



Lesson 2: Cetaceans – What makes a whale a whale?

Objectives:

Students will learn about general whale (and dolphin) biology. They will learn to identify cetacean species that they have some familiarity with....such as bottlenose dolphins and killer whales. They will learn the differences between toothed whales (odontocetes) and baleen whales (mysticetes). Finally, they will be introduced to basic external anatomy of cetaceans using right whales, humpback whales and bottlenose dolphins as examples.

What you will need:

- Copies of vocabulary list—one per student (page 2-5 through 2-7)
- Copies of vocabulary worksheet –one per student (page 2-8)
- Ability to project PowerPoint presentation
- Copy of PowerPoint presentation “What makes a whale a whale?”
- (Optional) *Whales—Activities based on research from the Center for Coastal Studies* (Scholastic Publishers; ISBN 0-590-49156-3)

Standards: CCSS.ELA-Literacy.RI.4.4

Strategy:

1. Explain to the students that during this lesson, they will learn about whale and dolphin biology.
2. Give students a copy of the vocabulary list and explain that these words will be used throughout the lesson. To help students with pronunciation, it would be helpful to read the words to the students and have them repeat them back to you.
3. Present the PowerPoint using the script below.

- Slide 1. What makes a whale a whale? Today we will learn about a group of animals called “cetaceans” [*suh-TAY-shuns*—these are the whales and dolphins.
- Slide 2. Horses, dogs, raccoons and humans are all mammals just like whales and dolphins. There are six main characteristics of a mammal. Who can remember one of the characteristics of mammals that makes them different from other groups of animals? [*Students should know characteristics of a mammal from 3rd grade!*]
- Slide 3. Mammals are all warm blooded; most mammals keep their bodies warm with hair or fat. Many marine mammals have a thick layer of fat or blubber to protect them from the cool ocean waters.
- Slide 4. Mammals have backbones made up of individual bones called vertebrae.
- Slide 5. Mammals breathe air. Whales and dolphins breathe air through blow holes on the tops of their head, just like cows breathe through their nose.
- Slide 6. Mammals have hair. Whales and dolphins have small areas of hair when they are born. For example, baby dolphins have a line of hair similar to a thin mustache that falls off shortly after birth. Whales, such as right whales, may have sparse hairs on the tip of the chin and upper jaw.
- Slide 7. Mammals give live birth to their young. If you look really hard, you may be able to see lines on this baby dolphin (called a calf) where it was curled up inside its mother.
- Slide 8. Mammals feed their young milk.
- Slide 9. Marine mammals are those mammals that are well adapted for life in the ocean. Some marine mammals, like dolphins and whales, spend their entire life in the water. Others, like polar bears, may spend part of their life on land but depend on the ocean for food.



- Slide 10. There are several groups of marine mammals. The group we will be learning more about are the cetaceans: the whales, dolphins and porpoises. Seals, sea lions and walrus are in a different group, called the pinnipeds. Manatees and their relatives are in the group called sirenians. Sea otters and polar bears are also considered marine mammals. [*Top row: sea lions (pinnipeds), manatees (sirenians), and sea otter; Bottom row: humpback whale (cetacean), beluga whale (cetacean) and walrus (pinniped)*]
- Slide 11. Cetaceans are divided into two groups: toothed whales and baleen whales. Toothed whales, or odontocetes, like the bottlenose dolphin, have teeth. [*Point out the photo of the dolphin:*] If you look carefully, you can see the dolphin's teeth in this picture. Dolphins have up to 100 cone-shaped white teeth along their upper and lower jaws. Baleen whales, also called mysticetes, do not have teeth in their mouths. Instead, they have special fibrous plates called baleen that hang down from the upper jaw. We will talk more about baleen in a few minutes. [*Point out the photo on the right side of the slide.*] This is a photo of a right whale, which is a type of baleen whale.
- Slide 12. Many of the whales that you may be familiar with, and all of the dolphins, are odontocetes. These cetaceans use their teeth to grab prey like fish, squid and even other marine mammals. [*Point at top left photo.*] Bottlenose dolphins are toothed whales. [*Point at top right photo.*] Orcas, also known as killer whales are a type of dolphin as well. [*Point at bottom photo.*] Sperm whales are very deep diving animals, hunting in 3,000 or more feet of water for their favorite food, the giant squid.
- Slide 13. The sperm whale is the largest member of the odontocete family. Male sperm whales can reach lengths near 60 ft. That's almost as long as two school buses! Mature male sperm whales are called "bulls". Sperm whales are able to hold their breath for more than an hour which allows them to pursue the giant squid deep in the open ocean.
- Slide 14. In contrast to the sperm whale, some odontocetes are very small. The Hector's dolphin, shown in this photo, only gets to be about five feet long. [*Suggestion--compare that to your height, or possibly the height of students in the class.*]
- Slide 15. This slide shows some of the body parts of a dolphin. The "beak" of the dolphin (and other whales) is called the "rostrum." The forehead is called the "melon." The blowhole, located on the top of the head, is basically the dolphin's nose. The fin on the dolphin's back is called the "dorsal fin," the side fins are called "flippers" and the tail fin is called the "fluke."
- Slide 16. Echolocation is the ability of producing sound waves, and then feeling the vibration as the waves bounce off prey and other items. Odontocetes use echolocation to find food and to navigate. Odontocetes rely on echolocation when they cannot see. For example, sometimes the water they swim in is not clear, or they may be swimming in very deep water where there is little light. To echolocate, odontocetes produce sound waves from the melon and receive echoes which they can feel through the lower jaw. Another characteristic of toothed whales is that they have a single blowhole, whereas baleen whales have paired blowholes.
- Slide 17. Dolphins and porpoises are both groups of toothed whales, but they are different from each other. Dolphins tend to have a longer, elongated rostrum and cone-shaped teeth, while porpoises have smaller rostrums, a rounded head, and flat teeth. If you look carefully at the two photographs, you may notice that the dolphin has a taller, hooked or curved dorsal fin), while the porpoise has a triangular dorsal fin. Dolphins tend to live in warmer waters and porpoises often live in colder areas. Dolphins are more talkative than porpoises. Dolphins make whistling sounds through their blowholes to communicate with one another underwater. Scientists are pretty sure that porpoises do not do this.



- Slide 18. There are only about 14 species of baleen whales or mysticetes. [*Top left photo*] Gray whales are only found in the Pacific Ocean; so we will not see them in Florida waters. Mother gray whales go into warm lagoons on Mexico's Pacific coast to have their calves. Then they migrate north to Alaskan waters to feed in the summer. These whales can be seen migrating along the California coast in late winter and early spring. [*Top right photo*] Humpback whales are sometimes seen off Florida's coast, but these whales can also be found almost worldwide. [*Bottom photo*] North Atlantic right whales can sometimes be seen off the northeast coast of Florida in the winter months.
- Slide 19. Mysticetes are very large whales, and include the blue whale...the largest creature ever to live on our planet. Blue whales can grow up to 100ft, larger than the largest dinosaur. Blue whales are larger than the largest dinosaur. The heart of a blue whale is the size of a small car. Blue whales were almost hunted to extinction in the early 1900s because whale oil was used for fuel. Today the population is slowly increasing in size.
- Slide 20. This is a humpback whale, which is a mysticete. Notice this whale has a small dorsal fin. Humpback whales have long flippers and a large tail fluke. They also have throat pleats, which allow them to stretch their throat open really wide when feeding. Like all mysticetes, the humpback whale has two blowholes.
- Slide 21. This is a North Atlantic right whale. Unlike the humpback whale, right whales do not have a dorsal fin. Right whales have short flippers. They also have two blowholes located on the top of their heads.
- Slide 22. In some ways, baleen whales are very different from toothed whales. Instead of teeth, they have large baleen plates in their mouth that hang down from their upper jaw. These baleen plates are made of the same material as our fingernails. [*Top right photo*] In this photograph of a right whale skeleton, you can see the dark baleen. The sheets of baleen are frayed on the inside—these hair-like strands are used to trap the tiniest of sea creatures—like zooplankton and small fish—which are then swallowed in very large numbers. [*Top left photo*] In this photo two right whales are feeding at the surface.
- Slide 23. Baleen whales do not have echolocation. Scientists are still unsure how baleen whales find the dense patches of food they are known to feed on.
- Slide 24. Baleen whales have two blowholes rather than the one found on toothed whale species. [*Left photo*] The blowhole area of a mysticete shows two distinct openings, similar to our nostrils. [*Right photo*] When the whale exhales, water droplets can make its breath visible and this is called the "blow".
- Slide 25. Let's review what we have learned today. What are the two different groups of cetaceans? [*toothed (odontocetes) and baleen, (mysticetes)*]. How are these two groups similar? [*they are whales/mammals; they have flippers, fluke and dorsal fin, etc.*] How are they different? [*teeth vs baleen; one blowhole vs two; echolocation or not; eat different types of food*]
4. Give students the vocabulary worksheet and ask them to complete the puzzles using words from the vocabulary list.
 5. Activity entitled "What is a Whale"
 - a. Use the "Whales" activity book (published by Scholastic Press and edited by the Center for Coastal Studies).
 - b. Make a double-sided copy of pages 9 and 10, one per student. As noted in the instructions, be careful not to invert the copy on the reverse side as the activity will not work.



- c. Follow instructions for this activity provided on page 8. Students will fold the paper as directed to create a mini-book.
 - d. The finished mini-book will reinforce the main points covered in the PowerPoint and give them a little project they can take home and share with their family.
6. Activity entitled “Whales: Inside and Out”
- a. Use the “Whales” activity book (published by Scholastic Press and edited by the Center for Coastal Studies).
 - b. Make double-sided copies of pages 11/12 and 13/14...one of each for each student. Again, be careful not to invert the pages while making the copy on the back side of the handout.
 - c. If students hold the whale images (pages 11 and 13) up to the light, they should be able to see a drawing of the skeletal structure within the body of the whale.
 - d. Students can color the whales. The anatomical features listed are the same as those shown in the PowerPoint presentation.
 - e. On the bottom of page 13 there are two questions asking for similarities and differences between the two groups of whales. This can be used to discuss/ review the points made in the PowerPoint presentation.

Acknowledgments: A special thanks to the following organizations for use of images in the accompanying PowerPoint presentation: Florida Sea Grant, NOAA, Florida Fish and Wildlife Conservation Commission, US. Fish and Wildlife Service, Georgia Department of Natural Resources (Permit #15488).



Vocabulary

(Adapted from: *The World of The North Atlantic Right Whales*, Grades 6-8, pages 26-29. Produced by NOAA Fisheries Service's Northeast Regional Office, Protected Resources Division. www.nero.noaa.gov).

Baleen (bay-LEEN) – These are long plates found in the mouth of baleen whales (mysticetes) and hang from the upper jaw (these whales do not have teeth). Baleen plates are made of material similar to fingernails, which is fringed on the edge. The whale gulps water, then pushes the water out of its mouth through the baleen with its tongue. Then it can swallow all the little sea organisms that were caught in the baleen.

Blowhole – The nose of a whale. A whale's nose, or blowhole, is located on top of its head so it can breathe without having to lift its whole head out of the water. Toothed whales (odontocetes) have one blowhole, but baleen whales (mysticetes) have two.

Cetacean (seh-TAY-shun)– The scientific word for animals in the groups that we call whales and dolphins.

Dorsal Fin – A triangle-shaped fin located on the back of some types of whales and dolphins. The dorsal fin may help stabilize the body of the whale (or dolphin) during swimming and diving, and may help it to regulate body temperature.

Echolocation (eh-koh-loh-KAY-shun)– The production of high frequency sound waves by toothed whales and dolphins (odontocetes). The sound waves bounce off objects and come back to the animal so it is able to “see” through “sound”. The dolphin receives the sound waves as vibrations through the fat and bone in its lower jaw. This system is very much like sonar used by submarines.



Flipper – These are the “arms” of dolphins and whales. They have the same bones in the flippers as you have in your arm and hands. The flippers help the animal steer, turn, and control its position in the water column.

Fluke – The tail of a dolphin or whale. There are no bones in the tail. The backbone ends where the tail fluke starts.

Krill – Very small shrimp-like animals that are important food for baleen whales (mysticetes). The krill get caught on the baleen plates when the whale pushes water out of its mouth with its tongue, then it is able to swallow the krill for its meal.

Mammal – Warm-blooded animals with backbones (vertebrates) that have hair. Mammals also give birth to live young, and produce milk to feed their babies. Mammals breathe air so even though whales live in the ocean they are not like fish at all. They must breathe air and stay warm to survive.

Marine Mammal – This is a group of mammals that can be quite different from each other, but they all live in the ocean for at least part of their life, and depend on the ocean for food. Marine mammals include dolphins and whales, seals and sea lions, manatees, walrus, polar bears and sea otters.

Melon – The forehead of a toothed whale or dolphin. The melon is made up of fatty tissue and often appears to bulge from the forehead area. It is important for sound production as part of the echolocation system.

Mysticete (miss-tuh-SEET)– This is the scientific term for whales that have baleen. These are the largest whales, and the blue whale is the largest animal that has ever lived (larger than the largest dinosaur!!). Mysticetes have two blowholes but do not have an echolocation system. They have baleen plates but no teeth. They feed on very little organisms like krill and plankton.

Odontocete (oh-don-toh-SEET) – This is the scientific term for toothed whales, which includes all of the dolphins. There are more kinds of



odontocetes than mysticetes. These animals have one blowhole, use echolocation to find fish and other food items, and use teeth to catch and hold their prey until they can swallow it.

Plankton – Plants and animals that drift on ocean currents. Plankton are often very small. These are important food items for mysticetes.

Prey – An organism that is eaten by another animal for food.

Rostrum—In some whales and dolphins, the snout that is somewhat like a dog’s mouth/snout in shape.

Zooplankton (ZOH-plank-ton) – Plankton made up of animals, including things like larval fish.



Student name: _____

Vocabulary Worksheet

Matching:

Draw a line from the word to the best definition for that word.

Echolocation	A group of animals that includes dolphins.
Flipper	Very small shrimp-like animals.
Baleen	The part of a whale that is like your arm.
Odontocetes	Large structures found in the mouth of mysticetes.
Krill	A type of navigation used by odontocetes.

Fill in the Blank:

The nose of a whale or dolphin is called a ___ O ___ O ___.

Fish are important ___ R ___ for many types of dolphins.

Whales are not fish. They are classified as ___ MM ___ S.

The scientific word for the group of animals that includes whales and dolphins is ___ T A ___ N S.

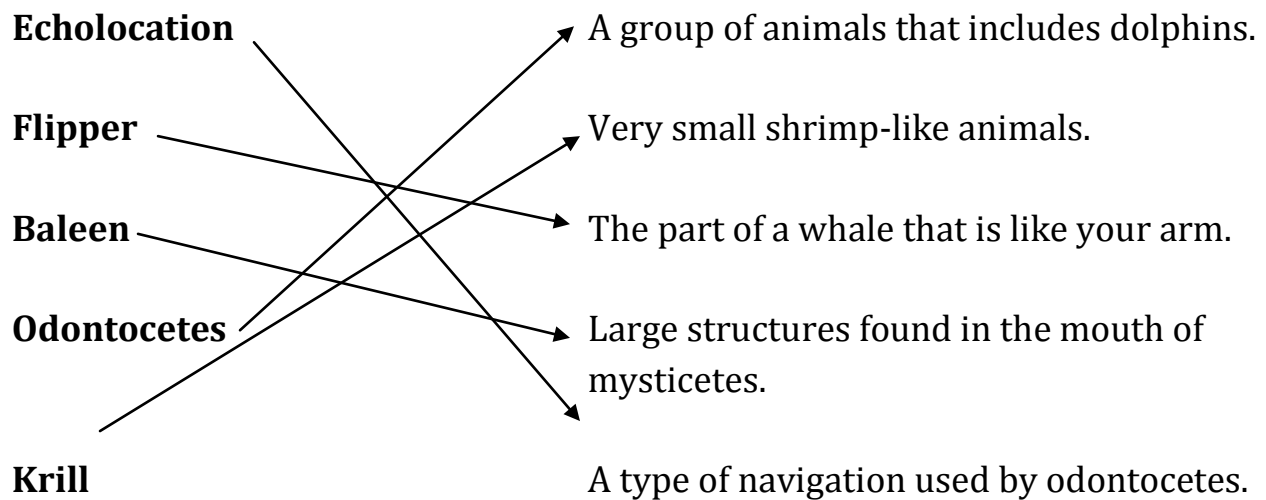
The triangular structure on the back of a dolphin is a D ___ S ___ F ___ N.



Answer Key for Vocabulary worksheet

Matching:

Draw a line from the word to the best definition for that word.



Fill in the Blank:

The nose of a whale or dolphin is called a B L O W H O L E .

Fish are important P R E Y for many types of dolphins.

Whales are not fish. They are classified as M A M M A L S .

The scientific word for the group of animals that includes whales and dolphins is C E T A C E A N S .

The triangular structure on the back of a dolphin is a D O R S A L F I N .