



Fig 11: Tropical Rain Forest.

**Check Your Progress-1**

- 1) Define a biome and ecotone.

.....

.....

.....

.....

.....

---

### 3.3 THE AQUATIC BIOMES

---

If you look up a world atlas or a globe you would notice that most of the earth's surface is covered by the waters of the oceans (about 71%). Beneath the water surface is a fascinating and world of a wide variety of habitats and living communities comparable in diversity to the terrestrial biomes but different enough from them to seem to belong to a different world altogether. The main factors affecting the type and numbers of organisms found in aquatic ecosystems are water salinity and depth to which sunlight penetrates; amount of dissolved oxygen and temperature of water.

Salinity levels are used to distinguish the waters of the earth into two categories, freshwater, and marine we shall first consider the freshwater biomes.

### 3.3.1 Freshwater Biomes

Low levels of dissolved salts characterise the freshwater biomes. The salt content of fresh water is about 0.005 percent. The freshwater biomes consist of inland bodies of standing water like lakes, reservoirs, ponds and wetlands as well as the flowing waters of the streams and rivers. Their nature does not depend as much on global climate, but on the individual site where they occur.

A lake or a body of standing waters can be divided into three zones according to penetration of sunlight in the water body, littoral, limnetic and profundal. Each of these have their own physical-chemical features and characteristic array of living organisms (Fig. 12).

The littoral zone is the area where light penetrates to the bottom. Aquatic life in the littoral zone consists of free floating and rooted plants, many aquatic insects, snails, amphibians, fish, turtles and water birds.

The open water zone is called the **limnetic zone**. This represents the zone or depth of the water upto which sunlight can penetrate. Phytoplankton along with algal forms, various zooplankton species and fish abound in this zone. The deep water zone lying below the limnetic zone is called **profundal zone**. It is relatively cool and dark, having low dissolved oxygen content and is inhabited by fish which can tolerate such stressful conditions. The bottom of the lake is inhabited by bacteria, fungi, blood worms and other decomposers which live on dead plants, organic matter including remains of animals and their metabolic wastes.

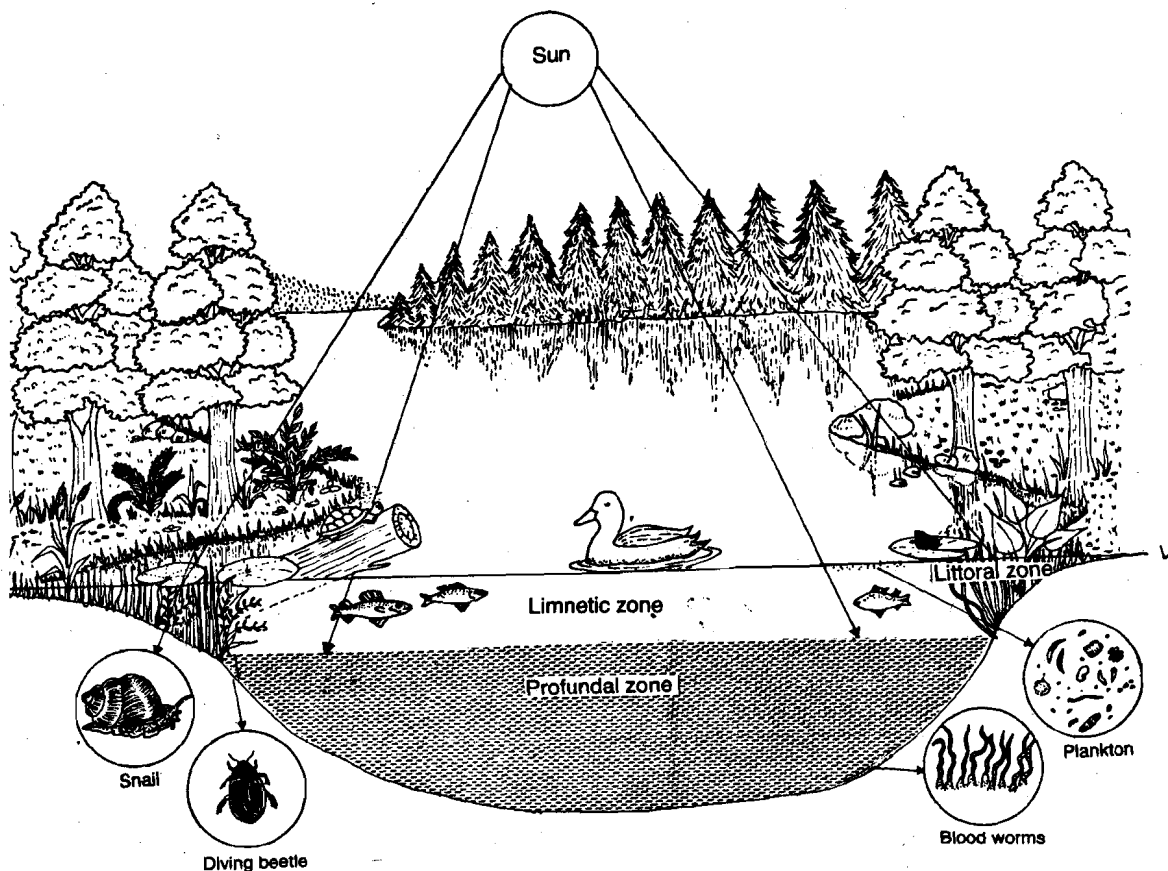


Fig. 12: Zonation in the lake biome.

Precipitation that does not evaporate or penetrate the soil remains on the soil surface resulting in run off which flows down from the mountains in the form of streams and rivers which ultimately discharge into the sea. The downward flow of the river comprises of three phases.

The first phase, when the stream with cold clear water rushes down steep slopes having high dissolved oxygen content. Most organisms which are adapted to cold temperatures and need

high amounts of dissolved oxygen are found here. In the second phase the stream flows over gentle slopes and through wider valleys. Here the temperature of water is warmer and supports a wide variety of cold water and warm water fish that require slightly lower dissolved oxygen. At the point where river discharges into sea, the river may divide into many channels, forming the **delta**.

Rivers and brookes which are flowing fresh water bodies differ from lakes and ponds in three major aspects.

- 1) current is the major controlling and limiting factor
- 2) land - water interchange is greater because of the smaller size and depth of moving water systems
- 3) oxygen is always abundant except in case of excessive pollution in river stretches.

Plants and animals living in streams and rivers are usually attached to surfaces. The free swimming animals are exceptionally strong swimmers.

The freshwater communities are utilised as a major source of food, for recreational purposes and for waste disposal as well as waterways for transport. In this manner we exert a significant impact on individual freshwater ecosystems and their communities.

### 3.3.2 Marine Biomes

The marine biomes consist of the earth's oceans and its associated areas like the shorelines, islands reefs and estuaries. The marine waters contain about 3.5 percent salt mostly sodium chloride and the organisms inhabiting these waters are profoundly adapted to these salty conditions. As landlivers we generally think of the earth as being mostly land and tend to forget that 71% of the surface of our planet is covered by oceans. Infact, often our planet is referred to as the 'water planet!'

#### Oceans

The oceans play a major role in determining the climate and sustaining the life on earth. Oceans help to redistribute the solar energy, through ocean currents and evaporation; they are huge reservoirs of carbon dioxide, oxygen and other minerals and help to regulate the ambient temperature and also help in maintaining atmospheric composition and serve as sources of various natural resources.

The world's seas and oceans are all inter-connected forming a World Ocean. The average depth of the ocean is 3.7 km. In some parts of the world the ocean is 11.5 km deep. Compare this with the height of Mount Everest that is 8848m above sea level.

Fig. 13 shows a diagrammatic representation of the vertical and horizontal zonation in the marine environment.

Most marine life is found in the shallower regions of the ocean and seas along the continental shelves, coral reefs and oceanic islands. Life at greater depths is limited by darkness, cold temperatures and pressure. Animal life at great depths comprises mainly of scavengers and predators that feed on the detritus rain and dead organic matter. The food that supports the large and diverse communities of the ocean is produced in the open water by phytoplankton in upper regions of the ocean where sunlight can reach. The average depth of the lighted zone of the sea is 200 meters in clean areas.

The marine habitat faces destruction due to pollution and resource use. Shorelines and open waters are subject to human activities such as fishing, recreational use, real estate development, garbage and effluent disposal, oil spills, radioactive waste disposal and exploitation of marine natural resources.

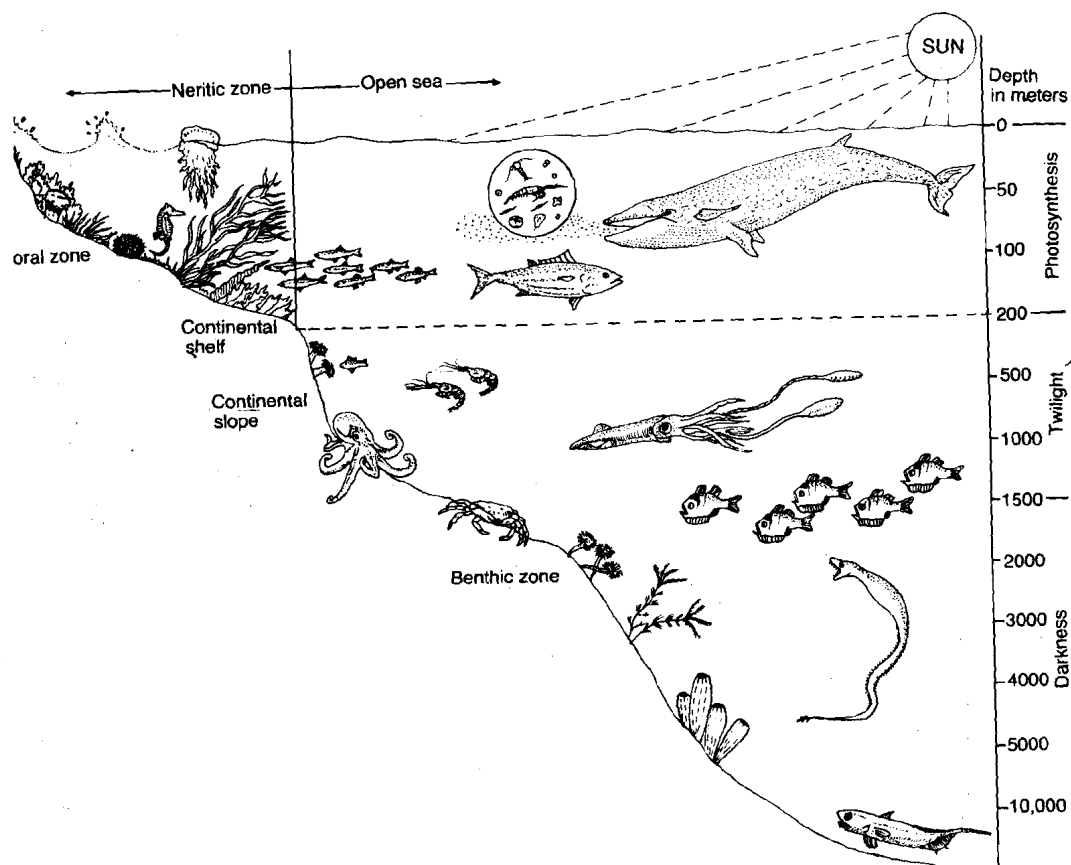


Fig. 13: Zonation in the ocean.

### Shorelines, Oceanic Islands and Reefs

Ocean shorelines include rocky coasts and sandy beaches that are particularly rich in diverse life forms. Rocky shorelines support a diversity of organisms that grow attached to some solid substratum. Sandy shorelines provide home to organisms that can live in burrows in sandy substratum.

Sandy beaches are important in our context as some of the finest tourist resorts and residences are built along them.

Oceanic Islands are interesting and somewhat specialised biomes. Islands which have broken away from the main continents have similarity of flora and fauna related to the continental source, volcanic and coral islands show results of chance colonization.

**Coral Reefs** - form in clear warm tropical seas and are particularly well developed in the South Pacific. They are formed by accumulation of calcareous skeletons of tiny colonial animals called corals over generations. Coral reefs usually form along the shallow submerged shelves and their depth is limited to a depth upto which sunlight can diffuse. Coral reef communities in terms of species diversity, number of organisms, brilliance of colours and interesting life forms are comparable with tropical forest communities.

### Wetlands and Estuaries

Wetlands and estuaries are transitional biomes. Land that remains flooded either part of the year or permanently with fresh or salt water is known as wetland. Bogs, swamps, marshes are covered by freshwater and found inland. These are known as **inland wetlands** those found on the coast and covered by seawater are known as **coastal wetlands**. Wetlands provide a variety of fish and wildlife and are major breeding, nesting and migration staging areas for water birds and shorebirds. Importance of wetlands cannot be underestimated as they act as

traps and filters for water that moves through them reducing flooding. As a result, sediments are deposited and chemical interactions in wetlands neutralise and detoxify substances in water and slow seeping of water into the ground helps to replenish the underground water reserves.

**Estuaries** are enclosed or semi closed bodies of water formed where a river meets the sea forming an area of mixed fresh and sea water. Estuaries usually contain rich sediment forming mud flats. The estuaries are very productive areas with high species diversity. They are important nurseries for ocean fish including all economically important fish and mollusks. The estuaries extend inland to form the coastal wetlands. In temperate areas, coastal wetlands usually consist of a mix of bays, lagoons and salt marshes, while in tropical areas we find mangrove swamps dominated by mangrove trees, the mangrove forests consist of evergreen, broad - leaf trees growing in brackish water in tropical areas.

**Check Your Progress--2**

- 1) Name three areas of the marine biome, list their characteristics.

.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....

- 2) Name two fresh water biomes. How do the organisms in them differ?

.....  
.....  
.....  
.....  
.....  
.....

---

### 3.4 BIOMES OF INDIA

---

India can be divided into 10 biogeographical regions as described by Rodgers and Panwar, 1988 (see Fig. 14). The biogeographical zone, biotic province and biome type for each zone has been presented in Table-1. You are already familiar with the typical characteristics of the various biome that you have read in the section on biomes of the world. Some details of these biomes are given after the table.