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Warm up:

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Study Notes/Questions

## Levels of Organization

- \_\_\_\_\_ - simplest level, a single living thing
  - surviving in a habitat \_\_\_\_\_
- \_\_\_\_\_ - second level, all organisms of the same species that share a \_\_\_\_\_
- \_\_\_\_\_ - all of the populations in a particular area that interact \_\_\_\_\_
- \_\_\_\_\_ - the living community and the surrounding non-living \_\_\_\_\_
- \_\_\_\_\_ - total area on earth where living things are found \_\_\_\_\_

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## Biotic and Abiotic Factors

- \_\_\_\_\_ - living components of the ecosystem
  - includes \_\_\_\_\_
- \_\_\_\_\_ - non-living (physical and chemical) components in the environment
  - include \_\_\_\_\_

## 2.1 Biotic and Abiotic Factors in Ecosystems

### Study Notes/Questions

These factors influence each other in a constantly changing balance called a

\_\_\_\_\_

\_\_\_\_\_ – the most critical factor in determining the type of organism that exists in an ecosystem (e.g. \_\_\_\_\_ only grow where there is \_\_\_\_\_ )

Summary: (two to three sentences summarizing this section)

### Self-Reflection Questions:

1. Describe one thing that you knew about this topic before today.

2. Describe one thing you learned about this topic today.

### Activity 2.1 # 1 – 5

1. Compare the following terms. Give both similarities and differences.

(a) ecosystem and habitat

(b) organism and population

(c) biosphere and community

(d) ecosystem and community

**2.** What level of organization within the biosphere is represented by each of the following?

- (a) a herd of water buffalo
- (b) the plants and animals on the Serengeti plain of Africa
- (c) a lake and all of the organisms that live within it
- (d) a grizzly bear
- (e) sunflowers growing in a garden

**3.** Which level of organization is being considered in each of the following ecological studies?

- (a) observing how the talons of a bald eagle are used to capture food
- (b) observing the migratory pattern of a flock of snow geese
- (c) observing the impact of a hazardous chemical spill on living things in a nearby stream
- (d) observing the nest-building behaviour of hummingbirds
- (d) observing the effect of fleas on the health of house pets
- (e) measuring the changes in oxygen levels of a small lake during periods of rapid plant growth

**4.** Why is the science of ecology important?

**5.** List at least three characteristics of ecosystems that make them challenging to understand in detail.

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Study Notes/Questions

## Ecological Roles and Relationships

An \_\_\_\_\_ is a complex network of interactions.

All organisms must take in \_\_\_\_\_.

Nutrients are elements and compounds that organisms need \_\_\_\_\_

Organisms can be \_\_\_\_\_ in ecosystems.

### Producers

Also called \_\_\_\_\_

Make their own food (usually by photosynthesis using \_\_\_\_\_)

eg: \_\_\_\_\_

### Consumers

Also called \_\_\_\_\_

Eat (consume) other \_\_\_\_\_ and break it down to get energy

**Herbivores** or \_\_\_\_\_ eat only producers

**Carnivores** or \_\_\_\_\_ eat other consumers

\_\_\_\_\_ are consumers that eat both producers and consumers

Eventually nutrients cycle back into the \_\_\_\_\_.

## 2.2 Ecological Roles and Relationships

Study Notes/Questions

### Detritivores and Decomposers

\_\_\_\_\_ – organisms that feeds on waste material in the ecosystem including dead bodies, plant debris and animal feces (e.g. \_\_\_\_\_)

\_\_\_\_\_ - organisms that break down complex molecules in waste into simpler molecules (eg. \_\_\_\_\_)

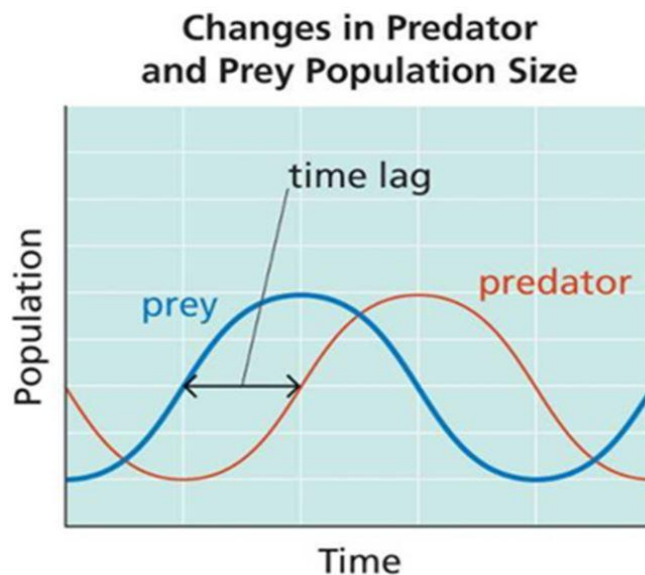
### Predators

Consumers that capture and kill a prey animal

Usually think of mountain lions, tigers, etc, but also includes \_\_\_\_\_

\_\_\_\_\_ between populations of predator and prey

When predators reduce populations of prey, their own numbers decrease



Summary: (two to three sentences summarizing this section)

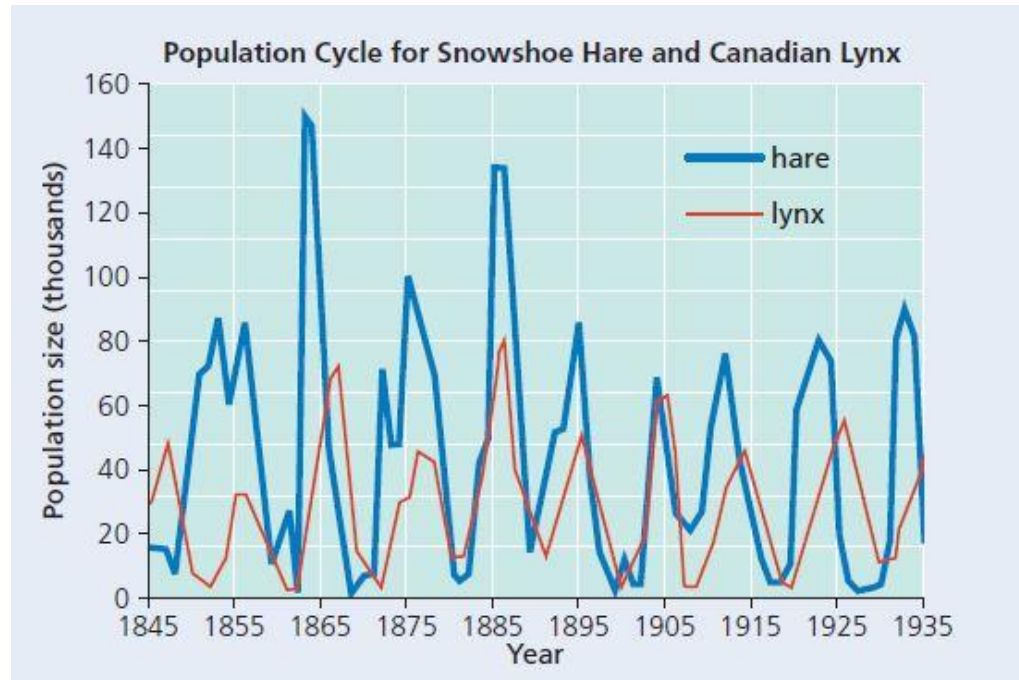
**Self-Reflection Questions:**

1. Describe one thing that you knew about this topic before today.
2. Describe one thing you learned about this topic today.

**Activity 2.2 # 1 – 7**

1. The word “autotroph” literally means “self feeder.” Why is this term appropriate in reference to producers?
2. The word “heterotroph” literally means “other feeder.” Why is this term appropriate in reference to consumers?
3. How does a consumer differ from a decomposer?
4. What role do decomposers fill in an ecosystem?
5. List five producers and five consumers that live near your home.
6. Compare a herbivore, a carnivore, and a detritivore. Indicate both similarities and differences.

7. The interaction between the snowshoe hare and the Canadian lynx has been documented for over 100 years.



- (a) In what ways is the predator–prey cycle shown above similar to the idealized model shown in your notes?
- (b) In what ways is it different?
- (c) Suggest factors that may be responsible for any difference you see.

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Study Notes/Questions

## Symbiosis

\_\_\_\_\_ refers to any close relationship between two different species.

There are \_\_\_\_\_ of symbiotic relationships:

1. \_\_\_\_\_ is a relationship in which both species obtain some benefit from the interaction.

e.g. a lichen is a symbiotic relationship between a \_\_\_\_\_

- the fungus \_\_\_\_\_ the algae

- the algae \_\_\_\_\_ for the fungus

2. \_\_\_\_\_ is an interaction in which one organism benefits while the other is unaffected.

e.g. \_\_\_\_\_ feeding on plankton in passing water

3. \_\_\_\_\_ occurs when one organism (\_\_\_\_\_) benefits by living and feeding on, or in, the body of another organism (\_\_\_\_\_).

- harms host, but usually slowly \_\_\_\_\_

e.g. \_\_\_\_\_ lives in digestive system of mammals

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Summary: (two to three sentences summarizing this section)



## 2.3 Symbiosis

<b>Self-Reflection Questions:</b>	1. Describe one thing that you knew about this topic before today.	2. Describe one thing you learned about this topic today.
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### Activity 2.3 # 1 – 6

- Which type of symbiotic relationship is illustrated by each of the following situations?
  - a small tick that slowly sucks the blood from a black tail deer
  - a grizzly bear that leaves the bodies of salmon as food for birds and small mammals
  - a bat that pollinates a plant as it feeds on nectar from a flower
- In which of the symbiotic relationship do both organisms benefit?
- Streptococcus* bacteria in the human mouth digest sugars and produce lactic acid that dissolves tooth enamel, causing cavities. Which of the following types of symbiotic relationship is represented by this example?
- Corynebacterium* are microscopic bacteria that live on the surface of the human eye. They feed off the secretions and discarded cells and do not seem to affect the human they are living on. Which of the following types of symbiotic relationship is represented by this example?
- Helicobacter pylori* is a bacteria that can thrive in stomach acid, where they are known to cause stomach ulcers. Which of the following types of symbiotic relationship is represented by this example?
- Biologists estimate that as many as 25 % of all living things are parasites. Suggest several characteristics that may allow them to be so successful.

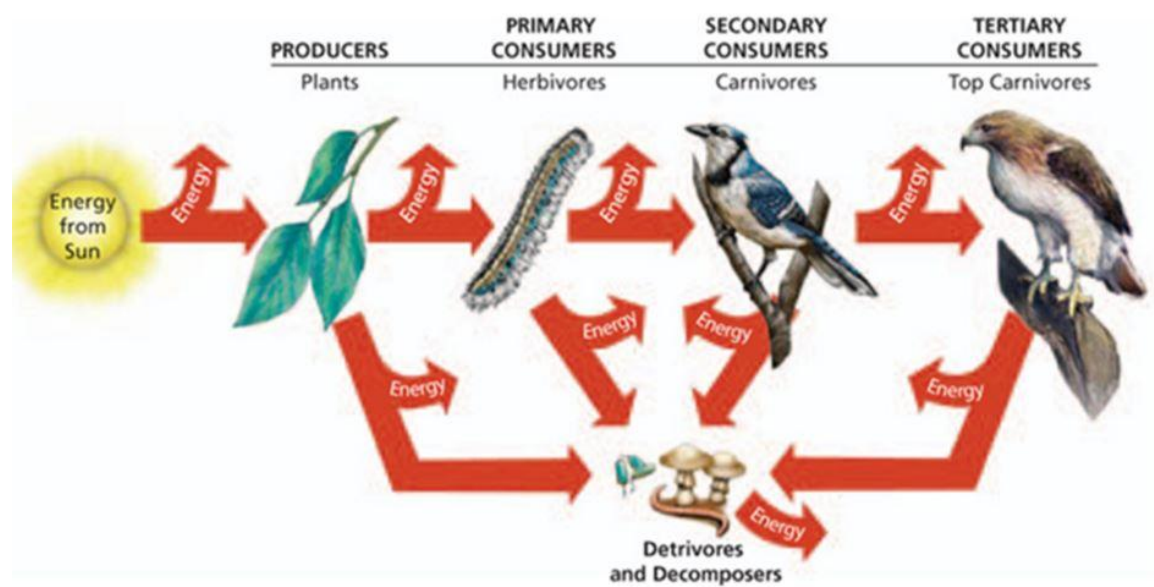
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## Study Notes/Questions

**Trophic Levels and Energy Flow**

Nutrients are \_\_\_\_\_ in the ecosystem, but energy only moves in \_\_\_\_\_ only from \_\_\_\_\_

Some energy is lost to the surroundings at each level

**Trophic Levels**

\_\_\_\_\_ describes the position of the organism in relation to the \_\_\_\_\_ in an ecosystem.

Organisms that eat the same type of food belong to the same \_\_\_\_\_

## 2.4 Trophic Levels and Energy Flow

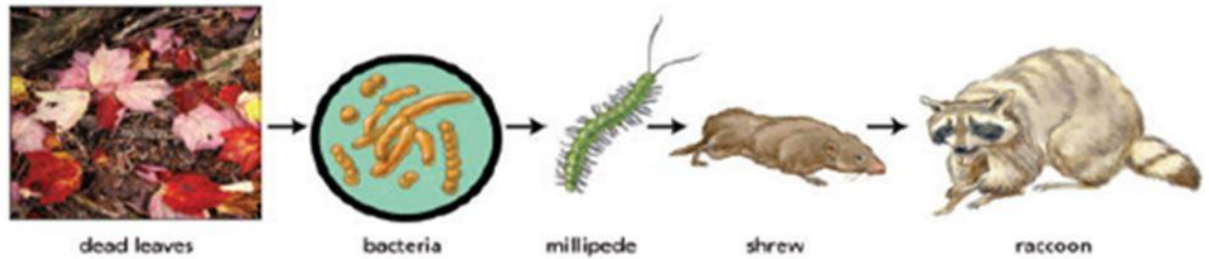
### Study Notes/Questions

### Food Chains and Food Webs

\_\_\_\_\_ - a single pathway taken by nutrients and energy through the trophic levels.

Arrows show that the first organism is \_\_\_\_\_

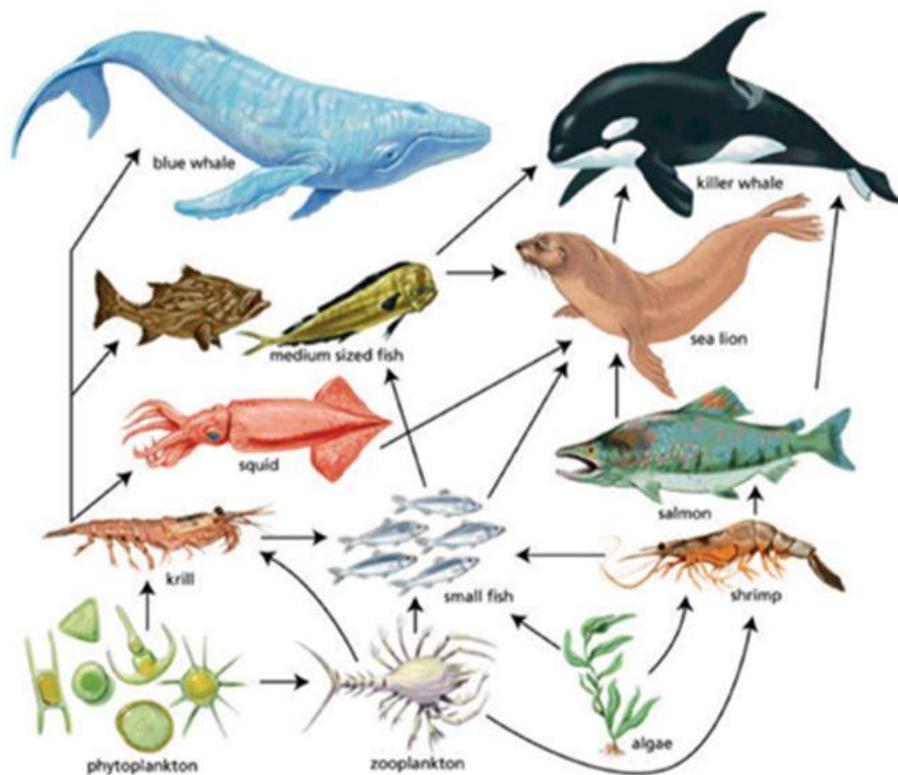
\_\_\_\_\_ at one level affects other levels.



Some sources show decomposers at the end of most food chains, but we will consider their interactions separately.

In reality, ecosystems have more complex \_\_\_\_\_, showing the different cross-linked food chains.

A single organism may eat different foods, and be \_\_\_\_\_ for more than one \_\_\_\_\_



## 2.4 Trophic Levels

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Summary: (two to three sentences summarizing this section)

Self-Reflection Questions:	1. Describe one thing that you knew about this topic before today.	2. Describe one thing you learned about this topic today.

### Activity 2.4 # 1 – 9

1. Why is sunlight essential to most food chains and food webs?
2. Explain the term “trophic level” in your own words.
3. Define and give three examples of a top carnivore.
4. Using a T-chart, compare and contrast food webs and food chains.
5. Why is energy flow in an ecosystem considered a one-way process?

6. Consider the food chain shown.



(a) How would a decline in the number of frogs affect each of the other organisms in this food chain?

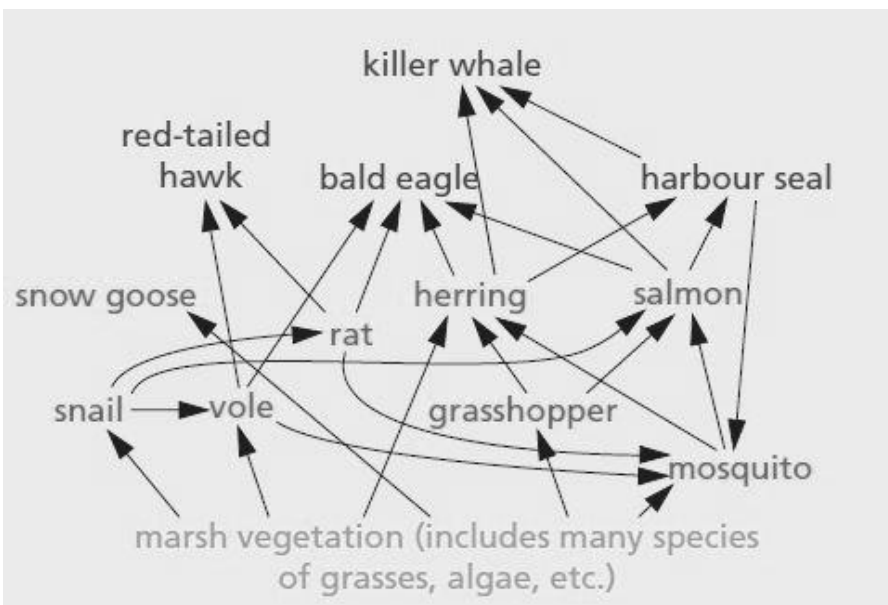
(b) Redraw this food chain with the addition of bacteria, in order to show the role of decomposers in this community.

7. (a) What type of food is eaten by a consumer in the second trophic level?

(b) What type of food is eaten by a consumer in the third trophic level?

8. Is it possible for an organism to belong to more than one trophic level? Explain, using an example and description.

9. Use the food web shown, answer the following questions:



(a) Which organisms are the top carnivores in this food web?

(b) Which organisms are the producers in this food web?

(c) If the population of grasshoppers was eliminated from the area, what organisms would lose one of their food sources?

(d) Which organisms in the food web could be classified as primary consumers? Which organisms in the food web could be?

## 2.5 Ecological Pyramids

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### Study Notes/Questions

Ecologists use three different types of ecological pyramids to illustrate ecosystems:

\_\_\_\_\_ : represents how much energy is available in each trophic level

- usually only about \_\_\_\_\_ is passed on to next level. (limits the number of trophic levels – \_\_\_\_\_)

- rest is used by organisms for \_\_\_\_\_

\_\_\_\_\_ : represents the actual number of organisms present in each trophic level

- shape depends on \_\_\_\_\_

## 2.5 Ecological Pyramids

### Study Notes/Questions

\_\_\_\_\_ : represents the total mass of living things in each trophic level

- usually standard \_\_\_\_\_

- \_\_\_\_\_ (small mass of producers, but they reproduce very rapidly)

Summary: (two to three sentences summarizing this section)

### Self-Reflection Questions:

1. Describe one thing that you knew about this topic before today.

2. Describe one thing you learned about this topic today.

## 2.5 Activity

1. Why are producers essential to a stable ecosystem?
2. List two factors that are responsible for the small percent of energy that passes from one trophic level to the next.
3. Why can more herbivores than carnivores live in equal-sized ecosystems?
4. On average, how much energy is available to organisms in the third trophic level if 5000 kJ were available at the first trophic level?
5. Describe the effects of removing all of the herbivores from an ecosystem. Which organisms would be affected and how?



6. Explain why ecosystems usually contain only a few trophic levels.
7. Why do energy pyramids have the specific shape that they do?
8. Explain the similarities and differences between an ecological pyramid of energy, a pyramid of biomass, and a pyramid of numbers for a coniferous forest.
9. You have the option of choosing between a beef steak or a plate of beans and rice. Both meals provide you with 1000 kJ of energy. How will your choice affect the amount of energy required from the ecosystem?