FISHING METHODS:
PRAWN TRAWLING IN AUSTRALIA

Teacher Resources - Lesson Plan

NSW Syllabus for the Australian Curriculum

Years 7-10 (Stages 4 & 5): Marine and Aquaculture Technology

Module 18: Fish Harvesting

Outcomes - A Student:

- MAR5-3 - identifies, describes and evaluates the effects humans have had on the marine environment
- MAR5-7 - identifies, describes and evaluates the ethical, social and sustainability issues related to the marine environment
- MAR5-14 - recalls aspects of the marine environment using relevant conventions, terminology and symbols

Fishing Techniques

Students:

- investigate various methods used to catch fish (trawling)
- describe the relationship between the method of capture and the physiology of the fish
- describe the differences between and uses of trawl nets, gill nets and seine nets

Module 36: Food from the Sea

Outcomes - A Student:

- MAR5-2 - identifies, describes and evaluates the social and economic importance of marine ecosystems

Handling and preparing seafood

Students:

- investigate seafood preparation methods and eating habits in a range of cultures
- outline methods used to prevent seafood from deteriorating
- describe the steps involved in preparing seafood for consumption
- demonstrate skills needed for preparing seafood (peeling and deveining prawns)

Cooking and consuming seafood

Students:

- investigate cultural relationships between seafood and its consumption, including the importance of seafood as a source of protein
- demonstrate skills needed for the cooking of seafood (cooking prawns peeled and prawns still in a shell)
- evaluate different utensils required for preparation and consumption of seafood

Years 11-12 (Stage 6) - Marine Studies

Optional Module 10: Commercial and Recreational Fishing

Outcomes

A student:

- 1.1 - relates with a respectful and caring attitude to the ocean and its life forms
- 1.2 - identifies the roles of individuals or groups involved in maritime activities
- 2.1 - appreciates the importance of effective management practice
- 2.3 - communicates information by writing reports, giving short talks and contributing to discussions
- 4.2 - appreciates marine environments as sources of employment and leisure
- 5.3 - interprets and follows instructions with accuracy

Students learn about:

- fish habitats and current state of Australian fish stocks
- effects of fishing on stocks
- regulations - the legal restrictions on professional fishing
- techniques used by professional fishermen - scaling, gutting and filleting a fish (prawn)
- fishing safety
- professional fishing techniques (trawling)
- the value of professional fishing to the Australian economy
- the effects of commercial and recreational fishing on national and global fish stock of selected species
- major commercial fisheries in Australia
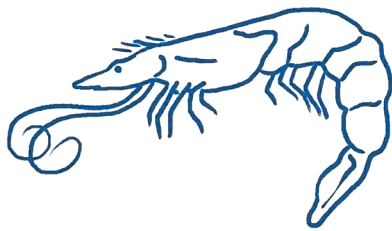- the technology used by professional fishermen

Students learn to:

- locate fish habitats in one coastal or local area
- identify and discuss the status of stocks of major commercial fish species (prawn)
- undertake the practical investigation of the advantages/disadvantages of professional fishing techniques
- identify the parts of trawl gear and explain their functions
- identify those changes to equipment that have been made to prevent damage to the marine environment or species

In this lesson for ages 12+ learners will study commercial prawn fishing in northern Australia. Students will examine the fishing method of bottom trawling, learn about the regulations and practices in place for sustainable fishing, and learn to peel and cook a prawn.

Key terms

- Prawn (Banana, Tiger, Endeavour)
- Commercial fishing
- Fishery
- Bottom trawling
- Sustainability
- Fish stocks
- Bycatch
- Turtle Excluder Device (TED)
- Bycatch Reduction Device (BRD)

You will need

- Access to Youtube for video links
- Student copies of the Fishery Factsheet (pages 7-9)
- Student copies of the Trawling methods factsheet (page 11)
- Printed copies of the student questions (page 10)
- Printed copies of the diagram drawing box (page 12) and pencils / pens
- Prawns, ingredients and utensils for cooking (Activity 6).

Key questions

- How does prawn trawling work?
- What is a bycatch reduction device?
- Why is bottom trawling well-suited to catching prawns?
- How is the safety of crew ensured on a boat at sea?
- What kind of job would you most like to do on a fishing boat?
- How sustainable is prawn fishing in Australia?
- Why do fishers process and freeze prawns at sea?

Class activities

- Students read a Factsheet about the Northern Prawn Fishery and answer questions
- Students watch videos and use diagrams to learn about the fishing method of bottom trawling
- Students work in groups to consider why bottom trawling is the preferred method of catching prawns
- Students listen to an interview with the Operations Manager of Austral Fisheries
- Students conduct a research project to analyse the sustainability of prawn fishing in Australia
- Students do a practical activity to learn how prawns are handled, processed, and cooked

LESSON PLAN

Starter

In this lesson, students will learn about prawn fishing in Australia, with a case study on trawling methods used in the Northern Prawn Fishery. Introduce students to the case study topic by watching the short film Karumba Prawns (14.18) which gives the ocean-to-plate story of a prawn fishing vessel in the Gulf of Carpentaria. If you are short on time, there is the alternative film Skull Island Life (5.47).

Activity 1

Students read the Fishery Factsheet (pages 7-9) to learn about the Banana, Endeavour and Tiger prawn species caught in northern Australia, and about the management and sustainability of the Northern Prawn Fishery. Students then answer questions on page 10.

Activity 2

Students watch a 360 video Trawl gear in action (1.05) to see trawl gear being used on a commercial fishing vessel. Students then read the factsheet 'How does prawn trawling work' (page 11). Students then draw and label their own diagram of a trawling vessel, identifying the different parts of bottom trawling gear (page 12).

Next, show students a video that explains turtle excluder devices (TEDs) and bycatch reduction devices (BRDs), Reducing Bycatch in Australia's Northern Prawn Fishery (4:42). Ask students to include turtle excluder and bycatch reduction devices in their diagram.

Also see a glimpse of the BRD in action (0.17)!

Activity 3

Group work

Using the fishery factsheet, students consider the behaviour, physiology, and habitats of prawns. Students then work in groups to investigate why bottom trawling might be the preferred method of catching prawns. Students should compare trawl nets with other commercial fishing methods, such as gill nets, seine nets and longlining. Students then discuss why bottom trawling is well-suited to catching prawns, as compared with other kinds of fish. Students share their findings with the class. Helpful sources include:

- Fishing methods: Bottom trawling
- Fishing methods: Gillnets
- Fishing methods: Purse seine nets
- Fishing methods: Longlining

Activity 4

Listen to an audio interview with Bryan Van Wyk, Operations Manager of the Northern Prawn Fishery (10.15). Bryan explains what life looks like on a prawn trawling boat and some of the different types of jobs on board. Bryan also speaks about where trawling equipment comes from, how the prawn trawling gear is maintained, and the importance of safety on board.

Students discuss: Which kind of job would you most like to do on a prawn trawling boat, and why?

Activity 5

Student Research Project

Students work independently or in groups to complete a research project on the sustainability of prawn fishing in Australia.

To get started, show students these resources about sustainability in the Northern Prawn Fishery:

- Video: Prawn Fishers Innovate to Reduce Bycatch (7:14)
- Video: Witness to Climate Change: Austral Fisheries (2:27)
- Webpage: Australia Northern Prawn: Continual Innovation / Sawfish Project

Note: The video examples above were created by the prawn fishing industry. Encourage students to use a range of sources, to include diverse perspectives in their research.

In their research, students should answer the following:

1. What species of prawn are fished in Australia?
2. Are the prawn stocks (populations) being fished in Australia healthy? Are any prawn stocks threatened or endangered?
3. Are prawns an important food source in Australia?
4. What is the value of prawn fishing to the Australian economy?
5. What are the environmental impacts of commercial prawn fishing in Australia?
6. What are commercial fishers doing to prevent the overfishing of prawns?
7. What other ways are commercial fishers reducing their environmental impacts?
8. Can you think of other ways that prawn fishing could be made more sustainable in Australia?

Students present their findings in the form of a report, class presentation, or video (teachers choice).

Activity 6

In this activity students learn about preservation, preparation methods, handling and cooking prawns. Prawns caught at sea by the Northern Prawn Fishery are snap-frozen at sea. Show students these behind-the-scenes video clips of prawns being processed and packaged on a vessel at sea:

- 360 video: Packing banana prawns (**click and drag the video to look around** - 0.18)
- Tiger Prawns catch processing (3.13)
- How factory staff peel prawns (0.10).

Discuss as a class, why would fishers process and freeze prawns at-sea? *Answers might include*

- Fishing vessels travel a long away off the coast, and can spend weeks or months at sea. By processing the prawns on board, they save time and fuel, rather than making multiple trips back to shore.
- By handling and freezing prawns straight away, prawns stay as fresh and flavoursome as possible.
- Prawns are delicate, and can be damaged easily or turn bad if left for too long in heat.
- Freezing enables fishers to transport and store prawns easily, meaning that fishers can sell their prawns to a wider market around Australia and other countries.

To wrap discussion, show students the video Handling Australian Wild Prawns (2:28).

Next, students will learn how to cook with prawns! You can buy prawns with the MSC blue fish tick from Coles (fresh and frozen) and Woolworths (frozen). A list of suppliers is also available on the Northern Prawn Fishery (NPF) website. Tip! Prawns have different flavours and textures, and are best cooked according to the type of species you have. You can learn about the cooking profiles for different prawns using the videos linked on page 9.

If you are buying frozen prawns, make sure to defrost them in a bowl of cold water overnight before class.

Show students the video Preparing Australian Wild Prawns (4:21) to learn about the different ways that prawns are best cooked.
Then choose a prawn dish from the MSC's library of sustainable seafood recipes.
Easy options to cook with a class are garlic prawns or barbecued prawns. If you have large prawns (e.g. tiger prawns) you could choose to butterfly them.

As part of the cooking process, teach students how to peel and devein a prawn.
See two methods from Australian Masterchef stars below.
Method 1 - Courtney Roulston - use your hands

| Twist off the head | Grip firmly and use thumb to peel the shell and legs in segments | Pinch or 'pop' the tail off | Devein - pull out the intestinal tract |

Method 2 - Larissa Takchi- spoon and fork

| Use a fork to puncture the backbone | Scoop under the shell and pull away legs with a spoon | Pierce with a fork, and strip the shell | Serve with a squeeze of lemon! |

FISHERY FACTSHEET: NORTHERN PRAWN FISHERY

Australia's Northern Prawn Fishery is a located off Australia's northern coast from Cape York in Queensland to Cape Londonderry in Western Australia. There are 52 vessels licensed to operate within the fishery, targeting banana, tiger and endeavour prawn species.

Prawns

Classification: *Penaeidae* family of Decapods

Sizes:

Endeavour prawns 7-14cm length, 22-30g weight

Tiger prawns 11-20cm length, 35-50g weight

Banana prawns 14-17cm length, 20-30g weight

Lifespan: 1.5 to 2 years

Diet: Molluscs, small crustaceans, worms, detritus (decaying organic matter).

Prawns feed mostly at night.

Eaten by: Squid, cuttlefish, large fish (e.g. barramundi), sharks, rays, and humans.

Habitat: Coastal waters, living on muddy or sandy bottoms up to depths of 90 metres (banana and endeavour prawns) & 200m (tiger prawns).

Juveniles are found in shallow waters, on coral reef platforms, seagrass beds, or mangrove banks.

To learn more, read the Species of Prawns chart on page 7.

Prawn food web
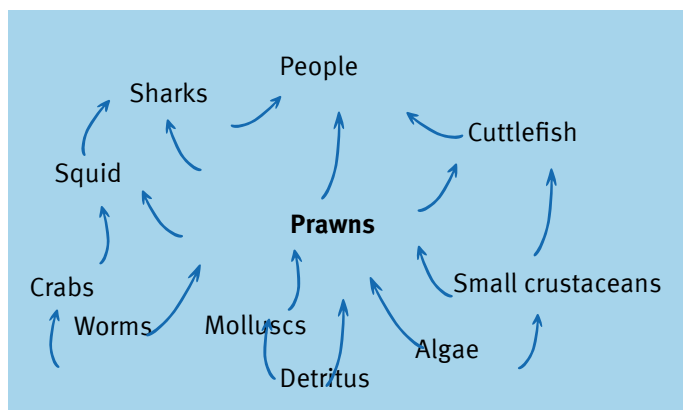
Where are prawns fished?

The Northern Prawn Fishery is located in northern Australia, covering 880,000 square kilometres from Cape Londonderry, Western Australia to Cape York, Queensland. It is a huge area, but only 12% of these waters are fished for prawns.

The Northern Prawn Fishery is an area of the ocean where prawns are fished for commercial purposes. The fishery was started in the 1960s and by the 1980s there were 300 vessels (boats) catching prawns. This had a big impact on the marine environment and prawn populations. So changes were implemented to manage prawn fishing more sustainably. Today, 52 vessels are licensed to operate in the fishery using the **bottom trawl** method. This involves towing a conical-shaped net over the seabed. Spotter planes are sometimes used to find dense aggregations or 'boils' of white banana prawns at the water's surface, and direct the trawlers towards them. Trawl times are short, lasting 20-30 minutes.

There are two prawn fishing seasons each year:
Season 1 - April to June (mainly Banana Prawns)
Season 2 - August to November (mainly Tiger Prawns)
Seasonal fishing closures ensure that prawns are able to continue breeding. Trawling is banned during daylight hours for the second season, to reduce the catch of egg-bearing female prawns.

Map of the Northern Prawn Fishery, Northern Prawn Fishery | Australian Fisheries Management Authority (afma.gov.au). Image courtesy of the Australian Fisheries Management Authority © The Northern Prawn Fishery.

How sustainable is prawn fishing?

The Northern Prawn Fishery is regulated by the Australian Fisheries Management Authority (AFMA). AFMA are complete ecological risk assessments, set catch limits, and make workplans to reduce bycatch.

There are strict controls in place for the fishery such as:

- the number of vessels (boats) allowed to fish
- the amount of net used
- requirements to use bycatch reduction devices on all trawl nets
- seasonal and area closures for the fishery.

Boats are fitted with a satellite 'Vessel Monitoring System' which tracks the fishers' position, course and speed. Scientific observers are also employed by AFMA to go out on boats with fishers are independently record the catch effort, size of prawns caught, other wildlife sighted, weather conditions, and incidents of bycatch.

Each year, the industry surveys prawn stocks (populations) before fishing. Restrictions may be imposed to ensure the sustainability of a stock. For example, the red-legged banana prawn fishery was closed during 2007 and 2010. This fishery has also been closed in the first half of the season since 2022, and is now only open between August and November. In May 2023, a new research project was created reduce sawfish and sea snake interactions in the fishery, trialling innovative methods such as the use of electromagnetic fields and underwater lights.

While at sea, fishers collect data in logbooks, including:

- the number and species of prawns caught
- the location of each net
- the type and amount of fishing gear used
- the catch and release of any protected species, and any catch discarded.

Trawl nets in-action on Tiger Prawn fishing vessel

What is 'bycatch'?

Bycatch is the term used for fish or animals that fishers catch by accident, don't really want, or shouldn't take. It can include species such as turtles, seals, or sea birds, as well as female prawns carrying eggs, or young or undersized prawns.

All boats in the Northern Prawn Fishery are required to use turtle excluder devices (TEDs) and bycatch reduction devices (BRDs) on their trawl nets. Following the introduction of TEDs, turtle catches dropped from 5000 to less than 100, with a 99% survival rate.

Markets

The economic value of the Northern Prawn Fishery in 2021-22 was AUD $76.6 million. Most of the prawns caught are frozen on-board the boat and sold both within Australia, and to other countries including Japan and China.

The MSC fisheries standard

In 2012, the Northern Prawn Fishery received Marine Stewardship Council (MSC) certification, or the **Blue Fish Tick'**. The MSC Fisheries Standard is designed to assess if a fishery is well-managed and sustainable. To meet this standard, fisheries must demonstrate that they meet three principles:

1. Sustainable fish stocks
The fishing activity must be at a level which ensures that it can continue indefinitely.

2. Minimising environmental impact
Fishing operations should allow for the maintenance and diversity of the ecosystem.

3. Effective management
The fishery must comply with relevant national and international laws and have a management system that is responsive to changing circumstances.

Banana prawn

Two species of banana prawn are fished in northern Australia, the Redleg banana prawn (*penaeus indicus*) and the White banana prawn (*penaeus merguinesis*). Banana prawns make up almost a third of Australia's commercial prawn catch, with 90% caught in the Gulf of Carpenteria. They are light coloured, white to yellow when raw, with pink or red legs.

Banana prawns live in tropical or subtropical coastal waters, on muddy or sandy floors. They sometimes form dense aggregations at the water surface called 'boils'. Females produce 100,000 - 450,000 eggs per year. Watch the video Australian Wild Banana Prawn (1:29).

Tiger prawn

Two species of tiger prawn are fished in northern Australia, the Brown tiger prawn (*penaeus esculentus*) and the Grooved tiger prawn (*penaeus semisculcatus*). Tiger prawns contribute about one quarter of Australia's commercial prawn catch. Named for their dark brown or green striped markings that turn red when cooked, they are also the largest size of prawn in Australia.

Tiger prawns live in deep coastal waters up to depths of 200m, on coarse sediments. They are only trawled at night when they are active, at around 16 to 20m depth. Watch the video Australian Wild Tiger Prawn (1:51).

Endeavour prawn

Two species of endeavour prawn are fished in northern Australia, the Blue endeavour prawn (*metapenaeus endeavouri*) and the Red endeavour prawn (*metapenaeus ensis*). They are have pale brown to pink bodies, with a bright blue or red marking on the tail fin. Endeavour prawns live in tropical coastal waters, over sandy or muddy substrates at depths of 60-95 metres. As with other species, prawns spawn (reproduce) during moulting seaons. The male implants a sperm package onto the female, and the eggs are shed and fertilised in the water after she moults. Watch the video Australian Wild Endeavour Prawn (1:45).

Use the Northern Prawn Fishery Factsheet to answer the following questions.

1. What method of fishing is used by commercial fishers in northern Australia?

_____

2. *Circle true or false:* The Northern Prawn Fishery is open all year round

                          True   False

3. How many vessels are there in the Northern Prawn Fishery today?

_____

4. Which species of prawn is the biggest in size and lives at the greatest depths?

_____

5. Which government body is responsible for regulating the Northern Prawn Fishery?

_____

6. Which species of prawn is currently closed to fishing in the first half of the season?
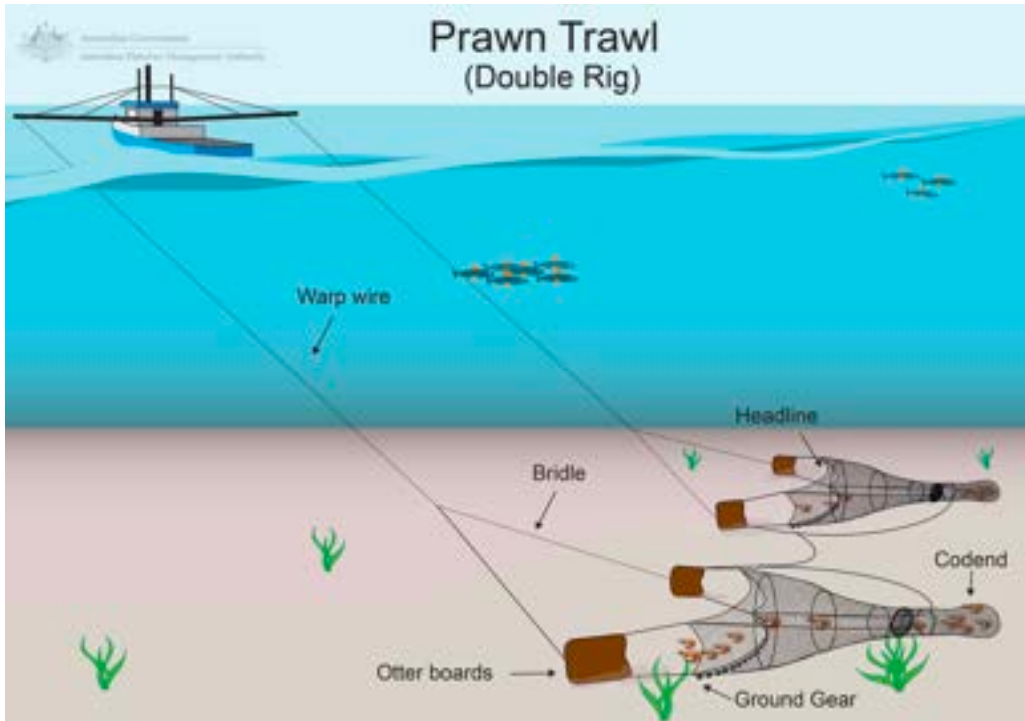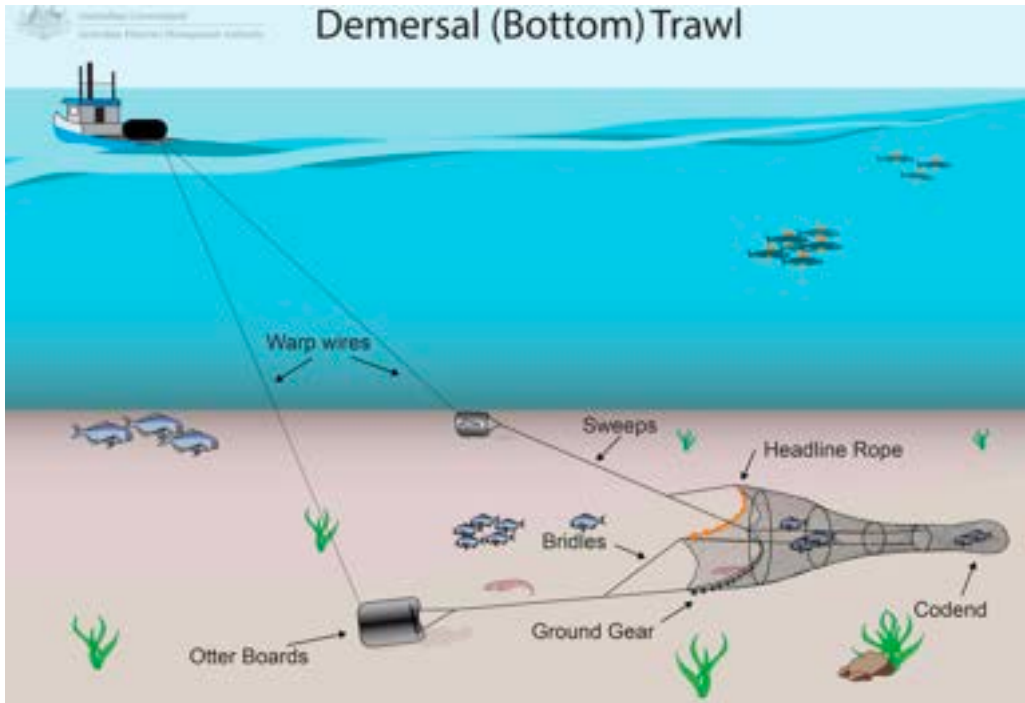
_____

7. *Circle.* Following the introduction of Turtle Excluder Devices (TEDs), the survival rate of turtles increased to

     a) 10%

     b) 25%

     c) 75%

     d) 99%

How does prawn trawling work?

Demersal (Bottom) Trawl

Prawn Trawl (Double Rig)

Trawling is one of the most popular methods used in commercial fishing. A boat is used to tow the trawl nets, which are shaped like a funnel with a wide opening on one end, and a closed 'cod-end' bottom. Nets are dragged through the water at different depths, in the mid-water or along the sea floor. Different sizes of mesh netting are used for different purposes. All nets in the Northern Prawn Fishery must be fitted with Turtle Excluder Devices and Bycatch Reduction Devices.

Trawling, Trawling | Australian Fisheries Management Authority (afma.gov.au). Images courtesy of the Australian Fisheries Management Authority ©

Draw a diagram of a prawn trawling boat, labelling each piece of equipment.

Gear list:

Warp wire - Bridle - Otter boards - Headline - Ground Gear - Cod-end - Spotter plane -

Turtle Excluder Device (TED) - Bycatch Reduction Device (BRD).