

## **PUC 1<sup>st</sup> Year-Semester-2**

### **Unit VI: Ecology and Environment**

#### **Module No: 30. Population interactions-Mutualism, Competition,, Predation and Parasitism**

The living or biotic environment deals with the interaction among different organisms of the same or different species. In nature, no organism is free from the effect of other living beings. The existence of other species is very important for getting food and shelter and for meeting other requirements. Thus animals may have relations with other animals, plants with other plants, animals with plants and some plants are dependent upon animals. The interaction or interdependence or relationship among the individuals of the same species is known as intra – specific relationship and among the organisms of different species is termed as inter- specific relationship.

#### **Predator – Prey Interaction:**

Predation is a kind of animal relationship where one animal kills and devours other animals for food. The animal which kills and devours other animals is called a predator and the animal which is killed and consumed is called a prey. In predation, stronger attacks the weaker.

Almost all the animals are predatory, but a few plants are also predatory. Predatory animals that eat other animals are carnivores, and those that feed on plants are herbivores. Examples of predation are very many. Carnivorous plants also provide very interesting examples of predation. The sundew plant, *Drosera*, entraps insects in a sticky fluid on its leaves. The pitcher –

shaped leaves of the pitcher plant (*Nepenthes*) contain a watery liquid that serves as death trap for the insects. The bladder wort, *Utricularia* has bladder like leaves, which catch and digest minute crustaceans and insects. It keeps the prey population in control, which otherwise would lead to very high population densities and cause ecosystem instability. The prey species have evolved various defensive methods to avoid being preyed upon. Some species exhibit deceptive and advertising colouration to avoid the predators. Mimicry is one adaptation evolved in some species. Herbivores are the predators for plants. Plants have evolved various defensive mechanisms (for example, Thorns, Toxic Chemicals etc.) to avoid predation.

**Symbiosis**: Symbiosis is the association between members of two species where no partner is harmed ,rather one or both the partners are benefited.

The symbiotic relationship may be for food, shelter, substratum or transport. This association may be continuous or transitory and obligatory. The two symbionts or partners may be in close contact with their tissue intermingled or one partner may live within the cavity of the other or attached to its surface. Symbiotic relationships are divided into two categories namely mutualism and commensalism,

**Mutualism**: Association of two or more members of different species where both partners are benefited is known as mutualism, In such association, there occurs a close and often permanent and obligatory contact more or less essential for survival of each. The two populations enter into some sort of physiological exchange. The following are some common examples of mutualism.

1. Bees, moths, butterflies etc., derive food from the nectar or other plant product and in turn bring about pollination.

2. The best example of this type of association is of Lichens. Each Lichen is an association of an algae with a fungus. The algae is capable of synthesizing its food as it contains Chlorophyll, while the fungus, which is without chlorophyll, is incapable of synthesizing the food. The fungus in its turn provides water,  $\text{CO}_2$  and minerals to algae, which are essential for photosynthesis. Besides these, the fungus also provides shelter to the algae. Both are dependent upon each other.
3. The association of *Chlorella Vulgaris* (a unicellular algae) and *Hydra viridissima* (a coelenterate), exhibits good example of mutualism between plant and animal. These algae commonly called Zoochlorella, live in the endodermal cells of Hydra. The algae provide food and oxygen to the Hydra. In turn these algae get shelter, water,  $\text{CO}_2$  and other necessary materials from the Hydra. Water and  $\text{CO}_2$  are essential materials for the synthesis of food.

### **Commensalism:**

Association of two different species in which one partner is only benefited and other partner is not harmed, is known as commensalism. There is no physiological dependence between the partners. The advantages derived by the commensal involve the provision of substratum, shelter, transport and food. This association may be temporary or permanent. Commensals which are simply attached to the outer surface of the host are termed ectocommensals. The commensals which are found inside the body of the host are called as endocommensals. Few examples of commensalism are given below.

1. The sucker fish( *Echeneis*) attaches itself, with the help of dorsal sucker, on the ventral surface of shark. The sucker fish gets transportation and food

left over by the shark. The other partner shark is neither benefited nor harmed.

2. Some organisms are found in the lower intestine of animals, where they consume undigested food and secretions and complete their life – cycle unnoticed by their hosts. *Escherichia Coli* of human colon is a familiar example of endocommensals.

**Competition:** Competition may be defined as the active demand by two or more individuals of the same species (intra – species competition) or members of two or more species at the same trophic level (interspecific) for a common resource, thereby contributing to the density and diversity of a population.

The resources competed for can be divided into two types. i) Raw material such as light, inorganic nutrients and water in autotrophs and organic food and water in heterotrophs. ii) Space to grow, nest, hide from predators, etc. In higher plants this is manifested in spatial patterns; in animals by spatial patterns or movements. When these materials are in more than adequate supply for the demands of those organisms seeking them, competition does not occur; when they are inadequate to satisfy the needs of all the organisms seeking them, the weakest, least adapted or least aggressive individuals are forced to do without or go elsewhere.

Competition may be either direct (Interference) or indirect (Exploitation). It is direct where there is active antagonism, struggle or combat between individuals; indirect, when one individual or species monopolizes a resource or renders a habitat unfavourable to the establishment of other organisms having similar requirements.

Competition is usually keenest between individuals of the same species, intraspecific competition, because they have identical requirements for food, mates and so on. Interspecific competition occurs where different species require in common at least some materials or conditions. The severity of competition occurs where different species require in common atleast some materials or conditions.

The end result of competition is the adjustment of the equilibrium stability of the competing species or replacement of one species by another. It is often observed that closely related organisms having similar habits or life –forms often donot occur in the same place. The explanation for the widely observed ecological separation of closely related species has come to be known as Gause’s Rule or more recently, as Hardin’s competitive exclusion principle (“Complete competitors cannot coexist) It states that an ecological niche cannot be simultaneously and completely occupied by stabilized populations of more than one species. In other words, two or more species with closely similar niche requirements cannot exist indefinitely in the same area as sooner or later they come into competition for possession of it.

### **Parasitism: (Covered earlier in Module No: 44)**

#### **Check Points**

1. Different populations interact with each other for the sake of food, shelter and defence purposes.
2. The animal which kills and devours other animals is called a predator and the animal which is killed and consumed is called a pray.

3. In symbiosis, either both or one of the species is benefited while none is harmed.
4. Mutualism is an association where both organisms are mutually benefited, unable to survive in isolation.
5. Commensalism is symbiotic association where one species is benefited and the other not harmed.
6. Competition is the more or less active demand in excess of the immediate supply of material or condition exerted by two or more organisms.
7. Competition may be intra specific or inter specific.
8. Competition may be either direct (Interference) or indirect (Exploitation).
9. Competitive exclusion principle was proposed by Hardin (1960)

### **Short Answer Questions**

1. Explain predation
2. What is mutualism
3. Explain commensalism

### **Long Answer Questions**

1. Explain different types of population interactions
2. What is competition? Explain it in detail.

### **MCQ**

1. Association of two or more members of different species where both partners are benefited is known as

**A) Mutualism**

B) Commensalism

C) Parasitism

D) Competition

2. Association of two different species in which one partner is only benefited and the other partner is not harmed is known as

A) Mutualism

**B) Commensalism**

C) Parasitism

D) Neutralism

3. Animal relationship where one animal kills and devours other animals food is called

A) Mutualism

B) Parasitism

C) Commensalism

**D) Predation**

4. The animal which kills and devours other animals is called

A) Prey

**B) Predator**

C) Parasitic

D) Host

5. The animal which is killed and consumed is called

**A) Prey**

B) Predator

C) Parasitic

D) Host

6. One of the following is an example for mutualism

**A) Zoochlorella and Hydra**

B) Sucker fish and shark

C) *E.Coli* and Man

D) Pea Crab and Mussels

7. One of the following is an example for commensalism

A) Lichens

B) Zoochlorella and Hydra

**C) Sucker fish and Shark**

D) None of the above

8. The association of Echeneis and shark is called

**A) Commensalism**

B) Mutualism

C) Parasitism

D) Neutralism

9. Who said that “ Complete Competitors cannot co exist”

**A) Hardin**

B) Devries

C) Lamarck

D) Darwin



