

# SCIENTISTS & MSY (3.2)

## OVERVIEW

Sustainable fishing sounds easy! But working out whether fish are being fished sustainably is tricky. Scientists collect data and use mathematical formulas such as the 'Maximum Sustainable Yield' to help them work out what level of fishing can occur without causing a decline in fish stocks.

The activities provided explore how a fish stock grows and shrinks over time, and include a game and vocabulary cards to help understand the concept of Maximum Sustainable Yield.

For more knowledge and related activities see slide set [Scientists and the Maximum Sustainable Yield](#).

## FOCUS QUESTIONS

- *What is 'maximum sustainable yield'?*
- *What is the role of science in ensuring fisheries are sustainably fished?*
- *What new words and concepts have we learnt?*

## LEARNING OBJECTIVES

- Understand the concept of Maximum Sustainable Yield (MSY)
- Investigate the role of science in ensuring fisheries are sustainably fished
- Use scientific and fishery related vocabulary

## LOCATION

Indoors

## DURATION

50 mins +

## LEVEL

Level 3 - 5+

## CURRICULUM

Science, Social Science, Geography, Mathematics, Pūtaiao, Tikanga-ā-iwi

**Key competencies:** Thinking; Managing Self; Relating to others

## NEXT STEPS

This topic

- Assessing fish stocks in Aotearoa (3.3)
- When fish stocks decline (3.4)
- Reviewing key concepts (3.5)

Other topics:

- Well managed fisheries (5.1)
- Environmental impacts of fishing (4.2)

Prior learning:

- Overfishing (1.2)
- Sustainable fishing (1.4)



## MATERIALS

- Slide set **Scientists & MSY**
- This **Teacher Outline**
- Copies of Go Fish! Vocab cards (page 6)
- Access to Quizlet
- **Go Fish! Game** materials (see **Go Fish! Game**)
- Copies of one or more scientific papers

## PROCEDURE


1. DISCUSS how fish stocks grow and shrink over time (slide 19). CREATE a diagram (using the pieces provided on slide 20) showing how fish populations change in number (abundance) over time (slides 19, 20, 21) (Answers on slide 21)
2. DISCUSS the maximum sustainable yield diagram (slide 22)
3. TEST knowledge of key words using the Go Fish Vocab Cards (slide 23) (page 6)

### **EITHER (EASIER)**

- In groups, have learners match cards (Set #1) (pages 6) with correct definitions or use the Quizlet set already created ([Marine Stewardship Council NZ: Go Fish](#)). Add some fun and set a timer or create a competition to see how can complete them first and with no errors!
- Discuss new ideas and words. What did we learn? What more do we want to learn? Where might we find this information?

### **OR (HARDER)**

- Use the cards provided (Set #2) (page 10) and have learners (in pairs or groups) research meanings for one of the terms and create cards either on paper or on [Quizlet](#). Add some fun and set a timer or create a competition to see how can complete them first and with no errors!
  - Share answers as a class. Correct definitions as needed. Discuss new ideas. What did we learn? What more do we want to learn? Where might we find this information?
4. PLAY the Go Fish game (slide 23) (See **Go Fish! Game**)
  5. BRAINSTORM what unknown factors can affect the ongoing sustainability of a fishing catch? (slides 23, 24) (Answers on slide 24)
  6. CATEGORISE factors and deepen the inquiry using the (Teacher notes slide 24)

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7. INVESTIGATE the idea of biomass and fishing effort in sustainable yield calculations (EXPERTS ONLY) (slides 25, 26, 27)
  8. DISCUSS the idea that size of fish does matter when catching fish sustainably (slide 28)
  9. BRAINSTORM a list of research topics that fisheries scientists might look at (slide 29)
  10. FIND or STUDY a scientific paper about fish or fisheries and study it. What is it about? What is the meaning of words like methodology, findings, results, discussion, conclusions etc. Discuss the role of fisheries scientists and scientific protocols for research and presenting research (slide 29) (see Teacher notes for answers and additional ideas)
  11. REFLECT and DISCUSS – If we can calculate the MSY for a fishery – will this ensure the sustainable fishing and a healthy fishery for that stock of fish?
  12. LIST new words learnt and write a meaning for each new word
  13. REVIEW: Use the following inquiry to reflect on what we have learnt? What more would we like to learn. Where might we find this information?
    - a. What are some of the different viewpoints on fisheries management and fisheries science?
    - b. How does fishery science impact you and your whānau?
    - c. How do we know if the scientists are getting it right?
    - d. Who has ultimate responsibility for deciding what data scientists collect and how fisheries are actually managed?
    - e. What might the job of a fisheries scientist in Aotearoa New Zealand actually look like?
    - f. Why do we even need fisheries scientists and science to help manage fisheries?

## KEY WORDS

Fish stock

Migration

Mortality

Maximum Sustainable Yield

Abundance

Sustainability

Biomass

Fishing pressure



## CURRICULUM LINKS

### Nature of Science (Level 3-5)

- Investigating in science
- Communicating in science
- Participating and contributing

### Living World (Level 3-5)

- Ecology

### Science (Level 6+)

- Participating and Contributing
- Ecology

### Social Science (Level 3-5)

- Understand how people make decisions about access to and use of resources (Level 3)
- Understand how formal and informal groups make decisions that impact on communities (Level 4)
- Understand how people's management of resources impacts on environmental and social sustainability (Level 5)

### Geography (Level 6, 7, 8)


- Geographic research
- Contemporary New Zealand geographic issue
- Geographic topic at a global scale
- Application of geographic concepts

### Maths (Level 3-5)

- Statistics

### Tikanga-ā-iwi (Level 3-5)

- *Kotahi tonu te matua o te tangata Māori, ko Ranginui e tū nei, ko Papa-tū-ā-nuku e takoto nei.* Place and Environment
- *E tama, e hine, tangata i ākona ki te whare, tū ana ki te marae, tau ana.* The Changing World

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- *E kore e ngaoko te rākau ki te tīkina i te pūtake whakangaoko ai engari, me tiki ki te matamata.* The Economic World

#### Pūtaiao

- Uses of Science: Learn about the people and the work they do to produce science knowledge (Level 4+)
- Philosophy and history of science: Develop understanding of the processes by which science and society affect each other and co-evolve (Level 4+)
- The Natural World: The Biological Environment: Investigate the effect of human actions, and natural processes, on an Aotearoa ecosystem (Level 6+)

#### Hauora

- Relationships to earth and sky (natural environments) (Level 4+)



## GO FISH VOCAB CARDS [VERSION #1: EASIER]

### Fish Biomass

The total amount of fish in a fishery at any given time (usually measured by weight)

### Maximum Sustainable Yield

The largest **yield** (or catch) that can be taken from a species' stock and sustained over time



## Fishing Quotas

The limit or amount of fish that can be caught by a commercial fishery

## Habitat

The home of an animal or plant



## Coral bleaching episode

A period of time when bleaching has occurred [Colourful algae are expelled out of corals and corals turn white]. Bleaching is not a healthy sign for corals

## Predator

An animal that naturally hunts and kills another animal





Fishing Pressure or  
Fishing Effort

Total amount of  
fishing

Fish Population  
[or Fish Stock]

The group of fish from  
which catches are taken in  
a fishery. A group of fish  
that is more or less  
isolated from other stocks



## GO FISH VOCAB CARDS [VERSION #2: HARDER]

Fish Biomass

Maximum Sustainable  
Yield



## Fishing Quotas

## Habitat



Coral bleaching  
episode

Predator



Fishing Pressure or  
Fishing Effort

Fish Population  
[or Fish Stock]