

The world's *fisheries* are under more pressure than ever before. From 1950 to 1990, there was a fivefold increase in the world annual fish catch. The average yearly per person fish consumption in the *industrialized* world (59 pounds) is three times that of people in the developing world (20 pounds). Fish demand remains high: An additional 15.5 million tons of fish will be required by 2010 just to maintain current rates of fish consumption. Today, 70 percent of the planet's marine stocks are fully exploited or overexploited.

The number of people fishing and practicing aquaculture worldwide has doubled since 1970. More than 21 million people are full-time fishers, and 200 million depend on fishing for their *livelihood*. Asia contains the vast majority of the world's fishers. In the early 1950s, developed countries took 80 percent of the world's fish catch. Today, they take only 36 percent of the catch, while developing countries take 64 percent.

The technology used to catch fish and the number of fish caught per fisher varies enormously. Modern fleets are the most environmentally destructive, as they use enhancements such as airplanes, radios, seafloor maps, and *video sonar* to track down fish schools. Once they have found the fish, these fleets use large nets to drag up not only the targeted fish but also coral, the seafloor, and around 27 million tons annually of "by-catch"—nonmarketable fish that are killed and thrown overboard.

To compensate for reduced wild fish stocks, more and more fish are being farmed. Nearly a third of all fish for food is harvested from *aquaculture*. For every 11 pounds of beef grown globally, there are now 4.5 pounds of farm-raised fish produced. Fish farming causes environmental destruction comparable to the replacement of rain forest with cattle ranches. About 11 pounds of wild ocean fish need to be caught to feed each pound of farmed species. Thailand, which has one of the biggest aquaculture industries, has lost half its *mangrove forests* due to shrimp farming. Densely stocked salmon farms in British Columbia, Canada, produce waste (including fertilizer, effluent, and fishmeal) equivalent to that generated by half a million people.



Despite these numbers, there is still hope for the world's fisheries. Fisheries can be restored through the adoption of sustainable fishing practices. With the proper incentives, fishers can be encouraged and rewarded in their effort to sustainably manage marine resources. For example, partnerships between local communities and scientists in the central islands of the Philippines resulted in the establishment of marine reserves to help manage *overexploited* fisheries. The establishment of no-fishing zones in the reserves has increased catches in adjacent fishing grounds. Another solution is to use the power of the market to encourage sustainable fishing practices. The Marine Stewardship Council together with the World Wildlife Federation and Unilever, one of the largest makers of fish products, has developed a certification process that includes a label telling consumers that fish products came from fisheries certified as sustainable.

References: The New Internationalist magazine issue 325 - [www.newint.org](http://www.newint.org)

The United Nations Food and Agriculture Organization - [www.fao.org](http://www.fao.org)

Environmental News Service, February 2002 - [www.enn.com](http://www.enn.com)



## Day 1: Pre-Assessment

Name: \_\_\_\_\_

Date: \_\_\_\_\_ Period: \_\_\_\_\_

1. The average yearly fish consumption in the industrialized world is less than that of the developing world.  
True                      False
2. Asia contains the vast majority of the world's fisheries.  
True                      False
3. Modern technologies such as airplanes, radios, and seafloor mapping are more environmentally destructive than traditional fishing methods.  
True                      False
4. Most of the fish consumed as food is harvested from aquaculture.  
True                      False
5. About 1 pound of wild ocean fish need to be caught to feed each pound of farmed species.  
True                      False

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True                      False



# Day 1: Sum it Up

Name: \_\_\_\_\_

Date: \_\_\_\_\_ Period: \_\_\_\_\_

1. Read "Fishing for the Future" and underline the key words and main ideas. Write these in the box below labeled "Main Idea Words"
2. At the bottom of this sheet write a one-sentence summary of the article, using as many main idea words as you can.
  - a. Imagine you only have \$2.00 and each word you use costs \$0.10 each. See if you can "sum it up" in twenty words!

Main Idea Words:

"Sum it up" for \$2.00 (one word per box)


### Background Information

1. Define the term “population”? Give an example of a population.
2. What is a natural resource? Give an example.
3. What is a common pool resource? Give an example.
4. What are some strategies you know of that can help manage natural resources?
5. What is “overfishing?”

### Gone Fishing: Rules of the Game

1. 4 fisherpersons will be fishing in each ocean (a bowl). You cannot touch, tip, or move the ocean!
2. Each fisherperson will be given 1 fishing pole (spoon) to fish with. There should be NO fishing with hands! Each fisherperson will also get a boat (a napkin) onto which any fish that are caught should be placed.
3. **You must catch at least 2 fish each year to stay in business.** However, you can try to catch as many fish as possible.
4. At the end of each year, the fish have a chance to reproduce. Fish will reproduce at a rate of 40%. Thus for every 10 fish, they will make 4 baby fish.
5. Each ocean will start off with 64 fish. There is *carrying capacity* (maximum) of 80 fish in the ocean.
6. You will be fishing in your ocean for 8 years. Each year you will have 20 seconds to bring in your catch. When the teacher says “STOP” all fishing poles must be put down.
7. Fill in your data tables with the number of fish that remain in the ocean, the number of fish in your catch, the number of fish caught by each fisherperson in your group, and the total fish your group caught.
8. Once your tables are filled out, you can eat your catch!
9. Repeat steps 7-8 until there have been 8 years of fishing.

\*Note: If you manage to catch 64 fish by the end of year 8, you will win a candy bar. Also, if your group maintains at least 20 fish at the end of year 8, everyone will get a Hershey’s kiss/Airhead.

### YOUR ANSWERS TO THE BACKGROUND QUESTIONS:

- 1.
- 2.
- 3.
- 4.
- 5.



**The Catch**

	My Catch	_____’s Fish Total	_____’s Fish Total	_____’s Fish Total	Total Caught Each Year
Year 1					
Year 2					
Year 3					
Year 4					
Year 5					
Year 6					
Year 7					
Year 8					
<b>Overall Totals</b>					

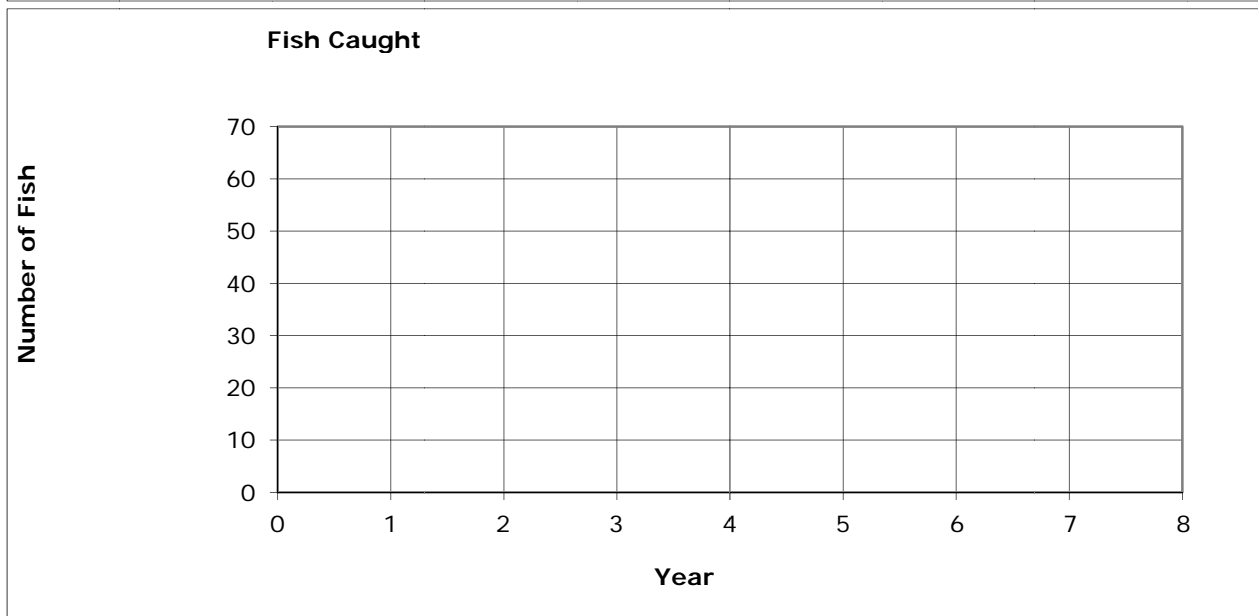
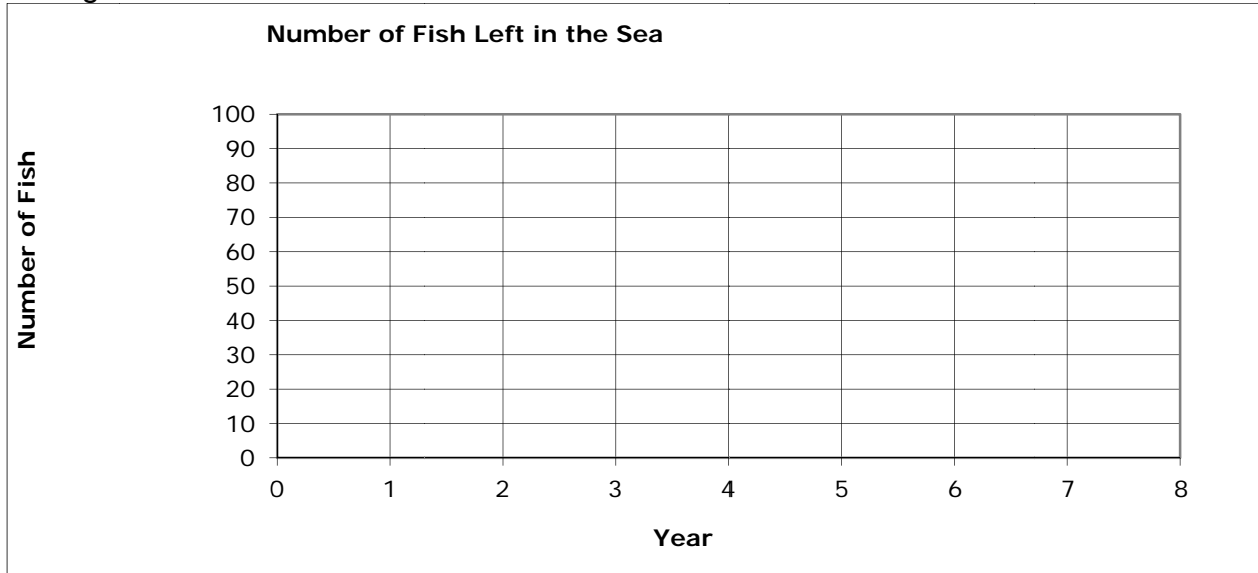
**Number of Fish Remaining**

	Fish Before Season Begins	Fish Left in the Sea	New Fish Hatched
Year 1	64		
Year 2			
Year 3			
Year 4			
Year 5			
Year 6			
Year 7			
Year 8			n/a
<b>Total</b>	n/a		n/a



**Part 1**

Below, graph the number of fish left in the sea and number of fish you caught over the 8 fishing seasons.



Describe how the fish population in your fishery changes over the 8 fishing seasons.

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**Fishing Game – Part 2**

**The Catch**

	<b>My Catch</b>	<b>_____’s Fish Total</b>	<b>_____’s Fish Total</b>	<b>_____’s Fish Total</b>	<b>Total Caught Each Year</b>
Year 1					
Year 2					
Year 3					
Year 4					
Year 5					
Year 6					
Year 7					
Year 8					
<b>Overall Totals</b>					

**Number of Fish Remaining**

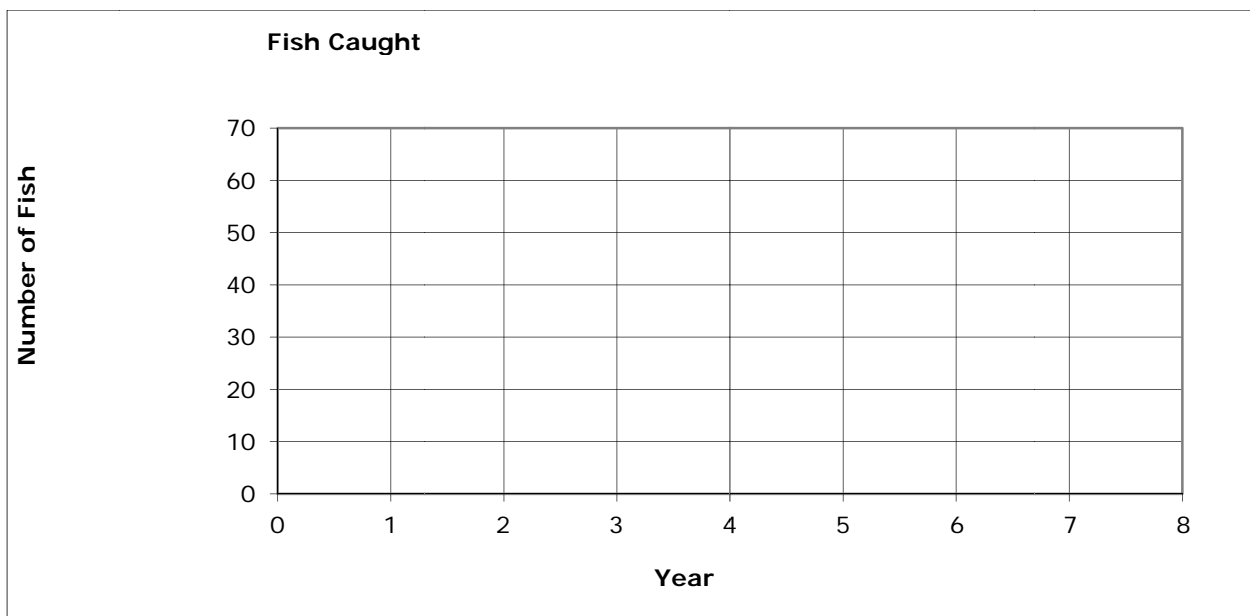
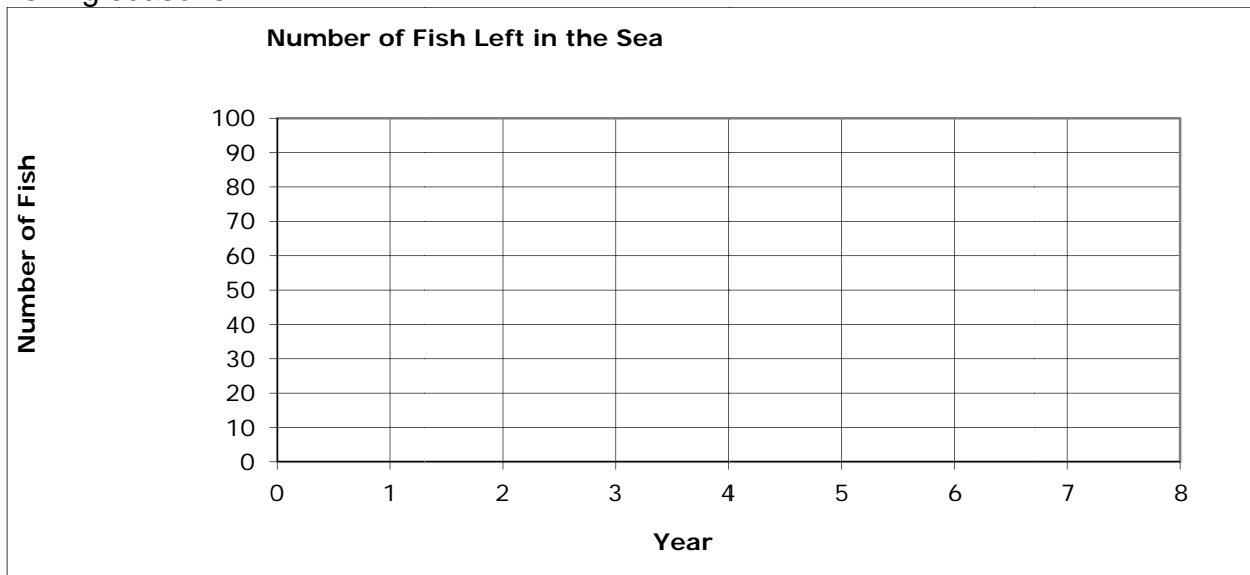
	<b>Fish Before Season Begins</b>	<b>Fish Left in the Sea</b>	<b>New Fish Hatched</b>
Year 1	64		
Year 2			
Year 3			
Year 4			
Year 5			
Year 6			
Year 7			
Year 8			n/a
<b>Total</b>	n/a		n/a





**Part 2**

Below, graph the number of fish left in the sea and number of fish you caught over the 8 fishing seasons.



Describe how the fish population changes over the 8 fishing seasons this time.

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Analysis Questions (answer on a separate sheet):



1. Describe the graphs of the fish population for Day 2 and Day 4. How were they similar and/or how were they different?
2. What strategies did your group choose for Day 2? What are some changes you made in Day 4 of fishing that were different from your first attempt at fishing?
3. Compared to other groups, was your group successful in preventing the collapse of your fishery? Why or why not? Explain how your personal actions and choices (or those of your classmates) affected the fishing game.
4. Why do you think there are rules about hunting and fishing? From your point of view, what should be the goal of these regulations?
5. Do you feel your strategies for maintaining your fishery could be sustainable in the real world? Why or why not?
6. What types of local or world events could change your answer to question 7?
7. Do you feel that fish farms are the answer to maintaining the balance between having enough fish for human consumption while preserving ocean fish populations? Why or why not?
8. What is the “tragedy of the commons” and how can we help to prevent this tragedy for natural resources that are used globally by multiple countries and people?
9. Other than fisheries, identify three common pool natural resources that humans impact and explain how humans impact that resource.

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3. Modern technologies such as airplanes, radios, and seafloor mapping are more environmentally destructive than traditional fishing methods.  
**True**
4. Most of the fish consumed as food is harvested from aquaculture  
**False (1/3)**
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**False (11 pounds!)**