LESSON 1 Understanding Food Chains and Food Webs

Lesson at a Glance

The students get a brief review of food chain and food webs of living marine organisms. They develop vocabulary and assemble a list of the marine organisms that are used as food and are sold in stores in Hawai‘i using advertisements from local newspapers. Then, students fill in the *Marine Organism Identification* Worksheet by looking up the definitions of and classifying their seafood lists as finfish, shellfish (mollusk or crustacean), and other vertebrates, invertebrates. They develop an understanding of the different categories of marine organisms and which marine organisms are harvested as a food source by us. They discuss the criteria of a marine food web and construct a seafood web using the marine organism lists that they have collected. They discuss and collect information on marine organisms to complete a complex marine food web.

Lesson Duration

Three 45-minute periods

Essential Question(s)

What are the roles of the producers, consumers, and decomposers in a marine ecosystem?

How does energy flow and matter cycle in a marine environment?

What kinds of marine organisms do humans consume?

How does human consumption impact the population of marine organisms in food webs and food chains?

Key Concepts

- All organisms are interdependent; energy must flow and cycle amongst organisms for them to survive.
- Living marine resources are found at all levels of the food chain/web.
- Each organism can be classified as a producer or consumer; animals may be predators as well as prey.
- Decomposers are important consumers in food chains and webs, breaking down remains of dead organisms into simpler chemical substances for uptake by the producers.

Instructional Objectives

- I can describe the role of producers and consumers in a marine food web or chain and construct a model to show how energy flows from producers and consumers.
- I can use a cycle of matter diagram to describe the interdependent roles of producers, consumers, and decomposers in terms of cycling of matter.

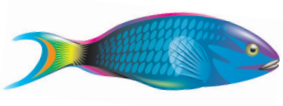
Related HCPSIII Benchmark(s):

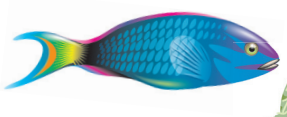
Science SC. 5.2.1
Use models and/or simulations to represent and investigate features of objects, events, and processes in the real world.

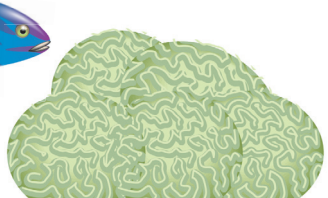
Science SC. 5.3.1
Describe the flow of energy among producers, consumers and decomposers.

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

Language Arts LA.5.1.1
Use new grade-appropriate vocabulary learned through reading print and online resources and word study, including meanings of roots, affixes, word origins.







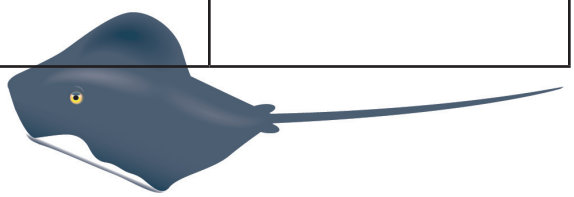
Assessment Tools

Benchmark Rubric:

Topic		Unifying Concepts and Themes	
Benchmark SC.5.2.1		Use models and/or simulations to represent and investigate features of objects, events, and processes in the real world	
Rubric			
Advanced	**Proficient**	**Partially Proficient**	**Novice**
Consistently select and use models and simulations to effectively represent and investigate features of objects, events, and processes in the real world	Use models and/or simulations to represent and investigate features of objects, events, and processes in the real world	With assistance, use models or simulations to represent features of objects, events, or processes in the real world	Recognize examples of models or simulations that can be used to represent features of objects, events, or processes

Topic		Cycles of Matter and Energy	
Benchmark SC.5.3.1		Describe the cycle of energy among producers, consumers, and decomposers	
Rubric			
Advanced	**Proficient**	**Partially Proficient**	**Novice**
Explain and give detailed examples of the cycle of energy among producers, consumers, and decomposers	Describe the cycle of energy among producers, consumers, and decomposers	Describe a part of the energy cycle with an example (e.g., describe one or two parts of a food chain)	Recognize an example of part of an energy cycle

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		Vocabulary and Concept Development	
Benchmark LA.5.1.1		Use new grade-appropriate vocabulary learned through reading print and online resources and word study, including meanings of roots, affixes, word origins	
Rubric			
Advanced	**Proficient**	**Partially Proficient**	**Novice**
Use new grade-appropriate vocabulary, with fluency, precision, and accuracy	Use new grade-appropriate vocabulary, with minimal difficulty and no significant errors	Use new grade-appropriate vocabulary, with difficulty and a few significant and/or many minor errors	Use new grade-appropriate vocabulary, with great difficulty and many significant errors or rarely use new vocabulary

Assessment/Evidence Pieces

Lesson
- Exit Pass (formative assessment evidence piece)

Materials Needed

Teacher	Class	Group	Student
• Method to present PowerPoint • Chart paper • Newspapers • Markers	• None	• White board • Dry erase markers • Eraser	• Student Worksheet: *Marine Organisms Vocabulary* • Student Worksheet: *Marine Organisms That We Consume* • *Exit Pass - Food Webs and Chains* • Newspapers

Instructional Resources

PowerPoint Presentation: *An Ocean of Food Chains and Food Webs*
Teacher Reading: *Food Chain Example*
Student Worksheet: *Marine Organisms Vocabulary*
Teacher Answer Key: *Marine Organisms Vocabulary*
Student Worksheet: *Marine Organisms That We Consume*
Student Worksheet: *Exit Pass-Food Webs and Chains*

Student Vocabulary Words

carnivores: animals that eat other animals.
consumers: Organisms that must find and eat food and cannot make it themselves.
crustacean: a class of invertebrates (animals without backbones), which includes crabs, lobsters and shrimp. These animals have a segmented body, a hard external skeleton (exoskeleton), two sets of antennae and one pair of legs per body segment.
decomposers: organisms that return nutrients into ecological cycles by breaking down dead organic material.
ecosystem: community of different living organisms and the physical environment in which they are found.

finfish: a term used in fisheries science to identify true fish from non-fish, such as shellfish, jellyfish, crayfish, etc.
food chain: a graphic representation of the transfer of food, showing how one organism feeds upon another.
food web: a graphic representation showing how many different food chains are linked to each other in an ecosystem.
energy pyramid: a graphic representation of interrelationships among organisms in an ecosystem. The pyramid may be drawn to depict food energy or numbers of organisms, or amount of biomass in an ecosystem.
herbivores (grazers): animals that eat plants or phytoplankton.
living marine resources: all of the living biological organisms in the ocean.
mollusk: invertebrate animals with soft, un-segmented bodies, such as *ophihi*, *pipipi* (nerite snails), clams, oysters, squid and octopus. Misconception alert: Some children use the term squid when referring to what scientists call octopus.
shellfish: general term for crustaceans and mollusks.
scavengers: organisms that look for, and feed on dead, decaying or waste material.
producers: organisms that comprise the base of the food chain; often, these are plants and algae in sun-driven ecosystems.

Lesson Plan

Lesson Preparation

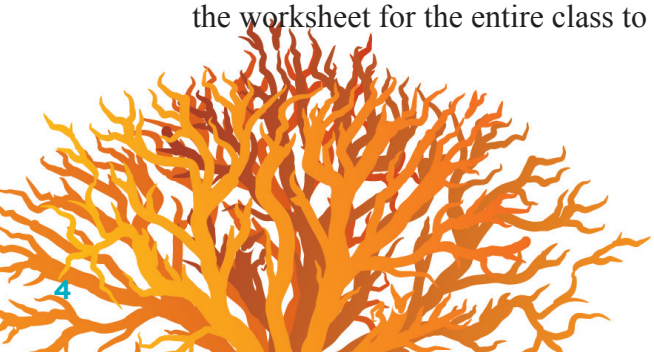
- Review the Science Background provided in the Unit Overview and Teacher Reading *Food Chain Example.*
- Collect food advertisements showing seafood (Food advertisements appear in newspapers at Mid-Week, and in the Sunday edition of newspapers). Ask or assign the collection of this information for homework.
- Prepare the chart paper with the information found in Section I Part B.
- Draw enlarged food web or chain outlines to use as instructional aides. Refer to Teacher Reading Food Chain Example.
- Preview PowerPoint *An Ocean of Food Chains and Food Webs* and make arrangements to project it.
- Review and make copies of Student Worksheets *Marine Organisms Vocabulary, Marine Organisms That We Consume* and *Exit Pass-Food Webs and Chains*, one per student.

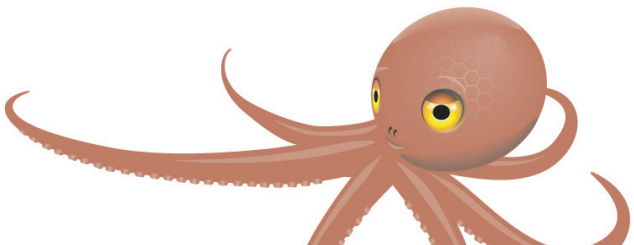
NOTE: If you have already taught Grade 5 Unit, *Life in the Open Ocean*, refer back to the food chains and webs developed to show the feeding relationships among near shore and offshore marine animals. Have the animal cards from that unit available in this unit for the information about what marine organisms eat.

I. Identifying Living Resources of the Ocean

A. Divide students into groups of 4 and provide each group with the Student Worksheet *Marine Organisms Vocabulary*, a whiteboard, dry erase marker and an eraser.

B. To record student responses, create a large chart of the worksheet. An Elmo may also be used to enlarge the worksheet for the entire class to see.





C. Starting with crustaceans, facilitate a class discussion to restate what they are in their own words. Then, have students discuss examples of crustaceans and record them on their whiteboards. Have the student groups share their ideas and record correct examples on the class chart. Have students do the same for "what they eat" and "where they are found." To make it more interesting for the students, you may want to award the groups a point for every correct response they provide. Repeat this process for all of the organisms on the first page of the worksheet (through Vertebrates).

II. Food Chains and Food Webs

A. Show students the *An Ocean of Food Chains and Food Webs* PowerPoint (Slides 1-8 only, the remaining slides will be used in Lesson 2). Have them use page two of their Student Worksheet *Marine Organisms Vocabulary* to take notes as they view the presentation. Then, conduct a discussion to complete their class chart of their worksheet and to reinforce key ideas presented in the PowerPoint.

B. Write *food chain* on the board. Working in their groups, have students start with a producer, such as *limu*, and then use the examples of organisms identified on their worksheet to create an example of a food chain and record it on their whiteboard. Have groups share their responses and select one to exemplify the concept of a food chain. Teach or clarify that the arrows point from the producer to the tertiary consumer to show how *energy flows* from organism to organism.

C. Next, write *food web* on the board. Then, teach or clarify with students that *food webs* are used to show the more complex feeding relationships that occur in a marine environment. Use the *food chains* generated by the other student groups to create a food web.

III. How Energy Flows and Matter Cycles

A. Reinforce the concept of how *energy flows* from producer to primary, secondary and tertiary consumers.

B. Point out that what is missing from their food chains and webs are the *decomposer*. Introduce the concept that *matter cycles* and that one of the ways decomposers enable matter to cycle is by breaking down the wastes or remains of dead organisms. Carbon dioxide is released in this process, which is then used (cycles back) to the producers for use in photosynthesis.

IV. Marine Organisms That We Consume

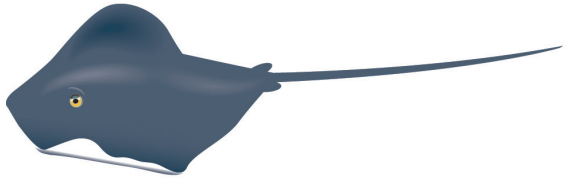
A. Working in their groups, have students share their seafood advertisements with each other. Students should pool their resources to complete the *Marine Organisms That We Consume* worksheet.

B. Re-convene the students as a class. Consider the following questions to guide your discussion:

1. What does the information you compiled tell you?
2. What kinds of living organisms do humans consume?
3. How might human consumption impact the population of marine organisms in food chains and food webs?
4. How might the over consumption of one organism (i.e., limu) impact marine organisms in food chains?

V. Assessment – Exit Pass

A. Distribute Student Worksheet #3 *Exit Pass – Food Webs and Chains*. Have the students complete the worksheet.



LESSON 1 - Teacher Reading

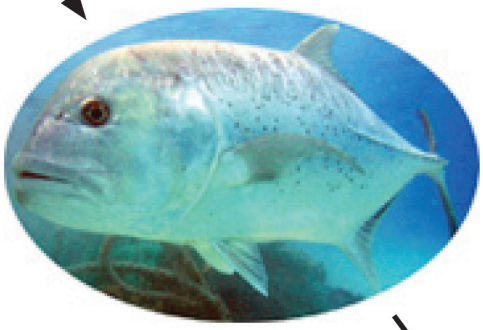
Food Chain Example

Opihi

Seaweed

Arrows show the flow of energy

Kala



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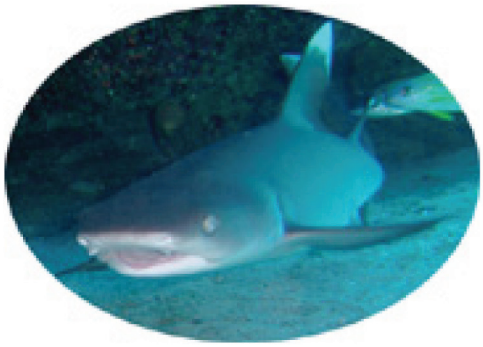

Shark

LESSON 1

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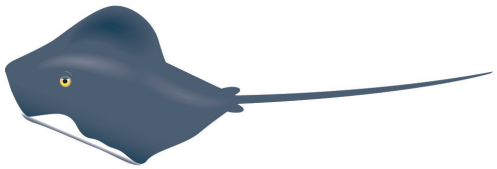
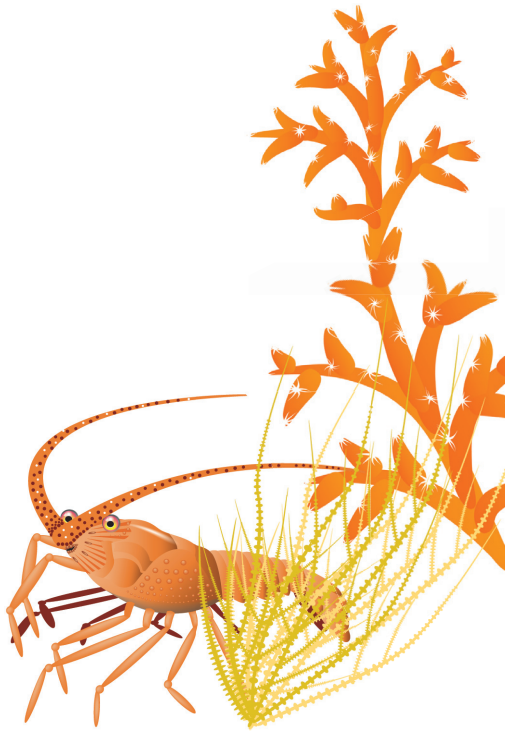
Marine Organisms Vocabulary



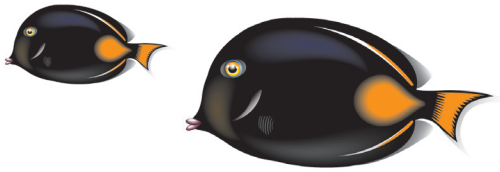
Vocabulary Word	Definition	In Other Words (restate the definition in your own words)	Examples of this type of marine organisms	Notes: (What they eat, where they are found, what they look like)
Shellfish	**Crustacean** An invertebrate group that includes animals with a hard external skeleton, two sets of antennae, and one pair of leg per body segment (examples; crabs, lobsters, shrimps).			
	Mollusk Invertebrate animals with soft, un-segmented bodies, often enclosed in a calcium shell (clams, and snails).			

Finfish	Term used in fisheries science to describe vertebrate fish that have backbones, and to differentiate them from other non-fish, such as shellfish, jellyfish, crayfish, etc.			
Invertebrates	Name used to describe shellfish, jellyfish, and other animals without backbones.			
Vertebrates	Name used to describe animals with backbones, such as sharks, dolphins, and tuna.			
Producers	Organisms that make their own food by converting the energy from sunlight into food energy.			

Consumers	Organisms that must find and eat food and cannot make it themselves.			
Decomposers	Organisms that return nutrients into ecological cycles by breaking down dead organic material.			



LESSON 1 - Teacher Answer Key

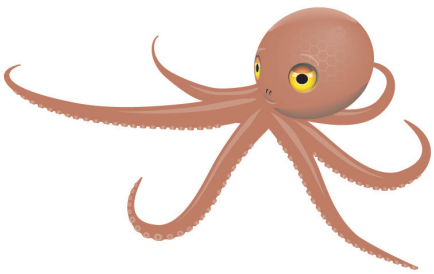


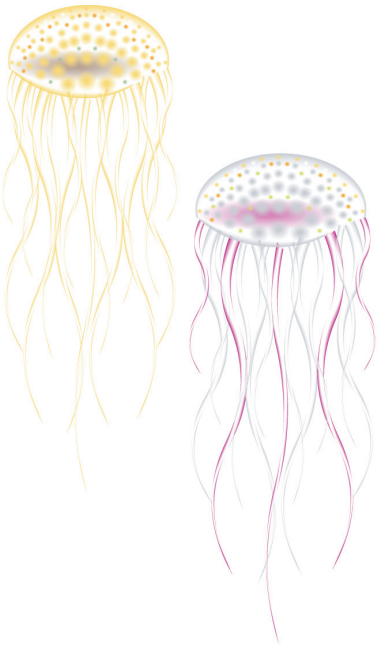
Marine Organisms Vocabulary

Vocabulary Word	Definition	In Other Words (restate the definition in your own words)	Examples of this type of marine organisms	Notes (What they eat, where they are found, what they look like):
Shellfish	**Crustacean** An invertebrate group that includes animals with a hard external skeleton, two sets of antennae, and one pair of leg per body segment (examples; crabs, lobsters, shrimps).	A group of marine animals with a hard outside shell, legs, and antennae. They are sea animals like crabs, shrimps, and lobsters.	Crabs, lobsters, shrimp, crayfish	**Eat** – Lobsters eat crabs, sea urchins, plankton, and small fish. Shrimp are mainly bottom feeders that feed on animal and plant matter. Sometimes, they are scavengers as well. **Live** – at all depths. **Look like** – depends on which crustacean, but can be very colorful. Some have a 5th pair of legs shaped like paddles to help them swim (crabs). Lobsters and crabs have a set of pinchers to help them crush the shells of other organisms they are eating.
	Mollusk Invertebrate animals with soft, un-segmented bodies, often enclosed in a calcium shell (clams, and snails).	A group of marine animals with soft bodies that are protected by shells. They are sea animals like clams and snails.	Clams, snails	**Eat** – Depends on the species. Clams are filter feeders, filtering water and food that moves through their shells. Some species of snails eat algae by scraping it off rocks using a rough, tongue-like appendage called a radula. They also might use the radula to burrow into other snail's shells to eat them. Some snails also eat fish and other organisms using a muscular foot. **Live** – depends on the species, so some clams and snails burrow into the ocean bottom and others are attached to plants and rocks. **Look like** – have soft bodies that are covered in hard shells for protection. Some have 1 shell (univalve) and some have 2 (bivalve).

Finfish	Term used in fisheries science to describe vertebrate fish that have backbones, and to differentiate them from other non-fish, such as shellfish, jellyfish, crayfish, etc.	A group of marine animals that have backbones and move through the water using fins, such as ahi and mahimahi.	Ahi, mahimahi, aku	**Eat** – this depends on if the fish are herbivores (eat plant material), carnivores (eat smaller fish), or omnivores (eat both plants and other fish). **Live** – at all depths. **Look like** – generally have multiple fins on their bodies, but sometimes 2 fins have adapted to fingerlike appendages for walking on the ocean floor.
Invertebrates	Name used to describe shellfish, jellyfish, and other animals without backbones.	A group of marine animals that do not have backbones, such as jellyfish and sea cucumbers.	Jellyfish, sea cucumbers	**Eat** – sea cucumbers eat tiny particles by wiping their tentacles over the ocean floor to pick up tiny particles or pick particles out of the water column using their tentacles. Jellyfish eat basically whatever their stinging tentacles can catch and bring into their mouth which is located underneath their bell-shaped body. Some food sources include smaller fishes, eggs and larvae of sea creatures and zooplankton. Larger jellyfish eat crustaceans and other jellyfish. **Live** – sea cucumbers live directly on the sediments or burrow in them, usually in shallow waters. Jellyfish live in varying temperatures and depths. **Look like** – sea cucumbers look like big sausages and contain tubefeet to move around at night time. Jellyfish have a bell-shaped body with long tentacles and are usually somewhat see-through.
Vertebrates	Name used to describe animals with backbones, such as sharks, dolphins, and tuna.	A group of marine animals that have backbones, such as sharks, dolphins, and fish.	Sharks, dolphins, tuna	**Eat** – depends on the species and if the animals are herbivores (eat plant material), carnivores (eat smaller fish), or omnivores (eat both plants and other fish). **Live** – in the water column at all depths. **Look like** – usually have fins that propel them through water and mouths that allow them to ingest food.

Producers	Organisms that make their own food by converting the energy from sunlight into food energy.	Animals that use the sun to produce their own food, such as bubble algae.	Limu palahalaha, bubble algae, ogo	**Eat** – glucose/sugar that they make from the sun. **Live** – live anywhere sunlight will reach. **Look like** – depends on the species.
Consumers	Organisms that must find and eat food and cannot make it themselves.	Animals that cannot make their own food and depend on others for food. Some of these animals include green sea turtles and fish.	Sea urchins, green sea turtles, herbivore fish, scavengers	**Eat** – there are so many and they eat all different things. Some are herbivores (eat plant material), carnivores (eat smaller fish), or omnivores (eat both plants and other fish). **Live** – all depths and temperatures. **Look like** – depends on the species.
Decomposers	Organisms that return nutrients into ecological cycles by breaking down dead organic material.	Animals that break down dead organisms, such as bacteria.	Bacteria	**Eat** – decaying animal and plant matter. **Live** – anywhere there is dead material. **Look like** – depends on the species, but some are round and some are long and rod-shaped.





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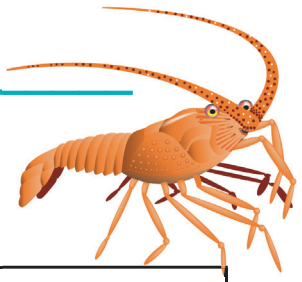

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Marine Organisms That We Consume

Organism Group	Names of the different marine organisms that humans consume in the organism group	Where it fits in a marine food chain or web.
Crustacean		
Finfish		
Mollusk		
Seaweed		
Invertebrates		
Vertebrates		

LESSON 1

Name: _____ Date: _____

Exit Pass - Food Webs and Chains

Explain the roles of the producer, consumer, and decomposers in a food chain.	**Explain how energy flows and matter cycles through a food chain.**
Draw and label a complex marine food web.