. Along the coast, sand ridges, extensive lagoons, and barrier islands (700 landlocked islands) are indicative of a dynamic coast. About 420 km of the 570 km coastline is protected by seawalls and about 30 km of the coast is undergoing severe erosion. Maximum loss of material has been reported along the southern sections. The predominant southwest wave approach during monsoons, result in northerly littoral drift with varying speed. Some parts of the Kerala coast are known for rich heavy-mineral deposits. The characteristic coastal geomorphology provides an ecosystem, which supports both agriculture and fisheries. Evidences of both emergent and submergent coasts are available for the southern Karnataka and Kerala coast.

East coast of India

The deltaic systems of the east coast experience the high sedimentation rate and periodic cyclones which result in extensive floods.

The east coast in the south, along Tamil Nadu and Pondicherry, is straight and narrow except for indentations at Vidyaranyam. The major landform along this coast is the presence of a large delta formed due to the Cauvery River and its tributary system. The other landforms are mudflats, beaches, spits, coastal dunes, rock outcrops, salt pans and

strand features. At a few places mangrove systems, and at Gulf of Mannar and Rameshwaram fringing and patchy reefs, are seen. Deposition and erosion have been reported at different beaches along this stretch. Rich heavy-mineral deposits have been reported at Muttam–Manavalakuruchi.

The coastline of Andhra Pradesh, mainly the deltaic coast, is 640 km long and comprised of bays, creeks, extensive tidal mudflats, spits, bars, mangrove swamps, marshes, ridges, and coastal alluvial plains. Inundations are seen in the extreme south of the Andhra Pradesh coast, that is, in the saltwater lagoon of Pulicate lake and also between the Godavari and Krishna deltas. The Kolleru lake, situated in the interdelta, formed due to coalescence of the deltaic deposits of the rivers and later it cut off from the sea (SAC, 1992), is shrinking on the northern side. The deltaic and southern coasts are rich in agriculture and aquaculture production. The deltaic coast is well vegetated with mangroves. The Pulicate lake has extensive tidal flats and a 12 km long spit. In the north, residual hills and ridges are seen close to the sea. Rocky outcrops and bay beaches are seen here. Storm wave platforms, sea caves in rocks, and cliffs are common coastal features in the north. A critical examination of the relief chart off the region around the Krishna River confluence has indicated the presence of extensive banks in the shelf zone (Varadarajulu *et al.*, 1985). The islands of the Krishna delta front are intertidal and submerged to a large extent during spring tide. The Krishna delta front has been growing through spits and barrier bars (SAC, 1992).

The Orissa coast is a site of deposition formed and controlled by the Mahanadi and Brahmani–Baitarani deltas. Mudflats, spits, bars, beach ridges, creeks, estuaries, lagoons, flood plains, paleo-mudflats, coastal dunes, salt pans, and paleo-channels are observed all along the Orissa coast. The Chilka lagoon is the largest natural water body of the Indian coast. The inlet mouth of Chilika lake is exposed to high annual northward littoral drift and observed to migrate about 500 m northward per year (Chandramohan *et al.*, 1993). The width of beaches at Orissa vary. Littoral transport of sediments in the coastal region is a strong process. The coast is also exposed to severe cyclones. Turbidity in the nearshore as well as in the estuarine region is very high. Progradation of the coastal region in the north of the Devi estuary, and drifting of beaches has been observed. The Bhitarkanika and Hatmundia mangrove reserves are as extensive as 190 km^2. Gopalpur is rich in heavy minerals. Prominent and well-developed sand dune deposits containing monazite, zircon, rutile, ilmenite, and sillimanite occur along the southern coast of Orissa.

The West Bengal coast represents a typical deltaic strip with almost a flat terrain. The Hooghly and its distributaries form the conspicuous drainage system and forms an estuarine delta. The major geomorphic features are mudflats, bars, shoals, beach ridges, estuaries, a network of creeks, paleo-mudflats, coastal dunes, islands like sagar and salt pans. The Sundarbans, one of the largest single block of halophytic mangrove systems about 1,430 km^2, of the world need a special mention.

SriLanka

SriLanka has a coastline of about 1,700 km including that of the Jaffna lagoon. It is a tectonically stable tropical island consisting mainly of Precambrian rocks, and in the northwest, Miocene limestones, and Quaternary sediments. The central portion of the island is a highland surrounded by lowland coasts. Two-thirds of the island's coastline consists of sandy beaches bounded by Precambrian headlands (Swan, 1979). The remaining one-third of the coastline, in the northwest and north, consists of sedimentary rocks. Beach material is predominantly terrigenous. Coastal dunes occur along some sections depending on prevailing energy conditions.

The continental shelf between the Gulf of Mannar and Pak Strait in the northwest and north, respectively, is considerably wide across to India. Elsewhere it is narrow.

The coastline of the island is affected by northeast and southwest monsoons. Wave energy is relatively low in the north and northwest because of shallow seas and barriers. In general, however, beaches are open to seasonal strong wave action. In the north and northwest where energy is low, sheltered lagoons with mangroves, estuaries, barrier beaches, spits, and tidal flats are common. Corals forming fringing and small barrier reefs are also seen. Beaches here are narrow and composed of coarse calcareous material. In the Pak Bay and Gulf of Mannar many depositional morphological units are seen. They include, intertidal barriers, multiple sand bars, dunes, and in the southern part of the Gulf of Mannar a stable sand spit growing toward the northwest. Net sediment movement toward the north along the west coast causes this spit to maintain a stable sand body. From this spit to Colombo in the South, important morphological features that are seen are relict beaches, sand dunes, flood plains, deltas, lagoons, and swamps backed by raised beaches. Dune deposits here overlie limestone. From Colombo, further to the south, lateritized Precambrian rocks form promontories. A sandstone reef offshore, opposite Colombo, acts as a barrier to incoming large waves and the supply of sand material. Raised beaches up to 8 m above sea level are seen at Colombo. Further south the coastline is smooth and sandy, with bays and headlands, backed by raised beaches, flood plains, swamps, and laterite terraces. Along the southwest coast, wave energy is high and sand supply is poor and therefore the coast is undergoing severe coastal erosion. Yun-Caixing (1989) studied coastal erosion and protection using remotely sensed data between Colombo and the southernmost point of the island. The southernmost part of the island consists of low platforms of resistant granitic rocks. The coast here is indented and morphologic units seen are promontories, cliffs, barrier beaches, lagoons, and swamps.

The east coast adjacent to the southern tip, consists of wide coastal plains and low coastlands. Headlands are spaced far apart, and behind long barrier beaches are lagoons, and estuarine deltas. Sand-rich rivers traverse this sector. This change in coastal morphology is in response to a change in geological structure (Cooray, 1967). Further north along the east coast, there are two linear submarine structures, namely the Great and the Little Basses (reef) ridges. These ridges are composed of calcareous sandstone (Throckmorton, 1964). The landforms of bedrock and sand dunes are replaced by broad flood plains, river terraces, and lagoons, further north small barrier beaches are present. A series of large lagoons which are interconnected are called Batticaloa lagoon, a major feature along east coast. Further north, the coastline is made up of bays and headlands of coral, backed by beach ridges and lagoons. Estuaries, deltas, lagoons, and bay-head barrier beaches are common features along the coast. Along the northeast, bays and headlands backed by raised beaches, lagoons, and low residual rises are the common morphological features. Old beach deposits and dunes are seen, which are rich in ilmenite and rutile minerals.

Bangladesh

The coastline of Bangladesh is around 654 km long from the Indian border in the west to the Myanmar border in the east. This excludes tidal channels and delta estuaries. If estuaries, islands, and tidal channels are included it is more than 1,320 km long. The Bangladesh coast is divided into four parts from west to east; Sundarbans, cleared Sundarbans, Meghna, and Chittagong. Except for the last one Chittagong, the coastline is low, swampy, and rapidly changing and composed of sediments of the Quaternary period in large alluvial basins. The source is from two vast river systems, the Ganges and the Brahmaputra.

The Sundarbans are thick mangrove and nipa palms swamps, with a total distance of about 280 km (about 195 km in Bangladesh) from the Hooghly River in India to the Tetulia River in Bangladesh. About 68 km long, sundarban forests have been cut and destroyed. This area, is presently, being used for extensive farming. Tidal estuaries, flat marshy islands, creeks and channels, banks of soft muds and clays with thick mangrove and nipa palms are characteristic features of the Sundarban coast. It represents the older deltaic plain of the Ganges with the presence of old beach ridges in the western swamps. The Meghna is a single main channel which after collecting water and material from the Ganges, Brahmaputra, and Meghna rivers, joins the Bay of Bengal. The characteristic feature is the series of extensive shoals called the Meghna flats developed at the mouth of the River Meghna. These shoals are barren mud and sand bodies. This strongly supports a drowned coastal region.

The geomorphic history of the deltaic plain, which includes Sundarbans and Meghna, is continuous shifting of the river course. In recent times, the Ganges has shifted to the east, resulting in the Meghna as a major course. The shifting is explained as tectonic by Morgan and Mcintire (1956). Sediment supply and tectonic history at the delta with reference to the last glacial period is explained by Chowdhury (1996).

The Chittagong coast extends 274 km between two rivers, namely River Feni in the north and River Naf on the Myanmar border. Small beaches and broad sand flats between headlands along this coast are the common features. There are many islands and shoals found along this stretch of the coast.

Myanmar

The Myanmar coast is about 2,300 km long from the Bangladesh border to the border of Thailand. The coast is divided into three parts namely the Arakan, Irrawaddy, and the Tenasserim.

The Arakan coast runs parallel to a mountain chain of strongly folded Mesozoic and Tertiary rock. Near the Bangladesh border, the coast is elongated with steep-sided rocks and islands, but further south the coast consists of estuarine channels, mangrove forests, patchy coral reefs, and islands. The coast is an example of an emerged coast with many raised beaches and old sea cliffs. Another significant feature of this coast is the presence of mud volcanoes which form temporary islands. With wave action, coming in slowly, they transform to shoals.

The Irrawaddy delta coast runs west to east, and is a large delta with deposition of silt and sand. The delta features a number of shoals, estuarine distributaries, channels, and mangrove forests. From the delta region a large volume of sediment is shifted to the east to the Gulf of Martaban by southwest waves during monsoons.

The Tenasserim coast is composed of rocky promontories, valleys, estuaries, mangrove-fringed creeks, and sand spits. Estuarine lagoons and bays are silted up and transformed into mangrove swamps and saline marshy lands. Beaches are rich in heavy minerals, namely ilmenite and monazite. Some beaches are also backed by coastal sand dunes.

G.N. Nayak

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Cross-references

Barrier Islands
Coral Reef Coasts
Coastal Lakes and Lagoons
Desert Coasts
Indian Ocean Coasts, Coastal Ecology
Indian Ocean Islands, Coastal Ecology and Geomorphology
Mangroves, Geomorphology

INDIAN OCEAN ISLANDS, COASTAL ECOLOGY AND GEOMORPHOLOGY

Geographically, the Indian Ocean islands (Figure I21) range from oceanic to continental, geologically from volcanic, limestone, granite, metamorphic to mixed, and physiographically from low to high. Most of these types of islands, though, are not sharply separated.

Oceanic islands are those considered never to have been part of, or connected with, any continental landmass. Their biota is commonly poor in diversity, with unbalanced or uneven representation of taxa, compared with those of continents or continental landmasses. Chagos archipelago, Diego Garcia, and Cocos-Keeling are some such examples. Continental islands may vary in dimensions from subcontinental sizes down to small rocky outposts, the essential characteristics being their continental type rocks and their history showing a former land connection to an adjacent continent. Madagascar, the Malay archipelago, Seychelles, Sri Lanka, and Indonesian islands are examples of continental islands. Seychelles in the north-west Indian Ocean is an extreme case that is totally isolated today, but in Mesozoic and possibly early Tertiary time it was connected to Madagascar. Volcanic islands are rather small (1–100 km across) but often very high, ranging in elevation from 500 m to 3,000 m. They occur generally in irregular clusters, in sub-rectangular patterns or in long lines. Coral islands appear either as an accumulation of coral sand and gravel on the surface of coral reefs or as a slightly emerged limestone platform of formerly live coral not more than a few meters above mean low water. Barrier Islands are constructed entirely by the terrigenous or bioclastic sands from barrier beaches and are built up by longshore drift, probably first as offshore bars, and gradually gaining size later by eustatic oscillations, dune building, and colonization by vegetation.

Because of the very high number of the islands within some island groups in the Indian Ocean it would be difficult to describe them all. Instead, salient features of major groups are given below (see also Table I3).

Western Indian Ocean

Gulf of Kachchh islands

The 42 islands of the Gulf of Kachchh (22°15′N–23°40′N; 68°20′–70°40′E) are the northernmost coralline or sandstone based islands in India. Almost uninhabited, the vegetation inland consists only of shrubs. Several of the islands have dense mangrove patches on the coast, 34 islands have fringing reefs (often called as patch reefs) confined to intertidal sandstones or wave-cut, eroded, shallow banks. The region is tectonically unstable and evidence of uplift can be seen in the form of raised reefs near the mouth of the Gulf, not far from extant islands.

The coastal geomorphology and the fauna and flora of the islands are influenced considerably by the sediment depositional regime, high-velocity tidal currents (up to 5 knots), and a large range in environmental parameters (e.g., temperature 15°–30°C, salinity 25–40). The extreme conditions also limit coastal biodiversity to 37 species of corals and a smaller number of other invertebrates. However, algal growth along these coasts can be substantial at certain times of the year. The mangroves already constrained by high salinity and high tidal exposure also have been heavily impacted due to felling for fuel and fodder. Areas around some of the islands have earlier been good pearl oyster and chank fishing grounds, and one of the islands is even called Chank island. However, overexploitation has decimated both these fisheries.

Laccadive–Chagos ridge

Lakshadweep islands. These are the northern-most islands of the Laccadive–Chagos ridge (9°–12°N; 72°–74°E). Located about 200–400 km off the southwest coast of India, this part of the ridge comprises of 12 atolls, 3 reefs, and 5 submerged banks. Of the 36 islands on the atolls, only 10 (Minicoy, Kalpeni, Andrott, Agatti, Kavaratti, Amini, Kadamat, Chetlat, Kiltan, and Bitra) are inhabited. The northernmost Bitra Island is the smallest inhabited island in India. Among these, Minicoy is separated from the rest by the 9° channel. It is culturally and linguistically closer to the Maldivian islands.

Basically coralline, and no more than a few square kilometers in area, all these islands are low-lying with profuse coral growth all around. The only cultivated plant is coconut, besides a few vegetable and horticultural