

The Living World

1. Biodiversity p 303

a- **Definition:** Biodiversity describes the variety of species living in a community.

What is a species?

Two things have to be considered when measuring biodiversity:

- (1) Species richness (how many species live in a community)
- (2) The relative abundance of each species (how many there are of each compared to the total.

For biodiversity to be high we need a high number 1 and similar ratios for number 2.

Example: Determine which community has a higher biodiversity.

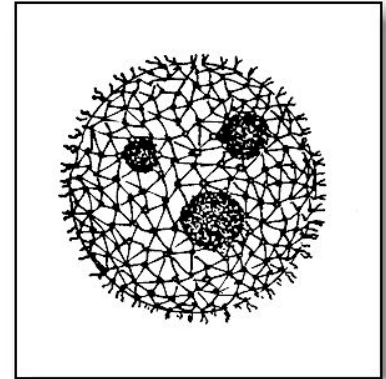
Community	Species	Number of species	Total number	Relative abundance
Section of Parc National de la Yamaska	Spiders	210*	8000*	
	Maple, balsam fir, hemlock, birch	40*	100 000	
	mammals	35*	2000	
	birds	230*	?	
20 Square km in Montreal	Homo sapiens	1	18000	
	Maple trees	1	1000	
	spiders	12	9000	
	linden	1	800	
	Sewer rats	1	18000	
	birds	5	?	

- *= estimates by biologists; no * = my guess

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2. Trophic Relationships

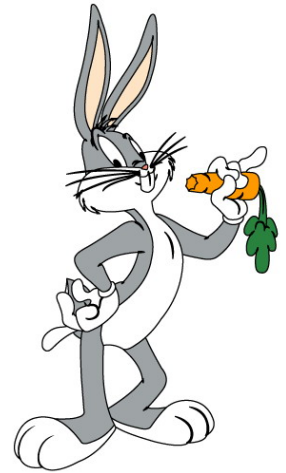
- Describes the trophic levels (producers, consumers, decomposers)
- Explains the relationships between the trophic levels of a food web



1. a) What is a **producer**? Give examples.

b) Why is a producer said to convert inorganic matter into organic matter? Give examples.

2. a) What is a **consumer** in an ecological context?

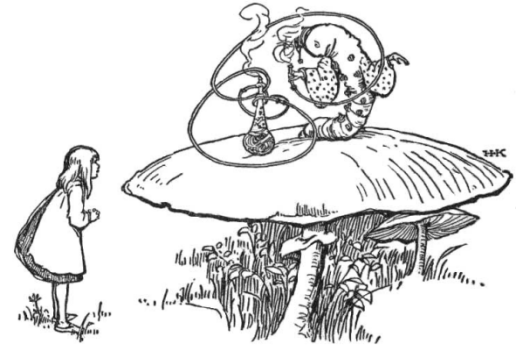


b) What is the difference between a first order, second order consumer and an omnivore?



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3. What is a **decomposer**? Give examples.



4. **Trophic relationships** are the feeding connections among the living organisms in an ecosystem.

What is an ecosystem? It's a community of living organisms (plants, animals and microbes) including the nonliving parts of their environment (air, water and minerals). They all interact as a system.

Example Draw a food web for the following:

Hare, fox, snake, fungi, bacteria, grasshopper, termite, autotrophs (photosynthesizers), shrew, woodpecker, field mouse,

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Exercises

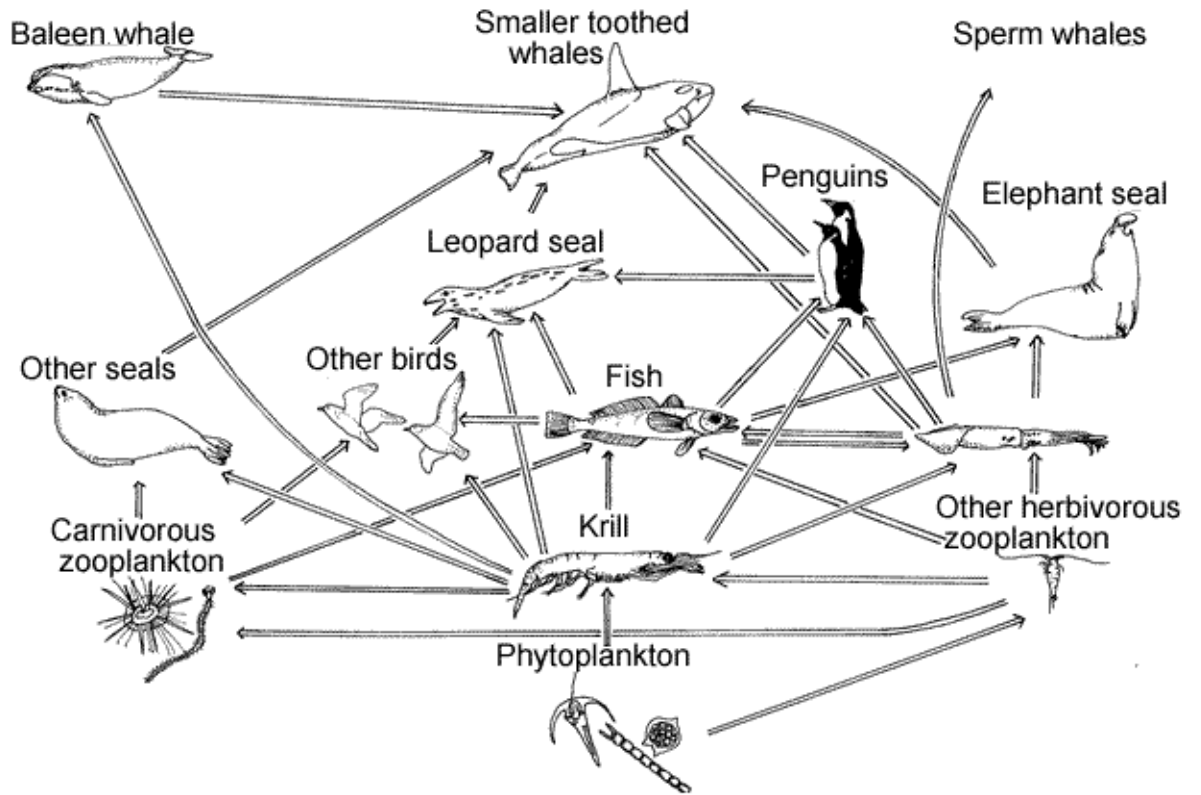
1. Why do all humans belong to the same species? List evidence.
2. What is biodiversity?
3. How is biodiversity measured?
4. a) Give examples of the different species of plants found in a lawn that has not been treated with weed killer.
b) Do the same for a lawn that has been treated.
c) Which has the greater biodiversity?
5. What is the energy source of producers?
6. What carbon-containing inorganic gas is needed by most producers?
7. What nitrogen containing ion is also needed by producers?
8. What organic material is the primary product of producers?
9. Give an example of the primary producer found in deserts.
10. What first order consumers are found in temperate forests?
11. A road runner`s consists of 90% of animal matter (insects, scorpions, lizards, snakes, rodents and other small birds) and the remainder is fruit and seeds.

Why isn't the roadrunner a second order consumer?



12. a) Aside from fungi, what other decomposers exist in nature?
b) In what cycles do decomposers play a role in? Give examples.
13. Use the food web to identify two mammals that are secondary consumers.

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14. Which animal wastes the most energy if you consider all the trophic level exchanges needed to feed it?
15. What factors can affect primary productivity in the sea?

3. Disturbances

A-Definition: a disturbance is an event that damages an ecosystem, possibly killing organisms or change the availability of food and water.

Example Think of disturbances that can occur ...

- a) In a Quebec winter
- b) In the spring in Quebec
- c) In the spring in Texas
- d) In the fall in Florida and elsewhere on the North Atlantic coast.

B- Types of Disturbances

1. Natural Disasters

Examples:

2. Human Disturbances

Examples:

C- Ecological succession

Definition:a series of changes in an ecosystem that occur following a disturbance

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Exercises

1. Using the internet find an example of a recent natural disaster.
2. Using the internet find an example of a recent human disturbance.
3. Describe the impact of a volcanic eruption on ecosystems. See <http://volcano.oregonstate.edu/how-do-volcanoes-affect-plants-and-animals>
4. Describe the impact of strip mining on a mountain top. What do you think will happen when sediment from the mountains ends up in valley streams? What will happen to biodiversity if large parts of forests are cut?
5. Find an example of ecological succession associated with
 - a) a natural disaster such as a fire. See http://en.wikipedia.org/wiki/File:Secondary_Succession.png
(if the above does not work see big picture in the Wikipedia article on ecological succession)
 - b) The cutting down of part of a forest to make a shopping mall.

The Living World The Material World The Technological World

Xxxxxx = not on exam

Ecology

– *Study of populations*
(*density, distribution, biological cycles*)

Dynamics of communities

– Biodiversity
– Disturbances

Dynamics of ecosystems

– Trophic relationship

– *Primary productivity*
– *Material and energy flow*
– *Chemical recycling*

The Earth and Space

Biogeochemical cycles
– Carbon cycle

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– *Nitrogen cycle*

Climate zone

– *Factors that influence the distribution of biomes*

– *Marine biomes*

– *Terrestrial biomes*

Lithosphere

– *Minerals*

– **Permafrost**

– **Energy resources---geothermal,fossil fuels**

– *Soil profile (horizons)*

Hydrosphere

– **Catchment area**

– **Ocean circulation**

– **Glacier and pack ice**

– **Salinity**

– **Energy resources**

Atmosphere

– **Greenhouse effect**

– *Atmospheric circulation*

– *Air mass*

– *Cyclone and anticyclone*

– **Energy resources**

Space

– *Solar energy flow*

– *Earth-Moon system (gravitational effect)*

Mechanical engineering

–Characteristics of the linking of mechanical parts

– Guiding controls

– Construction and characteristics of motion transmission systems

(friction gears, pulleys and belt, gear assembly, sprocket wheels and chain, wheel and worm gear)

– Speed changes

– Construction and characteristics of motion transformation systems (screw gear system, cams, connecting rods,

cranks, slides, rotating slider crank mechanisms, rack-and-pinion drive)

Electrical engineering

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- Power supply
- Conduction, insulation and protection
- Control
- Transformation of energy (electricity and light, heat, vibration, magnetism)

Materials

- Constraints
- Characteristics of mechanical properties
- *Types and properties*
- *Plastics (thermoplastics, thermosetting plastics)*
- *Ceramics*
- *Composites*
- Modification of properties (degradation, protection)

Physical properties of solutions

- Concentration (g/L, %, ppm)
- Electrolytes
- pH scale
- *Electrolytic dissociation*
- Ions
- Electrical conductivity

Chemical changes

- Combustion
- Photosynthesis and respiration (carbon cycle)
- Acid-base neutralization reaction
- Balancing chemical equations
- Law of conservation of mass

Organization of matter

- Rutherford-Bohr atomic model
- Lewis notation
- Groups and periods in the periodic table

Electricity and electromagnetism

- Electrical charge
- Static electricity
- Ohm's law
- Electrical circuits
- Relationship between power and electrical energy

Electromagnetism

- Forces of attraction and repulsion
- *Magnetic field of a live wire*

Transformation of energy

- Law of conservation of energy

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- Energy efficiency
- Distinction between heat and temperature