

LESSON 4 Marine Snow

Lesson at a Glance

In this lesson, students review the parts of the ocean water column, which consists of the photic and aphotic zones. These two zones play an important role in the formation and distribution of marine snow. Through a PowerPoint presentation, the students gain a better understanding of how marine snow forms, how it is distributed and what role it plays in the Open Ocean food chain. The lesson ends with students completing a zonation exercise that will show they can explain how marine snow forms and the role it plays in the marine ecosystem in terms of the cycles of matter.

Lesson Duration

One 45-minute period

Essential Question(s)

How does marine snow play a role in the Open Ocean ecosystem?

How does matter cycle through producers, consumers, decomposers in the open ocean?

Key Concepts

- Marine snow is decomposed organisms or their waste material that serves as a food source for deeper water animals.
- Marine snow forms in the photic zone and decomposes into nutrients by bacteria as it sinks down to the aphotic zone.
- Upwelling brings the nutrients as food up to the phytoplankton, thus completing the cycle of matter and flow of energy in the Open Ocean food chain.

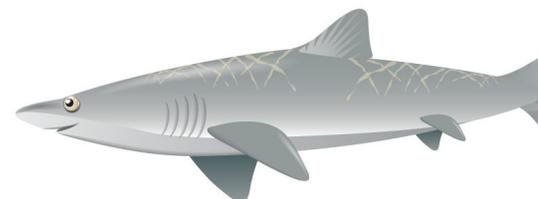
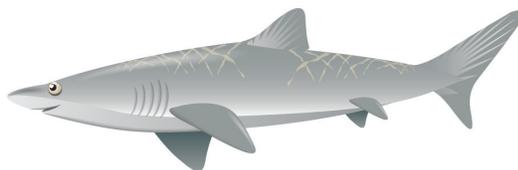
Related HCPSIII Benchmark(s):

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.

Instructional Objectives

- I can describe how marine snow forms and plays a role in the marine ecosystem.
- I can explain how organisms that live in the Open Ocean find food.

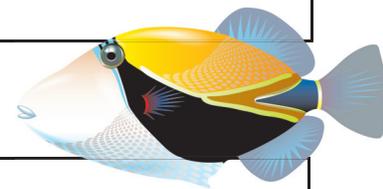


Assessment Tools

Benchmark Rubric:

| | | | |
|---|--|---|---|
| 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 |



Assessment/Evidence Pieces

| |
|---|
| Lesson |
| • Student worksheet <i>Open Ocean Ecosystem</i> |

Materials Needed

| | | | |
|--------------------------------|--------------|--------------|--|
| Teacher | Class | Group | Student |
| • Method to present PowerPoint | • None | • None | • Worksheet: <i>Open Ocean Ecosystem</i> |

Instructional Resources

PowerPoint Presentation: *Marine Snow*

Student Worksheet: *Open Ocean Ecosystem*

Teacher Answer Key: *Open Ocean Ecosystem*

Supplemental Resource: *Life in the Open Ocean Interactive Game*

Student Vocabulary Words

aphotic zone: the deeper regions of the water environment in which no light penetrates; generally, the bathypelagic and benthopelagic zones.

benthic zone: bottom portion of the ocean, also called seafloor, or sometimes seabed.

marine snow: decomposed or waste materials serve as a food source for deeper water animals.

nutrient: food or chemicals that an organism needs to live and grow or a substance used in an organism's metabolism.

oceanic zone: the Open Ocean, away from the influence of land, generally beginning at the outer edge of the continental shelf.

photic zone: the surface zone of the sea, having sufficient light penetration for photosynthesis.

upwelling: the movement of nutrient rich waters from the bottom of the ocean to the surface.

Lesson Plan

Lesson Preparation

- Review the Science Background provided in the Unit Overview.
- Preview the PowerPoint *Marine Snow* and make arrangements to project it.
- Make copies of the Student Worksheet *Open Ocean Ecosystem*, one per student.
- Preview the interactive piece *Life in the Open Ocean* to be completed in Step 11A.

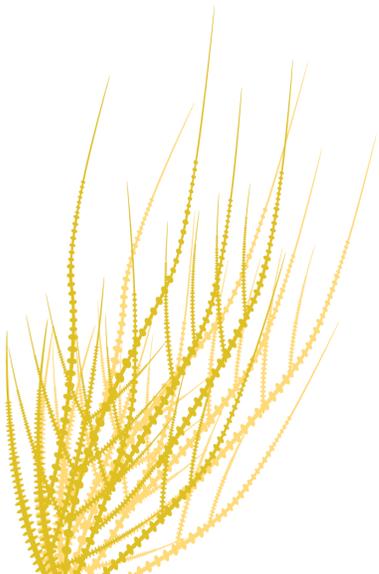
I. Marine Snow

- A. Use the PowerPoint: *Marine Snow* with students, and the notes embedded in the PowerPoint to discuss marine snow in various forms.
- Be sure to explain *upwelling* and emphasize its importance.
 - Upwelling is the process in which the surface water moves to open ocean and deep, nutrient-rich water flows up to replace the surface water.
 - Wind blowing parallel to the coast creates currents that push surface water to the open ocean.
 - The influx of nutrient-rich water increases the productivity of phytoplankton, which requires nutrients, along with sunlight, to photosynthesize.
 - Increased phytoplankton growth means more food for animals higher up in the food chain.
 - See the Science Background for more information on upwelling.

II. Open Ocean Ecosystem

- A. In order to reinforce the student learning for this unit, have the class work in pairs on the computer using the *Life in the Open Ocean Interactive Game*.

- B. Distribute the Student worksheet: *Open Ocean Ecosystem* to students. Students, using available resources, including books, textbooks, and the Internet, should identify the zones in the ocean, place animals and marine snow in the correct locations.
- You may wish to suggest search terms for research on the Internet, including *ocean zones*, or *vertical zonation*.
- C. Review the completed worksheet with students. Concentrate first on the ocean zones.
- 1) The two main layers are the photic zone and the aphotic zone. This is a critical difference to emphasize to students because most animals live in the photic zone, where food is plentiful.
 - 2) Now review the worksheet in terms of animal and plant life.
- Students should include phytoplankton and zooplankton in the photic zone, but not phytoplankton in the aphotic zone.
 - They should include marine snow in the photic and aphotic zones, including arrows to indicate snow falling and later upwelling.
 - Encourage students to think about whether animals move from the deeper zones into the more shallow zones to feed (*they do*). This is an important point.
 - Ask students questions such as: *Where is most of the food? (the photic zone), What do animals in the aphotic zone eat? (marine snow), and How does energy/matter transfer through this ecosystem?*



LESSON 4 - Teacher Reading

Marine Snow

Marine snow is organic material including dead animals and plants as well as sediment and fecal matter that is produced in the photic zone of the ocean, where sunlight penetrates and allows phytoplankton, the primary producers in the ocean, to thrive. Marine snow travels from the highly productive photic layer down to the sea floor, where sunlight cannot penetrate, and is the major food source for many of the deep ocean inhabitants. Marine snow is able to make it to the bottom of the ocean in as little as a few days due to its aggregating properties. Mucus from plankton acts as nets to capture and condense smaller particles of organic matter that allow the aggregates to sink faster. Much of the marine snow that falls through the water column does not end up on the bottom of the ocean, but instead is eaten by many different organisms along its journey to the deep. The amount of marine snow changes with surface productivity. Marine snow is decomposed into nutrients by bacteria as it sinks to the ocean floor. Upwelling brings the nutrients as food up to the phytoplankton thus completing the cycle of matter and flow of energy in the Open Ocean food chain.

When a dead animal such as a whale settles to the bottom of the ocean it is called Marine Fall. Once it decomposes into small particles it then becomes Marine Snow.

Here is a great audio website that explains marine snow in simple terms:

http://www.scienceandthesea.org/index.php?option=com_content&task=view&id=69&Itemid=10

LESSON 4

Name: _____ Date: _____

Open Ocean Ecosystem

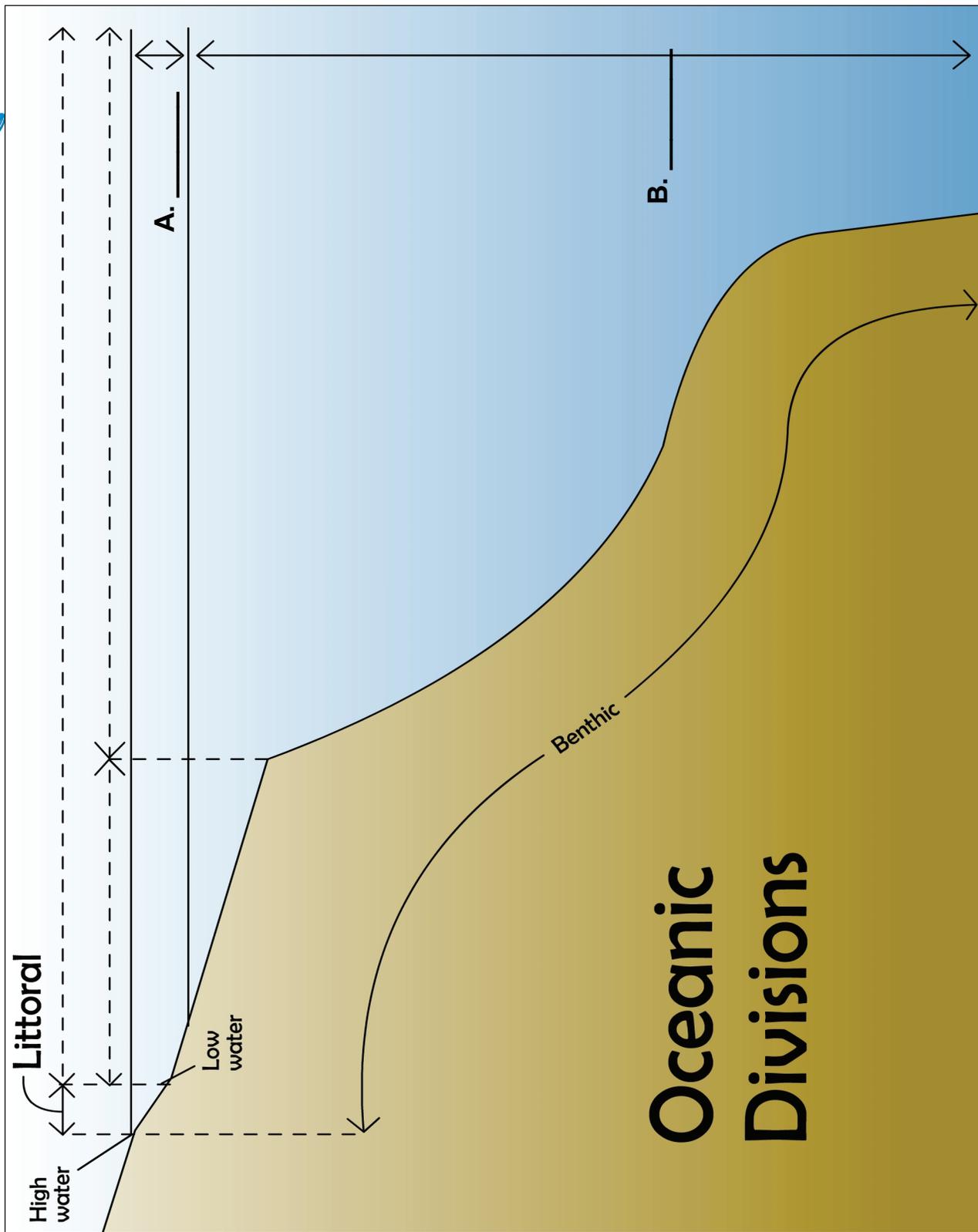
Directions

Follow the instructions given for each numbered item below. Use all available resources, including the Internet and books to help you.

1. Fill in the names of the ocean zones on the Oceanic Divisions diagram below next to the letters “A” and “B.”
2. In the diagram below, draw phytoplankton and zooplankton in the appropriate zones and label them.
3. Draw two Open Ocean organisms in the appropriate zones on the diagram and label them.
4. Include marine snow in the diagram, showing where marine snow is created, how it falls through the zones and how it returns to the photic zone to feed zooplankton (matter cycling).
5. Explain how and where marine snow forms.

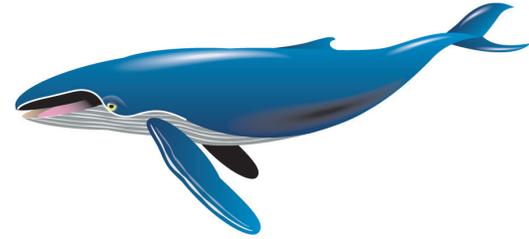
6. Using all of the organisms and the marine snow you drew in the diagram below, construct a food chain and describe how energy/matter would flow through that food chain.

Open Ocean Ecosystem



LESSON 4 - Teacher Answer Key

Open Ocean Ecosystem



Directions

Follow the instructions given for each numbered item below. Use all available resources, including the Internet and books to help you.

- Fill in the names of the ocean zones on the Oceanic Divisions diagram below next to the letters “A” and “B”.
(See diagram below)
- In the diagram below draw phytoplankton and zooplankton in the appropriate zone and label them.
Answer: Photic Zone only
- Draw two Open Ocean organisms in the appropriate zones on the diagram and label them.
(Answers will vary)
- Include marine snow in the diagram, showing where marine snow is created and how it falls through the zones and how it returns to the photic zone to feed zooplankton (matter cycling.)
Answer: The marine snow is created in the photic zone, falls to the ocean floor, and through upwelling returns to the photic zone which serve as food for the zooplankton.
- Explain how and where marine snow forms.
Answer: Marine snow is small particles of dead animals and plants (plankton), fecal matter, sand, soot and other inorganic dust, but it is produced at the surface of the ocean and falls through the photic zone down to the aphotic zone.
- Using all of the organisms and the marine snow you drew in the diagram below, construct a food chain and describe how energy would flow and matter would cycle through that food chain.
(Answers will vary)



Open Ocean Ecosystem - Teacher Answer Key

