

CHAPTER 4:

INTERDEPENDENCE AMONG LIVING ORGANISMS AND THE ENVIRONMENT

4.1 INTERDEPENDENCE AMONG LIVING ORGANISM AND ENVIRONMENT

HABITAT, SPECIES, POPULATION, COMMUNITY AND ECOSYSTEM

Go to <http://www.fi.edu/tfi/units/life/habitat.html> Gather useful information about ecosystems, biomes and habitats.. For easy access, go to www.icd.com.my

HABITATS (natural places population lives)

1. A habitat is a **natural living place** of certain plants and animals.
2. It is the place where an organism obtain its food, shelter, protection and reproduces.

Habitats			
plant	habitat	animal	habitat
<i>coconut</i>	<i>beach</i>	<i>snake</i>	<i>grass</i>
<i>lotus</i>	<i>pond</i>	<i>shark</i>	<i>sea</i>
<i>durian</i>	<i>garden</i>	<i>crocodile</i>	<i>river</i>
<i>cactus</i>	<i>desert</i>	<i>millipede</i>	<i>earth</i>

SPECIES (group of organisms)

1. A species is **an organism** that have the same shape and structure, and can breed together.
2. Monkeys, rats, cats and elephants are examples of different species of organism.

POPULATION (same species, live in certain area/location) **PMR 2010**

1. A population is **a group of organisms** (animals or plants) of the same type (species) that live together in a habitat.
2. For example
 - a. a population of monkey on a tree
 - b. a population of lion in a grassland.

COMMUNITY (all the population in the certain area)

1. A community consist of **several types of animals and plants population** that live together and interact with one another in a habitat.
2. For example:
 - a. a pond community consists of fish, plant, tadpole and insert populations. These organisms interact with each other.
 - b. A grassland community consists of herbivorous and carnivorous animals, trees and grass that interact with one another.

ECOSYSTEM (all organisms, environment and interaction among these in a certain location)

1. A ecosystem consists of **several communities (animal and plant) that interact with one another** and with the physical environment (non-living things such as water, air, soil, light and mineral salts)
2. for example:
 - a. a pond ecosystem
 - b. a tropical rainforest

4.2 INTERACTION BETWEEN LIVING ORGANISMS

1. Living things interact with each other and with non-living things in order to survive.
2. The interaction between living things and non-living things lead to balance in an ecosystem.
3. The interaction between living things and non-living things is shown below,

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- a. aquatic plants obtain mineral salts from the soil in the pond.
- b. Aquatic animals depend on aquatic plants to supply oxygen for the process of respiration.
- c. Aquatic plants depend on aquatic animals to obtain carbon dioxide for photosynthesis.
- d. Small fish and tadpoles eat aquatic plants.
- e. Big fish eat small fish.
- f. Kingfishers eat fish
- g. Lotus, duckweed, water hyacinths and land plants obtain sunlight for the process of photosynthesis.

4. Interaction between living things and non-living things is important as it maintains
 - a. balance in the environment (the number and types of living thing within the environment remain the same)
 - b. balance in the oxygen and carbon dioxide content within the environment remain the same)

INTERACTION AMONG LIVING THINGS

1. The organisms in a community interact with one another to obtain food, shelter, transport and many other necessities.
2. This interaction helps ensure that an ecosystem survives.
3. There are different kinds of interaction in nature
 - a. Prey-Predator
 - b. Symbiosis e.g. commensalisms, mutualism, parasitism.
 - c. Competition

a. PREY-PREDATOR

- i. A predator is an organism that kills and eats another organism.
- ii. A prey is the organism that is eaten.
- iii. A predator usually has special physical characteristics such as sharp claws and fangs or beaks, with which to kill its prey.
- iv. Predators are carnivores and prey may be carnivores or herbivores.
- v. Other examples are
 - a tiger (predator) eats chickens(pre)
 - an eagle (predator) eats rabbits (prey)
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b. SYMBIOSIS

[Http://www.theoceanadventure.com/vlie02/VIBiology.html#symbiosis](http://www.theoceanadventure.com/vlie02/VIBiology.html#symbiosis)

- i. In symbiosis, different organisms live together in a close relationship.
- ii. One organism always benefits by receiving food, a place to stay and shelter. The other organism may benefit, be at a disadvantage or is not affected.
- iii. There are three types of symbiotic relationship –

- **commensalisms,**

Commensalisms is a relationship between two organisms which are not same species. One organism benefits from the other and is called the commensal. This second organism is not adversely affected by the relationship and is called the host.

Example of plants that live on trees to obtain sunlight are: the money plant, the staghorn fern

Example of animals: remora fish and shark

- **parasitism**

Parasitism is another type of interaction between two organisms. Only one organism benefits (parasite). The other organism is negatively or adversely affected (host).

Examples: stem borers and oil palm leaves

Aphids and trees

A parasite may live outside the body (ectoparasite) or inside the body (endoparasite) of another living organism (host).

- **Mutualism**

Mutualism is an interaction between two different organisms that live together in which both organisms benefit. It can be between two animals, two plants or one animal and one plant. They obtain nutrition and shelter from each other.

Examples: i. sea anemone and hermit crab

ii. Ox peckers eat the leeches and ticks that feed on buffaloes.

c. COMPETITION

1. Competition occurs when organisms compete for the same basic resources.
2. Plants compete to obtain water, sunlight, minerals and living space.
3. Animals compete to obtain water, food, living space and mates for reproduction.
4. for example:
 - a. Flowering plants compete with weeds to obtain water and mineral salts.
 - b. Lions in a pride compete for food
 - c. Plants in a tropical rainforest compete for basic needs. Taller trees obtain sunlight more easily.

BIOLOGICAL CONTROL PMR 03

1. Biological control is a method in which a predator, which is a natural enemy to a certain pest, is used to control the population of that pest in an area.

2. Biological control is usually used in agriculture to control populations of pests without the use of pesticides.
3. The predator-prey interaction is applied in biological control.
4. Biological control has many advantages as compared to using pesticides. Some of them are
 - a. does not pollute the environment
 - b. does not kill other pests because natural enemies are used
 - c. is cheap and safe to use.
5. For example
 - a. owls and snakes eat rats
 - b. fire ants eat aphids on leaves
6. Two types of interaction used in biological control are
 - a. parasitism – where the parasite destroys crops
 - b. predator-prey – eventually removes the pest.

4.3 FOOD WEBS

Go to <http://www.marietta.edu/~biol/102/ecosytem..html> Describe the role of living organisms, energy flow in the ecosystem, food chains and food webs.. For easy access, go to www.icd.com.my

Producers, Consumers and Decomposers

1. Producers are **all green plants** that make food through photosynthesis.
2. Consumers are animals that eat plants or other animals.
3. Decomposers are organisms that decompose dead organisms (animals or plants) and change them into simple substances. Examples of decomposers are **bacteria and fungi**.

Food Chains **PMR 06, PMR 2010**

<http://www.picadome.fcps.net/lab/currl/food%5Fchain>

1. A food chain is an energy link showing how energy in food is passed from plants (producers) to animals (consumers).

Paddy  rat  bird  eagle

2. When the organism in a food chain die, they are decomposed by decomposers such as fungi and bacteria, into simple minerals.

Food Webs **PMR 03, 04, 07**

http://www.absc.usgs.gov/research/seabird_foragefish/marinehabitat/home.html

<http://www.memorial.ecasd.k12.wi.us/departments/Science/kwudi/biology.htm>

1. A food web consists of several food chains that are interlinked.
2. The organisms in a food web interact with each other.

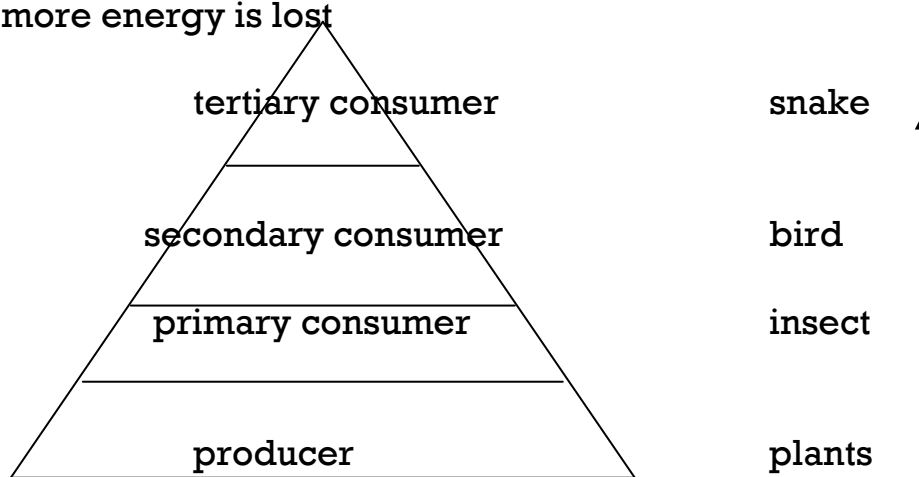
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Pyramid of Numbers **PMR 05, 06, 07 2010**

<http://www.accs.net/users/kriel/chapter%20three/pyramid%20of%20biomass.jpg>

<http://www.accs.net/users/kriel/chapter%20three/pyramid%20of%20numbers.jpg>

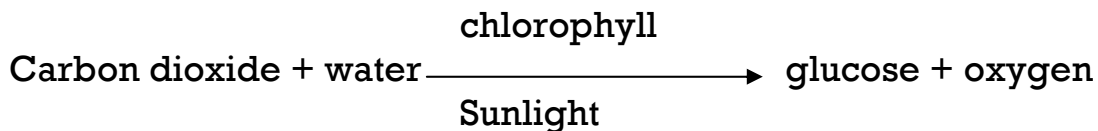
1. A pyramid of numbers shows the number of organism at each link of the food chain.
2. From the base of the pyramid to the top
 - a. the number of organisms decrease
 - b. the size of the organisms increase
 - c. more energy is lost



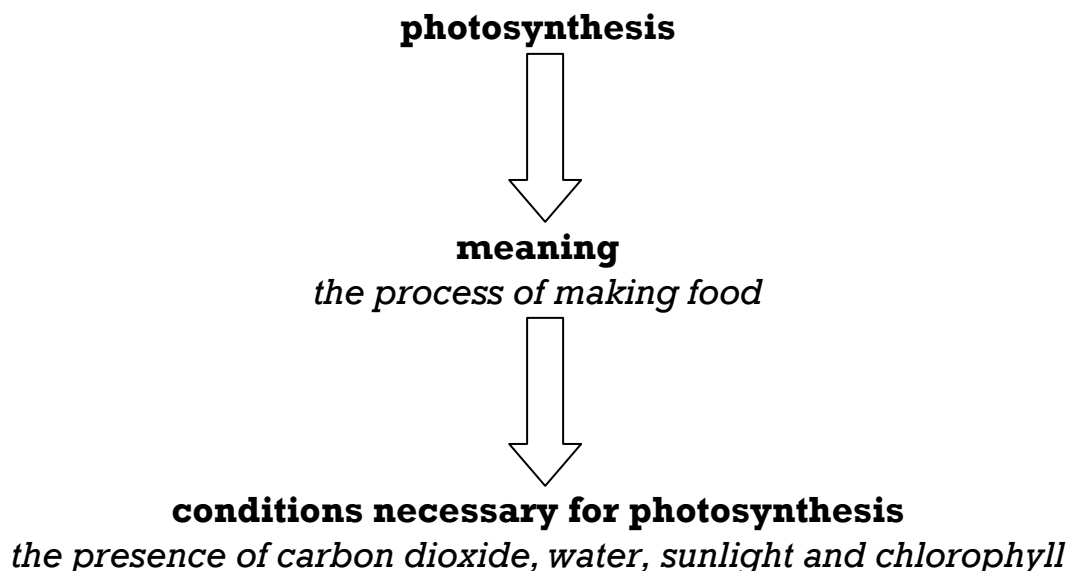
4.4 PHOTOSYNTHESIS

<http://links.baruch.sc.edu/scael/personals/pjpb/lecture/lecture.htm>

1. Photosynthesis is a process that occurs in green plants, in which food is made from water and carbon dioxide in the presence of chlorophyll and sunlight.
2. Light energy is used to convert carbon dioxide and water into glucose, a simpler sugar and carbohydrate. More complex sugars are formed from glucose.
3. The equation below shows the process of photosynthesis:



4. The glucose produced is brought to other parts of the plant to be
 - a. oxidised through the process of respiration to provide energy
 - b. stored as starch, if in excess



The Importance of photosynthesis

1. Photosynthesis is important to maintain the equilibrium of an ecosystem.
2. The importance and role of photosynthesis are:
 - a. supplies food to animals
 - b. removes carbon dioxide from the atmosphere.
 - c. Enables green plants to make their own food.
 - d. Regulates equal and maintains carbon dioxide content in the atmosphere.
 - e. Increases oxygen content in the atmosphere; this gas is used by organisms for respiration as well as in the process of combustion, rusting and decomposition.

Natural Gas Cycle **PMR 04**

1. Natural gas cycles maintain the content of gases in the air.
2. The carbon and oxygen cycles are two natural gas cycles.

The Carbon Cycle **PMR 07**

http://www.tnmanning.com/Test/Tests/oxygen_and_carbon_cycle.htm

1. The carbon cycle is the circulation of carbon dioxide on Earth. It involves the use and return of carbon dioxide to the air. These processes take place continuously.
2. The carbon cycle maintains the content of carbon dioxide in the air.
3. The processes that release carbon dioxide into the air include:
 - a. respiration and breathing
 - b. combustion
 - c. decomposition

The Oxygen Cycle

1. The oxygen cycle is the circulation of oxygen on Earth. It involves the end return of oxygen to the air. These processes take place continuously.
2. The oxygen cycle maintains the content of oxygen in the air.
3. The processes that use oxygen include:
 - a. respiration and breathing
 - b. combustion
 - c. decomposition
 - d. rusting
4. Photosynthesis is the only process that releases oxygen into the air.

4.6 THE ROLE OF HUMAN BEING IN MAINTAINING THE BALANCE OF NATURE

1. Human beings have a very close relationship with the ecosystem.
2. Human beings are a part of the ecosystem that depend on living and non-living things for survival.
3. Human beings interact with the ecosystem to obtain needs and to lead comfortable lives.
4. We obtain our needs in many ways. At the same time, we also disturb the balance of nature.
5. Human activities bring about an imbalance and decline in the ecosystem. Human activities that destroy the balance of nature are
 - i. Forestry/logging
 - ii. Industry
 - iii. Housing
 - iv. Fishing
 - v. Agriculture
 - vi. Construction
 - vii. Mining

Environmental issues

Human activities cause pollution and have raised the following environmental issues:

- a. the greenhouse effect
- b. the thinning of the ozone layer
- c. acid rain

The Greenhouse effect.

1. The greenhouse effect occurs because a layer of carbon dioxide in the atmosphere prevents a portion of heat from escaping to outer space.
2. The greenhouse effect raises Earth's temperature. This is known as *global warming*. This phenomena causes changes in the weather the world over.
3. Climatic change as a result of global warming causes the melting of icebergs in both poles. The sea level increases and this results in the flooding of low-lying coastal areas.

The Thinning of the ozone layer.

1. The ozone layer absorbs ultraviolet rays and prevents them from reaching the Earth.

2. Chemicals such as chlorofluorocarbons (CFCs) are used in the manufacture of aerosol sprays, refrigerators and air conditioners. These chemicals are pollutants that break down ozone molecules in the ozone layer.
3. As a result, the ozone layer has thinned and ultraviolet affected human health by causing:
 - a. skin cancer
 - b. cataracts
 - c. the immune system to function improperly.

Acid rain

1. Gases such as sulphur dioxide and nitrogen dioxide dissolve in rainwater and form acid rain.
2. Acid rain can,
 - a. destroy the habitats of living things
 - b. lower the soil pH value and make it unstable for plants. Example river water is no suitable for aquatic organisms.

CONTROLLING ENVIRONMENTAL POLLUTION

1. Managing environmental pollution can save our Earth.
2. The following are steps we can take to reduce environmental pollution.
 - a. use unleaded petroleum
 - b. make nuclear testing illegal.
 - c. Create special places to burn rubbish.
 - d. Stop the use of chlorofluorocarbons (CFCs) by replacing it with hydrochlorofluorocarbons (HCFCs)

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