PITTSBURGH ZOO
& PPG AQUARIUM

Marine Mammals

Grades 4-8

Teacher Packet

Contents:

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Marine Mammals

Grades 4-8: Learn how this diverse group of mammals has adapted to life in the sea. Life history, behavior, and conservation will all be discussed.

Academic Standards for Environment and Ecology

4.3 Environmental Health
- 4.3.4 B Identify how human actions affect environmental health.
  C Understand that the elements of natural systems are interdependent.
- 4.3.7 A Identify environmental health issues.
  C Explain biological diversity.

4.4 Threatened, Endangered and Extinct Species
- 4.7.4. B Know that adaptations are important for survival.
  C Define and understand extinction.
- 4.7.7 B Explain how species of living organisms adapt to their environment.
  C Explain natural and human actions in relation to the loss of species.

4.8 Humans and the Environment
- 4.8.4 C Explain how human activities may change the environment.
- 4.8.7 C Explain how human activities may affect local, regional, and national environments.

4.9 Environmental Laws and Regulations
- 4.9.4 A Know that there are laws and regulations for the environment.
- 4.9.7 A Explain the role of environmental laws and regulations.

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Background Information

In most cases, a marine mammal is primarily ocean-dwelling or depends on the ocean for its food. Over 120 different species of marine mammals have been identified, ranging from whales to polar bears. Also considered marine mammals, several species of freshwater dolphins live in a few of the world's large rivers. With water covering about seventy percent of the Earth's surface, much is left to learn about many of the species that inhabit this vast area.

Marine Mammals at the Pittsburgh Zoo & PPG Aquarium

Polar Bear – *Ursus maritimus*

Polar bears are found along Arctic coasts, islands, and the adjacent sea ice of Eurasia and North America, spending much of their lives hunting seals. Other items in their diet include other marine mammals, small land mammals, reindeer, sea birds, fish, and vegetation. Their clear, hollow hairs add buoyancy in the water and insulation from the cold climate. Polar bears have partly-webbed feet, helping them to swim for long distances if needed. Due to various factors, including global warming, polar bears have been listed as a threatened species throughout their range. Currently the Pittsburgh Zoo & PPG Aquarium has two male polar bears.

California Sea Lion – *Zalophus californianus*

Found along the Pacific coastline, these pinnipeds are not only good swimmers but also agile on land due to their ability to lift their bodies off the ground with their flippers, unlike true seals which move on land on their bellies. They eat fish, squid, clams, crabs, and lobster, using both excellent eyesight and sensitive vibrissae to help them find the food. Currently the Pittsburgh Zoo & PPG Aquarium has one male and three female sea lions.

Alaskan Northern Sea Otter – *Enhydra lutris kenyoni*

Sea otters were once found along the Pacific coast from California to Alaska. A population of Southern sea otters still exists in California, listed as "threatened" by the US government, and a more vigorous population of Alaskan Northern sea otters can be found in Alaska, with less numerous, but relatively stable populations living in British Columbia and Washington. Sea otters spend much of their time in kelp forests diving for various invertebrates such as sea urchins, abalone, mussels, clams, crabs, snails, and about forty other species. The sea otter has the thickest fur in the animal kingdom. Threats include pollution and fishing nets, and predators include hawks, sharks, sea lions, and orcas.

Pacific Walrus – *Odobenus rosmarus divergens*

Walruses are one of the largest pinnipeds, often weighing in at over 3,000 lbs. They inhabit both the Pacific and Atlantic oceans, with the Pacific walrus being slightly larger and much more numerous

than the Atlantic walrus. The tusks are used primary for social dominance and to haul out onto the ice. The sensitive, bristly vibrissae of the walrus are used to feel for food on the ocean bottom. Their food items include clams, mussels, snails, crabs, shrimp, squid, sea cucumbers, worms, occasionally fish, and some eat seals. Predators include orcas and polar bears.

Marine Mammal Protection Act (MMPA)

The MMPA prohibits, with exceptions, the taking of marine mammals in U.S. waters and by U.S. citizens on the high seas, and importing marine mammals and marine mammal products into the U.S. It was established in 1972 due to findings that:

- Some marine mammal species or stocks may be in danger of extinction or depletion as a result of human activities.
- These species or stocks must not be permitted to fall below their optimum sustainable population level (depleted).
- Measures should be taken to replenish these species or stocks.
- There is inadequate knowledge of the ecology and population dynamics.
- Marine mammals have proven to be resources of great international significance.

In 1994 the act was amended to provide for:

- Certain exceptions to the take prohibitions, such as for Alaska Native subsistence and permits and authorizations for scientific research.
- A program to authorize and control the taking of marine mammals incidental to commercial fishing operations.
- Preparation stock assessments for all marine mammal stocks in waters under U.S. jurisdiction.
- Studies of pinniped-fishery interactions.

Endangered Species Act (ESA)

The ESA was established in 1973 to seek to conserve all endangered and threatened species and to resolve water resource issues in concert with the conservation of species. The law prohibits any action toward "taking" of listed species or affecting its habitat. It also prohibits the import, export, and all interstate and foreign commerce of listed species. The EPA can also reduce or cancel the use of certain pesticides if it feels that they will harm a listed species.

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Vocabulary

Adaptation – Behavioral or physical change that improves a plant or animal's chance for survival in its habitat
Biodiversity – The variety of life on our planet
Blubber – An insulating layer of fat just below the surface of the skin in most marine mammals
Camouflage – An organism's ability to hide or blend with its surroundings using color, pattern or shape
Cetacean – Belonging to the order Cetacea, an order of aquatic, chiefly marine mammals, including the whales and dolphins
Conservation – The wise use of natural resources in order to insure continued availability to future generations
Counter shading - the development of dark colors on parts usually exposed to the sun and of light colors on parts usually shaded, esp. as serving for protection or concealment
Ecology – The study of the interrelationships among organisms and their environment
Ecosystem – An ecological community together with its environment, functioning as a unit
Endangered – A species at risk for becoming extinct unless conservation measures enable the populations to increase
Extinction – The complete loss of a species
Mammal – A vertebrate species that has fur or hair, is endothermic, has lungs, and nurses its young
Marine – Of or pertaining to the sea; existing in or produced by the sea
Over Consumption – The excessive use of a species by humans that results in a decline in the wild population of that species
Pinniped - Of or belonging to the Pinnipedia, a suborder of carnivorous aquatic mammals that includes the seals, walruses, and similar animals having finlike flippers as organs of locomotion
Pollution – Any substance that destroys the purity of land, air, or water
Population – The number of individuals of a species living within a specific area
Predator – An animal that kills and eats other animals
Prey – An animal that is killed for food
Threatened – A species whose population is low enough to be of concern, but is not yet close enough to extinction to be considered endangered
Vertebrate – An animal with a backbone
Vibrissae – Stiff, but sensitive whiskers on the face or head of an animal

Suggested Student Reading List

A Polar Bear Biologist at Work by Dorothy Hinshaw
Making Friends with Killer Whales by Zaner-Bloser Inc.
Oceans by Seymour Simon
Rescue of the Stranded Whales by Kenneth Mallory and Andrea Conley
Sea Otter Rescue: The Aftermath of an Oil Spill by Roland Smith
Seals, Sea Lions, and Walruses by Melissa Stewart
Song of the Sea Otter by Edith Thacher Hurd
Zoobooks: Whales by John Bonnett Wexo

Teacher's Resources

Aquariums: Windows to Nature by Leighton Taylor
Dolphins and Porpoises by Louise Quayle
Endangered Arctic by Toni Albert
Getting To Know The Whales by Larry Wade
Sea Searcher's Handbook by the Monterey Bay Aquarium
The World of the Polar Bear by Thor Larsen
Whales: Giants of the Deep by Dorothy Hinshaw Patent
Whales Dolphins and Porpoises by Kevin Weldon
World of the Walrus by Peter Knudtson

Internet Resources:

Pinnipeds:
www.pinnipeds.org
www.mnh.si.edu/arctic/html/wildlife.html
Polar Bears:
www.polarbearsinternational.org
www.arctic.noaa.gov
Whales and Dolphins:
www.whale-museum.org
www.oceanalliance.org/
www.acsonline.org/
www.wdcs.org/
www.marinewildlife.org/
www.oceanic-society.org/index5.html
Manatees/Dugongs:
www.savethemanatee.org/
www.fws.gov/northflorida/manatee/manatee-gen-facts.htm
Sea Otters:
www.oceanlink.island.net/seaotterstewardship/conservation1.html
www.seaotters.org/
Marine Mammals:
www.cousteau.org

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"What Is That Marine Mammal?"
Pre-Visit Activity

OBJECTIVES:

TSW create an informational brochure about a marine animal of their choice.
TSW acquire information through internet searches and resource materials.

MATERIALS:

- Computers with publishing programs and printers
- To be done without a computer you will need: magazines for pictures, multi-colored construction paper, scissors, glue, markers, pens
- Animal resource materials (encyclopedias, general animal books from the library, or web sites from the web resource page found in the Pittsburgh Zoo & PPG Aquarium information packet)
- A variety of brochures
- Overhead projector or chalk board
- Choose from these marine mammals: Seal lions, walruses, polar bears, sea otters. If more groups are required, use manatees and orca whales.

PROCEDURE:

ANTICIPATORY SET:
Explain to the students that today they will get the opportunity to become eco-friendly, globe trotting, graphic artists. Their project will be to create an educational, tri-fold brochure about a marine mammal species as a group. To help them get the feel for creating a brochure, pass around a variety of brochures. Break the class into small cooperative groups, and have them evaluate and take notes on what they liked and disliked about the brochures (colors used, size of pictures, font, amount of information, etc.) Once the groups have finished looking at the brochures, have them share their likes and dislikes. You may want to write these on the overhead or chalkboard as reminders to the class while they are working on their own brochures.

DEVELOPMENT OF LESSON:
The students will need to choose a marine mammal species and gather information on it. For their project, each student's brochure must include the following items:
The title of their brochure: "What is this marine mammal?"

- A map highlighting where their chosen marine mammal species lives.
- A brief description of what the weather/water is like where the animal lives.
- At least 3 pictures
- A "FUN FACTS!" section, which should include some amazing facts about their animal.
- A "WHAT YOU CAN DO!" section, which should include some ideas they brainstorm on what we can do to help save endangered species.

SUMMARY:
Once all of the brochures have been created, have the students present them to the class. You may wish to do this individually, or by holding a "Brochure Extravaganza!" where they display and explain their brochures to a visiting classroom.

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Polar Bear Observation
In-Zoo Activity

OBJECTIVES:

- TSW learn the importance of scientific observation.
- TSW practice their observation skills by watching the polar bears at the Pittsburgh Zoo & PPG Aquarium.
- TSW identify different behaviors that the polar bears exhibit.
- TSW record and analyze data from their observations.

MATERIALS:

- Polar Bear observation data sheets
- Stop watch
- Pencils and clipboards

PROCEDURE:

ANTICIPATORY SET:

Ask the students what a behavior is and how behaviors are important to animal survival. Why should we study behavior? (To learn how animals communicate and to better understand animals, to learn how we can make animals in captivity more comfortable, to learn how we can create a more natural setting for breeding purposes and public education, to learn how much space we need to conserve a species, and it is fun!)

DEVELOPMENT OF LESSON:

Pass out the polar bear observation data sheets. Have the students look at each picture of the polar bears and describe the behaviors they are exhibiting. You may have the students act out each of the behaviors--with no physical contact! Explain to the students that they will be observing the polar bears for three minutes and recording the behaviors that they see. If they see a behavior not on the list, they may list it in the "other" column. Have each student choose one polar bear to observe. They look very similar, so advise students to keep a close eye on the bear they choose. The three minute observation session will be broken down into six 30-second observations. At the beginning of each 30-second session, you will announce the start of the interval. Have the students check off each behavior that they observe their polar bear exhibiting. They should only check each behavior one time during each interval, no matter the frequency of the behavior. At the end of the 6 intervals, have students tally up the number of checks for each behavior.

SUMMARY:

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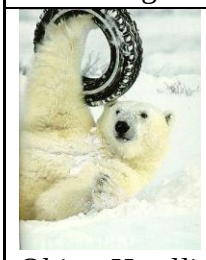
List each behavior and ask students to raise their hands when you say the behavior that they observed the most. What did the polar bears do the most in those 3 minutes? What did they do the second most? What did they do the least? Do you think they do the same thing all the time? If not, what would affect their behaviors? (time of day, weather, amount of visitors, their health, moods, etc.)

EXTENSION:

When you get back to the classroom, make a large chart for each polar bear behavior with boxes at equal spacing. (example: 5 boxes across and 25 boxes high for each behavior) Have the students take their tallies from each behavior and color in one box per tally for each behavior to create bar graphs. Discuss how this is a good visual representation of the data they collected because each box is the same size. It is a great way to compare the frequency of each behavior observed.

Polar Bear Observation Sheet

Time

Behaviors	**0:00-0:30**	**0:31-1:00**	**1:01-1:30**	**1:31-2:00**	**2:01-2:30**	**2:31-3:00**
 Resting						
 Standing						
 Walking						
 Running						
 Swimming						
 Object Handling						

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Marine Mammal Quiz
Post-Visit Activity

1. _____ have no external ear flaps. (Seals or Sea lions?)

2. Name three features of whales that tell us that they are mammals and not fish.

3. What would happen to the kelp forest if all of the sea otters disappeared?

4. Dolphins and porpoises use _____ to find their food.

5. What is blubber?

6. The _____ of a whale is similar to the nose of a seal.

7. What do walruses use their tusks for?

8. What color is polar bear skin?

9. What is sustainable seafood?

10. _____ is the name of shrimp-like animals eaten by many species of baleen whales.

11. Name a conservation threat that marine mammals face.

12. Which marine mammal inspired the mermaid myth?

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Marine Mammal Quiz

Answer Key

1. Seals
2. Breathe air: bear live young: warm-blooded & also have hair or blubber for warmth
3. The sea otters would not be eating the urchins; the urchins would eat all the kelp, so the kelp forests would disappear!
4. Echolocation
5. Blubber is a thick insulating layer of fatty tissue under the skin of marine mammals.
6. The blowhole, which is the whale's nostril
7. They use them to "haul-out", or pull themselves out of the water onto the ice floes.
8. Black
9. Seafood that is fished for or farmed in an environmentally friendly way, avoiding negative impact on wildlife populations or habitat
10. Krill
11. Pollution, noise pollution, over-consumption, oil spills, hunting, etc.
12. The manatee

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Whale of a Tail

Post-Visit Activity
Three or Four 20- to 60-minute sessions
Subject Areas: Math, Expressive Arts
Grades 4-8

Procedure:

1. This activity requires the students to draw life-size whales. For this activity, students will need to know the average size of several species of whales. Divide the class into groups of five and assign a different whale species to each group.
2. Have the students research the length of the different whale species. Students can also gather information about the life history of the whale to report to the class. Research topics include the characteristics of the whale, what it eats, how it reproduces and cares for its young, its migration routes, its history in terms of whaling, and its current status.
3. Once the size and natural history information have been complied, students can learn how to use grids to draw the whale to scale. Provide the students with grid paper. Tell them to make a drawing of the outline of their hand on the grid paper.
4. Once they have finished drawing the outline of their hand, have students make a grid on a much larger paper (i.e.,flip chart paper or butcher paper). The grid squares on the large paper should be three to five times bigger than the squares on the smaller grid paper. Once the students have a larger grid made, have them transfer the small drawing of their hand to the larger paper. NOTE: It helps to number the squares on both pieces of paper. Matching the numbers of the squares on the two pieces of paper helps to transfer the drawing.
5. Students will use the same method to draw life-sized whales. First, have the students make a drawing of a whale on a clean sheet of one-inch grid paper. For this drawing, one-inch squares represent 10 feet on each side. For example, a blue whale is 90 feet long. On the one-inch grid paper, the drawing will be nine squares long.
6. Using chalk, students next create a large grid on a parking lot or other open site. The site should be large enough to accommodate the full size of a whale. Make each of the grid squares at the site 10 feet on each side. Transferring the whale image from the one-inch grid to the 10-foot grid may be made easier by the following:
   - Use two or three long strings with markers every 10 feet. (Knots, short strings tied to the main string, or magic marker spots at 12 inch intervals all work well.)
   - If available, use a carpenter's chalk line.
   - Make sure to number the squares on the drawing and have them numbered the same on the site.
   - The site grid does not have to be exactly square, so don't let this part of the process become too burdensome.
   - NOTE: Whales can also be created using the metric scale. On one-centimeter grid paper a blue whale, for example, would be 27 squares long. Make the large squares at the site one meter on each side.
7. After the grid is transferred to the study site, the students can begin drawing the whale. Depending upon how large the study site is, the class only may be able to do one whale at a time. If this is the case, make enough copies of the one-inch grid drawing of the selected whale so that each group can have their own copy. Each of the groups can then select a portion of the whale and transfer a section. Collectively the groups will accomplish the transfer.
8. Have the class gather around the image of the whale. Invite the students to join hands and see if the class can make a continuous chain that surrounds the whale. Ask them to stand inside of the outline of the whale. How many students fit inside? How many students could fit inside the whale drawing? How many cars could park on the drawing of the whale?
9. Next, have the groups report on the whale species they have researched. If more than one whale was drawn, repeat the process with each whale group.
10. Summarize by asking students how this activity has broadened their awareness and appreciation of the variety and size of the different species of whales.