GO FISH!

Games and activities for classrooms

GO FISH!

The balance between fishing and reproduction of fish is a sustainable fishing level.

Can learners work in groups to play and experiment to find the maximum sustainable yield of a fish population?

This game aims to help learners understand how human and physical processes interact to influence, and change the marine environment; and how human activity relies on effective functioning of natural systems.

Learning objectives

- Learners work together in groups to play a game to build their understanding of maximum sustainable yield
- Learners experiment to find a balance between fishing and reproduction of fish
- Learners take notes and make calculations to understand the processes that inform sustainable fishing

You will need

If needed, **Go Fish! Game Rules** and trial rounds sheet for each group (page 2)

Go Fish! Scenarios sheet printed and cut up, or on screen (page 3)

Go Fish! Calculations sheet printed for each group (page 4)

Go Fish! Fish sheet printed per group
Scissors for each group (page 5)

Go Fish! Information sheet printed for each learner / group or displayed on screen (page 6)

Preparation

To play the game, split learners into groups of 4-6 around a table, which represents a fishery. Each group needs:

- A **fish**, to represent the fish population.
- A **shark**, to represent predators who eat that fish.
- Up to 4 **fishers**, who want to make as much money as they can from fishing.

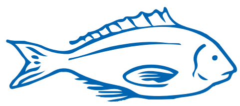
The group cut up their sheets of fish and read their sheets.

GO FISH! GAME RULES

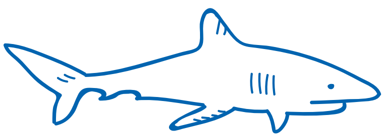
The balance between fishing and the reproduction of fish is a sustainable fishing level. Can you work together to find the maximum sustainable yield of a fish population?

The game is played in a series of rounds. Some of the rounds continue as long as possible, others play out specific scenarios to test different environmental conditions or changes in fishing practices.

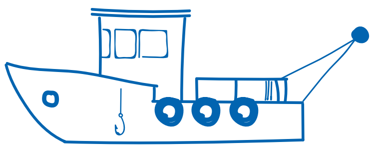
Play in a group around a table, representing the fishery. Each player takes on a role:



- A fish, to represent the fish population or fish biomass.



- A shark, to represent predators who eat that fish.



- Up to four fishers, who want to make as much money as they can from fishing.

The fish holds the fish cards and deals out the correct number at the beginning of each round. As the game goes on, the fish adds more fish cards to the fishery, for each round, according to the number specified at the beginning of the round (rounded up if necessary). The fish represents the **fishing biomass**.

The fishers have to agree to each take the same number of fish out of the fishery in each round, once they know the scenario.

Together, the fishers represent the **fishing pressure**.

The shark always gets one fish each round, to represent how predators affect the fishing biomass. The shark takes their fish after the fishers take theirs, if there is one left.

During each round, record the decisions taken and changes in fishing biomass on the **Go Fish! Calculations** sheet (page 4).

Trial rounds

First, play a trial couple of rounds. The fish starts by putting 16 fish cards into the fishery. The fishers agree between them how many fish to take, and remove that number, handing them back to the fish. Don't forget the shark needs to eat too!

The fish then adds more, by counting the number of fish left in the fishery, and adding 50% to it, rounding up if necessary. *For instance, if the fishery had 16 fish to start with, 3 fishers each took 2 fish each and the shark took one, there would be 9 left, and the Fish would add 50% more – which is 5 more fish (rounded up). The resultant fish biomass would be 14.*

Record the decisions taken and changes in fish numbers on the **Go Fish! Calculations** sheet (page 4).

A new round starts when the fishers and shark then take some fish – again the fishers need to agree how much to take (if anything) and the shark will have one.

What happens to the fishery population?

GO FISH! SCENARIOS

Sustainable livelihoods?

Start with 16 fish that replenish at 50% at the end of each round. Imagine that the price of fish has gone down, and so the fishers are feeling the pressure to earn as much money as they can from their businesses. What happens to the fish biomass?

Fishing quotas

Start with 16 fish that replenish at 50% at the end of each round. Imagine that the fishers have decided that they should only catch one fish per round - this is called a quota. What happens to the fish biomass?

Hurricane alert

Imagine that another environmental pressure, for instance, a hurricane has affected the fish habitat and the population has gone down. To represent this, start with 12 fish that replace 25% at the end of each round. What happens to the fish biomass?

Warming oceans

Climate change is warming the oceans. Imagine that this has caused the fish to migrate away from the fishery. Start with 8 fish and then play as normal. What happens to the fish biomass?

Coral bleaching

Climate change is causing oceans to heat up, causing coral bleaching and even death. This reduces fish food supply and removes fish habitats. Imagine a coral bleaching episode has affected the fishery. Start with 16 fish and replace 25% at the end of each round. What happens to the fish biomass?

Maximum Sustainable Yield Challenge

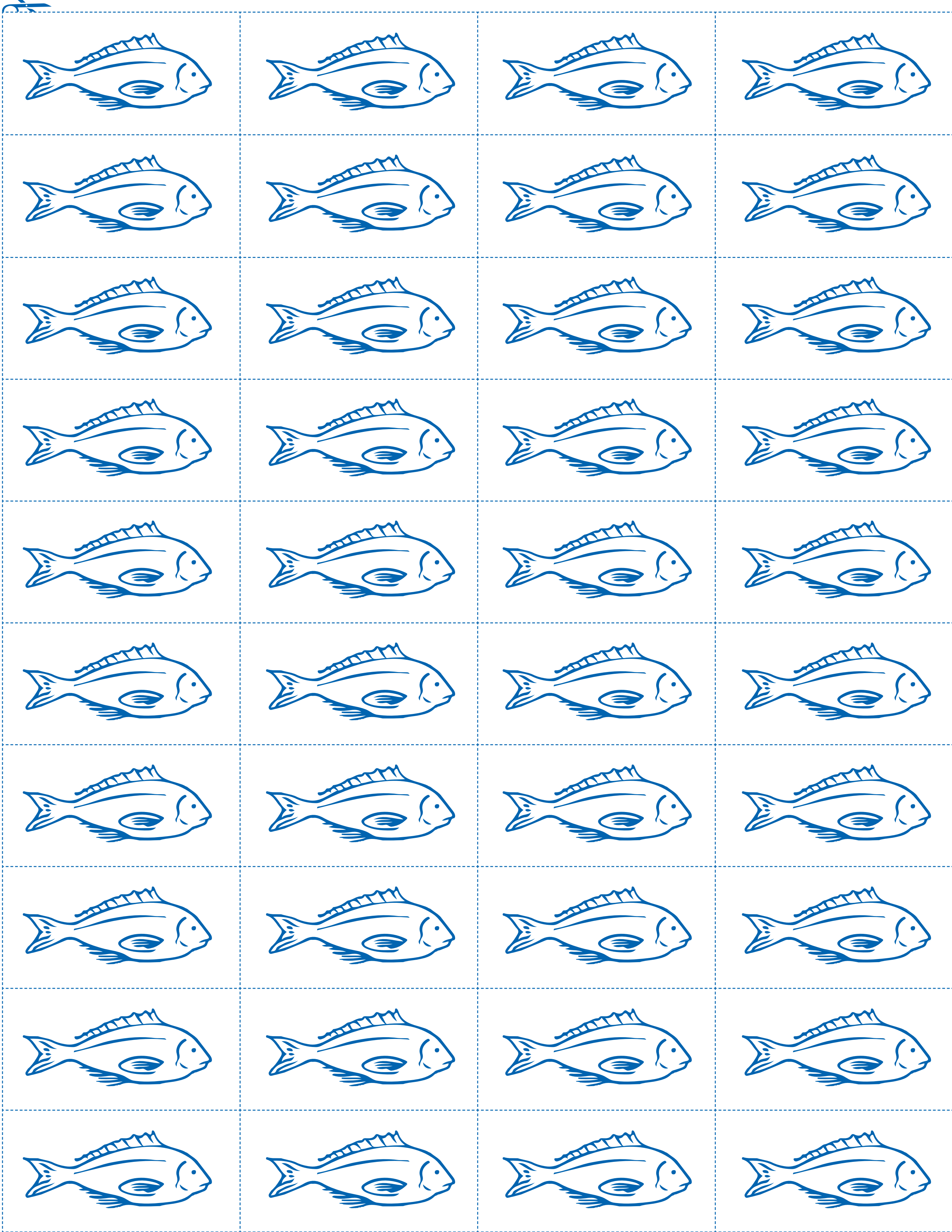
Try to work out a fishing pressure that allows the fishers to fish indefinitely, without taking out so many fish that they can't be replaced to similar levels. Start with 16 fish and play as normal. You are allowed to

- Change the amount taken by the fishers each round
- Take no fish for some rounds
- Take out a different number of fish for each boat during each round

GO FISH! CALCULATIONS

Round name/ number	Fish biomass (x)	Fishing pressure (y)	Fish remaining (z) z=(x-y)-1	Reproduction replacement rate (r)	Resulting fish biomass (b) b=z+r
e.g	16	6	9	50%	14

GO FISH! FISH



GO FISH! INFORMATION

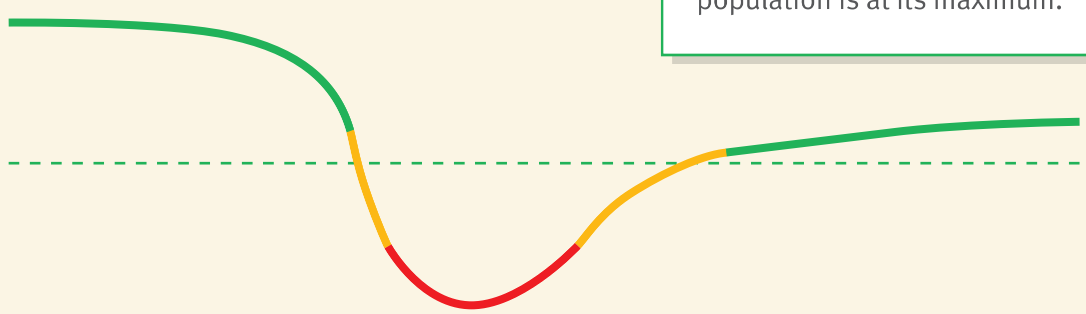
Sustainable fishing means fishing in a responsible way, making sure fish populations do not drop below levels where they cannot reproduce and grow faster than they are caught.

Firstly, fishers need to know as much as they can about the fish and shellfish they catch, and the ecosystem they live in. Fisheries work with scientists to understand how the fish and shellfish population grows and shrinks over time. This is controlled by births, migrations in and out of the fishery, and deaths.

This information can show them how much fish they can catch without overfishing. This scientific calculation is called the ***maximum sustainable yield****.*

When a new fishery is first harvested, the number of fish will go down to start with, as a result of fishing.

There is a point where a roughly constant fishing level can be maintained indefinitely without causing decline in the population, and where the productivity of the fish population is at its maximum.



If a fishery is overfished, it becomes unsustainable. This means the fish population is too small to reproduce and replace the fish being harvested. There is a risk that this will affect other sea creatures in the food web too.