"FOOD WEB"

QUESTION
What is a food web?

UNDERLYING CONCEPT
Animals obtain the energy they need to live from food. Organisms are connected to other organisms through food webs. A food web is a diagram of "who eats whom" for the organisms in a given area.

SKILLS
- Interconnecting ideas and information
- Investigating

OBJECTIVES
Students will be able to:
- Describe what certain organisms eat.
- Demonstrate the flow of energy through a food web.

TIME NEEDED
- 2 class periods

MATERIALS NEEDED
- Marine biology books and resources
- **Examples of Marine Food Webs**
- **Predator/prey lists**
- Crayons

VOCABULARY
food web*:* the interconnected food chains between organisms in a community
predator: an animal that captures and eats another animal
prey: an animal that is hunted and eaten by another animal
parasitism: A relationship between two organisms in which one (the parasite) infects or attaches to another (the host), and the host organism is harmed in the process.
herbivores: organisms that eat plants, algae or phytoplankton

BACKGROUND INFORMATION
Almost all animals must eat other organisms to obtain energy. Animals do not generally eat just one thing, nor are they eaten by only one thing. This means that each organism, through feeding, is interconnected to many different organisms. This interconnection is called a **food web**.

When an animal captures and eats another animal, it is a **predator**. The animal which is hunted is called the **prey**. Notice that an animal can be *both* a predator and a prey. For example, a small fish may eat certain types of snails, but he may also be eaten by an octopus. So the fish is both predator and prey. The key to survival is to be a successful predator without becoming a prey.

(Some biologists consider **herbivores** to also be predators, and **parasitism**, in which one organism infects another and does it harm, is also considered to be a form of predation.)

"INTO"

Let's talk about why we think organisms are distributed the way they are. First, we noticed from our zonation map that many more organisms live in coastal waters than in oceanic waters, even though the oceanic zone is a much larger part of the ocean. Let's list the things that might be important for an organism to be able to live in a certain area:

Shelter
Right temperature
Food
Etc…

The availability of **food** is the most important reason for why organisms are located mostly in the nearshore coastal area.

How many of you have heard of a **food chain**? Let's draw a simple food chain that is familiar to us:

Grass_ Cows_ Humans

Grass is a kind of plant, and plants make their own food. But animals can't make their own food, they have to either eat plants, like the cow, or they eat other animals, like a wolf, or a human. Some animals, like humans, eat both plants and animals.

In the ocean, it's the same thing, but the organisms are different. I am going to introduce a new word to you – **phytoplankton** (sound it out: fi-to-plankton)
Like the grass or the plants on land, phytoplankton is the base, or bottom, of the food chain in the ocean. These are very tiny, microscopic organisms that make their own food just like land plants. To do this they need two things:

Sunlight – energy from the sun
Nutrients – things that help them grow

We find the most sunlight near the surface of the water (less than 200 meters deep), and many of the nutrients actually come from the land and are washed into it during rains. So the area with the most nutrients will be closest to the shore.

Let's go back to the food chain. Notice that the arrows are pointing toward the animal that is doing the eating. Scientists do this to demonstrate the flow of energy from the thing that is being eaten to the one that is doing the eating. We eat food because we need energy from that food. There are two words that you have already heard but let's discuss their meaning:

Predator – an animal that eats other animals/organisms
Prey – an organism that is eaten

Using our example of a simple food chain, we could add many more organisms to this food chain:

What else eats grass? *(Teacher should provide 2-3 more examples of animals that eat food.)*
What else might eat a cow? *(Teacher should provide 2-3 examples of animals that may eat a cow.)*

We call this a **food web** because it is a connection of many different food chains.

ACTIVITIES:

Activity I

1) Place students into groups of 4-6 students. Each table will have their own marine food web to study (they will be passed out after instructions are given).

2) Teacher now passes out examples of **marine food webs** emphasizing the direction of the arrows and predator/prey roles. They must carefully study the pictures and the arrows will be explained.

3) Students will now create a simple chain from the web they are given, like the food chain with only one animal at each stage. Each student will explain their food chain.

4) The teacher will ask each of the students the following questions:

Discussion questions

1. What is the start of the food chain and why?
2. Explain your food chain (one type of animal at each stage).

Activity II

1. Divide students into pairs so that they may make their own food webs.

2. Pass out the predator/prey list.

3. Give each pair a picture of an organism *(ideally one from the food chain activity in activity one).*

4. Students should paste the picture onto a blank sheet and color it.

5. Using the predator/prey list, create a food web.

Discussion questions

1. Do the larger animals eat all of the animals smaller than them?
   Not necessarily, some eat only certain organisms
2. Do some animals have more than one type of prey? If so, what are they?
3. Do small animals only eat what is smaller than them or can they eat animals larger than them? If they can, what type of features on their body allow them to eat larger animals?
   Special size of mouth, claws, beaks, etc.

Activity III

1) Using the distribution map that you constructed in the previous exercise (**Link to Zonation**) you are going to draw in the food webs that interconnect the organisms on your map.

2) Assign each student two organisms from the map to research. Using books, magazines, the internet or any other source you like, have them find out what those organisms eat and what eats them. This will probably take 1 to 1 1/2 class periods. It is best to leave the organisms cards on the map because you will want them in place for the next part of the activity. Have the students write down the information on a separate piece of paper.

3) Next, have the students present their findings to the class. Using a large marker, draw a line on the map between an organism and the animal that eats it. If a particular prey or predator of an animal is not on the map, write it in, place a box around it, and draw a line between it and the other organism. Draw the lines with an arrow pointing *toward* the predator. This indicates the direction of the flow of energy from the prey to the predator. When you are done, your map will have many lines with arrows connecting all the organisms together and you will have created a food web.

Discussion

Food webs are not the only way in which organisms interact with each other. When organisms exist in groups with others of their own species and of different species, many types of interactions can occur. Ecologists have categorized these interactions according to their purpose, they are competition, communication, and symbiosis:

COMPETITION: What do we mean by competition (for a resource)?

When two organisms are each using the same limited resource, they are *competing* with each other. Organisms may compete for food, space, mates or territory. There are two kinds of competition:

- **interspecific competition**, in which the two organisms are of different species.
- **intraspecific competition**, in which the two organisms are of the same species. Because individuals of the same species use resources in very similar ways, this type of competition can be much more intense than interspecific competition.

COMMUNICATION: Can you name some reasons they might communicate?

Animals may communicate with one another for a variety of reasons. We know that animals of the same species, such as dolphins, communicate with each other for mating, play, distress and hunting, but animals of different species may also communicate. This may be as simple as a color display to warn another animal to "back off" (like an octopus) or a posture to indicate that an animal is going to attack (sharks do this).

SYMBIOSIS: Who can tell me what a symbiotic relationship is?

Symbiosis is a broad term that generally means "living together." Usually, this applies only to organisms that live in very close proximity (often one inside the other) to each other for a

substantial portion of their life histories. Symbiotic interactions can be beneficial, harmful, or nonconsequential to the organisms involved:

- **mutualism** – A relationship both parties benefit. Most often, symbiosis refers to this type of interaction (examples: clownfish and anemone or coral reefs, which contain symbiotic algae).
- **commensalism** - one party benefits and the other is unaffected (it is very difficult to prove such a case and many biologists doubt whether this type of interaction exists).
- **parasitism** - one party benefits and the other is harmed.
- When speaking of symbioses, the organism that lives *inside* the other organism is called the **symbiont** and the larger organism is called the **host**.

EXTENSIONS

1. Write up ideas of how humans fit in the web of life.
2. Have students explore how a shortage or excess of resources may alter food webs.
3. Challenge students to design a demonstration of a food web.
4. As students learn about new organisms, have them place these organisms on the zonation map.

EVALUATION

1. Journaling – Have students write down what they have learned
2. Teacher will evaluate final food webs for accuracy and thoughtfulness.