Mangroves

Mangrove forests play a central role in transferring organic matter and energy from the land to marine ecosystems. This matter and energy comes from detritus from fallen leaves and branches, and forms the base of important marine food chains. Bacteria break down the detritus, releasing useful nutrients into the water that can then be used by marine animals.

They also serve as nurseries for juvenile fish. Many coral reef fish, for example, spawn in mangrove forests.

Worldwide, many threatened and endangered species are native to mangrove forests, which provide critical habitat for diverse marine and terrestrial flora and fauna, such as:

- manatees
- crab-eating monkeys
- fishing cats
- monitor lizards
- sea turtles
- Royal Bengal tigers
- mud-skipper fish

Most significant among these benefits are their ability to bring greenery to places where no other species can thrive, the supportive role they play in enriching our coastal biodiversity, their proven value in climate change mitigation and their matchless utility in protecting our coastal communities from natural disasters like tsunamis, cyclones and storm surges.

Mangroves are found along muddy estuaries of large rivers, and in sheltered intertidal coastal settings that include lagoons, bays, tidal creeks and inlets.

The Sunderban mangroves of India and Bangladesh are the largest mangrove forest on Earth and are home to Bengal tigers, spotted deer, saltwater crocodiles, fishing cats, and various dolphin species.

Zonation in Mangroves

In India this zonation may be very distinctive (east coast of India) or merging (west coast of India). A very broad and general distinction would be:-

1. **Proximal Zone (Front mangroves)**

This zone is towards water front, subject to regular tidal effect where intensity of soil accumulation and inundation is a continuous process. The mangrove species in this zone are specially adapted with stilt roots, prop roots for stability and anchorage. Main species with

these features are *Rhizophora apiculata* and *Rhizophora mucronata*. On rocky and coral reef substrata, are also found. Both Avicennia and Sonneratia produce pneumatophores.

2. **Middle Zones (Mid mangroves)**

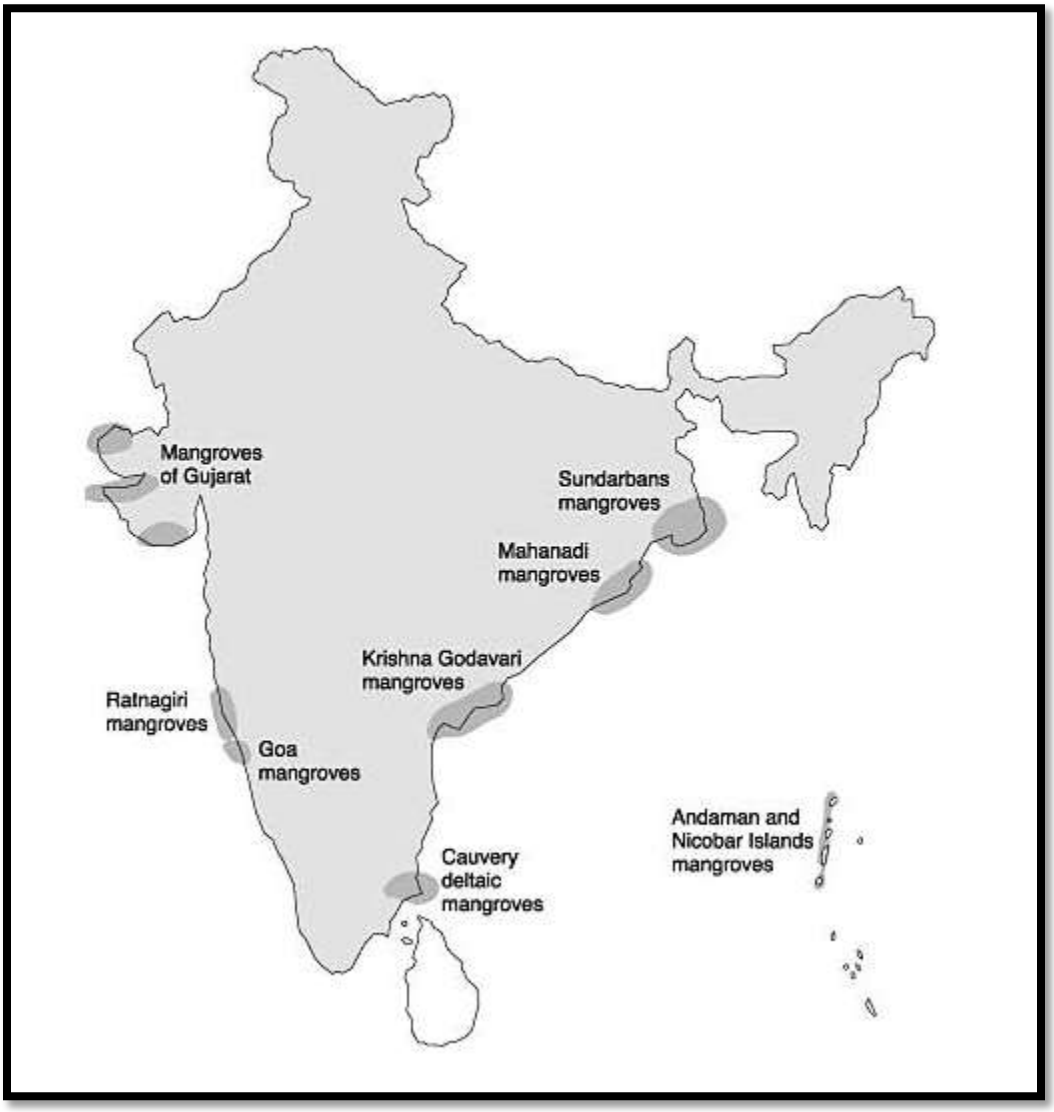
Above the *Rhizophora/ Avicennia* line luxuriant group of Bruguiera gymnorrhiza, B. Cylindrica, *Lumnitzera racemosa, L. littoralis, Ceriops tagal* and *Aegiceras corniculatum* occur. *Ceriops* and *Bruguiera* develop a strong hold fast in the form of knee roots or bent roots as a special adoption for supporting the erect bole.

3. **Distal Zone (Back mangroves)**

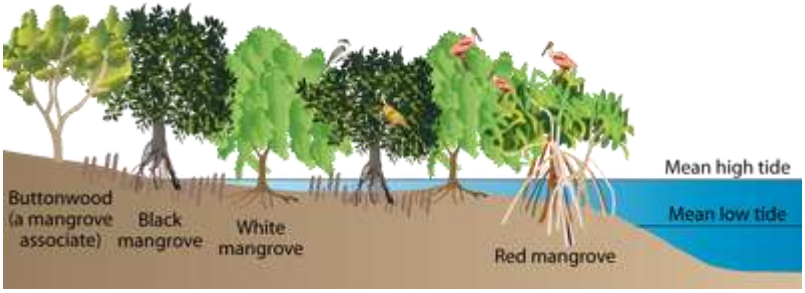
Towards island area mangroves like *Excoecaris agallocha*, *Heritiera littoralis* and *Xylocarnus spp* occur. Both *Heritiera* and *Xylocarpus* produce buttresses. Generally the salinity is on lower side in this zone occurring towards hill sides where run off of fresh water is for a prolonged period. The duration of tidal submersion is low in this zone compared to front mangroves.

However, the zonation in mangroves is not so simple and varies from place to place. Every species has its own level of salinity tolerance. Estuaries on east coast show distinct zonation. The high salinity range on the east coast estuaries may be the principal reason for distinct zonation there. The range and force of tidal action also play a determinant role in creation and maintenance of zones as distribution of seeds or propagules is influenced by tidal action. Also, tides do influence the salinity in an estuary.

Mangrove sites in India



Specialized Root System in Mangroves



The major plant species forming the mangrove ecosystem have aerial roots, commonly prop roots or even stilt roots (*Example: Rhizophora spp).* Stilt roots serve, of course, to anchor the plants, but also are important in aeration, because the mangrove mud tends to be anaerobic.

Rhizophora spp **(Red mangroves)** have prop roots descending from the trunk and branches, providing a stable support system. Other mangrove species, including the white mangroves (A. marina) obtain stability with an extensive system of shallow, underground ”cable roots” that radiate out from the central trunk for a considerable distance in all directions: pneumatophores extend from these cable root

Breathing Roots (Pneumatophores): Special vertical roots, called *pneumatophores,* form from lateral roots in the mud, often projecting above soil (to a height of 20-30 cms, e.g. *Avicennia*, *Sonneratia)* permitting some oxygen to reach the oxygen-starved submerged roots. Roots also can exhibit development of air cavities in root tissues, designs that aid oxygenation of the

tissues. The density, size and number of *pneumatophores* vary per tree. They are green and contain chlorophyll.

Stilt roots are the main organs for breathing especially during the high tide. They are very common in many species of Rhizophora and Avicennia (Avicennia marina and Avicennia offficinalis). The stilt roots of Rhizophora mucronata extend more than a meter above the soil surface and contain many small pores (lenticels) which at low tide allow oxygen to diffuse into the plant and down to the underground roots by means of open passages called aerenchyma. The lenticels are highly hydrophobic and prevent water penetration into the aerenchyma system during the high tide. In Brugeira and Ceriops they become hollow and malfunctional after some stage.
Aeration occurs also through lenticels in the bark of mangrove species, e.g., species of Rhizophora.

Major threats to Mangroves

- Land reclamations for construction activity, aquaculture, agriculture, tourism
- Industrial and domestic pollution
- Port development
- Dumping of all kinds of waste and debris
- Deforestation for fuel wood
- Over harvesting of marine resources