



EARTHECHO Expeditions **What's the Catch?**

Go Fish **A Hands-On Lesson on Fisheries**



Presented in Partnership with Northrop Grumman Foundation

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TABLE OF CONTENTS

Introduction	1
Learning Objectives	1
Engineering Connection	2
Student Handout / Worksheets	4
Curriculum Standards	14
References	14

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What's the Catch?

Go Fish

A Hands-On Lesson on Fisheries

Introduction

This lesson aims to encourage students to start thinking about fish in the ocean and how fish stocks can change for the better or for the worse. In everyday life, students can be unaware of the impact of their food choices on the environment. Therefore, it is essential that students are educated on their food choices. Often when asked where their food comes from, most students reply with a supermarket chain name. If students cannot link their food to where it comes from, they are unlikely to make sustainable choices in the future. Students often ask what to do about climate change and often feel they cannot do anything to make a difference. Students should be aware that sometimes change needs to be demonstrated by the consumer before companies will take notice – the power of the purse. In this game, cards will be selected by chance, so some students 'oceans' may be more successful than others. Students will complete a fishing log to monitor events of the game and reflect on the events that cause change. By playing this game, students become aware of the negative and positive actions that can take place to enhance or decrease fish stocks. Hopefully, this will encourage students to question where their seafood comes from and what they can do to make a positive difference in fisheries management with the power of their own purchases.

Learning Objectives

Students will:

- Recall types of fish and methods of fishing.
- Examine events that positively or negatively affect fish stocks.
- Design ideas to encourage the public to make sustainable choices.



There are many types of fishing methods present in the world of commercial fishing today. Examples include trawl nets, purse seine nets, and longlines. Data collection on these different fishing methods is critical in allowing engineers, marine biologists, policymakers, and others to work together to create ways to allow fisheries to be sustainable.

LESSON

Materials:

- Fish Match Up cards
- Go Fish Cards (The card worksheet is mixed ability. Please remove the more difficult cards depending on the ability of your students.)
- Smarties / M&Ms / squares of colored card (teacher preference)
- Large Bowls (your "ocean")
- Medium Bowls (your community "pool")
- Small Bowls (your trash "bins")
- Paper towels

LESSON ONE

Starter:

Display images to the class including types of fish and ways of catching them. Talk through the 5 Ws. What? When? Where? Who? Why? Encourage students to describe what they can see.

Question examples: Where do you get your fish from? Where does this fish come from? Have you eaten this fish?

Would you eat this fish? How are fish caught? What is sustainability? Is sustainability important? Should people care where their fish come from?

Give students starter cards and have them match up images to statements.

Main activity:

'Go Fish'. Put students into groups of 4-6. Each student is a fisherman/woman. Each student is given a selection of M&Ms/colored cards/ smarties depending on your choice of materials. Students need 6 colors (Colors can be adapted but for the purposes of this activity we assume M&M colors). All colors are placed in a bowl in the center of the table. This is their ocean. Select from: North Atlantic, etc. Each student will have their own amount of fish to begin. Each group should also have a medium pool, which is their community pool of organisms. These represent the local ecosystems that the fisherpeople take from. They should also have a smaller bowl that is their trash bin, this is where organisms that are lost to things like bycatch may end up. The medium and small bowls should have a small handful of M&M's (between 10-15). Students will each have their own 'fishing log' to complete (in student handouts).



Key:

Red: Cod

Orange: Tuna

Yellow: Mackerel

Green: Megrim

Blue: Cuttlefish

Brown: Turtle

Students then need to 'go fish'. Next to the 'ocean' are the piles of cards. Ask the students to sit around the table from youngest to oldest. The youngest is the first to select a card. This card will affect the fish stocks in the ocean and the fish stocks of the fisherman. Once they have completed the action on this card, they then keep the card next to their fish stocks.

Students play this game for approximately 20 minutes. The teacher circulates the room checking for understanding and any misconceptions.

The teacher then gives the students 5-10 minutes to reflect on the game and complete their fishing logs.

Questioning:

Reflect on the questions asked prior to the game. Have any answers changed? Particularly- should we care where our fish come from? What could we do differently to help fish stocks?

Complete the rubric to allow students to calculate their points and reflect on understanding and classroom effort. What went well? Even better if? If there were to play this game again what would they do differently?

Plenary:

Teacher should lead a class discussion with the following guiding question: What was the main issue that negatively/positively affected fish stocks in the ocean? Who is in control of that/those issues?

Extension and challenge:

What could you do to make people more aware of their choices with seafood and the ocean? Students could research local sustainable seafood recommendations. Or write interviews for local fisherman. What questions would they ask?



GO FISH STUDENT WORKSHEET:

Starter Match Up Keywords and fish cards:

Sustainability

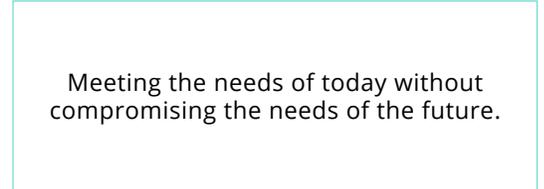
Bycatch



Meeting the needs of today without compromising the needs of the future.

Purse Seine

Longline



Trawl Net

A large boat that uses a wide net to encircle schooling fish like mackerel. The net is then closed or pursed at the bottom, trapping the fish as the net is brought aboard the boat.



Mackerel

Fish or other sea creatures that are caught unintentionally by people who are trying to catch other types of fish.

Tuna



Megrim



Cuttlefish

A large wide-mouthed fishing net dragged by a vessel along the bottom or in the midwater of the sea, used to catch things like cuttlefish or megrim.

Cod

A type of deep-sea fishing gear consisting of a long main line anchored to the bottom to which shorter lines with baited hooks are fastened at intervals. Used for catching fish in deep waters, like tuna.

Turtle

Fishing Log Worksheet:

	#
Red: Cod	
Orange: Tuna	
Yellow: Mackerel	
Green: Megrin	
Blue: Cuttlefish	
Brown: Turtle	

Key notes from the game:

Your sea structure at the end of the game:

	#
Red: Cod	
Orange: Tuna	
Yellow: Mackerel	
Green: Megrin	
Blue: Cuttlefish	
Brown: Turtle	



Which events led to more fish in your ocean? Your community?

Did some fish types experience more negative impacts than others?

What were the positive and sustainable impacts in your ocean? Your community?

What were the negative and unsustainable impacts in your ocean? Your community?

In your opinion, what was the most important event in your ocean? Your community?



Student Rubric

				Points
Lesson Objectives:	Emerging: 5	Developing: 10	Secure: 15	
Teamwork	I was able to read out my event cards to the group.	I was able to read out my event cards and chat with my group about why it was good/bad for the ocean.	My whole group worked together to understand each event card and talk about if it was sustainable for the ocean or not.	
Recall types of fish and methods of fishing.	I was able to describe the fish on the board. What they looked like and if I had eaten them.	I was able to match up the picture of the fish with the definition.	I was able to explain the different ways that fish are caught.	
Examine events that positively or negatively affect fish stocks.	I knew if the event card was good or bad, because I gained or lost fish in my ocean.	I was able to describe what happened to each type of fish.	I was able to link events in my ocean and the types of fish it impacted.	
Engineer ideas to encourage the public to make sustainable choices.	I created ideas on what we could do in the future to make people aware of fish stocks.	I designed a poster and put it around school to raise awareness of food choices.	I wrote to local fisherman asking them how they fish and if they would consider more sustainable methods.	
Discussion and reflection	My team managed to fill in the fishing log but did not get any further. Must try harder next lesson. What went well: Even better if:	My team worked okay together but we could have produced more work.	I worked well with the team and tried my best in this lesson.	
Total				



Go Fish Student Cards

You are a fisherman who gets sick and cannot go to work.

You lose 3 cod (or as many as you have if less than 3) to the ocean.

A huge commercial beam trawler has been seen in the area. You cannot catch any fish today.

The pool loses 1 of each species of fish to the bin.

You try to sell your cuttlefish in the UK. No one wants to eat it.

The pool loses 1 cuttlefish to the bin.

The government changes the law on bycatch. You have too much bycatch and are fined.

Lose 3 megrim to the bin.

Using your new purse seine you accidentally catch 2 sea turtles. They are alive. You throw them back into the ocean.

Gain 2 turtles.

You bought a new otter trawler. You can catch 3 times the amount of fish.

Take 1 cuttlefish, 1 megrim and 1 cod from the ocean.

You decide to catch your cuttlefish in pots instead of trawling. This does not damage the seabed.

Take 4 cuttlefish.

There is a torrential storm. You cannot go out on your boat and fish today.

You lose 2 cod to the ocean and 1 to the bin.

There is a huge storm. You go out on your boat anyway and your purse seine is damaged.

You lose 4 tuna to the ocean.

A scientist shows you new technology for potting for cuttlefish. You can remove the areas that the cuttlefish have laid eggs and put them back in the ocean. This means more cuttlefish in the future.

Take 3 cuttlefish.

Using pots to catch cuttlefish means that some young and undersized cuttlefish can escape so they will breed when they are older. That's more fish for you in the future.

Gain 2 cuttlefish.

Catching cuttlefish in pots means that you do not have any bycatch.

Gain 3 cuttlefish.



Cuttlefish are extremely popular in Italy, with the ink being used in pasta. You find a new market to sell your cuttlefish.

Gain 4 cuttlefish.

Schools decide to educate students about eating local fish.

This means less food miles.

Gain 4 megrim.

Cuttlefish pots result in low environmental impact.

Gain 1 cuttlefish.

Your friend in Scotland starts to fish megrim. It's an ugly fish, people don't really want to eat it in the UK, but it is sustainable.

If he sells to UK: lose 2 megrim.

Sell to Spain: gain 2 megrim.

People in Cornwall want to eat locally caught fish that is inexpensive because there are lots of them.

Gain 3 megrim.

Jamie Oliver features megrim in his restaurant as a sustainable fish. It is also delicious. Megrim rises in popularity.

Gain 2 megrim.

There is a super trawler in your ocean. They have a high amount of bycatch.

Lose 1 megrim and 1 turtle to the bin.

Ghost fishing is when remains of fishing gear is lost at sea. It ends up catching turtles.

Lose 2 turtles to the bin.

People have been collecting and eating turtle eggs.

Lose 3 turtles to the pool.

Turtles mistake plastic bags for jellyfish they eat.

Lose 1 turtle to the bin.

Your country bans plastic bags and people start using reusable bags. There are fewer plastic bags in the ocean for turtles to mistake for jellyfish.

Gain 2 turtles from the pool.

Your area organizes a beach clean. You collect old fishing materials, plastic waste, and rubbish.

Gain 1 turtle from the ocean.



Your area introduces a 'closed season' when turtles nest and lay their eggs. People are not allowed to collect the eggs.

Gain 3 turtles from the pool.

Your country bans tourists from entering the beach when turtles lay their eggs in the sand.

Gain 1 turtle from the ocean.

You teach local fishermen to only collect turtles once they reach a certain weight to allow them to breed.

Gain 2 turtles from the pool.

You arrange guided turtle walks to educate local people in protecting the turtles. They want to help.

Gain 1 turtle from the pool.

You install turtle friendly lighting near beaches so they do not get confused by the lights.

Gain 2 turtles from the pool.

Beaches become more popular because of tourism. Hotels install lights that confuse the turtles.

Lose 2 turtles to the bin.

The beaches become more developed. Tourists spend more time there and roads are built. This impacts the turtle beach habitat.

Lose 1 turtle to the bin.

Seagrass beds are destroyed by trawling.

These are turtle feeding grounds.

Lose 1 turtle to the ocean.

Sea temperatures are rising and coral is dying. Turtles cannot feed in the coral.

Lose 1 turtle to the ocean.

Turtle soup is very popular in China. Fishermen have been catching turtles and selling them to China.

Lose 2 turtles to the bin.

Turtles are caught for their shells to be turned into medicine.

There is no scientific evidence that the shell has healing qualities.

Lose 1 turtle to the bin.

The police work hard to catch turtle poachers. They found 550 marine turtles. 378 were dead. The turtle poachers go to prison.

Gain 1 turtle from the ocean.



In many Asian countries
turtle shell is used to make
decorative items.

Lose 1 turtle to the bin.

Fishermen start using
advanced technology that
draw tuna into bunches to
make them easier to catch.

Lose 3 tuna to the pool.

Adult tuna are caught faster
than they can breed.

Lose 2 tuna to the bin.

There is high demand for
tuna as sushi becomes more
popular.

Illegal tuna fishing takes
place.

Lose 1 tuna to the bin.

There are no ocean police to
stop illegal fishing.

Lose 1 tuna to the bin.

The Fishery Improvement
Project (FIP) talks with all
stakeholders to help improve
fishing practices.

Gain 1 tuna from the pool.

People start to care about
where their cod comes from.
They begin to look for the
logo of sustainability in the
supermarkets.

Gain 1 cod from the pool.

A nonprofit organization
provides financial support
to fishermen wanting to use
sustainable fishing practices.
You want to be able to fish in
the future.

Gain 2 tuna from the ocean.

The International Seafood
Sustainability Foundation
encourages long-term
conservation and sustainable
use of tuna stocks. This idea
is becoming more popular as
people begin to care about
the environment.

Gain 1 tuna from the pool.



British mackerel has lost its sustainability status.

Lose 1 mackerel to the bin.

Seas are getting warmer so mackerel are moving northward to Iceland.

Lose 2 mackerel to the ocean.

Conflict over mackerel allocation leads to overfishing in Icelandic waters.

Lose 2 mackerel to the bin.

New technology adds lights to fishing nets. This reduces the amount of accidental bycatch.

Gain 2 turtles from the ocean.

BBC releases a news article about the dangers of bottom trawling. People begin to avoid buying cod caught by bottom trawling.

Gain 2 cod from the pool.

Fisherman start using cod pots to catch cod. This is much less damaging to the environment.

Gain 1 cod from the ocean.

You speak to the local fish and chip shop about trying to sell locally caught fish. They agree.

Gain 1 megrim from the pool.

You speak to the local fish and chip shop about trying to sell locally caught fish.

They disagree.

Lose 1 cod to the pool.

You try to convince a local restaurant to add cuttlefish to their menu as a sustainable, locally caught option. They think it tastes too rubbery.

Lose 1 cuttlefish to the bin.



Teacher Rubric

				Points
	5	10	15	
Teamwork	Students are able to collect event cards and read out what happens.	Students are able to briefly discuss cards and share some ideas.	Students are able to listen and work collaboratively to understand the impact of events that take place in each student's ocean.	
Recall types of fish and methods of fishing.	Students can describe the fish on the board. What do they look like? Shape? Color?	Students match up the picture of the fish with the definition.	Students can explain the 5Ws and start to link to how the fish are caught.	
Examine events that positively or negatively affect fish stocks.	Students can connect the event cards to negative or positive effects on the fish stocks in the ocean.	Students can describe the positive and negative events for each fish in their fishing log.	Students can link the cause and effect of the event to specific fish types in the ocean.	
Design ideas to encourage the public to make sustainable choices.	Students are able to create ideas on what to do in the future to make people aware of fish stocks.	Students design posters and place them around the school to raise awareness of food choices and to look for the sustainability logo.	Students design questions for local fishermen to ask them about how sustainable their fishing practises are and what they would like to see in the future. Would they consider more sustainable methods? What are the barriers to managing fish stocks?	
Discussion and reflection	Students reflect on their work ethic. What went well: ven better if:			
			Total	



UK Science Standards:

Geography: To understand how human and physical processes interact to influence and change landscapes, environments and the climate; and how human activity relies on effective functioning of natural systems and the use of natural resources.

Science: To ask questions and develop a line of inquiry based on observations of the real world, alongside prior knowledge and experience.

Biology: To examine changes in the environment which may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction.

Next Generation Science Standards:

5-ESS3-1:

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

ESS3.C: Human Impacts on Earth Systems

- Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments.

3-5: Use evidence to construct or support an explanation or design a solution to a problem.

Australian Standards:

Technologies and Society – Investigate how people in design and technologies occupations address competing considerations, including sustainability, in the design of solutions for current and future use. (VCDSTS033)

- **Materials and Technologies Specializations** – Investigate characteristics and properties of a range of materials, systems, components, tools, and equipment and evaluate the impact of their use. (VCDSTC037)
- **Examine and prioritize competing factors** including social, ethical, economic, and sustainability considerations in the development of technologies and designed solutions to meet community needs for preferred futures. (VCDSTS043)
- **Investigate the ways in which designed solutions evolve** locally, nationally, regionally, and globally through the creativity, innovation, and enterprise of individuals and groups. (VCDSTS044)

Technologies Contexts: materials and technologies specializations – Analyze ways to create designed solutions through selecting and combining characteristics and properties of materials, systems, components, tools, and equipment. (VCDSTC048)

- **Creating Designed Solutions: Investigating** – Critique needs or opportunities for designing and investigate, analyze, and select from a range of materials, components, tools, equipment, and processes to develop design ideas. (VCDSCD049)
- **Generating:** Generate, develop, and test design ideas, plans, and processes using appropriate technical terms and technologies including graphical representation techniques. (VCDSCD050)
- **Producing:** Effectively and safely use a broad range of materials, components, tools, equipment, and techniques to produce designed solutions. (VCDSCD051)

Planning and Managing: Use project management processes to coordinate the production of designed solutions. (VCDSCD053)

References

"MSC: Marine Stewardship Council." *Sustainable Fishing*, <https://www.msc.org/home>.

