

# Lesson 5: ECOSYSTEMS

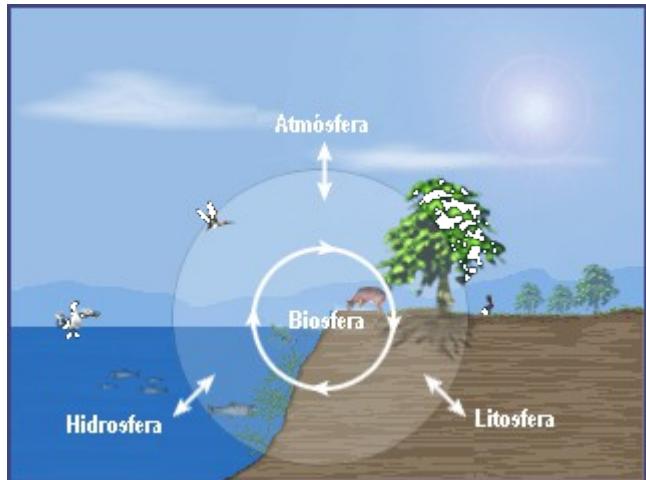
## 1. BIOSPHERE

It means life sphere. It is the **zone of life** (where life can be found) on Earth and it is the global sum of all ecosystems. It can be divided into three parts:

a) **Troposphere**. It is the lowest part of the atmosphere. The average depth of it is approximately 11 Km.

b) **Lithosphere**. It is the outer layer of the Earth's crust (corteza). It is the solid part of the biosphere.

c) **Hydrosphere**. It is the aquatic part of Earth (oceans, lakes, etc....).

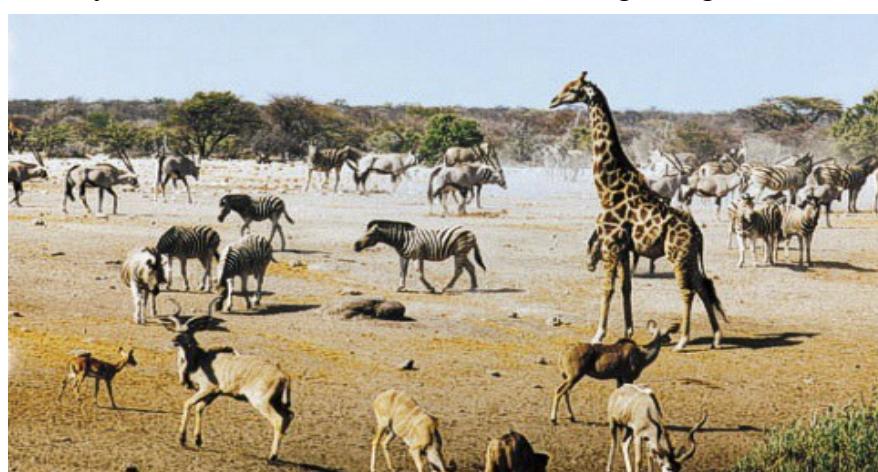


## 2. ECOSYSTEMS

It consists of all the **living beings** living in a particular area, as well as all the **non-living**, physical components of the environment, such as air, soil, water, sunlight, etc., and the **relationship** among them.

There are three parts:

a) **Community or biocenosis**. This refers to all living beings that live in a specific area or region.



b) **Biotope (biotopo)**. This consists of the non-living, physical components of the environment, like soil, air, water, sunlight, temperature, etc...



c) **Relationships.** There are two types, the relationship between living beings, and the relationship between living beings and the environment.

c.1) **Intraspecific interactions** are interactions among organisms of the same species.

Members of a group must be able to communicate with each other to stay in touch with others in the group. A **population** (población) is a group of the same type of living organisms living in the same place at the same time. All of the population interacts and forms a **community**.

There are different kinds of intraspecific relationship, some of them positive to the group and another one negative. Some of them are:

- familiar (normally with reproductive purpose)

- colonial (making colonies, colony in singular, where the members of the community live together, with protective purpose)

- gregarial or statemental (hierarchy, division of work)

- **Intraspecific competition** is an interaction in population ecology, whereby members of the same species compete for limited resources (food, females, ...)



c.2) **Interspecific relationships** are interactions among organisms of **different** species.

Typically, these interactions are classified based on whether they are beneficial to one or both of the species involved, or whether they are detrimental to one of the species involved. There are several types:

Relationship	Specie 1 benefit	Specie 2 benefit	Description
Mutualism/symbiosis	+	+	A relationship between two species where both benefit
Predation	+	-	When a larger animal eats other, smaller animals.
Parasitism	+	-	When a smaller organism feeds on a larger (called <b>host</b> ), weakening or killing it.
Commensalism	+	0	A relationship between two species that is beneficial to one but of neutral benefit to the other.
Competence	-	-	When two species eat the same food



Relationships between the living things and the environment. **Adaptation** is the evolutionary process whereby a population becomes better suited to its habitat. This process takes place over many generations. This term may also refer to a feature that is especially important for an organism's survival, for example, the ability of horses to run fast and escape predators. Different populations reproduce and adapt differently than other populations, that is, by natural selection, allowing them to outlast other populations.

### 3. FOOD RELATIONSHIPS.

### LINK 2

Every organism needs food in order to live and has to get that food from somewhere. Every organism can be classified by where it fits into the food chain. Most broadly, all organisms fit into one of three camps: producers, consumers, and decomposers.

**3.1. Producers.** They are able to produce food from the energy of the sun through photosynthesis or, in some instances, from inorganic molecules through chemosynthesis. They are **autotrophs**. They are the beginning of every food chain. They are plants, some bacteria, algae and chemosynthetic organisms.

**3.2. Consumers.** They are **heterotrophs** because they must consume other organisms in order to get the energy necessary for life. There are three types of consumers; the categories of consumers are based on which organisms a particular consumer preys on.

a) **Primary consumers**, such as sheep, grasshoppers, and rabbits, feed on producers. They are **herbivores**, which is the name for a plant-eating animal.

b) **Secondary consumers** eat primary consumers, making them **carnivores**. Foxes and insect-eating birds are examples of secondary consumers.

c) **Tertiary consumers** eat secondary consumers and are therefore **carnivores**. Polar bears that eat sea lions are tertiary consumers.

There are also consumers called omnivores. Omnivores can either be secondary or tertiary consumers. Humans and bears are considered omnivores.

**4.3 Decomposers.** They are the last links in the chain and they feed on waste or dead material.

They are **heterotrophs**. Decomposers break down nutrients in the dead bodies and return it to the soil to be used by producers.

### Sample Food Chains

Trophic Level	Grassland Biome	Pond Biome	Ocean Biome
Primary Producer	grass ↓	algae ↓	phytoplankton ↓
Primary Consumer	grasshopper ↓	mosquito larva ↓	zooplankton ↓
Secondary Consumer	rat ↓	dragonfly larva ↓	fish ↓
Tertiary Consumer	snake ↓	fish ↓	seal ↓
Quaternary Consumer	hawk ↓	raccoon ↓	white shark ↓

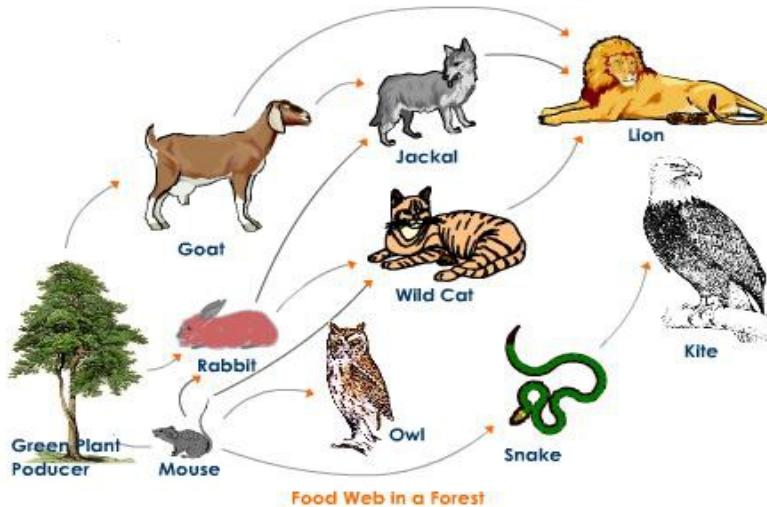
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## 4. FOOD CHAINS AND FOOD WEBS.

All predatory interactions between producers and consumers in a community can be organized in food chains or more complex and realistic food webs.

**Food chains** are simple and help us to understand the predation interactions between organisms, but because they are so simple, they aren't really accurate.

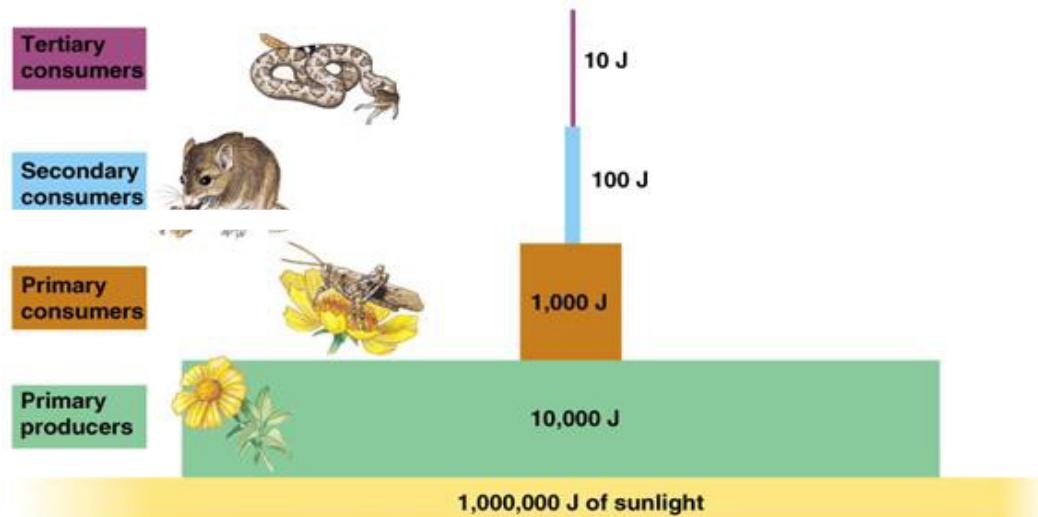
Most organisms in a community hunt more than one kind of prey and are hunted by more than one predator. These numerous predation interactions are best shown by a **food web**.



## 5. WEBS AND ENERGY AND MATTER FLOWS .

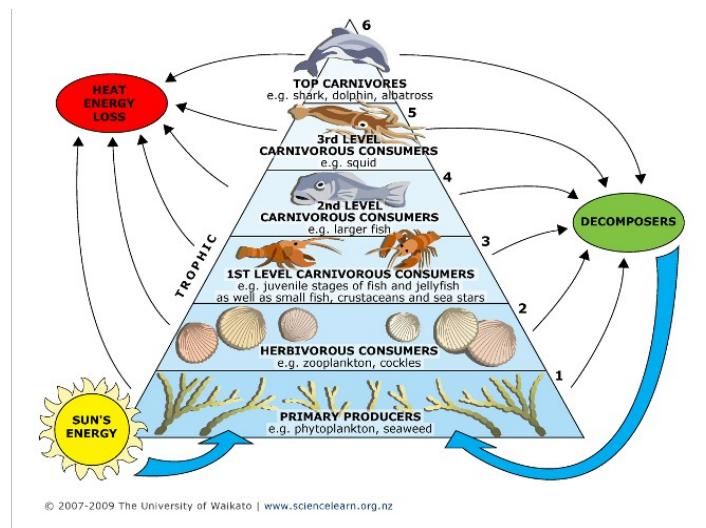
**5.1 Energy flow or calorific flow.** This refers to the **flow of energy through a food chain**. Solar energy is collected by plants. Each trophic level in a food web consumes the lower trophic level in order to obtain energy. But not all of the energy from one trophic level is transferred to the next. At each trophic level, most of the energy is used up in running body processes such as respiration. Typically, just 10 percent of the energy present in one trophic level is passed along to the next.

The **energy lost between each trophic level affects the number of organisms** that can occupy each trophic level. If the secondary consumer trophic level contains 10 percent of the energy present in the primary consumer level, it follows that there can only be about 10 percent as many secondary consumers as there are primary consumers. The energy pyramid is therefore also a biomass pyramid that shows the number of individuals in each trophic level. Ultimately, all of the energy originally captured by plants is transformed and lost as heat; energy is not recycled.



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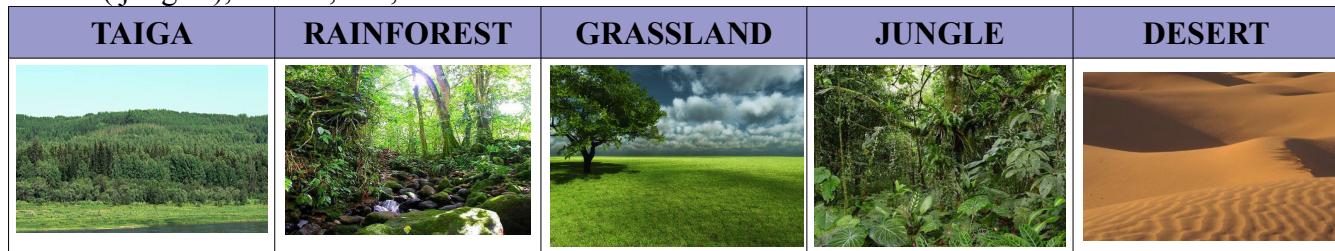
## 5.2 Matter flow. Matter cannot be created or destroyed. It is used over and over again.



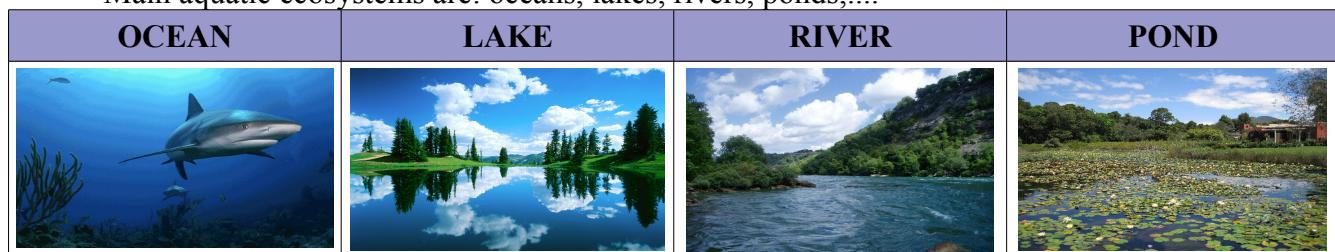
## 6. TERRESTRIAL AND AQUATIC ECOSYSTEMS.

Earth's ecosystems can be divided into two groups . **Terrestrial and aquatic**.

Main terrestrial ecosystems are: taiga (boreal forests), rainforests, grasslands, tropical rain forests ( jungles), deserts, etc ..



Main aquatic ecosystems are: oceans, lakes, rivers, ponds,....



Both ecosystems are organized in a similar way with producers, consumers, etc.... Their differences are:

- Aquatic environments are **rich** in nutrients and they support more life than equivalent terrestrial ecosystems.
- Aquatic environments are much more **stable** than terrestrial environments, with smaller fluctuations in temperature and other variables.
- Aquatic organisms are seldom exposed to **desiccation** while terrestrial organisms are often exposed to desiccation and are usually relatively resistant to drying out.
- **Oxygen** (because it is less present) is sometimes a limiting factor in aquatic habitats, but this is seldom the case in terrestrial habitats.
- **Light** can be a limiting factor in some aquatic habitats, but in most terrestrial environments there is hardly ever a shortage of light.
- Terrestrial animals are influenced far more by **gravity**, while water supports aquatic organisms.

## 7. SUMMARIZE

Watch the following presentations to summarize the main ideas about the unit:

<http://www.slideshare.net/shoreyl/3-biosphere>

<https://drive.google.com/file/d/0B3hQhZnQQPnHSzFjRDION3pxNzA/edit?usp=sharing>

## ECOSYSTEM ACTIVITIES

**Activity 1.** Why is it impossible to find plants below 100 m in the water?

**Activity 2.** Why are there fewer forms of life as you ascend a mountain? Explain.

**Activity 3.** Are they part of the biocenosis or the biotope? Soil , plants, wind, animals, water, algae, temperature , humidity, microorganisms , light , oxygen, fungi .

BIOCENOSIS	BIOTOPE	BIOCENOSIS	BIOTOPE

**Activity 4.** Match the following words:

Hive	(colmena)	Ants
Herd	(manada)	Birds, reptiles, mice,....
Anthill	(hormiguero)	Sheep, birds
Nest	(nido)	Fish
Burrow	(madriguera)	Bees
Flock	(rebaño,bandada)	Wild animals
Shoal	(banco)	Wasps
Wasps' nest	(avispero)	Rabbits

**Activity 5.** Describe this ecosystem in this order: producers, consumers and biotope ( aquatic, terrestrial, temperature, light, the water, what is the water's current?...)



**Activity 6.** Complete the following sentences:

egrets      horses      relationship      hermit crabs      commensalism      anemones      predation  
horses      egrets      parasitism      competence      zebras      wildebeest (ñu)

- The relationship between lions and zebras is called \_\_\_\_\_ because (explain) \_\_\_\_\_

- The relationship between \_\_\_\_\_ and \_\_\_\_\_ is called \_\_\_\_\_ because the movement of \_\_\_\_\_ stir up (agitan) various insects and the \_\_\_\_\_ eat the insects.

- The \_\_\_\_\_ between lice and humans is called \_\_\_\_\_ because (explain) \_\_\_\_\_

- The relationship between \_\_\_\_\_ and \_\_\_\_\_ is called **symbiosis** because (explain) \_\_\_\_\_

- The relationship between \_\_\_\_\_ and \_\_\_\_\_ is called \_\_\_\_\_ because (explain) \_\_\_\_\_

**Activity 7.** Indicate at least two examples of each type of relationship, explaining them briefly.

RELATIONSHIP	EXAMPLE	EXPLANATION
Mutualism/symbiosis	Lichen ( liquen)	
Mutualism/symbiosis		
Predation	Spider and fly	
Predation		
Parasitism		
Parasitism		
Commensalism	Egret and horse	
Commensalism		
Competence		
Competence		

**Activity 8.** Fill in the following table:

LIVING THINGS	INTRASPECIFIC/INTERSPECIFIC	RELATIONSHIP
Two young bears playing	Intraspecific	-----
Flower and butterfly		
Bees living in a hive		
Lions and hippopotamus		Predation
Vulture and hyena		
Louse and boy		
Beetles and cows		
Spider and grasshopper		
Mosquito and horse		

**Activity 9.** Explain the advantages of the following adaptations:

- a) A Crocodile's colour (similar to water) and its gentle movement through water.
- b) A giraffe's long neck.
- c) A carnivore's claws .
- d) An elephant's trunk.
- e) A zebra's stripes.
- f) Two eyes on both sides of the head ( horse, zebra, ...)
- g) The skin colour of a chameleon and an octopus.
- h) The thick layer of fat in bears, seals and penguins.
- i) The narrow leaves on the cactus.

**Activity 10.** Match the followings adaptations with the correct animal:

It has a thick coat

It can store water

It is a good swimmer

Cold weather ( polar bear)

It is white for camouflage

It produces little urine.

Hot deserts ( camel)

It does not sweat.

Its sandy colour provides camouflage

**Activity 11.** Briefly explain the main environmental adaptations of the following living things:

a) Polar bear.

b) Camel.

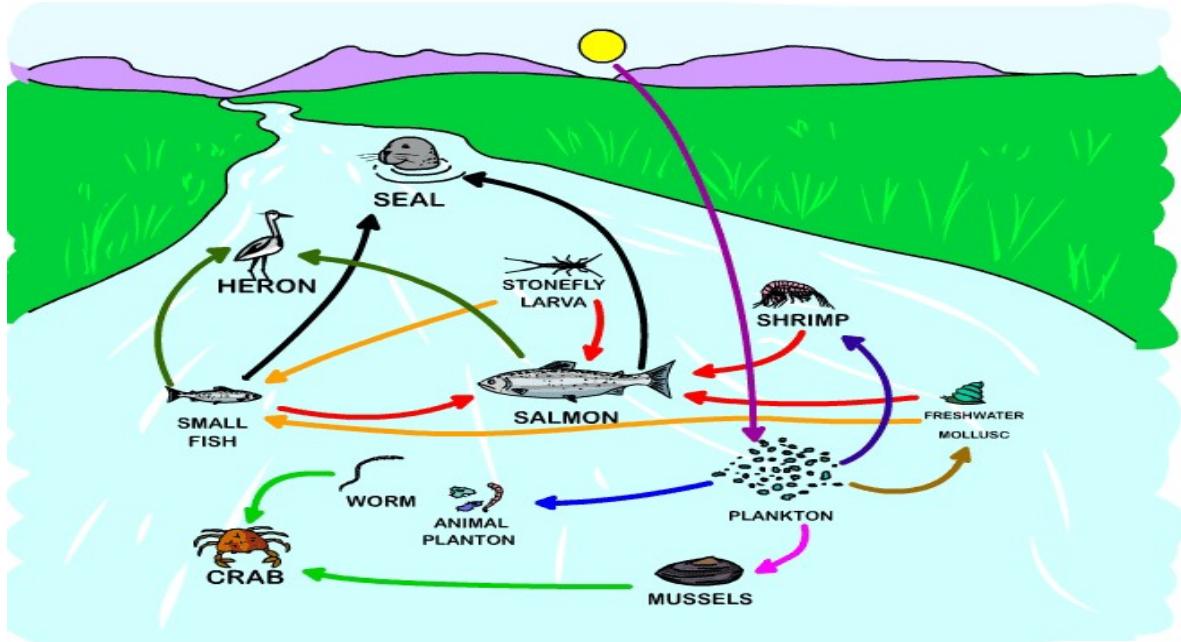
c) Horse.

d) Cactus.

**Activity 12.** Are they producers or consumers?

LIVING THINGS	TYPE	LIVING THING	TYPE
Cow		Rabbit	
Zebra		Grass	
Lion		Crocodile	
Pine tree		Bush	
Fungi		Daisy	
Algae		Green frog	

**Activity 13.** Have a look at the following picture:



Write three simple food chains with four steps.

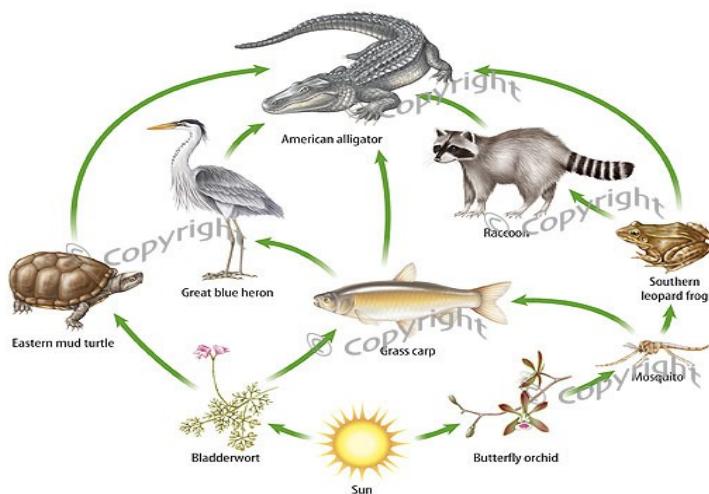
- 1: → → →
- 2: → → →
- 3: → → →

**Activity 14.** What would happen if a step was erased?

**Activity 15.**

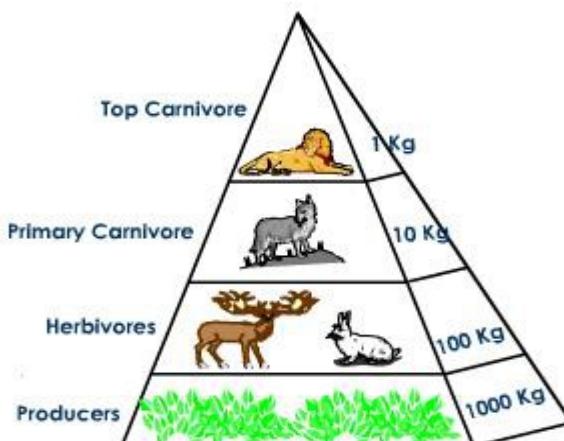
- a) Explain what would happen if small fish were erased.
- b) What about producers ( plankton)?
- c) What about predators?

**Activity 16.** Have a look at the following picture:



- a) Explain what would happen if butterfly orchids were erased?
- b) What about the grass carps?
- c) What about alligators?

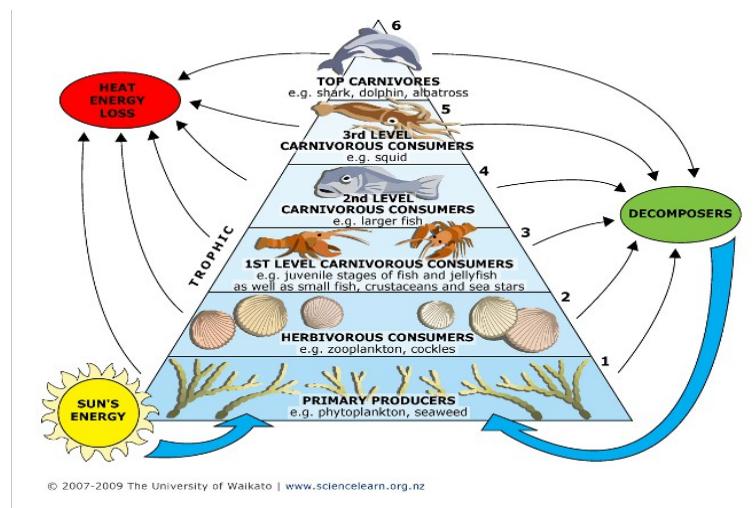
**Activity 17.** Have a look at the following picture:



Why are the biomass producers higher than the consumers?

Upright Pyramid of biomass in a Terrestrial Ecosystem

**Activity 18.** Explain how energy and matter flow through the following ecosystem:



**Activity 19.** Write a description of this ecosystem taking into account all the concepts from the unit: biocenosis, biotope (weather, land, water...) and relationships.

