PUDUCHERRY ENVIS HUB

Host Centre: Puducherry Pollution Control Committee
Funded by Ministry of Environment, Forest & Climate Change
Government of India, New Delhi

THE INTERNATIONAL DAY FOR THE CONSERVATION OF THE MANGROVE ECOSYSTEM

26th July, 2021

The International Day for the Conservation of the Mangrove Ecosystem, adopted by the General Conference of UNESCO in 2015 and celebrated each year on 26 July, aims to raise awareness of the importance of mangrove ecosystems as “a unique, special and vulnerable ecosystem" and to promote solutions for their sustainable management, conservation and uses.

INTERNATIONAL DAY FOR THE CONSERVATION OF THE MANGROVE ECOSYSTEM

The International Day for the Conservation of the Mangrove Ecosystem is celebrated worldwide on July 26th of every year. The day was adopted by the General Conference of UNESCO (United Nations Educational, Scientific and Cultural Organization) in the year 2015.

This day is also knowns as **"World Mangrove Day"**

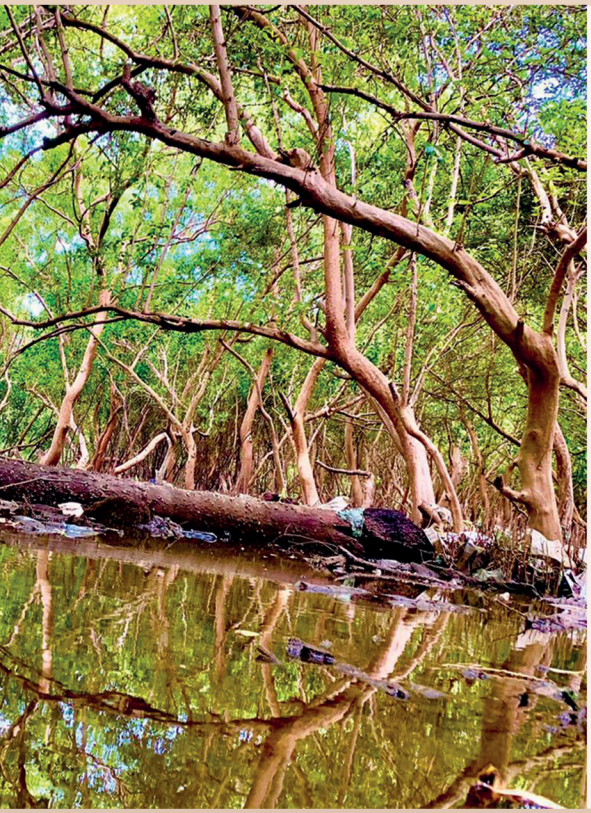
Aim

to raise awareness of the importance of mangrove ecosystems as "a unique, special and vulnerable ecosystem" and to promote solutions for their sustainable management, conservation and uses.

What Is Mangrove?

The word "Mangrove" is considered to be a combination of the Portuguese word "Mangue" and the English word "grove". Mangroves are salt-tolerant plants of tropical and subtropical intertidal regions of the world. The specific regions where these plants occur are termed as 'mangrove ecosystem'. These are highly productive but extremely sensitive and fragile. Besides mangroves, the ecosystem also harbours other plant and animal species.

SIGNIFICANCE OF MANGROVES ECOSYSTEM



1). Mangroves are rare, spectacular and prolific ecosystems on the boundary between land and sea. These extra ordinary ecosystems contribute to the wellbeing, food security, and protection of coastal communities worldwide. They support a rich biodiversity and provide a valuable nursery habitat for fish and crustaceans. Mangroves also act as a form of natural coastal defense against storm surges, tsunamis, rising sea levels and erosion. Their soils are highly effective carbon sinks, sequestering vast amounts of carbon.

2). Mangroves provide an important breeding site for many species of migratory and non-migratory bird species.

3). Mangroves support a large range of wintering and foraging wetland birds.

4). Mangroves are an important nursery site for many aquatic species such as fish and crustaceans (i.e. crabs, shrimp, and lobster).

5). Mangroves provide harvestable products such as food, including fish and crustaceans.

6). Mangroves provide regulating functions such as carbon sequestration and water management: mangroves capture and store different forms of carbon responsible for climate change and slow the passage of water, collecting silt running off the land towards the sea.

7). Mangroves protect our coasts from erosion by waves and wind.

UNIQUE FEATURES OF MANGROVES:

Mangrove plants tolerate salinity of the soil and water by the following ways:

i) Salt excretion: Some mangrove plants take saline water as such through roots. But in the tissues, only water molecules and essential salts are retained. Excess salts are excreted through salt glands that are present in the leaves.

ii) Salt exclusion: In some of the mangrove plants the roots possess an ultra filtration mechanism called reverse osmosis by which water and salts in the seawater are separated in the root zone itself and only water is taken inside and the salts are rejected (reverse osmosis mechanism is widely used for producing drinking water from seawater!).

iii) Salt accumulation: In this type of mangrove, plants posses neither salt gland nor ultra-filtration system but these species have the capacity to accumulate a large amount of salts in their leaves.

iv) Mangrove forests can be a secret weapon in the fight against the climate change. Mangroves have a vital role to play in reducing the impacts of climate change and extreme weather events. In addition to that they also have huge potential to store carbon in their root systems.

Mangroves of Puducherry

Geographically, Pondicherry mangrove lie at latitude 11° 46'03" to 11° 53'40" North and longitude 79° 49'45" to 79°48'00" East and is encircled by three villages - Ariankuppam, Murungapakkam, Veerampattinam and two islets - Thengaithittu and Ashramthittu. The mangroves exist as fringing vegetation over 168 ha distributed along the sides of Ariankuppam estuary, which opens into the Bay of Bengal on the Coromandal coast (Department of Survey & Land Records, Government of Puducherry).

TRUE MANGROVE SPECIES OF PUDUCHERRY MANGROVES

Order	Family	Species
Labiales	Avicenniaceae	*Avicennia marina*
Myrtales	Rhizophoraceae	*Bruguiera cylindrica*
Myrtales	Rhizophoraceae	*Bruguiera gymnorrhiza*
Myrtales	Rhizophoraceae	*Rhizophora apiculata*
Myrtales	Rhizophoraceae	*Rhizophora mucronata*
Personales	Acanthaceae	*Acanthus ebracteatus*
Personales	Acanthaceae	*Acanthus illicifolius*

MANGROVE ASSOCIATE SPECIES OF PUDUCHERRY MANGROVES

Order	Family	Species
Graminales	Poaceae	*Aleuropus lagopoides*
Apocynales	Asclepiadaceae	*Sarcolobus carinatus*
Apocynales	Asclepiadaceae	*Wattakaka volbulis*
Caryophyllales	Aizoaceae	*Sesuvium portulacastrum*
Caryophyllales	Chenopodiaceae	*Suaeda maritima*
Caryophyllales	Chenopodiaceae	*Suaeda monoica*
Caryophyllales	Caesalpinaceae	*Suaeda nudiflora*
Leguminales	Caesalpinaceae	*Caesalpinia bondoc*
Leguminales	Fabaceae	*Derris scandens*
Leguminales	Fabaceae	*Derris trifoliata*
Leguminales	Leguminosae	*Pongamia pinnata*
Malvales	Malvaceae	*Thespesia populnea*
Pandanales	Pandanaceae	*Pandanus tectorius*
Solanales	Convolvulaceae	*Ipomoea pes-caprae*
Theales	Clusiaceae	*Calophyllum inophyllum*
Verbanales	Verbenaceae	*Clerodendrum inerme*

TRUE MANGROVES AND MANGROVE ASSOCIATES

In general, plants of the mangrove wetlands are divided into two groups namely,

a) true or exclusive mangrove and

b) associate mangrove species.

The following are, the characteristic features of true mangrove species:,

a). True mangrove plants grow only in mangrove environment and do not extend, into terrestrial plant communities.

b). They play a major role in determining structure of the plant community of the mangrove wetland and ability to form pure stands.

c). They are morphologically adapted to live in waterlogged condition.

e.g. aerial, roots associated with gas exchange

d). They are physiologically adapted to live in saline environment.

e). They have viviparous reproduction.

f). They are taxonomically isolated from terrestrial relatives.

About 69 species in 27 genera, belonging to 20 families are considered as true, mangrove species.

MANGROVE ROOT SYSTEMS

The root system of mangroves is divided as in other plants in three main groups, flat root system, heart root system and top root system.

- The **flat root** system's primary root is hardly or not at all developed, therefore the lateral roots are strongly developed. Flat root systems are found especially in solid, dense and impermeable soils.

- The **heart root** systems develops many, differently strong main roots simultaneously which grow vertically into the ground. Especially mangroves like Avicennia, Ceriops, Rhizophora and Sonneratia species as well as Nypa fruticans and Pelliciera rhizophorae, mangroves that often grow directly in the tides and need to protect their location, depend on the successful heart root system which develops roots like anchors in all directions.

The tap root system develops one single, strong and dominant main root that grows vertically into the ground. This main root has the ability to reach groundwater.

Aerial roots are roots with various abilities and functions, primary gas exchange in oxygen-poor soils. The aerial roots are divided into groups as follows:

1. Stilt roots 2. Knee roots 3. Pencil roots 4. Peg roots 5. Buttress roots

6. Spreading roots 7. No Aerial roots

Stilt Roots

Stilt roots also called prop roots are developed by Rhizophora species and Pandanus species. Stilt roots outgrow the trunk of the mangrove, branches or already existing stilt roots. As soon as stilt roots reach the ground the tip of the stilt root develops an underground root system with which it connects the stilt root into the ground and then develops one or more further stilt roots which grow arcuately into the air to again run into the ground to develop an underground root system, this process repeats several times.

Knee roots

Knee roots are developed by Bruguiera species. Knee roots emerge as a root loop from the underground root system and allow the exchange of gases in oxygen-poor sediments. Each underground horizontally growing root develops several knee roots at regular intervals.

Pencil roots

Pencil roots belong to pneumatophores, under the mangroves only Avicennia species develop pencil roots. Pneumatophore is Greek, 'pneuma' means something like 'air flow' and 'phoros' something like 'bearing', in English the word aerial roots are also very common for pneumatophores. Pneumatophores are roots that grow vertically up from the underground root system.

Cone roots

Cone roots belong to pneumatophores and are developed by Sonneratia species and Xylocarpus moluccensis. Pneumatophore is Greek, 'pneuma' means something like 'air flow' and 'phoros' something like 'bearing', in English the word aerial roots are also very common for pneumatophores. Pneumatophores are roots that grow vertically up from the underground root system.

Bruttress roots

Buttress roots are developed by many trees, concerning mangroves especially Heritiera littoralis and Pelliciera rhizophorae are famous for their buttress roots.

Buttress roots provide huge trees stability, especially in tropical areas, and the buttress roots can grow up to 10 meters in heigt. Buttress roots, also called buttresses do not continue their growth underground as they do above, underground buttresses develop a huge amount of small roots that grow in the soil under the buttress root.

Spreading roots

Spreading roots are developed by Ceriops species. Spreading roots do also provide stability and normally do not exceed 1 meter in height. Spreading roots grow similar as buttress roots do with numerous small roots underground.

No Aerial roots

Generally we can say that aerial roots belong to true mangroves and false mangroves do not develop any aerial roots at all.

Mangroves that do not develop any aerial roots as Barringtonia species for example normally grow more inland where the soil is richer in oxygen and spared by the tides. The growing conditions do not require the mangrove to develop aerial roots to support the underground root system with additional oxygen.

THREATS TO MANGROVE ECOSYSTEM:

The threats to the mangrove ecosystem could be broadly grouped into two: Natural and Anthropogenic

NATURAL THREATS:

- Climate change
- Cyclones
- Infestation by barnacles
- Damage by Crustaceans
- Insect pests such as woodborers, caterpillars
- Drying of mangrove trees

ANTHROPOGENIC THREATS:

- Tree felling for fuel wood and wood products
- Grazing by cattle
- Reclamation for agriculture and aquaculture
- Urban development
- Industralisation

PROTECTION OF MANGROVES IN INDIA - LEGISLATIVE MEASURES

In India, mangrove ecosystems are legally protected by the **Coastal Regulation Zone Notification, 2011** under the **Environment Protection Act, 1986. The Indian Forest Act, 1927 and the Wildlife (Protection) Act, 1972** provide protection to flora and fauna. Although they do not specifically mention mangroves, these acts can also apply to the conservation of the flora and fauna of mangrove ecosystems. Since 1927, the Indian Forest Act has been applied to the mangrove forests of the Sundarbans, which have been declared as a reserved area (Naskar and Mandal, 1999).

Covid-19 Pandemic Situation

This day is a reminder of the pivotal role of mangroves in preserving ecosystems. Taking care of the nature that surrounds us has become even more critical as the world grapples with the ongoing COVID- 19 pandemic.

"If there are no mangrove forests, then the sea will have no meaning. It is like having a tree with no roots, for the mangroves are the roots of the sea."