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Dr. R. K. Dawale

Associate Professor,

Department of Zoology,

D. B. F. Dayanand College of Arts and Science, Solapur

rkdawale@dayanandsolapur.org

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	MODULE No. 1 (Aquatic Ecosystem)

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1. Learning Outcomes:

In this module,

➢ You shall learn about the information regarding the concept of freshwater ecosystem.

➢ You shall learn about morphology, classification and behaviour of members of aquatic ecosystem.

➢ You shall learn about morphological and behavioural adaptation in animals.

2. INTRODUCTION:

- ➤ Aquatic ecosystems perform numerous valuable environmental functions.
- ➤ They recycle nutrients, purify water, attenuate floods, augment and maintain streamflow, recharge ground water, and provide habitat for wildlife and recreation for people.
- ➤ At the same time that water pollution and releases of nutrient-laden municipal sewage effluents have increased, water consumption has also increased, thus reducing the flows available for the dilution of wastes.
- ➤ Increased sediment delivery resulting from urban construction, agriculture, and forestry also has resulted in greater turbidity and sedimentation in downstream channels, lakes, and reservoirs, with attendant losses of water storage and conveyance capacity, recreational and aesthetic values, and quantity and quality of habitat for fish and wildlife.
- ➤ The aquatic ecosystem definition states it is a water-based environment, wherein, living organisms interact with both physical and chemical features of the environment.
- ➤ These living creatures whose food, shelter, reproduction and other essential activities depend in a water-based environment are known as aquatic organisms.
- ➤ Some of the most common aquatic organisms are – nekton, plankton and benthos. Additionally, lakes, oceans, ponds, rivers, swamps, coral reefs, wetlands, etc. are a few popular aquatic ecosystem examples.

3. Characteristics of Aquatic Ecosystems:

- ➤ Characteristics of aquatic ecosystems can be divided into abiotic and biotic factors.
- ➤ The abiotic factors include depth, nutrient, temperature, salinity, flow, temperature, etc.,
- ➤ while the biotic factors comprise the living organisms.

4. Types of Aquatic Ecosystem:

In general, there are two types of aquatic ecosystem, namely marine ecosystems and freshwater ecosystems. Both marine and freshwater ecosystems are further divided under different aquatic ecosystems. Different types of aquatic ecosystems are as follows:

Freshwater Aquatic Ecosystem:

They cover only a small portion of earth nearly 0.8 per cent. Freshwater involves lakes, ponds, rivers and streams, wetlands, swamp, bog and temporary pools. Freshwater habitats are classified into lotic and lentic habitats. Water bodies such as lakes, ponds, pools, bogs, and other reservoirs are standing water and known as lentic habitats. Whereas lotic habitats represent flowing water bodies such as rivers, streams.

❖ **I) Lotic Ecosystems:**

- **Rivers, streams, creeks**

They mainly refer to the rapidly flowing waters that move in a unidirectional way including the rivers and streams. These environments harbor numerous species of insects such as beetles, mayflies, stoneflies and several species of fishes including trout, eel, minnow, etc. Apart from these aquatic species, these ecosystems also include various mammals such as beavers, river dolphins and otters.

II) Lentic Ecosystems: They include all standing water habitats. Lakes and ponds are the main examples of Lentic Ecosystem. The word lentic mainly refers to stationary or relatively still water. These ecosystems are home to algae, crabs, shrimps, amphibians such as frogs and salamanders, for both rooted and floating-leaved plants and reptiles including alligators and other water snakes are also found here.
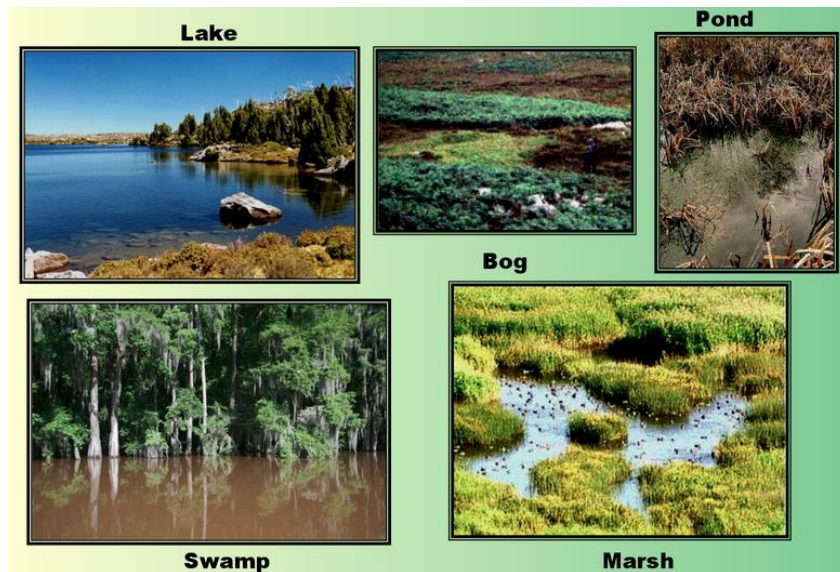
❖ **Wetlands**

Wetlands are marshy areas and are sometimes covered in water which has a wide diversity of plants and animals. Swamps, marshes, bogs, black spruce and water lilies are some examples in the plant species found in the wetlands. The animal life of this ecosystem consists of dragonflies and damselflies, birds such as Green Heron and fishes such as Northern Pike.

❖ **Marine Aquatic Ecosystem:**

This particular ecosystem is the largest aquatic ecosystem and covers over 70% of the earth's total surface. This ecosystem is relatively more concentrated in terms of salinity. Nonetheless, the body of aquatic organisms is well-adjusted to saline water, and they may find it challenging to survive in freshwater. These following categories comprise the marine ecosystem.

Marine ecosystem covers the largest surface area of the earth. Two third of earth is covered by water and they constitute of oceans, seas, intertidal zone, reefs, seabed, estuaries, hydrothermal vents and rock pools. Each life form is unique and native to its habitat. This is because they have adaptations according to their habitat. In the case of aquatic animals, they can't survive outside of water. Exceptional cases are still there which shows another example of adaptations (e.g., mudskippers). The marine ecosystem is more concentrated with salts which make it difficult for freshwater organisms to live in. Also, marine animals cannot survive in freshwater. Their body is adapted to live in saltwater; if they are placed in less salty water, their body will swell (osmosis).

❖ **Coral Reefs:**

These are fondly referred to as the Rain Forest of Oceans as they harbour a wide diversity of aquatic flora and fauna.

❖ **Estuaries:**

Typically, it is the meeting point of a sea and rivers, which makes the water slightly more saline when compared to freshwater and more diluted when compared to the marine ecosystem.

Biologically, estuaries are considered to be productive as it stimulates primary production and trap plant nutrients. Some examples of estuaries include – tidal marshes, river mouth, and coastal bay.

❖ **Ocean Ecosystems**

Our planet earth is gifted with the five major oceans, namely Pacific, Indian, Arctic, Southern Ocean and the Atlantic Ocean. Among all these five oceans, the Pacific and the Atlantic are the largest and deepest ocean. These oceans serve as a home to more than five lakh aquatic species. Few creatures of these ecosystems include shellfish, shark, tube worms, crab small and large ocean fishes, turtles, crustaceans, blue whale, reptiles, marine mammals, seabirds, plankton, corals and other ocean plants.

Pacific Ocean, Atlantic Ocean, Indian Ocean, Arctic Ocean and the Southern Ocean are the five major oceans on earth. Notably, the Pacific Ocean is the largest and deepest of these five, while Atlantic is the second largest in terms of size. Also, the Southern Ocean harbours the largest population of Krill among them. Other than that, the oceans serve as home to aquatic organisms like – turtles, crustaceans, plankton, corals, shellfish, blue whale, shark, tube worms, reptiles, etc.

❖ **Coastal Systems**

They are the open systems of land and water which are joined together to form the coastal ecosystems. The coastal ecosystems have a different structure, and diversity. A wide variety of species of aquatic plants and algae are found at the bottom of the coastal ecosystem. The fauna is diverse and it mainly consists of crabs, fish, insects, lobsters' snails, shrimp, etc.

Plants and animals in an aquatic ecosystem show a wide variety of adaptations which may involve life cycle, physiological, structural and behavioural adaptations. Majority of aquatic animals are streamlined which helps them to reduce friction and thus save energy. Fins and gills are the locomotors and respiratory organs respectively. Special features in freshwater organisms help them to drain excess water from the body. Aquatic plants have different types of roots which help them to survive in water. Some may have submerged roots; some have emergent roots or maybe floating plants like water hyacinths.

5. Functions of Aquatic Ecosystem:
➢ Facilitates recycling of nutrients
➢ Helps to purify water
➢ Recharges groundwater
➢ Is a habitat for aquatic flora and flora
➢ Mitigates flood

5. Summary:

Aquatic ecosystems perform numerous valuable environmental functions. They recycle nutrients, purify water, attenuate floods, augment and maintain streamflow, recharge ground water, and provide habitat for wildlife and recreation for people.

Water supports many lives. Organisms which survive in water are called aquatic organisms. They depend on water for their food, shelter, reproduction and all other life activities.An aquatic ecosystem includes a group of interacting organisms which are dependent on one another and their water environment for nutrients and shelter. Examples of aquatic ecosystem include oceans, lakes and rivers.

An aquatic ecosystem includes freshwater habitats like lakes, ponds, rivers, oceans and streams, wetlands, swamp, etc. and marine habitats include oceans, intertidal zone, reefs, seabed and so on. The aquatic ecosystem is the habitat for water-dependent living species including animals, plants, and microbes.

Video:
https://drive.google.com/file/d/1sW8g0MqORS8q575YBbqgFEKDRnS8DJu6/view?usp=sharing

Assignment:
https://docs.google.com/forms/d/e/1FAIpQLSf5SvlrcFOV7UB5aAlfVkU4K6Dpb8cgdl0xPB7ijdFvzHVjAQ/viewform?usp=sf_link

Know more:

Suggested readings, web links:

1. Text book of Invertebrates Dhami Dhami
2. Invertebrates by R.L.Kotpal
3. Text book of Non chordates by S.N.Prasad
4. Bradshaw, A.D. 1983. The reconstruction of ecosystems. J. Appl. Ecol. 20:1– 17.
5. https://www.vedantu.com/biology/aquatic-ecosystem

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