

LESSON 2 A Humpback Whale's World

Lesson at a Glance

Students participate in an interactive brainstorming activity to discuss their prior knowledge about humpback whales with their classmates. Students plot the migration route of a humpback whale on a map, locate the areas where whales feed, mate and give birth, and compare the features of the humpback's Hawaiian and Alaskan environments. The whales visit Hawai'i in the winter, therefore it is best, if possible, to do this lesson during the period of November to April.

Lesson Duration

Three 45-minute periods

Essential Question(s)

Why do humpback whales migrate between Alaska and Hawai'i each year?
Why do Humpback Whales need both Alaskan and Hawaiian environments to survive?

Key Concepts

- Humpback whales migrate to the nutrient-rich waters of Alaska to feed during the summer, and to the warm waters of Hawai'i to give birth and mate during the winter.
- They feed in the near-shore waters of Alaska during the summer months where the cold, nutrient rich waters and long, sunny summer days fuel the production of large amounts of plankton and small fish, the food source for the whales.
- Humpback Whales migrate to the near-shore waters of Hawai'i during the winter months where the warm water is suitable for giving birth. Japan and Mexico are also breeding grounds for the Humpback Whale.

Instructional Objectives

- I can describe how a humpback whale's behavior is determined by its environment.
- I can describe why the humpback whale needs both the Hawaiian and Alaskan environments to survive.
- I can plot ordered pairs on a map.

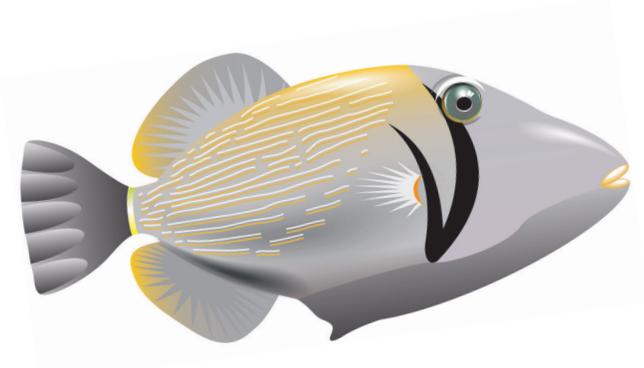
Related HCPSIII Benchmark(s):

Science SC.4.3.2
Describe how an organism's behavior is determined by its environment.

Science: SC.4.5.3
Describe how different organisms need specific environmental conditions to survive.

Social Studies: SS 4.7.2
Collect, arrange, and analyze data to interpret and construct geographic representations.

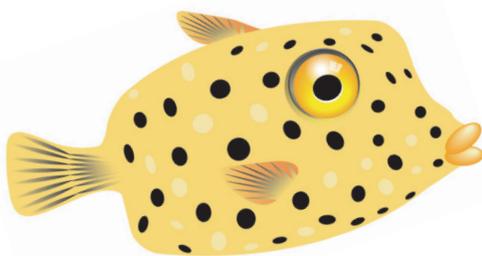
Math: MA.4.8.1
Use ordered pairs to plot points on a coordinate grid.



Assessment Tools

Benchmark Rubric:

Topic		Interdependence	
Benchmark SC.4.3.2		Describe how an organism's behavior is determined by its environment	
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Explain and give examples of how different organisms' behaviors are determined by their environments	Describe how an organism's behavior is determined by its environment	Identify a way that an organism's behavior is influenced by its environment	Recognize that an organism's behavior is influenced by its environment
Topic		Unity and Diversity	
Benchmark SC.4.5.3		Describe how different organisms need specific environmental conditions to survive	
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Explain why different organisms need specific environmental conditions to survive	Describe how different organisms need specific environmental conditions to survive	List specific environmental conditions that organisms need to survive	Recall that organisms need specific environmental conditions to survive
Topic		World In Spatial Terms	
Benchmark SS.4.7.2		Collect, organize, and analyze data to interpret and construct geographic representations	
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Collect, organize, and analyze data to interpret and construct geographic representations, with accuracy	Collect, organize, and analyze data to interpret and construct geographic representations, with no significant errors	Collect, organize, and analyze data to interpret and construct geographic representations, with a few significant errors	Collect, organize, and analyze data to interpret and construct geographic representations, with many significant errors
Topic		Coordinate Geometry	
Benchmark MA.4.8.1		Use ordered pairs to plot points on a coordinate grid	
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Use ordered pairs to plot points on a coordinate grid, with accuracy	Use ordered pairs to plot points on a coordinate grid, with no significant errors	Use ordered pairs to plot points on a coordinate grid, with a few significant errors	Use ordered pairs to plot points on a coordinate grid, with many significant errors



Assessment/Evidence Pieces

Lesson

- Student Worksheet: *Miraculous Migration*, includes Discussion Questions and Mapping Activity.

Materials Needed

Teacher	Class	Group	Student
<ul style="list-style-type: none"> • World Map • 3 dry erase markers (3 different colors) 	<ul style="list-style-type: none"> • Computer projector 	<ul style="list-style-type: none"> • GPS (Extended Activity) 	<ul style="list-style-type: none"> • Materials for illustration • Pencil • Ruler or straight edge • 1 sheet of notebook paper

Instructional Resources

PowerPoint: *Humpback Whale Basics*

PowerPoint: *Harriet's Migration Map* (the 3 maps used in the activity)

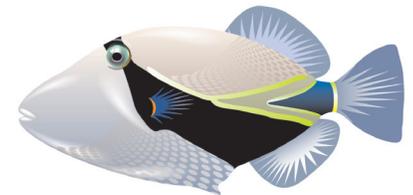
Student Worksheet: *Miraculous Migration*

Teacher Answer Key: *Miraculous Migration*

Student Worksheet: *Sighting Record of Harriet the Humpback Whale*

Student Worksheet: *Pacific Centered Map*

Student Worksheet: *Discussion Questions*



Student Vocabulary Words

behavior: the actions or reactions of an organism in response to external or internal stimuli.

breeding grounds: a place to which animals go to breed.

coordinates: two numbers in an ordered pair used to locate points on a grid or map.

environment: the total of all of the surroundings (climate, location, and other organisms) that may have an impact on the development, action, or survival of an organism or group of organisms; the surroundings of an organism.

equator: an imaginary line around the Earth halfway between the North Pole and the South Pole with latitude of zero.

feeding grounds: the areas where whales feed.

krill: shrimp-like planktonic crustaceans; a major food source for humpback whales.

latitude: imaginary lines that cross the surface of the Earth parallel to the Equator measuring how far north or south of the Equator a place is located.

longitude: imaginary lines that cross the surface of the Earth, running from north to south, measuring how far east or west of the Prime Meridian a place is located.

migration: the regular movement of animals from one location to another.

ordered pair: two numbers listed in a certain order.

plankton: tiny free-floating plants and animals that drift through the layers of the ocean and serve as the base of the ocean food chain; unable to swim against currents.

prime meridian: an imaginary line running from north to south through Greenwich, England, used as the reference point for longitude.

Lesson Plan

Lesson Preparation

- Review the Science Background provided in the Unit Overview.
- Make copies of the Student Worksheets *Miraculous Migration*, *Sighting Record of Harriet the Humpback Whale*, *Pacific Centered Map*, and *Discussion Questions*, one per student.
- Preview PowerPoint Presentations *Humpback Whale Basics* and *Harriet's Migration Map*, make arrangements to project them.

I. *Whale Word Wall*

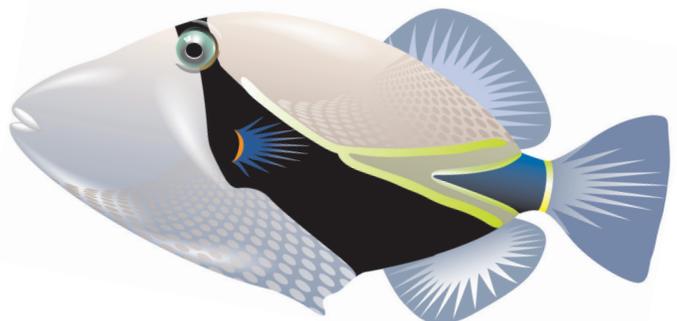
- Begin the lesson by engaging the students in a brainstorming activity to share their prior knowledge about humpback whales. (Note: This lesson is an introduction to humpback whales and their environments. Specific humpback classification, anatomy, and behaviors will be addressed throughout the unit and is also covered in the third grade whale unit called “Humpback Whales 101”.)
- Show and discuss the PowerPoint: *Humpback Whale Basics*.
- On the white board, write Question 1, *What are the characteristics of a humpback whale?* and then read it aloud. Discuss humpback whales, and ask students to think of descriptive words and phrases describing the body features of humpback whales. Write the students’ responses on the board.
- On the white board, write Environment and Question 2, *Where do humpback whales live?* and then read them aloud. Discuss the term *environment* with the students. Make sure the students understand that an environment is all of the surroundings of an organism, including air, water, climate, and other plants and animals. Explain that humpback whales have two different environments, Hawai‘i and Alaska. Add a column to the board under question 2, and label each column *Alaska* and *Hawai‘i*. Discuss the environment of humpback whales with the class, and ask the students to list descriptive words and phrases describing each environment. Write the descriptive words and phrases on the board in their respective column.
- On the white board, write Behavior and Question 3, *What do humpback whales do?* and read aloud. Discuss the term *behavior* with the class. Ask the students to think about the behaviors of humpback whales, and to share descriptive words and phrases describing the behaviors. Write the descriptive words or phrases students come up with on the board. (Note: This is an introductory lesson about humpback whales and the descriptions of their Hawaiian and Alaskan environments. Specific Humpback behaviors will be addressed in future lessons.)

II. *Miraculous Migration: Presentation and Mapping Activity*

NOTE: *This activity will require that you spend extra time explaining latitude and longitude in detail. This activity may take two 45 minute periods. The students may be easily distracted by the dots on the map; Please remind the students that this is a scientific chart they are filling with data and not a dot-to-dot drawing.*

- Provide each student with a copy of the *Miraculous Migration*, *Sighting Record of Harriet the Humpback Whale*, and *Pacific Centered Map* student worksheets. Encourage the students to visualize the images of the whales they observed during the PowerPoint: *Humpback Whale Basics*, as they plot the migration route of Harriet the whale, during the next activity.
- Guidelines for plotting ordered pairs and teaching about latitude and longitude (use the first two points plotted on the worksheet map to guide the students through the following steps):

1. Explain that an *ordered pair* is two numbers listed in a certain order. Have the students locate the ordered pair for Point A on the Sighting Log. In this case, the two numbers in the ordered pair represent latitude and longitude. Latitude is the first number of the ordered pair (labeled as LAT on the Sighting Log), and longitude is the second number (labeled LONG on the Sighting Log).
 2. Explain that the two numbers in an ordered pair are called *coordinates* when used to locate a point on a grid or map. The two coordinates for Point A are 56°N and 136°W , and are read as 56 degrees north, 136 degrees west. Note: The Earth is a sphere, and therefore, these coordinates are measurements of angles that are expressed in degrees ($^{\circ}$). Check out the following website for additional information on latitude and longitude:
www.Earthkam.ucsd.edu/public/educators/pdf/GeoImportandFactsLatAndLong.pdf
- C. Define *latitude*. Make sure the students understand that latitude measures how far north or south of the equator a place is located and that the lines of latitude run east to west, or parallel to the equator. Have the students locate the equator on the map, then *hop up* (north) five lines to 50°N . Ask the students to determine where 56°N lies in the space between 50°N and 60°N . (You may need to draw an example on the board to help students determine where 56°N lies between 50°N and 60°N .) Have the students lightly draw a small line with pencil to mark the location of 56°N .
- D. Define *longitude*. Make sure the students understand that longitude measures how far east or west of the Prime Meridian a place is located. Explain that the Prime Meridian is an imaginary line that passes through Greenwich, England. (The Prime Meridian is not on the student worksheet map. Have the students find the International Date Line on a world map for reference.) Have the students locate the vertical line farthest to the east (right side of the migration worksheet map), then *hop west* until they find 136°W . Have the students lightly draw a small line with pencil to mark the location of 136°W .
- E. Have the students follow imaginary lines over from the pencil mark at 56°N , and up from the pencil mark at 136°W , until they find where the two lines intersect. The dot marks the exact point where the two lines intersect, and is labeled *A*.
- F. Have the students read the coordinates for Point B on the Sighting Log. Ask them to find the latitude first and place a light mark at 59°N . Then ask them to find the longitude and place a light mark at 140°W . Have the students follow the imaginary lines to where they intersect. The exact point is a dot labeled *B* on the map. (Students can use rulers to help them visualize the imaginary lines.)
- G. Review the activity directions on Page 1 of the worksheet with the students. Remind the students to use a pencil to plot and label the points on the map.
- H. Read the observations and notes for Points A and B (on the Sighting Log) with the class. Explain to the students that scientists record many observations and notes when they see whales. These observations and notes help scientists learn more about the whales, their environment, and their behaviors. Whale researchers keep a Sighting Log (similar to a journal) with them at all times to record their observations and notes each time they see a whale. When they see a whale on the surface, scientists document the location (latitude and longitude) using a GPS, time, date, activity of the whale, and any other relevant notes. When they see a whale, it is called a *sighting*.

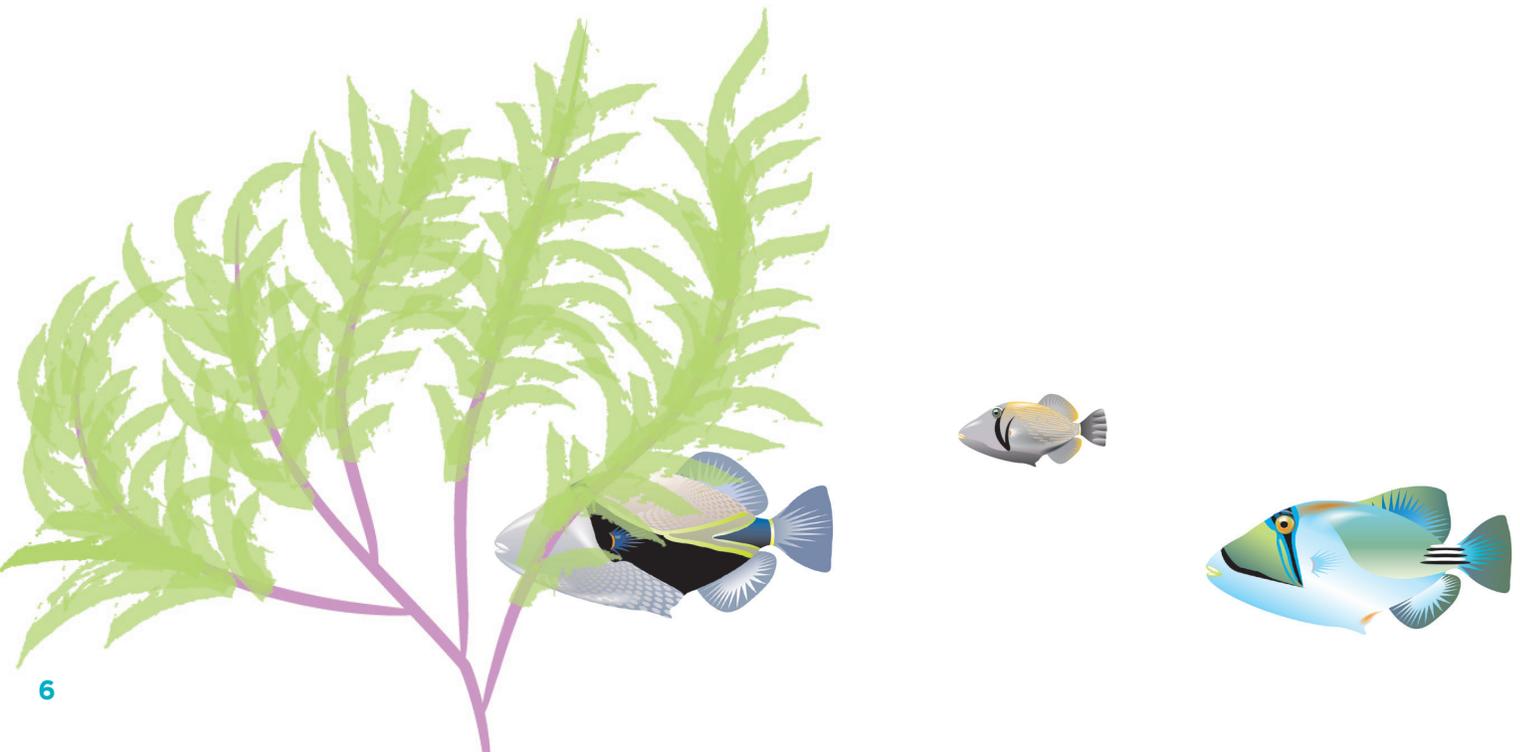


- I. Tell students their feeding ground shaded areas should extend from West Bay to Southeast Alaska.
- J. Hand out the Student Worksheet *Discussion Questions*. Tell the students to use the information from the map, and in the Observations and Notes log to answer the discussion questions after they have plotted the points.
- K. After students have had an opportunity to plot the points and answer the discussion questions go over the worksheets as a class. In order to discuss plotting the points the teacher may want to use PowerPoint *Harriet's Migration Map*.

Extended Activities

Whale Wall Mural

1. Create a large wall mural of the migration map, and allow the students to add illustrations to the mural as they learn about the life and times of humpback whales throughout the unit.
 - a. Make a transparency of the migration map, and use an overhead projector to project the map onto a large piece of white butcher paper hung on the wall.
 - b. Trace the migration map image onto the paper.
 - c. Put the traced map on the floor, and have the students paint the ocean and land using watercolors.
 - d. Have the students label the map and add illustrations as they learn about the environments and behaviors of the humpback whale.
2. Bring in a GPS to show the students how whale researchers determine the latitude and longitude of marine mammal sightings. Have them take turns to read the GPS to determine the location of the classroom.
3. Compare other migratory animal life cycles and migration paths (i.e. Kōlea) with that of the Humpback Whale
4. Compare the migratory patterns of the Humpback whales that breed in Hawai'i with the migratory patterns of other populations of Humpback whales.

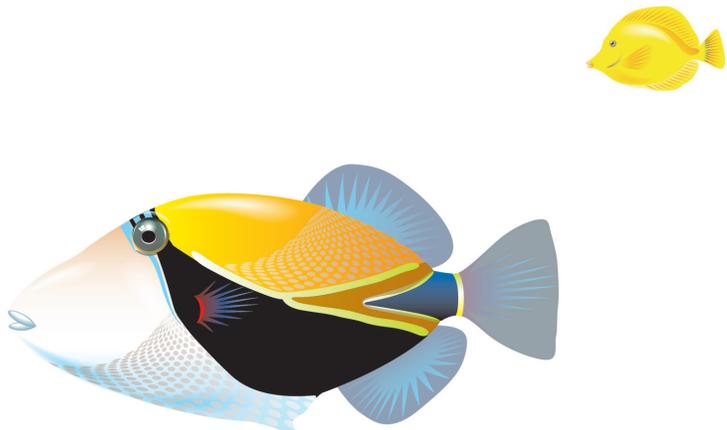


LESSON 2 Miraculous Migration

Teacher Answer Sheet

Discussion Questions (page 1 of student worksheet):

- List the names of four areas in the humpback whale feeding grounds:
 Western Gulf of Alaska _____ Prince William Sound _____
 Yakutat Bay _____ Southeastern Alaska _____
- Describe Harriet's Alaskan environment?
The near shore waters of Alaska are cold and nutrient-rich (produce a lot of plankton). The water appears greenish-blue and murky due to the high plankton content.
- Describe Harriet's Hawaiian environment?
Hawai'i has warm, tropical water, which is ideal for whales to give birth. The water appears deep blue, and is very clear due to the low plankton content.
- Why do humpback whales feed in Alaska and not in Hawai'i?
Humpbacks feed on large amounts of krill and small schooling fish that can only be found in cold, northern nutrient rich environments, such as Alaska. Hawai'i's warm, clear water is not as nutrient-rich and does not provide enough food for whales.
- Where do some humpback whales give birth to their babies? Why?
Hawaiian Islands (although not covered, Japan and Mexico would also be correct)
They need to give birth in warm water because the calves are not born with blubber and would freeze in the cold waters of Alaska.

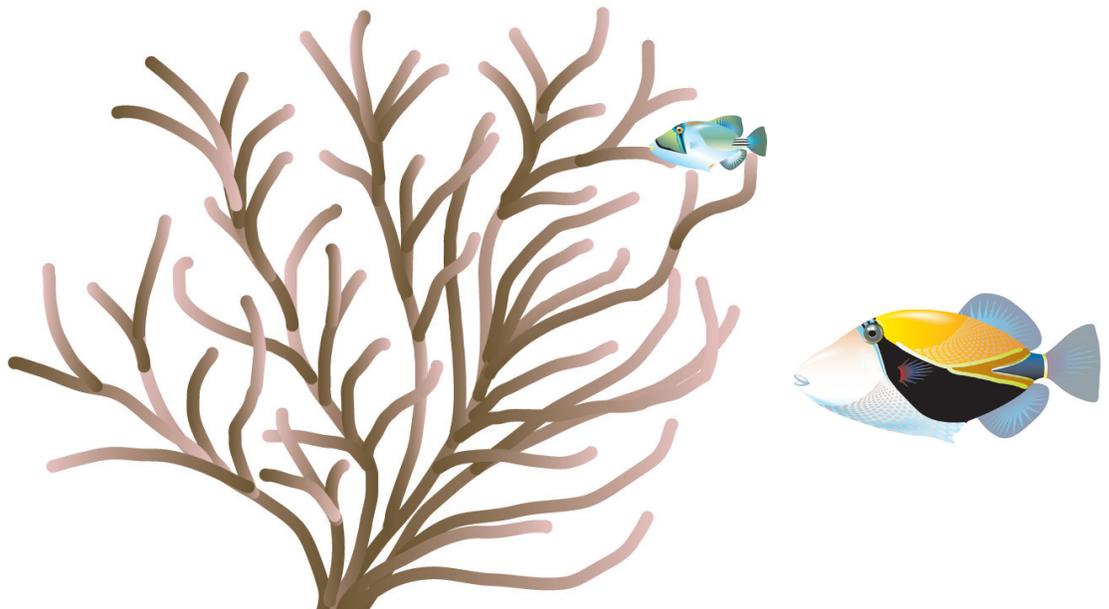


LESSON 2 Miraculous Migration

Name: _____ Date: _____

Directions:

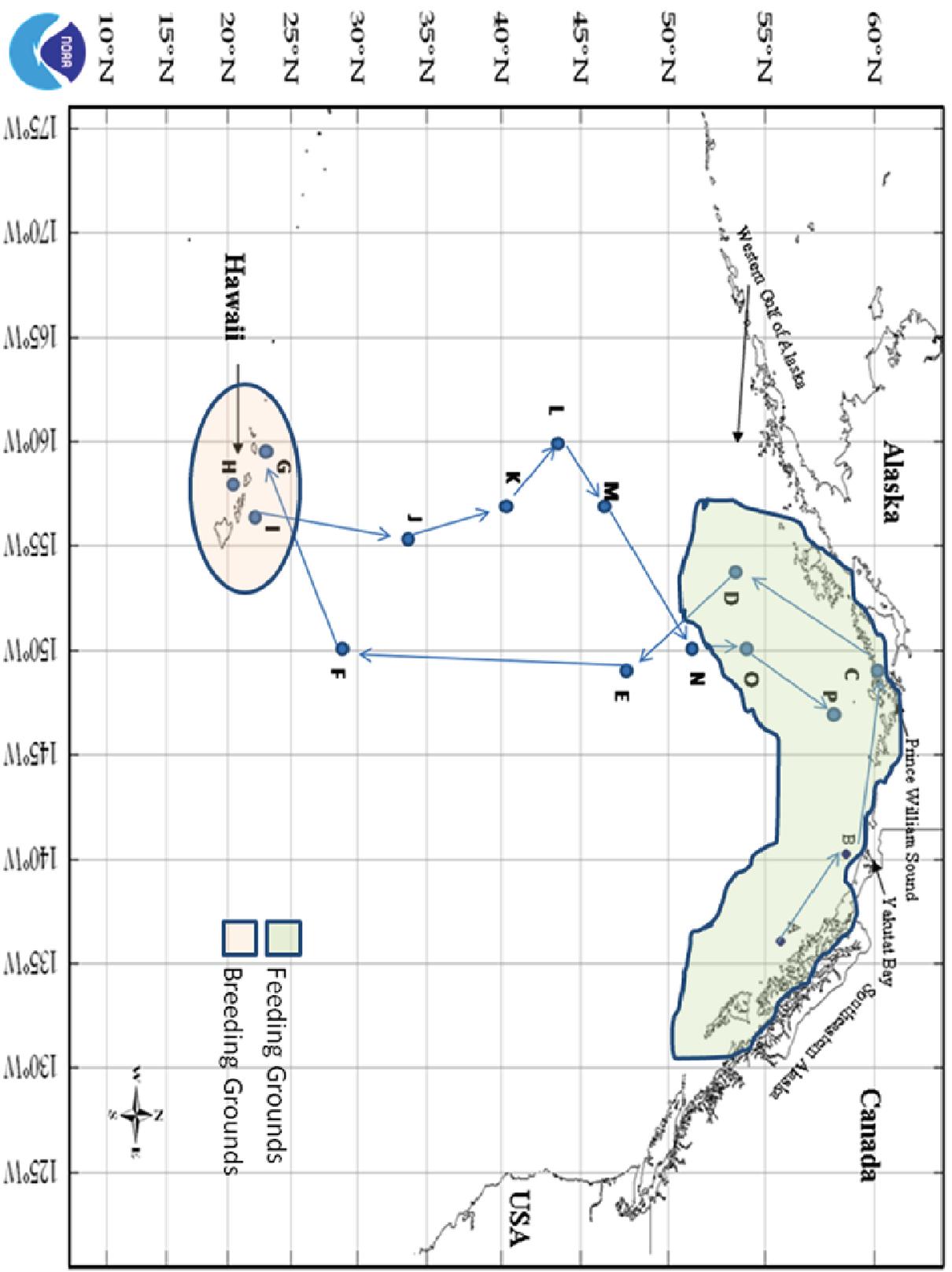
1. For this exercise you will need to use the worksheets Sighting Record of Harriet the Humpback Whale and the Pacific Centered Map. The goal is to plot on the map Harriet's migration route using the latitude and longitude points listed on the data sheet. The first two points are already marked on the map for you. Label each point with the appropriate letter from the data sheet. Use a pencil!
2. Read the researcher's observations and notes to learn about Harriet's Alaskan and Hawaiian environments, and the miraculous migration between these environments.
3. Draw a line to connect the points. Label the migration route on your map.
4. Choose a colored pencil, and shade in the feeding grounds. Label the feeding grounds on your map.
5. Choose a different colored pencil and shade in the breeding grounds, and area where humpbacks give birth. Label the breeding/birthing grounds on your map.
6. Answer the discussion questions that follow.



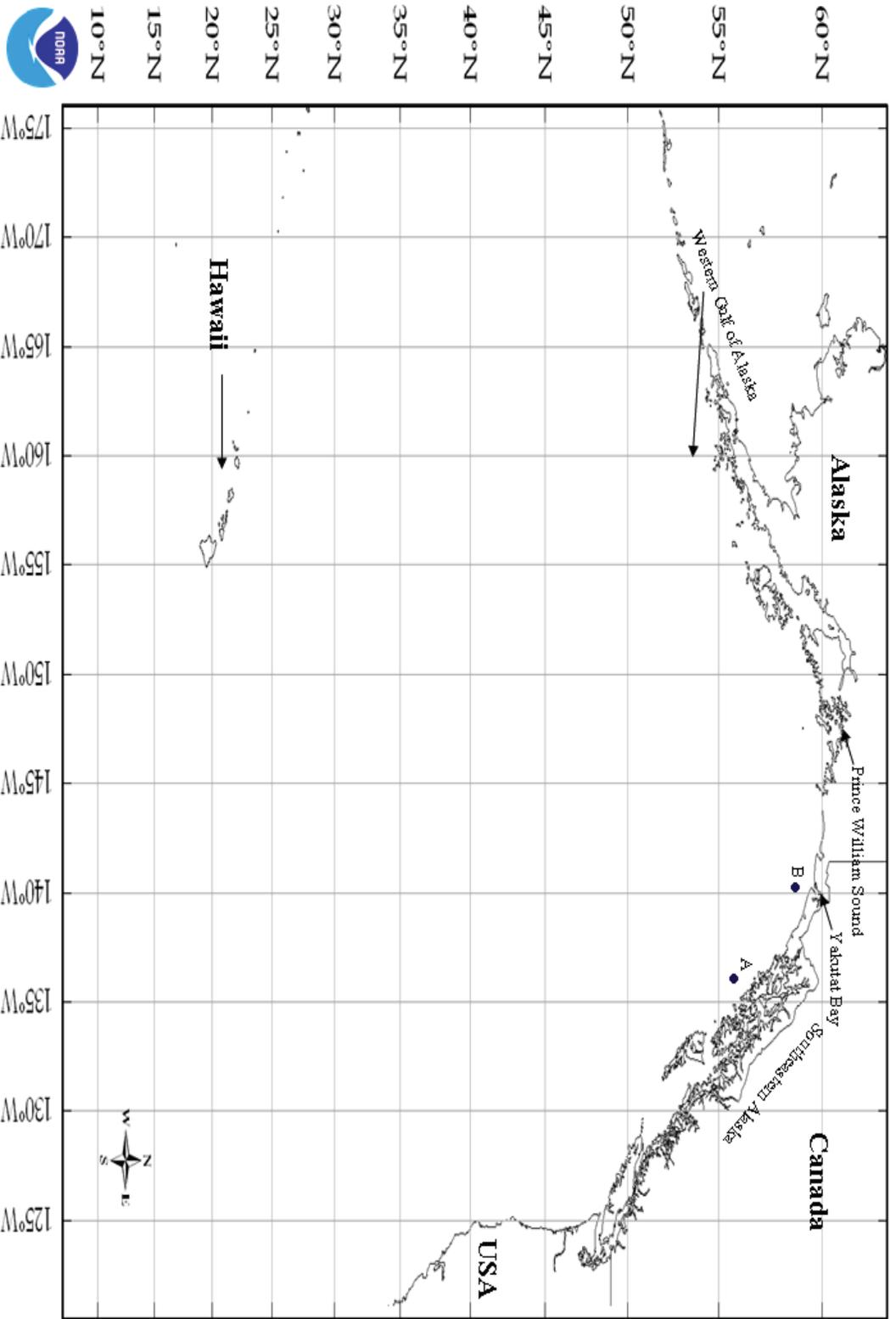
LESSON 2 Sighting Record of Harriet the Humpback Whale

POINT	LAT/LONG	DATE	OBSERVATIONS AND NOTES: Sighting Record of Harriet the Humpback Whale
A	56°N 136°W	June 21	Harriet (pregnant female) feeding near surface of cold, nutrient-rich water.
B	59°N 140°W	July 4	Harriet (pregnant female) feeding near surface of cold, nutrient-rich water.
C	60°N 148°W	Aug. 13	Feeding in green-blue, murky water; lots of sunlight + cold water = lots of plankton growth. (This makes water not very clear, but provides lots of food for krill, small fishes, and whales.)
D	W53°N 153°W	Nov 10	Heading south; not sure if she left Alaska due to decreasing water temperature, less sunlight, less food available, or changing hormones from pregnancy?
E	47°N 149°W	Nov. 22	Swimming south; pregnant females are typically last to leave feeding grounds, so that they can pack on more blubber for energy to give birth and tend calves.
F	29°N 150°W	Dec. 14	Swimming at 3 mph (average swimming migration speed); water is warmer; almost completed the 3,500-mile swim to Hawai'i. It usually takes whales approximately 1½ months to get to Hawai'i.
G	23°N 159°W	Dec. 24	Giving birth to her calf; water is warm and tropical; newborns have no blubber.
H	20°N 157°W	Feb. 14	Mom and calf resting in the warm, shallow, protected water of the Hawaiian Islands; near whale watch boat; males making big splashes nearby; the males compete to mate with females in breeding area.
I	22°N 157°W	March 20	Nursing calf near surface of clear, blue water; not much plankton to cloud water.
J	34°N 155°W	April 8	Swimming north: females with newborn calves are typically last to leave the breeding grounds, so they can fatten up calf and strengthen its swimming muscles; there is no food for adult whales in Hawai'i.
K	40°N 157°W	April 20	Swimming north; newly pregnant females are first to leave Hawaiian breeding ground to head back to Alaskan feeding grounds.
L	44°N 160°W	April 28	Swimming at a slow and steady pace; Harriet hasn't eaten since leaving Alaska.
M	46°N 157°W	May 1	Swimming north; she has lost 1/3 of her body weight since November; calf swims very close to her for protection from predators.
N	51°N 150°W	May 12	Swimming north; calf has nursed throughout the journey and has gained a layer of blubber as protection from the cold waters of Alaska.
O	54°N 150°W	May 15	Feeding, feeding, feeding; she seems hungry after her long journey.
P	58°N 147°W	May 18	Breaching; Harriet seems happy to be back in the feeding grounds.

Pacific Centered Map-Teacher Answer Key



Pacific Centered Map



LESSON 2 Discussion Questions

Name: _____ Date: _____

1. List the names of four main areas in the humpback whale's feeding grounds.

2. How can you describe Harriet's Alaskan environment?

3. How can you describe Harriet's Hawaiian environment?

4. Why do humpback whales feed in Alaska and not in Hawai'i?

5. Where do some humpback whales give birth to their babies?

Why? _____

