

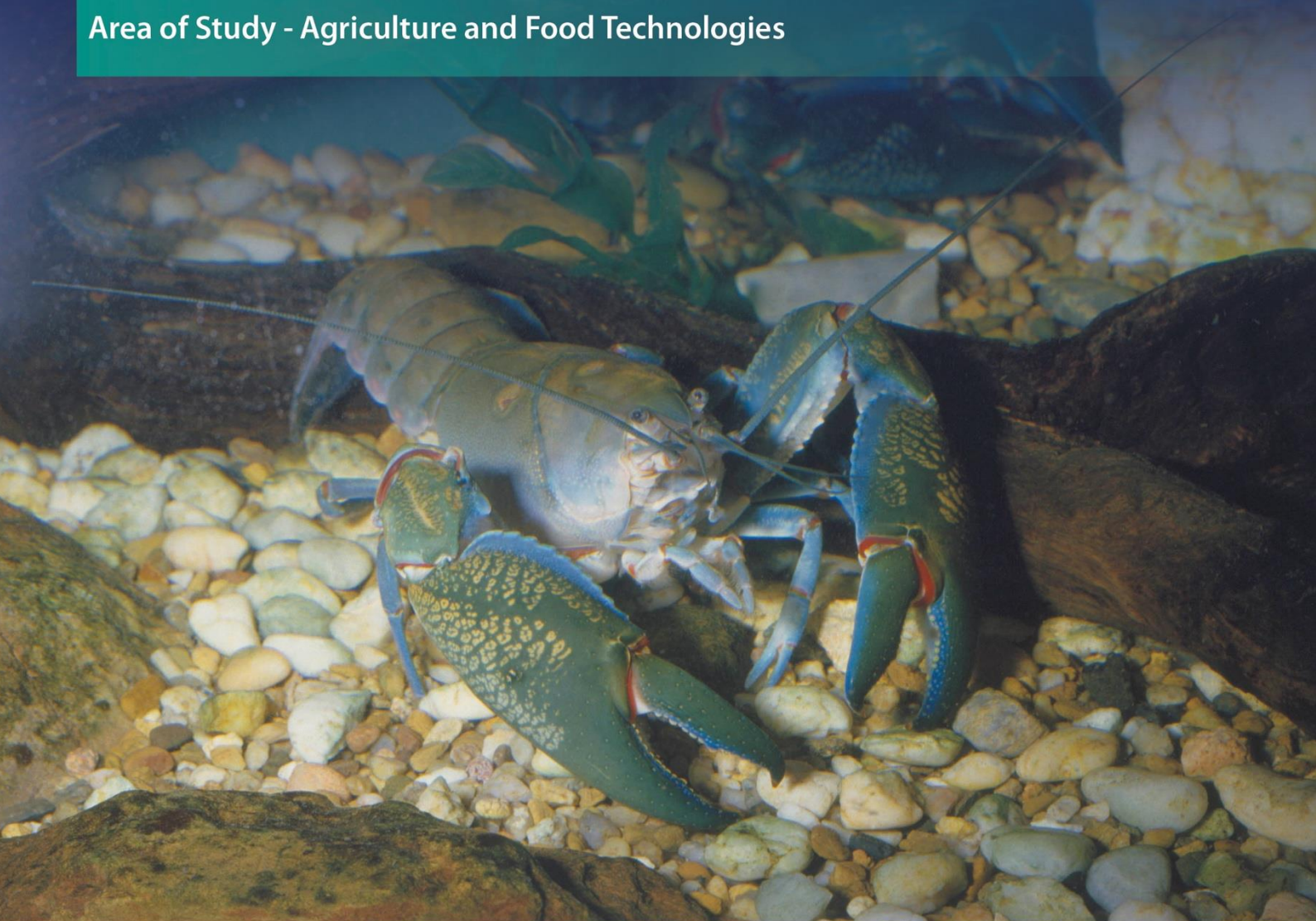


Department of
Primary Industries

The Yabby Unit

Technology Mandatory

Area of Study - Agriculture and Food Technologies



www.dpi.nsw.gov.au



Supporting document - Answer guide

NSW DPI Schools Program

Author: Meg Dunford (Project Officer School programs, NSW DPI Orange).

Editors and Advisors: Michelle Fifield (Education Officer Schools, NSW DPI Orange), Jo Hathway (Project Officer School programs, NSW DPI Tocal College) and David Brouwer (NSW DPI Tocal College).

Design: Romina Barbagallo (Communications officer, NSW DPI Orange).

Thank you to Rob McCormack from [Australian Aquatic Biological](#) for images and advice.

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The Yabby unit – Answer guide

Sample answers have been provided for learning activities where applicable. The following suggested answers should be used as a guide. It should be noted that these sample answers are suggested answers and not necessarily the very best answer, nor are they the only possible answers.

Aquaculture in Australia learning activities

- Define aquaculture.**
Farming of aquatic organisms, including fish, molluscs, crustaceans and aquatic plants.
- List the 7 plants and animals farmed for aquaculture from paragraph three. Use the internet to research an Australian example for each.**
Finfish (barramundi, trout, cod, yellowtail kingfish), crustaceans (prawns, yabbies, marron), molluscs (abalone, oysters, mussels), echinoderms (sea urchins, sea cucumbers), polychaetes (aquatic worms for food or bait e.g. bloodworms), as well as seaweeds (kelp) and other aquatic plants (plants for consumption or ornamental purposes e.g. water lillies).
- List four different uses for Australian aquaculture products.**
Four uses include human or stock consumption, chemical extraction, pharmaceuticals, jewellery and ornamental purposes.
- Identify three factors that determine which aquaculture system can be used.**
The type of system depends upon the physiological requirements of the species (for example space, water quality and nutrition), the site (for example offshore, estuarine or land-based) and operational criteria (for example proximity to transport, processing facilities and markets).
- For one of the factors above explain why it will determine the type of system. For example physical requirements of the species.**
Physiological requirements of the species. You could not grow a fresh water variety off shore because of water type, salt content and nutrient availability. The freshwater species could not survive in that environment.

Use the internet to investigate the Australian Aboriginal fish weirs and dams at Brewarrina in NSW to complete 6-13. (A helpful site to assist your investigation is [Brewarrina Aboriginal Fish Traps / Baiame's Ngunnhu](#))

- Identify the river system and Aboriginal name for the Brewarrina fish weirs.**
Brewarrina Fish Traps, also known as Baiame's Ngunnhu near the Barwon River, North-West NSW. They are found in a semi-arid area with a hot and dry climate.
- Identify the traditional custodians and engineers of the site.**
The traditional custodians of the fish traps are the Ngemba Wayilwan (or Wailwan) people. Nearby Aboriginal groups include the Baranbinja, Morowari, Kula, Naualko, Ualarai, Weilwan, Kamilaroi, Kamu and Paarkinji people. It has been estimated that the region supported a population of about 3,000 people prior to European settlement. Many Aboriginal people believe that the fish traps were designed and created by Baiame, a great ancestral being.
- How old are the fish traps?**
The exact age of the fish traps is currently unknown. However, they are estimated to be more than 40,000 years old.
- Summarise the creation or dreaming story behind the fish traps.**
The design of the traps is attributed to a creation story whereby Baiame reached the site where the Ngunnhu now stands during a time of drought. The Ngemba Wayilwan people were facing famine as Gurrungga (the deep waterhole at Brewarrina upstream of the rock bar) had completely dried up. Upon seeing their plight, Baiame conceived of a gift for the Ngemba Wayilwan. The gift was an intricate series of fish traps in the dry river bed. He designed the traps by casting his great net across the course of the river. Using the pattern of their father's net, Baiame's two sons Booma-ooma-nowi and Ghinda-inda-mui built the traps from stones. Baiame then showed the Ngemba Wayilwan men how to call the rain through dance and song. Days of rain followed, filling the river channel and flooding Baiame's net which filled with thousands of fish. The old men rushed to block the entry of the stone traps, herding fish through the pens. Baiame instructed the Ngemba Wayilwan people in how to use and maintain the Ngunnhu. Although they were to be the custodians of the fishery, Baiame declared that the maintenance and use of the traps should be

shared with other cultural groups in the area. People from all of the groups that came to use and rely upon the fish traps had deep feelings of gratitude to Baiame.

10. **Describe the design and size of the fish weirs.**

The fish traps are nearly half a kilometre long and consist of a complex series of dry-stone weirs and ponds arranged in the form of a stone net across the Barwon River. They occupy the entire length of a 400m-long bedrock outcrop that extends from bank to bank across the river bed. The trap system is the largest group recorded in Australia and are arranged in an unusual and innovative way that allowed fish to be herded and caught during both high and low river flows. The stone-walled pens, designed to withstand the high water flows of the Barwon River, are tear-drop shaped with the convex wall facing upstream. Some of the pen walls are higher than others enabling their use during both low and high water flows. This is combined with pond gates set at different locations enabling fish to be caught as they migrated both upstream and downstream. The structure of the fish traps demonstrates the development of an efficient method for catching fish involving a thorough understanding of dry stone wall construction techniques, river hydrology and fish ecology. The fish traps are an essential landmark in this Aboriginal community's sense of place.

11. **List the materials used to make the fish weirs.**

The traps are built from a combination of a large bedrock bar and local rocks forming rock walls, which manipulate seasonal river flows. The size (up to half a kilometre long), design and complexity of these fish traps are exceptional. The role of an ancestral being (Baiame) in creating built structures is also rare in Aboriginal society and adds to the significance of the fish traps.

12. **Explain how the fish weirs worked.**

Some of the pen walls are higher than others enabling their use during both low and high water flows. This is combined with pond gates which could be opened and blocked at different locations enabling fish to be caught as they migrated both upstream and downstream.

13. **Do you think the fish traps were effective? Explain your answer.**

Answers and justifications will vary. May discuss complexity, use of materials, ability for the fish traps to feed a population of approximately 3,000 people.

The value of aquaculture in NSW learning activities

1. **List the top 5 contributors to NSW Primary Industries GVP?**

The top 5 NSW industries are wheat, beef, horticulture, cotton and wool.

2. **According to Figure 2; how much did aquaculture contribute to NSW primary Industries; and what is its rank?**

Aquaculture contributes \$158 million to NSW economy and is ranked 16th.

3. **List the main two countries NSW imports aquaculture products from?**

Countries include any two of the following Thailand, New Zealand, Vietnam and China.

4. **Complete the table to list the five main export destinations and the value of product exported for NSW fisheries.**

Export Destinations	Export value
Vietnam	\$2.5 million
Japan	\$2.2 million
Taiwan	\$1.8 million
New Zealand	\$1.4 million
Thailand	\$1.1 million

Freshwater crayfish production learning activities

1. Use the internet and other sources to research one of the three freshwater crayfish species commercially produced in Australia. For your chosen species include the following:

The following links direct you to fact sheets which provide information for the activities.

- [Yabbie crayfish \(*Cherax destructor*\)](#)
- [Redclaw Crayfish Aquaculture](#)
- [Fisheries Fact Sheet- Marron](#)

Unfortunately many Australian crayfish species are threatened by habitat loss and invasive species.

2. Use the internet and other sources to investigate a native freshwater crayfish species not farmed. For your chosen species investigate and provide:

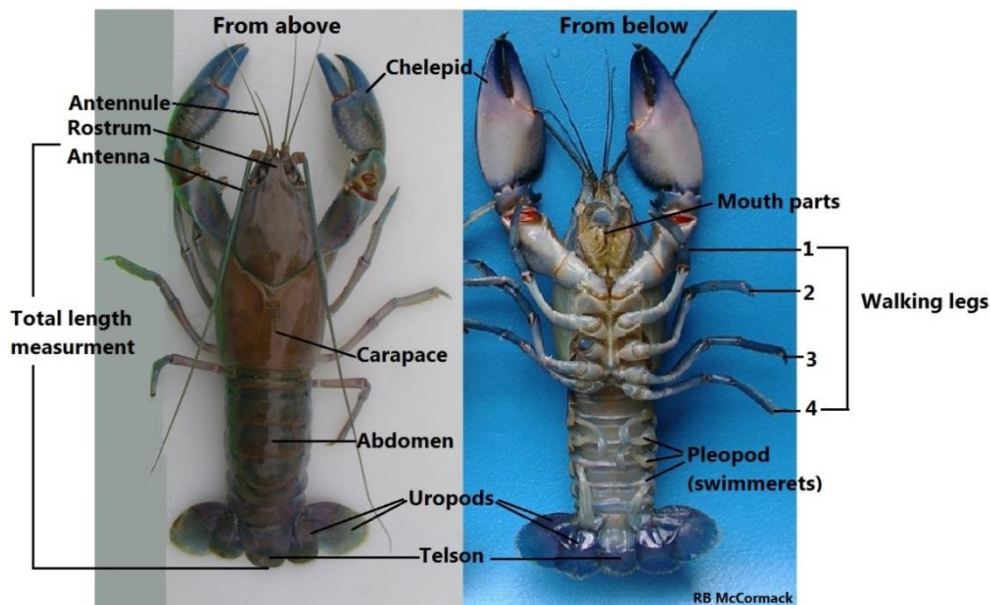
- An image of the species
- A physical description of the species
- A map or description of the distribution of the species
- A description of the natural habitat
- A list of reasons why the species is threatened or endangered
- A description of how we can conserve this species

The following links direct you to fact sheets which provide information that could be used for the activities.

- [The Tasmanian Giant Lobster \(*Astacopsis gouldi*\)](#)
- [Australian endangered species: Hairy Marron](#)
- [Australian endangered species: Leckie's Crayfish](#)
- [Australian endangered species: Spiny Crayfish \(Murray crayfish\)](#)
- [*Engaewa pseudoreducta* —Margaret River Burrowing Crayfish](#)

Observe the parts of a freshwater crayfish practical

1. Label the crayfish in Figure 10 using the Glossary terms from this worksheet.



Develop a calendar of operations for yabby management

Develop a calendar of operations for yabby management by filling out the management operations into the table.

Specific management operations which must be included are:

- Summer feeding and frequency
- Winter feeding and frequency
- Yabby joining
- Juvenile separation from adults
- Breeding season (when you would expect juveniles and berried females)
- Harvesting of yabbies

Season	Time of Year	Management Operation
Summer	January	<ul style="list-style-type: none"> • Feed yabbies twice a week • Joining male and females combined • Breeding season- remove juveniles and care for berried females • Harvesting
	February	<ul style="list-style-type: none"> • Feed yabbies twice a week • Joining male and females combined • Breeding season- remove juveniles and care for berried females • Harvesting
Autumn	March	<ul style="list-style-type: none"> • Feed yabbies once a week • Joining male and females combined • Breeding season- remove juveniles and care for berried females • Harvesting
	April	<ul style="list-style-type: none"> • Feed yabbies once a week • Breeding season- remove juveniles and care for berried females
	May	<ul style="list-style-type: none"> • Feed yabbies once a week • Breeding season- remove juveniles
Winter	June	<ul style="list-style-type: none"> • Feed yabbies once a fortnight
	July	<ul style="list-style-type: none"> • Feed yabbies once a fortnight
	August	<ul style="list-style-type: none"> • Feed yabbies once a fortnight
Spring	September	<ul style="list-style-type: none"> • Feed yabbies once a week • Joining introduce males to females for reproduction if they are kept separately
	October	<ul style="list-style-type: none"> • Feed yabbies once a week • Joining male and females combined • Breeding season- remove juveniles and care for berried females
	November	<ul style="list-style-type: none"> • Feed yabbies once a week • Joining male and females combined • Breeding season- remove juveniles and care for berried females

		<ul style="list-style-type: none"> • Harvesting
Summer	December	<ul style="list-style-type: none"> • Feed yabbies twice a week • Joining male and females combined • Breeding season- remove juveniles and care for berried females • Harvesting

Regulation and welfare

Follow the link to the NSW Department of Primary Industries [Starting up in Aquaculture](#) page. Investigate the page to complete the activities

- List 5 responsibilities a NSW aquaculture producer must carry out to hold a NSW aquaculture permit.**

 - It is an aquaculture permit holder's responsibility to be aware of their obligations under the Fisheries Management Act 1994 (the Act) and the Fisheries Management (Aquaculture) Regulation 2012 (the Regulation) to protect the environment and to manage the aquaculture industry.
 - The permit gives the holder the authority to take fish of the species authorised by the permit.
 - Aquaculture is prohibited except in accordance with a permit.
 - Permit holders must notify the department if they suspect the presence of a declared disease.
 - Permit holders must notify the department if they suspect a noxious fish or marine vegetation incursion.
 - Permit holders must not release, sell or be in possession of noxious fish or marine vegetation unless authorised by their aquaculture permit.
 - Permit holders are not authorised to release into any waters any live fish except under the authority of a permit issued by the Minister. This means that you are only authorised to stock the species listed on your permit onto your aquaculture farm or lease area.
 - A lease area must be kept in a tidy condition as a condition of an aquaculture permit.
- Use research to explain the ethical issues why farmed yabbies (*Cherax destructor*) cannot be released into native waterways.**

The common yabby *Cherax destructor* is especially hardy and can survive in a range of environments and habitats. They are very territorial, breed quickly and out-compete existing indigenous species in waterways. Farmed yabbies released into natural water systems act as invasive species and are ecological threats which potentially could wipe out indigenous crayfish species. This has been seen in Western Australia.

Aquaculture production of yabbies

1. **Successful farming means getting the maximum return for your investment.**
2. **What percent of farm dams produce yabbies in WA.**
Less than 15% of the 90,000 farm dams in WA.
3. **Western Australia is the leading producer of farmed yabbies in Australia, and demand for yabbies is increasing steadily.**
4. **What 3 things do you need to have to start up a yabby farm?**
 - A dam with high quality water
 - Juvenile of breeding yabbies to stock the dam
 - A food source such as second grade grain and old straw or hay

5. **What are the weights for the five market sizes of yabbies?**
 - 30-40 gram
 - 40-50 gram
 - 50-70 gram
 - 70-90gram
 - 90+ gram
6. **What sizes of yabbies does the market prefer?**
The market or consumers prefer larger sized yabbies in the market grades: 50-70 gram; 70-90 gram and 90+ gram grades.
7. **List physical characteristics that indicate poor quality yabbies:**
 - Heavily stained yabbies
 - Yabbies with 'stumps' or missing limbs and claws from fighting or predation
 - Low yield of tail meat
 - Tail blisters
8. **Explain why clear water is not essential for yabby production.**
Turbid or muddy water provides yabbies shelter from predation. Clear water does not provide protection.
9. **List the three conditions yabbies don't like:**
 - Clear water
 - Black tannin water (water that has a blackish colour and is very acidic. It is black in colour because it contains tannins from vegetable matter that has decayed)
 - Dams with salinity higher than six thousand parts per million.
 - Acidic dams with a low pH less than 6.0
 - Dams containing chemicals. Such as dams used for watering recently drenched stock
 - Dams containing predators, for example turtles and fish
10. **What times of year will yabbies reproduce?**
Yabbies will reproduce in WA between spring and summer. Through these times you will find females 'in berry'.
11. **What feedstock is recommended to feed yabbies?**
Detritus (organic waste) and grains including second grade lupins, barley, oats, wheat or old Lucerne hay.
12. **How can you tell that yabbies are being underfed?**
When putting out traps to monitor and check yabby health, you will find a huge amount of yabbies in the traps with no left over bait. You will also observe yabby shells from yabbies having cannibalised each other.
13. **List things to avoid when feeding yabbies:**
 - Don't over feed yabbies in low stocked dams or in dams which are polluted by nutrients from paddock run-off. Over feeding deteriorates water quality and increases the chance of problems associated with parasite and disease.
 - Do not feed meat- it spoils the water and can contaminate the eating quality and flavour of the yabbies.
 - Do not give yabbies feed contaminated with chemicals, especially insecticides as yabbies are extremely sensitive to toxins. Also, be aware of spray drift from chemicals being used on nearby crops. It is best practice to harvest yabbies before and crop spraying is carried out.
 - Closely monitor water quality for temperature, oxygen levels.
14. **In Western Australia, how often should you harvest yabbies?**
Harvesting should be carried out every four to six weeks from October to May.
15. **Once the yabbies have been removed from their nets explain how they should be stored in preparation for transport?**
 - Yabbies must be rinsed in clean water to rinse their gills from bacteria and microbes in the dam's mud and sediment.
 - Yabbies must be kept cool with an ice pack and wet cloth and handled with low stress techniques at all times.
 - Yabbies should be handled gently so that they are not bruised, damaged or stressed.
 - Grading should occur immediately to remove large yabbies from smaller yabbies.
 - Never pack yabbies upside down and always separate yabbies so they have adequate space.

16. **List some of the factors that will result with a harvested yabby being returned back to the dam.**

Soft shelled or a small juvenile yabbies should be returned to the dam immediately. Soft shelled yabbies have just moulted. Yabbies that have recently moulted their exoskeleton will not survive to the processor. Small juveniles will not meet market grades so need to continue growing.

17. **Explain why you cannot introduce any yabbies into streams, rivers and waterways?**

You should never introduce farmed yabbies or bait into streams, rivers and waterways because farmed yabbies or bait can carry pest and diseases which are biosecurity threats. By not introducing farmed yabbies into a waterway you are minimising the potential to introduce pests and diseases that will negatively impact native crayfish and other aquatic species already present in the waterways.

This will also minimise the risk of introduced yabbies negatively impacting or possibly destroying native populations through predation and competition for resources.

18. **Name and explain three areas that research has identified as important factors to increase yabby production.**

- Gill washing to reduce bacteria content and increase the quality of the yabbies for consumption
- Density reduction to reduce cannibalism and allow yabbies to better access feed available
- Mono-sex. This involves growing out yabbies only of the same sex in dams which increases production yield and profits
- Feed quality. Only feed vegetable material including hay, and cereal grains
- Feed rate. Do not over feed yabbies because it can reduce water quality and increase the chances of pest and disease burdens and spread.