

MARINE FOOD WEB /INSTRUCTOR INFO

Summary

This lesson includes vocabulary, content, and creative activities to help students learn about marine food chains and food webs. Students will gain an understanding of how energy travels through a food web and that the ultimate source of energy is the sun.

Part 1. Introduction

Part 2. Food Chains

Part 3. Food Webs

Activity 1. Web of Life

Goals & Objectives

The students will:

- Learn what a food chain and food web are;
- Learn the effects of removing an animal from a food chain or food web;
- Learn understand the roles of producers, consumers, and decomposers in a marine ecosystem;
- Learn how to describe the flow of energy through food webs.

Helpful Tips

1. The content in this lesson is related to OCEARCH and the Global Shark Tracker. Spend a few minutes getting familiar with the website and the tracker if you have not done so already. The Global Shark Tracker is also available as an app for iPhone and Android.
2. This lesson plan is designed to be adaptable to suit your specific needs. Use the entire lesson plan or just parts of it. This material can be expanded to be an entire unit or condensed for just one day in the classroom.
3. Vocabulary words will be underlined as they appear in the lesson plan. A complete list of vocabulary words is included as well.
4. Answers to questions and prompts for discussions will appear in italics.
5. Optional activities and content (side notes) will appear in a box. Use these to enhance your lesson and adapt it to suit your needs!
6. Have questions for OCEARCH Expedition Leader, Chris Fischer? Email info@OCEARCH.org to schedule a Skype session and let your students/child talk directly to Chris and the OCEARCH crew!
7. Email all questions about this lesson to info@OCEARCH.org.

// STANDARDS

This lesson aligns with the following TEKS:

Grade 3 Science: 1B, 2F, 3A, 3D, 4B, 6A, 9A, 9B, 10A

Grade 4 Science: 1A, 2F, 3A, 3D, 4B, 6A, 9A, 9B, 10A

Grade 5 Science: 1A, 2F, 3A, 3D, 4B, 6A, 9A, 9B, 9C, 10A

This lesson aligns with the following Next Generation Science Standards:

Ecosystems: Interactions, Energy, and Dynamics - 5-LS2-1

Science and Engineering Practice

Developing and Using Models

- Modeling in 3–5 builds on K–2 models and progresses to building and revising simple models and using models to represent events and design solutions. (5-LS2-1)

Disciplinary Core Ideas

LS2.A: Interdependent Relationships in Ecosystems

- The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as “decomposers.” Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. (5-LS2-1)

Crosscutting Concepts

Systems and System Models

- A system can be described in terms of its components and their interactions. (5-LS2-1)

STEM

This lesson plan aims to assist teachers in implementing a STEM-based program into their classroom while inspiring the next generation of explorers, scientists, and stewards of the ocean. Based on real science and the Global Shark Tracker™, this lesson is intended to promote environmental awareness and to prepare students for STEM careers.

MARINE FOOD WEB / VOCABULARY

Apex Predator - A predator residing at the top of a food chain upon which no other creatures prey.

Carnivore- An animal that eats other animals.

Consumer - An organism that eats other organisms.

Decomposer - An organism, especially a soil bacterium, fungus, or invertebrate, that decomposes organic material.

Ecosystem - A biological community of interacting organisms and their physical environment.

Energy - The strength required to be active.

Food Chain - Shows how each living thing gets food, and how nutrients and energy are passed from creature to creature.

Food Web - A complex system of interlocking and interdependent food chains.

Herbivore - An animal that eats plants.

Omnivore - An animal that eats either other animals or plants.

Organism - An individual animal, plant, or single-celled life form.

Photosynthesis - The process that plants use to make their own food using light, water, and carbon dioxide.

Predator - An animal that naturally preys on others.

Prey - An animal that is hunted and killed by another for food.

Producer - Organisms that make their own food.

Trophic Level - The position of a plant or animal in a food chain or web.

MARINE FOOD WEB / PRE-LESSON ASSESSMENT

Use the following true/false and multiple-choice questions as an introduction/warm-up to the lesson topics. You can do this in a verbal or written format, as a game, individually, or as a whole class! A handout is provided if you wish to hand the questions out in a quiz format.

The questions do not need to be graded. They are intended to give the students an idea of what they will be learning and to see what they already know.

1. True or False

A predator eats plants.

Answer: False

2. True or False

A primary producer uses photosynthesis to produce its own food.

Answer: True

3. An animal that eats other animals can be called:

- a. A consumer
- b. A predator
- c. An omnivore
- d. All of the above

Answer: d

4. If we were to eat the same things as an herbivore, we would eat:

- a. Steak
- b. Vegetables
- c. Insects
- d. Chicken

Answer: b

5. A food _____ is a simple example of the flow of energy from producers to consumers. A food _____ is a complex system of what plants and animals eat in an entire ecosystem.

- a. Web, chain
- b. Court, kitchen
- c. Chain, web
- d. Hog, store

Answer: c

Name: _____

Date: _____

Marine Food Web

Select the correct answer(s) to each of the following questions.

1) True or False

A predator eats plants.

2) True or False

A primary producer uses photosynthesis to produce its own food.

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MARINE FOOD WEB

/ LESSON PLAN

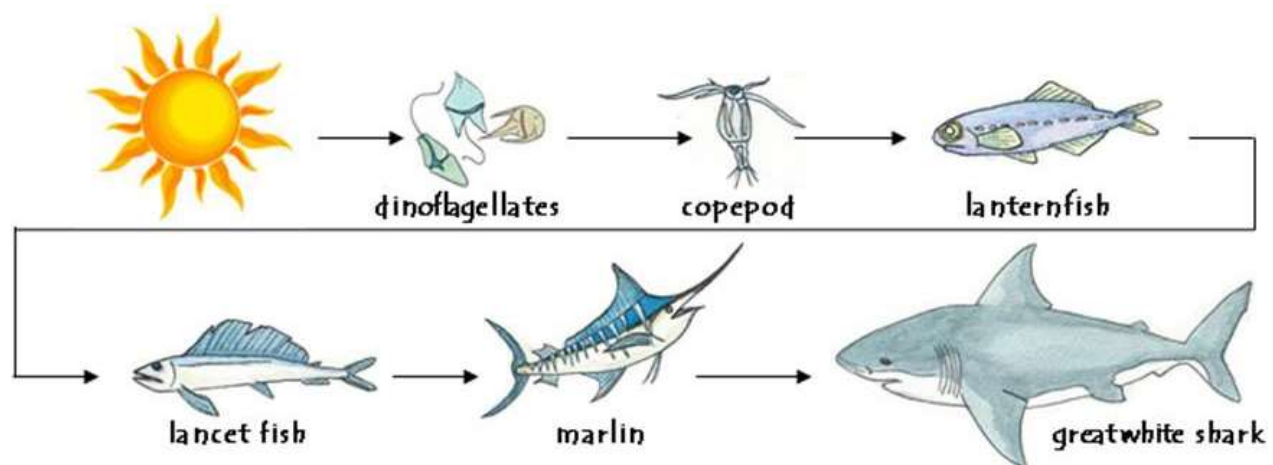
PART 1. INTRODUCTION 3-5 mins

All plants and animals require energy to survive. Energy cannot be created or destroyed, but it can be stored and recycled. The original source of energy for our planet comes from the Sun. Energy from the sun is captured by plants and processed to make sugar (energy) through photosynthesis. Plants are a food source for animals we call herbivores. Omnivores are animals that gain their energy from eating plants, *or* preying on the herbivores. Carnivores are animals that gain their energy from preying on all others; other carnivores, omnivores, and herbivores. Does anyone know what this is called? A food chain!

PART 2. FOOD CHAINS 5-10 mins

A food chain shows how energy flows from the sun, to a plant, to a carnivore, and ends with an apex predator. In comparison, a food web is a more complex system of interlocking food chains. Food chains and food webs can be observed all around the world in every type of ecosystem. However, today we are going to focus on marine food chains and webs.

Just like all other food chains, the marine food chain starts with the Sun. The energy from the Sun is gained from tiny marine plants called phytoplankton. A dinoflagellate is a great example of phytoplankton. Dinoflagellates are then eaten by small copepods such as shrimp. Shrimp are eaten by small fish. The small fish are eaten by larger fish and so on until you get to the largest predator, like a great white shark. This is just one example of a simple food chain in the ocean.



Example of a marine food chain.

Illustration Credit: Sarah Rich, Landry's Downtown Aquarium, Houston

A food chain is a perfect way to begin to understand the relationship between organisms in an ecosystem. However, a food chain does not give us a true picture of how the energy in a complex ecosystem is transferred through food sources. In any given ecosystem, few animals rely on only one food source, just like most food sources are consumed by more than one animal.

PART 3. FOOD WEBS 5-10 mins

First Trophic Level

A food web begins at the base, or first trophic level, with primary producers. Producers are organisms that make their own food. The primary producers in the ocean are phytoplankton. Phytoplankton are microscopic plants that use photosynthesis to convert sunlight into energy.

Second Trophic Level

The next level is full of tiny drifting animals called zooplankton. Some of these zooplankton are so tiny, the only thing they can eat are the phytoplankton. These herbivores are called primary consumers because they can only feed on primary producers for energy. The larger zooplankton can eat both the phytoplankton and the smaller zooplankton, making them omnivores. The most abundant type of the zooplankton in the ocean are small crustaceans called krill.

Third Trophic Level

The third trophic level consists of shrimp and other larger zooplankton that feed on krill, copepods, and larval jellies from the second trophic level.

Fourth Trophic Level

Small fish, squid, and other small carnivores eat shrimp and large zooplankton.

Fifth Trophic Level

The carnivores in the fourth trophic level are consumed by larger carnivores like tuna and stingrays.

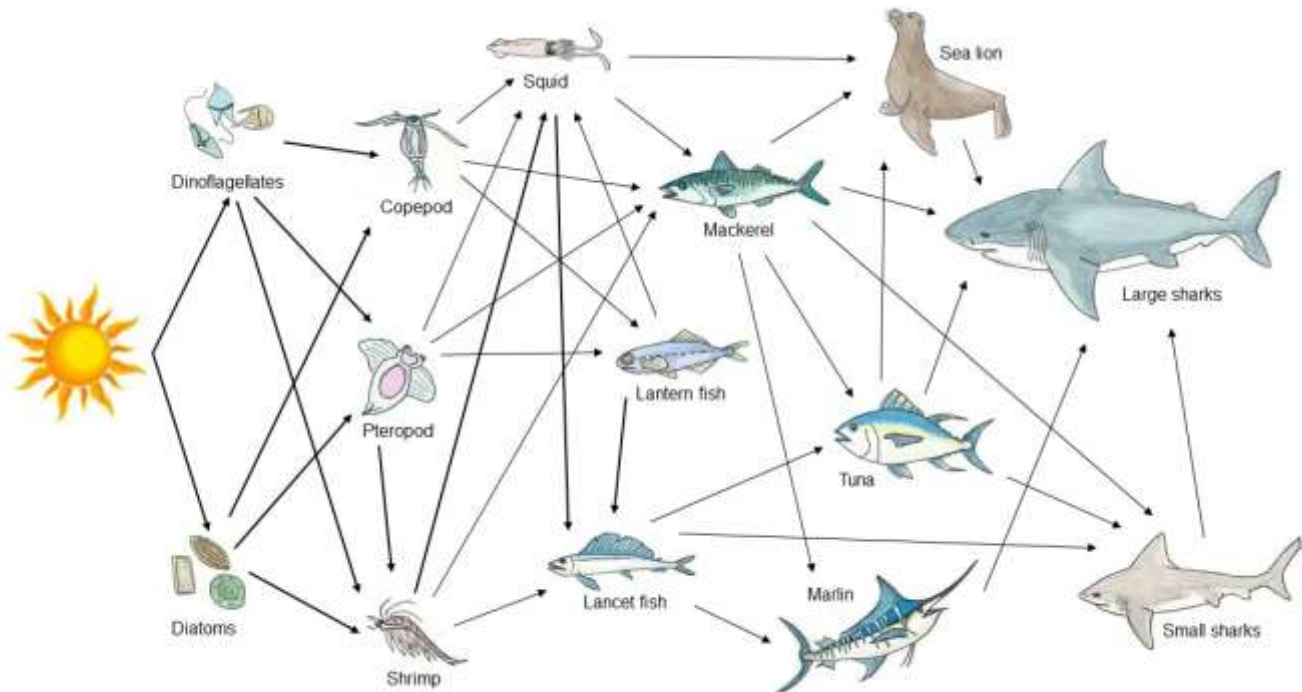
Sixth Trophic Level

In this case, the sixth trophic level is also the highest trophic level. What types of animals feed on large fish and stingrays. Big sharks such as the great hammerhead, mako, tiger, and great whites! As juveniles, these shark species may find themselves at much lower trophic levels, but when they are full grown they have no predators of their own. The largest predators in any ecosystem with no known predators of their own are called apex predators.

Decomposers

When an animal dies, it sinks to the bottom of the ocean where it is consumed by small organisms called decomposers. Decomposers consist of mostly bacteria, fungi, and worms who get their energy by feeding on decaying plant and animal matter.

If we connect one primary producer to one primary consumer, then to a single secondary consumer, up each trophic level to a single apex predator, we will have created a simple food chain. However, an entire ecosystem is much more complex. A proper representation would mean that we draw lines from our primary producers to all their respective primary consumers. Then we would draw another set of lines from each primary consumer to all their predators. We would ultimately have a vast, complex web of relationships between organisms.



Example of a marine food web.

Illustration Credit: Sarah Rich, Landry's Downtown Aquarium, Houston

MARINE FOOD WEB

ACTIVITY 1. WEB OF LIFE

INTRODUCTION

In this activity, students demonstrate both a simple food chain and a complex food web. They will discuss and hypothesize how all these animals interact with each other and how the ecosystem may be affected when an animal or plant is added or removed from this web.

MATERIALS

Ball of yarn
Pictures of marine organisms (one for every student)

INSTRUCTIONS

Prep: Before this activity print out pictures of a variety of marine organisms of all shapes and sizes and a picture representing the Sun. Some of the organisms you should definitely have are phytoplankton, shrimp, crabs, jellyfish, squid, hagfish, small fish, large fish, sharks, stingrays, and whales. You can write the names of the organisms on the back of the pictures.

1. Pass a picture out to each student. This picture shows the organisms that the student will represent in a food chain and web. Ask students look at their picture and determine if their organism is a producer or consumer.
2. Have all the students stand a circle with the student holding the Sun in the middle of the circle.
3. Give the ball of yarn to the student holding the Sun. They will identify one producer (phytoplankton for example), and pass the ball of yarn to that producer while holding onto the end of the yarn. Make sure they don't let go!
4. The producer should look for a primary consumer (jellyfish for example) and pass the yarn to a primary consumer while holding onto the end of the yarn.
5. The primary consumer then looks for a secondary consumer and passes the yarn to them while holding onto the end of the yarn.
6. The students will continue doing this until they reach an apex predator. You should now have a complete food chain.
7. To begin again, cut the yarn and instruct the students to not let go! Give the yarn back to the Sun and begin again.

Note: It's ok for students who already have yarn to receive it again (sometimes it's unavoidable), but try to encourage all students to be included. The one creature that should not be holding the yarn is the hagfish. Hagfish are decomposers. The student holding the hagfish may choose any 1 link in your chain/web, this represents the death of that plant or animal. The plant/animal that the hagfish chooses may drop the yarn. Another student with the same trophic level may take the place of the hagfish's prey. This gives you the opportunity to explain that all animals have multiple food sources and predators. This also shows students how decomposers help to keep the ocean clean! Decomposers breakdown the nutrients and energy, making them available for the primary producers to use and the cycle begins again!

When you finish, you should have a much more complex web of yarn, which represents a marine food web!

8. Ask the students what would happen if one of the organisms was removed from the food web (due to overfishing, habitat loss, or climate change)? How are the other organisms affected? How many organisms can continue to survive without that organism?