

## **Ecology:**

The term ecology is derived from the Greek term “**oikos**” meaning “house” combined with “logy” meaning “the science of” or “the study of”.

Ecology is ‘the science of inter-relations between living organisms and their environment including both the physical and the biotic environments and emphasizing **inter species** and **intra species** relations’ (Allee, 1949).

The term ecology was coined by a German biologist **Ernst Haeckel** (1869).

## Ecology related terminology

- **Autecology:** Study of an individual organism, or an individual species in relation to environment.
- **Synecology:** Study of the groups organisms associated in a community in the same environment.
- **Biome:** The grouping of communities that have similar structure composed of ecosystem of a similar vegetation type

i. **Habitat** is the place where the organism lives.

ii. **Population** denotes groups of individuals of any kind of organism. Insect populations are groups of individuals set in a frame that is limited in time and space.

iii. **Community** in the ecological sense includes all the populations of a given area.

#### **iv. Ecosystem**

- Ecosystem or ecological system is the functioning together of community and the nonliving environment where continuous exchange of matter and energy takes place.

- Examples of natural ecosystem: Ponds, lakes and forests ecosystem

#### **v. Biosphere**

All of the earth's ecosystems functioning together on the global scale.

## Balance of Nature

The natural tendency of plant and animal population resulting from natural regulative processes in an undisturbed ecosystem (environment) to neither decline in numbers to extinction nor increase to indefinite density.

## **ii) Environmental resistance**

The sum total of all factors in an environment that tend to reduce the rate of multiplication of an insect.

### **1. Biotic factors - includes**

- a) Food
- b) Other organisms
  - i) Competition (interspecific and intraspecific)
  - ii) Natural enemies (predators, parasites and pathogens) .

### **2. Abiotic factors -**

- a) Temperature
- b) Light
- c) Moisture and water
- d) RH
- E) Air and Rain fall

### **BIOTIC FACTORS ( density dependent factors.)**

#### **A) Food:.**

According to nutritional requirements, insects are categorized into:

1. **Omnivorous:** Which feed on both plants and animal. Eg. Wasps, cockroaches
2. **Carnivorous:** which feed on other animal as parasites and predators. Eg: Predators (Lady bird beetles and Mantids)
3. **Herbivorous:** which feed on living plants (crop pests)
  - (1) **Polyphagous:** which feed on wide range of cultivated and wild plants. Eg. Locusts, grasshoppers
  - (b) **Monophagous:** which feed on single species of plants. Eg: Rice stem borer
  - (c) **Oligophagous:** which feed on plants of one botanical family. Eg: Diamondback moth

- Beneficial associations:

i) **Symbiosis**: Inter relationship between organisms of different species which live in close union without harmful effects are known as symbiosis, each member being known as symbiont. Eg pollinator insects

ii) **Commensalism**: One insect is benefited by living on or inside another insect without injuring the other and is known as commensalism.

Eg: Gall forming insects.

When the commensal uses its host as a means of transport the phenomenon is termed as **phoresy**.

iii) **Mutualism**: When both the symbionts are benefited by the association it is known mutualism Eg: Ants and aphids. Termites and flagellates.



## **Factors influencing population growth.**

Competition :

Competing with one another or with members of another species for limited resources like food, mates, suitable site for oviposition or pupation.

### **a) Intraspecific competition:**

When members of population of the same species compete for resources we call it intraspecific competition.

Examples:

- Cannibalism in American bollworm larvae
- Cannibalism in later stage grubs of Chrysopid.

## 2) Predators and Parasites

**Predators** : Predators are free living organisms that feed on other animals, their prey, devouring them completely and rapidly.

**Parasites**: An organism that is dependent for some essential metabolic factor on another throughout its all life stages,

**Parasitoid**: An insect parasite of an arthropod that is parasitic in its immature stage killing the host in the process of development and adults are free living.

## **ABIOTIC FACTORS ( Density independent)**

## Temperature

### •1) Warm Blooded Animals (Homeothermic):

These animals maintain a constant body temperature within certain narrow limits irrespective of the temperature variations in the external environment. These are also called as 'Endothermic animals'

Eg. Mammals

### 2) Insects are poikilothermic (cold blood animals)

They do not have internal mechanism of temperature regulation and therefore their body temperature varies with that of the surroundings. These are also called as 'Ectothermic animals'

Eg. Insects

•3) Socio-homeothermic Animals: body temperature slightly above the atmospheric temperature and are able to air condition their nests .

Eg. Honey bees

... animals ... internal environment. These are also called as 'Endothermic  
Eg. Mammals

**2) Insects are poikilothermic (cold blood animals)**

They do not have internal mechanism of temperature regulation and therefore their body temperature varies with that of the surroundings. These are also called as 'Ectothermic animals'

Eg. Insects

•3) Socio-homeothermic Animals: body temperature slightly above the atmospheric temperature and are able to air condition their nests .

Eg. Honey bees

- **Thermal constant:**

The total heat energy required to complete a certain stage of development in the life cycle or in the completion of a physiological process of a species is constant

- **1) Hibernation:** (during winter)

A period of suspended activity in individuals occurring during seasonal low temperature Eg: Mexican beetle

- **2) Aestivation:** (during summer)

A period of suspended activity of individual occurring during seasonal high temperature or in a dry weather. Eg cotton boll worm *Heliverpa armigera*

## • MOISTURE

1. **Body pigments:** Insects develop dark pigment in cooler areas which help to absorb more heat from sun for raising body temperature. This aids in getting rid of excessive moisture from the body.
2. **Integument:** Well developed integument and fused sclerites in beetles and weevils aid in conserving body moisture. Waxy coating of integument also saves from excessive evaporation.
3. **Winglessness:** Grasshoppers and crickets in arid regions have poorly developed wings and some are wingless by which the area of evaporation is reduced.
4. **Pilosity:** Dense hairs on the body prevent evaporation.
5. **Form of body:** Oval and compressed body of some desert beetles protects them from hot winds
6. **Desiccation - faster from products of evaporation**

## Relative humidity

Different species and their different immature stages have their own range.

Humidity effects the speed of development, fecundity, colour etc. If water content of the body is high, dry air accelerates the development.

Locusts sexually mature quicker and the number of eggs laid are more at 70% R.H.



- **Rainfall**

Rainfall also plays an important role in movement of swarms of desert locust. Saturated condition of moisture is injurious for the development of spotted boll worm *Earias vetilla*

Rain induces emergence of most of the insects from soil.

Eg: Ants, termites, red hairy caterpillar, root grub beetles etc., emerge out from the soil after the receipt of rains.

- **Wind**

- Interferes with feeding, mating, oviposition
- Wind aids in dispersal of insects
- Aphids, mites (Eriophyid mites also) disperse through wind
- Helicoverpa flies upto 90 km with the aid of winds