

Activity Title: Summer Fishing Trip

Subject (Focus/Topic): Life Science: Marine Ecology

Grade Level: 3rd-5th Grade

Average Learning Time: 4-5 hours (First meeting, 90 minutes, will discuss fish, habitats, and adaptations. Once the background knowledge is established, the fishing trip will be scheduled and look at overfishing and science aboard the Dyson)

Lesson Summary (Overview/Purpose): Students will embark on a fishing trip in order to discover the fascinating world of fish as well as experience firsthand what field research aboard NOAA's Oscar Dyson was like! Students will begin by learning the distinguishing characteristics of fish. Students will also learn the wide variety of habitats fish inhabit, as well as the adaptations they possess to survive in those environments. Finally, students will explore why scientists study fish in the wild and what tools scientists use to gather data about fish in the wild once those fish have been caught.

Overall Concept (Big Idea/Essential Question): This fishing trip is designed to acquaint students with the kinds of data that scientists gather while studying fish as well as why that data is important. In other words, the students will learn how scientists handled the fish after they had been caught, what tools scientists used to get data, and what data scientists are most interested in as well as why.

Specific Concepts (Key Concepts)

- A fish is any gill-bearing aquatic vertebrate that lacks limbs with digits.
- Fish live in a wide variety of water sources. These include, but are not limited to, rivers, lakes, streams, ponds, marshes, swamps, and oceans.
- Fish have a wide variety of adaptations (both physical and behavioral) which help them to survive in their environment. These include gills, fins, body shape, and schooling behaviors.
- Fish are important to humans as a food source. In 2005, the world harvest for commercial fisheries in the wild was 93.3 million tons, with an additional 48.1 million tons produced in fish farms.
- Overfishing is a dangerous threat to fish in the wild. Cod is an example of this. In 1992, the cod fishery off of New Foundland collapsed, leading Canada to declare a indefinite moratorium. In 2000, The WWF placed cod on the endangered species list, stating that the global catch had suffered a

70 percent drop in the previous 30 years. It also remarked that continuing the trend would completely deplete the stock in only 15 years.

-In order to check the status of wild fish, NOAA launches research vessels to study the fish. They examine a variety of species, including pollock. They look at weight, length, gender, stomach contents, and otoliths in order to obtain a feel for how the fish are doing in the wild.

Focus Questions

- What specific characteristics make up a fish?
- Name some of the habitats where fish can be found.
- What are some of the differences in these habitats?
- In what ways are fish physically adapted to survive in their habitats?
- What behaviors do fish exhibit to survive in their habitats?
- Why are fish important to human beings?
- What is overfishing?
- Why is overfishing dangerous?
- How do scientists study fish in the wild?

Objectives/Learning Goals

- Students will be able to provide an accurate definition of a fish.
- Students will be able to name a variety of habitats where fish can be found.
- Students will be able to name both physical and behavioral adaptations for fish.
- Students will be able to define overfishing and why it is dangerous.
- Students will have a solid grasp of how scientists study fish in the wild.

Background Information

A fish is any gill bearing aquatic vertebrate (water living animal with a backbone) that does not have any limbs with digits on it. Many fish are also extothermic (cold blooded), which means that their bodies are dependant on the environment for their temperature. There are over 32,000 fish, which means that they are more diverse than any other vertebrates on the planet.

Fish live in most bodies of water. Examples of these bodies include creeks (a small to medium sized stream), rivers (a large natural stream), ponds (a body of standing water that is smaller than a lake), lakes, marshes (wetlands that are subject to flooding), swamps (these have more open water surface and tend to be deeper), seas (a large body of salt water),

and oceans (a major body of salt water). In the ocean, fish can be found at all levels, being found at the surface all the way down to the abyssal plain.

In order to survive in the water, fish have numerous adaptations. All fish have gills, which are breathing organs that can take dissolved oxygen out of water. Many fish also have fins, which provide the thrust necessary to push the fish through the water. Some fish can use these fins to exceed speeds of 60 miles an hour, such as the swordfish. In addition, many fish also have streamlined body shapes, which allow them to smoothly move through water. Scales can be used for armor, which is a primary function, but it can also be used to streamline the fish for that extra burst of speed.

Fish are an incredibly important food source for human beings. In 2005, the world harvest for commercial fisheries in the wild was 93.3 million tons, with an additional 48.1 million tons produced in fish farms. This provides both food for human beings, but also puts money into the hands of the individuals and nations who obtain the fish. Fish are also important economically in terms of the pet trade and tourism.

One of the greatest threats to wild fish is that of overfishing. This occurs when fishing leads to the drastic reduction of the fish stocks. There are three types of overfishing recognized. The first is growth overfishing, when fish are harvested at an average size that is smaller than the size that would produce the maximum amount of fish. In other words, the fish are not fully grown yet.

The second type of overfishing is called recruit overfishing. This occurs when the adult population is depleted to the point where the adult fish are no longer able to replenish themselves through reproduction.

The final type is called ecosystem overfishing. This occurs when the ecosystem of the waters have a change in balance due to the type of fish being caught. For example, catching too many sharks will offset the balance in the ecosystem, as the fish that the sharks would normally keep in balance will explode, possibly decimating the marine environment.

Common Misconceptions/Preconceptions

- All fish have scales
- All fish have bones
- The ocean is so vast that removing fish is not a problem

Materials Meeting I

Biofacts (include shark)
Light Board with Markers
Pictures for teaching and assessment
Paper
Colored Pencils
Printouts of various waterways
Hat
Paper Scraps with various waterways.

Materials Meeting II

1 Fish Knife (teacher, for cutting fish)
1 Frozen Fish (in case we do not catch anything)
Fishing Poles
Fishing Lines
Hooks
Bobbers
Bait
Approval/Necessary Permit
Location
Pads and Pencils (for Data collection)
Rulers
Shark Gummies and Goldfish Crackers

Technical Requirements

None. We will be outside the entire day.

Teacher Preparation

1. Obtain necessary fishing permit.
2. Obtain supplies necessary.
3. Find location for fishing
4. Obtain permission (if necessary) to use location
5. Establish date and time for lesson and notify parents

Keywords: growth overfishing, recruit overfishing, ecosystem overfishing, otolith

Pre-assessment Strategy/Anticipatory Set (optional)

Begin by reviewing the terms adaptation, habitat, and niche.

At this point, I will ask my first question. I will then have my students pair off and will begin a think/pair/share exercise. Think/Pair/Share exercises are a great way for me as a teacher to grasp what my students understand and what they are having trouble grasping.

First, students think (only for a few moments) about the question at hand. After thinking, the students will get with their partner for one minute and quietly discuss their answers. At the end of the minute, each pair group will be given an opportunity to answer the question. Answers will be recorded on the light board. These first answers will give me an idea of what they know of the question.

Lesson Procedure for Meeting I:

I. What is a fish?

1. Think/Pair/Share. What makes an animal a fish?
2. Using the shark, the frozen fish, and other biofacts (parts of animals used for educational purposes), point out the defining characteristics of a fish.
3. Using pictures, point out some interesting fish that do not look like the "usual" fish. (e.g. Hagfish). On these photos, point out the distinguishing characteristics of a fish.
4. Assess understanding using a picture game. Show students 2 photos, 1 of a fish and 1 without a fish. Give each student a chance to answer a question.

II. Habitats

1. Quickly review the definition of a habitat. This is easy review for my consistent homeschoolers.
2. Think-pair-share for the question "Where are the different places I can find fish, and how are these places different?" Once again, answers will be recorded on the board.
3. Using photographs and the location, describe the different types of waterways that can be found on the planet.
4. Have each student pull a water source from the hat. Give the students 2 pieces of paper. On one, they should draw their waterway. On the second, they should write as much information as they can possible obtain about their source. Inform them that they must become experts, as they will be creating a fish to live in that environment.

III. Adaptations

1. Quickly review the definition of a habitat. This is easy review for my

consistent homeschoolers.

2. Tour of the Zoo-Look at the several fish in the zoo. Discuss what adaptations they possess and why they have those adaptations.

3. On return to the classroom, assess students understanding of fish adaptations by having them create a new fish for their environment. Their creature must have ALL of the requirements to be considered a fish, and it must be able to get the four necessary things required for life-(air, water, food, and shelter) from its environment. It must also have one new, neat adaptation that scientists are really excited about!

Lesson Procedure Meeting II:

I. Set up

1. Set up the fishing poles!
2. Let the students fish until a fish is caught OR the kids get bored.
3. Plant the poles in the ground, using a bell to indicate a fish on the line.

II. What do people use fish for?

1. Think/Pair/Share question above. This is for pre-assessment for overfishing.

III. What do you know about overfishing?

1. For this, we will use the K-W-L method. We will start by brainstorming what they know, again using the Think/Pair/Share method. Once the knowlege is pooled together, have students answer the want to know segment of the chart.

2. Teach students the three types of overfishing using goldfish crackers and fish gummies to give students a visual image for what is happening to the fish during overfishing.

IV. Catching a fish

1. The fish is used to show that overfishing is not the end of the world! We can, and are, doing something about it!

2. When a fish is caught, the students will be shown what we did with the fish on Oscar Dyson. I will show the students how we sexed the fish, measured the fish, examined stomach contents, and removed otoliths. While doing these things, I can explain how these pieces of information help us to better understand how the fish are doing in the wild, so that they can be protected from being overfished.

3. At the end of fishing, students will finish filling out the KWL chart, listing 5-10 things that they learned during the course of the trip.

Assessment and Evaluation:

For the first meeting, learning will be assessed through the fish that was "invented". Special attention will be paid to the characteristics of the fish (this tells me if the student understands the characteristics of a fish), the ability of the fish to survive in its habitat (does it have adaptations to get oxygen, food, water, and shelter? In other words, does the student understand what a habitat is and how a fish can survive in it), and the special adaptation (this tells me if the student understands what an adaptation is).

The second lesson (the fishing trip) will be evaluated on the KWL chart. I will be looking for thoughts in all three columns, focusing on the last column to see what they learned.

As this is a lesson for homeschool students at a zoo, the work will not actually be graded as course grades are not kept.

Standards

National Science Education Standard(s) Addressed:

NSES A: Science as Inquiry
Subsections 1 and 2

NSES C: Life Science
Subsections 1, 2, 3, 4, and 5

NSES E: Science and Technology
Subsection 2

NSES F: Science in Personal and Social Perspectives
Subsection 2

NSES G: History and Nature of Science
Subsection 1, 2, and 3

Ocean Literacy Principles:

Principle 1: The Earth has one big ocean with many features
Fundamental Concepts: a, g, h

Principle 4: The ocean makes earth habitable

Fundamental Concepts: b

Principle 5: The ocean supports a great diversity of life and ecosystem
Fundamental Concepts a, c, d, e, f, g, i

Principle 6: The ocean and humans are inextricably connected
Fundamental Concepts: b, c, d, e, g

Additional Resources

Video:

-Blue Planet

Webpages:

-<http://www.nmfs.noaa.gov/> -NOAA Fisheries Service Homepage

-<https://www.was.org/Main/Default.asp> -World Aquaculture Society
Homepage

- <http://www.afsc.noaa.gov/species/pollock.php> - NOAA Walleye
Pollock Research

-http://www.nmfs.noaa.gov/fishwatch/species/walleye_pollock.htm -
Another NOAA page on Pollock research

-<http://archive.greenpeace.org/comms/cbio/canod.html> -Story of the
1992 Cod collapse, mentioned above in lesson plan

-<http://www.epa.gov/wed/pages/staff/lackey/pubs/history.pdf> -History of
Fisheries

Books:

-*Teacher at Sea: Mr. Tanenbaum Explores Atlantic Fisheries on the
NOAA Ship Henry B. Bigelow*
by Diane M. Stanitski and John J. Adler.

-*Fisheries Biology, Assessment and Management*
by Michael King

-*5 Easy Pieces: The Impact of Fisheries on Marine Ecosystems (State
of the World's Oceans)*
by Daniel Pauly

Author: Jason Moeller, Knoxville Zoological Gardens

Creation Date: June 19, 2011