

LESSON 6

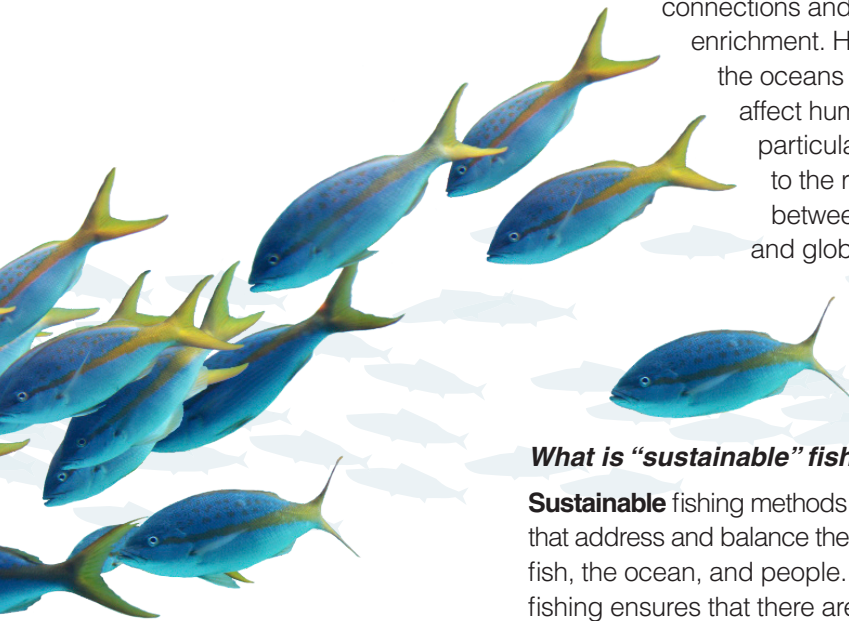
Sustainable Fisheries

INTRODUCTION & BACKGROUND

How are humans connected to the ocean?

Humans are inextricably connected to the ocean. The ocean is a source of food, medicine (from minerals, plants, invertebrates, fish and mammals), energy, and recreation. People use it for commerce (fishing, research, processing mineral and energy resources) and transportation (moving goods or people great distances). It is a rich source of human cultural

connections and personal enrichment. Humans affect the oceans and oceans affect humans: this is particularly relevant to the relationship between humans and global fish stocks.



What is “sustainable” fishing?

Sustainable fishing methods are strategies that address and balance the needs of the fish, the ocean, and people. Sustainable fishing ensures that there are enough fish left in the ocean to reproduce and enough fish to sustain human needs for food.

This type of practice maintains a healthy ocean ecosystem, by meeting the needs of all stakeholders in a way that provides for the future.

Special Focus: What are “catch share” programs?

Catch share programs are fish management practices in which the total quota of a certain type of fish is decided for the season, and divided into designated portions for each

participant. Catch share programs go by many names: Limited Access Privilege Programs (LAPPs), Individual Fishing Quotas (IFQs), or simply Catch Shares. In general, catch share programs encourage fishers to invest in the sustainability of fish stocks. All catch share programs are not identical. They vary with region, fish conditions, participants involved (both individuals and communities), and how catch shares are allocated (lottery, auction, direct sale) and maintained (returned or retained at end of season, purchased from other fishers).

What are the effects of catch share programs?

Scientists have recently discovered statistically significant benefits to catch share programs. Benefits of catch share programs include the use of more efficient fishing methods, improvement in the safety of fishers, and an increase in fish populations. In addition, since fishers in catch share programs know their fish quota, they tend to fish when weather conditions are favorable and there are good chances of catching fish. Fewer fishing trips use less fuel and fishers are less likely to fish during storms or other instances where physical risks increase. Fishers are also more likely to use methods that target their quota fish and reduce the amount of “**bycatch,**” or fish caught unintentionally and discarded.

Catch share programs are not perfect. Each region has its unique problems related to fish populations. However, researchers now have data that support the use of catch share programs as a way not only to slow the decline of fish loss, but also to increase fish populations (Costello, 2008).



Where are catch share programs used?

In the Americas, Catch Share programs are used on the West and East Coast of the United States (the Pacific Northwest, Alaska, New England, and North Carolina), British Columbia, Canada, the Gulf of Mexico, and Chile.

(See Online Supplementary Background Information for Lesson 7 more information on sustainable fishing).

ACTIVITY MISSION

Time: 30-45 min. (Procedure + Extension A)
20-45 min. (Extension B)

Students simulate fishers catching fish from the world's oceans. They explore different harvesting methods, using simple to complex technologies. In Extension A, students participate in a “catch share” program and examine the effect on fish populations and group dynamics. In Extension B, students identify local fish use and **overfished** populations.

CONCEPTS

- Humans are connected to the ocean.
- Human actions and technology have positive and negative impacts on the ocean.
- Ocean systems are very complex and involve many intertwined connections.
- Many of the ocean's fish populations have been over-fished.
- Sustainable practices can have ecological and economic benefits.
- Solving complex problems involves complex answers and cooperation.
- Individual choices have an impact on the environment.

LEARNING OBJECTIVES

- Students will be able to demonstrate their comprehension of sustainable practices by explaining “catch share” programs.
- Students will be able to demonstrate their analysis of sustainable practices by comparison and contrast.
- Students will be able to demonstrate their evaluation of sustainable practices by explaining their personal choices when eating fish.

STANDARDS & PRINCIPLES

U.S.: 6.2, 11.4, 13.6

Canada: 306, 113-1, 113-2, 113-9, 211-3, 211-4, 211-5, 430, 431, 432

Ocean Literacy Principles: 1b, 1e, 1g, 7c

PRE-DELIVERY PREP

Supplies Needing a Day or More to Prepare

- None

Hard-to-Obtain Materials

- None

SAFETY GUIDELINES

Safety Procedures

Monitor student use of materials.

Hazardous Materials

None

Safety Concerns for Students

Tokens are choking hazards.

SUMMARY OF SUPPLIES

Durable Supplies

ITEM	DESCRIPTION	QUANTITY
“Fish” tokens (mixture)	Small and medium dried beans or pebbles	About 200
“Ocean” Basins	Bowl or coffee filter	1/group
“Boat”	Cup or folded paper boat	1/student
Spoons		1/student

Consumable Supplies

ITEM	DESCRIPTION	QUANTITY
Paper and Pencil/pen	For student use	1/student
straws		1/student

PROCESS & PROCEDURE

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Pre-Activity Preparation (Optional)

1. Show students how to fold a boat from a sheet of paper. Students will use this boat to contain their “catch.” Only fish that land in the boat can be counted.

The Activity

1. Introduce and discuss the concept of sustainability using the following definition:
“Sustainability is meeting the needs of the present without limiting the ability of people, other species, and future generations to survive.”
 - Why might sustainability be an important goal for a society?
 - What might be difficult about realizing this goal?
2. **“Today you’re going to go fishing and explore some of these sustainability issues.”**
3. Explain the basic game rules:
 - a. Fishers - Each student will be a “fisher” whose livelihood depends on catching fish.
 - Each fisher must catch at least two fish (large or small) in each round to survive (i.e., get enough fish to either eat or sell).
 - b. Fish –
 - Medium beans (such as kidney beans) represent the largest and most valuable fish (tuna, swordfish, etc.).
 - Small beans (such as pinto beans) represent the next most-valuable fish (cod, salmon, etc.).
 - c. Methods – (listed here for quick teacher reference. Share with students before each season.)
 - Season 1: without hands, use straws to suck beans from bowl into boat
 - Season 2: hands on straws to catch fish
 - Season 3: spoon

General Rules for Playing the Game

1. Divide the class into groups of three or four students and have each group choose an ocean basin such as North Pacific, Arctic, North Atlantic, South Atlantic, Southern, South Pacific, etc.
2. Give each group one serving bowl and each student one boat and one straw. Have students create a data table similar to this Fishing Log: www.pbs.org/emptyoceans/educators/activities/fishing-for-the-Future.html

3. Put 20 small and 10 medium beans in each group's bowl. (You may wish to prepare these before class.)
4. Follow the directions for each fishing season.
5. Discuss impressions.
6. Repeat with Extensions and Discuss.

Season 1: (Method – Fishing rods)

1. In order to fish with their “fishing rods,” students must hold their hands behind their backs and use the “fishing rod” (straw) to suck “fish” beans from the “ocean” (bowl) and deposit them into their “boat” (cup).
2. Declare the fishing season “open” (Say “start fishing”) and give the students 20 seconds for the first “season” of fishing.
3. At the end of 20 seconds, declare the fishing season “closed” (“stop fishing”).
4. Have each fisher count his or her catch (beans in their boat) and record the data in their Fishing Log.
5. Fishers who did not catch the two-fish minimum must sit out for the following round.
6. The fish remaining in the ocean after each fishing season represent the breeding population. Add one new fish for every fish left in the ocean (bowl).

Variation for Season 1:

Have students close their eyes or put on blindfolds to simulate locating and catching fish without using technologies such as sonar.

Season 2:

(Method – Trawl nets or Long-line Fishing (See Recommended Resources))

1. In order to fish with their “newer technology,” fishers may use their hands on the straws.
2. Repeat Steps 2–6 in Season 1.

Season 3: (Method – the latest “fish finder” Sonar)

3. In order to fish with the “latest technology,” fishers may use a spoon.
4. Repeat Steps 2–6 in Season 1.

Variation for Season 3:

Give only one student per group the use of a spoon.
Sometimes there is a technological disparity among competitors.

Season 4 +: Expand Fishing Areas

“What happened when [ocean basin] ran out of fish? How are the fishers going to survive now?”

1. Have students brainstorm solutions. Allow students to “explore other fishing territories” (other ocean basins) when their ocean is depleted, but don’t tell them that they can do this beforehand. Fishers may either go as a group to another ocean or they may disperse to other oceans.
2. Repeat fishing, recording, and replenishing fish stocks until either sustainable fishing is achieved or until all (or most) groups fish out their ocean.

Reflection

- **As a fisher, how did you feel when you realized that you had depleted your fish stock?**
- **As a fisher, how did you feel when other fishers joined your ocean group?**
- **How does this activity relate to real ocean and fishery issues?**
- **What’s missing in this game?** (Impacts to other animals (e.g., birds and marine mammals) that rely on fish for their survival, population growth, etc.)
- **What happens to a resource when you have rapid human population growth, growing technology, and a finite resource?**

K-5 ADAPTATIONS

Substitute plastic marbles, small toy fish from a toy store or fish/oyster crackers for the “fish” tokens.

Write and illustrate a story. Creative writing prompts:

- What would it be like to be a fisher? What will the ocean be like if everyone tries to get the most fish? What should people do?
- What fish do the students and their families eat? Where does it come from? How does the fish get from the ocean to their plate?