

Chapter - 4 - Aquatic Ecosystems

- (i) Fresh water Ecosystem - salt < 5 PPT. Lake, Pond, River, Pool, Spring
- (ii) Salt water Ecosystem - salt - 35 PPT or above.
- (iii) Brackish water Ecosystem - salt - 5 to 35 PPT. Estuaries, Salt Marshes, Mangroves, Swamps etc.

Aquatic Organisms:

- (i) Neuston: unattached organisms which live at air-water interface. ex. water striders, beetles & back-swimmers.
- (ii) Periphyton: These organisms which remain attached to stems and leaves of rooted plants or substances emerging above the bottom mud such as sessile algae and their associated groups of animals.
- (iii) Plankton
 \rightarrow Phytoplankton: microscopic plants "Algae"
 \rightarrow Zooplankton: animals and protozoans
- (iv) Neuston: Animals which are swimmers (fish etc)
- (v) Benthos: The benthic organisms are those found living in the bottom of water mass.

Limiting factors: Aquatic \rightarrow sunlight and oxygen,
Terrestrial \rightarrow moisture and temperature.

Photic Zone: or euphotic zone is where light penetrates in the water.
 \rightarrow photosynthesis and respiration both takes place.

Aphotic Zone: Light levels are too low, below photic zone, only respiration. This deep water region is also known as the profundal zone.

- Oxygen in Aquatic Ecosystem - through air-water interface and photosynthesis activity of Aquatic plants.

Oxygen is less soluble in warm water. warm water also enhances decomposition so increase in Temp. of water body depletes O_2 level.

Lake Ecology:

- Naturally nutrient enrichment of lakes promotes the growth of algae, Aquatic plants etc. This is Natural eutrophication.
- When nutrient enrichment is caused by anthropogenic activities it is known as cultural eutrophication.

Lake Suddarshan in Girnar. old one was made lake in India
Oligotrophic (Low nutrient lake), mesotrophic (medium), eutrophic (high)

Precipitation & P. absorbers. Removal of nutrient from lake.

Mitigation of Lake Pollution

1) Riparian buffer.

(ii) N-testing (technique to find the optimum amount of fertilizer required for crop plants).

(iii) non-point pollution reduction.

Harmful Algal Blooms (HABs)

Some algae produce harmful toxins, when they increase rapidly water color changes to brown red etc. known as HABs.

2 common causes for HABs - "nutrient enrichment & warm waters"

changes in climate can change the occurrence, severity, and impacts of HAB events.

Wetland Ecosystems

- transitional zone between deepwater & terrestrial habitats - marsh, wetland etc. Presence of Hydrophytes. Hydric soil (O₂ deficient)

- In lake Ecosystems productivity is little less in comparison with wetland Ecosystems. Biodiversity is high.

India - 18.4% of Area (70% under Paddy cultivation)

National Wetlands Conservation Programme, 1985-86

Aim: Conservation of wetlands to prevent their further degradation and ensuring their wise use for the benefit of local communities and overall conservation of biodiversity. Central govt is responsible.

Estuary Ecosystem: "most productive water bodies in the world"

- 0.35 salt PPT. from head to mouth, Area ab little wave action bays, harbors, lagoons, inlets etc.

- Biologically highly productive zone.

Mangroves

- Tropical & subtropical mangroves are trees & bushes growing below the high water level absorbing holes which exhibit remarkable capacity for salt water tolerance.

- Tropical evergreen land plants grow on sheltered shores typically on tidal flats, deltas, estuaries, bays, coasts & barrier Islands.
- Pneumatophores (bald roots) - overcome respiration problem in the anaerobic soil conditions.
- Rhizophora - send arching prop roots down into water
- Avicennia: send vertical Pneumatophores air root up from the mud.
- Mangroves exhibit viviparity.
- Kori Creek - Paludelta of Indus river.

Coral Reefs:

Living animal having symbiotic relationship with Zooxanthellae (Microscopic Algae)

- Zooxanthellae assist the coral in nutrient production through its photosynthetic activities (Coral receives their waste products from them)
- Coral - soft & hard ex. sea fans & gorgonians - only hard coral builds reefs.
- Polyps - builder of coral reefs - these are tiny animals when die leave their calcium carbonate & new polyps or grow on them.
- while the ~~major~~ majority of coral reefs are found in tropical and subtropical water - there are also deep water corals in colder region ex. coast reef off Norway.
- Coral reefs are one of the most productive and complex coastal ecosystems with high biological diversity.

They are known as Tropical Rainforest of the Ocean

Fringing reefs: Contiguous with shore most common. Andaman.

Patch reefs: Isolated & discontinuous - Palk bay, Gulf of Mannar etc.

Barrier reefs: linear offshore reef structure runs parallel to coastlines and arise from submerged shelf platform. The water body between the reef and the shore is termed as lagoon, seen in Nicobar & Lakshadweep.

Atolls: circular & semicircular reefs that arise from subsiding sea floor platform as coral reef building keeps ahead of subsidence. Atolls of Lakshadweep & Malabar. Corals are - largest biogenic calcium carbonate producer.

Coral bleaching: (Fading of coral colour)

- i) when densities of Zooxanthellae decline
- ii) when concentrations of photosynthetic pigment within the Zooxanthellae fall.

- High temperature & irradiance stressors.

Causes of Coral bleaching

- (i) Temperature: low or high sea temp. induces coral bleaching
- (ii) Solar Irradiance: Both photosynthetically active radiation (PAR, 400-700 nm) & UVR (280-400) causes bleaching
- (iii) Subsides of exposure: Sudden exposure due to ENSO (low tide etc.)
- (iv) Sedimentation
- (v) Fresh Water dilution
- (vi) Inorganic Nutrients
- (vii) Xenobiotics: chemical contaminants such as Cu, Herbicides, oil.
- (viii) Epizootics: Pathogen induced bleaching.