



Marine Mammals in Our Backyard

Background:

(excerpted/adapted from http://cetuc.ucsd.edu/voicesinthesea_org/education.html lesson 2)

All mammals, including marine mammals, have five key traits in common. These are:

- Breathe air
- Give birth to live young
- Nurse their young
- Warm-blooded
- Have hair (baby whales and dolphins actually have small hairs on their rostrums (nose) when born and it eventually sheds away leaving behind small follicles)

These mammalian traits are a large contrast to fish. Bony fish, like rockfish, and cartilaginous fish, like sharks and rays, obtain oxygen directly from the water through their gills. Fish are cold-blooded and have protective layers of scales.

The marine mammals in our backyard fall into two categories: cetaceans (whales, porpoises, and dolphins) and pinnipeds (seals, sea lions, and walrus). There are more than 70 species of cetaceans and more than 30 species of pinnipeds worldwide, but in general, you might find the following species off of Cape Cod:

- North Atlantic right whale – most commonly seen in February, March, and early April
- Humpback whale – most abundant in spring, summer and fall
- Fin whale – seen year round with peaks between spring and fall
- Minke whale – tends to be seen in spring, summer, and fall
- Blue whale – rarely sighted here because it likes deeper water
- Sei whale – rarely sighted here because it likes deeper water
- Atlantic white-sided dolphin – common in spring
- Atlantic pilot whale – these dolphins are usually found close to shore and are abundant
- Harbor porpoise – most common from December - June
- Gray seal – mostly seen in winter and spring
- Harbor seal – most commonly seen between late September and early spring

Some species, like the humpback whale, tend to be seen in our waters spring through fall while feeding and then go south to have their young. Other species, like the blue whale, are seen here rarely because they generally prefer deeper water. Although the seal species are around all year, they may be easier to spot in the winter as many move north prior to pupping in mid-May.

Cetaceans are broken up into two suborders based on whether they have teeth or not:

- 1) **Odontocetes** (toothed whales) are whales, dolphins and porpoises with teeth. Odontocetes use their teeth to grasp prey and swallow fish or squid whole. Some toothed whales, like killer whales, dismember their prey by shaking it violently. Most toothed whales, with a few exceptions like the sperm whale and killer whale, are relatively small compared to baleen whales.
- 2) **Mysticetes** (baleen whales), like the right whale, don't have teeth at all. They have unique structures in their mouths called baleen. Baleen is made of a protein called keratin, which is the same substance that makes up our hair and fingernails. Mysticetes have hundreds of long, flat plates of baleen suspended from the top of their mouths. These plates are stacked next to each other, where teeth would have been, with a small space between each plate. The inside edge of each baleen plate is hairy or fringed, like a broom, and these baleen hairs crisscross to form a net. This makes them experts at filter feeding. All the local species of whales mentioned above are baleen whales.

There are three methods that different types of baleen whales employ for catching their food:

- *Skim feeding:* Right and bowhead whales swim along the surface and trap slow-moving plankton (tiny, free-floating organisms) against the hairy linings of their baleen while water flows out of the sides.
- *Bottom or Pit Feeding:* Gray whales move along the muddy bottom on one side of their body, scooping up mud. They also will position themselves vertical in the water with their head burrowing into the mud. These techniques allow them to strain their crustacean prey out with their baleen. Gray whales are the only baleen whale that feeds using this method.
- *Lunge Feeding:* Humpback whales (baleen whales with throat pleats like the blue, fin, sei, Bryde's, minke, and rorqual whales), lunge forward quickly, taking hundreds of gallons of water into their mouths along with a school of small fish. The pleats expand making room for the large volume of water. The whales close their mouths partway and force the water out through the baleen. The baleen hairs trap small fish and plankton inside.

The first activity is about North Atlantic right whales. These baleen whales are skimmers that eat zooplankton and live to be about 50 years old. They were named the right whale by whalers because their thick layer of blubber makes them float on the surface of the water when dead, making them the "right" whale to hunt. They are the rarest of the large whale species and one of the rarest of marine mammal species. With less than 500 animals in the population, they are highly endangered. Most of the animals in the North Atlantic population winter and calve in coastal waters off the southeastern United States. They then migrate north to New England waters, the Bay of Fundy, and Scotian Shelf for summer feeding and nursery.



An endangered classification means “any species which is in danger of extinction throughout all or a significant portion of its range other than a species of the Class Insecta determined by the Secretary to constitute a pest whose protection under the provisions of this Act would present an overwhelming and overriding risk to man.”

There are only about 450 North Atlantic right whales left. Many scientists who study whales use photo identification as many whale species have distinctive markings. Specifically, right whales have distinctive callosities (rough patches of skin) on their head regions. No two right whales have the same callosity pattern, just like no two humans have the same fingerprint. Scientists will take pictures of the individual right whales they see and then compare those photographs with a catalog of known whales. This will allow them to figure out where and when that whale has been seen in the past. Doing annual surveys of the whales allows scientists to monitor population size, ocean habitat usage, individual whale health, and reproduction information. All this information can then be used to identify problems with the population and assess how best to conserve this highly endangered population of whales.

The second activity uses a dichotomous key. Despite its fancy name, dichotomous means ‘two parts,’ so a dichotomous key is a simple way to identify organisms by answering a series of questions with two answers, often yes or no. Dichotomous keys are often found in field guides, since they are a simple way to identify wildlife. In a marine mammal dichotomous key, a sample question might be whether the marine mammal has baleen. Each answer leads you to another question or to the name of the animal.

Lesson:

Introduce yourself and explain that this program is a partnership between the NOAA Fisheries Northeast Fisheries Science Center and Woods Hole Sea Grant. Show students (**slide 1**) where we are located in Woods Hole.

Introduction (5 minutes):

Questions to ask while showing the slideshow intro (**Always ask the questions, generate answers on the board, and THEN show the slide with information**):

(a) What is a mammal? (**slides 2 & 3**)

(b) What is a marine mammal? (**slide 4**)



- (c) Show them the real artifacts from marine mammals in our backyard: sperm whale teeth, minke and fin whale baleen, sperm whale vertebrae and sperm whale rib. For perspective, have one student hold the human rib and have 5 hold the sperm whale rib (this is a great photo-op for the classroom).

Activity 1

RIGHT WHALE ID

Goals:

- To learn about Right Whales.
- To learn how to sort and identify right whales.

Concepts:

- Right whales are endangered.
- Pictures are valuable tools to document individual animals and track populations.

Materials:

- Right whale picture sheets, one picture per pair of students (degree of difficulty starts with 1 being the easiest).
 - Answer key to the pictures sheets for the teachers. Students should NOT be given the answer key.
 - Dry erase markers
 - Windex and paper towel
1. Today we are talking about marine mammals in your backyard. Where is your backyard? Where do you go to sleep, play, eat, etc.? (Use Google Earth to show their school, grocery store, and NOAA – **slide 5** reminds you)
 2. Explain that today we are going to be talking about the highly endangered North Atlantic right whale. There are only 300-400 of these animals left in the world.
 3. Pretend you are a North Atlantic Right Whale (**slide 6**). Where is your backyard now? Where do we sleep, play, eat, etc.? (Use Google Earth to show the North Atlantic right whale’s “backyard” – **slide 7** reminds you)
 4. How is your backyard different from the North Atlantic right whale’s?



5. **(Slide 8)** Explain that the students are no longer right whales but are now the scientists that study them. They need to take pictures of North Atlantic right whales from ships and planes and then come home and identify the animals. They must compare their photos to drawings and identify the animals they saw. Show them the photo ID book or online catalog (<http://rwcatalog.neaq.org/Terms.aspx>).
6. Explain that today they will be identifying North Atlantic right whales by looking at the pattern of their callosities. Use the stuffed whale to demonstrate. Why would you want to identify individual animals?
7. Divide the students up into pairs.
8. Demonstrate the activity using **slide 9**. You must look at the callosity pattern on the whale photograph and determine which individual drawing it matches.
9. Give each pair of students a right whale ID page and 2 dry erase markers. Depending on the grade, you can start with a different level. Level 1 is the easiest. There are several different sheets for each level. You can start all grades off with an easy one and move up in difficulty as they identify their right whales.
10. Set up the right whale ID sheets into piles on a table or on the ground. Each level is color coded. All the red folders are level 1, green- level 2, blue- level 3, yellow- level 4, and brown- level 5. When they have a match they should ask the teacher or you to check that it is correct. Next, they need to wipe off their lines (you spray the Windex and give them a paper towel) and put their sheet back. Tell them to take another whale ID sheet from level ____.
11. Allow them to do this for about 10 minutes. When you are all done, have them clean off their sheets, return them to their pile, and collect the dry erase markers.

Discussion

1. Was this harder or easier than you expected? What did you look for to help you identify your right whale?
2. How is it possible that we have pictures of ALL the North Atlantic right whales?



3. How can scientists protect North Atlantic right whales? Show them the Right Whale Listening Network (**slide 10**). Tell them that they are looking at buoys that listen for North Atlantic right whales. Fisherman can put the app on their Smartphone so they know whether there are endangered right whales around and when and where they need to slow down to avoid collisions.

Activity 2

IDENTIFYING MARINE MAMMALS: CETACEAN AND PINNIPED DICHOTOMOUS KEY
(Adapted from OIMB GK12 Curriculum)

Goals:

- To learn about different kinds of local marine mammals.
- To learn how to use a dichotomous key to identify organisms.

Concepts:

- There is a great diversity of marine mammals.
- Dichotomous keys are valuable tools that can be used to identify organisms.

Materials:

- Dichotomous key, one copy per pair of students
 - Unlabeled whale and seal picture sheets, one picture sheet per pair of students
 - Answer key to the whale and seal pictures sheets for the teachers. Students should NOT be given the answer key.
1. We will identify local marine mammals using a dichotomous key. Does anyone know what that is? It is similar to choosing in an adventure book where each option takes you on a different path.
 2. How do we tell the marine mammals apart? (**slide 11**) Use baleen, whale tooth, vertebrae, rib, and stuffed whale as visuals. The rib and vertebrae demonstrate size.
 3. How an animal eats can be an identifying feature. We'll be looking at whales (cetaceans) and seals (pinnipeds). There are toothed whales (e.g. killer whale, sperm whale, dolphin, and porpoise) and baleen whales (e.g. blue whale, gray whale, and humpback whale).



- a. Questions: How and what does a baleen whale eat? How and what does a toothed whale eat? Explain the different feeding techniques. What does a seal eat? Does it have baleen or teeth?
4. Pass out a picture to every pair of students (it is ok if there are duplicates) and a piece of paper. Ask them to take out a pencil.
5. Explain that they should NOT write on the picture paper, but only on their own paper.
6. Explain that on their own paper, they should write down each ID step that they take.
 - a. ex. #1 = Yes, has teeth, #9 = Yes, whale is spotted, #10 = Yes.....
 - b. #1= Yes, has baleen, #2 = No throat grooves, #4 Point back.....
7. Pass out a copy of the dichotomous key to each pair of students.
8. Students identify their animal.
9. When students are done, have them check their identification with the instructor or their teacher (you should both have a copy of the key but do not hand it out). They can then have a new picture to identify.
10. Have them do this for about 15 minutes.
11. Have some students report on their animals and the features used to identify it.

Discussion:

1. Ask students how dichotomous keys can be useful for identifying organisms.
2. Why is it important to identify different species?
3. Review what species they identified and what differences they saw. Remind the students that these are all species they can find in local waters.

Conclusion:

1. The species we identified are local species. Let's review some of the species we saw. Use **slide 12**, click on the picture of the pilot to link to PSB's sounds page: <http://www.nefsc.noaa.gov/psb/acoustics/sounds.html>. As the students name local species you can show them the animal picture and play the animal's vocalization for them.



2. Scientist Spotlight (**slide 13**): Allison Henry flies in a plane looking for North Atlantic right whales. She takes pictures of the whales she sees for photo identification. She also counts the whales and records their location so they can warn vessels to slow down.
3. Scientist Spotlight (**slide 14**): Michael Moore works with many species of whales reviewing their cause of death and researching ways we can prevent injury and mortality.
- 4.
5. How can each student help protect the marine mammals in our backyard? (**slide 15**) Click on any of the yellow words to show a quick conservation video clip.

Lesson Link to Massachusetts State Science Curriculum Standards

*All of the lessons reinforce the scientific method by asking students to observe, predict, hypothesize, participate in an experiment or activity, sort/classify, and make conclusions.

- a. LS1 – Sort and classify marine mammals based on their physical characteristics.
- b. LS5 – Observed characteristics of marine mammals can be fully inherited or affected by the marine environment.
- c. LS7 – Changes in the environment have caused some marine mammals to move to new locations.
- d. LS10 – Give examples of how humans can change the environment to ensure the survival of marine mammals.