

Ecosystem

By

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Ecology

All living organism, whether plant or animal or human being is surrounded by the environment, on which it derive its needs for its survival.

Each living component interacts with non –living components for their basic requirements form different ecosystem.

Definition

Ecology is the study of interactions among organism or group of organisms with their environment. The environment consists of both biotic components (living organisms) and abiotic components (non – living organisms). or Ecology is the study of ecosystems.

Ecosystem is the basic functional unit of ecology. The term ecosystem is coined from a Greek word meaning study of home.

Definition

A group of organisms interacting among themselves and with environment is known as ecosystem. Thus an ecosystem is a community of different species interacting with one another and with their non living environment and one another and with their non-living environment exchanging energy and matter.

Example

Animals cannot synthesis their food directly but depend on the plants either directly or indirectly.

TYPES OF ECOSYSTEM– Natural ecosystem

Natural ecosystems operate themselves under natural conditions. Based on habitat types, it can be further classified into three types.

1. Terrestrial ecosystem

This ecosystem is related to land.

Example

Grassland ecosystem, forest ecosystem, desert ecosystem, etc.,

2. Aquatic ecosystem

This ecosystem is related to water. It is further sub classified into two types based on salt content.

- Fresh water ecosystem

- (i) Running water ecosystems.

Examples

Rivers, Streams

- (b) Standing water ecosystems

Examples

Pond, lake (ii) Marine ecosystem Example : Seas and sea shores

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Man – made (or) Artificial ecosystems

Artificial ecosystem is operated (or) maintained by man himself.

Example

Croplands, gardens

STRUCTURE (or) COMPONENTS OF AN ECOSYSTEM

The term structure refers to the various components.

So the structure of an ecosystem explains the relationship between the abiotic (non –living) and the biotic (living) components.

An ecosystem has two major components

- Biotic (living) components
- Abiotic (non living) components

Biotic components

The living organisms (or) living members in an ecosystem collectively form its community called biotic components (or) biotic community.

Examples

- Plants (producers),
- animals (consumers),
- microorganisms (decomposers).

Members of components of an ecosystem (or) Classification biotic components

The members of biotic components of an ecosystem are grouped in to three based on how they get food.

- Producer (plants)
- Consumer (Animals)
- Decomposers (Micro-organisms)

1.Procedures (Autotrophs)

Procedures synthesize their food themselves through photosynthesis

Example :

All green plants, trees.

Photosynthesis

The green pigments called chlorophyll, present in the leaves of plants, converts CO₂ and H₂O in the presence of sunlight into carbohydrates.



This process is called photosynthesis

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Consumers
(heterotrophs)

Examples

Plant eating species

Insects, rabbit, goat, deer, cow, etc.,

Classification of consumers

Consumers are further classified as

(i) Primary consumers (Herbivores) (Plant eaters)

Primary consumers are also called herbivores, they directly depend on the plants for their food. So they are called plant eaters.

Examples : Insects, rat, goat, deer, cow, horse etc.,

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(ii) Secondary consumers (primary carnivores) (meat eater)

Secondary consumers are primary carnivores, they feed on primary consumers. They directly depend on the herbivores for their food.

Example

Frog, cat, snakes, foxes, etc.,

(iii) Tertiary consumers (Secondary carnivores) (Meat-eaters)

Tertiary consumers are secondary carnivores, they feed on secondary consumers. They depend on the primary carnivores for their food. **Examples** Tigers, lions, etc.,

3.

Decomposer

Examples

Microorganisms like bacteria and fungi. Decomposers attack the dead bodies of producers and consumers and decompose them into simpler compounds. During the decomposition inorganic nutrients are released.

The inorganic nutrients together with other organic substances are then utilized by the procedures for the synthesis of their own food.

Abiotic (non-living) components

The non-living components (physical and chemical) of ecosystem collectively form a community called abiotic components (or) abiotic community.

Examples

Climate, soil, water | air, energy, nutrients, etc.,

1. Physical components

They include the energy, climate, raw materials and living space that the biological community needs. They are useful for the growth and maintenance of its member.

Examples

Air, water, soil, sunlight, etc.,

2. Chemical Components



They are the sources of essential nutrients

Examples

- Organic substances : Protein, lipids, carbohydrates, etc.,
- Inorganic substances: All micro (Al, Co, Zn, Cu) and macro elements (C, H, O, P, N, P, K) and few other elements.

FUNCTION OF AN ECOSYSTEM

To understand clearly the nature of ecosystem its functioning should be thoroughly understood.

The function of an ecosystem is to allow flow of energy and cycling of nutrients.

Types of Functions

Functions of an ecosystem are of three types.

1. Primary function

The primary function of all ecosystem is manufacture of starch (photosynthesis).

2. Secondary function

The secondary function of all ecosystem is distribution energy in the form of food to all consumers.

Tertiary Function

All living systems die at a particular stage. These dead systems are decomposed to initiate third function of ecosystems namely “cycling”.

The functioning of an ecosystems may be understood studying the following terms.

- Energy and material flow.
- Food chains
- Food webs
- Food pyramids



FOOD CHAINS

Definition

*“There sequence of eating and being eaten in an ecosystem is known as food chain” (or)
“Transfer of food energy from the plants through a series of organisms is known as food chain*

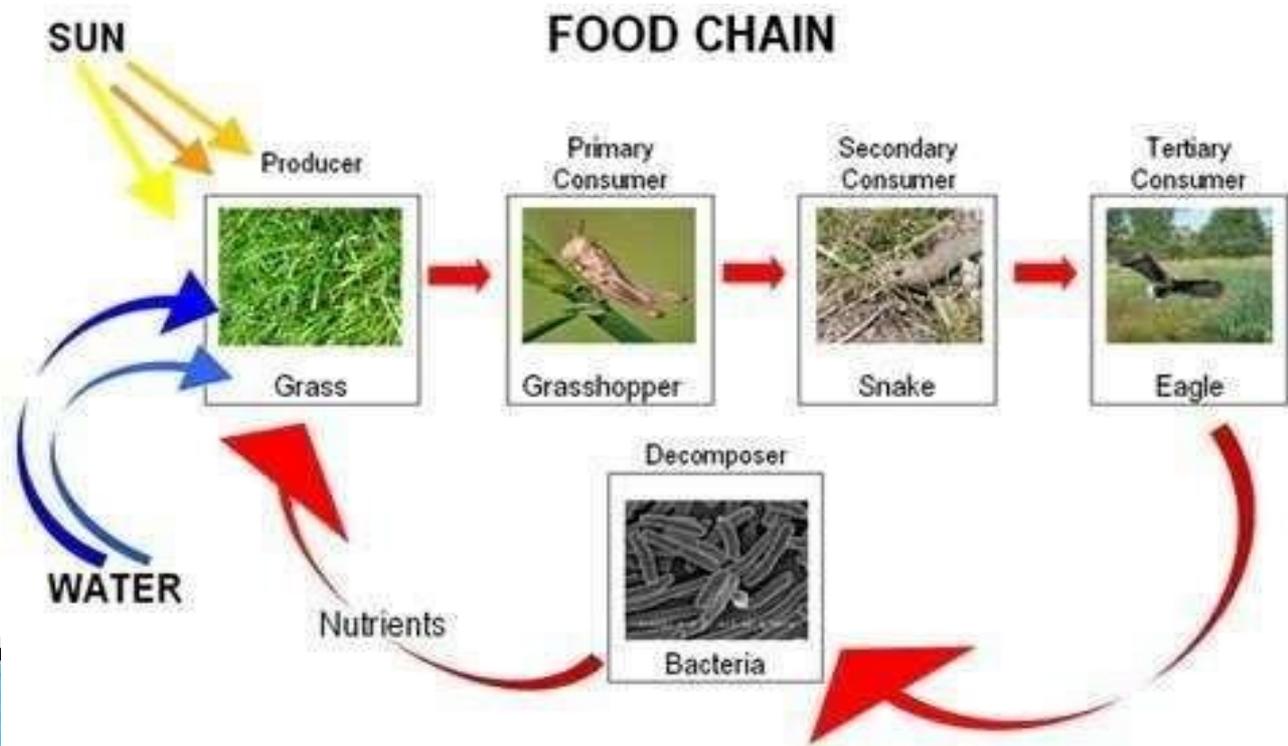
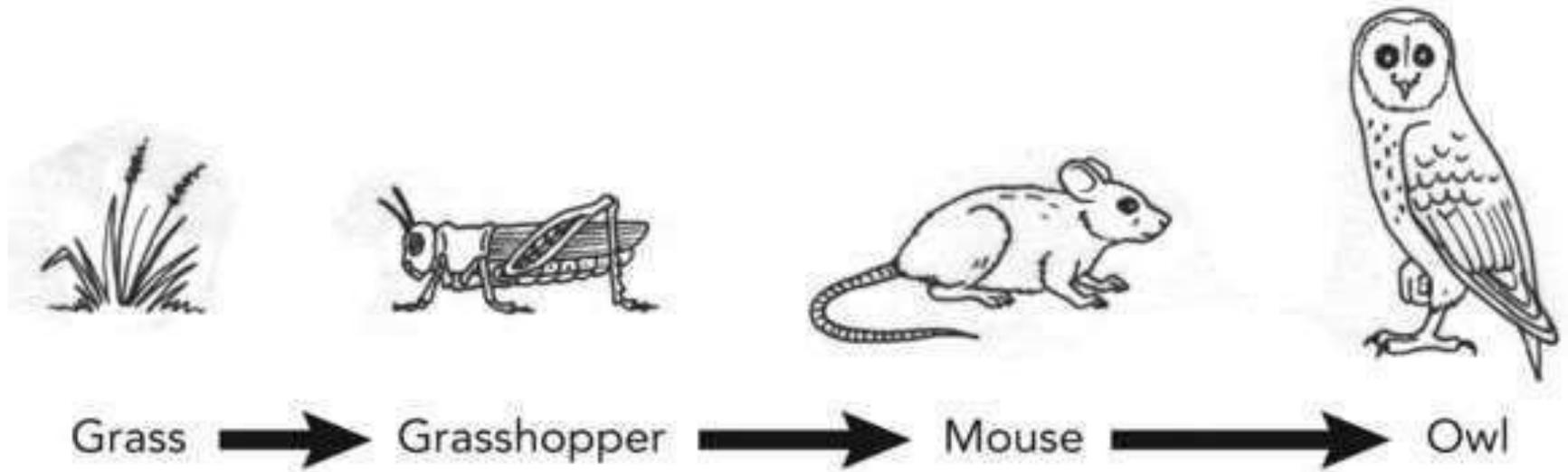
When the organisms die, they are all decomposed by microorganism (bacteria and fungi) into nutrients that can again be used by the plants. At each and every transfer, nearly 80-90% of the potential energy gets lost as heat. A food chain always starts with plant life and ends with animal.

Herbivores

Animal that eat only plants are called herbivores.

Carnivores

Animals that eat other animals are called carnivores.



Food chain in a pond Food chain in a forest

Tropic Levels (T1,T2, T3, T4, T5) (or) Feeding levels

The various steps through which food energy passes in an ecosystem is called as tropic levels.

The tropic levels are arranged in the following way as Where ,

The green plants or producers represent first tropic level T1,

The herbivores or primary consumers represent second tropic level T2. The carnivores or secondary consumers represent third tropic level T3. The tertiary consumers are fourth tropic level T4.

Finally decomposers represent last tropic level T5

Types of food chain

Food chains are classified into two main types

1. Grazing food chain

2. Detritus food chain

Grazing food chain

Found in Grassland ecosystems and pond ecosystems. Grazing food chain starts with green plants (primary producers) and goes to decomposer food chain or detritus food chain through herbivores and carnivores.

Detritus food chain

Found in Grassland ecosystems and forest ecosystems. Detritus food chain starts with dead organic matter (plants and animals) and goes to decomposer food chain through herbivores and carnivores.

FOOD WEB

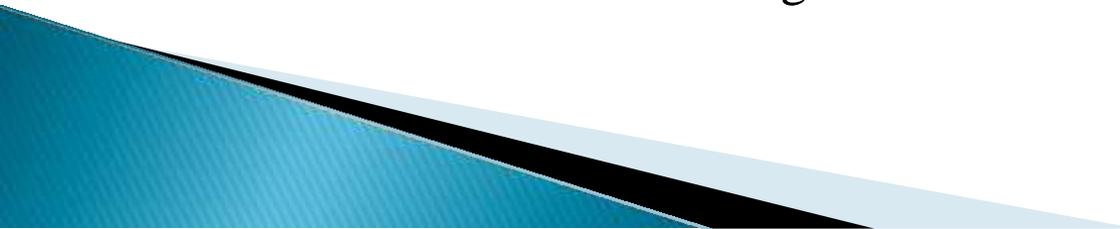
Definition

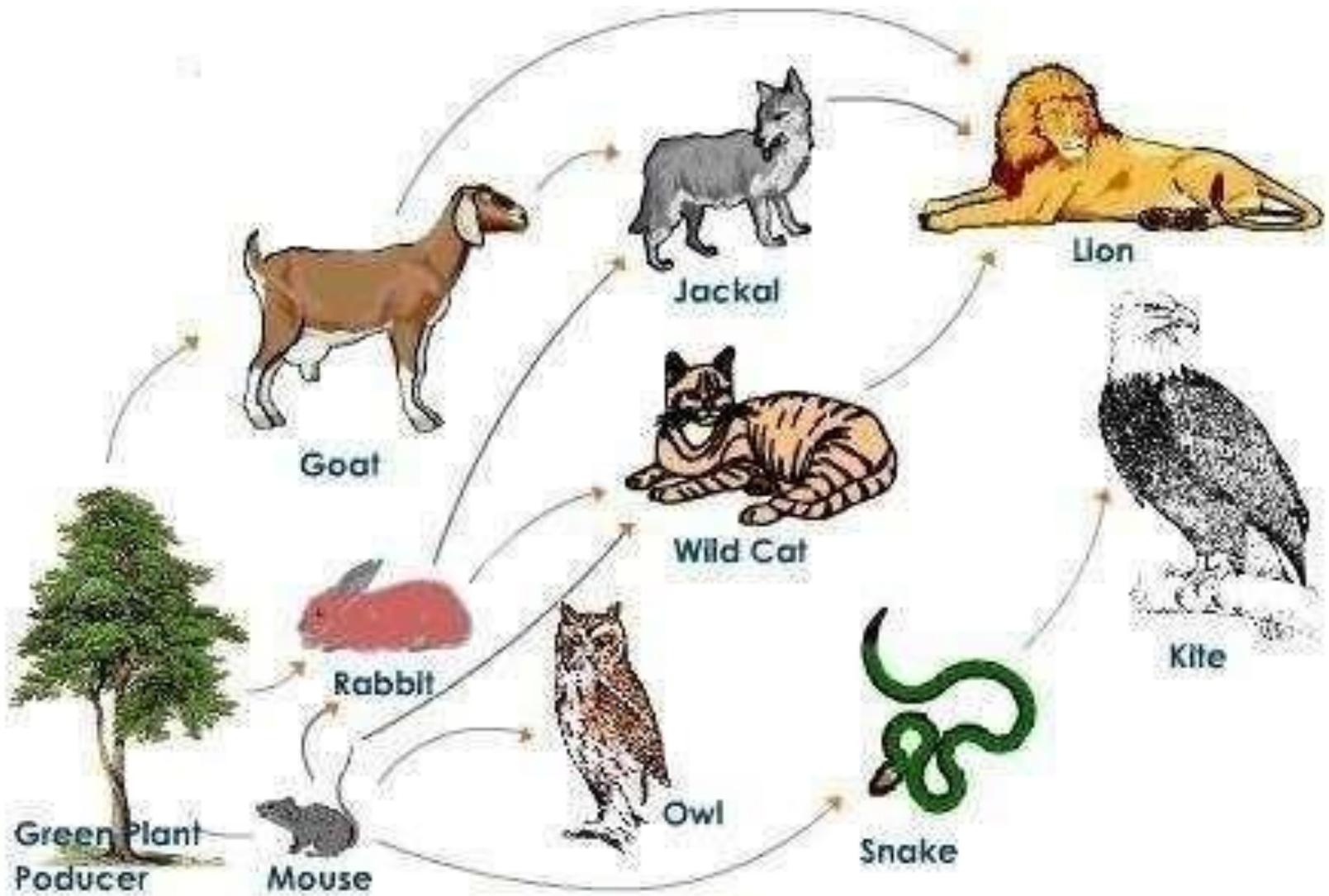
The interlocking pattern of various food chains in an ecosystem is known as food web. In a food web many food chains are interconnected, where different types of organisms are connected at different trophic levels, so that there is a number of opportunities of eating and being eaten at each trophic level

Example

Grass may be eaten by insects, rats, deer's, etc., these may be eaten by carnivores (snake, tiger).

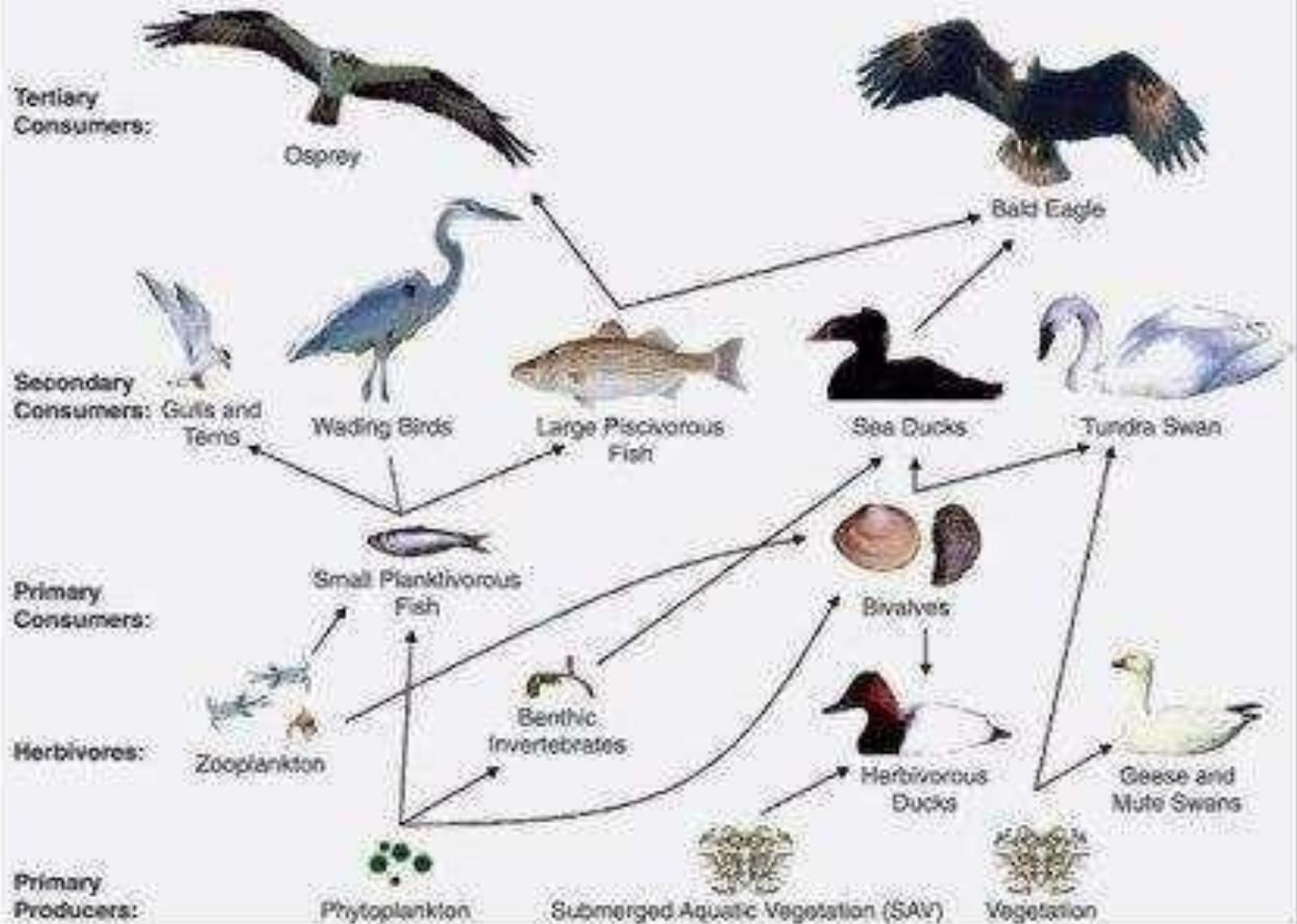
Thus there is an interlocking of various food chains called food webs





Food Web in a Forest

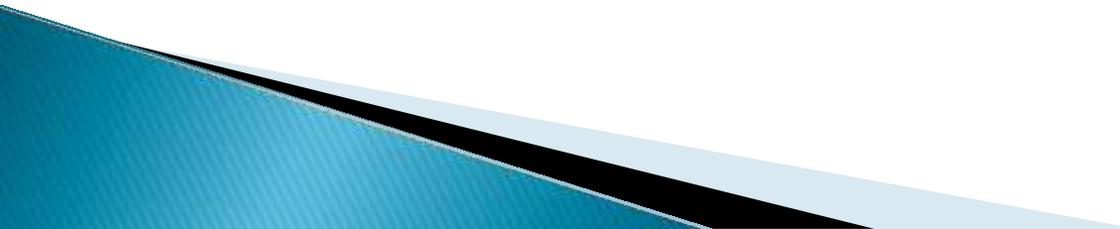
Chesapeake Bay Waterbird Food Web



Difference between food chains and food web

In a linear food chains if one species gets affected (or) becomes extinct, then the species in the subsequent tropic levels are also affected. But, in a food web, if one species gets affected, it doest not affect other tropic levels so seriously.

There are number of options available at each tropic level.



Significance of food chains and food webs

1. Food chains and food webs play a very important role in the ecosystem. Energy flow and nutrient
2. cycling takes place through them.
3. They maintain and regulate the population size of different trophic levels, and thus help in maintaining ecological balance.
4. They have the property of bio-magnification. The non – biodegradable materials keep on passing from one trophic level to another. At each successive trophic level, the concentration keep on increasing. This process is known as bio-magnification.

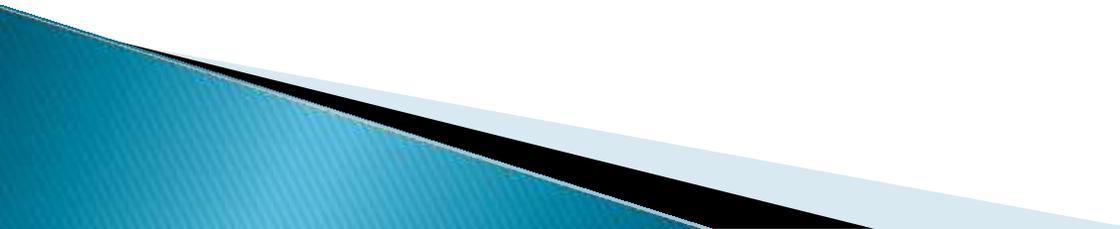
ECOLOGICAL PYRAMIDS

Definition

“Graphical representation of structure and function of trophic levels of an ecosystem, starting with producers at the bottom and each successive trophic level forming the apex is known as an ecological pyramid.”

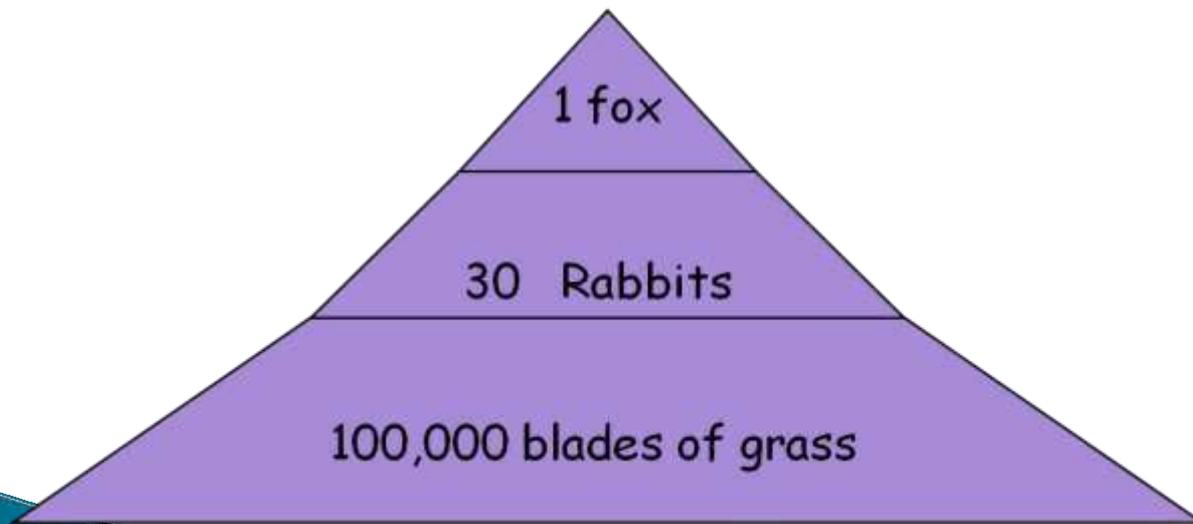
In food chain starting from the producers to the consumers, there is a regular decrease in the properties (ie., biomass and number of the organisms). Since some energy is lost as heat in each trophic level, it becomes progressively smaller near the top.

Types of Ecological pyramids

1. Pyramid of numbers.
 2. Pyramid of energy.
 3. Pyramid of biomass.
- 

Pyramid of Numbers

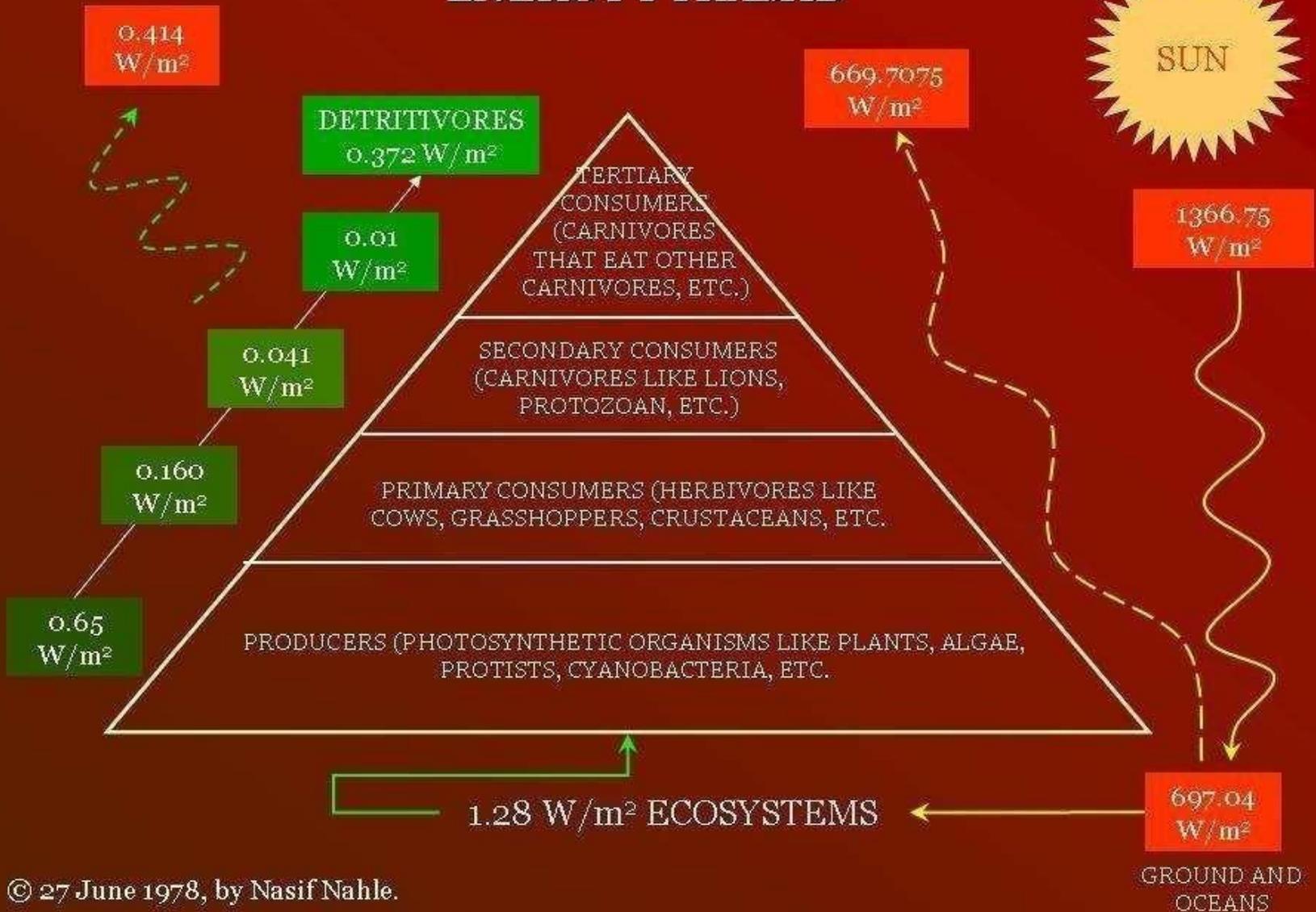
A pyramid of numbers can be used to show the **number** of organisms at **each stage** of a food chain.



Small numbers of large organisms

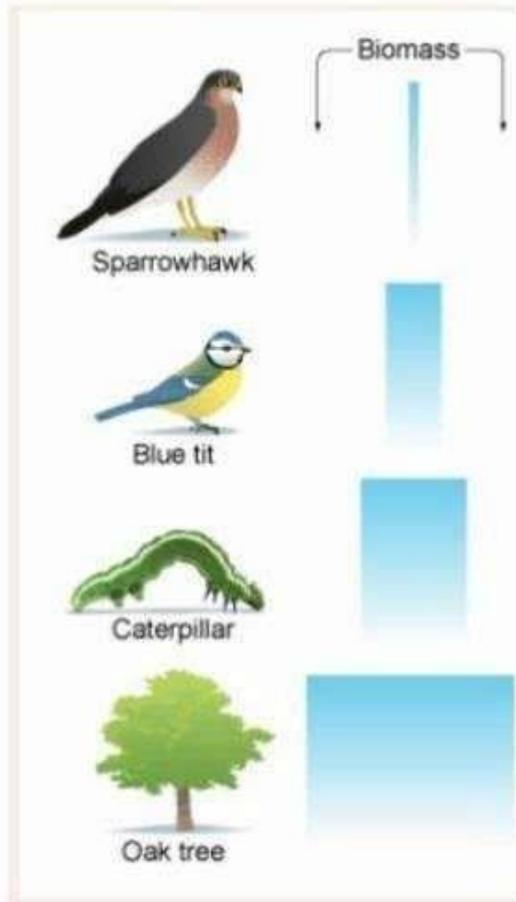
Large numbers of small organisms

ENERGY PYRAMID



Pyramids of biomass

(mass of tissue of living organism)



- Energy moves from one trophic level to the next.
- So energy moves from oak tree to caterpillars.
- Energy is lost at each stage due to it being lost to the environment by
 - respiration (heat energy)
 - faeces (poo)

Pyramids of Biomass

It represents the total amount of biomass (mass or weight biological material or organism) present in each trophic level.

A forest ecosystem

The above figure shows that there is a decrease in the biomass from the lower trophic level to the higher trophic level. This is because the trees (producers) are maximum in the forest, which contribute a huge biomass. The next trophic levels are herbivores (insects, birds) and carnivores (snakes, foxes). The top of the trophic level contains few tertiary consumers (S and tigers), the biomass of which is very low.

It represents the number of individual organisms present at each trophic level. A grassland Ecosystem Example

The primary consumers (herbivores) are rats, which occupy the 2nd trophic level. Since the number of rats are lower compared to the grasses, the size of which is larger.

The producers in the grasslands are grasses, which are in size and large in numbers. So the producers occupy lower trophic level (1st trophic level).

The secondary consumers (carnivores) are snakes, which occupy the 3rd trophic level. Since the number of snakes are lower when compared to the rats, the size of which is larger. The tertiary consumers (carnivores) are eagles, which occupy the next trophic level. The number and size of the last

FOREST ECOSYSTEM

Introduction

A forest ecosystem is the one in which tall trees grow that support many animals and birds. The forest are found in undisturbed areas receiving moderate to high rainfall.

The forest occupies nearly 40%

of the world's land area. In India it occupies only 19% of its total land area.

Types of forest ecosystem

Depending upon the climate conditions, forests can be classified into the following types.

1. Tropical Rain forests.
2. Tropical deciduous forests.
3. Tropical scrub forests.
4. Temperate rain forests.
5. Temperate deciduous forests

Features of different. types of Forests

1. Tropical Rain forests

They are found near the equator. They are characterized by high temperature. They have broad leaf trees like teak and 1. and the animals like lion, tiger and monkey.

2. Tropical deciduous forests

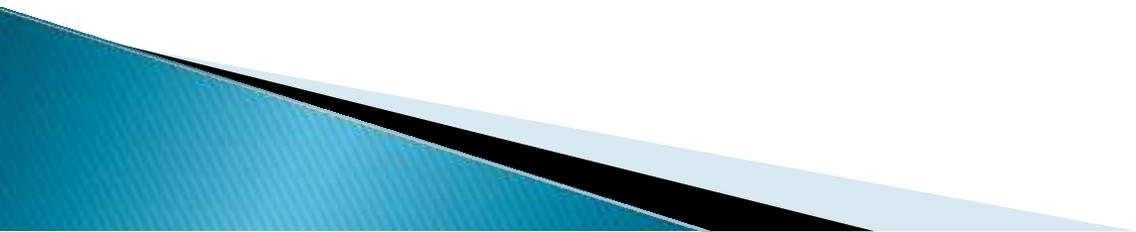
They are found little away from the equator. They are characterized by a warm climate and rain is only during monsoon. They have different types of deciduous trees like maple, oak and hickory and animals like deer, fox, rabbit and rat.

3. Tropical Scrub forests

These are characterized by a dry climate for longer time. They small deciduous trees and shrubs and animals like maple, oak and hickory and animals like deer, fox, etc.,

4. Temperate Rain Forests

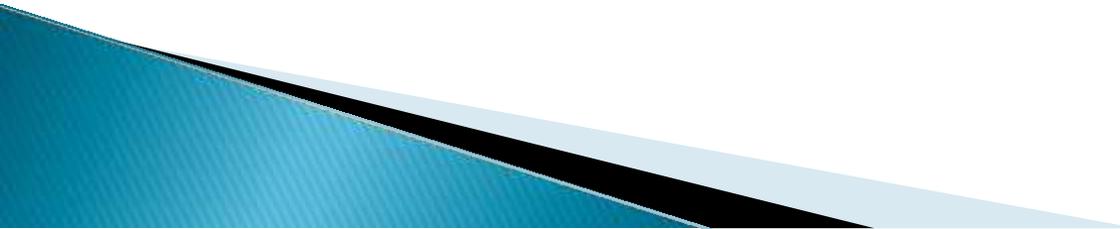
They are found in temperate areas with adequate rainfall. They are characterized by coniferous trees like pines, firs, red wood etc., and animals like, squirrels, fox, cats, bear etc.,



5. Temperate deciduous forests

They are found in areas with moderate temperatures. have major trees including broad leaf deciduous trees like oak, hickory and animals like deer, fox, bear, etc.,

Characteristics of forest ecosystems

1. Forests are characterized by warm temperature and adequate rainfall, which make the
 2. generation of number of ponds, lakes etc.,
 3. The forest maintains climate and rainfall.
 4. The forest support many wild animals and protect biodiversity.
 5. The soil is rich in organic matter and nutrients which support the growth of trees.
 6. Since penetration of light is so poor, the conversion of organic matter into nutrients is very fast.
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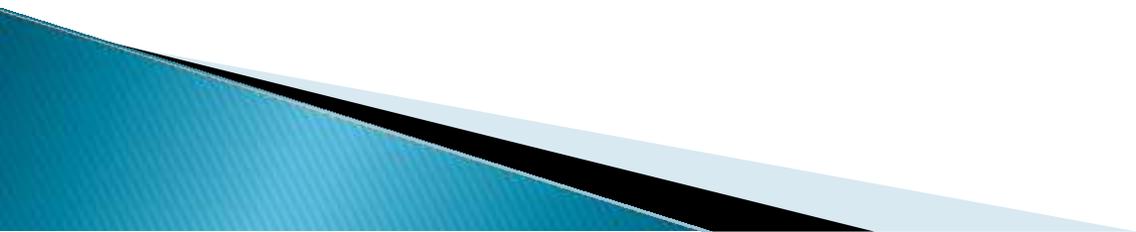
Structure and Function of forest ecosystem

I. Abiotic components

Climatic factors (temperature, light, rainfall) and minerals The abiotic components are inorganic and inorganic and organic substances found in the soil and atmosphere. In addition minerals, the occurrence of litter is characteristic features, majority of forests.

II. Biotic components

1. Producers: The plants absorb sunlight and produce photosynthesis Trees, shrubs and ground vegetation..



2.

Consumers

(a) Primary consumers (herbivores) :They directly depend on the plants for their food.

Example : Ants, flies, insects, mice, deer, squirrels.

b. Secondary consumers (primary carnivores):They directly depend on the herbivores for their food

Examples: Snakes, birds, fox.

c. Tertiary consumers :They depend on the primary carnivores for their food

Examples : Animals, like tiger, lion, etc.,

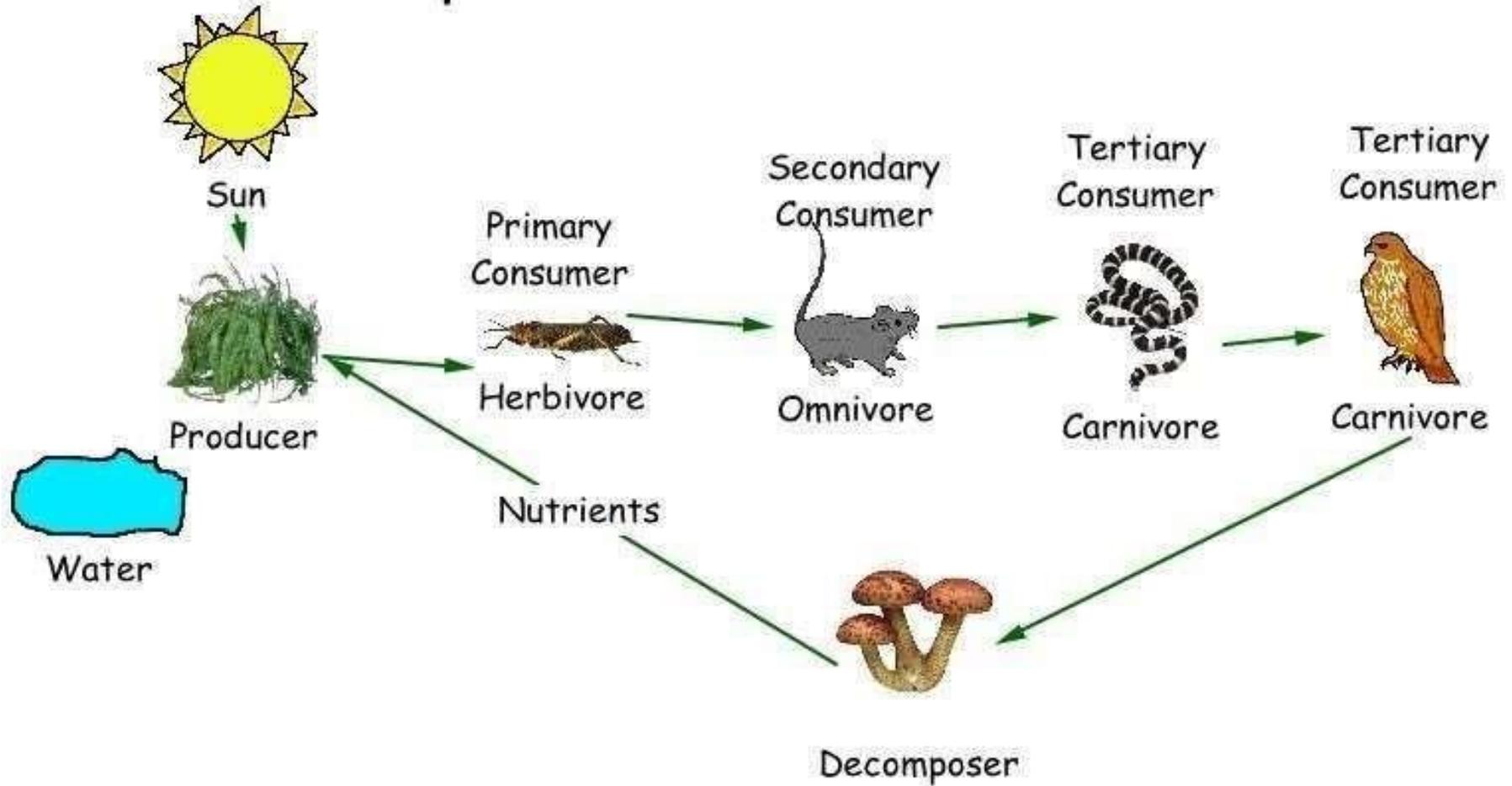
3. Decomposers

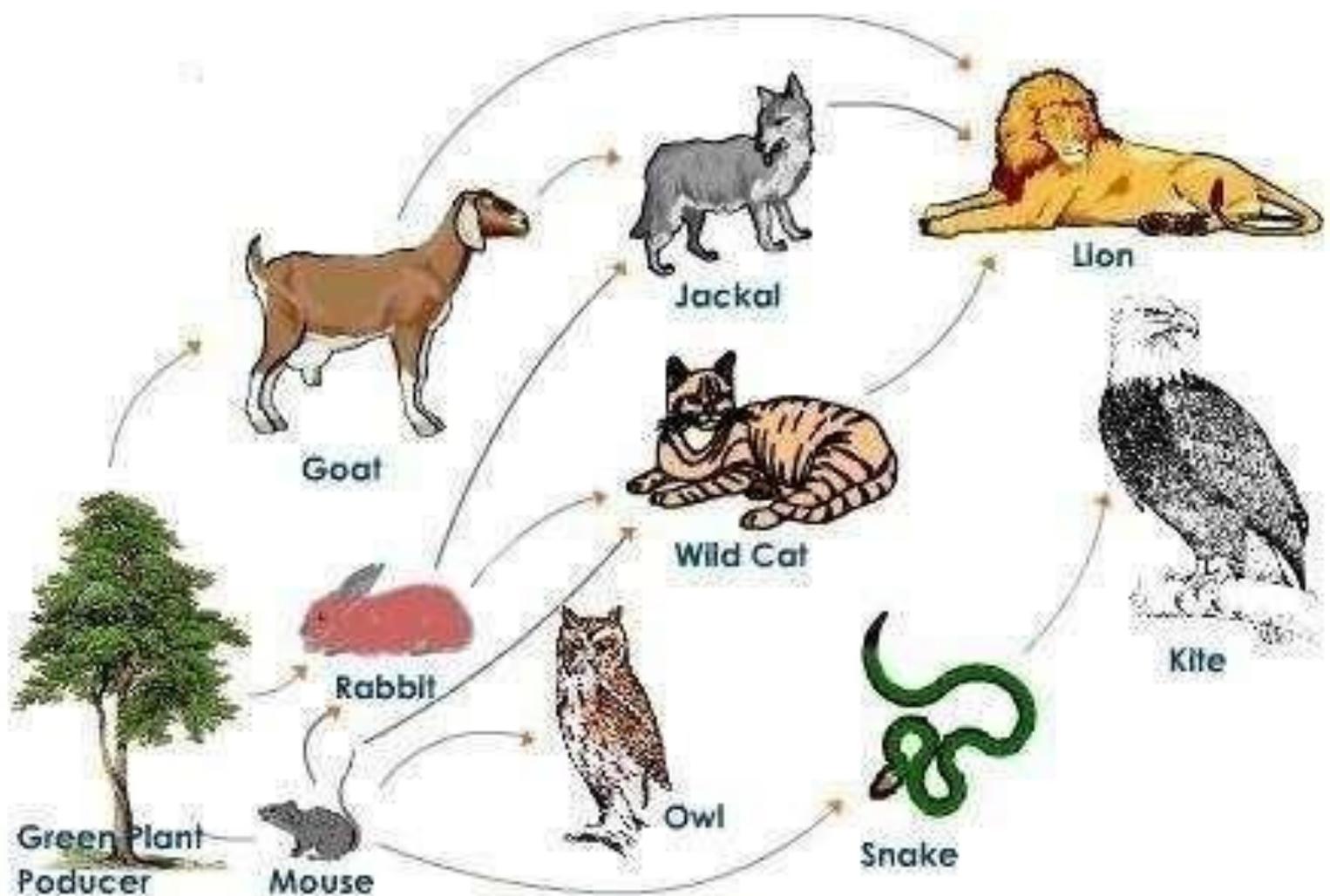
Bacteria and fungi.

They decompose the dead plant and animal matter.

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Temperate Deciduous Forest Food Chain





Food Web in a Forest

AQUATIC ECOSYSTEMS

The aquatic ecosystem deals with water bodies. The major types of organism found in aquatic environments are determined by the water's salinity.

Types of aquatic life zone

Aquatic life zones are divided into two types.

- Fresh water life zones

Examples : Ponds, streams, lakes, rivers.

- Salt water life zones

Examples : Oceans, estuaries.



FRESH WATER ECOSYSTEM

POND ECOSYSTEMS

Introduction

A pond is a fresh water aquatic ecosystems, where water is stagnant. It receives enough water during rainy season. It contains several types of algae, aquatic plants, insects, fishes and birds.

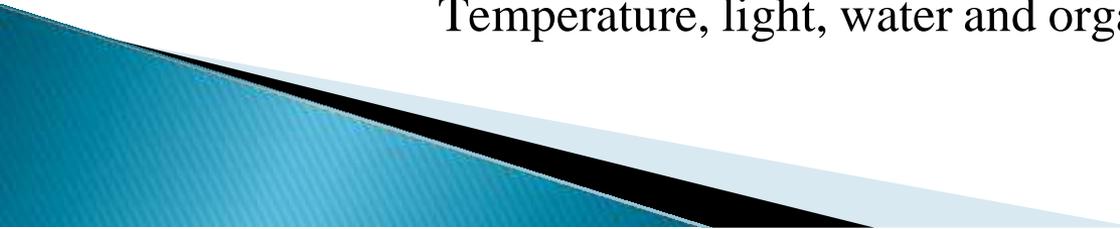
Characteristics of pond

- Pond is temporary, only seasonal.
- It is a stagnant fresh water body.
- Ponds get polluted easily due to limited amount of water.

Structure and functions of pond ecosystems

I. Abiotic components Examples

Temperature, light, water and organic and



inorganic compounds

Example
s:

Large floating plants and
submerged plants like
hydrilla,

II. Biotic Components

- **Producers**

These include green photosynthetic organism. They are of two types.

- **Phytoplankton**

These are microscopic aquatic plants, which freely float on the surface of water.

Example :Algae, small floating plants like volvox, pandorina anabaena, consmarium.

Microphytes

Consumers

- **Primary consumers (Zooplanktons):** These are microscopic animals which freely float on the surface of water. Zooplanktons are found along with phytoplankton. They feed on plants (phytoplankton).

Examples :Protozoa, very small fish, ciliates, flagellates and protozoans.

- **Secondary consumers (Carnivores):**They feed on zooplankton

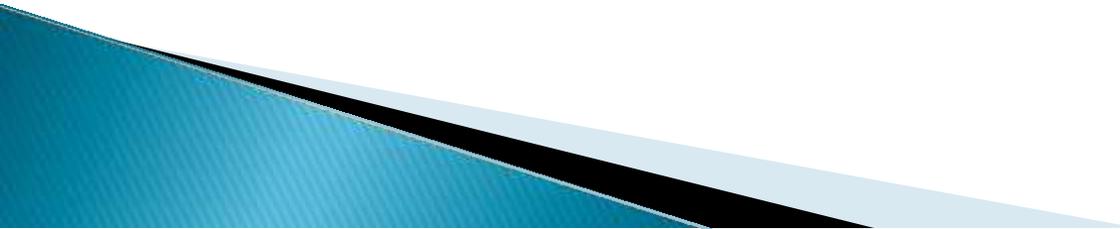
Examples :Insects like water beetles and small fish.

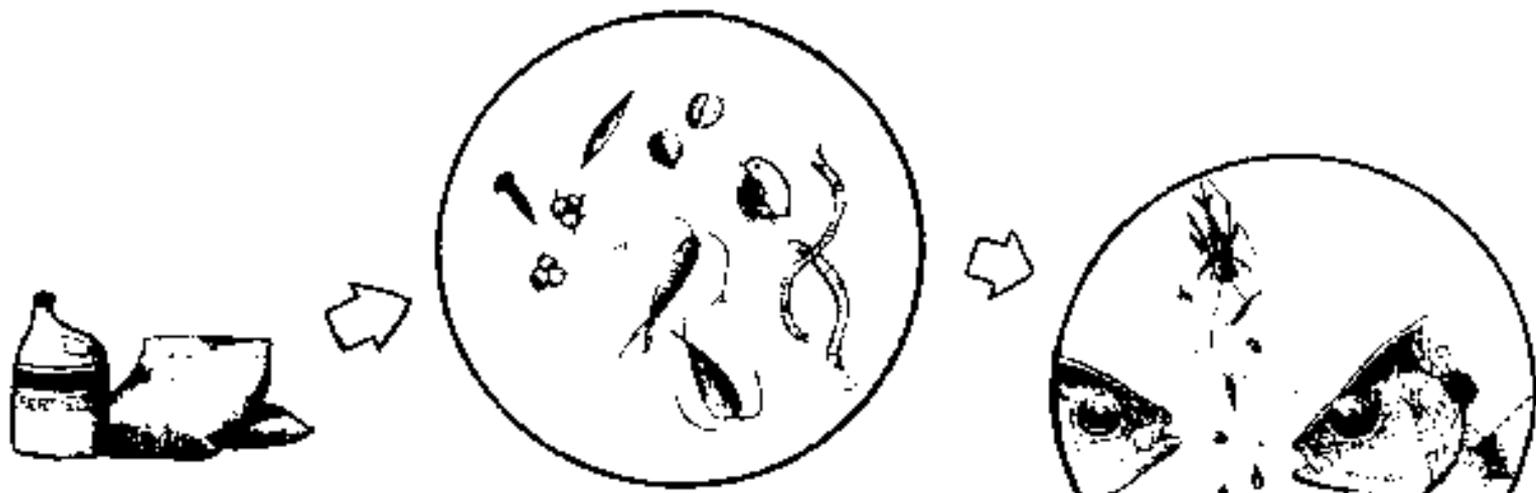
- **Tertiary consumers :**They feed on smaller fish

Examples :Large fish like game fish.

Decomposers: They decompose the dead plant and animal matter and their nutrients are released and reused by the green plants.

Examples :Fungi, bacteria and flagellates





Pond
Food
Chain

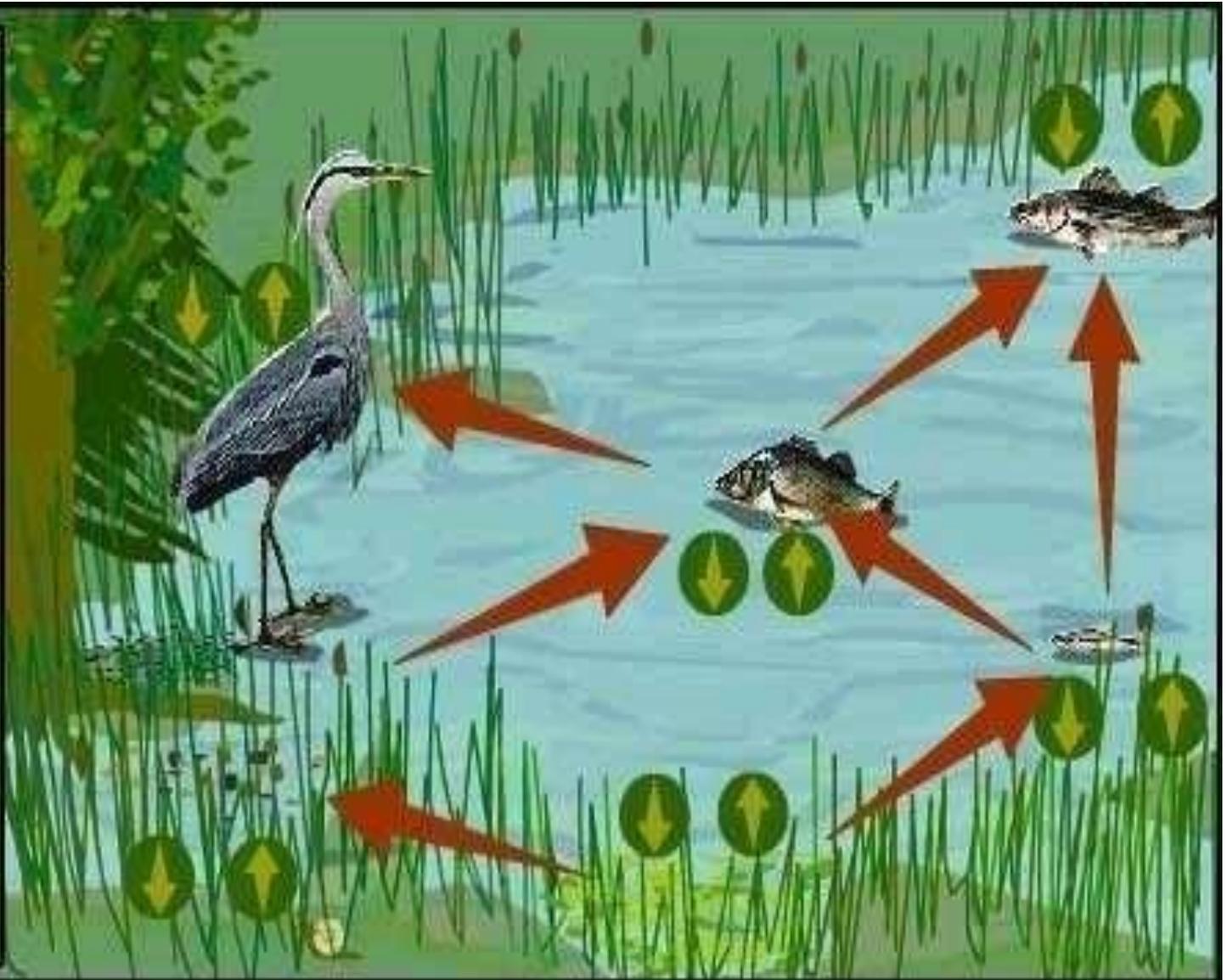


Food Web of a Pond

What happens when one animal population in a food web increases or decreases?

The impact of the population change ripples through the trophic levels, eventually affecting all species in this food web.

Trace the ripple effects from a change in one species and see!



SALT WATER ECOSYSTEMS.

OCEAN (MARINE) ECOSYSTEMS

Introduction

Oceans cover more than two thirds of the earth's surface. ocean environment is characterized by its high concentration of salts and minerals. It supplies huge variety of products and drugs. It also provides us iron, magnesium, iron, natural gas.

Zones of Oceans

The oceans have two major life zones.

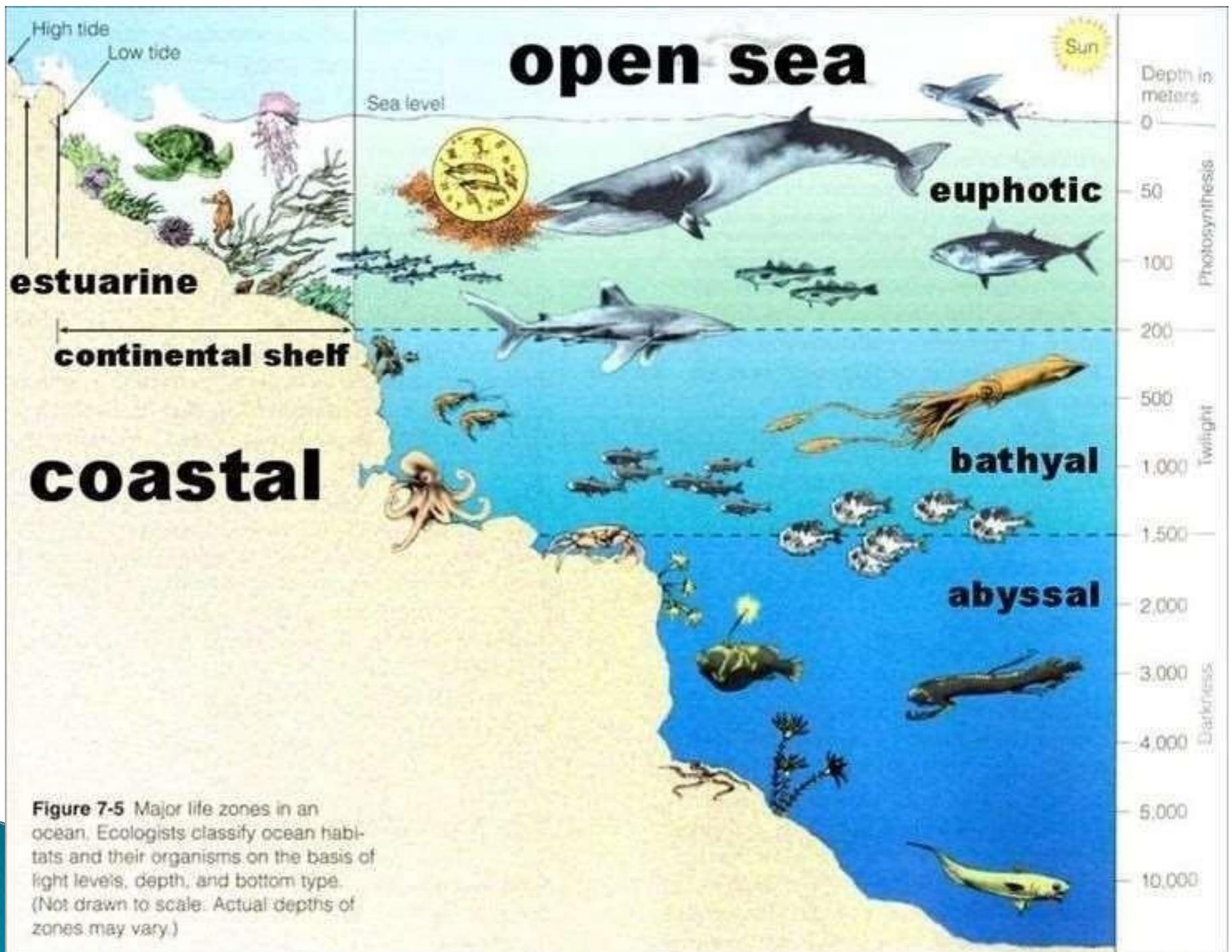
(a) Coastal zone: It is relatively warm, nutrient rich shallow water. It has high primary productivity because of high nutrients and sunlight.

(b) Open sea: It is the deeper part of the ocean. It is vertically divided into three regions.

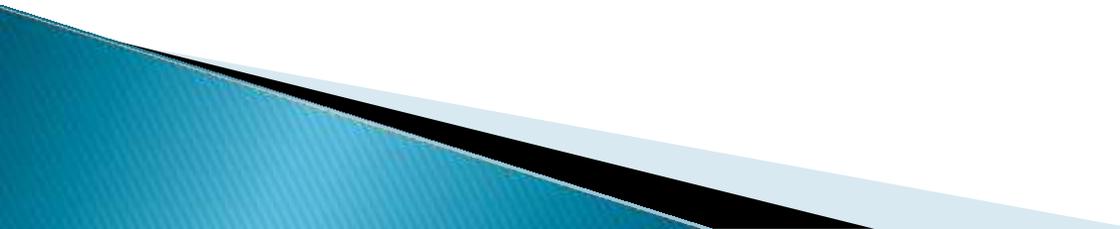
(i) Euphotic zone: It receives abundant light and shows high photosynthetic

(ii) Bathyal zone: It receives dim light and is usually geologically active.

(iii) Abyssal zone: It is the dark zone and is very deep (2000 to metres).



Characteristics of Ocean Ecosystem

1. It occupies a large surface area with saline water.
 2. Since ship, submarines can sail in ocean, commercial activities may be earned out.
 3. It is rich in biodiversity.
 4. It moderates the- temperature
- 

Structure and function Ecosystems

I. Abiotic components

Examples

Temperature, light, NaCl, K, Ca, and Mg Salts alkalinity

II. Biotic components

1. Producers :

Phytoplanktons (diatoms, unicellular algae, etc.,) and marine plants (sea weeds, chlorophycela, phaeophyceae).

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2. Consumers

These are heterotrophic macro consumers. They depend on producers for their nutrition.

- Primary consumers (herbivores) :They feed on producers
 - ⊠ **Examples** :Crustaceans, molluscs, fish
- Secondary consumers (carnivores) : They feed on herbivores
 - ⊠ **Examples** :Herring, salmon, mackerel, etc.,
- Tertiary Consumers: They are the top consumers. They feed on small
 - ⊠ **Examples** :Cod, Haddock, –etc.,
- ⊠ **3.Decomposers**: They decompose the dead organic matter.
 - ⊠ **Example s**:Bacteria and some fungi.

Trophic level

4
3
2
1

