Chapter 9

# Adaptations in Different Ecosystems

L9B2H8

Let us discuss these questions

- What is a habitat?
- Is a tree habitat only for a crow?
- In what way an ecosystem is different from habitat?

We found that there were differences between the ecosystems of land and water. We can see differences within ecosystems in very small areas as well.

We have studied in class VI in the chapter 'habitat' about the variations in the living organisms, as well as organisms present at different levels, in the pond ecosystem and the tree. In this chapter we will see how organisms have started inhabiting certain areas? What needs they have? And how they acquire adaptations to different conditions from their surroundings to meet them?

To adjust themselves to diverse and distinct changes in ecosystems, organisms have to adapt different means for better survival. For example, some trees such as Mangroves like *Avicennia* have evolved a curious way to deal with the problems of growing in a wet and salty place. They have evolved to have curiously appearing projections from their roots called Pneumatophores.

*Fig-1 : Mangroves*

These aerial roots develop from the lateral roots that are growing near the surface, and protrude up to 12 inches out of the soil or sediment. They aid the plants in maintaining adequate root respiration in saline marshy environment. We do not find such structures in plants growing around us.

All such ways and means that organisms adopt or develop over a certain period of time in different conditions for better survival are adaptations of organisms. We may also say that adaptation is a feature that is common in any population because it provides some improvements for better survival.

Let us try to know more about adaptations in different ecosystems.

## Activity-1

Take a Kalabanda (Aloevera) and a Rose plant in two separate pots. Water each of them with only two tablespoons of water. Leave them for a week without water. Observe the condition of the plants after a week.

- *Which plant showed growth? Why?*
- *Which plant dried first? Why?*

## Activity-2

Collect an aquatic plant (Eg. *Hydrilla, Vallisneria* etc.) either floating at the surface or propping out of it. Plant it in a pot and water it.

- *What do you observe? Compare your observation with that of activity1 and write a note on your findings?*

From the above activity we see that some plants dry up without water very quickly, while others can grow even with very little water. Each of these plants are adapted to the conditions in their surroundings on the basis of need of water.

- *What is meant by adaptations?*

Organisms in nature adapt to situations specifically. For example in *Opuntia*, the leaves are reduced to spines so that transpiration loss is checked and water is stored in the tissues of the stem (succulent stems). This helps the plant to live in conditions of water scarcity such as deserts and dry lands. *Aloe vera* is found in our surroundings as well but you may have heard that they are generally called as desert plant (xerophyte).

*Aloe vera*

*Opuntia*

*Fig-2*

## Think and Discuss

- Can you give some examples of fleshy leaf plants?
- Why xerophytic plants do not have broad leaves?
- You may see *Agave* (Kittanara), a Xerophytic plant, grown as fence around crop fields in some areas in our state. Actually those places are not desert. How can they grow there?

Do you know details of Boabab tree? Its trunk is swollen. What do you think it contains? It stores water in its trunk and survives the scorching heat of dry seasons.

*Fig-3 : Desert plants (Baobab tree, Cactus)*

Though the plants seen in Fig-4 are called living stones but they are not stones. These are swollen leaves adapted to desert conditions to minimize water loss and storing water. These are also called Pebble

Plants. Each pebble is actually a leaf with a cut window that lets in light. The stone like appearance deceives the animals and saves it from being eaten.

*Fig-4 : Pebble plants*

Now a days, many Xerophytes are grown as ornamental plants in pots at homes. Some plants as a whole seem to be flowers. Some with thorns, some have flowers with bright colour petals. Now a days these kind of plants are used as gifts for Birthdays and other occasions also.

Like plants, adaptations can be seen in animals also. What adaptations can we see in Camel? How do they help?

*Fig-5 : Cactus*

**Hump -** stores fat for later use.

**Long eye lashes -** Protects eye from sand.

**Nostrils -** closes voluntarily to protect from blowing sand.

**Long legs -** keeps the body away from hot ground.

*Fig-6 : Camel*

## Think and discuss

- Do all animals living in desert conditions show adaptations?
- Why some animals have scales on their body?
- Why the animals that lives in burrows usually wander during night time only?

## Adaptations in some more desert animals

- The Side-Winder adder snake crawls sideways with only a small amount of its body pressed against the hot sand. This technique helps it to keep itself cool.
- The Golden Mole escapes the heat of the sun by swimming through the sand just below the surface. It rarely emerges out as it finds all the needs below the ground.

*Fig-7 : Side winder sanke, Rat, Golden mole, Sandgrouse*

Some animals show extraordinary ability to survive in the desert.

- The *Kangaroo Rat* of western North American desert can live without drinking water through out its life. Because its body synthesizes little water in the process of digestion.
- The desert bird the *Sand grouse* flies long distances to an oasis in search of water, which it carries back in its crop for its nestlings.
- The furry soles of Fennec Fox helps it walk on hot sand and loses heat through its ears.
- When the sand becomes too hot the sand diving Lizard holds its feet in the air to cool down.

### Do you know?

Animals which are active during night and sleep during the day are called Nocturnals. These creatures generally have highly developed senses of hearing and smell. They have specially adopted eye sight to see well in dark. Animals like bats, emit a high pitched sound which bounses off objects to find prey and protect from predators.

Cats, Rats, Bats, Owls are the Nocturnals generally seen in our suroundings. Some insects like Crickets, Firefly and Fishes like Cuttle fish are active during night only. Some desert animals become nocturnals inorder to escape extreme day time heat.

We know that organisms need shelter, food, light, air and many other things for their survival. Organisms often show adaptation according to these requirements.

## Adaptations in Aquatic ecosystems

We shall study two different types of ecosystems in water (aquatic ecosystems) and some conditions in the environment that influence adaptations.

Aquatic ecosystems are mainly classified into two different types as Fresh water and Marine ecosystems.

Ponds, Lakes, Rivers are the examples of Fresh water Ecosystems

Seas, Oceans are the examples of Marine Ecosystems

As the living conditions are different we come across various adaptations in several organisms living in these ecosystems.

- You may know animals that live in water. Do you find in them any suitable characters adopted to live in water. Write a note on them in your notebook.

General aquatic adaptation as can be seen structurally (in body structure) are like presence of some special air spaces inside bodies or presence of such structures that help organisms to swim and float in water to inhabit different levels in the water body. Some animals bear specialized structures to swim such as flippers as in Turtles and fins in fishes. Fishes and Dolphins have floaters in their body (special structures of their digestive canals) to be able to inhabit particular levels in the water body. Microscopic photosynthetic organisms like phytoplanktons have droplets of oil in their cells that keeps them float. Larger plants have long broader leaves and flexible stems.

- *In what way flexible stem is useful to the aquatic plants?*

Ask your teacher or collect information from your school library and write a note on it.

## Marine ecosystem

Over the last 2,000 million years, plant and animal life on earth has continuously evolved from its simple beginnings in the oceans to the complex existence on land today. It is no accident that protoplasm, a substance found in every living cell, strongly resembles seawater. Although some animals emerged from the sea millions of years ago to fill all available places on land, some remained in the ocean and evolved and adapted to life beneath the surface.

The ocean covers a larger part of the planet, yet it remains a little understood place as scientists have limited scope for the study of habitats that lack physical boundaries and a span of thousands of miles.

Each form of marine life has become adapted to a specific area with a relatively narrow variation in salinity, temperature, and light. The high salt content found in the ocean can support the large bodies of Giant Squids and Whales, which has allowed them to evolve without the use of strong limbs for support. Nevertheless, salt water exerts enormous pressure on the air spaces of marine animals at depth fluids like blood are practically incompressible. For every 10 meters pressure increases by one atmosphere ($10^5$ Newton/metre$^2$). You studied about in the chapter 'Force and Pressure' in VIII class Physical Science text book and let us recall them.

This limits our study of occean depths significantly unless we use diving craft specifically designed to maintain one atmosphere.

## Secret of swimming

Swimming is the fundamental characteristic feature of aquatic animals. Their bodies have certain adaptation to fight with pressure of underwater current. Let us try to find out these secrets.

Yet, all sorts of other organisms thrive at high pressure. Some of them are even air-breathing surface dwellers like us. Some Seals can dive up to a mile and some Whales can go much deeper than that (these are mammals like us). All these animals seem to share the same secret: instead of fighting the pressure, they let it shrinks their lungs completely. Some oxygen remains in their lungs, but they mostly store it in their muscles, where it is needed; their muscle tissue contains much higher concentrations of oxygen-binding chemical than our muscles.

Moreover, shrinked lungs give deep-diving mammals another big advantage, once a seal's lungs have shrinked, it becomes heavier than water, and so it sinks. Thus it doesn't have to flap flippers all the way down; it reaches great depths mostly by gliding effortlessly, saving its oxygen stores, for the strenuous climb back to the surface.

The deep seafloor itself, well beyond the range of diving mammals, is inhabited by an incredible diversity of animals. Some

of the fishes even have lung-like swim bladders to control their buoyancy (ability to float in a medium) e.g. Whales, Seal. They move up in the water column by releasing gas into the bladder and inflating it, and down by reabsorbing gas into their blood. Researchers have observed that such fishes hang motionless a few feet above the seafloor. A swim bladder does not shrinks at depth because the gas inside is at the same pressure as the water outside which means if that external pressure suddenly decreases, the bladder will swell greatly. When such a fish is brought up from depth, its swim bladder sticks out of its mouth.

Marine animals must also regulate the interaction of freshwater and saltwater in their bodies. Specially developed kidneys, gills, and body functions help to maintain salt concentrations across membranes through osmosis. Marine animals must also be able to take dissolved gases like oxygen from the water needed to release the energy from food. Animals, such as Anemones or worms, take the gases through their skin. Mobile animals use gills, or even lungs to take oxygen from the water and air. All animals in the ocean release carbon dioxide into the water as waste, which is then used by plants to produce energy.

Temperatures vary dramatically between the surface and the ocean floor. Marine life has developed many adaptations to the variations in temperature. Many marine mammals have blubber for insulation from the cold, and some fishes have an antifreeze-like substance in their blood to keep it flowing. It is interesting to study the dramatically different adaptations in marine life on a vertical scale in the water.

Animals and plants living in surface waters have access to high nutrient levels, increased temperatures, reduced pressure, and more light and therefore lack the adaptations of deep sea creatures that must live in high pressure, cold, dark waters with scarce nutrients.

Marine life has adapted to an incredible variety of conditions and habitats. Barnacles and Mussels have developed mechanisms that allow them to cling to rocks in environments where they might otherwise be easily washed out by strong waves. Brightly-coloured Clownfish have adapted symbiotic relationships with Anemones to protect both the Clownfish and the Anemone from predators. Some Whales and herring gulls have adapted the ability to travel long distances and the ability to survive in a variety of environments.

Marine adaptations also include symbiosis, camouflage, defensive behavior, reproductive strategies, contact and communication like most other ecosystems on earth and adaptations to environmental conditions like pressure, temperature, light and salinity.

- Ask your teacher about symbiosis, camouflage, go to internet and find out some more details to prepare a paper and submit in your school symposium/ seminar.

Now lets study light related adaptations of marine life forms.

The Fig-8 shows how certain zones in a marine ecosystem on the basis of availability of light at different depths are demarcated.

You can see different types of organisms at different depths in marine ecosystem. (this is only a representative figure showing only a few types of organisms).

The following table shows some more abiotic characteristics and some types of organisms present at different depths in a marine ecosystem.

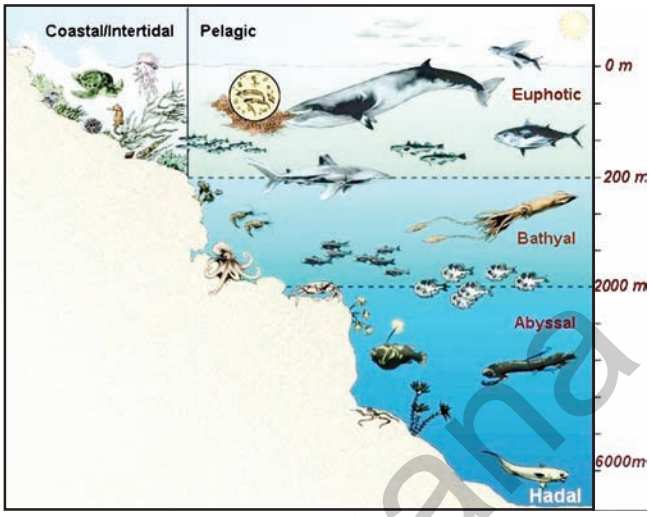


*Fig-8 : Different zones in marine ecosystem*

**Table-1**

| Oceanic Zones | Light | Temperature | Depth | Plants / Animals |
|---|---|---|---|---|
| Euphotic zone (sunlit zone) | Brightly lit | Upto 30$^0$C (104 $^0$F) | 0-200m | Planktons, physalia, dolphins, flying fish, green turtles, sea anemones etc. |
| Bathyal zone (twilight zone) | Dimly lit | 4$^0$C (39$^0$F) | 200m-2000m | Whales, lantern fish, red, brown kelps. sea cucumbers, squids, octopus, sponges, corals etc. |
| Abyssal zone (dark zone) | Dark | 2$^0$ - 3$^0$C (36$^0$F-37$^0$F) | 2000m-6000m | Brittle star, angler fish, tripod fish etc. |

- How many zones can you see in the Fig-8 on the basis of light penetration? Name them.
- What types of abiotic conditions do you find as per the given table?
- What will affect adaptation to marine life other than the conditions shown in the figure?
- How do temperature and pressure vary as the depth increases?
- Which zone has more animals? Why?

The above analysis shows that there are different oceanic zones with variations in temperature, pressure, light etc. These abiotic factors give rise to various adaptations in organisms in the different zones.

## Adaptations on the basis of light penetration

### Euphotic zone

The organisms living in this zone are mostly floaters and swimmers. Animals in this zone usually have shiny bodies reflecting light away to merge with shiny water surface are transparent. These usually have very sharp vision. Plants are mostly green and photosynthetic activity is maximum in this zone. Some flora and fauna of this zone are trouts, herrings, dolphins, jelly fishes, different type of coral colonies which are extremely colourful, different types of algae & sea grasses (emergent plant species: rooted to the sides, in marine ecosystems these are rooted in the continental shelf area) diatoms etc. Nearly 80% of marine flora and fauna are found in this zone.

*Fig-9 : Coral colonies*

### Bathyal zone

Most of the plants found in this zone are the red and brown kelps, sponges, corals even animals with tubular bodies like squids and large animals like whales etc. Some of these have a flat body like the ray fishes. They may have big eyes sensitive to very dim light.

*Fig-10 : Ray fish*

### Abyssal zone

*Fig-11(a) : Angluar fish*

This zone is dark and cold throughout the year. Photosynthetic activity is absent. Deep sea animals are mostly predators and scavengers. The larger forms have wide mouths and huge curved teeth which prevent escape of any prey. Absence of skeleton, flattened bodies are some other characteristics observed. Some also have special structures that produce light on their bellies, around their eyes (which are usually nonfunctional that is, the some organisms are blind) and at the sides of their bodies, some animals glow (shows bioluminiscence) in the darkness of deep waters.

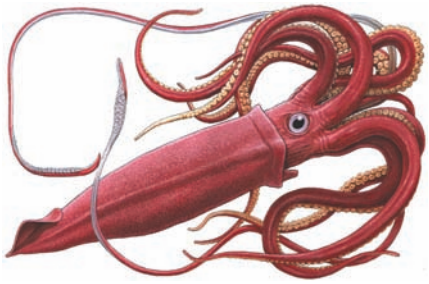

*Fig-11(b) : Giant Squid*

## Do you know?

Electric Eel is an electric fish. It is capable of generating electric shocks of upto 600 Volts, when it uses for hunting self defence. It is an apex predator. Despite its name, it is not an eel, but rather a knife fish.

## Think and discuss

- In Jelly fishes, Decomposers which organism do you think is present in euphotic zone?
- What kinds of adaptations can be seen in the organisms of the euphotic zone?
- What kind of adaptations can be seen in the organisms of abyssal zone ?
- What differences can you find in the animals of bathyal zone when compared to animals of euphotic and abyssal?
- How do the organisms of different zones in marine ecosystem are adapt?

## Fresh water Ecosystems

Fresh water ecosystems are stagnant water types as well as running water types. They may vary in size from as small as a puddle and pond to a large lake, river etc.

Osman sagar, Durgam cheruvu, Shamirpet lakes of Hyderabad and Vaddepalli cheruvu, Laknavaram of Mulugu, Paleru Cheruvu of Khammam, Koyal sagar in Mahaboob nagar, Ali sagar in Nizamabad etc. are fresh water ecosystems in Telangana state.

- Does the Lakkavaram lake of Mulugu comes under fresh water ecosystem or not. Why? Give reason.

Just like the marine ecosystems, to study environmental conditions in lakes, some zones are marked. The Littoral zone, Limnetic zone and Profundal zones on the basis of light penetration. Based on availability of light different kinds of organisms are found in these zones. Different factors like light, salt content, food, oxygen affect the organisms and their populations in different ways.

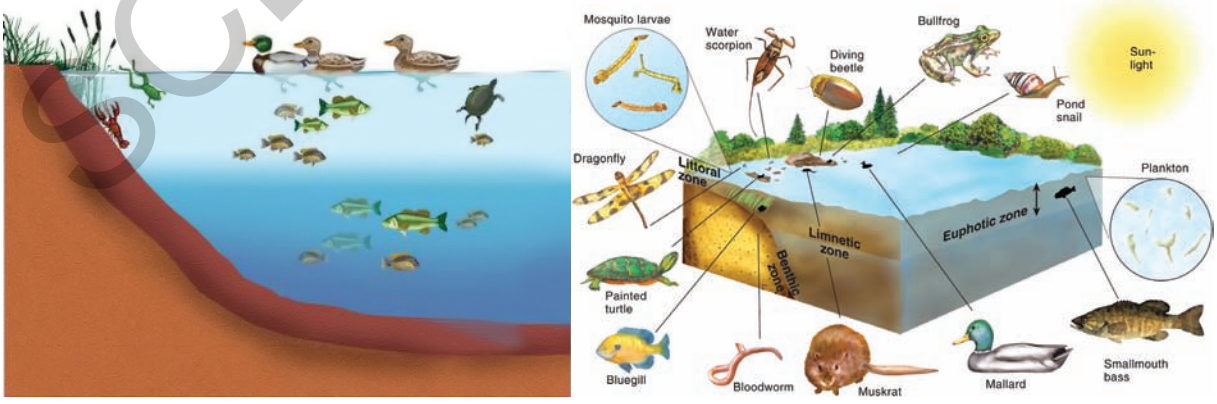


*Fig-12 : Zones in Lake Ecosystem and Types of Organisms present*

**Littoral zone:** The shallow zone near the shore is also called as littoral zone. The water near the shore is usually muddy or turbid. This topmost and warmest zone at the edge of a water body is home to Snails, Clams, Insects, several Crustaceans, Fishes and Amphibians and the eggs and larvae of Dragonflies etc.

Several organisms in this zone have well developed sight, usually have dull and greyish bodies and are fast swimmers. Plants like Mosses, Water lily, Vallisneria, Hydrilla etc are found here along with several types of algae. High photosynthetic activity occurs in this zone. Predators of this zone are Tortoise, Snakes and Ducks.

The **limnetic zone** is the open water zone at the top of the water body and consequently receives a good deal of light. This zone contains a variety of freshwater fish with bright shiny, greyish or silver black scales that help them to merge with the surroundings. Transparent or whitish bodied crustaceans like Daphnia, Cyclops, small Shrimps are also found in this zone. There are different types of floating plants like Water hyacinth, Wolffia, Pistia along with a variety of algae. Photosynthetic activity is highest.

Both littoral and limnetic zones are photic zones.

The **profundal zone** is dimly lit and cold. Mostly heterotrophs (saprochytes - microbes that decompose dead organisms) are found in this region. Most of the animals, the so called bottom dwellers, that live here are mostly scavengers and predators, for example Crustaceans, Crabs, Fishes like Eels and Glossogobius (isika dondu), Snails, Turtles etc. They adapt themselves by feeding on dead animals that settle down. Many kinds of bacteria (detritus) thrive here that help in decomposing the dead organisms. Mud of the bottom floor, tiny particles of dead and decaying matter of plants and animal bodies make the water very turbid. Hence the bottom dwellers , rely mostly on smell and auditory (related to hearing) senses rather than vision to aquire their food.

The surface layers in the lake ecosystem gets heated while the deeper layers remain cool during day time. Often some organisms migrate to deeper layers during the day and reach the surface layers during night time when it cools down.

**Other organisms found in lake**

Mammals (like Badgers, Otters) live near water and are capable of swimming to catch their main food source, particularly fish.

Amphibians and reptiles like Toads, Frogs, Alligators, Crocodiles, Salamanders start life underwater as eggs and tadpoles, and then move to ground as adults.

Insects such as Skaters, Water beetles, Mosquitoes and Dragonflies can swim over the surface of ponds, playing a critical role in the food supply for other animals.

Many species of Ducks and Cranes also reside in and around the lake ecosystem feeding on a number of different items including fish.

- Think, how webbed feet helps duck?
- Why cranes have long legs and long beaks?

## Activity-3

You know some of the animals that reside in and around lake or pond. Make a list of those animals and the characteristics of their body.

Webbed feet of these help them to adapt to conditions on land as well as in water. Webbed feet and streamlined bodies have enabled them to be good swimmers. Wading birds such as Herons and Egrets which have long thin legs wander through the mud shallows searching for insects.

### Water salinity and fish adaptations

Different fish species have very different tolerances for water salinity. All marine and freshwater fish maintain a constant internal salt concentration, which is midway between that of fresh water and sea water. Several marine species have a lower internal salt concentration than that of the water they swim in, so they tend to dehydrate as water is lost by osmosis. To compensate, they drink large amounts of water, and excrete the salts both through their kidneys and through highly specialised cells in the gills.

In contrast, freshwater fish have a higher internal salt content than their medium, and they tend to float, because osmosis leads to excess water entering the body through the permeable membranes in the mouth and gills. The water can be excreted in the form of urine, but to maintain a suitable salt balance freshwater fish need to reabsorb salt through the kidneys, and collect additional salts through salt-collecting cells in the gills.

It is the ability to regulate this salt absorption that determines the tolerance of a freshwater fish for saline water. When the water salinity level exceeds the fish's ability to adjust its salt regulation mechanisms, the delicate salt and fluid balance is upset and the fish dies.

### Think and discuss

- Organisms of the oceans have a lesser salt content in their bodies than the sea water which has around 3.5%. The fluid could drain out of the body of the organism into the sea. This could be dangerous and fatal to the organism. How do they survive under such conditions?
- Can fish in estuarine ecosystem survive in river as well as in sea?

During summer the water in the lakes gets heated up and evaporates. Other requirements necessary to the organisms, like oxygen and nutrients gets decreased. This leads to the death and decomposing of organisms which makes living conditions unsuitable. In cold regions, the water in the lakes and ponds gets frozen, killing all the organisms. You have studied about fresh water ecosystems. Discuss the following points in your class.

- How are marine ecosystems different from fresh water ones?
- Write two types of adaptations you find in marine ecosystems, different from freshwater ecosystems.
- What are the similarities in adaptation on the basis of light

penetration in the two aquatic ecosystems?

- Which zone do you think,when compared to marine ecosystem, is absent in freshwater ecosystem?
- What would be a major factor leading to different types of adaptations in marine and freshwater ecosystems?

## Adaptations in some aquatic plants

*Fig-13(a) : Water hyacinth (floating) Hydrilla (submerged)*

*Fig-13(b) : Water lily (emergent)*

Partially submerged plants have numerous air spaces inside the stems ,leaves ,roots that aid in gaseous exchange and buoyancy. Leaf bases of Water Hyacinth (*Eichhornia crassipes*) form air filled structures to keep them afloat. In water lilies leaves are flat, have an oily surface with stomata present on the upper surface of the leaf, while incompletely submerged plants like *Hydrilla*, stomata are absent, leaves are thin, stems are highly flexible. The main adaptations that give *Hydrilla* an advantage over other native plants are: it can grow at low light intensities, it is better at absorbing carbon dioxide from the water (diffuses into leaves), it is able to store nutrients for later use, it can tolerate a wide range of water quality conditions for example salinity(can grow in saline waters as well), and it can propagate sexually and asexually.

## Other examples of adaptations

### Adaptations to temperature in plants

The effect of temperature on plants of terrestrial ecosystem can be seen in different ways.

- Do all plants shed their leaves at same time in a year throughout the world.

*Fig-14 : Fall season modified stem*

Some plants in temperate regions shed their leaves before the winter starts. This is to minimize transpiration loss as well as reduce photosynthetic and other metabolic activities, as low temperature renders several chemicals inactive for some time. In tropical regions some plants shed their leaves before the start of summer. Plants

growing in hot climates, usually keep the stomata closed during the day to reduce transpiration loss. High temperatures also lead to adaptations like reduced leaf.

Let us recall why xerophytic plants have modified stems and leaves.

- Are thorny leaves also an adaptation to temperature?
- What will happen, if the trees have broad leaves at the time of snow fall season?

## Adaptation to temperature in animals

Body heat changes occur due to increase or decrease in atmospheric temperatures. These changes greatly affect the life of organisms in different ecosystems.

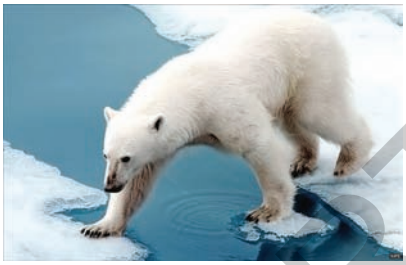

*Fig-15(a) : Polar Bear*

*Fig-15(b) : Blue Whale*

In cold regions the upper layers of the lakes get frozen during winter and the lower layers does not. Hence organisms migrate to deeper layers of the lake which is warmer and survive.

- Why polar bear has thick fur over its body?
- In what way thick skin helps the Seal to protect from cold weather?

*Fig-16 : Seal*

Animals living in these regions adapt themselves in different ways. They have a thick layer of fat deposited under their skin, or thick fur coat or hair covering their bodies. These act as insulators preventing heat loss from their bodies. The fat not only insulates the body but helps in producing heat and energy. Such adaptations can be seen in Whales, Seals, Polar Bears etc.

## Adaptation as a response to adverse situations

Some adaptations, to cope up with adverse situations, are quite peculiar and prominent and yet go unnoticed by us.

Observe these pictures .You may find many kinds of organisms living underground like this. Why did they choose such places?

*Fig-17 : Hibernation/ aestivation*

Many organisms that live in the hot deserts or polar regions migrate to the deeper layers of the earth to protect themselves from the extreme conditions of heat and cold. For example seasonal adaptations can be seen in amphibians like frog .To protect themselves from the extremes of hot and cold conditions they burrow deep in the ground and remain motionless until the conditions are favourable. During this period the rate of metabolic activities slow down and the animal goes into a nearly sleepy condition called *Hibernation* (winter sleep) and *Aestivation* (summer sleep).

- Collect information about hibernation and aestivation and make news bulletin. For this you need to go to library or internet and also take your teachers help for more examples.

## Lichens

You may have observed greenish patches on the bark turn into a greyish or whitish mass and then to a peculiar flaky or greenish growth. What do you think it is? A flavouring agent in the name of 'Patther Phul' is used in preparing biryani. It is also a type of lichen.


*Fig-18 : Lichen*

Figure -18 shows the successful adaptation of algae and fungi colonies. The fungus colony attacks an algal colony where most of the algal colony that fails to compete dies out. The more adaptive forms of *Algae* live on to form symbiotic relationship with the fungi in colonies called Lichens. The figure shows such a colony growing on a tree trunk. The fungus provides water and minerals to the alga, while the alga performs photosynthesis and supplies food in the form of sugars to the fungus. Due to such symbiotc adaptations lichens are able to survive even in extreme conditions.

Adaptation to environment is not a simple phenomena. If we keep a cow in a desert, will it be modified like a camel? If a giraffee is kept in a forest with short trees or plants it would not convert like a goat. Adaptation takes place over a long period of duration.

### Story of Darwin's Finches

Charles Darwin in the year 1885 landed from the famous ship H.M.S Beagle on one of the islands of the Galapagos islands. He studied about different organisms of the islands. His most remarkable observation had been about Finches (our state bird is also a finch). He was amazed to see that different types of finches that differed with respect to beaks and the colour of feather were present in the small region of the Galapagos islands. He noted that some finches eat seeds,while some eat fruits and the others eat insects.

## Adaption in Galapagos Finches

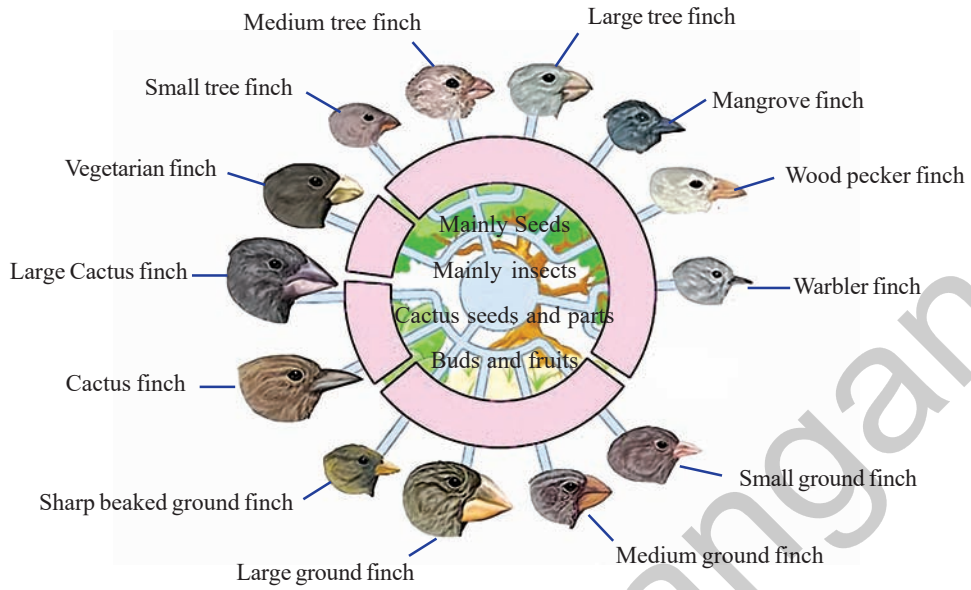


*Fig-19 Finches of Galapagos Islands*

- *Is there any relation between type of food taken and the structure of beak? Specify.*
- The seed eaters had thick and heavy beaks.
- The fruit eaters had stubby beaks.
- The insect eaters had sharp and long beaks. .

Darwin observed that these birds had adapted to their immediate surroundings for food and shelter and showed a lot of variation even within the same species, especially with respect to the form of beaks. He made a sketch of the same as shown in the above figure-19. Thus he concluded that adaptation was something that an organism is undergoing continuously, even within very closely related forms in a particularly geographically separated area.



### Key words

***Adaptations, ecosystems, photosynthesis, transpiration, xerophytes, scavengers, euphotic zone, bathyal zone, Abyssal zone, littoral zone, limnetic zone, profundal zone, phytoplanktons, bioluminescence, amphibians, aestivation, hibernation.***

## What we have learnt?

- Organisms adjust to diverse conditions of the ecosystem for better survival by adaptations.
- Different adaptations are found in organisms of marine and fresh water ecosystems.
- For their survival organisms have developed special characters to adapt themselves to temperature, water availability, pressure etc.
- Most of the xerophytic plants have fleshy, succulent and green coloured stem and reduced leaves.
- Marine ecosystem is divided as euphotic, bathyal and abyssal zones.
- Fresh water ecosystem of a lake has littoral, limnetic and profundal zones.
- In temperate regions, some plants shed their leaves before winter.
- Animals in cold regions have thick fur coat and a fat layer below their skin that act as insulators.
- The factors that affect the aquatic ecosystems are salt content, oxygen, food, light and pressure.
- Animals living in the bottom layers of the sea are usually blind.
- Hibernation and Aestivation seen in amphibians like frogs is an example of adaptation.

## Improve your learning

I2U3Y5

1. What do you understand by adaptations in organisms and why do they adapt? (AS 1)
2. With the help of two examples, explain how these organisms have adapted themselves in the ecosystem? (AS1)
3. What special adaptations can be seen in the following organisms? (AS1)
   a) mangrove trees b) camel c)fish d) dolphins e)planktons.
4. If an animal of euphotic zone has to survive in abyssal zone, what adaptations are required to survive there? (AS1)
5. Marine water fishes drink more water than fresh water fishes. Do you agree? Justify. (AS 1)
6. Write the effect of temperature on the organisms adapted in a lake and pond in a tabular form. (AS1)

7. In the chapter on ecosystem, we had studied about the mangrove ecosystems. In what way it is differ from marine ecosystem. (AS1)
8. How frogs protect themselves from cold and heat. (AS 1)
9. The Murrel (korramatta) and Rohu are fishes found in rivers. Will they be able to live in the Mangroove forest ecosystem? Give reasons for your answer. (AS 2)
10. Collect some aquatic plants- cut the leaves and stems Observe them under microscope and record your observations like presence air /absence of air spaces etc., and answer the below. (AS 3)
    a) Why do they float on water?
    b) Which factors helps to float?
    c) Draw a diagram of what you have observed under microscope?
11. Visit a nearby pond or a lake. Record the organisms you have observed and their adaptations? (A S 4)
12. Collect information of one lake from internet and prepare a table of organisms adapted at different zones? (AS 4)
13. Are there any rivers meeting in the Bay of Bengal in the Mangroove forest ecosystem collect information and make a note on them? (AS 4)
14. Draw a lake showing different zones. Why are they called so? (AS 5)
15. Amphibians are wonderful creatures on the earth. How do you appreciate their adaptation? (AS 6)
16. How do you appreciate the processing protection pebble plants from the enimies (AS 6)
17. Some animals and plants survive only in certain conditions. Now a days, human activities cause damage to these conditions. What do you think about this? (AS7)