Museum Educator's Guide:
"Food Web Game"

Station Overview

Students will see that even small changes in the ecology of the ocean environment can have a large impact!

Next Generation Science Standards

3 LS 4-4: Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

Disciplinary Core Idea

LS 4.D: Populations live in a variety of habitats, and change in those habitats affects the organisms living there.

4 ESS 3-1: Obtain and combine information to describe that energy and fuels are derived from natural resources and that their uses affect the environment.

Disciplinary Core Idea

ESS 3.A: Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not.

5 LS 2-1: Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

Disciplinary Core Idea

LS 2.A: The food of almost any kind of animal can be tracked back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants…Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance or an ecosystem.

MS LS 2-3: Develop a model to describe the cycling of matter and flow of energy among living and non-living parts of an ecosystem.

Disciplinary Core Idea

LS 2.B: Food webs are models that demonstrate how matter and energy are transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level…The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and non living parts of the ecosystem.

MS LS 2-4: Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

Disciplinary Core Idea

LS 2.C: Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations.

Materials

- 1 set of Jenga (www.jenga.com)
- Permanent markers: green, blue, red, and black
- Clear tape
- Cardstock

Preparing the Station

Prepare the Jenga blocks.

1. Use the permanent markers to color the ends of the Jenga blocks as specified below.
   - 21 green (phytoplankton)
   - 12 blue (zooplankton)
   - 12 red (krill and small fish)
   - 9 black (humpback whales)
2. Tape the images from Humpback Whale Food Web Jenga Block Pictures on each of the sides of the blocks, matching them to their corresponding colors.

Worksheets & Printables

Sheet	Number to Print
Task Card: Food Web Game	1 Per Station
Lab Card: Food Web Game	1 Per Student
Discovery Sheet: Food Web Game	1 Per Station
Printable: Food Web Game Jenga Block Pictures	1 Per Game
Printable: Food Web Game Playing Cards	1 Per Game

Task Card:
"Food Web Game"

Print on cardstock & laminate

Task Card:
"Food Web Game"

Today you will discover that even small changes in the ecology of the ocean environment can have a large impact!

1. Set up the Game

1. Build a Jenga food web tower by layering blocks in the following order:
   a. Bottom layer: phytoplankton (green)
   b. Second layer: zooplankton (blue)
   c. Third layer: krill and small fish (red)
   d. Top layer: humpback whales (black)
2. Shuffle the playing cards and stack them face down.

2. Make a Hypothesis

What do you think will happen as you introduce human and environmental impacts into the ecology of the ocean?

3. Play the Game!

1. Pick a card, read it aloud, and follow the instructions on the card. (Note: You are not allowed to hold the rest of the stack together while removing the blocks. Only the block being removed or returned may be touched!)
2. Place the used cards face-up in a discard pile.
3. Create a discard pile for the blocks.
4. Continue to take turns until the food web collapses, or until all cards are used up.

4. Clean up Your Station

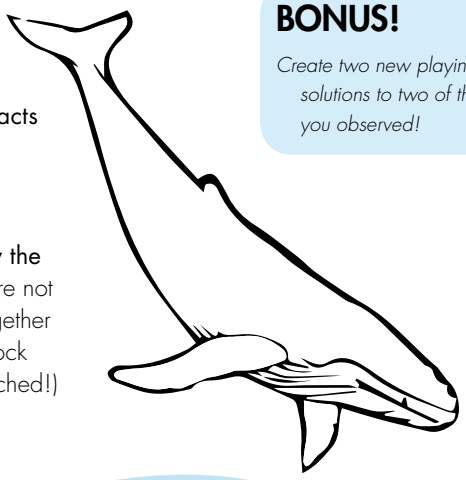
Sort the Jenga blocks into four piles, arranging them by color.

5. Analyze the Results and Draw Conclusions

Group Discussion: What did you discover about human influences on the environment? How could something as large as a humpback whale be impacted by small changes in the ocean? What did this game inspire you to want to investigate further? Brainstorm ways humans can help sustain life in the ocean.

BONUS!

Create two new playing cards that include solutions to two of the human impacts you observed!



Lab Sheet:
"Food Web Game"

Marine Biologist:

Objective

You will see how human and environmental factors affect both the food chain and the food web of humpback whales.

1. Make a Hypothesis

What do you think will happen as you introduce human and environmental impacts into the Ecology of the ocean?

2. Analyze the Results and Draw Conclusions

Group discussion: What did you discover about human influences on the environment? How could something as large as a humpback whale be impacted by small changes in the ocean? What did this game inspire you to want to investigate further? Brainstorm ways humans can help sustain life in the ocean.

BONUS!

- *Think about two solutions to local impacts that YOU could help facilitate.*
- *Create 2 solution "playing cards" that could be added into the game! The top lines should state the solution, and the bottom line should state the action for the level it impacts.*

CARD 1

CARD 1

Discovery Sheet:
"Food Web Game"

A food chain is a series of living things in which each one uses the next lower member as a source of food. A food web shows all the interacting food chains.

Humpback Whale

Humpback whales use baleen, not teeth to catch their prey. They mostly eat krill, but sometimes also consume small fish.

Krill

Krill are an important connection near the bottom of the food chain. They mainly feed on phytoplankton.

Phytoplankton

Phytoplankton are microscopic plant-like organisms. They contain chlorophyll, just like plants do, and use carbon dioxide, sunlight, and water to make their own food through the process of photosynthesis.

A food chain is a series of living things in which each one uses the next lower member as a source of food. Humpback whales feed on krill, and krill feed on plant-like organisms called phytoplankton.

A food web shows all the interacting food chains in an ecological community, such as the ocean. The humpback whale's food chain is part of a larger food web that includes various zooplankton and phytoplankton. The Jenga tower today will represent a food web.

Food webs are part of a greater whole called an **ecosystem**. An ecosystem is a community of living and nonliving things that work together. Everything is connected. Humans can affect the marine ecosystem in many ways, and this has potential of upsetting the ecology of the food chain and food web of humpback whales. If the balance of one level is disturbed too much, the other levels will be affected and the food web could potentially collapse.

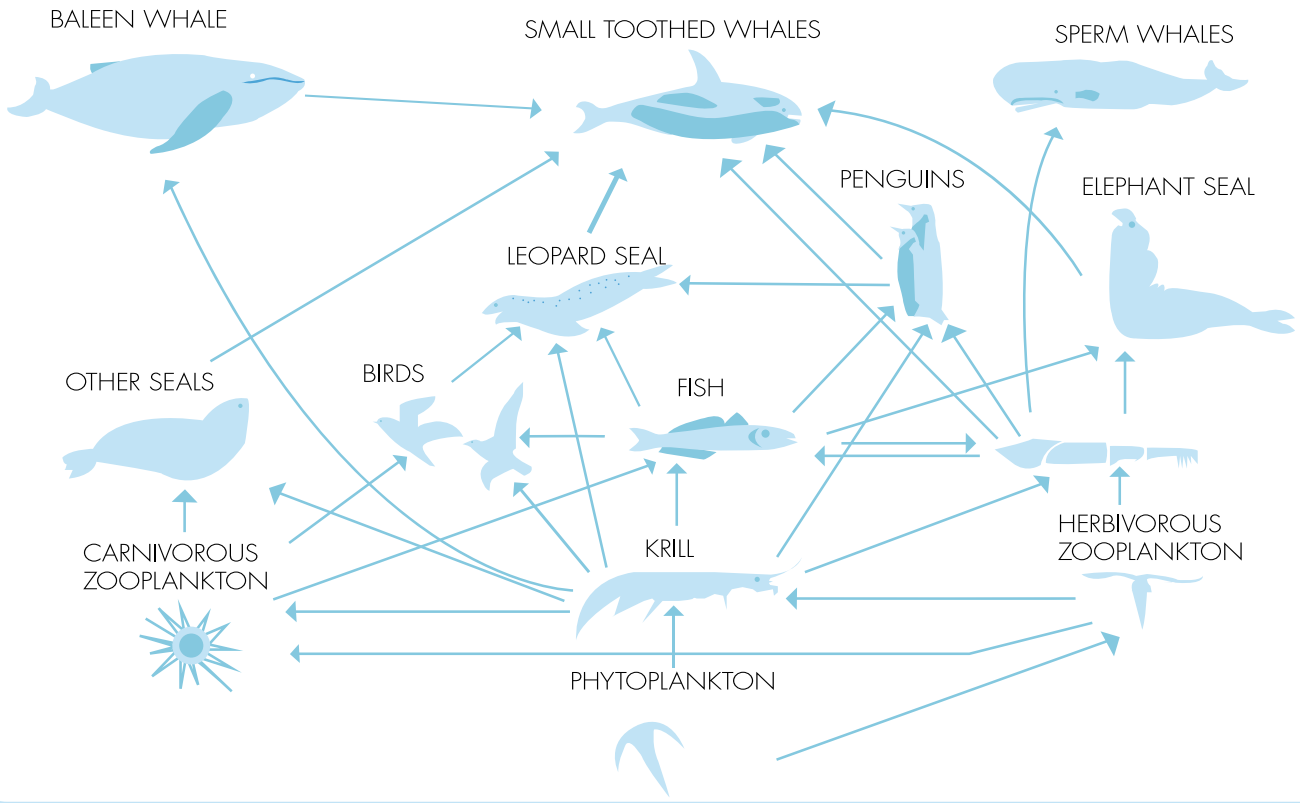
Definitions

Ecosystem: everything that exists in a particular environment

Ecology: the study of the relationships between a group of living things and their environment

Krill average about two inches in length, which is about the size of a paperclip!

Antarctic Food Web



Discovery Sheet:
"Food Web Game Jenga Block Pictures"

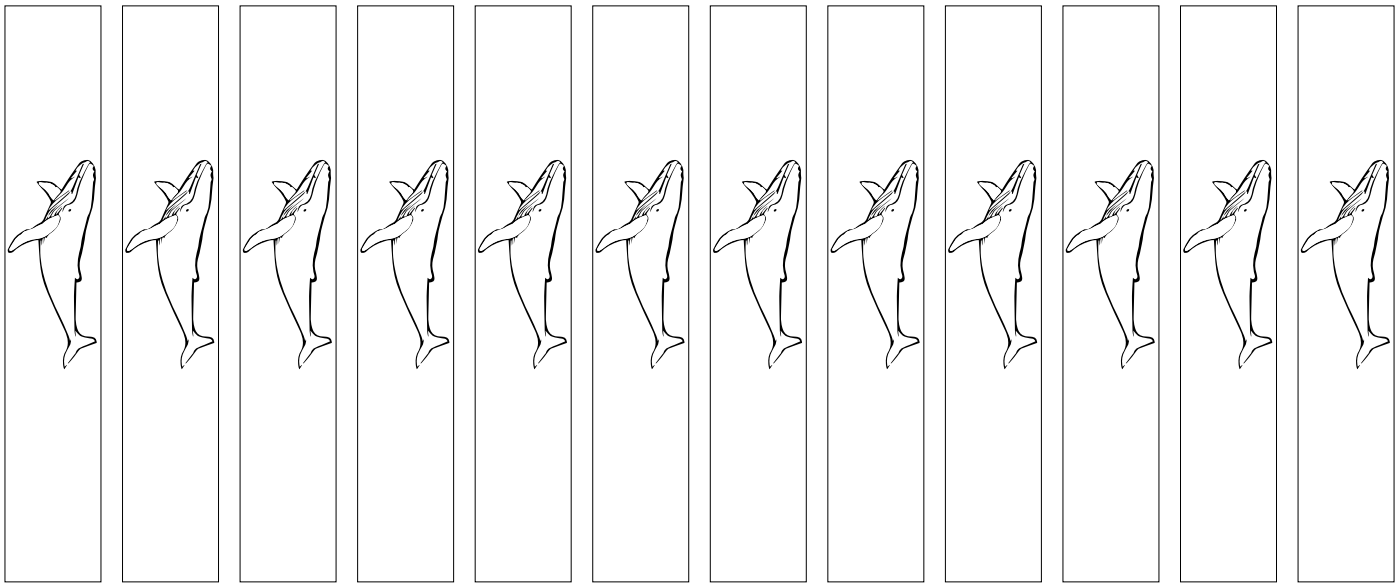
Jenga Game

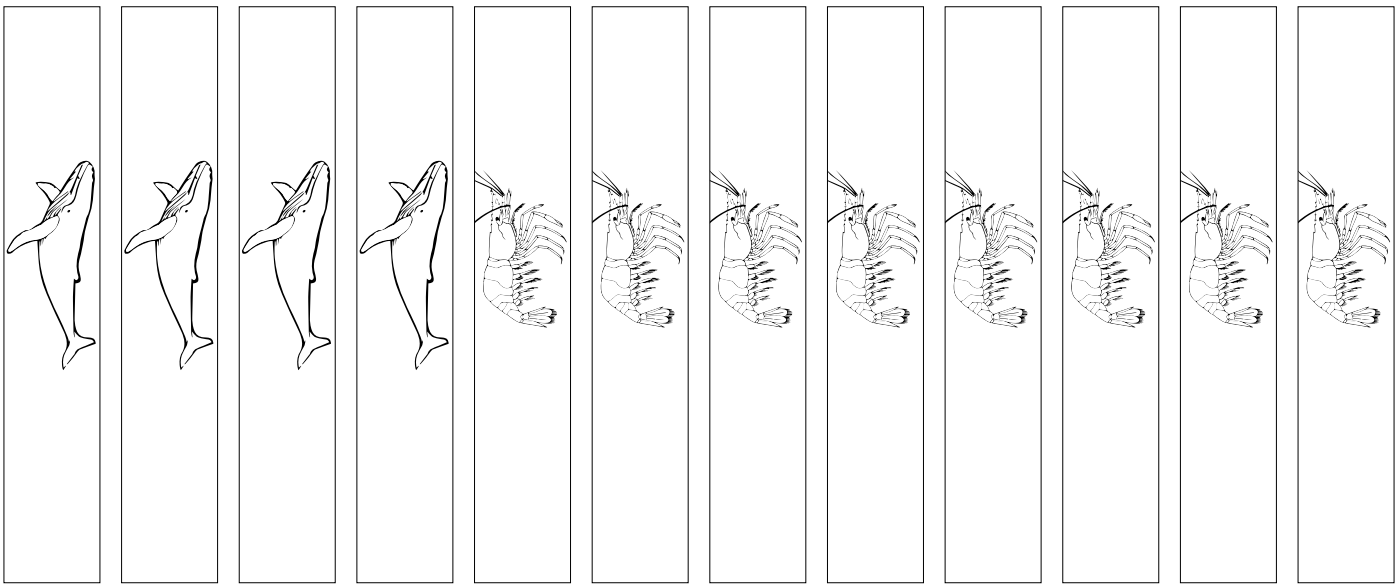
Block Size: 3 x 0.5 inches

You Will Need:

- **9 Humpback illustration**
- **6 Krill illustration**
- **6 Fish illustration**
- **12 Zooplankton**
- **21 Phytoplankton**
  There are more phytoplankton than zooplankton illustrations

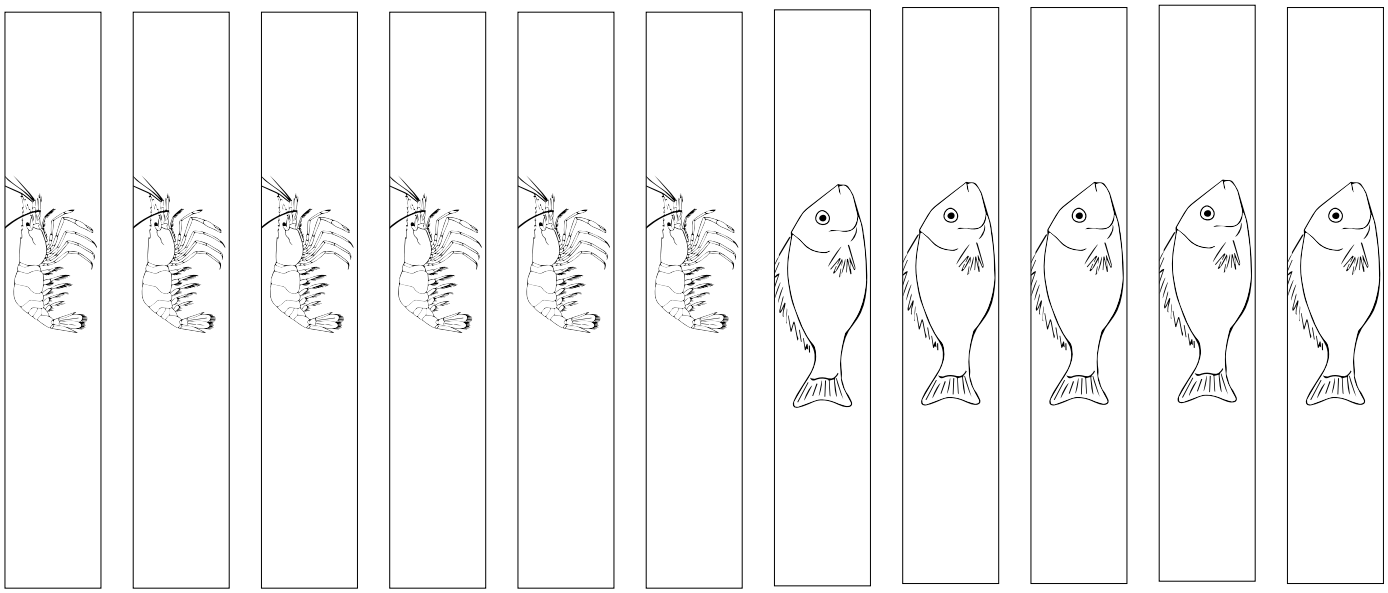
Please Note: there are a few extras of each image.

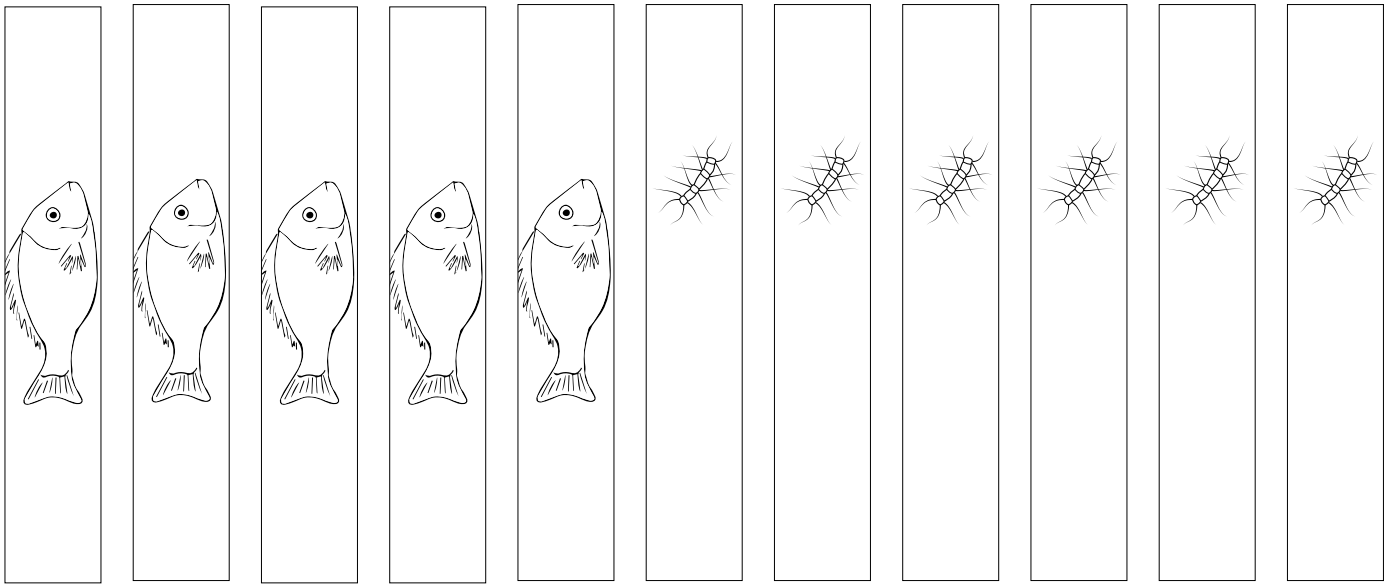


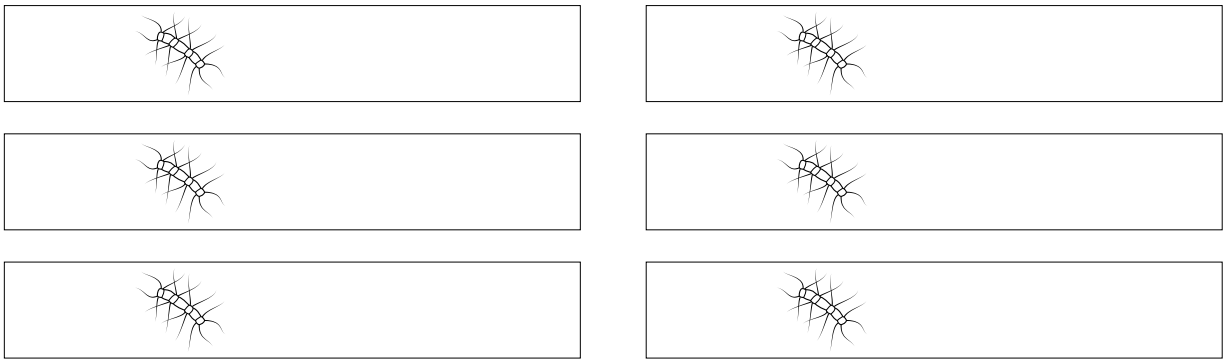


Discovery Sheet:

"Food Web Game Jenga Block Pictures"







Discovery Sheet:

"Food Web Game Jenga Block Pictures"

Discovery Sheet:
"Food Web Game Playing Cards"

Sunlight reaching the ocean increases.

PUT BACK ONE *GREEN BLOCK*

A storm hits. Pollution from storm drains flow into the ocean.

REMOVE ONE *GREEN BLOCK AND* **ONE** *BLUE BLOCK*

Ocean currents change and disperse phytoplankton.

REMOVE ONE *GREEN BLOCK*

Ocean acidification results from an increase in carbon dioxide.

REMOVE ONE *RED BLOCK*

Successful beach clean-up reduces pollutants entering the ocean.

PUT BACK ONE *GREEN BLOCK*

An oil spill occurs in a nearby harbor.

REMOVE ONE *GREEN,* **ONE** *BLUE AND* **ONE** *RED BLOCK*

Discovery Sheet:
"Food Web Game: Additional Prompts"

—Too many zooplankton are consumed by invasive filter feeding invertebrates. **Remove 1 blue block**

—Algae pulls oxygen from ocean water. **Remove 1 blue and 1 red block**

—A bloom of harmful algae creates toxins. **Remove 1 blue and 1 red block**

—Oh no! A chemical spill at a factory leaks toxins into the watershed. **Remove 1 green, 1 blue, and 1 red block**

—Whales leave the area to migrate. **Put back 1 red block**

—Changes in ocean currents decrease upwelling of nutrients for zooplankton. **Remove 1 blue block**

—A layer of smog reduces the amount of sunlight able to reach the ocean. **Remove 1 green block**

—An increase in ocean temperature leads to smaller phytoplankton. They are unsuitable as food for zooplankton. **Remove 1 blue and 1 red block**

—Humpback whales remain in an area longer than usual. **Remove 1 red block**

—Ocean temperatures continue to rise. **Remove 1 green, 1 blue, and 1 red block**

—A storm is brewing! The influx of rainwater into the ocean reduces the concentration of phytoplankton. **Remove 1 green block**

—Invasive zooplankton reduce the number of phytoplankton. **Remove 1 green block and put back 1 blue block**

—Loud noises from ship engines harm marine mammals**. Remove 1 black block**

—Sonar testing interferes with whale communication. **Remove 1 black block**

—Oil drilling in the ocean disturbs the ocean environment. **Remove 1 green and 1 blue block**

—A local power plant releases warm water into the ocean, raising water temperatures. **Remove 1 green, 1 blue, and 1 red block**

—A new marine species from a traveling fishing boat is introduced into the local environment. **Remove 1 green block**

—Fishermen dredging the ocean floor disturb the natural habitat. **Remove 1 green block**

—Fishermen over fished an area. **Remove 1 red block and replace 1 green block**