

LESSON 3 Seafood and Human Health

Lesson at a Glance

In this lesson, students are first asked whether humans are part of food chains, and to modify a food chain/web, an energy pyramid, or a cycle of matter and flow of energy graphic model to show where humans fit into these models. Students then learn from a PowerPoint slide shown about the USDA dietary guidelines that fish and shellfish are healthy foods, but that some seafood should be avoided because of mercury content. Images in the slide show illustrate the process of bioaccumulation.

Lesson Duration

Two 45-minute periods

Essential Question(s)

How does the human consumption of seafood impact the marine food chain?

Is the consumption of seafood always a healthy choice?

Key Concepts

- Finfish provide humans with foods that are low in fats and high in proteins.
- Some seafood contains high amounts of mercury and other materials that bioaccumulate up the food chain that are toxic to humans.
- Information can be used to formulate and defend conclusions.

Instructional Objectives

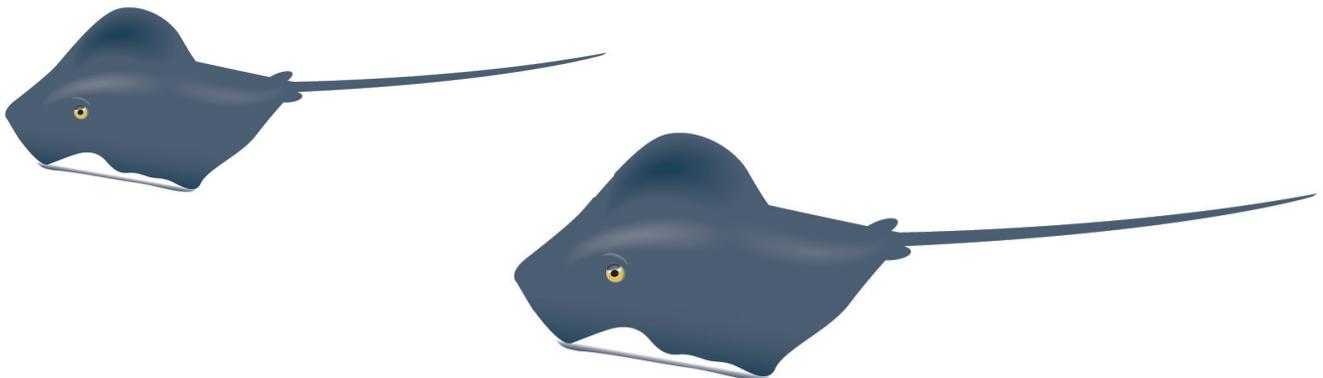
- I can describe the general guidelines for a healthy human diet.
- I can describe if the consumption of seafood is always a healthy choice and why.

Related HCPSIII Benchmark(s):

Science SC 5.1.2
Formulate and defend conclusions based on evidence.

Science SC.5.3.2
Describe the interdependent relationships among producers, consumers and decomposers in an ecosystem in terms of cycles of matter.

Health HE 3-5.1.3
Explain the importance of a healthy diet as part of a healthy lifestyle.



Assessment Tools

Benchmark Rubric:

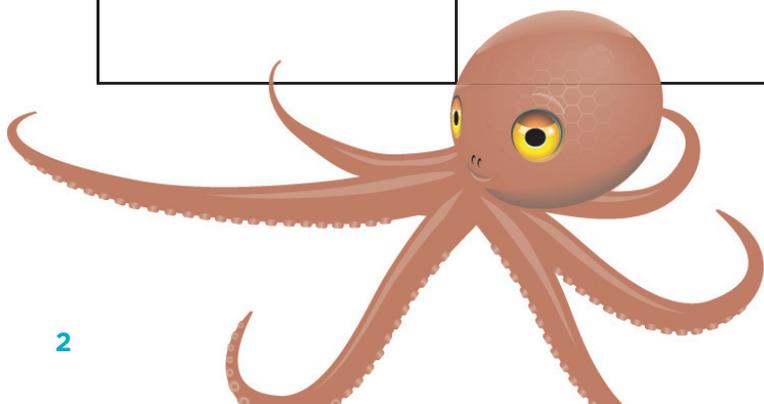
Topic		Scientific Inquiry	
Benchmark SC.5.1.2		Formulate and defend conclusions based on evidence	
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Formulate and defend conclusions that are supported by detailed evidence and make connections to the real world	Formulate and defend conclusions that are supported by evidence	Make conclusions that are partially supported by evidence	Make conclusions without evidence

Topic		Interdependence	
Benchmark SC.5.3.2		Describe the interdependent relationships among producers, consumers, and decomposers in an ecosystem in terms of the cycles of matter	

Rubric			
Advanced	Proficient	Partially Proficient	Novice
Explain and give examples of how specific relationships among producers, consumers, and decomposers in an ecosystem affect the cycling of matter	Describe the interdependent relationships among producers, consumers, and decomposers in an ecosystem in terms of the cycling of matter	Identify a few relationships between producers, consumers, or decomposers in an ecosystem in terms of the cycling of matter	Recall, with assistance, that matter cycles in an ecosystem among producers, consumers, and decomposers

Topic		Healthy Eating and Physical Activity	
Benchmark HE.3-5.1.3		Explain the importance of a healthy diet as part of a healthy lifestyle	

Rubric			
Advanced	Proficient	Partially Proficient	Novice
Explain, in great detail, the importance of a healthy diet as part of a healthy lifestyle	Explain, in detail, the importance of a healthy diet as part of a healthy lifestyle	Explain, in some detail, the importance of a healthy diet as part of a healthy lifestyle	Explain, in minimal detail, the importance of a healthy diet as part of a healthy lifestyle



Assessment/Evidence Pieces

Lesson

- Student Worksheet *You Are What You Eat*
- Diagrams drawn by each group

Materials Needed

Teacher	Class	Group	Student
<ul style="list-style-type: none"> • Projector • Internet access 	<ul style="list-style-type: none"> • None 	<ul style="list-style-type: none"> • Chart Paper • Pens 	<ul style="list-style-type: none"> • Student Worksheet: <i>You Are What You Eat</i>

Instructional Resources

Student Worksheet: *You Are What You Eat*

The Marine Food Chain,

at <http://drake.marin.k12.ca.us/stuwork/ROCKwater/PLANKTON/Food%20Chain.htm>

Ocean food chain image (please note: arrows show consumption, not energy flow),

at <http://cache.eb.com/eb/image?id=90496&rendTypeId=34>

Lake Ontario food chain image,

at <http://telstar.ote.cmu.edu/enviro/m3/s6/graphics/biomagnification.gif>

Fact Sheet: A marine food pyramid,

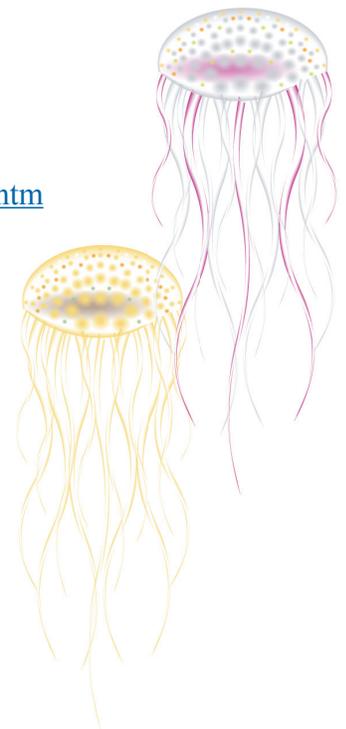
at http://www2.dpi.qld.gov.au/extra/nnn/fact_foodpyramid.html

Ocean Web - Marine Food Web,

at http://oceanworld.tamu.edu/students/forams/forams_marine_food_web.htm

Food Pyramid,

at http://www.mypyramid.gov/pyramid/meat_print.html



Student Vocabulary Words

bioaccumulation: when the input of a toxic substance in an organism is greater than its removal.

biomagnification: the input of a toxic substance gets concentrated throughout the food chain as a result of bioaccumulation in organisms involved in the food chain.

dietary guidelines: guidelines that tell people what they should eat for a healthy lifestyle.

food hazard: seafood that may contain contaminants, such as mercury, polychlorinated biphenyls, dioxins, or other chemical pollutants; also, microbes and viruses in fish.

food pyramid: a diagram that shows a healthy diet by placing food groups in a pyramid according to the number of servings from each group to be eaten every day.

Lesson Plan

Lesson Preparation

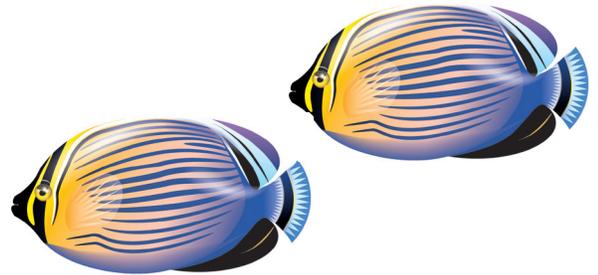
- Review the Science Background provided in the Unit Overview.
- Review and make copies of Student Worksheet *You Are What You Eat*.
- Familiarize yourself with the USDA dietary guidelines found at <http://www.mypyramid.gov/>
- Post a completed food web, energy pyramid, and diagram of the cycling of matter and flow of energy.
- Either arrange student access to computers, or have a computer with Internet access and a projector available.
- Preview information given in the recommended websites.

I. Humans and the Food Chain

- Ask students whether humans are part of the food chain, and to give reasons to support their answers.
- Referring back to an example of each of these models of matter and energy in a marine ecosystem students created in Lessons 1–3 (Food web, energy pyramid, and diagram of the cycling of matter and flow of energy), ask students where humans fit into these graphic models.
- Organize students into groups, and give each group chart paper and pens. Ask each group to create a graphic model showing where humans fit into graphic models of ecosystems.
- Either do a gallery walk, or ask each group to share and explain its ideas. Establish that humans are a natural part of the ecosystem—we are consumers, and most of us are omnivores, but a few are vegetarians, hence herbivores. The food we eat provides us with energy and with chemical substances that allow us to grow and maintain our bodies. We, too, contribute to detritus wastes, and so on.

II. Is it Healthy to Eat Fish and Seafood?

- Briefly discuss the USDA's Recommended Human Dietary:
 - What fish products are on the USDA's pyramid?
 - What shellfish are on the USDA's pyramid?
 - What are the benefits of consuming seafood?
 - According to the USDA's food recommendations, how much seafood should people consume? How much fish? How much shellfish?



III. Bioaccumulation and Biomagnification

- Explain and discuss the following concepts:
 - Bioaccumulation:** Refer to a posted example about the cycling of matter as you discuss bioaccumulation. Bioaccumulation is when the input of a toxic substance in an organism is greater than its removal. In addition to nutrients (Nitrogen, Phosphorus, potassium), plants and phytoplankton absorb other elements, including heavy metals such as mercury or cadmium.
 - Biomagnification:** Refer to a posted example of an energy pyramid of a marine ecosystem. Point out that energy shifts from plants to animals after the first (primary) level. Remind students that at each successive level, the animals get bigger, and those bigger animals eat more food.

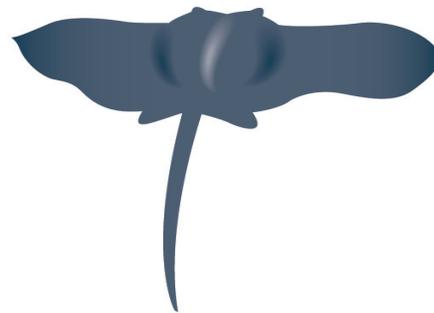
3. Ask student volunteers to help demonstrate the biomagnification process.
 - Select five students who are plants, and give each student a plastic bag with a red (or any colored) piece of paper in the bag.
 - Select two students to be small fish, and give each student a plastic bag. Have the small fish eat the plants, and transfer the colored paper into the small fish plastic bag (stomachs).
 - Select one student to be a big fish. Have the big fish eat the two smaller fish, thereby accumulating all five pieces of colored paper.
 - Repeat the process, but first write the word “Mercury” or “toxin” on the plants papers. This shows how mercury can enter a food web.
4. Have a closing discussion question to ask how humans are part of the food chain just demonstrated.

IV. You Are What You Eat

- A. Tell students that they will be working in pairs to look more closely at some favorite local Hawaiian seafood dishes and prepare a health report. Provide access to library or online information, so the group can support their conclusion. Give each group a Student Worksheet *You Are What You Eat* and assign a food.

Food Ideas:

1. Tako poke
2. Squid luau
3. Lomi salmon
4. Miso butterfish
5. Ahi poke
6. Ahi limu poke
7. Ocean salad
8. Salmon poke
9. Kamabuko
10. Ika (dried cuttlefish)
11. Smoked marlin
12. Pickled ogo

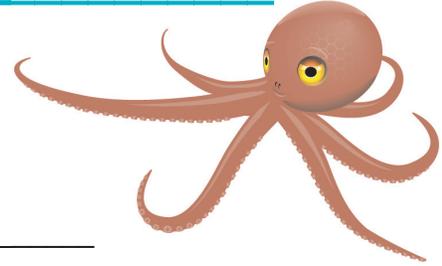


- B. Students will research the nutritional value of their food product as well as the health benefits and risks of consuming too much of their food. In addition, they will determine how much of their seafood is harvested each year and what impact this may have on marine food chains and webs.
- C. Students will present their Hawai‘i seafood dish research to the class.
- D. Optional: Students may bring a portion of their food for students to sample.

LESSON 3

Name: _____ Date: _____

You Are What You Eat



My local seafood dish is: _____

Serving size _____ Calories per serving _____

	Nutritional Value (in grams)			
	Fat	Protein	Sodium	Carbohydrates
Seafood:				
Other ingredients:				

Health Benefits:

Health Risks:

How much of your seafood is harvested every year? What is the impact on marine food chains and webs?