



TEACHING RESOURCE | TASMANIAN SEAFOOD: CATCHING, GROWING AND HARVESTING

Image credit: John Turnbull

RATIONALE

This resource aims to help students and teachers in secondary schools investigate and understand more about Tasmania's seafood industry, including;

- Commercial, recreational and Aboriginal fishing in Tasmania
- Species that are fished and farmed in Tasmania
- Fishing methods and aquaculture facilities
- Management of the seafood industry in Tasmania
- Buying local seafood

LEARNING OUTCOMES

- Students will learn how seafood is caught, grown and harvested in Tasmania, including wild caught fisheries, aquaculture facilities, recreational and Aboriginal fishing practices.
- Students will learn how commercial, recreational and Aboriginal fishing are managed in Tasmania.
- Students investigate the production costs of Tasmanian seafood and understand that the price of seafood reflects the quality and sustainability of the fishing resource.

LOCAL TASMANIAN SEAFOOD

Many Tasmanians are engaged in seafood collection and production for their livelihood, income and recreation. Recreational, cultural and economic factors contribute to the total amount of seafood caught and produced in Tasmania's waters. This learning resource gives an overview of seafood collection and production in Tasmania, including;

- Fishing methods in Tasmania – commercial and recreational; wild catch and aquaculture.
- Local seafood - production and costs, including eating local seafood.



Shell midden. Image provided courtesy of Aboriginal Heritage Tasmania, copyright DPIPWE. Image credit: Jillian Mundy

FISHING METHODS IN TASMANIA

Aboriginal fishing

Tasmanian Aboriginal people have a deep connection to sea country. Respecting the sea as a resource, and the understanding the cultural significance of seafood harvesting is an important part of the Tasmanian Aboriginal people's knowledge of country. Aboriginal people of Tasmania would rely on shellfish, scale fish, seals and mutton birds (shearwaters) for sources of protein. Middens found around many coastal areas of Tasmania indicate the variety and abundance of shellfish eaten by Aboriginal people.

Aboriginal people managed their resources by moving from place to place to harvest a variety of different seasonal plants and animals. Today there is a need to sustainably manage fishing resources, and fishing regulations so that Aboriginal people can continue to practice traditional harvesting. This is covered further on page 4.

Commercial and Recreational Wild Catch Fishing

Commercial fishing in Tasmania is highly regulated and licences are required for any commercial practice. Further information is available at DPIPWE Sea Fishing and Aquaculture – Commercial Fishing <https://dPIPWE.tas.gov.au/sea-fishing-aquaculture/commercial-fishing>

An important aspect of all wild-catch fishing is reducing the catch rate of bycatch (non-target species) and juvenile animals. Most commercial fishers adopt Codes of Practice which provide advice on best practice fishing techniques to reduce the rate of non-target animals being caught. For example: https://www.tsic.org.au/uploads/9/6/8/7/96879568/scalefish_cop_august_2014_final_1.pdf

Commercial and recreational wild-catch fishing involves numerous catch methods – some of which require a licence. Responsible practices are promoted for all fishing, whether commercial, recreational or Aboriginal.



Rod and line fishing. Image credit: Chloe Simons

Wild Catch Fishing Methods

| | |
|---|---|
| Rod and line | An attended line with a single hook where fish are caught one at a time. Some larger predatory fish are caught this way, for instance tuna species and shark. |
| Netting | A large range of nets are used in commercial fishing, for example gillnet and seine. Nets can be selective depending on their use, allowing non-target species to escape. They typically hang vertically in the water and stretch along a series of buoys on the surface. They are used to catch scale fish species in Tasmania (e.g. Banded Mowong, Flathead, Striped trumpeter, Bastard trumpeter, Blue grenadier, Blue eye trevalla, Snotty trevally/Blue warehou, Silver trevally). |
| Set lines (longlines and droplines) | An unattended line with multiple hooks either suspended from a buoy toward the seabed (dropline) or spread horizontally using weights and two buoys (long-line). |
| Pots | 'Cray pots' are wooden circular pots with a hole in the top. Bait attracts species inside, but shape prevents southern rock lobsters from escaping. Octopus pots are ceramic or plastic pots that are an attractive place for octopus hide in, allowing them to be captured. |
| Jigs | Often an artificial lure - although sometime baited – with multiple sets of spikes to latch on to squid and calamari. |
| Diving, snorkelling and collection by hand | Target species are typically abalone, urchin, southern rock lobster, periwinkle and scallop in Tasmania; as well as foraging for shallow water gastropod and bivalve molluscs and crabs. Scallop and rock lobster are only dived for recreationally, not commercially. |
| Dredging | Basket shaped net dragged along the seabed on a heavy-duty frame. Bottom of the net is made from metal chain to prevent net breakage. Used to collect scallops. |

Some of these fishing methods are used by recreational fishers. Information on recreational fishing methods, licence requirements, bag limits and season and size restrictions can be found in the Tasmania Recreational Sea Fishing Guide and the Tas Fish Guide app, available at:

<https://dPIPWE.tas.gov.au/sea-fishing-aquaculture/publications-and-products/recreational-sea-fishing-guide>

For more information about wild fisheries management, go to www.fishing.tas.gov.au

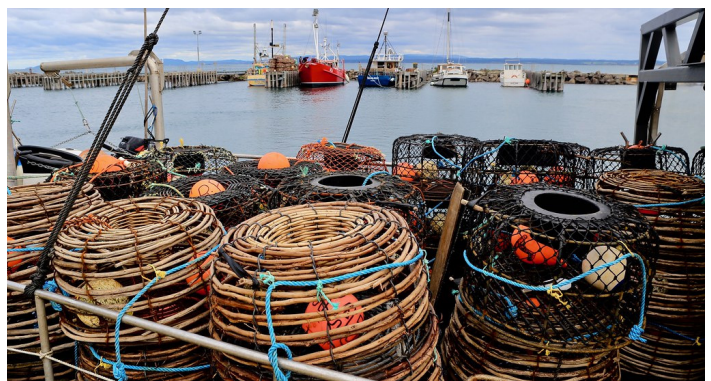


Image credit: Harry Calderbank - Flickr

MARINE AQUACULTURE

Aquaculture means 'to grow in water'. Fin fish, shellfish, crustaceans and seaweeds can all be farmed in aquaculture facilities. Aquaculture is an important economic industry for Tasmania. It can also reduce pressure on wild-catch fish stocks, and there is no bycatch. Like all farming systems, growers and regulators must work together to ensure sustainability.

Types of aquaculture facilities in Tasmania

1) FIN FISH

Fin fish such as Atlantic salmon and ocean trout are farmed in fish pens in Tasmania. The aquaculture pen consists of a sea net that is held up by a floatation ring and anchored to the seafloor to stop it drifting away. There is usually bird netting to keep birds away from the fish, with an escape hatch to allow birds to escape.

Food is delivered to the fish from a 'feed hopper' boat that is usually controlled remotely from an on-shore location. Fish pens are often equipped with a range of technology such as cameras and sensors to monitor fish behaviour and detect any un-eaten food; and automatic net cleaners. Marine farm leases are marked with yellow marker buoys in Tasmania.

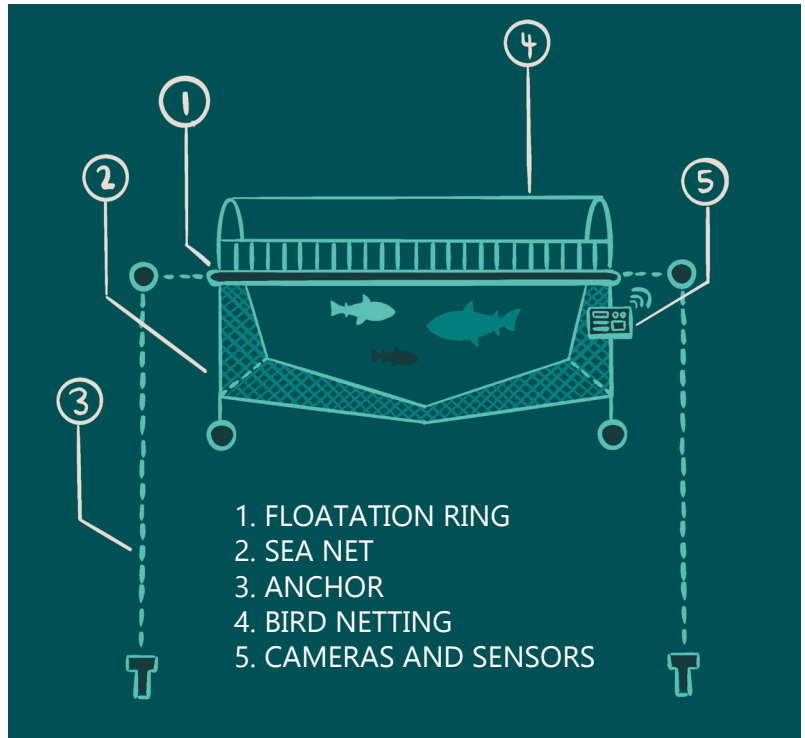


Figure 1: Aquaculture pen design

2) SEAWEED

Seaweed farming is becoming an important industry in Australia. It has uses in food products and medicine as well as carbon capture and storage. As seaweed is a photosynthesizing organism, it plays an important role in carbon dioxide and oxygen levels in the ocean.



Image credit: IMAS

3) SHELLFISH

Shellfish farmed in Tasmania include oysters, mussels and abalone. Baskets of oysters are hung from adjustable lines or ropes. The line is attached to posts by hooks. The basket height can be adjusted by transferring the line to hooks that are positioned lower or higher on the post. Mussels are often hung from ropes that are submerged in the water. The mussel spat is put into mesh bags called 'socks' that grow out over about 18 months. Abalone can be farmed in land-based tanks or sea cages.



Image credit: Spring Bay Seafoods

4) INTEGRATED MULTITROPHIC AQUACULTURE

This practice involves farming different species together in proximity, such as growing invertebrates and seaweeds near fin fish facilities. Multi-trophic farming is an emerging practice in Tasmania

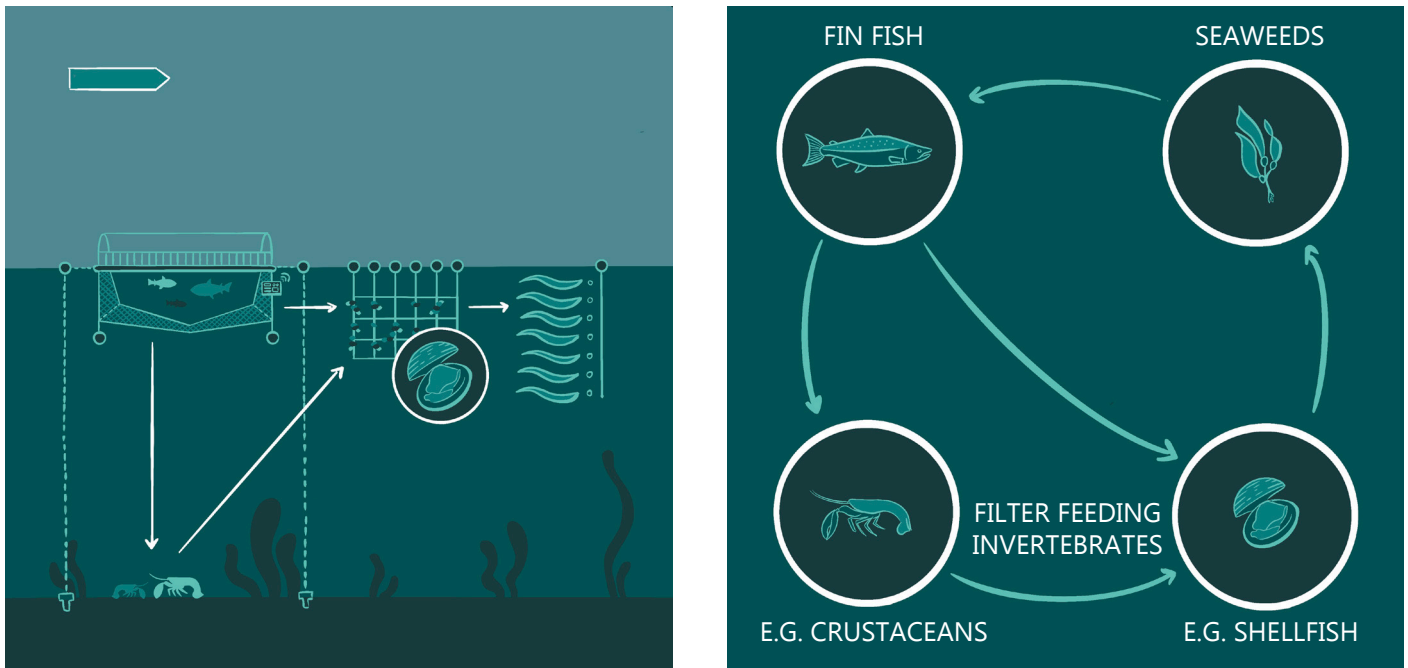


Figure 2: Filter feeding invertebrates take up excess nutrients from fin fish pens and seaweeds re-oxygenate water. Image on the right is an enlarged version of left hand side image.

MANAGEMENT OF FISHERIES IN TASMANIA

For management purposes, Tasmania's seafood industry can be divided into wild-catch fisheries management which includes commercial and recreational fishing; aquaculture farm management and Tasmanian Aboriginal fishing. To ensure sustainability of the resource, food collected from the sea is regulated with catch limits, fishing seasons and in some cases, licences.

Commercial, recreational and Aboriginal fishing activities in Tasmania are regulated under the *Living Marine Resources Management Act 1995*. Aquaculture activities are regulated under the *Marine Farming Planning Act 1995*.

Aboriginal fishing

Tasmanian Aboriginal people abide by legislation when harvesting seafood and in some instances, are exempt from the requirement to purchase a licence. There are unique regulations for Tasmanian Aboriginal fishing practices.

'People engaging in Aboriginal activities associated with fish and fishing must be able to prove that they are Aboriginal and that their fishing is an Aboriginal activity. The Act exempts Aboriginal non-commercial fishers from requirements to hold a sea fishing licence but requires that they must comply with all other fisheries rules, including bag and possession limits, size restrictions and seasons.'

Excerpt from [Economic And Social Assessment Of Tasmanian Fisheries 2016/17](#).

There are parameters in the Living Marine Resources Management Act 1995 designed to support the continuation of traditional cultural practices of Tasmanian Aboriginal People. A summary of these can be found on the [Tasmanian Government website](#).

Commercial and recreational wild catch

The commercial and recreational wild catch sector has management parameters such as:

- limiting the number of fishing licences for some species to ensure sustainability and prevent overfishing;
- setting size limits for popular seafood species; succession management, allowing young fish to reach sexual maturity and in some cases to protect active breeders;
- setting a total allowable catch (usually by weight) to aid sustainability and prevent stock depletion;
- capping the allowable catch for specific geographical zones to protect important breeding grounds or other sensitive areas;
- seasonal closures and other general closures during breeding/spawning seasons and allow successful reproduction;
- setting gear restrictions (gear type, soak time or mesh size and other controls) to minimise harm to bycatch and support animal ethics;
- limiting the time spent at sea to reduce pressure in a geographical zone and support best handling practice.

In Tasmania, stock assessments of wild fisheries are conducted by the Institute of Marine and Antarctic Studies (IMAS) at the University of Tasmania.

Quotas in marine waters – including total allowable catch – are set by the Tasmanian Government using information from scientific assessments of fish stocks.

Stock assessments are conducted using the commercial catch and effort data submitted by fishers to the Department of Primary Industries, Parks, Water and Environment (DPIPWE) as a part of the compulsory Tasmanian Commercial Catch, Effort and Disposal Returns, and Commonwealth non-trawl and Southern Squid-jig Fishery logbook submissions.

Tasmanian scalefish stock assessments can be found online through the [IMAS website](#), including [scalefish fishery assessment reports](#) that outline various sector histories; gear, catch and effort data; numbers of scalefish licences; and much more. They also categorise whether species are “sustainable”, “depleting”, “recovering” or “depleted”.

See Table 1 in Appendix A for more information.

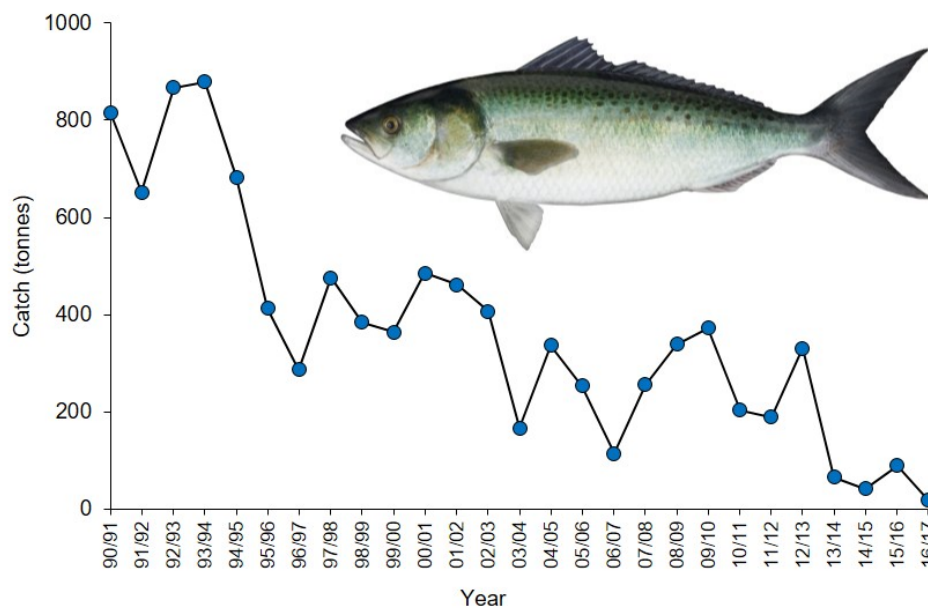


Figure 3: Australian Salmon catch through time. Source: IMAS

<https://www.imas.utas.edu.au/news/news-items/the-latest-assessment-of-the-tasmanian-scalefish-fishery>

Aquaculture Industry

There are different stages of aquaculture farming operations, including hatcheries, nurseries and grow-out farms. Like wild-catch fishers, all aquaculture farm businesses must be licenced to operate, and there are many management parameters affiliated with this licence. Fish farmers also require an Environmental Licence if they have the capacity to produce five tonnes of seafood or more annually, or if they hold a biomass of two tonnes or more at any one time. Aquaculture licences specify the total allowable product by tonnage.

REPORTING

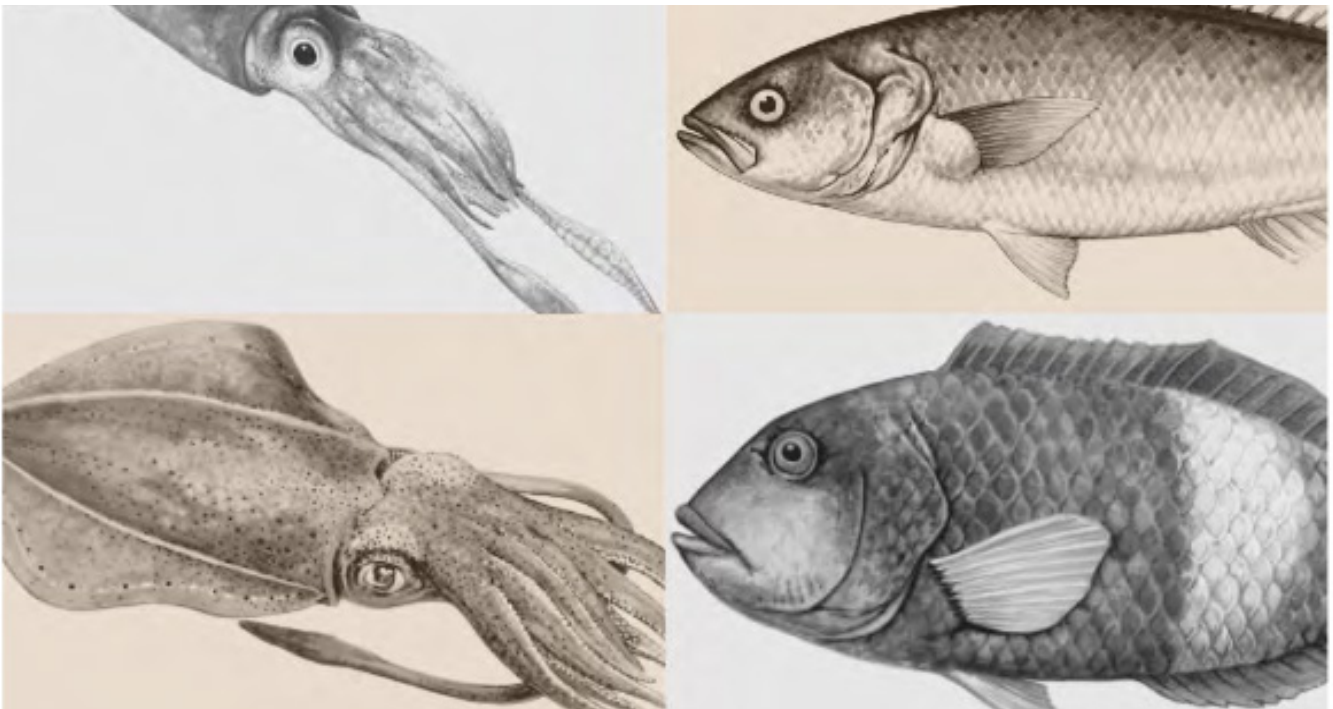
Wild catch

All commercial wild-catch fishers are required to submit Tasmanian Commercial Catch, Effort and Disposal Record Book, and Commonwealth non-trawl and Southern Squid-jig Fishery logbook. For scale fish, parts of the logbooks must be completed within 4 hours immediately after landing:

- before any of the landed scale fish are moved outside the landing area;
- before any of the landed scale fish are moved inside a temporary structure or a building; and
- if the fishing vessel is on a fishing trip that lasts longer than 24 hours, before the end of each day of that fishing trip.

This is to aid accuracy and assist in governance. The logbooks must be submitted by fishers to DPIPWE within 48 hours of the end of each month, accompanied by receipts for all fish commercially sold or transferred. Licence holders also document fishing trip details in a logbook.

Information about interactions with Threatened, Endangered or Protected species (e.g. seals and whales) is also captured in these logbooks. Fishers are legally obligated to report all physical interactions with a protected species. An example of a reporting page can be found in Appendix B, and more information on Tasmania's [commercial scalefish fishery operations can be found here](#).



Aquaculture

Environmental reporting requirements vary between aquaculture sites and are specified within Environmental Licences prior to farm establishment. Environmental reports are prepared by contractors and licenced operators, and typically include results from sediment and water quality sampling. Specific salmon aquaculture licences and associated reports [can be found on the Environmental Protection Authority \(EPA\) Tasmania website](#).

[Tasmanian Salmon Farming Data](#) is shared and available from the Tasmanian Government in its regulatory capacity. Some Tasmanian owned and operated aquaculture businesses also make their environmental data available on their company dashboards.

Data associated with shellfish farming, including rainfall, biotoxin levels and chemical indicators, is collected and assessed to ensure that farmers can make decisions about when to harvest healthy shellfish for human consumption. Environmental data is published weekly for farmers through the [Shellfish Market Access Program \(ShellMAP\)](#) and [Biotoxin News](#). When an infringement is detected, authorised Government officers may issue an infringement notice (salmonfarming.dpipwe.tas.gov.au).

MONITORING

IMAS compiles logbook data annually and makes comparisons with previous years. They investigate trends, for example a drop in catch with the same or larger fishing effort may suggest that the species is in decline. They also consider other possible factors such as climate change and accelerated changes to ocean conditions that may impact fish stocks.

Annual fisheries stock assessment reports are produced and published online, and these are used by to inform fisheries management for the following year. This work is also undertaken for the recreational fishing sector and used to make decisions considering all users and cumulative impacts. Recreational fisheries stock assessments are conducted by phone every five years by IMAS.

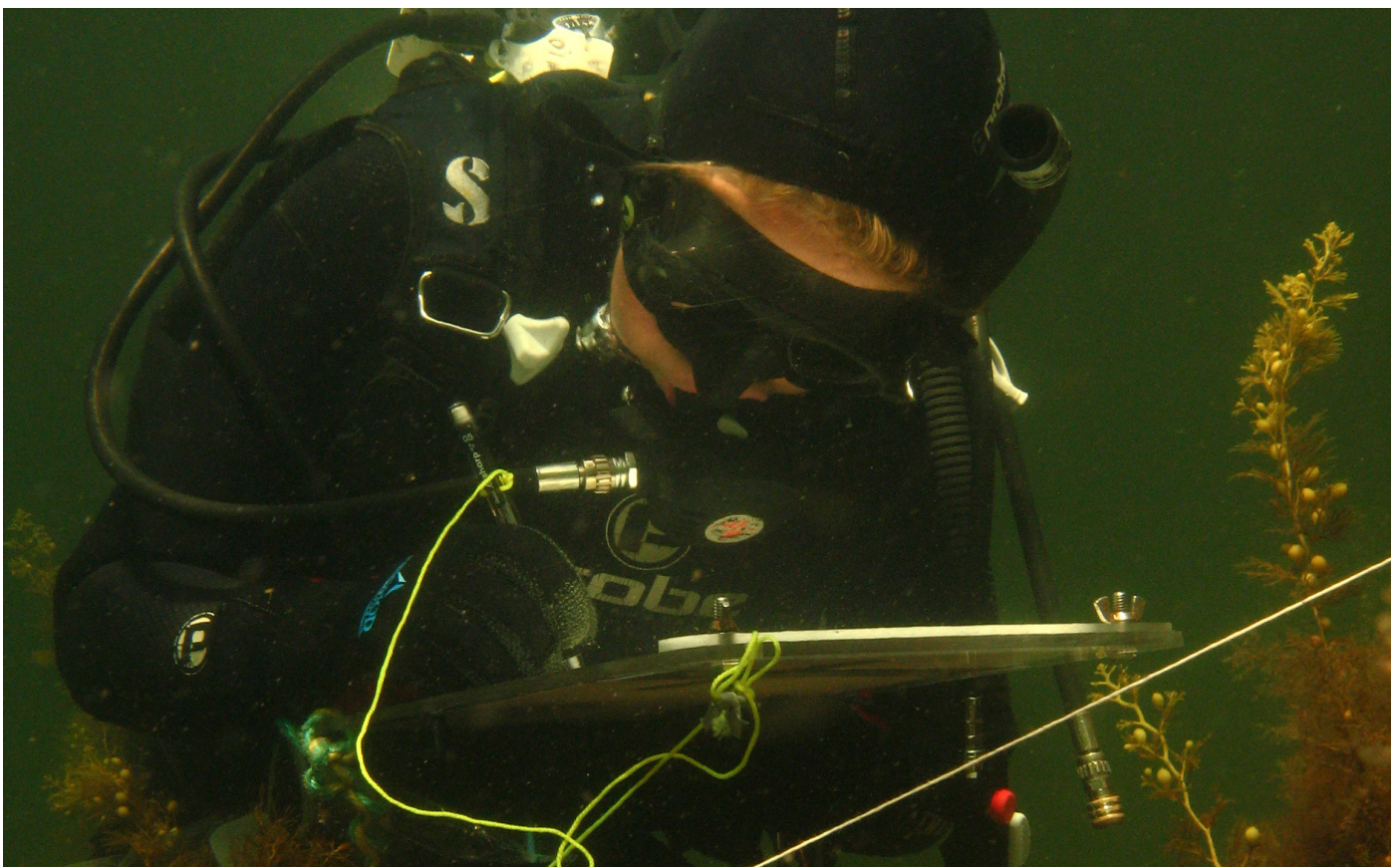
IMAS conducts studies on the effect of salmon farming on the surrounding environment, which includes the seabed, native flora, and fauna. It uses an array of sampling technologies to achieve an assessment. Examples include dissolved oxygen sensor buoys, temperature and salinity meters, Van Veen Grab sediment samplers, and GPS trackers for animals.

Salmon farms have cameras and other monitoring devices within pens that provide live dissolved oxygen and water temperature data to control centres in Hobart. Each farm has a technician in Hobart closely monitoring these readings, fish behaviour, and controlling the distribution of food pellets – ensuring that feed distribution halts when it reaches a certain depth to avoid pellet wastage and associated environmental impact.

Remotely operated vehicles are regularly used within farm monitoring operations. They perform seabed surveys, net cleaning and biosecurity inspections. According to most development plans, marine finfish farms must not have any significant visual, physio-chemical, or biological impacts at or extending 35 metres from the boundary of the lease area, unless otherwise specified by the Director, EPA.

Marine Farming Development Plans outline management controls that relate to various parameters, for instance nitrogen outputs [on the DPIPWE website](#).

Further information on water quality parameters can be found in the teaching resource **Understanding the Tasmanian Marine Environment**.



LOCAL SEAFOOD – PRODUCTION AND COSTS

As an island state, many individuals, families and Indigenous groups rely on harvesting seafood for cultural practices, food and/or income. Purchasing local seafood supports local communities, and consumers know they are getting a top-quality product that is sourced from clean waters with low food miles, and that they are supporting an industry that is closely monitored and managed to ensure it is as sustainable as possible. It is worth asking suppliers which of their products are from Tasmania and how it was caught and handled.

Where to buy local seafood and how to cook it

The Tasmanian Seafood Industry Council's website has a [Support Local/Eat More Seafood page](#) that uses an interactive map of Tasmania to illustrate the various local seafood suppliers. You can view the various places to purchase Tasmanian seafood, by zooming in to your local area.

There is also a free seafood cookbook available to download on this page. It describes how to prepare and cook seafood straight from the sea and includes a seasonal guide. It's important to know the market you're buying from; supporting industries that are sustainably managed ensures food security for future generations.



Cost of seafood

Choosing to purchase local seafood does more than support local producers and their families; you are contributing to an industry that operates within government regulations and is informed by scientific research. Management strategies ensure that fish stocks are closely monitored and maintained; staff receive fair wages; and that catch is regulated. Tasmanian management practices and standards are not always met by international fisheries and this is often reflected in product price.

The price of seafood may seem straightforward, but there are background costs involved in producing seafood products. The price tag of local products can be higher than imported products, yet this does not necessarily imply a larger profit for fishers or retailers. There are several background costs to ensure Tasmania's seafood industry is well managed. Without these costs, Tasmanian seafood would be at risk of exploitation and significant stock depletion.

COSTS TO THE FISHER

- Fishing license
- Boating license
- Leasing or purchasing quota to catch
- Fishing equipment (nets, pots, rods... etc.)
- Boating equipment (navigation, radio, winches...etc.)
- Boat and gear maintenance (including slippage fees)
- Safety equipment and maintenance for compliance
- Boat engine servicing
- Fuel
- Mooring/marina fees
- Deckhand wages (with minimum wage)
- Pigovian tax
- Product transportation costs

COSTS TO THE SEAFOOD RETAILER

- Seafood product (i.e. payment to fisher for product)
- Seafood retail license
- Building maintenance
- Cleaning (wages and equipment)
- Staff wages (with minimum wage)
- Utilities (e.g. power, water)
- Sanitary products (toilet paper, paper towel, napkins)
- Alcohol license
- Lease
- May include seafood processing licence

LEARNING ACTIVITIES

1) REVIEW AND CRITICAL THINKING QUESTIONS FOR STUDENTS

- Why do you think so many Tasmanians enjoy fishing?
- Suggest three ways that we can ensure the fishing resources are sustainable so that everyone can enjoy catching a feed of fish.
- What are some ways that the commercial fishing industry is monitored and regulated?
- Why do aquaculture operators need to apply for a permit to operate?

2) EXTENDED RESEARCH QUESTION – RESEARCH A SPECIES OF FINFISH, INVERTEBRATE OR SEAWEED THAT IS GROWN, CAUGHT OR HARVESTED IN TASMANIA.

- Provide some details about your chosen species (common name, scientific name, what is its usual habitat etc).
- How is this species grown, caught or harvested?
- What are the requirements for growth of this species (eg diet, preferred temperature, oxygen levels etc).
- What is the market for this species? (eg is it sold locally, exported, or caught and eaten by the fisher).

3) EXTENDED RESEARCH QUESTION – MULTITROPHIC AQUACULTURE

Prepare a document (report, poster, PowerPoint, brochure, movie clip, podcast etc) about Multitrophic Aquaculture. Describe:

- What is meant by 'multitrophic'?
- Why this approach may provide benefits from an environmental perspective.
- Which species can be farmed together in multitrophic aquaculture systems and how each animal/plant or algae contributes to the nutrient, oxygen and carbon dioxide levels of the water.
- Can there be any economic benefits from Multitrophic Aquaculture?
- What other efficiencies can be gained from aquaculture systems (e.g. fish attraction, marine renewable energy systems)?

4) RESEARCH QUESTIONS – COMMERCIAL FISHING

- What is quota and why do we have it?
- What are some costs involved in operating a fishing boat?
- Why is it important to reduce bycatch and how is this done for different commercial fishing areas?

5) RESEARCH AND CRITICAL THINKING QUESTION – IMPORTED SEAFOOD

Australia is an island nation with a large coastline and extensive exclusive economic zone that is reserved mainly for Australian fishing activities, however Australia imports a large amount of seafood.

Read this quote from the Australian Government's Department of Agriculture, Water and Environment web page <https://www.agriculture.gov.au/fisheries/aus-seafood-trade>

Australia's seafood trade: It has been estimated that around 70 per cent of the edible seafood Australians consume (by weight) is imported, predominantly from Asia. With such a long coastline and a relatively small population, people often question why Australia imports so much of its seafood.

The full article is available here <https://www.agriculture.gov.au/fisheries/aus-seafood-trade/ast> and contains useful information for the questions below:

CONSIDER AND RESEARCH THE FOLLOWING QUESTIONS:

- What fish species make up the estimated 70% of seafood imported into Australia?
- Where does the majority of the imported seafood come from?
- How and where are these imported fish products sold?
- Are there any geographic, environmental, oceanographic or abiotic reasons why even though Australia has extensive coastline, we import a high percentage of seafood?
- What do you think about Australia's imports and exports of seafood, and if you were working in managing Australia's seafood industry, what would you recommend?



APPENDICES

APPENDIX A: Summary of management parameters for the various wild-catch fisheries.

| | Limiting entry | Size limits | Total allowable catch | Catch caps for specific zones | Seasonal closures and/or general closures | Gear restrictions | Trip limits |
|---|----------------|-------------|-----------------------|-------------------------------|---|-------------------|-------------|
| Scalefish | ✓ | ✓ | ✓ (banded morewong) | | ✓ | ✓ | ✓ |
| Abalone | ✓ | ✓ | ✓ | ✓ | ✓ | | |
| Tasmanian Giant Crab | ✓ | ✓ | ✓ | | ✓ | ✓ | |
| Commercial Dive (Periwinkle, sea urchin, Japanese Kelp) | | | | | | | ✓ |
| Scallop | ✓ | | ✓ | | ✓ | | |
| Rock Lobster | ✓ | ✓ | ✓ | | ✓ | ✓ | |
| Southern Calamari | | | ✓ | | ✓ | | |

APPENDIX B

[illegible]