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3.3 Energy Flow in Ecosystems

Lesson Objectives

- Trace the flow of energy through living systems.
- Identify the three types of ecological pyramids.

Lesson Summary

Food Chains and Food Webs Energy flows through an ecosystem in one direction from primary producers to various consumers.

- A **food chain** is a series of steps in which organisms transfer energy by eating and being eaten. Producers, such as floating algae called **phytoplankton,** are at the base of every food chain.
- A **food web** is a network of all the food chains in an ecosystem. Food webs are very complex. Small disturbances to one population can affect all populations in a food web. Changes in populations of **zooplankton,** small marine animals that feed on algae, can affect all of the animals in the marine food web.

Trophic Levels and Ecological Pyramids Each step in a food chain or food web is called a **trophic level**. Producers make up the first trophic level. Consumers make up higher trophic levels. Each consumer depends on the trophic level below it for energy.

An **ecological pyramid** is a diagram that shows the relative amounts of energy or matter contained within each trophic level in a food chain or food web. Types of ecological pyramids are pyramids of energy, pyramids of biomass, and pyramids of numbers:

- Pyramids of energy show relative amounts of energy available at different trophic levels.
- Pyramids of **biomass** show the total amount of living tissue at each trophic level.
- A pyramid of numbers shows the relative numbers of organisms at different trophic levels.

Food Chains and Food Webs

1. Complete the table about feeding relationships.

Feeding Relationships	
Relationship	**Description**
Food Chain	
Food Web	

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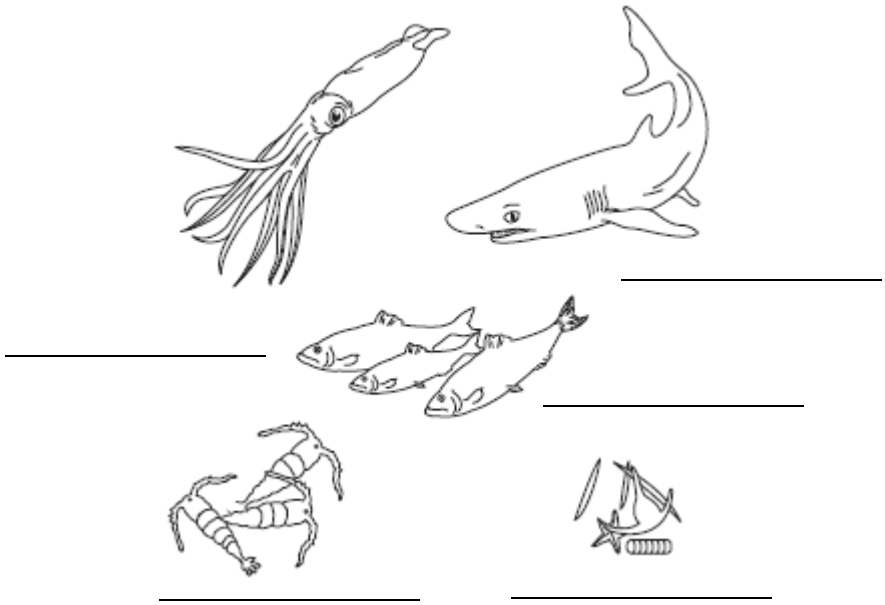
Use the food chain to answer Questions 2–4.

2. Draw arrows between the organisms to show how energy moves through this food chain. Write *producer, herbivore,* or *carnivore* under each organism.



3. Explain how energy flows through this food chain. _____

_____

_____

_____

4. What would happen to this food chain if a disturbance caused a serious decline in the shark population? _____

_____

_____

_____

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Trophic Levels and Ecological Pyramids

Write TRUE in the blank if the statement is true. If the statement is false, write the correct term in the blank.

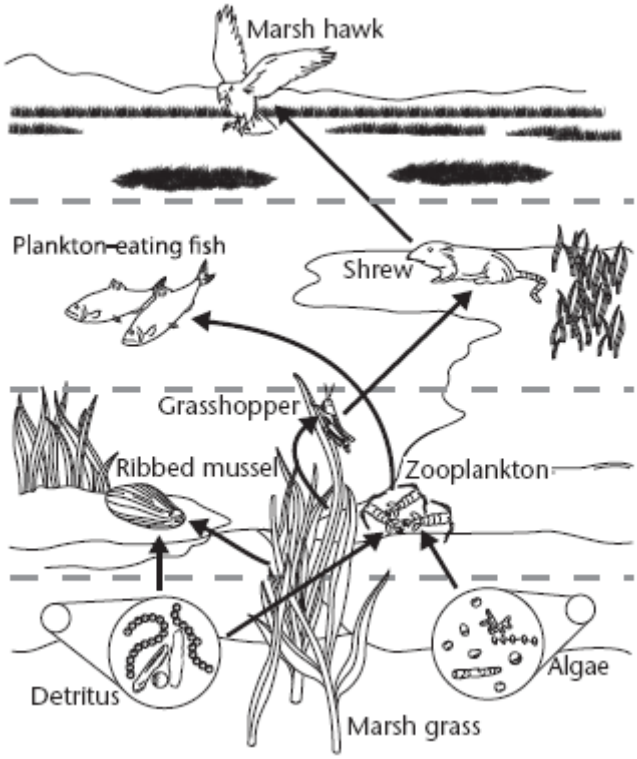
_____ **6.** Primary consumers always make up the first trophic level in a food web.

_____ **7.** Ecological pyramids show the relative amount of energy or matter contained within each trophic level in a given food web.

_____ **8.** On average, about 50 percent of the energy available within one trophic level is transferred to the next trophic level.

_____ **9.** The more levels that exist between a producer and a given consumer, the larger the percentage of the original energy from producers is available to that consumer.

Use the diagram to answer Questions 10–17.



Match the organism with its trophic level. There are more questions than choices so (DUH!!) they might be used more than once.

Organism

_____ **10.** algae

_____ **11.** grasshopper

_____ **12.** marsh grass

_____ **13.** marsh hawk

_____ **14.** plankton-eating fish

_____ **15.** ribbed mussel

_____ **16.** shrew

_____ **17.** zooplankton

Trophic Level

A. primary producer

B. first-level consumer

C. second-level consumer

D. third-level consumer

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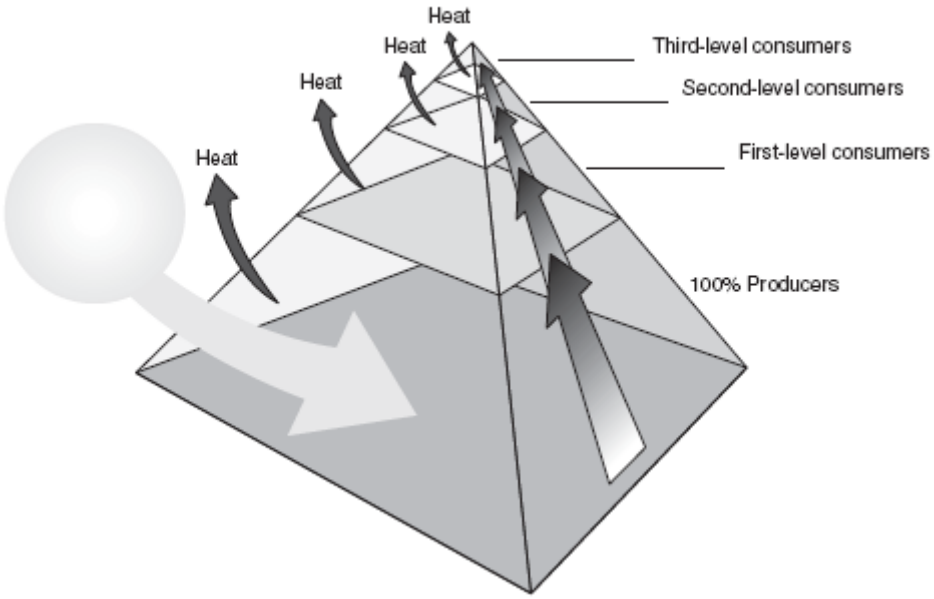
18. Complete the energy pyramid by writing the source of the energy for the food web and how much energy is available to first-, second-, and third-level consumers.



For Questions 19–21, complete each statement by writing the correct word or words.

19. A pyramid of _____ illustrates the relative amount of living organic matter available at each trophic level in an ecosystem.

20. A pyramid of _____ shows the relative numbers of individual organisms at the trophic levels in an ecosystem.

21. A pyramid of _____ shows the relative amounts of energy available at the trophic levels of a food chain or food web