

Breathing, Feeding, & Moving in Water

Overview

Students will learn about whale adaptations for breathing, feeding, and moving in water.

Before Your Visit: Students will read and discuss a text about whale adaptations to life in water.

During Your Visit: Students will identify, sketch, and label whale adaptations for breathing, feeding, and moving.

After Your Visit: Students will use what they learned from the reading and the Museum visit to produce an illustrated text.

NYS Science Standards

LE 5.1b: An organism's overall body plan and its environment determine the way that the organism carries out the life processes

Background for Educators

Adaptations are behavioral or physical characteristics that help an animal survive in its environment: find food, stay cool or warm, move, and defend itself. Many adaptations are visible. They can consist of body parts, coverings, or behaviors. Adaptation is a result of natural selection. Typical adaptations of mammals to life in water include a streamlined shape, and layer of blubber that insulates against the cold.

Before Your Visit

Activity: How Are Whales Adapted to Living in Water?

Have students read the text about whale adaptations. Discuss what adaptations are, and why they're important for survival. Prompts might include:

- What is an adaptation? How do adaptations help animals survive? *(Answers may include: Adaptations are ways that animals behave or physical traits that help an animal survive in its environment. In order to survive, animals need to interact with their environment to find food, move, and adapt to changes in the environment.)*
- How is living in the ocean different than living on land? *(Answers may include: Water is harder to move through than air and contains less oxygen for them to breathe.)*
- What are the some of the special adaptations discussed in the reading? How do they help whales live in water? *(Breathing: Whales come to the surface and breathe through blowholes at the tops of their heads. Eating: Baleen helps whales swallow large amounts of small prey. Toothed whales use sound (echolocation) to find prey. They have teeth to grab it with. Movement: A streamlined shape helps them move smoothly through water. Flippers are stiff, like paddles, which helps whales manoeuver.)*
- How might it be harder for whales to survive without these adaptations? *(Answers may vary.)*

Plan how your students will explore the *Whales* exhibition using the worksheets.

Divide your class into small groups of three to four and assign each to a teacher/parent chaperone who will facilitate their exploration.

If possible, distribute and review copies of the map and worksheets to chaperones beforehand.

You can also show the following videos to help illustrate the reading for students:

Humpback Ballet: Cousteau Divers Film Close Encounter

youtube.com/watch?v=UpKICRfvjjU

BBC Deep Into the Wild: Humpback Whales Feeding on Krill

youtube.com/watch?v=1_BqC9lluKU

BBC Life: Bottlenose Dolphin Hunt

youtube.com/watch?v=r9FK12j8oz4

During Your Visit

Whales: Giants of the Deep

4th floor, LeFrak Family Gallery (30-45 minutes)

Using the worksheets, students will make several stops in the exhibition to collect information. They will refer to these notes when completing the assignment back in the classroom.

Milstein Hall of Ocean Life

1st floor (30-45 minutes)

Students will continue to explore adaptations to help answer the question: How is life in the water different than life on land?

Divide students into two groups: one group will focus on vertebrates and the other on invertebrates. To the left and right of the entrance to the Hall (on the Upper Level Balcony), have students explore the corresponding “Life in Water” text panels, videos, and trees of life to learn more about the adaptations needed to survive when living in water. Using the back of their student worksheet, they should collect information on how the adaptations that the organisms in their group uses to breathe, eat, and move. Regroup the class in a quiet section of the Hall and have them share their findings.

Back in the Classroom

Activity: Writing Informational Texts About Whale Adaptations

Have each student create an illustrated text that:

1. defines adaptation
2. names and describes one adaptation for each of the following:
 - breathing
 - feeding
 - moving

For information on submitting your students’ work to the LeFrak Class of the Month Essay Contest, go to amnh.org/lefrakessaycontest.

Student Reading: Whale Adaptations

In order to survive, animals need to favorably interact with their environment, find food, move, and adapt to changing environmental conditions. An **adaptation** is a physical or behavioral characteristic — like feathers or fins, or howling or hunting in groups — that helps an organism survive and reproduce in a particular environment.

Whales are mammals; they breathe air and live their whole lives in water. People often use the word “whale” to refer to large species like sperm and humpback whales, but dolphins and porpoises are also whales. Whales inhabit all of the world’s major oceans, and even some of its rivers.

Every organism is adapted to the particular environment it lives in. For whales, that means special features for living in water, which contains less oxygen for them to breathe, allows them to have more effective ways of feeding than land animals and is harder to move through than air.

Let’s look at three different sets of features that help whales live in water:

Breathing

Whales breathe air, like other mammals; they don’t have gills that allow them to breathe underwater the way fish do. They have to hold their breath underwater, and come to the surface to breathe through blowholes on top of the head. The expulsion of a whale’s breath — the ‘blow’ — is fast and forceful.

Feeding

Living whales are divided into two groups, baleen whales and toothed whales, depending on how they feed.

Baleen Whales: Filter Feeding

Baleen whales are filter feeders. They have plates of baleen rather than teeth. These flexible plates hang from their upper jaws and knit together to form a mat for straining tiny prey from the water. The prey may be small, but this is a very efficient way to hunt in water. Some baleen whales can eat tons of krill, small shrimp-like crustaceans, a day.

Baleen whales can be divided into three groups according to how they filter their food: gulpers, skimmers, or silt sifters.

Student Reading Continued

Gulpers like Bryde's whale take in huge amounts of water with their prey, their pleated throats billowing out to accommodate it. They then force the water out, straining the food through the mesh of baleen. Gulpers' food depends on how coarse or fine the species' baleen is.

Right whales are skimmers. They cruise with their large arched mouths open, usually near the surface, continuously straining the water for food. Long, very fine baleen catches swarms of near-microscopic zooplankton.

Gray whales are silt sifters. They pump water and sediment from the seafloor into their mouths, and force it out again through very coarse baleen. Silt-sifters eat small crustaceans called amphipods.

Toothed Whales: Echolocation

Toothed whales use echolocation to find food: they emit sound and listen to the echoes in order to locate prey. Toothed whales either grab prey with their teeth and/or suck it directly into their mouths. These whales tend to eat individual animals, such as squid, fish, and, in some cases, other marine mammals. Toothed whales are social animals and often cooperate to round up schools of fish.

Moving

Whales are superb swimmers. Their streamlined, teardrop shape reduces resistance, so whales can move through water smoothly.

Their tails end in horizontal lobes called flukes. Flukes have a rounded leading edge that tapers at the rear, similar to a wing. Most of a whale's swimming power comes from moving its body and these horizontal lobes at the end of its tail up and down.

A whale's front limbs, or flippers, have the same kinds and basic arrangement of bones as human arms. While the joints in human hands are mobile, the whale flipper has become a rigid, rudder-like paddle that provides both stability and great maneuverability in the water.

Some whales, like dolphins and killer whales, have a dorsal fin on their backs that stabilizes them as they swim.

WHALES: Giants of the Deep

Student Worksheet

Grades 3-5

Name: _____

- Draw a baleen (Mysticeti) whale skull.
- Whale name:
- Explain how the whale feeds, and label the relevant parts of the skull.

- Draw a toothed (Odontoceti) whale skull.
- Whale name:
- Explain how the whale feeds, and label the relevant parts of the skull.

Compare the feeding strategies of the two types of whales. How does the structure of each skull reflect that animal's feeding strategy?

Sketch a whale.

Whale name:

Label and describe its adaptations for breathing and moving.

What shape is the whale's body? Why?

How do the flippers and tail fluke help it move through water?

WHALES: Giants of the Deep

Student Worksheet

Grades 3-5

Name: _____

ANSWER KEY

- Draw a baleen (Mysticeti) whale skull.
- Whale name:
- Explain how the whale feeds, and label the relevant parts of the skull.

- Draw a toothed (Odontoceti) whale skull.
- Whale name:
- Explain how the whale feeds, and label the relevant parts of the skull.

Compare the feeding strategies of the two types of whales. How does the structure of each skull reflect that animal's feeding strategy?

(Mysticetes use baleen to efficiently filter large quantities of small animals from seawater. Odontocetes, toothed whales, either grab prey with their teeth and/or suck it directly into their mouths.)

Sketch a whale.

Whale name:

Label and describe its adaptations for breathing and moving.

What shape is the whale's body? Why?

(A streamlined teardrop shape helps the whale move easily through water.)

How do the flippers and tail fluke help it move through water?

(Most of a whale's swimming power comes from moving its body and its tail flukes up and down. Flippers are stiff, like paddles, which helps whales manoeuvre.)