A learning journey workbook for grades 3-4
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1. WHAT IS AQUACULTURE?

Give a person a fish and you feed them for a day; teach them how to grow fish and you feed them for a lifetime.

(Chinese proverb)

Aquaculture is a really big word for a simple idea. It is the farming of animals and plants that grow in salt and fresh water. People usually do this for food, though there are many other reasons.

Aquaculture is also used to grow ornamental fish such as clownfish or goldfish, for aquariums.

Aquaculture is used to grow pearls for jewelry.

Crocodiles are grown for food but also for making things out of their skin, such as handbags.

**Q.**

What’s one thing the Ancient Egyptians and the Australian Aborigines had in common?

**A.**

They both were amongst the first to use aquaculture!

Aquaculture is not new; thousands of years ago Australian Aboriginals farmed short-fin eels and other fish at Budj Bim in Victoria. This is the oldest example of aquaculture in Australia and perhaps the oldest in the world.

The Chinese have also been using aquaculture for over 4000 years. They mostly farmed the common carp. The first book about aquaculture was written in China in about 500BC. Evidence of tilapia farming in ancient Egypt was recorded in hieroglyphics in the tombs of the pharaohs.

**GLOSSARY**

**Historian:** somebody who learns about history, the things that happened in the past.

**Ornamental fish:** fish for aquariums. These are chosen for their interesting or beautiful looks, which is why they are called ‘ornamental’ fish.
2. OUR HISTORY: THE FIRST AQUACULTURE IN AUSTRALIA

A group of Aboriginal people in Victoria called the Gunditjmara people used aquaculture for thousands of years to make sure they always had enough food. The Gunditjmara people lived at Budj Bim in Victoria for more than 30 000 years.

How did they do it?
The Gunditjmara dug channels to bring water and young eels from Darlots Creek to low lying areas. They made ponds and wetlands linked by channels that had weirs in them. The weirs were small ponds where the eels could live and grow. They made special hand woven baskets, which were put in the weirs to get the eels out once they were big enough to eat. The Gunditjmara people lived there all year round, in villages. They slept in stone huts. They did not have to move to another place to find more food because aquaculture gave them food all the time.

What happened when the Europeans came?
When the Europeans came to Budj Bim in the 1830s, the Gunditjmara did not want to give up the land where they had lived for thousands of years. They did not want to leave their huts, or the land where they practised aquaculture, because they could always get food there. The Europeans wanted to take the land, so there was a war.

The Gunditjmara fought for their land during the Eumerella wars, which lasted more than 20 years until the 1860s. When the fighting stopped, many Gunditjmara people lost their homes and the Victorian government began to make reserves to give them a new place to live. The Gunditjmara did not want to live on the reserves. They wanted to live in their homes. Some people refused to move from their land and finally the government agreed to build a mission at Lake Condah, close to some of the eel traps and within sight of Budj Bim. The mission was destroyed in the 1950s but the Gunditjmara continued to live in the area and protect their land.

Did the Gunditjmara get their land back?
It took a long time, but yes! The land was given back to the Gunditjmara in 1987. Everyone is allowed to go and visit the land and learn about the Gunditjmara people.

GLOSSARY

Low lying areas: these areas are lower than the land that is around them.
Reserve: an area put aside by the government for Aboriginal people to live.
Mission: a place that is run by a church group where people usually get food and a place to live.
Channel: a kind of a long hole dug into the ground that helps water move from one place to another.
Weir: a weir is a dam, a pond where water is kept for a reason.
THE FIRST AQUACULTURE IN AUSTRALIA

Across clues
2. Something used to catch eels. (4)
5. Somebody who learns about history, the things that happened in the past. (9)
8. The farming of animals and plants that grow in the water. (11)
10. The name of the wars fought so the Gunditjmara people could keep their land. (9)

Down clues
1. The name of the first Australians to use aquaculture. (11)
3. An area put aside by the government for Aboriginal people to live. (7)
4. A kind of long hole dug into the ground that helps water move from one place to another. (7)
6. The huts of the Gunditjmara were made of this. (5)
7. The Australian state where aquaculture was first practiced. (8)
9. A dam or pond where water is kept for a reason. (4)
In Australia today, most of the animals and plants grown using aquaculture are sold, either in Australia or overseas. When we sell seafood overseas, it is called **exporting** seafood.

While there are many types of plants and animals grown by aquaculture in Australia, there are five main types that sell the most. These are pearls, oysters, Atlantic salmon, prawns and Southern Bluefin Tuna. Most Australian aquaculture is located in the ocean.

Australians eat more seafood than they catch or grow, so at the moment, we buy a lot of seafood from other countries. This is called **importing** food. Hopefully in the future we can grow more seafood in Australia using aquaculture.

Today, about one third of all the seafood in Australia comes from aquaculture. In 20 years, this will probably increase to one half! As other countries such as China become wealthier, they will probably want to buy more of the things we make using aquaculture. This will be good for Australia.

### Where our seafood comes from

**Today (2010)**
- Fishing: 70%
- Aquaculture: 30%

**In 20 years (2030)**
- Fishing: 30%
- Aquaculture: 70%

**Think/Pair/Share:**
Why do you think it is good for Australia to export more food than we import?

### SOLVING THE PROBLEM OF FISHY NAMES

As different seafood types are known by many different names, buying seafood can be very confusing. For example, the blue-eye trevalla is commonly known as a blue-eye cod, but that is not its real name. It is easy to see how there can be cases of mistaken identity!

When seafood is being sold, shops need to use the same names for the fish so that people know which fish they are buying. Approved fish names have been decided on so that everyone calls the same kind of fish by the same name. This prevents confusion. When you see this symbol, it means that approved fish names are being used.

### GLOSSARY

**Exporting**: selling and sending things to a buyer in another country.

**Importing**: buying things from another country, which are sent here.
Which Australian state is making the most and how is this changing over time?

**Aquaculture production (in tonnes), by state 1995-2002**

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<thead>
<tr>
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<tbody>
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<td>2 279</td>
<td>2 617</td>
<td>3 317</td>
<td>3 350</td>
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<td>8 260</td>
<td>10 314</td>
<td>12 052</td>
<td>12 509</td>
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<td>Tasmania</td>
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<td>11 447</td>
<td>10 785</td>
<td>13 625</td>
<td>13 639</td>
<td>15 211</td>
<td>16 697</td>
</tr>
</tbody>
</table>

Information about the Northern Territory and the ACT were not available.

Taken from “Australian aquaculture: industry profiles for selected species”, www.environment.gov.au/soe

**GRAPHING ACTIVITY**

1. The table above shows you how many tonnes of animals and plants were grown in the different states of Australia using aquaculture from 1995 to 2002. Using graph paper, make a line graph using the information from the Aquaculture production table.

2. Once you have made your graph, answer the following questions:
   - Which state produced the most in 1998-1999?
   - Which state had the biggest change in the number of tonnes they made from 1995 until 2002?
   - Which state produced the most tonnes overall from 1995 until 2002?
4. AQUACULTURE FOR FOOD

As you might imagine, aquaculture farms are quite different in many ways to the agriculture farms you may be used to. For example, instead of lambs grazing on grass in a paddock, salmon graze on algae-rich food in a river or in a special aquaculture pond. The ideas are similar but the species and environment are different.

While sea-based aquaculture is done in the seas and oceans, relying on the power of the ocean to help do many of the important jobs such as keeping the water clean for the fish, land-based aquaculture on aquaculture farms relies on inland water, technology and workers to keep the farm running smoothly.

Aquaculture farms are very interesting places to work. There is usually a lot of work to do.

Who works in aquaculture?

FARM MANAGER
The farm manager has to make a lot of important decisions on the farm. The manager tells everyone else what they need to do to help on the farm. This may sound like fun, but if something goes wrong, the manager is in charge of fixing it.

FARM HANDS
These are also called technicians. They do lots of different things, such as feeding fish, cleaning, checking the equipment and taking out the fish that are ready to sell.

DIVERS
Some farms need divers to keep the cages clean so that water can move through them to keep the fish healthy. On pearl farms, divers are also used to get the pearls when they are ready to be sold.

VETERINARIANS
The veterinarian, or vet, takes care of the health of the animals on the farm. For example, if the fish get sick, the vet will tell the farm hands which medicines they should give them to make them better.

Think/Pair/Share:
If you could choose one of these jobs, which job would you would like to do? Why?
Let’s take a closer look at how two of the best selling aquaculture foods, Atlantic salmon and oysters, wind up on our plates.

**ATLANTIC SALMON**

Atlantic salmon is a special kind of fish, because it spends part of its life in salty water and part of its life in fresh water. It is called an **anadromous** fish.

The most amazing thing about Atlantic salmon is that it can find its way back to the river where it was born, no matter how far away it travels! Scientists are still debating how this is possible, with some believing that salmon are able to remember a kind of chemical ‘fingerprint’ of their river which helps them to find it again. Others believe that salmon find their homes again by remembering the place on the Earth’s magnetic field. Either way, these are amazing fish!

Most Atlantic salmon farming is done in Tasmania. Atlantic salmon like it there because it is cold.

Generally, aquaculture grown salmon start their lives in a **hatchery**, in fresh water. At the hatchery there are **broodstock**, which are mother and father fish. The broodstock are squeezed by the farm hands, but first they are given an **anaesthetic** so that it doesn’t hurt them. Squeezing the fish gets the eggs out of the mother fish, and the milt out of the father fish. They are mixed together and then put into cold, fresh, shallow running water. It’s like following a recipe for baby fish!

The eggs hatch and out come tiny little salmon with the yolks of their eggs still attached to them. These are called **alevins**. Alevins don’t need to find their food as the yolk gives them all the energy that they need to continue growing. The yolk is like a backpack full of food.

Once the yolk disappears they become **fry**. Fry are tiny fish and for the first time, they need to start to find their own food. When they reach about 6 inches in length they are known as **parr**.

The parr continue to grow until they begin to turn silver. At this stage they need to go and live in salty water. Once they reach this stage, which is called smolt, they are taken to the ocean. There they can grow, usually in big sea cages, until they are big enough for **harvesting**.

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**GLOSSARY**

- **alevins**: young fish that feed off the yolk from their egg
- **anadromous**: fish that move from the sea to fresh water to lay their eggs
- **anaesthetic**: medicine that takes away pain.
- **broodstock**: the parent fish
- **fry**: newly hatched or born fish
- **harvesting**: when seafood is collected to be sold.
- **hatchery**: a hatchery is where baby fish and other sea animals are grown.
- **parr**: young fish
Have you ever eaten an oyster? Oysters have a unique flavour and texture. Australian oysters are considered to be some of the best in the world.

Tasmania, New South Wales and South Australia grow the most oysters. Three main kinds of oysters are grown; they are Sydney Rock Oysters, Pacific Oysters and Native Oysters.

We will take a closer look at how oysters are farmed.

Strange transformers!

The weirdest thing about oysters is that they are born as boys and then turn into girls. Aquaculture of oysters starts on the land in a hatchery. Oysters begin life as an egg which then hatches. A larva comes out of the egg and it floats around for about 3 weeks.

Then it is time for the larvae to start growing up. If it wants to turn into an oyster, it has to find something to stick itself to and then change into spat. Once oysters are ready to change into spat, they get taken to a place by the ocean called a nursery.

In a human nursery, babies are kept safe and comfortable and are given milk to drink. An oyster nursery is similar because it has food for the growing oysters and it gives the oysters plenty of racks, cages, baskets, trays or lines to hold onto while they are growing so that they feel safe and secure. They are like the oyster’s cot!

Oysters are filter feeders which means they suck in tiny bits of food from the water around them. The oysters stay in one spot, eating and growing, until they are ready to be sold. When oysters or other seafood are collected to be sold, it is called harvesting. It’s a pretty easy life, being an oyster!

GLOSSARY

larva: a young form of fish, amphibian, or invertebrate (small animals without a backbone)
spat: a stage of growth for most shellfish
1. Life cycles

On a piece of poster paper, draw the life cycle of an Atlantic salmon or an oyster. Draw each stage and label it.

2. Project

- In pairs, choose another plant or animal grown by aquaculture in Australia.
- Write a list of questions you would like to find out about the plant or animal.
- Use the resources given to you by your teacher, the library, and the internet to find out information about your plant or animal.
- Talk to the class about what you have found out.
WHERE TO GROW YOUR SEAFOOD

Seafood in Australia is usually grown in raceways, cages, ponds, tanks, ropes, rafts or racks.

Raceways

Raceways sound like fun places for fish to go to have races against each other! It is possible that the fish do race each other while we are not looking, but the main purpose of raceways is so that many fish can live together in a small area and stay healthy.

Raceways are also known as ‘flow through’ systems because water moves through them quickly carrying the fish poo away from the fish. Fish poo is called waste. It also means the water has a lot of oxygen in it, because when the water moves quickly it captures a lot of oxygen.

Cages

If you put fish into the ocean, rivers or estuaries, they will probably swim away. They certainly won’t wait in one spot, waiting for you to come back and harvest them.

To grow fish in the ocean you need to keep them in cages. The cages have room in them for fish to swim around and it is easy to make sure they get enough food to eat. The movement of the water in the oceans (tidal movement) takes away the waste, keeping the water nice and clean for the fish. The cages are attached to the sea floor so that they don’t float away, even in storms.

Ponds

Most of the world’s aquaculture is done in ponds. Seafood can either be grown directly in the pond or in a cage in the pond. Ponds need to be near a water supply that is available all year round. As the water does not move like a raceway, there needs to be a way to drain away some of the old water and replace it with fresh water on a regular basis to keep the pond clean for the fish.

Tanks

Tanks are usually made of plastic or fiberglass. They are often used in hatcheries. The water is pumped through filters to keep it clean. Filters take the waste out of the water.

Think/Pair/Share:

Why do you think it is a good thing for the fish poo to be taken away from the fish?
Ropes

Ropes are used for growing mussels. Mussel spat attach to the ropes and if they fall off they can easily attach themselves again.

Racks/rafts (stick and tray)

Growing oysters on racks is one of the oldest and most popular ways of growing oysters. Oyster spat attach themselves to sticks placed on racks. The racks are set up in areas where the tides go out and in. When the tide comes in they are covered by water, and when the tide goes out, they are not covered by water anymore. The oysters like this.

Once the young oysters are stuck to the sticks, the sticks are taken further up the river so that the oysters can grow. They stay there for two to four years before they are harvested.

QUESTIONS

1. Which is the best way to grow mussels?
2. In your own words, what is a raceway?
3. What are tanks usually made of?
4. What is the oldest way to grow oysters?
5. Why do ponds need to be near a water supply that is available all year round?
SUPPLY CHAIN

Aquaculture grown fish travel a long way in their lives. We will now look at how a trout gets from the hatchery to the plate. This is called a supply chain. There might be some differences in the supply chains of different seafood companies. This is one example.

1. The trout begins its life in a hatchery.

2. The trout is moved from the hatchery to the indoor nursery once it gets bigger. If the nursery is not at the same place as the hatchery, the trout is usually driven there in a big truck in a large tank full of water.

3. Once it has grown a little bigger, the trout is taken outside into a raceway. There it grows until it becomes big and strong enough to be moved to sea cages.

4. The trout grows in the sea cage for a year or two. Once it is big enough to harvest, it is taken away for processing.

5. Processing the fish usually has several stages.
   • Fish are graded. This is similar to the mark your teacher gives you for your school work. The fish are given a mark in order of best to worst based on their appearance and quality.
   • Fish are gilled and gutted. This means that their gills and insides are taken away.
   • Fish are packed and then taken away for sale. If they will not be sold fresh they are frozen while they are still fresh.

6. The trout is either put into storage, where it waits to be sold, or it is taken directly to shops or markets where it can be sold to you!

Can you remember the order of the supply chain? Close your workbook and try to list each of the steps!
Seafood contains many different types of nutrients which are good for us. These nutrients can help us to grow and be strong and healthy.

### Nutrients

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>What does it do for you?</th>
<th>Where can I get it?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Protein</strong></td>
<td>This helps to keep the body strong. Seafood is strength food.</td>
<td>Most seafood is rich in protein.</td>
</tr>
<tr>
<td><strong>Vitamin D</strong></td>
<td>Vitamin D acts to protect the body’s immunity, which is its protection against sickness. It also helps to make your muscles and strong bones.</td>
<td>Oily fish such as Australian salmon, Atlantic salmon and tuna are good sources of vitamin D.</td>
</tr>
<tr>
<td><strong>Zinc</strong></td>
<td>This important nutrient helps you to heal when you hurt yourself. It is also important for immunity. Zinc can also stop you from losing your sight as you get older.</td>
<td>Oysters are the best source of zinc, however many other shellfish are also good sources. Squid is also a good source for children.</td>
</tr>
<tr>
<td><strong>Omega-3 fatty acids</strong></td>
<td>Not all fats are unhealthy! Omega-3 fatty acids are good fats that are essential to keep you healthy. Seafood is known as brain food because the omega-3s in seafood help your brain to grow. Scientists even think eating fish may help you to concentrate, making you smarter at school. It is also important for keeping your heart, eyes, nerves and blood healthy.</td>
<td>The richest sources of omega-3s are oily fish such as sardines, rainbow trout, Atlantic salmon, tuna, herring and mackerel, though there are some omega-3s in most seafood, including shellfish.</td>
</tr>
<tr>
<td><strong>Iron</strong></td>
<td>Iron helps to give you energy and immunity.</td>
<td>Shellfish such as mussels and oysters are good sources of iron.</td>
</tr>
<tr>
<td><strong>Vitamins A &amp; E</strong></td>
<td>Vitamins A &amp; E are powerful antioxidants. They boost your immunity and can help you to see in the dark!</td>
<td>Most fish and shellfish contain vitamin A. Mussels are the richest seafood source of vitamin A. Atlantic salmon and sardines are good sources of vitamin E.</td>
</tr>
<tr>
<td><strong>Calcium</strong></td>
<td>Fish are a great source of calcium, which makes teeth and bones strong. Eating fish now can help protect your teeth and bones as you get older.</td>
<td>Bony fish such as sardines and Australian salmon are good sources of calcium.</td>
</tr>
<tr>
<td><strong>Iodine</strong></td>
<td>You need iodine to grow properly. It also helps to keep your body at a healthy weight and is good for your brain.</td>
<td>Seafood is the best natural source of iodine.</td>
</tr>
</tbody>
</table>
IS SEAFOOD GROWN THROUGH AQUACULTURE AS HEALTHY AS WILD SEAFOOD?

Have you heard the saying, you are what you eat? It is true for seafood as well as people. How healthy seafood is depends mostly on what it eats.

In aquaculture, people have a lot of control over what the seafood eats. In Australia, when fish are grown using aquaculture, they are usually given food that is rich in healthy oil, omega-3 fatty acids. This means that the fish grown by aquaculture often have more omega-3 fatty acids than fish caught from the wild.

Also, the water that Australian aquaculture seafood is grown in is tested often to make sure that the seafood is as healthy as possible. The owners of the farms are careful to protect their animals from pollution.

OUR CLASS SEAFOOD RECIPE BOOK

There are a lot of healthy ways to enjoy seafood.

As a class, make a list of all the different kinds of meals you eat at home that have seafood in them.

For homework, ask Mum, Dad or your carer to tell you how to make your favourite seafood dish. Write it down.

Draw your favourite seafood recipe to be the cover page of your recipe book. Once your teacher has checked your recipes, they will be copied to make the Class Seafood Recipe Book.
SEAFood IS Good Food!

Are you a seafood super sleuth?

Word bank:

<table>
<thead>
<tr>
<th>Protein</th>
<th>Brain</th>
<th>Strong</th>
<th>Vitamins</th>
<th>Shellfish</th>
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</thead>
<tbody>
<tr>
<td>Bones</td>
<td>Calcium</td>
<td>Nerves</td>
<td>Immunity</td>
<td>Seafood</td>
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<td>Blood</td>
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<td>Muscles</td>
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<td>Fatty acids</td>
<td>Oily fish</td>
<td>Smarter</td>
<td>Iodine</td>
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V M O I O S R O S F O E I H C O N S R E M B V V N
Y Y B R U S O L D E T F E T I E Y C I E D A I H E
E T V L C N O D B S O I D O S I H S N E N T E E L
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E F E S C N R R M E I O R B R B S E N U N O C D H
T Y E C L S S I A N F T I S E V B E T L U E O M E
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M M H Y S N E A H I O U T I N A H I N O I I L U S F
Create a seafood health poster or jingle

After looking at adverts and products in the classroom, think about how you would encourage children your age to eat more seafood. Think about:

• What nutrients are in seafood? You may wish to choose one specific nutrient to focus on, or talk about all or some of them.
• What is your key message?
• How will you make your poster look good? Or if you are doing a jingle, can you think of a catchy tune? How will you catch the attention of other children your age?
• Make a draft of your poster or your lyrics in pencil first.
• Make the good copy of the poster or record your jingle.

You can display the finished posters around the school or sing your song over the PA system!

ANALYSE AN ADVERTISEMENT OR HEALTH RESOURCE

There are a lot of advertisements on the television and in newspapers and magazines about food. Some of these talk about the vitamins and nutrients that are in the food. This makes the food sound healthy.

1. Bring in an advertisement that you have cut out from a magazine or newspaper or an item of packaging from home that talks about how a kind of food is healthy. One easy example is your cereal box.

2. Think, pair, share about how the health message is shown in the advert or on the product.
   • What is the product?
   • How does it say it can help you to stay healthy? Do you believe this is true? Why/why not?
   • Does the product or advert catch your attention? Why/why not?

PLAY ONLINE!

Now that you have learned about the health benefits of seafood, head to the Kidzone to play the fishing game!
www.cessh.curtin.edu.au/kidzone
6. **Aquaculture to the Rescue!**

Aquaculture can do a lot to help to save one of our favourite finned friends, the clownfish!

Clownfish are so beautiful, they have even been the star of a major film. Do you know which one?

Many people want to keep clownfish as pets. As understanding of the problems with taking clownfish from the wild begin to be understood, clownfish raised through aquaculture are becoming more popular. Clownfish grown through aquaculture can help to keep the clownfish in the wild.

Clownfish are a popular marine fish. They are found all over the world, though most of them live in warm water. They like to live around a reef. Over time, clownfish have developed a relationship with a poisonous friend, the anemone.

Clownfish like to rub against an anemone. This helps them to make a slime that protects them, called mucus, like the snot that comes out of your nose. The poisonous stings of the anemone can hurt all the other fish, but the mucus protects the clownfish from harm.

Clownfish don’t like to go far away from their anemone. They feel safe there because of the protection that the anemone gives them.

All clownfish are born as boys. As they grow up, the stronger, bossier clownfish will turn into a girl. If the girl is taken away or dies, the next bossiest boy fish will turn into a girl!
HOW CAN AQUACULTURE HELP SAVE CLOWNFISH?

Many clownfish in aquariums in Australia come from the oceans of Indonesia and the Philippines. One problem with this is that there are fewer clownfish in nature. Another problem is the way they are taken is often very harmful for the fish and the reefs. The reef offers such a natural protection for fish, when someone comes they hide amongst the corals and anemones. This means that the divers need to use aggressive ways to push the fish out into the open.

Here are 3 ways of taking clownfish from their homes:

**POISON**

Divers squirt a poison such as cyanide all over the reef. The fish get poisoned and float up to the surface, out of the holes where they were hiding. Fish are stunned and cannot move so it is easy for the divers to scoop them up in nets. The divers take them back to land and try to run sea water through the gills of the fish so that they don’t die. The fish are then usually packed and sent overseas. When they arrive, many of these fish die as a result of the poison and then the stress of transport and handling. The poison also kills the corals in the reef. While some fish may recover, the place where they used to live is destroyed.

**DYNAMITE**

As you might guess, dynamite and fish are not a good combination. The dynamite is used to destroy the reefs, the homes of the fish, so that they can be pulled out easily. The pressure of the explosion damages the internal organs of the fish. These stunned fish are easy to scoop up. Many of these fish die and the surviving fish are often damaged so their lives are shorter. This also destroys the reef, so any surviving fish left behind need to find new homes.

**NETTING**

This method is not as popular as poison and dynamite because it takes much longer. It is the safest method of taking fish, though nets can damage the skin of the fish and cause the fish to become tangled and trapped. Although netting is the least harmful method, it is usually used after poison or dynamite.
IF THESE METHODS ARE SO BAD FOR FISH AND THE REefs, WHY DO PEOPLE DO THEM?

In countries such as the Philippines, it is illegal, but some people do it anyway because they can make money. The World Wildlife Foundation is working in Indonesia and the Philippines to stop these fishing using dynamite and poison. The good news is that there has been some reduction in this kind of fishing in some areas of Indonesia. Hopefully the situation will continue to improve.

In the meantime, while people buy fish that are caught this way, fish may continue to be taken using dynamite and poison. If people understand how badly the fish are treated, maybe they will not want to buy clownfish collected from the wild. This could help to stop the use of dynamite and poison, and help to save the clownfish and the reefs.

It is much cheaper for pet shops to buy fish from the Philippines and Indonesia then from aquaculture growers in Australia. However, it makes more sense to buy the fish that have been grown using aquaculture.

Think/Pair/Share:
See if you can think of 5 good reasons to buy ornamental fish from aquaculture rather than the wild.

1. 
2. 
3. 
4. 
5. 
Here are 5 reasons that you could add to your list:

1. Fish born and raised in aquariums are used to eating food that comes from jars. Wild fish are used to specific kinds of food that may only be available in their old homes, the reefs. Wild fish often refuse to eat jar food or it may make them sick, and then they die.
2. Wild fish can bring diseases into your aquarium, whereas fish born and raised in aquariums have not had the chance to pick up different kinds of diseases.
3. Fish born and raised in aquariums have not had to go through the stress of being shipped in a bag from another country.
4. It is easy to find out how old your fish is if it has been born and raised in aquariums. Fish from the wild may be caught when they are very old, meaning they will live for a shorter time in your aquarium.
5. Buying fish born and raised in aquariums does not impact on ocean reefs.

To stop the destruction of the reefs, fish and coral, people need to know that it is happening. Who could you write to so the information can be shared?

1. Once you decide who you are going to write to, begin composing the draft of your letter.
2. When you have finished your draft, read it carefully.
3. Swap with a partner and check their letter while they check yours.
4. Write up a good copy.
5. Post your letter.
6. If you get a reply, bring it to the class to share.

To find out what is currently happening in this area, visit the World Wildlife Foundation at: www.panda.org
7. GROW FISH: AN EXPERIMENT

Raising healthy freshwater fish may seem easy, but to keep your fish healthy and help them to grow big and strong, you need to know many things. It is important to learn how to care for fish before you get one.

What you need to know

Your teacher will choose a fish for you to raise in pairs. Your job is to take care of the fish. Your teacher will tell you what kind of fish you will be growing.

This information is for caring for freshwater fish

If you are caring for marine fish (raised in the sea), you will need to prepare your tank at least two weeks before you get your fish and you will need a different set up. Marine fish are much harder to keep, so it is suggested that you first learn to care for freshwater fish.

Before the fish arrives, you will need to find out how to take care of the fish that you are getting. Learn about what your particular kind of fish needs.

YOU WILL NEED:
- A home for your fish. This might be a bowl, aquarium or pond.
- A fish net. You will need it to carefully take your fish out to be weighed in a cup. Your teacher will demonstrate the gentlest way to do this.
- A fish-only bucket. Soap kills fish, so you must be careful to keep this bucket separate from any cleaning buckets.
- Gravel for the bottom of your bowl or aquarium.
- Water conditioner.
- Food for the fish.
- A pH testing kit.
- An ammonia testing kit.
- A name for your fish!

YOU MIGHT NEED:
- A heater: Find out if your fish is from a warm climate. If it is, you will need a heater for your fish. You will need to find out what temperature your fish needs, and you will need a thermometer to check that the water stays at the right temperature.
- An air pump. If your fish breaks the surface to breathe you will not need an air pump. If you have a filter that moves the water, you will also not need an air pump.
- Plants. Goldfish dig up plants so if you are using a goldfish you will need to weigh down the plant with heavy rocks.
- A light. This will keep the plant alive.
- Filters help to keep the water clean for your fish. If you do not have a filter you will need to change the water more often. Do not change all of the water. This is not good for the fish as it takes away the good bacteria. Take out 25% of the water and replace it with conditioned tap water. Your teacher will show you how to condition the water.

Getting ready for your fish

The week before your fish arrives, you need to set up your tank or bowl. You will need to follow your teachers’ instructions carefully, making sure you don’t use any soap and that you use the right amount of water conditioner. Your teacher will show you how to test the pH and ammonia levels. It is very important that you remember how to do this properly. If the water that your fish lives in becomes dangerous for your fish, it can’t get out and walk away!
**TASKS**

**Moving in**
On day one of week one, put your new fish into its’ new home. Write down your observations; that is, how the fish looks and what you can see the fish doing.

**Think about:**
Does it look happy? Is it swimming calmly or jerking around the tank? Are the scales of the fish shiny? Are there any marks on the fish? How does the tail of the fish look? Write down everything you notice about the fish.

**Fish care log**
With your partner, keep a fish care log so that you can keep track of when and what you feed your fish. This is important as over-feeding your fish may harm it. You also need to make sure you do enough water changes and check the ammonia and pH and weigh your fish regularly.

Follow the teachers’ instructions on how to do the ammonia and pH testing, and weigh your fish. Keep a record of all of the things you do in the fish care log on the next page.

**To do list**
On the first day, your class will make a list of which things need to be done every day, and which things need to be done every week. Write them down in this table:

<table>
<thead>
<tr>
<th>Daily</th>
<th>Weekly</th>
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<tbody>
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**Weighing your fish**
You will need a clean jug, a set of scales and a net

1. Half-fill the jug with aquarium water.
2. Weigh the jug on the scales. Write down the weight. Leave the water in.
3. Carefully use the net to scoop the fish out of your aquarium or bowl. Gently place the fish into the jug taking great care not to hurt it.
4. Weigh the jug with the fish in it. Write down the weight.
5. Return the fish to the aquarium or bowl.
6. Take away the weight of the jug without the fish from the weight of the jug with the fish. This will tell you the weight of the fish.
PREDICTION: FOOD AND GROWTH
6-WEEK EXPERIMENT

Do not do this experiment until your fish has settled into its new home. Allow at least 2 weeks for settling in time.

Three kinds of food should be available for your fish. To find out if the different kinds of food change how your fish grows, you need to feed it only one kind of food for two weeks before changing to another kind.

Weeks 3-4
Flake food

Weeks 5-6
Pellet food

Weeks 7-8
Frozen food

Your teacher will show you the right amount to feed the fish and how to prepare it.

Stop and write: Which food do you think will be the best for your fish? Why?

Continue your observations. See if the different kinds of food make the fish look healthier. Your teacher will tell you what things to look for when checking the health of your fish.

Once the experiment is finished and you know which food is best for your fish, give your fish that kind of food.

Stop and write: Was your prediction right?

Class Fish Growth Over Time
Your fish should continue to grow over time. Once a week, for 8 weeks, you should weigh your fish on the same day at around the same time. You can add your measurement to a class graph to see how the fish grow over time. It doesn’t matter how big your fish is to start with, what is important is that it continues to grow over time. Be careful not to overfeed it though, or it may die.

Fish-keeping Interview
Imagine that you are a newspaper reporter; finding out about what your class has learned about growing fish.

- Write a list of questions you could ask to find out what another student has learned about caring for fish.
- Interview another student and write down their answers to your questions.
- Be interviewed by a student and answer all of their questions.
- Write your interview neatly for the class Fish Growers Magazine.
Now that you have finished your workbook, you should know a lot about aquaculture! You have helped to look after a little finned friend and have learned how to care for it in a tank or aquarium. You should also know what a supply chain is and just why seafood is so good for you.

If your teacher is pleased with how you have completed your workbook and is satisfied that you took the best possible care of your fish, you may receive the certificate below.
## RESOURCES

### State/Territory departments responsible for fisheries and aquaculture

<table>
<thead>
<tr>
<th>Department</th>
<th>State/territory</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSW Fisheries</td>
<td>New South Wales</td>
<td><a href="http://www.fisheries.nsw.gov.au">www.fisheries.nsw.gov.au</a></td>
</tr>
<tr>
<td>Primary Industries (formerly Natural Resources and Environment)</td>
<td>Victoria</td>
<td><a href="http://www.nre.vic.gov.au">www.nre.vic.gov.au</a></td>
</tr>
<tr>
<td>Department of Primary Industries</td>
<td>Queensland</td>
<td><a href="http://www.dpi.qld.gov.au/fishweb">www.dpi.qld.gov.au/fishweb</a></td>
</tr>
<tr>
<td>Department of Fisheries</td>
<td>Western Australia</td>
<td><a href="http://www.fish.wa.gov.au">www.fish.wa.gov.au</a></td>
</tr>
<tr>
<td>Primary Industries and Resources</td>
<td>South Australia</td>
<td><a href="http://www.pir.sa.gov.au">www.pir.sa.gov.au</a></td>
</tr>
<tr>
<td>Department of Primary Industries, Water and the Environment</td>
<td>Tasmania</td>
<td><a href="http://www.dpiwe.tas.gov.au">www.dpiwe.tas.gov.au</a></td>
</tr>
<tr>
<td>Inland Fisheries Service</td>
<td>Tasmania</td>
<td><a href="http://www.ifs.tas.gov.au">www.ifs.tas.gov.au</a></td>
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### Budj Bim and the Gunditjmara people


### Reefs at Risk

http://news.bbc.co.uk/2/hi/science/nature/6936634.stm


### Fish Names

www.fishnames.com.au