Food Chain, Food Web & Ecological Pyramids

Food Chain

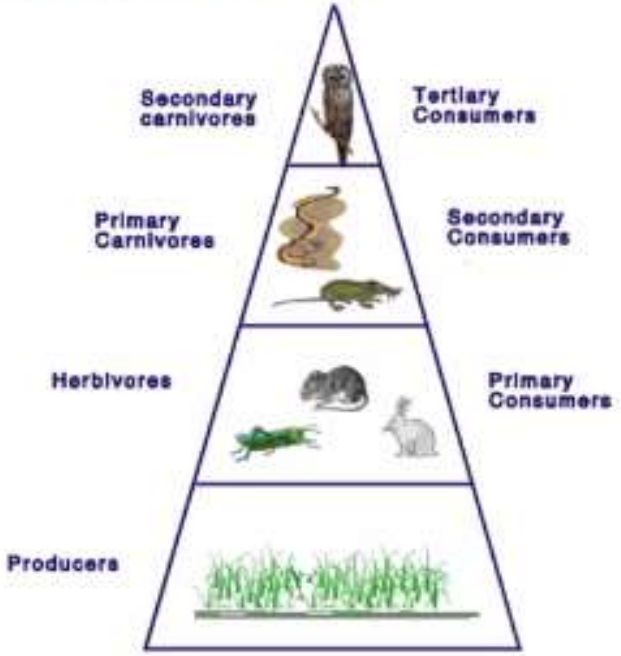
Flow of energy in an ecosystem is one way process. The sequence of organism through which the energy flows, is known as food chain.

Three tropic levels

Producers ⇒ Herbivores ⇒ Carnivores

Tropic levels in a food chain

- Producers
- Consumers
  - (i) Primary consumers
  - (ii) Secondary consumers
  - (iii) Tertiary consumers
  - (iv) Quaternary consumers
- Decomposers



The various steps in food chain in called tropic levels. Each trophic level is said to be link. A food chain usually consists of four or five such links.

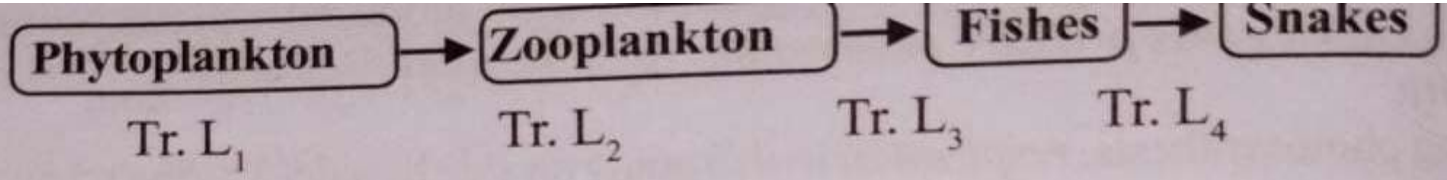


Fig.3.5: Four trophic levels of a food chain in a pond ecosystem.

A typical food chain can be seen in a pond ecosystem. The algae and phytoplankton are eaten by the zooplankton.

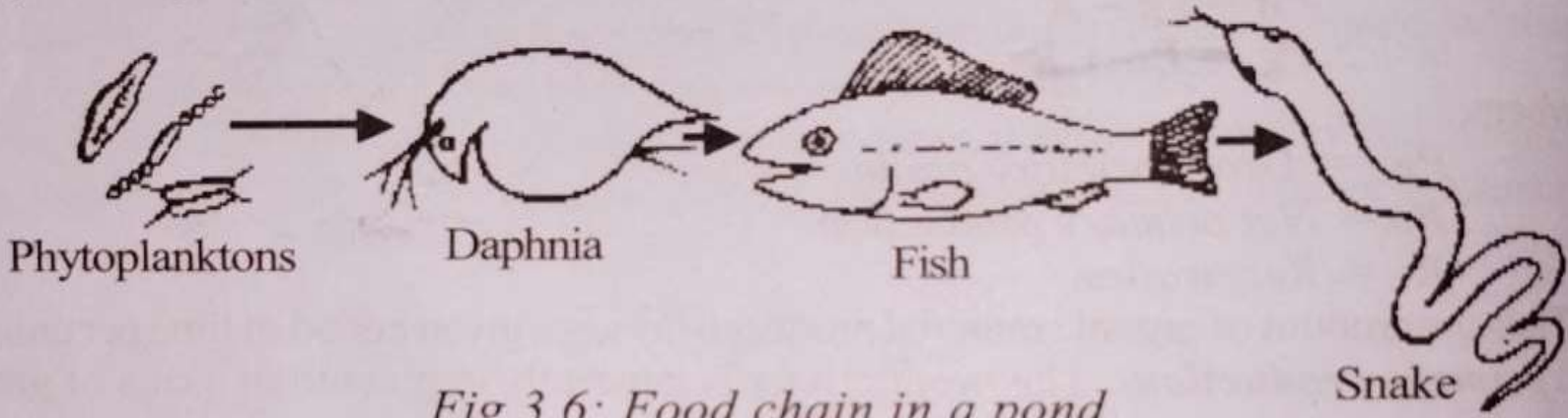


Fig.3.6: Food chain in a pond.

Types of Food chain -

1. Grazing food chain 2. Detritus food chain.

Types of Food Chain

(i) Grazing Food Chain

- The consumers utilizing plants as their food , constitute grazing food chain.
- This food chain begins from green plants and the primary consumer is herbivore.
- Most of the ecosystem in nature follows this type of food chain.

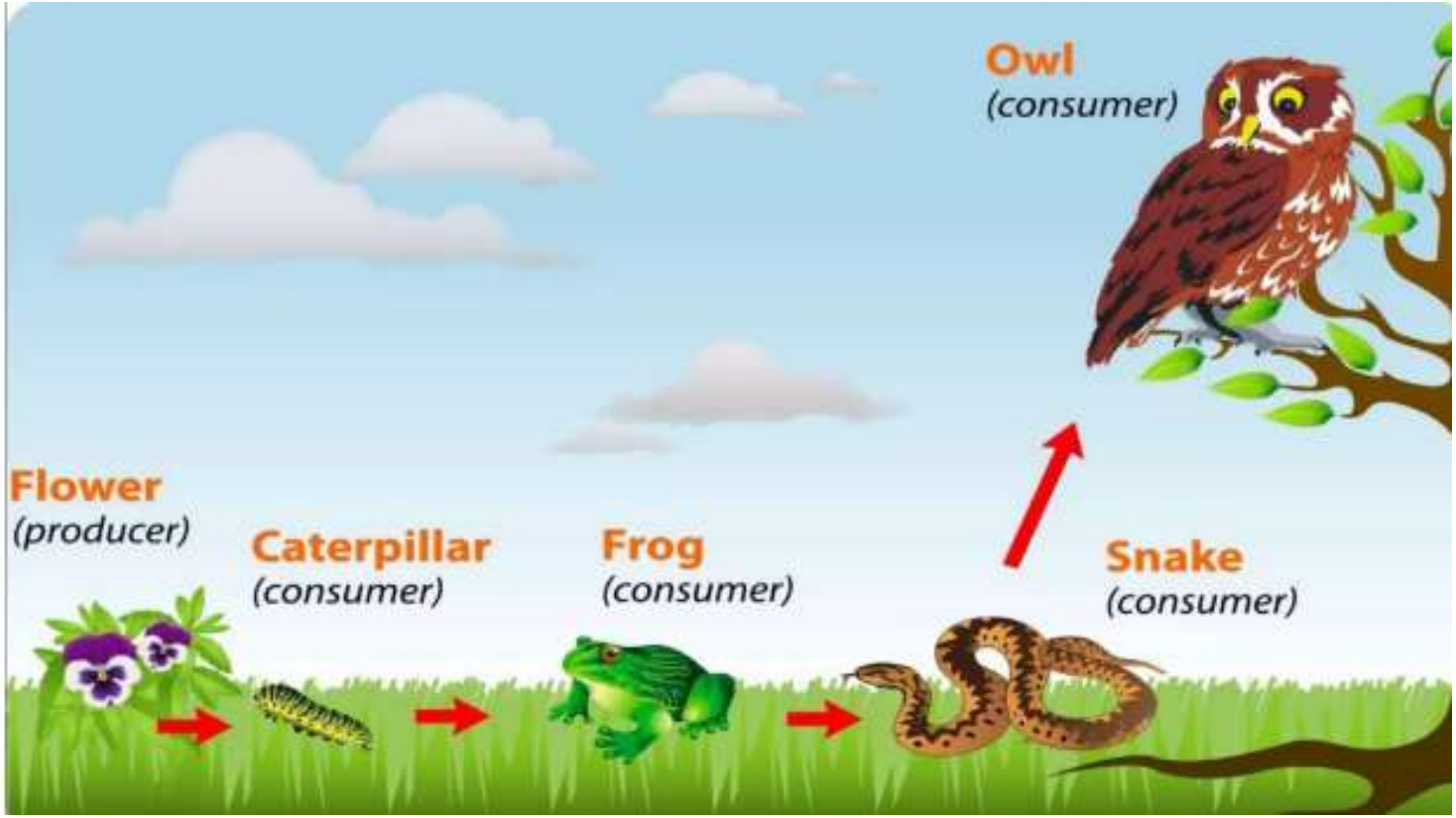
Ex: grass => grasshopper => birds => falcon

Types of grazing food chain-1.**Predator food chain 2. Parasitic food chain**

Predator food chain:

The predator food chain is formed of plants, herbivores, primary carnivores, secondary carnivores and so on.

Grazing food chain- predator food chain



Parasitic food chain:

The plants and animals of the grazing food chain are infected by parasites. Parasites derive energy from host. Thus the parasitic chain is formed within the grazing food chain.

(ii) Detritus food chain

- **This type of food chain starts from dead organic matter of decaying animals and plant bodies to the micro-organisms and then to detritus feeding organism and to other predators.**

- **The food chain depends mainly on the influx of organic matter produced in another system.**

- **The organism of the food chain includes algae, bacteria, fungi, protozoa, insects, nematodes etc.**

These organisms are called **detritivores.**

The detritus food chain starts from dead organic matter and ends in inorganic compounds.

Significance of food chain

Plants and animals are interlinked by food chain.

Animals get food from plants

The dead plants and animals are decomposed by decomposers.

Food and minerals flow in food chain.

Food chain caused biomagnification this is accumulation of non degradable material in higher animals.

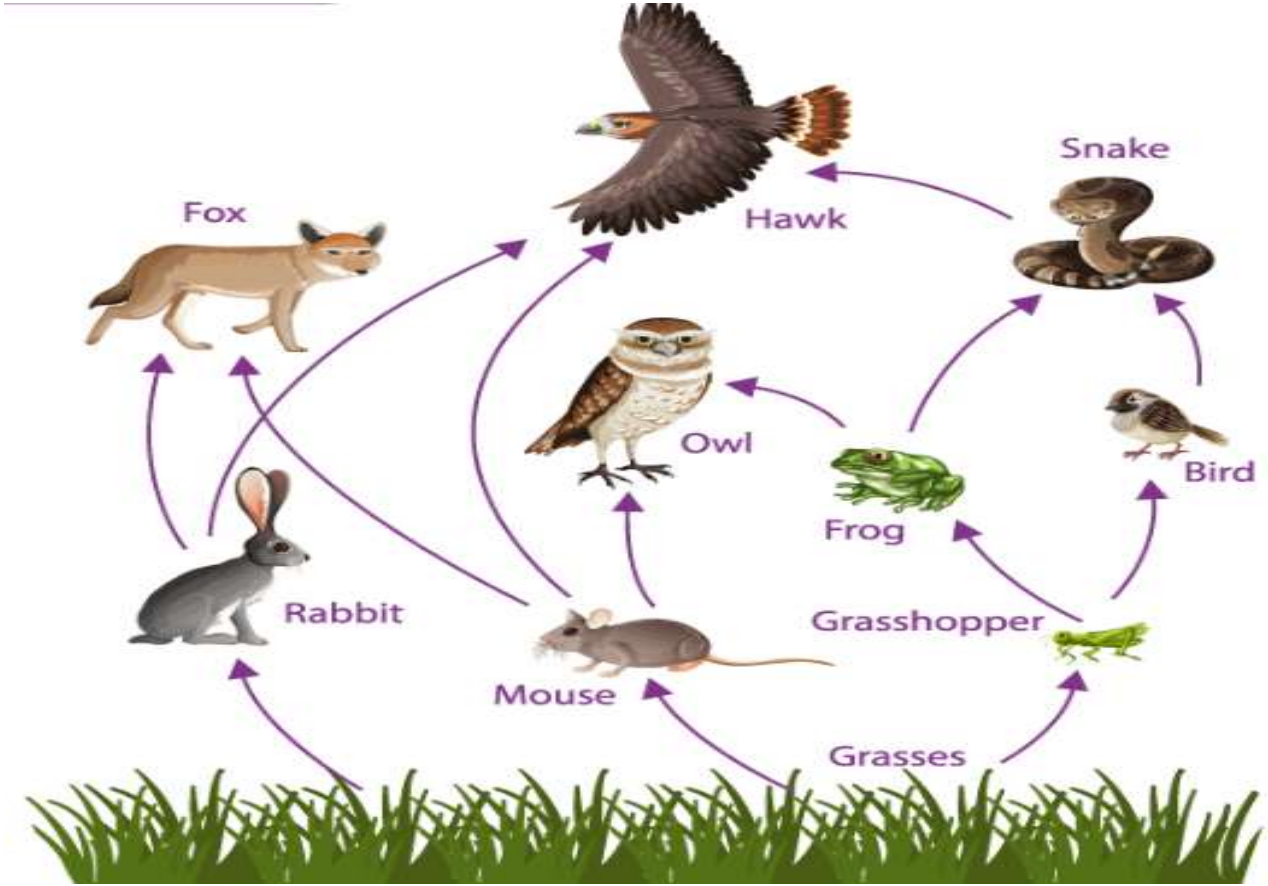
FOOD WEB

The interlocking of many food chains is called food web.

Simple food chains are very rare. Because each organism many obtain food from more than one trophic level.

Food webs are important because they maintain stability of an ecosystem.

Food web in grass land



Ecological pyramids

The trophic levels of different organisms based on their ecological position as producer to final consumer is represented by ecological pyramid.

- The food producer is present at the base of the pyramid and on the top.
- Other consumer trophic levels are present in between.
- The pyramid includes a number of horizontal bars presenting specific trophic levels.
- The length of each bar stands for the total number of individuals or biomass or energy at each trophic level in an ecosystem.
- An ecological pyramid is a graphical representation outlined to show the biomass or bio productivity at each trophic level in a given ecosystem.
- These are trophic pyramid, energy pyramid, or sometimes food pyramid.
- Biomass is the quantity of living or organic matter present in an organism.

The ecological pyramids are of three categories:

1. **Pyramid of numbers.**
2. **Pyramid of biomass.**
3. **Pyramid of energy or productivity.**

Pyramid of numbers:

- Pyramid of numbers represents the population of trophic level as the total number of individuals of different species present at each trophic level.
- Pyramid of numbers may be upright and or completely inverted depending upon count of individual present and so.

Pyramid of number- upright: grassland ecosystem

▪ In this pyramid, the number of individuals is decreased from lower level to higher trophic level.

▪ The examples of pyramid of numbers are Grassland ecosystem and pond ecosystem.

▪ In grass ecosystem, at base (lowest trophic level) grass is present in plentiful amount.

▪ The next higher trophic level is primary consumer i.e. herbivore (example – grasshopper).

▪ The number count of grasshopper is less than that of grass

. ▪ The next energy level is primary carnivore (example: rat). The number of rats are less than grasshopper, because, they feed on grasshopper.

▪ The next higher trophic level is secondary carnivore (example: snakes). They feed on rats

▪ The next higher trophic level is the top carnivore. (example – Hawk).

T_1 - Producers | T_2 - Herbivores | T_3 - Secondary consumers | T_4 - Tertiary consumers

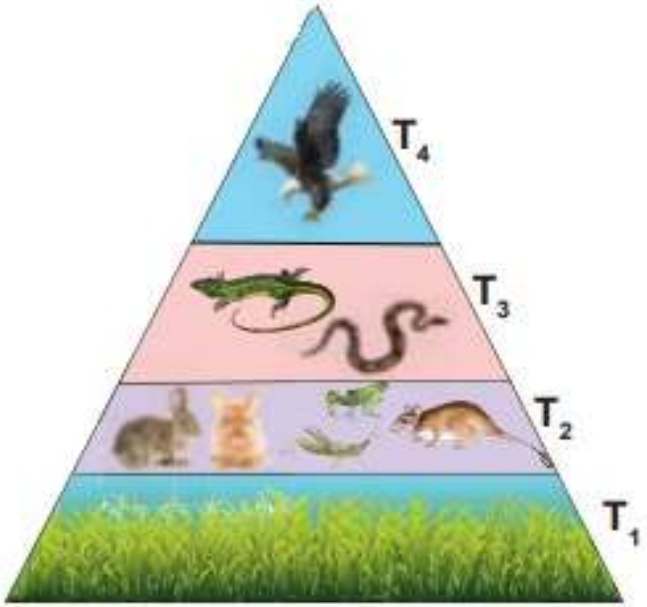


Figure 12 a: Pyramid of numbers in grassland ecosystem

Pyramid of numbers – inverted: tree ecosystem

▪ In this type of pyramid, the number of individuals is increased from lower level to higher trophic level. Example, tree ecosystem.

Pyramid of biomass

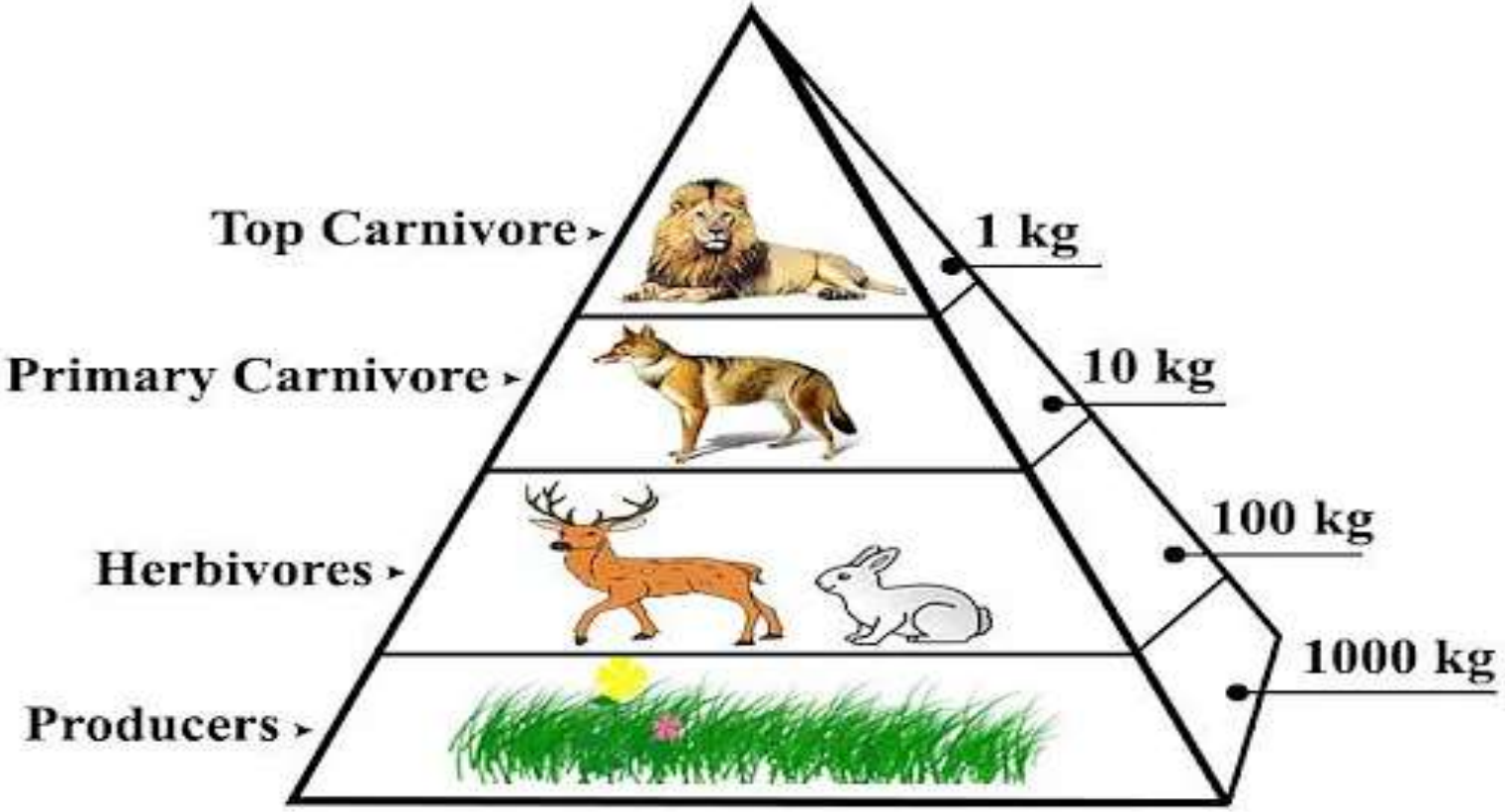
: ▪ Pyramid of biomass represents the total dry weight of organisms.

▪ It is usually determined by collecting all organisms invading each trophic level separately and measuring their dry weight.

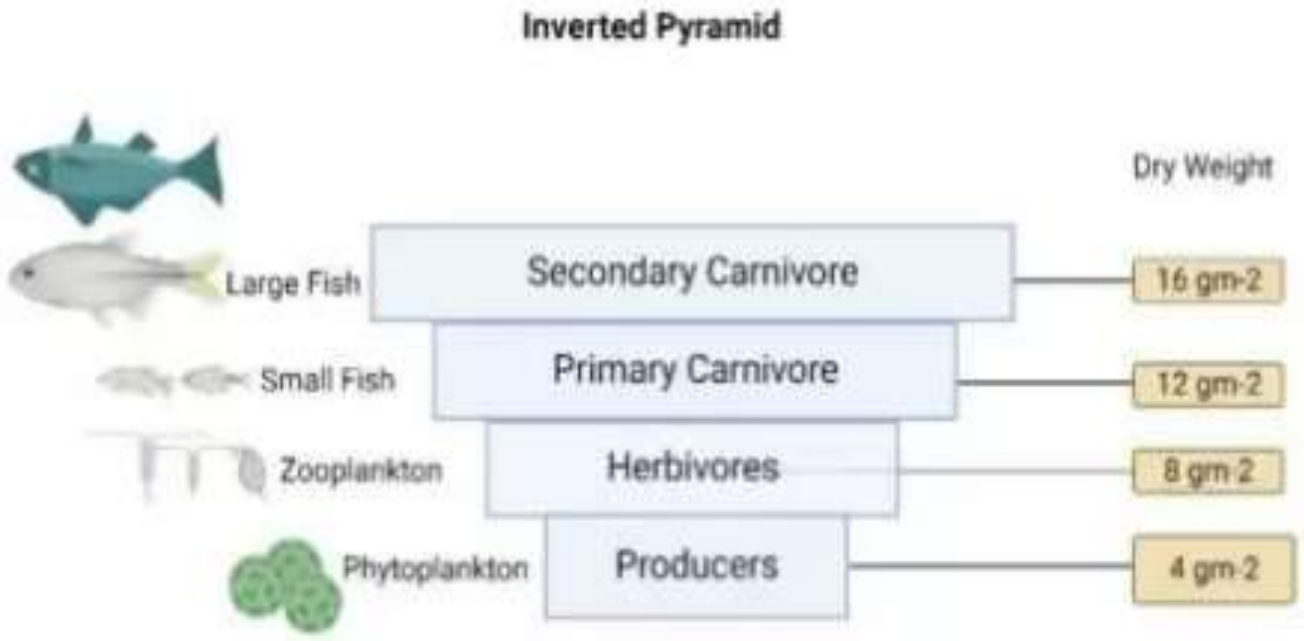
Pyramid of biomass: upright

- The pyramid of biomass on land contains a large base of primary producers with a lesser trophic level present on top.
- The biomass of producer termed as autotrophs is at the maximum trophic level.
- The biomass of next trophic level from base, i.e., primary consumers is less than the producers.
- The biomass of next higher trophic level, i.e., secondary consumers is less than the primary consumers.
- The top, high trophic level consists very less amount of biomass.

Upright Pyramid of Biomass in a Terrestrial Ecosystem



Pyramid of biomass in aquatic ecosystems



Pyramid of energy

- The pyramid of energy represents the flow of energy from lower trophic level to higher trophic level.
- During the flow of energy from one organism to other, there is remarkable loss of energy.
- This loss of energy is in the form of heat.

The primary producers like the autotrophs contain more amount of energy available.

- The least energy is available in the tertiary consumers.

The pyramid is always upward, with a large energy base at the bottom.

"10% Rule"

Aprox. 10% of the energy "harvested" at a lower tropic level is transferred up to the next higher tropic level.