LESSON 6: FISHING FOR SOLUTIONS

INTRODUCTION

Fishing is an important industry, providing both food security and income for many people. At the same time, overfishing is one of the threats to our oceans if people are not careful of the impact of their actions while fishing.

LESSON SUMMARY

In this lesson, students work in small groups to learn about different fishing methods. They demonstrate these methods to the class and share the strengths and limitations of each method. Based on their understanding, they make a recommendation about the best fishing methods, then watch a video about American Samoa to learn how this community uses responsible and sustainable fishing methods to support the people who live there.

OBJECTIVES

- Students will learn about different methods of fishing and the impacts those have on the animals that live in the ocean.
- Students will explore how humans in different parts of the world make use of resources from the ocean to survive.

ESTIMATED TIME

60 minutes. If you wish to divide this lesson over multiple days, there are a few opportunities to pause the learning. Consider breaking the lesson up at any of the following points: after step 4; at steps 6–8, sharing a few fishing methods the first day and a few on the second day; or between steps 10 and 11.

STANDARDS ADDRESSED

Science (NGSS): 4-ESS3-1. Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

OCEAN LITERACY PRINCIPLES

6 The ocean and humans are inextricably interconnected.

Geography: Standard 14 How human actions modify the physical environment.

Standard 16 The changes that occur in the meaning, use, distribution, and importance of resources.

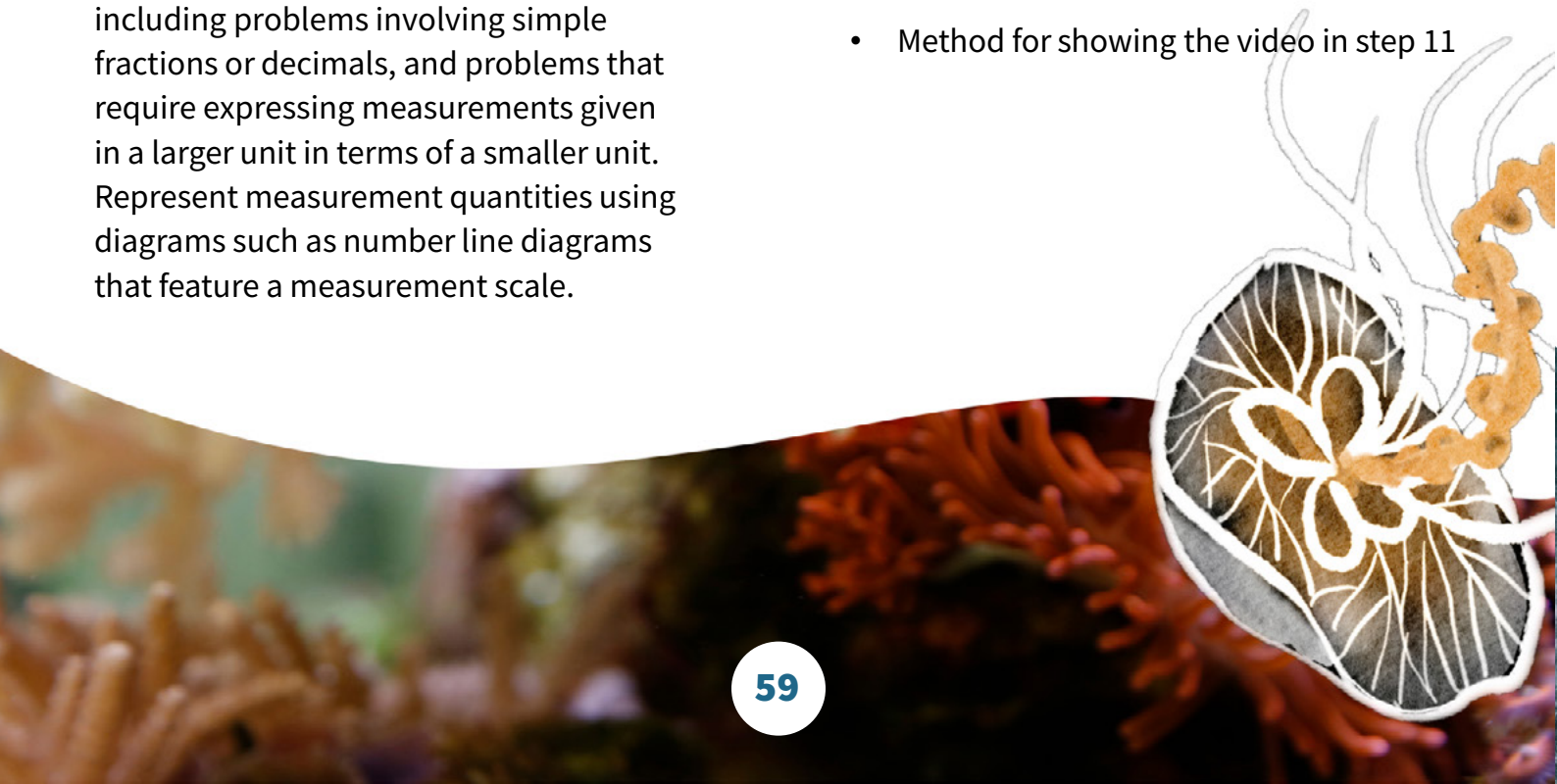
Mathematics (CCSS): 4.MD.A.2 Use the 4 operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

4.OA.C.5 Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself.

English Language Arts (CCSS): SL.4.1.D Review the key ideas expressed and explain their own ideas and understanding in light of the discussion.

MATERIALS

- Small objects for each group, such as coins, paper dots from a hole punch, paper clips, or others, approximately 50 objects per group of 3 students
- Yarn (enough to supply approximately 12" to each group of students)
- Methods of Fishing handout, enough copies for each group of 3 students to get information about one method (See Preparation section)
- Analyzing Fishing Methods handout, one per student
- Materials for either writing or drawing in step 10
- Method for showing the video in step 11



PREPARATION

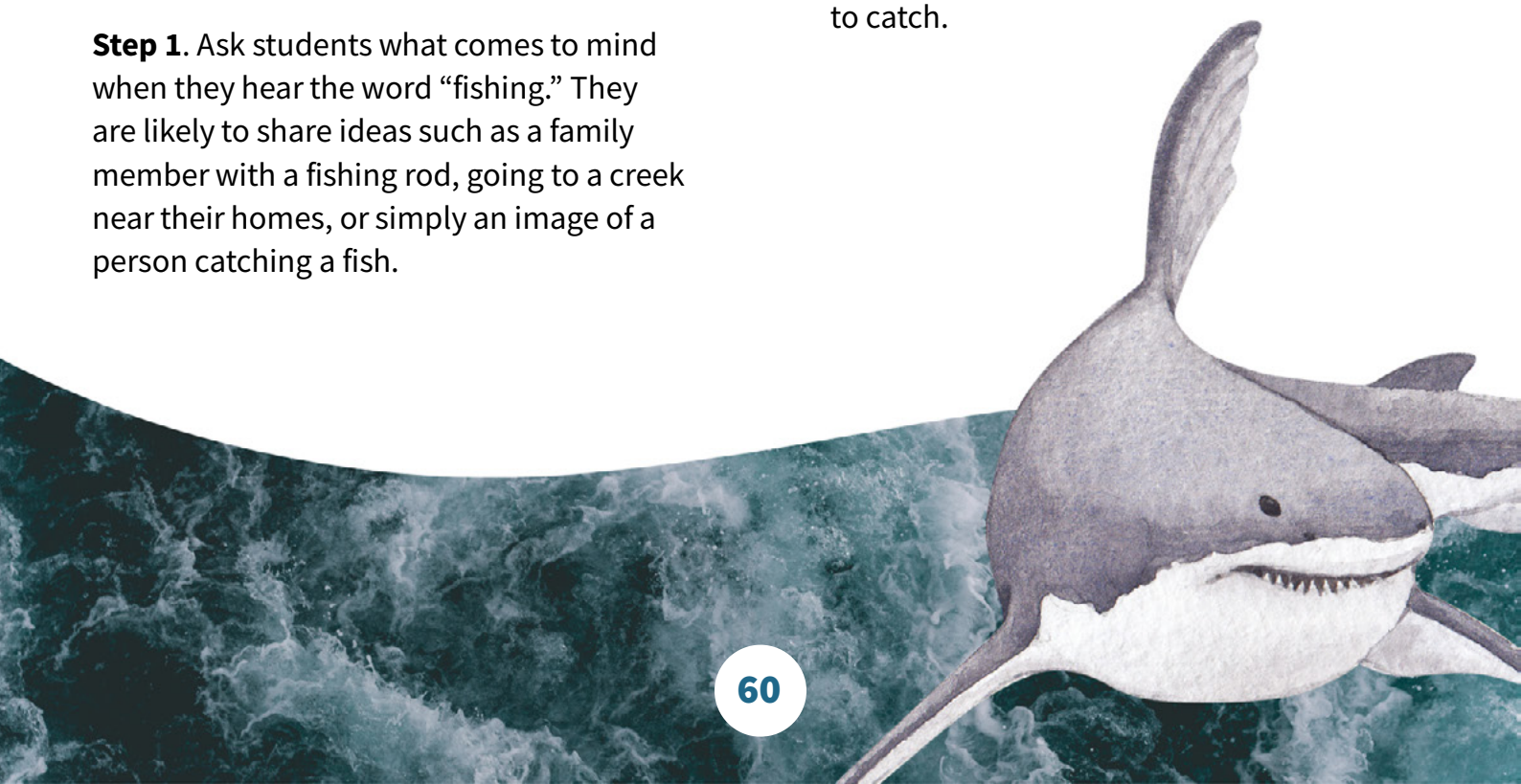
- Cut yarn into lengths approximately 12” long. Each group will need one length of yarn.
- Divide small objects into cups or small bags to make it easy to distribute them to groups. Each group needs approximately 50 objects, but this number does not need to be exact.
- Print copies of the Methods of Fishing handout and cut apart the information about the methods.
- Preview the video “Northeast Surveys: The Fisheries We Count On” (https://videos.fisheries.noaa.gov/detail/videos/sustainable-fisheries/video/6274478742001/northeast-surveys:-the-fisheries-we-count-on?autoStart=true) in the Extension to decide if you would like to use it. Plan on showing the whole video, but if time is short, consider showing from the beginning to timestamp 1:38.

FACILITATION

Step 1. Ask students what comes to mind when they hear the word “fishing.” They are likely to share ideas such as a family member with a fishing rod, going to a creek near their homes, or simply an image of a person catching a fish. Depending on their experiences, they may also have ideas about fishing boats or commercial fishing. Accept all answers at this point as this step is to get students thinking about fishing.

Step 2. Tell students that fishing is a major source of food and money for people around the world. Many of those people are involved in commercial fishing, where they are working to catch fish that will be sold in restaurants and markets. Today they are going to have a chance to learn more about different methods of commercial fishing.

Step 3. Divide the students into groups of 3. Distribute the small objects, yarn, and one Method of Fishing reading per group. Tell groups that they should start by reading about the fishing method, then use the materials to represent that method of fishing. The small objects represent fish, and the yarn might represent a net or fishing line. The students should represent the person fishing. One word that the students will need to know for the reading is “bycatch.” Write this word where students can see it and explain that it is the other fish and animals that are caught, that were not the kind of fish fishers were trying to catch.



Step 4. As students work, circulate around the room to make sure they understand the fishing method that they read about and what their materials should represent. For example, if they read about purse seine fishing, students might demonstrate that method by showing the objects in a group and wrapping the yarn around the outside of the group, then pulling it into a tighter circle. Tell students that they should be ready to share their fishing method with other groups and give them an opportunity to ask any questions before they begin their presentations.

Step 5. Distribute copies of the Analyzing Fishing Methods handout to each student.

Step 6. Ask for a volunteer group to describe the fishing method they learned about and share their representation. If you have more than one group who studied that method, ask other groups to share their representation as well and to add any additional information.

Step 7. Once all the groups have shared about one fishing method, ask students to complete the section for that method on the Analyzing Fishing Methods handout. Tell students that the questions are to help them think about the methods overall and there is not necessarily one specific answer. Give them some time to work individually, then to discuss with their groups.

Step 8. Complete steps 6 and 7 for each remaining fishing method.

Step 9. Hold a class discussion about the fishing methods. Discuss each of the following points.

- Have students talk about whether there are methods that seem like they might take all the fish from an area, which would not leave enough to have baby fish that grow up and repopulate the area.
- Ask students which methods seem to be able to collect specific kinds of fish and why that might be important. To help you with the discussion, commercial fishers generally only fish for certain fish. If they catch other types of fish, those fish are likely to be discarded, so it is better to use fishing methods that are specific.

- Discuss which methods seem to limit the number of fish that people can catch. Ask students what they think is important about this idea. To support the discussion, help students understand that commercial fishers need to make enough money to support their families and that markets and restaurants need enough fish to meet their customers' needs. If the fishers cannot catch enough fish, then they cannot meet these goals.

Step 10. Once students have discussed the different fishing methods, ask them to think about which fishing method they would recommend as one that makes sure the fish that are caught are used, that does not wipe out all the fish, and that allows people fishing to catch a reasonable number of fish. Ask students to share their ideas through either writing a paragraph, making a claim with evidence and reasoning, drawing a representation, or other appropriate means of sharing their ideas.

Step 11. Share with students that American Samoa is a U.S. territory about halfway between Hawaii and New Zealand and that fishing is a big part of life there. Show the video We Fish! American Samoa (https://videos.fisheries.noaa.gov/detail/videos/sustainable-fisheries/video/6238536283001/we-fish-american-samoa?autoStart=true) to students and ask them to write down any connections between what they have been learning and life in American Samoa.

Step 12. Hold a class discussion about the video to allow students to connect the ideas from the video to the importance of the fishing methods they learned about. Tell them that when we eat seafood that has been raised and caught responsibly—in ways that keep the ocean healthy—it is referred to as sustainable seafood. Share the FishWatch (www.fishwatch.gov) website with students and tell them that it is an excellent resource for helping to make choices about seafood. If there is time, consider having students go to the website and look up a type of fish to see the information that the website offers.

EXTENSION

Share with students that these ideas of catching fish in the ocean and making sure that fishing methods maintain fish populations fall under the guidance of "fisheries." The word fishery can refer to the area of the ocean where fish are caught or the business of catching them. To learn more about how fisheries scientists know what is happening with fish populations, have students watch the NOAA video Northeast Surveys: The Fisheries We Count On (https://videos.fisheries.noaa.gov/detail/videos/sustainable-fisheries/video/6274478742001/northeast-surveys:-the-fisheries-we-count-on?autoStart=true). Ask students what they noticed or was interesting to them in the video. Consider finding out their ideas not only about the type of information scientists collect and why it is important, but also whether this fits with students' ideas of what scientists do. This is an excellent link for showing the variety of careers that are available in STEM fields.

Lesson 6 NOAA References

- NOAA Fisheries video We Fish! American Samoa (https://videos.fisheries.noaa.gov/detail/videos/sustainable-fisheries/video/6238536283001/we-fish-american-samoa?autoStart=true)
- NOAA FishWatch website (www.fishwatch.gov)
- NOAA Fisheries video Northeast Surveys: The Fisheries We Count On (https://videos.fisheries.noaa.gov/detail/videos/sustainable-fisheries/video/6274478742001/northeast-surveys:-the-fisheries-we-count-on?autoStart=true)

Bottom Trawling

This method of fishing involves using a net that one or two boats pull along the bottom of the ocean. The bottom edge of the net has weights on it. The top edge of the net has floats attached to it. Bottom trawling catches everything in its path and there tends to be a lot of bycatch. Fisheries scientists have worked to make bottom trawling safer for turtles by making nets that allow turtles to escape. Bottom trawling can seriously damage habitats on the ocean floor.

Purse Seine

When people fish by purse seine, they start by finding a school of fish. They may watch where seabirds are gathering, search for active dolphins, or use helicopters to find the school. The seine is a large net that the boat uses to circle around the school. The fishers pull the net closed at the top to create a kind of "purse" that contains the fish. This technique can catch other animals but because it focuses on a school of fish, there are usually fewer bycatch fish.

Gillnets

Gillnets are nets that hang in the water, like a wall with holes in it. Gillnets do not need to be attached to a boat, which can make them easier to use. The mesh that makes up the net can be different sizes, depending on what fish the fishers are trying to catch. This also helps to not catch young, small fish. Fish swim into the net and get caught. Other animals can also get caught, so there is a risk of more bycatch. Often gillnets become "lost" at sea by fishers and float aimlessly through the water, killing turtles and many other marine creatures.

Longline Fishing

Longlines are very long fishing lines with baited hooks every few feet. They can be miles long. The average length in the U.S. is 28 miles. In some areas, there is not much bycatch. In other areas, not only can the hooks catch other fish, they may also catch turtles, sharks, and seabirds.

Pole and Line Fishing

Pole and line fishing is a person with a fishing pole catching individual fish. There is no bycatch because fishers can immediately throw back anything that is not what they were trying to catch. The number of fish that a fisher can catch is much lower than the number that one person could net.

Midwater Trawling

In midwater trawling, a boat pulls a net through the water without touching the bottom of the ocean. This means that the nets do not damage habitats at the seafloor. There can be bycatch because the net captures anything that is swimming in the water at the time. The size of the mesh for the net can be different, so some smaller fish may be able to escape. Trawling used to be very dangerous for sea turtles, but fishery scientists have worked to make nets that allow them to escape.

Traps and Pots

Traps and pots are generally used to catch crabs and lobsters. They are similar to small cages that are dropped to the bottom of the ocean with bait that attracts the animals. They crawl in to get the bait and cannot crawl back out. Fishers on boats come back later and pull the pots in. There is almost no bycatch because the fish may not be attracted to the bait and they cannot get into the trap easily. Sometimes the gear can get swept away by strong currents or storms, or the fishers can forget where they placed the traps and pots.

Diving

In diving, a fisher swims into the water to collect animals. This is a popular way to gather sea urchins and other bottom-dwelling seafoods. There is no bycatch because the divers can immediately see what they catch and release it if it is not the right kind of animal. Divers cannot collect as many animals as they might with a net.

Method	Does the method leave fish in an area to continue the population?	Does the method catch specific kinds of fish? Is there a lot of bycatch?	Do fishers bring in many fish at one time or just a few using this method?