

# MANGROVES

# INTRODUCTION

- The term mangrove refers to an ecological group of halophytic plant species as well as to a variety of complex plant communities dominated by these species, found along sheltered tropical and subtropical shores.
- This is also used to describe a diverse group of plants that are all adapted to a wet, saline intertidal habitats in the tropical and subtropical coasts. Healthy mangrove forests are key to a healthy marine ecology.
- The mangroves make an enormous contribution to the food chain that supports the coastal fisheries

# DISTRIBUTION

- Mangroves are commonly found throughout the world between latitudes  $32^{\circ}\text{N}$  and  $38^{\circ}\text{S}$
- According to the report of the World Resources Institute, mangroves cover an area of 190,000 to 240,000
- Largest mangrove areas occur in Indonesia (30%) followed by Nigeria (10%), Australia (8%) and Mexico (7%).



- India contributes approximately 3% to the world mangrove area. The mangrove forest cover in India has reduced from 6000 km<sup>2</sup> in 1953 to 2000 – 3000 km<sup>2</sup> in 1989.
- Mangroves in India are spread over an area of about 4,500 km<sup>2</sup> along the coastal States/UTs of the country.
- Sunder bans in West Bengal accounts for a little less than half of the total area under mangroves in India.

# MANGROVE WETLANDS IN INDIA

State	Mangrove wetland	Total area of the wetland (ha)*	Actual forest cover (ha)
<b>East coast</b>			
West Bengal	Sunderbans	4,26,000	2,12,500
Orissa	Mahanadi	67,000	21,500
Andhra Pradesh	Godavari	33,250	24,100
	Krishna	25,000	15,600
Tamil Nadu	Pichavaram	1,300	900
	Muthupet	13,000	1,200
<b>West coast</b>			
Gujarat	Gulf of Kutch	58,200	85,400
	Gulf of Khambhat	53,123	17,700
	Other mangroves	--	1 1,600
Andaman and	Andaman islands	--	92,900
	Nicobar islands	--	3,700
<b>Total</b>			<b>4,87,100</b>




# MANGROVE HABITAT AND GROWTH

- Most mangroves live on muddy soils, but they also can grow on sand, peat, and coral rock.
- Zonation often characterizes mangrove forests. Certain species occupy particular areas, or niches, within the ecosystem.
- Some mangrove species occur close to shores, fringing islands, and sheltered bays; others are found further inland, in estuaries influenced by tidal action.

- Mangroves vary in height according to species and environment, from mere shrubs to 40 meter (app. 131 feet) tall trees.
- The prop roots of some mangrove species, such as *Rhizophora* spp., or red mangrove, and the pneumatophores (unique breathing roots) of others, such as *Avicennia* spp., or black mangrove, contain many small "breathing" pores, called "lenticels."
- These allow oxygen to diffuse into the plant and down to the underground roots by means of air space tissue in the cortex, called "aerenchyma." The lenticels are inactive during high tide.



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- Certain species of mangroves exclude salt from their systems, others actually excrete the salt they take in via their leaves, roots, or branches.
  - In species that exclude salt, the mangrove root system is so effective in filtering out salt that a thirsty traveller could drink fresh water from a cut root, though the tree itself stands in saline soil.



# ADAPTATIONS TO THE MANGROVE ENVIRONMENT

## 1. Salinity

- They are capable of living in the salt water by separating the freshwater from seawater by reverse osmosis at the root level. Some species can exclude more than 90% of salt in seawater.
- Another method is to secrete salt through the use of special glands on the leaves of the tree, which are among the most active salt-secreting systems known.
- Structural adaptations to reduce water loss due to the extreme saline environment are also found within the mangrove floral assemblage. Leaves with thick, waxy cuticles and stomata found only on their lower surfaces are examples of such modification.

## 2. Survival in the anoxic soil

- The red mangroves, *Rhizophora*, the root mass is kept above the loose, anoxic soils so as to have contact with air for respiration as against keeping the roots below the soil in other plants.
- In black mangroves, the presence of respiratory roots or pneumatophores extending above the anoxic mud surface of the mangrove habitats so to have gaseous exchange is a special adaptation for efficient respiration mechanisms



### 3. Reproduction

- Many mangrove species show some form of vivipary (Eg. Rhizophora).
- The seed is germinated while on the parent tree itself and grows by combination of photosynthesis and acquisition of nutrients from the parent.
- This structure, which is neither a seed nor a fruit, which usually termed a propagule, then falls to the ground.
- The propagules of some species root almost immediately, but others appear to have an obligatory floating period before they sink and develop roots.

### 4. Succulent stem


- Some mangrove plants are known to have succulent stem to conserve water in its body.

# IMPORTANCE OF MANGROVE FOREST

- Protect coastlines against erosive wave action and strong coastal winds, and serve as natural barriers against tsunamis and torrential storms.
- Refuge and nursery grounds - Mangrove areas are excellent nursery grounds for a variety of commercially important prawns, crabs and fin-fishes, as they provide abundant food and shelter for these organisms.
- These ecosystems provide food, roosting and nesting site and shelter to a large variety of birds.



- The mangroves support many trophic levels of aquatic and terrestrial organisms, by enriching the fertility of estuarine waters for production of planktons.
- 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 etc

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- Mangrove forests also provide refuge and nursery grounds for juvenile fish, crabs, shrimps, molluscs, and other invertebrates.
  - Mangroves are prime nesting and migratory resting and feeding sites for hundreds of bird species.
  - Important breeding ground for many fishes, crabs, prawns and other marine animals essential for sustaining a viable fishing industry



- Fallen leaves and branches from mangroves contribute to the forest detritus and provide nutrients for the marine environment. These ecosystems are quite productive (350 – 500 g C m<sup>-2</sup> yrs.<sup>-1</sup>). Intricate food webs of immense varieties of sea life are supported directly through this detritus.
- Prevent salt water from intruding into rivers.
- Retain, concentrate and recycle nutrients and remove toxicants through a natural filtering process.
- Provide resources for coastal communities who depend on the plants for timber, fuel, food, medicinal herbs and other forest products.

# BIOTA

## Mangrove plants

- The approximately 50 mangrove species that are found worldwide belong to 20 genera in 16 families, although two families, Avicenniaceae and Rhizophoraceae, dominate in number of species and abundance.
- The most common genera include Rhizophora (red mangrove), Avicennia (black mangrove or grey mangrove)
- **Microalgae**
- Mangrove water ways are rich in phytoplankton species such as Navicula, Thalassiothrix, Pleurosigma, Ceratium, Peridinium, etc



# Animals

## INVERTEBRATES

- **Zooplankton:** Foraminiferans, copepods, rotifers, cladocerans etc.
- **Annelida:** Polychaete (Arenicola sp.)

## CRUSTACEANS

- **Marine Prawns:** Penaeus spp. (P. monodon), Metapenaeus spp., Acetes indicus, etc. Mangrove Snapping Prawn: Alpheus spp.; Mud shrimp: Upogebia sp.
- **Mud crabs:** Scylla spp. (S. serrata); Ghost crabs: Dotilla sp. etc. ; Sesarmine crabs: Chiromantheseumolpe (blue face band); Fiddler crabs: Uca spp.; Hermit crabs: Clibanarius sp; Mangrove crab: Aratus sp.

**Mud lobster:** *Thalassina anomala*

**Barnacles:** *Balanus* sp, *Lepas* sp. Etc.,

**Isopoda:** *Sphaeroma* sp ( wood borer).

## Molluscs

- **Gastropods:** (*Nerita*, *Littorina*, *Littoraria*, *Cerithidea*, *Ellobium*); bivalves (oysters, clams, cockles)

## Vertebrates

- **Fishes:** Sea bass, grouper (commercially important); mudskippers, mangrove archer fish
- **Amphibians:** Tree frogs



## Reptiles

**Turtles:** Marine turtles like Olive Ridley (*Lepidochelys olivacea*), Green Sea Turtle (*Chelonia mydas*), Hawksbill Turtle (*Eretmochelys imbricata*),

**Snakes:** Water snakes, mangrove pit-viper, mangrove cat snake

**Crocodile:** Crocodile (*Crocodilus porosus*)

## Birds

- Brahminy kite (*Haliastur indicus*), kingfishers, woodpeckers, herons, egrets (*Egretta garzetta*)

## Mammals

- Long-tailed monkey (*Macaca fascicularis*), fruit bats (*Macroglossus minimus*, *Eonycteris sp. pelaea*), otters, river dolphins (*Platanista gangetica*), etc.