



You Are What You Eat

Timeframe

1 -2 Fifty minute class periods

Target Audience

Grades 4th- 6th

Suggested Materials

- Pictures of different whale species
- Tape or clothes pin
- Multi-colored beads
- Calorie Score Card
- Whale Feeding Strategy Scenarios

Description

In this lesson students build on their knowledge of marine debris. Students will learn that whales and other species are increasingly at risk from plastics and microplastics. Students will play an interactive game based on whale feeding strategies and whale exposure to plastic associated toxins.

Objectives

Students will:

- Explore the different types of feeding strategies used by whales
- Understand how different types of plastics affect different species of whales
- Explore a variety of types of plastic products

Essential Questions

How does marine debris affect a different whale species ability to feed?

What kinds of marine debris may represent a danger to marine animals?

Background Information

The name “Pacific Garbage Patch” has led many to believe that this area is a large and continuous patch of easily visible marine debris items such as bottles and other litter, similar to an island of trash that should be visible with satellite or aerial photographs. While higher concentrations of litter items can be found in this area, along with other debris such as derelict fishing nets, much of the debris is actually small pieces of floating plastic that are not immediately evident to the naked eye.

The debris is continuously mixed by wind and wave action and widely dispersed both over huge surface areas and throughout the top portion of the water column. It is possible to sail through the “garbage patch” area and see very little or no debris on the water’s surface. It is also difficult to estimate the size of these “patches,” because the borders and content constantly change with ocean

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currents and winds. Researchers have been working to quantify ocean plastic pollution both at and below the surface using Mega nets to sample larger sea surface plastics and Manta nets for the macroplastics (less than 50cm in size) just below the surface. These nets are trawled behind the vessels.

The larger debris from degraded containers, bottle caps or crates to floats and derelict fishing gear represent 92% of the current available plastic mass floating in the Great Garbage Patch region. As it degrades over time, in the long term, this material has the potential to increase levels of microplastics by 30-fold to a staggering total of around 50 trillion particles.

Whales and other marine species are increasingly at risk from plastics and microplastics in the oceans. Species such as baleen whales which feed through filtering seawater for plankton, are ingesting the tiny particles of indigestible plastic which now permeate oceans throughout the world. Filter feeders swallow hundreds of cubic metres of water a day to capture their food from water, and may take in microplastics during the process. Exposure to these plastic-associated toxins pose a major threat to the health of these animals since it can alter the hormones, which regulate the body's growth and development, metabolism, and reproductive functions, among other things.

Preparation

Prepare bead bags for students (approximately 6-10 per player). Remove all of one color of beads from the bag (e.g. all of the red beads) and set them aside for later.

Activity Introduction

1. Ask students what they think that whales eat. Review whale feeding strategies with students (see lesson 2), and the many types of plastics that end up in our Oceans (see lesson 4), show students the video link of the whale that died off the coast of Thailand because it had eaten over 17lbs of debris. <https://www.cnn.com/videos/world/2018/06/03/plastic-bags-whale-death-thailand.cnn>

2. Engage in a discussion with your students about the negative impacts plastics have on whales. Explain to the students that whales are large creatures who need to eat over 400,000 calories per day to survive! When whales spend energy attempting to feed, and accidentally consume plastics, they are wasting calories and receive no nutritional value. Whales can also be physically impaired by becoming entangled or injured by plastics.

Activity Round 1

1. Have students stand along one side of a wall. Designate an

Next Generation Science Standards

PERFORMANCE EXPECTATIONS:

MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

DISCIPLINARY CORE IDEAS:

LS2.A.: Interdependent Relationships in Ecosystems

LS2.C.: Ecosystem Dynamics, Functioning and Resilience

SCIENCE AND ENGINEERING PRACTICES:

Asking Questions and Defining Problems

Developing and Using Models

Analyzing and Interpreting Data

Constructing Explanations and

Designing Solutions

CROSCUTTING CONCEPTS:

Cause and Effect

Structure and Function

Systems and Systems Models

Stability and Change

equal number of the players as blue whales, humpback whales, gray whales, minke whales, and killer whales. Pin or tape a picture of the corresponding animal on the front of each student (see below). Tell the players that each whale requires a different amount of food to survive and that in this game they will need to “catch” that much prey in order to stay alive.

2. Explain that one round of the game represents a week of feeding and that when the round begins, they should collect as much food as they can in 30 seconds.
3. Scatter at least two handfuls of beads around the room (approximately 6-10 per player). Begin the round!
4. After the round is over, players should count the number of beads they collected and count their ‘calories’ by color. Each player’s total is the number of calories required by their whale each week and is the number of calories they will require in the following rounds. Have students share their calorie amount and record it under round #1 on the score card.

Activity Round 2

1. Collect beads from players, scatter them again, and explain the following scenarios:
 - The killer whales tried to eat a plastic bag, which got caught in their throats, so now it is difficult to swallow. Killer whale players must put one hand around their throat and may use their one free hand to pick up AND hold their beads.
 - The gray whales mistakenly ingested microplastics when filtering plankton out of the mud! The gray whale has a stomach ache and has slowed down tremendously, to symbolize this, gray whale players must count 3 ‘Mississippi’s’ before grabbing each bead.
 - The humpback whale’s tale tangled in plastic fishing line leftover from a fishing vessel. To symbolize this, humpback whale players must hop on one foot during the next round.
 - The minke whale swam into a six-pack ring and got its fin stuck. Minke Whale players must keep their little fingers clasped together behind their backs during the next round, even while picking up the beads.
 - The blue whales were curious about something they saw floating in the water and got tangled in a plastic strap. To symbolize this, killer whale players must grab their ankles with their hands and waddle (they can still use their hands to pick beads up).

2. Before the beginning of the second round, designate one or two of each type of animal and tell them that they were rescued by a group that protects whales and were detangled. They can play the game unhindered. Then circle Y or N on the Calorie Score Card to indicate which players were not impaired.
3. Call out the beginning and the end of the 30 second feeding frenzy. Players should return to the sidelines and calculate their calories according to the You Are What You Eat: Calorie Score Card. Enter the number of calories each player collected under round 2 on the Score Card. Compare and discuss the differences between calories collected in rounds 1 and 2 for hindered and unhindered marine animals.

Activity Round 3

1. Collect the beads from all the players, this time quietly adding the red beads that had previously been removed. Scatter them again for the final round.
2. Tell the players who were hindered last round that they remain hindered by plastic debris, and those who were not unhindered remain so.
3. Call out the beginning and the end of the 30 second feeding frenzy.
4. Players should return to the sidelines and calculate their calories. Explain that red beads represent plastic pieces that have no nutritional value, but instead the whale wasted energy finding and foraging on the plastic items. For each red bead collected, each player must subtract 10 calories. Enter the number of calories of each player collected under round 3 of the score card.

Wrap Up

Discuss: Which players did and did not meet their caloric requirements? Find out if any of the hindered players improved their collect rate in the third round. If any did, explain that this may be due to them growing accustomed to their hindrance. Explain that animals could also become accustomed to their hindrance, but that they may weaken and die.

Have students present their results. As a class, graph caloric results by species. Ask students which species were impacted the most. Why do they think that is? Are some whale species impacted more based on the way they feed?

This project is supported by the Regional Class Research Vessel Program in the College of Earth, Ocean, and Atmospheric Sciences at Oregon State University.

Resources

Adapted from Plastic Pollution: It Can Be Deadly. The 5 GYRES Institution. <https://www.5gyres.org/search?q=Plastic+Pollution>

The Ocean Cleanup: <https://www.theoceancleanup.com/updates/the-exponential-increase-of-the-great-pacific-garbage-patch/>

NOAA Marine Debris Program: <https://marinedebris.noaa.gov/info/patch.html>

You Are What You Eat: Calorie Score Card

The typical whale eats over **400,000 calories** a day!

Green beads= 5,000 calories

Blue beads= 10,000 calories

White beads= 20,000

Whale Species	Round #1	Round #2	Impaired (Y or N)	Round #3	Impaired (Y or N)	Total Number of Calories