



Humpback Whales in Glacier Bay

Middle School Scientists Curriculum

Investigation 2: A Whale of a Tail

Overview:

In this investigation, students study the identification and monitoring of humpback whales in Glacier Bay National Park. Students will identify individual humpback whales by their fluke markings. Then, students will use these skills in a simulated whale monitoring trip. Finally, students will identify the humpback whales seen and learn more about the life histories of individual whales.

Background Information:

One of the longest ongoing humpback whale studies in the world happens in the waters of Glacier Bay, Alaska. The project was started by local high school teacher, Charles Jurasz, in 1973 and today scientists around the world use this method for identifying and monitoring whales. Jurasz was one of the first to realize that every humpback whale has different markings on its **flukes** (tails) and that these characteristics can be used to identify whales from year to year in different locations.

Every humpback whale fluke has **unique** characteristics. No other whale fluke in the world has the exact same features. Fluke markings are individual, much like human fingerprints. The unique fluke patterns stay stable throughout a humpback's life, allowing scientists to monitor the whale for years. Scientists look at several parts of humpback flukes to identify individual whales. Catalogues of humpback whale flukes are divided into sections based its characteristics. First, whale biologists categorize flukes by coloration, or the amount of black versus white on the fluke. The shape of the fluke is also distinctive, including the trailing edge and the size of the notch between the two flukes. Scars or nicks can be acquired over the lifetime of the whale and become another identifying feature. Additionally, some humpbacks can be identified by their dorsal fins. The presence of barnacles is not a good identifying feature because they change throughout the humpback's life.

Class Time Required	1 class period (50 minutes)
Materials Needed:	<ul style="list-style-type: none"> Fluke ID Chart* (2-3 per class, cut into individual pictures plus 1 chart per student pair) Humpback Whale Identification Chart* Fluke Images (large)* (2 sets per class) Digital Camera Humpback Whale Fluke Photo ID Data Collection Sheet* (1 for each pair of students) Humpback Whale Biographies Sheet* (1 per pair) Fluke ID Intro PowerPoint Science fair boards or folders <p>*Can be found online at www.nps.gov/glba/forteachers/classrooms/middle-school-scientists-humpback-whale-identification.htm under materials.</p>
Teacher Preparation:	30 minutes to read background information and investigation, review PowerPoint, and print appropriate pages
Student Knowledge:	Basic understanding of humpback whale behavior, ability to use a digital camera
Vocabulary:	abundance, distribution, dorsal fin, fluke, unique
National Content Standards	<ul style="list-style-type: none"> NS.5-8.1 Science as Inquiry NS. 5-8.3 Life Science NS. 5-8.7 History and Nature of Science

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In the summer, Glacier Bay National Park whale biologists monitor humpback whales in the bay daily. The Marine Mammal Protection Act prohibits people from approaching too closely to humpback whales and disturbing these endangered animals, but Glacier Bay scientists have a special permit that allows them to approach humpbacks slowly and carefully to do research. The data helps researchers learn two things: **abundance** and **distribution**. Abundance is how many whales are in the bay and distribution is where the whales are located and if they are alone or in groups. Researchers record the presence of mothers and calves. Using these data, biologists have created multi-generational family trees. The monitoring of humpback whales in Glacier Bay helps park managers care for the whales inside the park and is used by scientists around the world.

Focus Questions:

What characteristics do researchers use to identify humpback whales?

What methods do researchers use to monitor humpback whales?

Why do fluke identifications allow researchers to monitor a humpback throughout its life?



Engagement:

(15 minutes)

Introduce students to the story of Charles Jurasz, high school science teacher and pioneer in humpback studies and whale tail identification. Use the power point program provided. Have the students pay particular attention to the components of humpback whale fluke identification.

The students will practice identifying individual whales by playing a short game. Make the Fluke ID Chart available for all students to see, by either printing out several copies or projecting it onto a screen. Divide students into groups of two. Each student will get a photo of a humpback whale fluke, but keep the photo a secret from their partner. One student will describe his or her whale's fluke photo using vocabulary learned in the power point. The other student will look at the Fluke ID Chart and guess what whale is being described. When the student successfully identifies the fluke, they will switch roles. Make sure students are using the vocabulary from the presentation to describe the flukes.

Investigation:

(30 minutes)



Prior to doing this activity, the teacher must prepare some materials. Print the Fluke ID images (one for each student) and data collection sheets (one for each *pair* of students). Printing in black and white is acceptable for this activity. Additionally, the teacher should label the classroom walls as north, east, west and south by writing on the board or simple signs on the walls.

Now that students know how to identify humpbacks, they will test their ability to collect this data in the field. Begin by reviewing how humpback whale researchers go out in small boats and have special permits to approach very close to the whales. They take a photo of the fluke as the humpback dives. The whale does not show its flukes on every dive, but it will spout before it dives.

Students will have the opportunity to be humpback whales and researchers. The humpback whales will display their flukes and the researchers will attempt to photograph them. In the end, all students will attempt to identify the whales they photographed. As time allows, each student should have an opportunity to play the role of researcher and whale.

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Choose several students to be humpback whales. These students will set up science boards or folders on their desks. This will indicate the water. Remind the students of what they learned about humpback behavior in the first lesson. Humpbacks surface regularly to breathe. Researchers are alerted to their presence by the loud exhalation of breath. After surfacing to breathe, humpbacks go back underwater. Regularly, though not every time, humpbacks dive deep and show their flukes after spouting. Students playing humpbacks will be given an image of a humpback whale fluke. During the activity, the students playing humpbacks should periodically exhale loudly and raise their fluke image above their science fair board or folder. This gives the researchers an opportunity to photograph the fluke.

Students chosen to be researchers will work in pairs. Each pair needs a “Humpback Whale Fluke Photo Identification Data Collection” sheet, a pencil or pen, and a digital camera and will stand in the middle of the classroom. One researcher will be the photographer and the other the recorder, though the students may change roles. The students playing humpback whales will periodically surface and flash fluke pictures above the science fair boards. The photographer needs to capture an image of the fluke while it is above the “water,” or science fair board. The researcher who is recording will fill out the first four boxes of the data collection sheet while the photographer is trying to capture an image.

- **Researchers:** The names of the students collecting the data.
- **Photo number:** The number of the photo on the camera to be used to identify the whale. This may vary from camera to camera.
- **Number of whales:** How many “humpbacks” are in a group. If three students playing humpbacks are clustered close together the number of whales in the group is 3. If one humpback is alone in the room, the number of whales in that group is 1. Researchers record this information in order to learn about distribution and abundance.
- **Location:** Where the whale was located in relation to the researchers: north, east, south or west.
- **Whale ID:** This will be recorded later, after the researchers have had a chance to look at their photos and use the catalogue to identify individual whales.

Allow students to take turns in the different roles. After everyone has had a turn, upload the images to a computer. Share the images with the students. Were they able to get good images? Have each student use her or his photos and the fluke ID chart to identify their whales and record their results on their data collection page in the whale ID section.

For more tips and suggestions on fluke identification, visit Humpback Whales of Southeastern Alaska at: <http://www.alaskahumpbacks.org/matching.html>

Explanation:

(10 minutes)

Bring the class back together as a group. Have the students share which whale they found. Share the selected histories of the whales. Brainstorm about what can be learned from this research. What were the challenges? What else could be learned from this kind of study? Why is it important?

Extension:

Take a whale research trip acoustically with Richard Nelson, host of the radio show *Encounters*. Listen to his 29-minute show on humpback whales and hear humpbacks feeding, surfacing, and more, as well as learning more about the natural and cultural history of humpback whales.

<http://encountersnorth.org/index.htm>

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References/Resources:

Official Glacier Bay National Park Website

<http://www.nps.gov/glba/naturescience/whales.htm>

Humpback Whales of Southeastern Alaska

<http://www.alaskahumpbacks.org/index.html>

Juneau Humpback Whale Catalog

<http://www.afsc.noaa.gov/ABL/Humpback/default.htm>

Humpback Whales of Lower Cook Inlet and Kachemak Bay, Alaska

This organization uses a slightly different method of cataloging whales and has several photo galleries.

<http://www.kbaywhales.com/>

National Education Science Standards Addressed:

Grades 5-8

NS.5-8.1 Science as Inquiry

Understanding about Scientific Inquiry (5-8):

- Current scientific knowledge and understanding guide scientific investigations. Different scientific domains employ different methods, core theories, and standards to advance scientific knowledge and understanding.
- Mathematics is important in all aspects of scientific inquiry.
- Technology used to gather data enhances accuracy and allows scientists to analyze and quantify results of investigations.
- Scientific explanations emphasize evidence, have logically consistent arguments, and use scientific principles, models, and theories. The scientific community accepts and uses such explanation until displaced by better scientific ones. When such displacement occurs, science advances.

NS.5-8.3 Life Science

Reproduction and Heredity (5-8):

- The characteristics of an organism can be described in terms of a combination of traits. Some traits are inherited and others result from interactions with the environment.

NS.5-8.7 History and Nature of Science

Science as a Human Endeavor (5-8):

- Women and men of various social and ethnic backgrounds – and with diverse interests, talents, qualities, and motivations – engage in the activities of science, engineering, and related fields.
- Science requires different abilities, depending on such factors as the field of study and type of inquiry.

History of Science (5-8):

- Many individuals have contributed to the traditions of science. Studying some of these individuals provides further understanding of scientific inquiry, science as a human endeavor, the nature of science, and the relationships between science and society.