South Carolina Aquarium

3-5 Animals are Consumers

Overview

Focus Question
How do animals get the food energy they need to live?

Activity Synopsis
Students will examine and categorize different food items that people eat to learn the concepts: consumer, herbivore, carnivore and omnivore.

Time Frame
One hour

Objectives
The learner will be able to:

- Define the terms consumer, herbivore, carnivore and omnivore.
- Identify organisms that are consumers, herbivores, carnivores and omnivores and the foods they might eat.
- Given an organism, create a food chain in which that organism could be found in nature. Label each organism in the food chain as a producer or consumer. Label each consumer in the food chain as an herbivore, carnivore or omnivore.

Student Key Terms

- carnivore
- consumer
- herbivore
- omnivore

Teacher Key Terms

- adaptation

Standards

2014 Academic Standards and Performance Indicators for Science

3rd Grade: 3.S.1A.8, 3.L.5A.2
4th Grade: 4.S.1A.8, 4.L.5A.1, 4.L.5B.3
5th Grade: 5.S.1A.8, **5.L.4A.2**, **5.L.4B.1**, 5.L.4B.3

*** Bold standards are the main standards addressed in this activity**

Third Grade Performance Indicators
3.S.1A.8 Obtain and evaluate informational texts, observations, data collected, or discussions to (1) generate and answer questions, (2) understand phenomena, (3) develop models, or (4) support explanations, claims, or designs. Communicate observations and explanations using the conventions and expectations of oral and written language.
3.L.5A.2 Develop and use a food chain model to classify organisms as producers, consumers, and decomposers and to describe how organisms obtain energy.

Fourth Grade Performance Indicators
4.S.1A.8 Obtain and evaluate informational texts, observations, data collected, or discussions to (1) generate and answer questions, (2) understand phenomena, (3) develop models, or (4) support explanations, claims, or designs. Communicate observations and explanations using the conventions and expectations of oral and written language.
4.L.5A.1 Obtain and communicate information about the characteristics of plants and animals to develop models which classify plants as flowering or nonflowering and animals as vertebrate or invertebrate.

4.L.5B.3 Construct explanations for how structural adaptations (such as methods for defense, locomotion, obtaining resources, or camouflage) allow animals to survive in the environment.

Fifth Grade Performance Indicators

5.S.1A.8 Obtain and evaluate informational texts, observations, data collected, or discussions to (1) generate and answer questions, (2) understand phenomena, (3) develop models, or (4) support explanations, claims, or designs. Communicate observations and explanations using the conventions and expectations of oral and written language.

5.L.4A.2 Obtain and communicate information to describe and compare the biotic factors (including individual organisms, populations, and communities) of different terrestrial and aquatic ecosystems.

5.L.4B.1 Analyze and interpret data to explain how organisms obtain their energy and classify an organisms as producers, consumers (including herbivore, carnivore, and omnivore), or decomposers (such as fungi and bacteria).

5.L.4B.3 Construct explanations for how organisms interact with each other in an ecosystem (including predators and prey, and parasites and hosts).

Cross Curricular Standards

South Carolina College and Career Standards for ELA

Inquiry (I) – 3-1.1, 3-2.1, 4-1.1, 4-2.1, 5-1.1, 5-2.1

Communication (C) – 3-1.2, 4-1.2, 5-1.2

Common Core ELA Standards

Writing – 3.1, 3.2, 3.3, 4.1, 4.2, 4.3, 5.1, 5.2, 5.3

Speaking/Listening – 3.1, 4.1, 5.1

Background

Key Points

Key Points will give you the main information you should know to teach the activity.

- **Consumers** are organisms that must eat other organisms to receive the food energy and nutrients they need to survive. All members of the Animal kingdom are considered consumers.
- **Herbivores** are consumers that eat plants. **Carnivores** are consumers that eat other animals. **Omnivores** are consumers that eat both plants and animals.
- Producers are organisms that can make their own food energy. All plants are producers. They are the original source of food energy for consumers and without them, consumers could not survive.
- A food chain shows how food energy is passed from one organism to another. Because energy is used and lost as it passes between the organisms in a food chain, there are a limited number of organisms in a food chain. Food chains always starts with a producer, then move to an herbivore (a consumer) and then to a carnivore (a consumer) and sometimes to a second carnivore (a consumer).

Detailed Information

Detailed Information gives more in-depth background to increase your own knowledge, in case you want to expand upon the activity or you are asked detailed questions by students.

All organisms need energy and nutrients to survive. Plants are able to gather water, air, nutrients and sunlight with their leaves and their roots to make the food energy they need to survive. Plants, and organisms like them, are known as producers. Because of their self-sufficiency, it is conceivable for a natural world to exist in which there were only producers. But many organisms do not make their own food and have developed **adaptations** that allow them to get the things they need by consuming other organisms. These eating organisms are known as **consumers**. All the animals on the earth, including humans, are considered consumers.

Consumers need space, shelter, water, air, energy and nutrients to survive. Space provides the consumer room to live and shelter provides it protection. Water is necessary for animals because it is the most abundant molecule that makes up their bodies. It is part

of all of the body fluids and is a solvent for the chemical compounds in the body. Oxygen allows an organism to release the energy stored in food compounds. Energy is necessary to give the body the fuel it needs to perform its life functions, such as growth, maintenance and reproduction. Nutrients are necessary to make the chemical compounds that make up the structural components of the body as well as to synthesize enzymes, which help to perform life processes. In consumers, water can be acquired by drinking, and oxygen by respiration, but both nutrients and energy can only be acquired by eating other organisms.

Some consumers eat only plants, some consumers eat only animals and some consumers eat both. Consumers that eat only plants are known as **herbivores**. Herbivores feed on the leaves, flowers, roots and fruits of plants. Examples are deer, rabbits and grasshoppers. Consumers that eat only animals are known as **carnivores**. Examples are sharks, alligators and foxes. Most carnivores feed primarily on herbivores, while some will eat other carnivores. Animals that eat both plants and animals are known as **omnivores**. Examples are raccoons, songbirds and humans.

Because of the different ways they acquire food energy, consumers have very different adaptations than plants. One of them is locomotion. It is hard to catch something to eat if you are standing in one place, though some animals have figured out ways to do that. The ability to move around, to find plants or to capture prey, is an adaptation that the self-sufficient plants have not needed to develop. Animals, though, have developed locomotion, and along with this the nervous and muscular system that allows this to happen. Through locomotion, animals can find the food they need to survive.

Once a herbivore finds a plant it wishes to consume, it does not need adaptations to keep the plant still while it is feeding. With carnivores, this is not the case. Carnivores have developed many different adaptations to help them to hold and/or kill their prey. The sticky, extendable tongue of a frog, the sharp teeth of a shark, the venomous fangs of a rattlesnake, the sucker-covered arms of an octopus, the talons and beak of an eagle and the tool-making and tool-using capacity of humans are all adaptations that allow these carnivores to keep prey still while they are feeding.

A blade of grass or the flesh of a wildebeest will not do a consumer much good if it cannot be broken down into usable chemical compounds. Because of this, consumers have developed many adaptations for breaking down food into smaller parts. Teeth are an example of this. The sharp teeth of carnivores are not actually adapted for chewing. They are adapted for holding the prey until it can be swallowed whole, or for tearing the animal into smaller chunks that can then be swallowed. Other animals, such as birds have beaks for holding and tearing. Crustaceans have shredding devices in their mouths. Mammals are the only animals capable of true chewing. Though canine and incisor teeth are adapted for holding and tearing, the molars are adapted for crushing and grinding, and other animals do not have these. To allow them to eat both plants and animals, omnivores have adaptations that allow them to hold, tear and to grind food.

Herbivores have to have special adaptations to help them to tear through the tough cellulose cell walls of plants. The molars of mammal herbivores are developed for this purpose. They have enamel ridges that allow them to more effectively grind plant matter. Their molars are also usually wide and corrugated. Invertebrate herbivores have scraping mouthparts or grinding mandibles that perform the same function as a mammal's molars. Plant material would not be able to be digested without these adaptations, because the enzymes in animals' digestive systems cannot break down the tough cellulose cell walls of plant cells. By tearing through the cell walls with teeth or mandibles, this allows the consumer's digestive enzymes to break apart the cell contents. Because they do not have the correct adaptations, carnivores cannot digest enough plant matter to live on and they depend on eating other animals to get what they need.

After mechanically breaking down food with teeth or other adaptations, consumers have digestive systems that allow them to chemically break down food. The digestive tracts of consumers contain enzymes, which are biological catalysts that can break down food into absorbable parts. Proteins are broken down into amino acids, carbohydrates are broken down into simple sugars and fats are broken down into fatty acids and glycerol. These simpler compounds can then be absorbed in the blood stream and carried to all of the cells in the body for use.

Because consumers are dependent on producers for survival, there will always be more producers in a community than consumers. If consumers outnumbered the producers in a community, the herbivores would quickly eat up all the producers and then starve because there would be no more food available to them. Once the herbivores were gone, the carnivores would soon die.

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Consumers also have to outnumber producers because energy is always lost in the transfer from one organism to another. Only a small amount of the food energy made by the producer is passed to the consumer who eats it. For this reason the consumer will need to eat more than one producer to get the food energy it needs. If that consumer is eaten, only a small amount of its food energy passes on to the carnivore that ate it. This is why food chains are often drawn as food pyramids, showing that energy and number of organisms are always highest at the bottom of the food chain, and always lowest at the top.

Food chains help illustrate the interdependence of all living things. Consumers could not survive if it were not for the existence of producers. Carnivores could not exist if it were not for the existence of herbivores. Consumers depend on other organisms because they cannot get what they need to survive without them.

Procedure

Materials

- Food items (plastic or real) or pictures depicting food
- Animal and plant pictures
- Plastic freezer bags
- Paper
- Writing or drawing utensils

Procedure

1. (This activity works well if conducted after the "Plants are Producers" activity). Discuss with students how plants are able to make their own food energy from water, air and sunlight. Ask students if they can make their own food energy like plants. Ask them how they get their energy. Introduce the concept of consumers (organisms that get their energy and nutrients by eating other organisms) to the students and explain that they, like other animals, are consumers.

2. Divide the students into five groups. Give each group a bag of items depicting food, such as potatoes, lettuce, bananas, hamburgers, fried chicken. Have children identify each item. Then ask the students, "If you were going to eat one of these items, which would it be?" Have the students choose one item and record on paper what they chose. Ask them to discuss if the food they chose came from a plant or an animal. Have them record their response on their data sheet.

3. Introduce the concepts herbivore and carnivore. Have students think about which food item they chose. If they chose a plant item, tell the students that they are like herbivores. If they chose an animal item, tell the students they are like carnivores. Have them record on their data sheet if they are an herbivore or carnivore. Have some of the students name out loud the food item they picked. Have the rest of the class determine whether that student would be a carnivore or an herbivore.

4. Have the students return their food items to the bag. Have them pick out their two favorite food items from the bag. Have the students write the two food items down on their data sheet. Ask students to raise their hands if they picked both a plant and an animal item. Explain the concept of omnivores.

5. Wrap up the lesson. Review what consumers, herbivores, carnivores and omnivores are. Show pictures of some familiar plants and animals and have students identify them as producers or consumers. If the organism is a consumer, have the student identify the organism as an herbivore, carnivore or omnivore. (Examples of producers: dandelions, oak trees, grass, azaleas. Examples of herbivores: cows, deer, grasshoppers, rabbits. Examples of carnivores: wolves, sharks, owls, frogs. Examples of omnivores: Humans, raccoons, blue crabs, shrimp.)

Follow-up Questions

- Why do some animals have sharp teeth, some animals have flat teeth and some have both? Is this a clue as to whether they are a carnivore, herbivore or omnivore?
- What would happen if all animals were only carnivores?

- In a community would you have more plants or more herbivores? Would you have more herbivores or more carnivores?
- Can food chains be longer than 10 organisms? Why?

Cross Curricular Extensions

STEM Extension
Birds are an amazing group of animals that eat a variety of food items. Have students choose a favorite bird, research what it likes to eat and then design a beak for what it eats out of materials in the classroom. Have students report to the class the bird beak they designed and why it is shaped the way it is for what they eat.

Social Studies Extension
Have students compare a physical map of the world with a political map of the world. Have them determine where most cities are located, and whether they are on the coast, in forested areas, in deserts, in mountains or in polar regions. Ask them why they think the cities are located where they are? Ask them if they think the fact that humans are consumers might have something to do with the location of most cities. Lead them to the idea that because people are consumers, they need to be near food sources such as the ocean or farmable land in order to survive.

Math Extension
Food energy is measured in calories. Have students record how many calories they consume from plants and how many calories they consume from animals for one day. Using a bar graph, have them graph how many plant calories they consumed and animal calories they consumed. Compile all of the student's data for a bar graph that shows how many calories the class consumed collectively from plants and animals. Determine ratios of plant calories consumed to animal calories consumed and write as percentages.

English Extension
Have students read Eric Carle's book *The Very Hungry Caterpillar*. Ask them if they think all of the items in the book are really things that a caterpillar would consume. Have them research what caterpillars eat, and then write and illustrate their own story like The Very Hungry Caterpillar that shows items a caterpillar in the wild would really consume if it were hungry.

Resources

Teacher Reference Books

Audesirk, Gerald and Teresa Audesirk. *Biology: Life on Earth.* Macmillan Publishing Company, New York, 1993.
Do not be afraid of college textbooks. They are often the best sources for detailed information on general subjects such as biology and food chain ecology.

Fortey, Richard. *Life.* Vintage Books, New York, 1997.
This well-written and very interesting history of life on earth for the past 4 billion years provides insights into why and how living things developed into consumers to acquire the energy they need to survive.

Halliday, Tim. *Animal Behavior.* University of Oklahoma Press, Norman, OK, 1994.
This attractive book uses photographs and text to provide information on the varying behaviors of animals. Includes chapters on herbivores and carnivores.

Teacher Reference Videos

Attenborough, Sir David. *Trials of Life* (Video series), Turner Home Entertainment, 1995.
This is the most famous work of heralded nature documentary filmmaker Sir David Attenborough. This series shows the various behaviors animals have adapted in order to survive, including much on feeding. Though the entire series may be too advanced for elementary students, it is a wonderful resource for teachers.

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Teacher Reference Websites

Animal Planet
http://animal.discovery.com
This site contains information and interactive games on a variety of animals.

National Wildlife Federation
http://www.nwf.org/
This site contains information on this conservation society and conservation issues and education programs. It includes a kid's page.

Tim Knight's Wildlife Web
http://homepage.mac.com/wildlifeweb/
This site inks to a variety of animal related websites with sites dedicated to research, conservation, education and information.

Student Reference Books

Bennett, Paul. *Nature's Secrets: Catching A Meal.* Thomson Learning, New York, 1994.
Uses photographs and simple text to show the variety of different adaptations animals have developed to help them catch their prey.

Brooks, Bruce. *Predator!* Farrar Straus Giroux, New York, 1991.
A more in-depth look at how animals get the food they need that uses photographs and text.

Cleave, Andrew. *Hunters.* Raintree Steck-Vaughn Publishers, Austin, Texas, 1995.
Uses illustrations and simple text to show the variety of different adaptations animals have developed to help them catch their prey.

Eyewitness Science: Ecology, Dorling Kindersley, New York, 1993.
These very attractive books use photographs, illustrations and text to teach the readers about ecology, communities and the interactions of plants and animals. Includes information on food chains and producers and consumers.

Kitchen, Bert. *When Hunger Calls.* Candlewick Press, Cambridge Press , Cambridge, Massachusetts, 1994.
This beautifully illustrated book shows how twelve different animals are able to capture their prey. Includes explanatory text.

Student Fiction Books

Adams, Richard. *Watership Down.* Morrow, William & Co., 1975.
Though this book is a fantasy (it is about a group of talking rabbits) it is very realistic in its portrayal of the struggles of rabbits with finding food and avoiding predators. It is a long and is questionable if it is written at a fifth grade level (or so I'm told) but it is an excellent book.

Carle, Eric. *The Very Hungry Caterpillar.* Philomel Books, New York, 1969.
Though this book is a little too basic just to be read to these grade levels, it has applications for cross-curricular extensions (see the Assessment page of this activity).

Curricula

Aquatic Project WILD
Aquatic Project WILD is an interdisciplinary curriculum for K-12 teachers on aquatic wildlife and ecosystems. The activities cover a broad range of environmental and conservation topics.
For more information click on http://www.projectwild.org/ProjectWILDK-12AquaticcurriculumandActivityGuide.htm

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