



Protecting Humpback Whales in Hawaiian Island Humpback Whale National Marine Sanctuary

Lesson Specifications

Age

8 – 12

Timeframe

2 – 4 hours

Materials

Lesson:

- Computer and projector with screen OR
- Connect-it cards

Scuba:

- All primary scuba gear
- Compasses
- Laminated krill cards (4 per buddy team)
- Laminated humpback whale calf cards (1 per buddy team)

Key Words

Heat trapping blanket effect, migration, community solutions, kohalā

Standards

Ocean Literacy Principles 5,6
Climate Literacy Principles 3, 6, 7



An adult and a juvenile humpback whale. Ed Lyman, NOAA Permit #774-1714.

Activity Summary

This lesson introduces students to Hawaiian Islands Humpback Whale National Marine Sanctuary. Students will learn about humpback whales, their migration patterns for feeding and calving, and how these marine mammals may be impacted by humans. They will also learn about the important connection between whales and Hawaiian culture.

Learning Objectives

Upon completion of this lesson, students will be able to:

- Explain two ways that human actions may impact humpback whales.
- Describe the connection between Hawaiian culture and humpback whales.
- Describe actions they can take to positively impact the health of the ocean.

Essential Questions

1. How are humans impacting the marine environment?
2. How could human impacts affect humpback whales?
3. What is the significance of whales to Hawaiian culture?
4. What can we do to keep our ocean healthy?

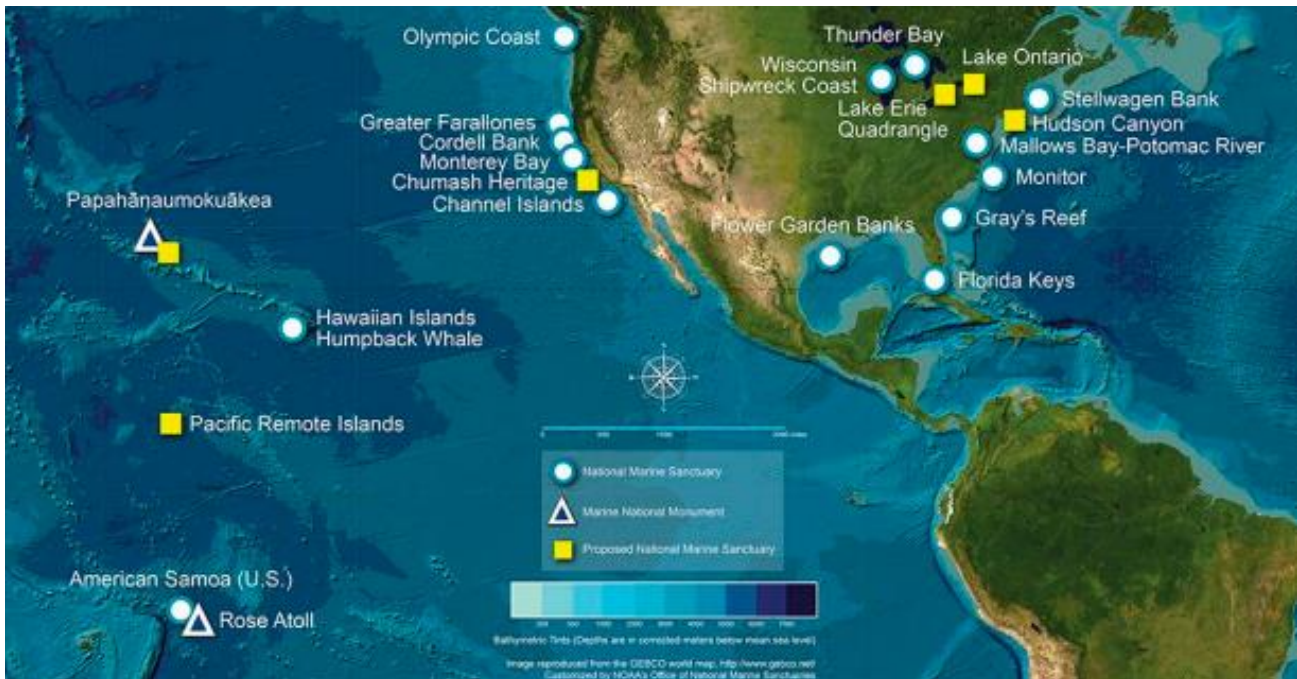
National Marine Sanctuary Diver Performance Requirements

At the surface, students will:

- Streamline gear prior to entry.
- Practice compass navigation on a reciprocal heading.
- Review hand signals that are necessary for the dive.

Underwater, students will:

- Locate and collect krill cards.
- Navigate from one end of the pool to another using a reciprocal heading.



A map of the National Marine Sanctuary System in the U.S. and its territories.

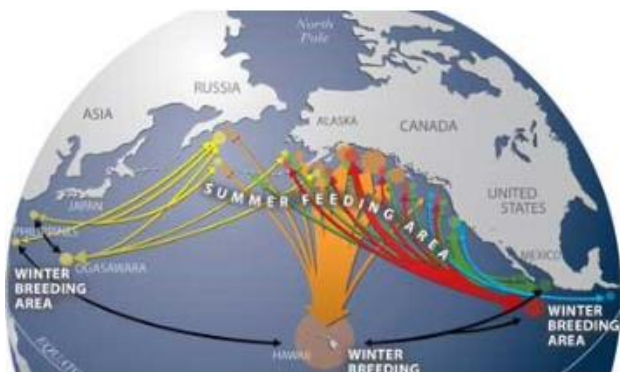
Background Information

Hawaiian Islands Humpback Whale National Marine Sanctuary (HIHWNMS) is one of the marine protected areas in the National Marine Sanctuary System. It was created by Congress in 1992 to protect humpback whales, *Megaptera novaeangliae*, and their breeding and calving habitat in Hawai'i. The waters around the Hawaiian Islands support more than half of the North Pacific humpback whale population. The sanctuary, which lies within the shallow (less

than 600 feet), warm waters surrounding the main Hawaiian Islands, constitutes one of the most important humpback whale habitats in the world.

The North Pacific humpback whales feed in northern waters on krill and small fish, like capelin and herring, during the summer months. For the winter months, the whales can travel up to 3,000 miles to their mating and

calving grounds in Hawai'i, western Mexico and the islands of southern Japan. Hawai'i is the only state in the United States where humpback whales mate, calve and nurse their young. The summer whale population around the islands may contain the largest seasonal population of North Pacific humpbacks in the world.



Humpback whale migration routes. Photo: NOAA

Human activities are changing the ocean. The atmosphere is like a blanket that surrounds the Earth. When we burn fossil fuels like coal, oil and natural gas for energy, it is adding carbon dioxide (CO₂) to the atmosphere. This buildup of CO₂ acts like a heat-trapping blanket, increasing the Earth's and the ocean's temperature.

Changes in ocean temperatures may affect the animals that live there. One example is that warmer waters may cause krill to move to cooler waters that they find more comfortable. Shifts in krill distribution could contribute to a

shift in humpback whale migration patterns, since krill is the primary source of food for humpback whales. This means that humpback whales may be forced to migrate earlier in the season and travel farther in search of food.

Ocean stewardship is deeply embedded in Native Hawaiian culture. Living in a world created by their gods, ancient Hawaiians spiritually connected with all forms of life. They traditionally believed in their family's `aumākua, a worshiped ancestor who could take the form of an animal such as the shark, turtle, owl and, for some families, the koholā or the humpback whale. The `aumākua was greatly respected as it provided guidance through dreams and visions to create a connection between the physical and spiritual worlds. Protecting the environment is an important part of Hawaiian culture.

There are many actions that we can take as a community to protect humpback whales and the ocean now and for future generations. Composting, choosing local food, planting trees, riding bikes and/or trains and using reusable bottles are just a few examples of how we can encourage our community to limit our dependence on fossil fuels, therefore adding less CO₂ to the atmosphere. For more information on how these actions can help our ocean see the Connect-It activity and accompanying slides.

Vocabulary	
Heat trapping blanket effect	When we burn fossil fuels (coal, oil, and natural gas) for energy, the carbon dioxide that is released builds up in our atmosphere and acts like a blanket that traps heat around the world.
Migration	The movement of people or animals from one area to another.
Community solutions	Local solutions to a problem that are lead and supported by people that live in the same area.
Koholā	(pronounced ko-ho-LAAH) Hawaiian word for humpback whale.

Procedure – Classroom

1. Provide students with an introduction to humpback whale feeding and nursing migration habits and how these are being impacted by humans. This can be done by using the provided PowerPoint.
2. Assess for student understanding by asking questions: (*Answers in italics*)

What significance do whales play in Hawaiian culture? *Ocean stewardship is deeply embedded in Native Hawaiian culture. They traditionally believed in their family's `aumākuā, a worshiped ancestor who could take the form of an animal such as the shark, turtle, owl and, for some families, the koholā or humpback whale.*



Photo: Ed Lyman/ NOAA Permit #15240

Sample Activity: Connect-It (developed by New England Aquarium)

1. Prior to the lesson, read the Connect-It instructor manual and familiarize yourself with the cards.
2. Break students into groups of two or fewer.

3. Introduce students to the Connect-It activity by walking them through the four *preview* panels to explain the heat trapping blanket effect:
 - a. When we burn fossil fuels like coal and gas, we pump carbon dioxide into the atmosphere.
 - b. As carbon dioxide builds up it creates a blanket around the Earth.
 - c. This thick blanket around the Earth traps heat.
 - d. Trapped heat warms up our ocean.

Note: This can be done using the provided PowerPoint slides or cards.

4. Explain to students that they will work in teams to put their Connect-It story cards in the right order, starting with a question card and ending with an organism card.
5. Provide each student with a set of Connect-It cards.
6. Assist students if they have questions or are unsure the correct order of the cards.
7. Once students have completed their set in the correct order they may try a different set of cards.
8. Assess for student understanding by asking questions:
 - a. How are human actions impacting humpback whale

feeding and nursing patterns? *Humpback whales feed on smaller animals called krill. Changing ocean temperatures cause krill to move to cooler waters that they find more comfortable. Moving krill populations may contribute to a shift in humpback whale migration patterns. This means humpback whales could be forced to migrate earlier and travel farther in search of food.*

- b. What can we do to help?
Composting, choosing local

food, planting trees, riding bikes and/or trains, and using reusable bottles are just a few examples of how we can encourage our community to limit our dependence on fossil fuels, therefore adding less CO₂ to the atmosphere.

- c. Who can you share this new knowledge with? *Answers will vary depending on the student, but could include my friends, my family, my school, my clubs, etc.*

Preparation – Pool Mission

Students will:

- Practice dive skills while meeting diving performance requirements and sanctuary learning objectives.
- Practice buoyancy and navigation skills while searching for items on the bottom of the pool.
- Simulate a humpback whale migration by locating a specified amount of krill cards on one side of the pool before migrating to the other side of the pool to locate a humpback whale calf card.

Prior to the mission, the instructor will set up the underwater environment in the pool. This will include setting up krill cards by laminating the provided cut outs and placing at different locations on the bottom of one side of the pool. There should be four krill cards for each buddy team at one end of the pool and one humpback whale calf card for each team at the other end of the pool. (See Figure 1.)

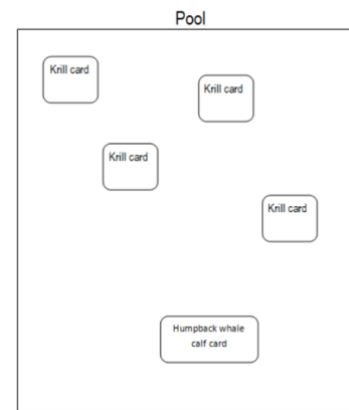


Figure 1

Procedure

1. Before the pool dive, the instructor will review humpback whale migration patterns. Explain to students that humpback whales spend their time feeding in cooler waters during summer months and then migrating to warmer waters to places like Hawaiian Islands Humpback Whale National Marine Sanctuary to have their young during the winter.
2. The instructor will place students in buddy teams and explain the pool mission. Each buddy team will conduct two dives. The instructor will highlight working in buddy teams and maintaining proper diving techniques throughout the mission. They will remind students of appropriate navigation techniques and have them practice a reciprocal heading before entering the water.
3. This mission is similar to an underwater scavenger hunt where students will act as humpback whales and work in buddy team to locate krill cards. Each team will need to find and collect four krill cards. Once a team has collected the four krill cards they will navigate to another location in the pool to locate a humpback whale calf card. When they have collected four krill cards AND one humpback whale calf card they will navigate back to their starting point. The instructor will time each group.
4. After each team completes the first dive, discuss the amount of time it took for each group to complete the task. Ask students: Was it easy to locate the krill cards? Why or why not?
5. The instructor will return to the bottom of the pool and set up more cards. This time the instructor will include only two krill cards for each buddy team.
6. Buddy teams will complete the same activity as dive 1 and will be required to locate and collect four krill cards and one humpback whale calf card. The instructor will challenge the students to beat their time from the first dive.
7. Note: The purpose of this dive is for students to notice a difference in difficulty from dive 1. There will be less krill cards available therefore it should take them longer and be more difficult for them to find the cards that they need.
6. Once students have completed dive 2 gather the group for discussion. Ask students:
 - What did you notice was different in dive 2?
 - Was it easy to locate the krill cards? Why or why not?
7. Remind students of the impacts that humans are having on humpback whale migration patterns by referencing the “why” card from the Connect-It deck.
8. Assess student understanding by asking: What can we do daily to protect humpback whales? *Composting, choosing local food, planting trees, riding bikes and/or trains, and using reusable bottles are just a few examples of how we can encourage our community to limit our dependence on fossil fuels, therefore adding less CO₂ to the atmosphere.*

Education Standards	
Dive Industry Standards	This lesson could be paired with: PADI AquaMission Creature ID Specialist SSI Marine Life Ranger NAUI Junior Scuba Diver or Passport Diver
Ocean Literacy Principles	5: The ocean supports a great diversity of life and ecosystems. 6: The ocean and humans are inextricably connected.
Climate Literacy Principles	3: Life on Earth depends on, and is shaped by, and affects climate. 6: The ocean and humans are inextricably interconnected. 7: Climate change will have consequences for the Earth systems and human lives.

Additional Resources

Hawaiian Island Humpback Whale National Marine Sanctuary This site provides information on Hawaiian Island Humpback Whale National Marine Sanctuary.
<https://hawaiihumpbackwhale.noaa.gov/>

North Pacific Humpback Whales This site provides more information about the North Pacific Humpback whale and how they use the sanctuary.
https://hawaiihumpbackwhale.noaa.gov/exploration/humpback_whale.html

Whales and Hawaiian Culture This brochure provides more background on Hawaiian culture and humpback whales.
https://hawaiihumpbackwhale.noaa.gov/documents/pdfs_brochures/cultural_brochure.pdf

Ocean and Climate Literacy Principals The ocean and climate literacy principals outline the key facts that an ocean and climate-literate person should understand.
<https://oceanservice.noaa.gov/education/literacy.html>

Humpback Whale Migration Game Play the migration game to find out more about humpback whales, where any why they migrate, and how you can help them.

https://sanctuaries.noaa.gov/whales/main_page.html



Photo: NOAA Fisheries Permit #782-1438

For More Information

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