13.7. POPULATION INTERACTION

No species can remain alone in a habitat. Species in nature require other species with whom they interact to derive benefit. In such interaction some species may be benefited and other may be harmed. Again some may be beneficial to each other. For example, in case of plants which do not need food from any other organisms, but are dependent upon soil microorganisms for mineral nutrition. Plant also need the help of pollinating insects for seed production. Tiger cannot remain alone in a forest unless there are prey. Pathogens cannot survive without their required hosts.

There are several types of interspecific interactions that take place in any ecosystem. These have been shown below:

1. **Mutualism.** When interactions are beneficial to each other.

2. **Competition.** When interacting species are not beneficial to each other.
3. **Predation.** When one prey upon the other. Therefore one gets benefit from the other.
4. **Parasitism.** Here parasites derive benefit from the host.
5. **Commensalism.** In this case one gets benefit from the other without harming it. In such case one is active and the other is passive.
6. **Ammensalism.** In this case one species is harmed while the other remains unaffected.

Now we will discuss these interactions with some detail.

(A) Mutualism

The interaction between species in which both the species are benefitted is called mutualism. For example:

(*i*) In case of *Lichen*, a fungus and an alga make partnership in which both are benefited.

(*ii*) In case of *Mycorrhizae* both plants and the fungi are benefited. The fungi supply nutrients, particularly phosphate to the plants and in return the plants supply the fungi with carbohydrate or its derivatives.

(*iii*) In case of *Rhizobium*-legume relation *Rhizobium* fix nitrogen which the plants absorb and in return the plants supply carbohydrates to the *Rhizobium*.

(*iv*) In case of flowers and pollinating insects the insects in return for nectar and pollen cause pollination. Some flowers and their pollinators have co-evolutionary history. They are made for each other. In such case the flower morphology has evolved in a way that only particular types of insects can enter the flower and pollinate it. Fig *(Ficus)* is a good example. Only waps species can enter fig to lay eggs and in that process cause pollination in fig. In *Bignonia,* only long beaked birds can pollinate. In *Calotropis* the pollinium remains hidden. Only bees can remove the lid and carry the pollinium. In case of some orchids (*Ophrys*) a different game plan is made in which one of its petel is coloured in such way that it resembles the female species of certain bee. The male bees are deceived by the mimicry and visit the flowers and unknowingly mingle among such flowers causing pollination.

(B) Competition

(*i*) Competition for same type of food or same habitat may occur among individuals of the same or different species.

(*ii*) It is not true that competition occurs among closely related species. Competition also occurs among unrelated species. Because completely unrelated species may share the same food. Again, when there is enough food the feeding efficiency of one species may be reduced due to interference by another species.

(*iii*) Another phenomenon called *'competitive release'* also effect certain population. Some smaller species which remains restricted to small area can expand to larger area if the bigger species which restrict the movement of smaller species are removed.

(*iv*) According to Gause's *'Competitive Exclusion Principle'* two closely related species when compete for same food and space the inferior one will be eliminated when resource is limited.

This is not always true. The recent study shows that the species facing competition may also develop mechanism to co-exist.

(C) Predation

It is an interspecific interaction where one animal which is strong and carnivore in nature kills another animal which is weak (for eating). The killer is called predator and the killed one is called prey. Predators and prey are not always animals. Herbivores are predators of plants. Among plants also there are predators. The insectivorous plant are predators of insects. In this case the insects are prey.

Predators play the following role in ecosystem:

(*i*) Predators transfer energy fixed in plants to higher trophic level. For example, when a deer eat grass, the solar energy stored in grass is transferred to the deer. Again when a tiger eats a deer the energy is further transferred to the tiger.

(*ii*) Predators keep the prey population density under check.

(*iii*) Helps maintain species diversity in a community by reducing the intensity of competition among species.

To avoid predators the prey species have developed certain mechanism. These are—

(*i*) Certain animals particularly insects, frogs and certain plants camouflage to avoid detection by predators.

(*ii*) Some prey are highly distasteful and therefore are avoided by peredators.

(*iii*) Some prey are poisonous and hence are avoided by predators.

Plants are more affected by the herbivores. There are a huge number of phytophagous insects which feed on the sap of plants. Many plants have developed mechanism to prevent predators. These are:

(*i*) Development of chemical defence against phytophagous insects and pathogens.

(*ii*) Many plants have thorn and spines and some other have thick growth of hairs on their body.

(*iii*) Many plants take to mimicry to avoid predators.

(*iv*) Many are poisonous to herbivores.

All the above adaptations have evolved only to protect themselves against certain predators.

(D) Parasitism

Parasitism is a specific interaction in which one partner derives benefit at the expense of the other. In their case the host is affected or killed. In such case of interactions the following facts are evident:

(*i*) In all such associations parasite is benefited and the host is affected or killed.

(*ii*) Interaction is specific for the host and the parasites. This means specific parasites have specific hosts range. They have co-evolved.

(*iii*) The parasites in course of evolution have

- (*a*) Lost sense organs
- (*b*) Lost digestive system
- (*c*) Developed adhesive structure like hook, suckers etc.
- (*d*) Developed high reproductive capacity.

(*iv*) Life cycle of some parasites are complex that involve more than one hosts. For example, human liver fluke needs snail and fish to complete life cycle. In case of *Plasmodium* (malarial parasite) they need human and female *Anopheles* mosquito to complete life cycle.

(*v*) There are two types of parasites:
(*a*) Endoparasite
(*b*) Ectoparasite
The endoparasites live inside the host body *e.g.* — Tape worm, Liverfluke, *Plasmodium.* The ectoparasites live on the body surface of the host *e.g.* Head-lice on human, *Cuscuta* on plant.

There is another kind of parasitism called brood parasitism. This is evident in case of transferring eggs to crows nest. Evolution has occurred in such a way that eggs of both the birds look alike to avoid detection.

(E) Commensalism

It is an interaction between two species in which one species is benefied but the other interacting species neither benefited not it is harmed by such interaction. Commensalism may also be called as "at table together". It means one consumes the unused food of another. The following examples may be cited:

(*i*) Orchids or any other ephiphytes grow on tree trunk without harming the plants.
(*ii*) Branacles growing on the whale surface are benefited as the whales lead them to the place where food is available.
(*iii*) Similar is the case of remora attaching themselves with shark. The remora share the scraps of the food thrown out by shark.
(*iv*) The cattle egrets (a kinds of birds) are always found near the place where cattles are grazing. The act of grazing causes flushing out of insects from grass which the birds can catch easily.
(*v*) The clown fish roam along with sea anemones to get protection from their predators. Their predator never come near sea anemones because of the presence of stringing tentacles of sea anemones.
(*vi*) A fish called *Fierasfer* live in the cloaca of sea-cucumber. It emerges from time-to-time to feed and then return to its unusual home.
(*vii*) Birds rest and build nest on tree. The tree is not harmed but the birds are benefited.

POPULATION INTERACTIONS

Name of interaction	*Species A*	*Species B*
(*i*) Mutualism	Benefited	Benefited
(*ii*) Predation	Benefited	Harmed
(*iii*) Parasitism	Benefited	Harmed
(*iv*) Commensalism	Benefited	Not affected
(*v*) Competition	Harmed	Harmed
(*vi*) Amensation	Harmed	Not affected

(F) Amensalism

It is an interaction in which one species causes harm to another without gaining any benefit. The adversely affected species is called *amensal* and the affecting species is called *inhibitor.*

Examples:

(*i*) Some microorganisms secrete antibiotics that affect other microorganisms. This phenomenon is called *antibiosis.*