What Happened to the Red Snapper?

For use with Fish Watch at www.fishwatch.gov

Grade Level
9-12

Materials
- Computers for pairs of students with Internet access for graphing (or graph paper if no Internet is available)
- Graph paper (optional)
- Handout 1
- Handout 2

Audio/Visual Materials
- Projector to show images
- Computers with Internet access

Teaching Time
Two to Three 45-minute class periods

Seating Arrangement
Students sitting in pairs

Key Words
- Annual landings
- Bycatch
- Overfished
- Catch share
- Sustainability

Focus
- Annual Landings
- Bycatch
- Overfishing

Focus Questions
- What happened to the red snapper?

Learning Objectives
- Analyze and draw conclusions from annual landings data
- Explain the difference between overfishing and overfished
- Explain the reasoning behind the fishery management decisions related to the red snapper

Background Information

Overfishing versus Overfished
Overfishing occurs when the rate of removal from a fish stock is too high. It would be natural to assume that overfishing and overfished have the same causes, but they may not. A stock is deemed "overfished" when its population is too low, or below a prescribed threshold. A population can be overfished but

National Science Education Standards

Grades 9-12

Content Standard A: Science as Inquiry
- Abilities necessary to do scientific inquiry
- Understanding about scientific inquiry

Content Standard C: Life Science
- Interdependence of organisms

Content Standard E: Science and Technology
- Abilities of technological design
- Understanding about science and technology

Content Standard F: Science in Personal and Social Perspectives
- Natural resources
- Science and Technology in Local, National and Global Challenges

Content Standard G: History and Nature of Science
- Nature of scientific knowledge
- Historical perspectives Ocean Literacy Essential Principles

Ocean Literacy Essential Principles

Essential Principle 1
The earth has one big ocean with many features.

Fundamental Concept h
Although the ocean is large, it is finite and resources are limited.

Essential Principle 6
The ocean and humans are inextricably connected.

be managed under a rebuilding plan that over time returns the population to optimal levels. Reasons that a fish stock becomes overfished can include environmental changes, natural mortality, disease and natural population cycles.

Environmental changes play a large role in what happens to a fish stock in our waters. A fish's environment (habitat) includes physical factors, such as temperature and bottom type, as well as chemical factors, such as oxygen levels and dissolved minerals. The habitat needs for each stage of a fish's life cycle—egg, larvae, juvenile, and adult—vary within the same water body. So changes in these environmental factors can greatly affect the population of a stock. For example, the cause of the overfishing and overfished status of the red snapper industry in the Gulf of Mexico is unique to many American fisheries. This status was not only the result of fishing mortality from the directed fishery, but also due to a high level of bycatch mortality on juvenile red snapper by the shrimp trawl industry. This non-directed fishery catches substantial numbers of juvenile red snapper as bycatch. Therefore, to end overfishing and rebuild the red snapper stock, large reductions in bycatch mortality from the shrimp fishery need to be achieved either through technological means such as bycatch reduction devices or through a reduction in effort by the shrimp industry.
History of the Red Snapper

Harvested off the southeastern United States for well over a century, red snapper is an iconic American fish, extremely popular among commercial and recreational fishermen alike. But this popularity comes with a downside – red snapper has been fished too heavily since the 1980s, and both stocks are currently below the level scientists have determined to be sustainable (overfished). However, both stocks are now managed under rebuilding plans, the strategy used to manage harvest at a level that will allow an overfished stock to rebuild to target population levels by a specified deadline. In the past, the Gulf of Mexico red snapper fishery had too many fishermen to be an environmentally and economically sustainable fishery. As the red snapper population declined, the number of fishermen stayed the same, and they raced to harvest a share of this once-abundant resource. Fishing seasons started getting shorter, and the fishery became inefficient and unsafe, catching too many juvenile red snapper (bycatch of trawling for brown shrimp) and further hindering the rebuilding of the stock. In response to these poor conditions, fishermen voted to change how this fishery was managed and supported a commercial "catch share program." Catch share programs set a biologically-based annual catch limit for each fish stock and allocate a specific portion of that catch limit to entities, such as fishermen, cooperatives, or communities. Knowing their share is secure, fishermen can be more selective about when and how they catch their allotment. They can plan their fishing schedules in response to weather, market, and individual business conditions. In 2007, the Gulf of Mexico Fishery Management Council and NOAA Fisheries implemented an Individual Fishing Quota program (a type of catch share) for the commercial fishery to reduce the number of fishermen and improve the operation of the fishery. Under the program, managers set a limit on the amount of red snapper that can be caught every year, then allocate fixed shares of this amount to eligible fishermen. Fishermen can harvest their share whenever they choose, slowing the pace of the fishery and easing the pressure on the resource.

Fundamental Concept b

From the ocean we get foods, medicines, and mineral and energy resources. In addition, it provides jobs, supports our nation's economy, serves as a highway for transportation of goods and people, and plays a role in national security.

Fundamental Concept e

Humans affect the ocean in a variety of ways. Laws, regulations and resource management affect what is taken out and put into the ocean. Human development and

In the few years the program's been in place, fishermen are no longer exceeding catch limits and are catching less juvenile snapper. And although fewer fishermen can participate in the fishery, the remaining ones are earning more money for their catch. Best of all, scientists recently confirmed that the Gulf red snapper stock is rebuilding as planned and commercial catch has not exceeded the allowable catch limit. Since overfishing is no longer occurring, managers recently increased the amount of red snapper fishermen can catch.

Sources:
www.fishwatch.gov
www.sefsc.noaa.gov/sedar/download/S7SAR_FINALreduce.pdf?id=DOCUMENT

Learning Procedure

1. This lesson is an inquiry-based learning lesson. Before beginning this lesson, make copies of NMFS Landings Queries results (Handout 1). This information is taken from the Annual Commercial Landings Statistics site at: www.st.nmfs.noaa.gov/st1/commercial/landings/annual_landings.html
More recent statistics may be available. Students can run this query independently if computer and internet access are available.

2. Distribute Handout 1. Define annual landings; be sure that students understand that landings are the report of the total number or weight of all marine species captured, brought to shore, and sold (or transferred) to another person or party. Landings are not the same as catch. Catch is a measure of all marine species removed from the marine environment, including bycatch, fish released, at sea discards and species not sold. Landings are anything received from a harvester regardless of whether it is discarded or not sold. Landings do not include all of the organisms that are released and/or discarded at sea.

3. Allow students time to review handout and graph data. Graphing data can be done online at: nces.ed.gov/nceskids/createagraph/default.aspx or students may use graph paper. An example of the graphed data can be found attached (Teacher Handout 1).

4. After graphing is completed, have students analyze the data and graph using Handout 2. Pose the question—What happened to the red snapper? Allow students time to research Red Snapper on the fishwatch.gov site at www.fishwatch.gov/seafood_profiles/species/snapper/species_pages/red_snapper.htm

6. Discuss the questions on Handout 2. Then lead the class in a discussion of larger questions:

- What are some of the ways that changes in technology might have changed the fishing industry?
- What are some of the ways that these changes might have changed the populations of red snapper?
- What might happen if annual landings are taken and stocks are not monitored?
- How might this affect our oceans in the future?

- Why is it important to take interest in the health of our fisheries and choosing sustainable seafood?

Encourage the class to think about the above questions from a number of perspectives (fisheries, red snappers, local restaurant owner, consumers).

7. Wrap up this lesson by discussing the annual landings data. At this point students should have come to the following conclusions:

- Overfishing occurred in the 1980s.
- Commercial shrimp fisheries can impact the abundance of red snapper. As juveniles, they prefer shallow water and are often caught in the trawl nets and die as shrimp bycatch, never surviving to adulthood.
- Catch limits were set to rebuild the red snapper population and trawling equipment mandates were implemented. Shrimp trawlers must have bycatch reduction devices (BRDs), which are designed to retain shrimp but allow fish to exit the net.

Share Teacher Handout 2 from the Stock Assessment of the Red Snapper in the Gulf of Mexico. Have students compare their red snapper graph with the stock assessment graph.

- What are the similarities between graphs?
- What are the differences between graphs?

Explain the importance of stock assessments. Assessments provide the technical basis for setting annual fishery quotas and other fishery management measures that will achieve optimum yield from the fishery while avoiding overfishing and ecosystem harm (www.sefsc.noaa.gov/sedar/download/Red%20Snapper%20Update%202009%205.0.pdf?id=DOCUMENT).

8. Discuss the following:
In the 1980s, red snapper were overfished. What is the difference between overfishing and overfished?
Why is it okay to eat red snapper today? (The stock in the Gulf of Mexico and the Atlantic is being rebuilt under a management plan.)

The Bridge Connection

www.vims.edu/bridge
Use the search function to search for "fisheries" to access lesson plans and many additional resources.

The “Me” Connection

Ask students if they or anyone in their family participates in recreational or commercial fishing. Discuss how overfishing could impact them personally, whether they are fishermen or they buy and consume fish.

Connections to Other Subjects

Mathematics, Language Arts, Environmental Policy

Evaluation

Assessment could include students' understanding of the concept of overfishing versus overfished, their data analysis, their graphing of the data, and participation in class discussions.

Extension

It is important that students understand that the issues in the Gulf of Mexico are complex. The commercial shrimp fishery is one of the most economically important fisheries in the southeast Atlantic and Gulf of Mexico. Have students read about brown shrimp here:
www.fishwatch.gov/seafood_profiles/species/shrimp/species_pages/brown_shrimp.htm
Then brainstorm additional ways to reduce shrimp bycatch and make the shrimping industry more efficient.

Additional Resources

- The Plan to Save Red Snapper
  www.pewenvironment.org/uploadedFiles/PEG/Publications/Fact_Sheet/pewRedSnapperPlan082411.pdf

- Louisiana Fisheries: Red Snapper FAQs
  www.seagrantfish.lsu.edu/faqs/redsnapper/stock.htm

- New Device to Cut Shrimping Bycatch; Reduction May Prevent Cuts in Red Snapper Quota
  www.publicaffairs.noaa.gov/pr98/apr98/seronr98-022.html

- Gulf of Mexico Red Snapper: FAQs
  sero.nmfs.noaa.gov/sf/RedSnapper/pdfs/red_snapper_general_FAQs_102307.pdf

- NOAA Increases Gulf of Mexico Red Snapper Catch Limit
  www.noaanews.noaa.gov/stories2012/20120529_redsnapper.html

- Two Year Old Ban on Fishing Red Snapper Could Be Eased
  articles.orlandosentinel.com/2012-05-08/news/os-red-snapper-fishing-reopening-20120504_1_red-snapper-ban-red-snapper-pew-environment-group

NMFS Landings Query Results **Handout 1**

- **Year : From: 1960 To: 2010**
- **Species : snapper, red**
- **State : Atlantic And Gulf**

Year	Species	Metric Tons	Pounds	$
1965	SNAPPER, RED	6,363.3	14,028,500	4,133,234
1970	SNAPPER, RED	4,146.4	9,141,100	4,231,978
1975	SNAPPER, RED	3,852.9	8,494,100	6,349,899
1980	SNAPPER, RED	2,303.7	5,078,735	8,099,498
1985	SNAPPER, RED	2,043.7	4,505,522	9,126,287
1990	SNAPPER, RED	1,307.9	2,883,342	7,298,253
1995	SNAPPER, RED	1,420.6	3,131,848	6,247,930
2000	SNAPPER, RED	2,243.0	4,944,844	10,651,480
2005	SNAPPER, RED	1,915.7	4,223,258	11,682,599
2010	SNAPPER, RED	1,479.7	3,262,233	10,210,156
GRAND TOTALS:	-	152,047.5	335,203,831	386,581,017

Handout 2

Names _____

Analyzing Red Snapper Data

What do we know by looking at data	Questions that requires research

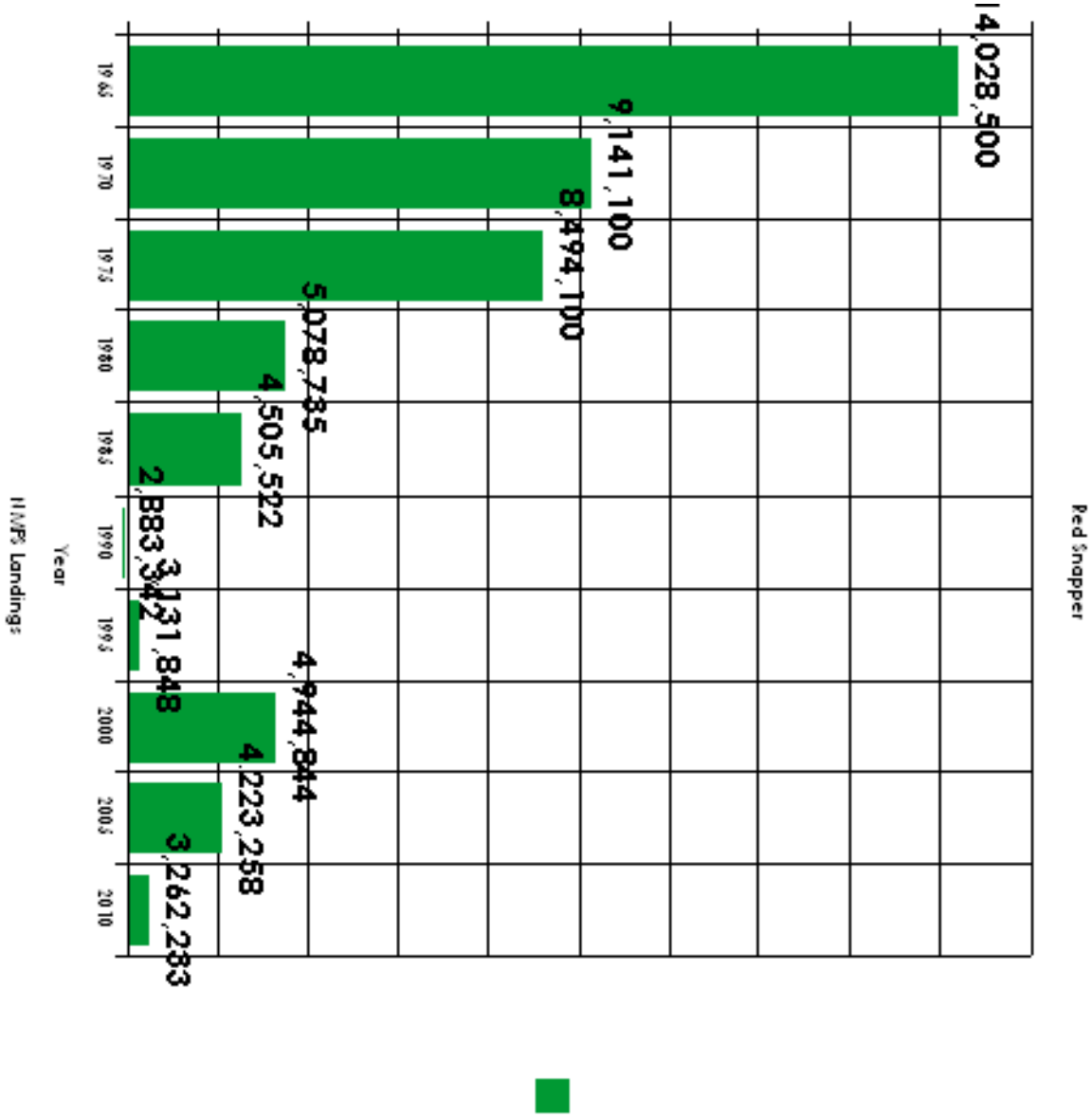
RESEARCH IT:

1. What is the life cycle of red snapper? (Include maximum age and habitat for various stages of life).

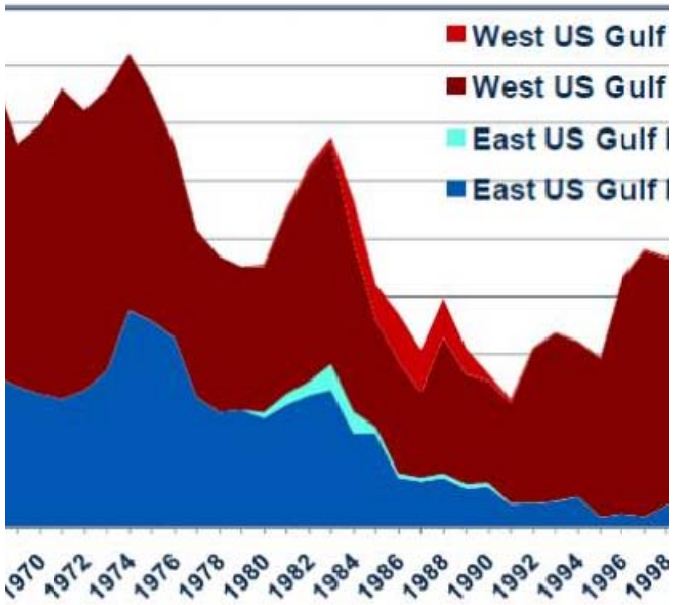
2. What do red snapper eat? Where do red snapper live?

3. In addition to overfishing, the red snapper population is also affected by another factor. Where do juvenile red snappers live? What might affect them/cause them to die early?

Teacher Handout 1



Teacher Handout 2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