MARINE FOOD WEBS AND OVERFISHING

Teacher Resources - Lesson Plan

Image credit: Sebastan Pena Lambarri

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Australian Curriculum Objectives

Years 7 & 8 (Stage 4) - Science

- AC9S7U01
  Investigate the role of classification in ordering and organising the diversity of life on Earth and use and develop classification tools including dichotomous keys
- AC9S7U02
  Use models, including food webs, to represent matter and energy flow in ecosystems and predict the impact of changing abiotic and biotic factors on populations
- AC9S7H01 / AC9S8H01
  Explain how new evidence or different perspectives can lead to changes in scientific knowledge

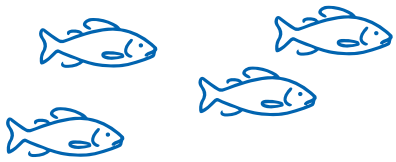
Extension Activities

- AC9S7H03 / AC9S8H03
  Examine how proposed scientific responses to contemporary issues may impact on society and explore ethical, environmental, social and economic considerations

In this lesson for learners aged 12+ students understand how food webs work in the marine environment. Students then explore the consequences that overfishing can have on all ocean life, and how sustainable fishing works to protect the entire marine ecosystem.

Key terms

- Marine Food web
- Species
- Ecosystem
- Producer
- Consumer
- Predator
- Prey
- Overfishing
- Trophic



You will need

- Access to the video David Attenborough sharing his favourite ocean memory.
- Printed or projected copies of the Ocean Connection cards (pages 5 and 6)
- Access to the video Born Free, Caught Wild
- A ball of string
- Access to the Marine Food Webs Kahoot quiz
- (Optional) Printed copies of the species cards from the String Game (page 8)

Key questions

- What are our favourite ocean memories?
- What does a marine food web look like?
- What does 'overfishing' mean?
- What is the relationship between fishing and the marine ecosystem?
- How can scientific knowledge be used to prevent overfishing and protect marine species?
- What can we all do to prevent overfishing and protect our oceans?

Class Activities

- Learners describe their favourite ocean memories and seafood meals
- Learners play a game to understand how marine food webs work
- Learners watch a video about overfishing and discuss
- Leaners watch a video of how science is used in a sustainable prawn fishery in Northern Australia
- Learners discuss how scientific knowledge can be used to prevent overfishing

LESSON PLAN: OCEAN SUSTAINABILITY

Starter (5-10 mins)

Begin by showing students this short video of David Attenborough sharing his favourite ocean memory, (1:47) then ask students to share some of their own ocean memories. It could be a beach day, snorkelling, boating or eating fish and chips on the beach... Encourage students to share what types of fish or other marine creatures they have seen in real life.

Next ask students,

- *What are some of their favourite seafood dishes to eat?*
- *Do they know what other animals might also eat that seafood species (eg. salmon, tuna, prawns)?*

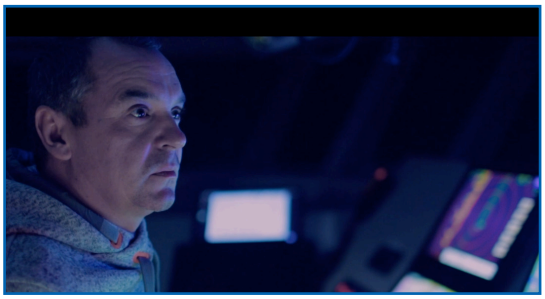
Use the cards on pages 5 and 6 to inspire some ideas.

Main activity (30-40 mins)

Introduce students to the focus of this lesson; Marine Food Webs and Overfishing.

Start by asking students what they know about **Food Webs**, or remind them that food webs start with a producer (usually a plant); consumers eat plants; predators eat consumers. In a food web, energy and nutrients (in the form of food) are passed from one living thing to another.

To illustrate this concept, play the String Game (pages 7 and 8) as a class. Look at the **Marine Classifications** page for clues on what the different marine animal like to eat. You could also cut out the animal cards and get students to work in groups to arrange some of the species into a simple marine food chain, or more complex food web.



Next ask students to describe what they think **Overfishing** means?
One definition of overfishing could be:
When a certain species of fish (usually one which people like to eat most) are fished too much they are unable to reproduce their numbers and begin to decline.

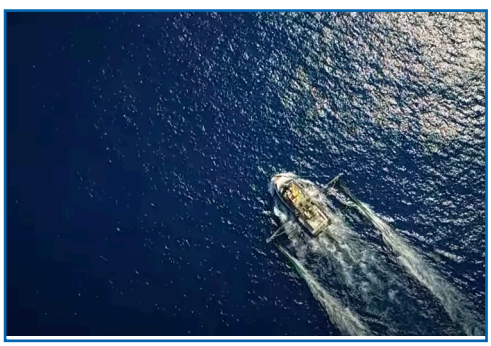
Show students the clip Overfishing (2:55) from the short film My Dad The Fisherman. Discuss as a class

- *What is the relationship between fishing and the marine ecosystem (the whole ocean environment)?*
- *What consequences do our food choices have for the oceans?*

Discussion (10-15 mins)

To close the class show students the short video Born Free, Caught Wild (8:40) about a sustainable prawn fishery in Northern Australia.
Ask students to explain

- *How can scientific knowledge be used to prevent overfishing in Australia?*
- *Is overfishing only a problem in Australia?*
- *How can we help to protect the oceans all around the world?*



Video Credit: Australian Council of Prawn Fisheries, FRDC and Millstream Productions

Review

Host a 5-minute Kahoot challenge on this topic at Marine Food webs and Overfishing

Extension Activity

1. Learners can further understand how marine food webs work by playing the online C.o.o.l Projects Food Web Game

2. Show learners the short video Exploring Ecosystems: Coastal Food Webs (4:14) from the California Academy of Sciences. This video explaining in greater detail what a marine food web looks like and how species off the coast of California such as kelp, sea urchins and sea otters interact. Ask students to use what they have learned in this video to create a food web using species from the Australian coastline.

3. Students use the Australian Fishing Marine Authority species guide to choose one Australian fish species. Students research the scientific classification of their fish, where it lives, what it eats and what eats it. Create a food web for this fish including at least five other marine species. Write a short paragraph below explaining what impacts overfishing would have on the community and habitat of this fish?

4. Students watch the 15-minute film My Dad The Fisherman and create a Consequences Kelp (page 8), taking into account the environmental, scientific, social and economic consequences of overfishing.

5. After watching the 15-minute film My Dad The Fisherman, students read through How My Dad Fishes for the Future. Visit the Global Fishing Watch's interactive map. Click 'play' and explore who's fishing where over time. Next, students find a location on the coastline where they have visited. Students will compare the amount of fishers in that area versus in the Arctic and write a small description of their results, describing the potential reasons.

OCEAN CONNECTIONS - SEAFOOD

Tuna Sandwich

Fish Curry

Fish, Calamari and Chips

Fish Taco

Sushi

Prawn Dumpling

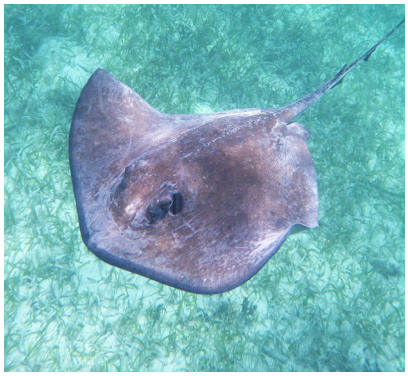
Seafood Pasta

Panfried Salmon

Oysters

OCEAN CONNECTIONS - OCEAN CREATURES

Shark



Stingray

Sea lion

Seahorse

Whale

Sea turtle

Clown fish

Octopus

Jellyfish

THE STRING GAME

A string game is a great way of introducing the idea of connections between organisms in a food web. You only need a ball of string and if you have them, some labels so learners can remember which organism they are pretending to be.

The game takes about 15 minutes to play as a class. In this string game sea creatures are from Australian waters, but you could create scenarios for other environments too, for instance a North Atlantic or Arctic food web.

How to play

A group of about 10 learners stand in a circle with others observing. Give each student a sea creature name written on paper, which they read to the rest of the group.

One learner will take the ball of string and hold it at the loose end. They then pass the ball to another student in the circle, creating a link in the food chain with that species, and explaining why they are connected to them. For instance, the sea lion might be linked to the tuna because sea lions eat fish.

Each learner then chooses another that they feel they're linked to, and passes the string across the circle, while keeping hold of the string themselves. After some time there will be a web of string across the circle.
Ask learners: *What does the web show?*

Observing students then read out a few of the scenarios given, involving changes to the marine environment. Ask those students whose species is affected by the change to wiggle the string.

Ask learners:

- *What happens when one organism is affected?*
- *How do they think they are affected by changes?*

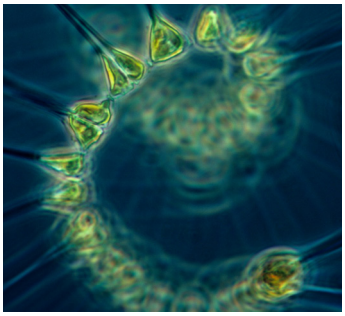
Phytoplankton	**Lobster**
Prawn	**Human**
Sea lion	**Tuna**
Sardines	**Octopus**
Pipis	**Whale Shark**

Scenarios

Prawns are **overfished** and their numbers go down sharply.
The mass coral spawning event occurs in the Ningaloo reef in Autumn
Increased carbon dioxide emissions lead to more acidic oceans, meaning that shellfish find it harder to build their shells.
Quotas for tuna are introduced, meaning fishers take fewer of them and their numbers slowly increase.

MARINE CLASSIFICATIONS

Phytoplankton
Microscopic Algae
Phytoplankton are the foundation of the aquatic food web, feeding animals of all sizes from shellfish to great whales.



Prawns
Crustacean *(Malacostraca)*
Prawns eat micro-organisms including decaying organic matter, small shellfish, worms and phytoplankton.

Sea Lions
Mammal *(Mammalia)*
Australian sea lions eat octopus, rays, lobster, squid and fish such as tuna and sardines.

Sardines
Ray-finned fish
(Actinopterygii)
Sardines are very low in the food chain, eating microscopic plants (phytoplankton) and animals (zooplankton).

Pipis
Bivalve Mollusc *(Bivalvia)*
Pipis are filter feeders that extract plankton through their gills. Their predators include sea birds and humans.

Rock Lobster
Crustacean *(Malacostraca)*
Lobsters have a highly varied diet, eating fish, shellfish, worms, plant life and sometimes even each other.

Tuna
Ray-finned fish
(Actinopterygii)
Tuna can grow to be very large fish. Their diet includes shellfish, octopus, squid, sardines, lobsters, krill, jellyfish and algae.

Octopus
Cephalopod
(Cephalopoda)
Octopus are bottom dwellers and predatory. They eat species including crustaceans (lobster), shellfish (pipis and prawns) and snails.

Whale Shark
Cartilaginous fish - Carpet Shark
(Chrondrichthyes)
Whale sharks are filter feeders. Their diet includes phytoplankton, fish eggs, krill, prawns, sardines and tuna.

Human
Mammal *(Mammalia)* - ***Primate***
Humans around the world consume marine species from across the entire food web, from seaweed and krill to sharks and whales.

CONSEQUENCES KELP

The 'Consequences Kelp' puts a problem in the centre and looks at the causes and consequences of it.

It's a great tool to get learners thinking about an issue from a variety of perspectives, and with a focus on sustainability, they can **grow their understanding of how human and physical processes interact to influence, and change environments; and the importance of biodiversity and the effective functioning of ecosystems.**

In the film My Dad The Fisherman, the girl says, **"some species of fish are under threat"**. Learners can work in groups or pairs to create the consequences tree about this problem, thinking about the

- Environmental
- Scientific
- Social
- Economic

causes and consequences of the threats to fish.

They might focus on

- food webs
- livelihoods
- biodiversity
- climate change

Encourage them to ask 'why, why, why?' to investigate the problem from many angles.