Trophic levels

The term trophic is derived from the Greek word ***τροφή (trophē)*** meaning food, feeding, or nourishment. Therefore, the trophic level of an organism is defined as the position it occupies in a food chain. Organisms can get their food by two basic ways which are autotrophs, and heterotrophs**:**

I. Autotrophs

The term 'auto' meaning self, and 'trophē' meaning nourishment, these organisms do not eat other organisms, but pull nutrients from the soil or water and manufacture their own food using energy, so they are also known as **producers**. According to the source of energy autotrophic organisms can be divided into 2 groups:

- ***Photoautotrophs:*** They used energy from sun light by a process known as **photosynthesis** as in plant and algae.
- ***Chemoautotrophs*:** They used energy released from breaking down simple chemical compounds by a process known as **chemosynthesis** as in some bacteria that live in dark area (deep oceans) away from sun light.

II. Heterotrophs

The term 'hetero' meaning other or different, and 'trophē' meaning nourishment, these organisms cannot manufacture their own food and need to get their food dependent on other organisms in order to survive, which include animals, fungi, and bacteria. Heterotrophic organisms can be classified into three groups:

1. Holozoic (Consumers):

They intake both solid and liquid food **(ingestion)**, slowly broken down into smaller organic particles **(digestion)**, the useful particles have been absorbed **(absorption)**, and utilized in the production of energy that helps in development and growth of cells **(assimilation)**, then the waste products are eliminated from the body **(excretion)**. All vertebrates and certain unicellular organisms like amoeba are holozoic organisms. There are three different types of holozoic organisms and are classified on the basis of the food they consume (either another organism or a plant):

a) **Herbivores:** They are animals that eat plants for their source of food such as deer, elephants, cows, among others.

b) **Carnivores:** They are animals that feed on other animals for their source of food such as tigers, wolves, lions, among others.

c) **Omnivores:** They are animals that can survive on other animals or plants for their source of food such as pigs, ants, raccoons, and cockroaches, human, among others.

2. Saprophytic (decomposers, detritivores, or scavengers):

It is a kind of heterotrophic nutrition where organisms obtain their food sources from remains of decaying organic substances including dead organisms, decomposed leaves and plant remains, excreta, and food particles. Saprophytic organisms include bacteria, worms, fungi (mushroom), and some insects. These organisms use a certain kind of

digestive mechanism called **extra-cellular digestion** by secreting certain **digestive enzymes** into the surroundings which help in breaking down organic substances (protein, lipid, and starch) into simpler matter (amino acids, fatty acids, simple sugar, and other inorganic chemicals). Therefore, decomposers play an important role in conserving energy and nutrients in the ecosystem by recycling mineral and nutrients for autotrophs to use again.

3. Parasitic organisms (Parasites):

The organism that derives its food and shelter from the other organism is known as a **parasite**, while the organism that lends food and shelter is known as a **host**. They are classified into two types:

a) **Ectoparasites:** They live on the surface of the host such as (mites, ticks, lice, mosquitoes).

b) **Endoparasites:** They live inside the host either by inhabiting spaces in the host's intestine **(intercellular parasites)** such as tapeworm, or inside cells of the host's body **(intracellular parasites)** such as parasitic protozoa.

Food Chain

The food chain is a linear sequence of organisms where nutrients and energy are transferred from one organism to the other. It begins with the **producer** organism, and ends with the **decomposer** organism. Each level of a food chain can be represented by numbers according to how far the organism is along the food chain:

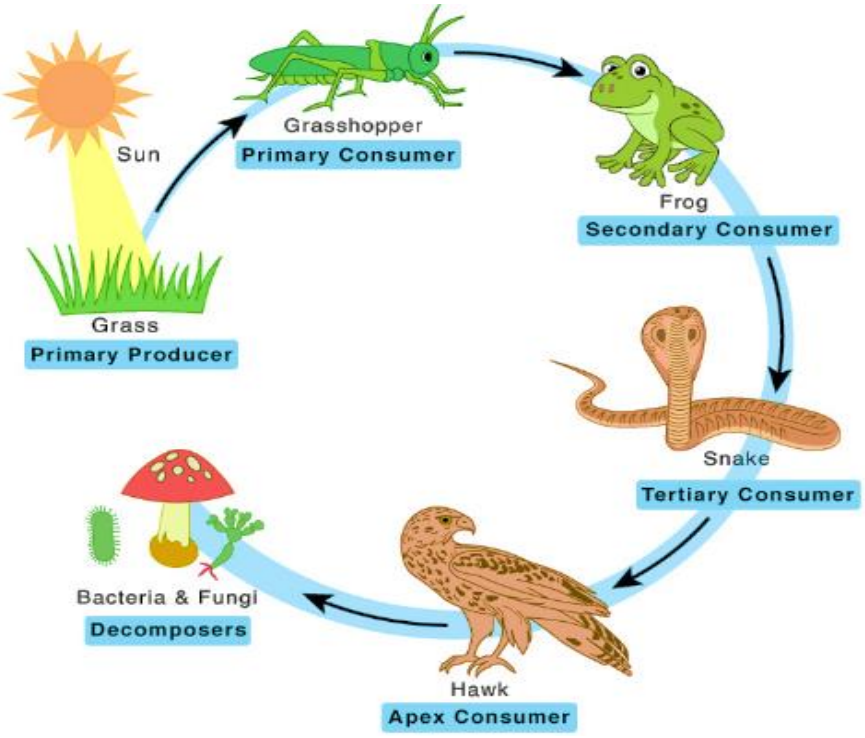
Level 1 (*primary producers):* Plants and algae that make their own food.

Level 2 ***(primary consumers):*** Herbivores that eat plants.

Level 3 (*secondary consumers*): Carnivores that eat herbivores.

Level 4 ***(tertiary consumers)*:** Carnivores that eat other carnivores.

Level 5 ***(Apex predators):*** Carnivores that have no predators.



Animal's Relationships

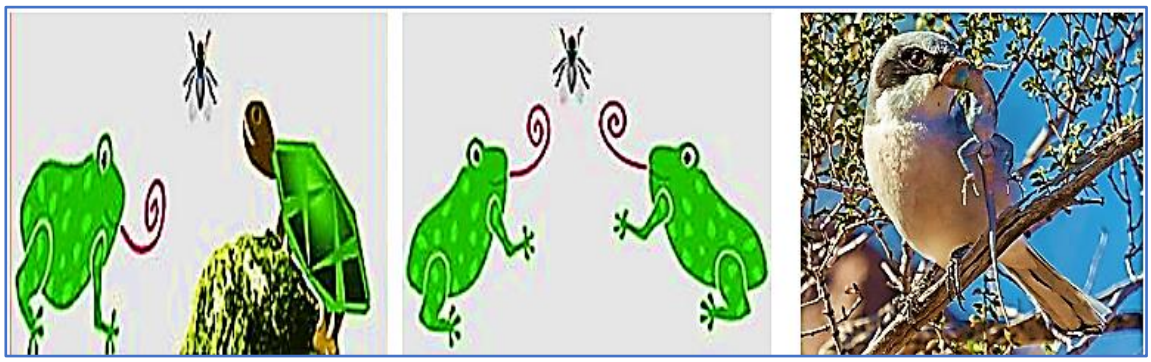
Organisms never live alone, but they are always interacting in some form or another with other living things. There are many different types of relationships between animal species:

1. **Predation:**

   It is the interaction between two different species: ***predator*** which is benefit and trying to eat the prey species, and the ***prey*** is killed and trying to run away. Examples: lion & zebra; bear & fish

2. Competition

Competition is an interaction between organisms, in which the fitness of one is lowered by the presence of another, so both of them called ***competitor***. Animals may compete for mating, food, water, or shelter. If competition occurs between members of same species, it is called ***intraspecific competition***, while competition between members of different species called ***interspecific competition***. For example, competition occurs between sparrows and white lizards: Sparrow fight for a shelter, while white lizard fight to catch insects.



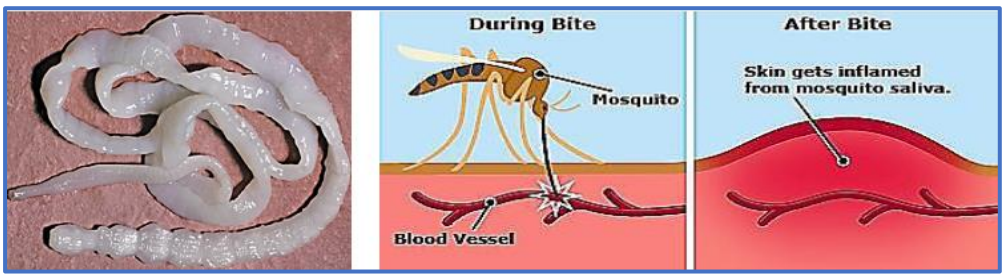
3. Symbiosis:

It is a relationship where two or more organisms depend on each other for resources, so each of them known as ***(symbiont)***. They aren't trying to kill each other and they aren't trying to fight over food. There are three types of symbiosis:

a) Parasitism

A relationship between two organisms where one organism benefits known as (parasite) while the other is harmed known as (host). Parasites do not kill their host, much smaller than their host, and can be classified into ectoparasites and endoparasites (as discussed above). The **mosquito** as ectoparasite needs to suck the blood from animals for feeding, while the animal that is bitten is harmed. While **tapeworm** as intercellular parasite

steals nutrients from its host's intestine; without a host, the tapeworm is unable to live, but the host suffers from weight loss.



b) Mutualism:

A relationship between two organisms in which both of them benefit, so they are called ***(mutualists)*.** An example: ***Egyptian plover*** and the ***crocodile***, the crocodile lies with its mouth open and the plover flies into its mouth and feeds on bits of decaying meat stuck in the crocodile's teeth. The plover eats a meal and the crocodile gets his teeth cleaned.

c) Commensalism:

A relationship between two organisms, one of them benefits but the other is neither harmed nor benefit (not affected). An example: **Remora** (sucker-fish) lives in close association with the **shark** (larger fish). The sucker-fish benefits from the shark's protection and fed on the scraps formed as the shark devours its prey. While shark neither harmed nor benefit.