

**HOLLOWAYS BEACH  
ENVIRONMENTAL EDUCATION CENTRE**



***AQUARIUM  
Standard Operating Procedures***



# AQUARIUM STANDARD OPERATING PROCEDURE

## AIMS

- Identify some of the local animals likely to be studied in the subsequent boating activity.
- Identify the adaptations in local animals that enable them to survive in this specialised environment.
- Handle animals carefully with respect to the safety of the animal and the handler.
- Deliver aquarium program by theme e.g. ADAPTATIONS or LIFE CYCLES for Year 5, SUSTAINABILITY for Year 6, CLASSIFICATIONS for Year 7 or theme to be prep for boating day.

## MANAGEMENT

The aquarium will be conducted by the HBEEC Centre teachers with support from the visiting teachers.

## EQUIPMENT

- Fish Info Cards
- Microscope
- Samples for microscope
- Fish food

## BACKGROUND INFORMATION

Holloways Beach has a unique aquarium area with many different species displayed including salt water, freshwater, reef and estuarine varieties of fish, echinoderms, crustaceans and reptiles. The staff can adapt sessions to the learning outcomes specified.

## AQUARIUM SESSION SOP - 1 to 1 1/2 hours

1. Choice of theme - if not chosen by school/group, then do ADAPTATIONS or LIFE CYCLES for Year 5, SUSTAINABILITY for Year 6. Default theme to be prep for boating day
2. Students to prep for session by washing arms and hands to elbows with soap, followed by thorough rinse.
3. Students to be guided through the hazards and safety conditions in the aquarium.  
No running, touching tanks, putting hands in.
4. The outline of mini sessions, and expectations of students feedback at end based on themes.  
Mini 1 - Students given card with photo and text - they have to find the organism and learn 1 fact about it. Do as many as possible in the 10 minute time frame. This allows students to explore the whole area and satisfy curiosity so the second session can focus on the selected organisms.  
Mini 2 - Tour of selected tanks. Start with Barra feeding and focus on the theme using the barra. Include as minimum - croc, blackbreem, toadfish, seastar, mullet, clown fish/anemone, sea cucumber, stonefish, tilapia, barcoo grunter, striped butterflyfish. Give students the chance to recall the fact from Mini 1 cards, or give input if they have prior knowledge.  
Mini 3 - Touch tank and videomicroscope. Demonstrate the use of the microscope first - use decorator sea urchin if available. Other specimens may include aquatic moss, brine shrimp, dead urchin shell, butterfly wing, crab leg. 2 or 3 students to use this at the one time; others will be around the touch tank. Touch tank rules - emphasise the importance of not hurting the animals. Keep low, wet and hold flat in hand.
5. Quick question and feedback "new" things learnt - 2 on sustainability, 2 on adaptations.

# Appendix One

## AQUARIUM FOCUS TOPICS

Listed below are 10 topics of choice for teachers and students for this activity. Teachers are also welcome to choose other focus areas to those mentioned in this document, or choose the activity as a general engager. A vocab list is provided for this activity for previsit use. A quiz is available on I pads if an assessment of the activity's adaptation topic is required.

- 1. Boating Day.** Recognition and knowledge of commonly encountered animals for /from the boating day
- 2. Adaptations.** Look at each animal in terms of its structural, physiological and behavioural features. A worksheet is available if wanted for assessment.
- 3. Classification.** The different groups and phyla of animals can be investigated to whatever level required by the class. A worksheet is available if required.
- 4. Food Chains and Webs.** Similar to 2, feeding mechanisms and adaptations linked to the animal's estuary/reef habitat. Human impacts to be discussed e.g. introduction of exotic species, reduction in habitat.
- 5. Aquarium Maintenance and Ethics.** Individual specimen's requirements for maximum health and welfare e.g. water quality, space, food etc. Discussion on display for educational purposes, breeding, hobby and plus/minus analysis
- 6. Life Cycles.** Have at least one display set up for breeding purposes e.g. red claw, rainbow fish. Others discussed or displayed eg mud crab life cycle.
- 7. Sustainability.** Focus on specimens that are a threat to natural systems e.g. Tilapia, Salvinia, and those that can be farmed (barra, perch, redclaw) to reduce pressure on natural stocks and resource demand. Link to Aquaponics, Organic Garden. Include regulations, closed seasons etc. used to try to maintain stocks in wild.
- 8. Relationships.** Have a range of types of animal relationships from beneficial such as symbiosis (corals), mutualism (anemone), commensal (hermit crab), through to harmful parasitic ones (mud crab abdomen (Sacculina).
- 9. Sustainable Fishing.** Have target species (mangrove jack, barra, whiting, bream) and their food sources, observe feeding behaviour. Discuss habitat, regulations, closed seasons
- 10. Biodiversity.** Have a range of as many animal groups as possible including protozoa and microscopic ones and work way through from simple to more complex/specialised animals.

## Appendix Two

### VOCAB LIST AQUARIUM ACTIVITY

Species- a group of living things that typically are very similar in form and function, and can breed to produce fertile offspring

Fish Life Cycle- the stages a fish goes through from birth to reproduction

Salinity- the amount of salts in water (none in pure fresh water, about 36 parts per thousand in sea water)

Fish fin names- dorsal (top), pectoral (side), ventral (beneath before anus), anal (behind anus), caudal (tail)

Sustainable fishing- taking of the fish stocks in a way that ensures the future population is not depleted.

Water Quality- measurement of certain properties of water that determine its ability to support living things.

Introduced/Native Pest Organisms- animals/plants that have a harmful effect on others, by upsetting the "natural" balance

Adaptation- Structural (body shape and features), Physiological (internal or chemical changes), Behavioural (movement, displays etc.)

Aquaponics- a system used to grow both aquatic animals and food plants using recycled nutrients

Crustacean- animals that share these features- hardened outer skeleton, jointed legs, two pairs of antennae, body usually in three sections, first two often fused

Filter- a part of an aquarium that cleans the water by trapping dirt and removing toxic nutrients

Respiration- a chemical process by which both plants and animals obtain energy to live, requiring oxygen and producing carbon dioxide.

## Appendix Three

### AQUARIUM ANIMAL FILES



#### **BLUE TANG**

Easily identified by bright blue and black on head and body, with yellow caudal (tail) fin. Lives near branching corals such as Acropora (Staghorn), feeds on zooplankton and algae. Grows to 30cm.

Other names – **“Dory”,  
Palette Surgeon Fish**



#### **DAMSEL FISH**

Small, brightly coloured fish very common around coral reefs. Although found in large numbers they are usually broken up into small groups. The male can be quite aggressive to protect its territory in breeding season. They may swim out and bite divers.



#### **SPOTTED BLUE EYE**

Small freshwater fish, males yellow sides with fins and body covered in black spots, female silver. Very scattered distribution, rare in parts, found in local streams in slow moving water. Feeds on mosquito and other insect larvae. Grows to 3.5cm

Other name – **Gertrudes  
Blue eye**



#### **EMPIRE GUDGEON**

During breeding season the males head become rich pink to scarlet and its dorsal fins and anal fin become red, white and blue, which is how it gets it's somewhat patriotic name. The colours can become so bright that the fish appears to glow.

Other name – **Carp  
Gudgeon**



### **SILVER BIDDY**

Oval shaped with a forked caudal (tail) fin, juveniles common in estuaries on muddy bottoms. Protrusible mouth Adults have an extended dorsal spine. Grows to 25cm

Other name -  
**Featherbream, Threadfin**



### **FORCEPS FISH**

Very distinctive long snout, slightly open at end, hence name. Mouth adapted for feeding on hydroids, small crustaceans, tubed feet of echinoderms and sea urchin pedicellaria. Grows to 22cm.

Other name - **Long Nose Butterflyfish**



### **PYJAMA CARDINAL FISH**

A small reef fish to 8 cm. Lives amongst branching corals in sheltered lagoons in shallow water, usually in groups



### **BARCOO GRUNTER**

Silvery-grey on sides with black blotches that may change colour and position.

A voracious feeder, its natural range is restricted to turbid water in rivers and waterholes of central

Australia. Due to its quick growth and wide tolerance of water quality, it is becoming an important fish for aquaculture and aquaponics.

Grows to 35cm, larger in culture.

Other name: **Jade Perch**



### **STRIPED BUTTERFISH**

If left in the sun when caught, the flesh becomes soft and butter-like in consistency to eat, hence its name. Care must be taken when handling as their sharp spines can cause severe stings. Eats algae on mudflats and intertidal rubble.

Other names – **Johnny Dory.**



### **BANDED TRUMPETER**

Commonly found in bays and estuaries. Called trumpeters for their striking “trumpeting” ability.

Other name – **Northern Grunter**



### **MANGROVE JACK**

A well-known fighting fish that likes to live near submerged snags and mangrove roots for much of its lifespan but moves to the reef when very large. It has strong powerful teeth. Other

names – **Dog Tooth Bream, Reef Red Bream**



### **BUTTERFLY COD**

Belongs to the Scorpion Fish family i.e. stone fish. The pectoral fins are used to herd prey into a position where it can suck in its prey. All spines except for those on the tail are venomous.

Found in underwater caves, wharf pylons and old wrecks.

Other names – **Lion Fish, Red Fire Fish**



### **TILAPIA**

This is a noxious fish (pest) introduced from Africa. They are very aggressive, breed rapidly and force away native fish. If you catch a Tilapia you must kill and bury it.

Some types of Tilapia incubate their eggs in their mouth. They will eat almost anything including fish, insects and plants.

Other names – **Mozambique Mouth Breeder**



### **SNAKE HEADED GUDGEON**

Found in coastal freshwater streams. They are carnivorous feeding on insects, crustaceans and fish. They are similar to a sleepy cod.

Other name – **Mud Cod**



### **EASTERN RAINBOW**

A freshwater fish. They are a schooling fish that feed on plants, aquatic insects, laval, crustaceans and plankton.

Found in just about every local freshwater creek

Other name – **Rainbow Fish**



### **BLACK BANDED PONYFISH**

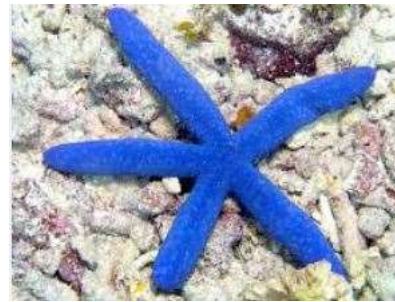
The Ponyfish get their name from the form of their mouth, which can be extended forward, causing the head and mouth to look like a horse's head. Ponyfish have an internal light organ surrounding their gullet.





### **SEA CUCUMBER**

Classified as an echinoderm – same phylum as sea stars and sea urchin and brittle stars, and feather stars. Tentacles protrude from mouth for feeding. Most species have toxic flesh/skin, though if prepared properly are considered a delicacy in Asia.



### **BLUE SEA STAR**

Can regrow arms if broken off. Arms can be shed as a means of defence. If a part of the central disc is with the arm, a whole new sea star may regenerate.

Tubed “feet” work on a hydraulic system which is why they must be kept wet/under water when handled.



### **FLATHEAD**

Large flat head and body shape used to burrow into soft sand and mud and assist with camouflage. Entire body can be hidden from prey that passes overhead. Body colour can change to match its environment.



### **GLASS PERCHLET**

Usually travels in schools of up to several hundred fish. It gets its name because it is transparent and you can see its backbone and gut cavity.

They are covered in slime hence the common name "snotty". They are covered in slime hence the common name "snotty". They are covered in slime hence the common name "snotty". They are covered in slime hence the common name



### **BLACK BREAM**

One of the most popular estuarine angling species. Identified by the black tinge on fins. Bream are timid, sensitive to noise and flashing lights.

Other names – **Pikey Bream**



### **STONE FISH**

Most dangerous of the scorpion fish family. They are named because of their resemblance to weed covered stone. Its spines are very venomous. They can survive for several hours out of water. If stung you should immerse the wound in hot water and seek medical help.



### **SQUIRREL FISH**

Brightly coloured fish that are active at night hence the large eye. They are a noisy fish with the ability to click or squeek loudly underwater. Found on the Great Barrier Reef (hide in caves during daylight).



### **BARRAMUNDI**

{Aboriginal name meaning large scales}  
Frequents both fresh and salt water but breeds in estuaries and on coastal flats. Males change to females at approximately 5 years of age or 600mm. This fish is highly regarded by anglers for its fighting ability and eating. This fish captures its prey by sucking the fish in. The gills act like rasps and they scale the prey before the barramundi swallows it whole.



### **SPANGLED PERCH**

Australia's most widespread freshwater fish, it is found throughout tropical Australia and in inland streams and arteisian bores. It is edible. It is recognised by its 'spangling' of reddish brown spots.

Other names – **Bobby, Nicky**



### **ARCHER FISH**

Has the ability to shoot water through its mouth. It uses this water to shoot insects down into the water so that it can eat them.

Other names – **Rifle Fish**



### **CLOWN FISH**

Clown Fish live in anemones which they use for protection. Anemone's have stinging cells that are dangerous to other fish. Clown fish develop a slime that makes them immune to these stinging cells. In turn, they feed the anemone. This relationship is called symbiosis.

Other name – **Anemone Fish**



### **CLEANER WRASSE**

These small fish swim around larger fish removing small external parasites, damaged skin and fungus.

Other names – **Cleaner Fish**



### **BANDED TOAD FISH**

This fish is highly poisonous and eating it can be fatal. It can puff itself up in defence to make itself look bigger.

The teeth of a toadfish resemble rabbit's teeth. Some Toadfish have teeth so sharp they can cleanly bite through a fishing hook.

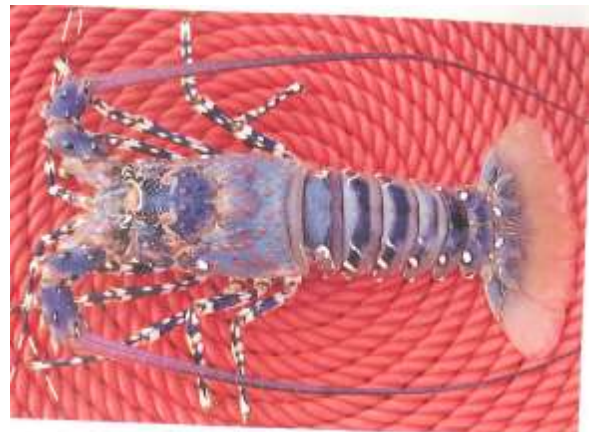
Other names – **Puffer Fish, Blow Fish**



### **GOLDEN LINED SPINEFOOT**

Feeds mainly on marine algae. Its spines all have venom glands which inflict a painful wound hence its common name of "Happy Moments". If stung immerse the wound in hot water.

Other names – **Golden Lined Rabbitfish, Stinging Bream, Happy Moments**



### **PAINTED CRAYFISH**

So called for its distinctive colours. The crayfish gives out a series of low frequency creaks and flaps its tail repeatedly. These sounds are said to be powerful shark attractants. The meat from its tail is very good eating.



### **MUD CRAB**

To be legally taken crabs must be male and over 150mm in width. Crabs are measured across their carapace from the last two spikes on either side. The male crab is called a "buck" and has a triangular shaped abdomen. The female is called a "jenny" and has a "honeycombed" oval shaped abdomen.



### **HERMIT CRAB**

These are not 'true' crabs as they don't have a hard outer shell. The long soft coiled abdomen is protected inside a "borrowed" shell. Shells are replaced as the hermit crab grows.



### **BAR TAILED GRUNTER**

Is commonly taken by bait netting and is usually used as live bait for barramundi. It is conspicuously speckled.

Other names - **Yellow Tailed Perch, Spotty Perch**



### **CROWN OF THORNS**

Have dangerous spines and should not be touched. They live on coral and can destroy reef. If food is scarce they do not die immediately but shrink in size until new coral can be found.



### **SEA ANEMONE**

The most easily seen anemone are those associated with clown fish.

The tentacles contain hundreds of microscopic stinging cells (nematocysts). These are used for capturing food items or repelling predators.



### **TROPICAL SAND GOBI**

Gobies are found all over the world and are one of the largest families of fish with more than 2000 species. There are closely related to mud skippers, and most are relatively small, bottom dwelling creatures.



### **RED CLAW**

Redclaw Crayfish are native to the Gulf of Carpentaria and usually eat decaying plant and animal material. The sex of a redclaw is most easily identified by studying its claws. The male claw is relatively large and swollen compared to that of the female. The male also has a soft, bright red membrane on the outside of the claw. In addition, if you hold the crayfish carefully and look underneath the body you can see the difference between male and female. The male has 'Gonopores' on raised knobs at the base of the bottom walking legs. The female has Gonopores at the base of the third set of walking legs.



### **MULLET**

A very common estuary fish which is regularly eaten by larger predatory species such as Barramundi. There are many species of Mullet including the Diamondscale Mullet, Poddy Mullet and Sea Mullet.



### **WHITING**

One of the most commonly targeted fishing species right around Australia. While there are different species of Whiting it is the 'Sand Whiting' usually found in tropical waters.



### **MOSES PERCH**

Often confused for the 'Fingermark' but can be identified by looking for the yellow pectoral, pelvic and anal fins. The black 'spot' is also located mostly above the lateral line in Moses Perch.



### **HARLEQUIN TUSK FISH**

A type of Wrasse with 'tusk' like teeth. Usually eats benthic (bottom dwelling) invertebrates such as worms, crustaceans and molluscs.



### **YABBY**

Burrowing crustacean usually found on sandflats near the mouths of estuaries. A very popular food source for many fish and birds. Also create habitat for many other creatures by burrowing in the sand. Vital part of the Tropical Estuary Food Web.



### **ESTUARY COD**

Common fish covered in small gold spots, often caught in crab pots. A good eating fish, min size 38cm, grows to a very large groper like fish to 1 m.

Other name: **Goldspot cod**



### **LEADER PRAWN**

Large wild tiger prawn that is sought after by farms for breeding stock. Ranges from NSW through tropical waters. Grows to a very large 34cm.

Other name: **Blue Tiger**



### **HUMBUG FISH**

Is so called as it resembles the old fashioned lolly known as humbugs. Lives around staghorn corals. Feeds on algae.





**DIAMOND SCALED  
MULLET**

A warm water species of tropical Australia, it usually lives in very large shoals in shallow reef waters and lagoons. Grows to 52 cm and is good eating



**DECORATOR SEA URCHIN**


A sea urchin with mostly soft spines and specialised tubed feet called "pedicellariae" which it uses to arrange small rocks and bits of coral over its body. This serves as both camouflage and protects it from the sun in the rock pools where it lives.









**SPOTTED BUTTERFISH**





Feeds mainly on algae but also small worms and crabs. Is not at all a fussy eater, as its scientific name translates to 'feeder on dung'. Its strong sharp dorsal spines can inflict painful wounds. Other names – **Tiger Scat**  
**Spotted Butterfish,**  
**Spotted Scat**



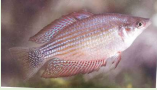



## APPENDIX 4- TEACHER NOTES





ORGANISM	ADAPTATIONS	SUSTAINABILITY NOTES	GENERAL INFORMATION
<p><b>Barramundi</b></p> 	<p>Large bony upturned mouth, no teeth, sucking action so whole prey is engulfed (no teeth to hold).            Large fish &gt;70 cm are females, more eggs produced.            Can live in both fresh and salt water - expands the range and food sources available. Night vision due to high number of rods, eyes glow reddish.            Serrated gill rakers scale fish whilst eating, razor sharp gill edges – can be flared in defence. 3 – 6 million eggs per season promotes survival chances.</p>	<p>Closed season 1<sup>st</sup> Nov to 1<sup>st</sup> Feb every year wild stock. Minimum size 58cm maximum size 120cm to protect breeding stock.            Farmed Barra takes pressure off wild stocks; dams stocked with fingerlings enable year round fishing.</p>	<p>Named for large scales – the word Barramundi literally translates to large scales. Only breeds in Salt water, e.g. Tinaroo is non breeding – stocked.</p>
<p><b>Sea Anemone</b></p> 	<p>Most live with symbiotic algae (zooxanthellae similar to corals) in their tissue and need adequate sunlight to survive. The adhesive “foot” at the base of the animal allows it to move to preferred spots.            Have a single mouth through which food enters and waste leaves.            Can retract tentacles as a form of defence.</p>	<p>Warming oceans may cause the algae to die (as in coral bleaching events) which may affect anemone’s survival.</p>	<p>Some species live in mutually beneficial relationship with Clown fish. Clown fish provide food and protection, clown fish have a mucus covering their body that allows them to shelter within the anemone’s tentacles. Other organisms are stung. Belongs to same group of organisms as jelly fish and corals.</p>
<p><b>Tilapia</b></p> 	<p>Omnivorous (mostly plants). Looks after eggs and young, hence high survival rate, can breed several times a year. Aquarium species is a nest builder, Mozambique species is a mouth breeder – both found in Australia.            Very tolerant of poor water quality. Can survive in high saline environments – unlike other freshwater competitors. Can breed at small sizes and in poor conditions.</p>	<p>Has become a major pest of many freshwater rivers. Originally introduced from South Africa for aquariums. Ability to outcompete and replace native species, reducing biodiversity.</p>	<p>Popular eating fish in many parts of the world farmed as a food source but not permitted in Australia. Caught species in Australia must be killed and buried.</p>

ORGANISM	ADAPTATIONS	SUSTAINABILITY NOTES	GENERAL INFORMATION
<p><b>Toadfish</b></p> 	<p>Very large sharp teeth. Ability to “blow up” body as a defence mechanism Poisonous flesh and organs (“fugu”).</p>	<p>Some fishermen kill these when caught as considered “vermin”, but they have an important role as scavengers in the estuary system.</p>	<p>Second most poisonous vertebrate in the world.</p>
<p><b>Sea Cucumber</b></p> 	<p>Tentacles protrude from mouth for feeding over the substrate, collecting detritus and cleaning sand. Some species have a defence where they extrude very sticky threads from rear end. This harms the animal, and it may take a while to recover. Most species have toxic flesh/skin, though if prepared properly are considered a delicacy in Asia. Tubed feet allow for movement and work on a hydraulic system which is why they must be kept wet/under water when handled. The catch collagen that forms the body wall can be loosened or tightened at will to allow the animal to squeeze through small gaps. It can essentially liquefy its body to pour into a given space.</p>	<p>Have been overfished in the local region. Green Island was once a beche-de-mer centre, with “Yorkey” (George Lawson), of Yorkey’s Knob fame, being an original fisherman there in the 1880’s. The “black teat” sea cucumber is now totally protected.</p>	<p>Large industry centred on beche-de-mer from 1830’s till recent past. Classified as an echinoderm – same phylum as sea stars and sea urchin and brittle stars, and feather stars. Spicules (spines) and plates under the skin in various combinations alter the rigidness of the body from soft (sea cucumber) to rigid (sea urchin). Reproduction occurs through spawning and gender is difficult to determine externally. Some species have the ability to change gender.</p>
<p><b>Sea Star</b></p> 	<p>Can regrow arms if broken off. Arms can be shed as a means of defence. If a part of the central disc is with the arm, a whole new sea star may regenerate. Tubed “feet” work on a hydraulic system which is why they must be kept wet/under water when handled. Several species have an extrudable stomach which they can wrap around the prey and externally digest before retracting e.g. thorny sea star.</p>	<p>One of the major threats to the reef is the COT. The outbreaks of these have been linked to increased nutrient levels, raising the possibility of land/farm/sewerage run off being a cause.</p>	<p>Classified as an echinoderm – same phylum as sea cucumber and sea urchin and brittle stars, and feather stars. Spicules (spines) and plates under the skin in various combinations alter the rigidness of the body from soft (sea cucumber) to rigid (sea urchin). Reproduction occurs through spawning and gender is difficult to determine</p>

ORGANISM	ADAPTATIONS	SUSTAINABILITY NOTES	GENERAL INFORMATION
<p><b>Clown Fish</b></p> 	<p>Has mucus covering on body to protect against anemone stings.</p> <p>Lives in a group, one dominant male and one dominant female acting as breeding pair. Hatchlings are genderless and mature into males. Once the dominant female dies, the dominant males changes gender and another male takes on the role of dominant male.</p> <p>It lives in a mutually beneficial way with the anemone but both can live quite well apart.</p>	<p>Popular aquarium fish now bred successfully commercially.</p> <p>Wild collection of these from reefs is strictly controlled by permit only.</p>	<p>externally.</p> <p>Best known because of the Nemo movie.</p>
<p><b>Black Bream</b></p> 	<p>Lives in schools - benefits of this behavioural adaptation include less chance of being prey, ease of finding mate.</p> <p>Can tolerate brackish waters of estuaries and therefore extend food range. Peg like teeth are used to pry mussels and barnacles from rocks and pylons. A large female can release up to 6 million eggs.</p> <p>Can tolerate a wide range of salinity levels but are susceptible to poor water quality such as high turbidity, low O<sub>2</sub>, increased nutrient levels.</p>	<p>A targeted food fish, so regulations apply to its capture - min 25cm, max 30 in number. (Discuss whether this is sustainable??).</p>	
<p><b>Barcoo Grunter</b></p> 	<p>Very hardy fish that originally lives in inland creeks and rivers that may dry and become very warm. Feeds and grows quickly, as it has evolved to eat whenever it can due to drought conditions.</p>	<p>Recently “discovered” as a very suitable fish for aquaculture and aquaponics.</p> <p>Underlines the importance of maintaining our native fish/animals so we don’t lose these opportunities.</p>	<p>Commercially known as Jade Perch.</p>

ORGANISM	ADAPTATIONS	SUSTAINABILITY NOTES	GENERAL INFORMATION
<p><b>Sea Urchin</b></p> 	<p>Has a hard “egg” or shell, from which protrudes spines and pedicellariae which protect, clean and fasten it to the substrate. The “Aristotle’s Lantern” feature underneath the animal is made up of mouth parts which scrape off algae Some species have poisonous spines; all should be handled with care.</p>	<p>They are harvested for food, the egg sacks inside the animal being the only edible part. Large numbers of urchins in one area may indicate a high algae cover, and an imbalance in the ecosystem.</p>	<p>Classified as an echinoderm – same phylum as sea cucumber and sea star and brittle stars, and feather stars. Spicules (spines) and plates under the skin in various combinations alter the rigidity of the body from soft (sea cucumber) to rigid (sea urchin). Reproduction occurs through spawning and gender is difficult to determine externally.</p>
<p><b>Forceps Fish</b></p> 	<p>Long “beak” allows it to get into and between small spaces for food. It can even pick between the spines of sea urchins to eat the pedicellariae near the shell. When threatened, it flips its body so the large dorsal spines point at the threat.</p>		<p>Common aquarium species.</p>
<p><b>Whiting</b></p> 	<p>Lives in schools - benefits of this behavioural adaptation include less chance of being prey, ease of finding mate. Long conical snout is used for excavating marine worms which are a large part of their diet. Feed in conjunction with stingrays, who use their wings to disturb yabby beds.</p>	<p>A targeted food fish, so regulations apply to its capture - min 25cm, max 30 in number. (Discuss whether this is sustainable??).</p>	
<p><b>Glass Perchlet</b></p> 	<p>Lives in schools - benefits of this behavioural adaptation include less chance of being prey, ease of finding mate. Mouths are turned upwards to facilitate feeding on surface prey.</p>		<p>Commonly referred to as a snotty. Omnivorous, feeding mainly on insects, crustaceans and other invertebrates.</p>

ORGANISM	ADAPTATIONS	SUSTAINABILITY NOTES	GENERAL INFORMATION
<b>Harlequin Tusk Fish</b> 	<p>Tusk like fish are an adaptation to diet and are used to hold small crustaceans.</p>		<p>Carnivorous eating mainly invertebrates such as echinoderms, crustaceans, molluscs and worms. Common aquarium species. Little is known about breeding habits.</p>
<b>Humbug</b> 	<p>Striped pattern is a camouflage to help blend in with staghorn coral where the Humbug is usually found. Is a member of the Damsel fish family. Can be very territorial and travels in schools.</p>		<p>Common aquarium species. Omnivorous and feeds on a wide variety of foods ranging from algae to small shrimp.</p>
<b>Rainbowfish</b> 	<p>Eggs are laid in long strings attached to water plants.</p>		<p>Distribution is restricted to Northern Queensland and parts of the Northern Territory. Very popular aquarium species.</p>
<b>Flathead</b> 	<p>Large flat head and body shape used to burrow into soft sand and mud and assist with camouflage. Entire body can be hidden from prey that passes overhead. Body colour can change to match its environment.</p>		<p>Spines on either side of head contain a venom that whilst not fatal can cause pain and infection.</p>
<b>Hermit Crab</b> 	<p>Soft abdomen creates the need to find a suitable sized shell. Competition for suitable shells can be fierce, at times crabs will kill each other during competition. Some species create a vacancy chain of up to 20 individuals whereby each crab moves on to a larger shell, vacating its shell for a smaller crab.</p>		<p>Some species can live up to 70 years. The coconut crab is the world's largest terrestrial invertebrate.</p>
<b>Diamond Scale Mullet</b> 	<p>Lives in schools - benefits of this behavioural adaptation include less chance of being prey, ease of finding mate.</p>		<p>Can grow up to 5 kilograms. Popular eating fish in southern Australia.</p>

ORGANISM	ADAPTATIONS	SUSTAINABILITY NOTES	GENERAL INFORMATION
<b>Empire Gudgeon</b> 	<p>Changes colour during breeding season to help attract a mate. Colours can become so bright that the fish appears to glow.</p>		<p>Very effective at feeding on mosquito larvae. Australian native freshwater species.</p>
<b>Redclaw</b> 	<p>Hatchlings remain attached to the female for several weeks after hatching. Females can lay 300 – 800 eggs and can breed 3 – 5 times per season.</p>	<p>No size limit and bag limit of 40. (Is that sustainable???) Females with eggs or hatchlings present must be released.</p>	<p>Crustacean native to Northern Australia. Males are identified by the bright red patches on the claw. Their non-aggressive behaviour and highly fertility rates, maturing in 6 – 12 months make them an ideal aquiculture specimen.</p>
<b>Pony Fish</b> 	<p>Extendable mouth enables bottom feeding. Lives in schools - benefits of this behavioural adaptation include less chance of being prey, ease of finding mate.</p>		<p>Illuminated internal organs.</p>
<b>Happy Moments Also known as a Golden-lined Spinefoot</b> 	<p>Dorsal fins can deliver a painful wound.</p>		<p>Feeds mainly on marine algae. Spines have a venom gland at the base – treatment for stings is immersion in hot water for up to two hours.</p>

# Appendix Five

## SAMPLE ASSESSMENT

### ADAPTATION QUESTIONS - Aquarium

1. Which of these is a structural adaptation?
  - a. A crocodile lying in the sun to get warm
  - b. The flattened bottom fins of the mudskipper that support it on the mud
  - c. A barramundi moving upstream to search for food
  - d. A fiddler crab waving its claw
2. A barramundi does not have sharp teeth to hold its prey. Which of these helps the barra to make sure the prey does not escape?
  - a. The white stripe on top of the body
  - b. The red pigments at the back of the eye
  - c. Small hooks on its gills
  - d. Its sucking action when the mouth is opened quickly
3. The barramundi undergoes an interesting change when it reaches about 70 cm length. This is:
  - a. Changing from male to female
  - b. Swimming upstream to freshwater to look for a mate
  - c. Growing a hard plate in its mouth
  - d. Changing colour to dark grey
4. The crocodile will sometimes lie in the sun with its mouth open. This is to:
  - a. Warn others to keep away.
  - b. Cool the body as the mouth's skin is thin and has a good blood supply
  - c. Allow birds to pick at parasites in their teeth
  - d. Give it some Vitamin D
5. One of the reasons that many fish live in a school or large group is that they:
  - a. Learn more from each other
  - b. Are not lonely and can communicate with their buddies
  - c. Can share any food they find
  - d. Have a better chance of surviving an attack by a large predator



6. Which of these best describes the way an anemone fish/clown fish/Nemo fish benefits from living with its host anemone?

- a. It gets food from the anemone
- b. It eats the anemone's tentacles when hungry
- c. The stinging tentacles of the anemone gives it protection from other fish
- d. The anemone attracts small fish for it to eat

7. The mouths of the grunter and the whiting are turned downwards in shape. This tells you that:

- a. Most likely they will eat food off the bottom of the river
- b. They have strong jaws adapted for eating mud crabs
- c. They are easy to catch as the hook will set firmly
- d. They are nest builders

8. The Tilapia is a pest animal because it is remarkably adapted to its environment. Of the choices below, which is of least value to the Tilapia for its survival?

- a. It has dark splotches on its side
- b. It lays eggs in a nest and protects them
- c. It is very tolerant of poor water quality
- d. It has a very varied diet











9. The blue seastar *Linkia* is a very slow moving animal and therefore can't escape predators by hiding. The reason it can survive is because:

- a. It is poisonous to eat and the bright colour warns of this
- b. It lays many eggs
- c. It releases a poison into the water if attacked
- d. The reef protects it

10. The mud crab lives in a burrow at low tide, and comes out to feed once water covers it at high tide. Which of the following is not a benefit of having the burrow ?

- a. Stop it drying out at low tide
- b. Protects it from predators such as birds
- c. Allows it to drag food back and consume away from other crabs
- d. Food falls down the burrow and is trapped

## ADAPTATION TABLE - FILL IN THE MISSING INFORMATION

Name of Animal	Feature of Animal	How it Helps	Type of Adaptation		
			Structural	Behavioural	Physiological
<i>Barra</i> 	Can live in fresh and salt water	Allows the fish to exploit a wide range of habitats and exploit seasonal food supplies			x
<i>Mud Crab</i> 	Lives in burrow	<b>Keeps gills moist at low tide</b>		x	
<i>Stonefish</i> 	Powerful dorsal fin spines with venom	Venom will kill or repel any predator	x		
<i>Yabby</i> 	Produces many eggs constantly	<b>Ensures populations are maintained in a changing environment</b>			x
<i>Seastar</i> 	<b>Tube Feet</b>	Many hydraulically operated legs to allow movement in all directions and on all surfaces	x		
<i>Tilapia</i> 	Parents guard nest of eggs and young	Improves survival chances of young		x	
<i>Mullet</i> 	<b>Swims in schools</b>	Confuses predators – shiny scales help also by reflecting background		x	
<i>Crocodile</i> 	Large tail with good blood supply	Helps regulate body temperature			x
<i>Whiting</i> 	Downturned mouth with extendable lips adapted for sucking	Adaption to feed on animals buried in the sand	x		
<i>Bream</i> 	Powerful jaws, rubbery lips and strong peg like teeth	<b>Helps feed on hard shelled animals such as crustaceans and snails</b>	x		

## Year 7 Classification

Name .....

GROUP ANIMAL	FISH	REPTILE	ECHINODERM	CRUSTACEA	COELENTERATE	MOLLUSC
<i>Crocodile</i>						
<i>Barramundi</i>						
<i>Sea Cucumber</i>						
<i>Mud Crab</i>						
<i>Mullet</i>						
<i>Jelly Fish</i>						
<i>Yabby</i>						
<i>Lion Fish</i>						
<i>Sea Star</i>						
<i>Black Bream</i>						
<i>Red Claw</i>						
<i>Snail</i>						



**RISK ASSESSMENT**

Aquarium	Common Potential Hazards											
	Actions by Public	Biting Midges / Sandflies	Dangerous Behaviour	Dangerous Plants, Animals or Insects	Dog Attack	Lost	Marine Stingers	Medical Conditions	Mosquitoes	Snake Bite	Sun Radiation	Syringe
		R	R						R			
Risk Level Low	Specific Potential Hazards	Risk Control Measures						Risk Control Measures By		Risk Management Required		
							EEC Staff	Camp Leader				
	<ul style="list-style-type: none"> <li>- Biting Midges</li> <li>- Glass: Tanks break under pressure or students cut hands.</li> <li>- Electricity</li> <li>- Marine Organisms.</li> <li>- Dangerous Instruments.</li> </ul>	<ul style="list-style-type: none"> <li>- Overhead fans to be used when required.</li> <li>- Behavioural controls to limit chance of accidents.</li> <li>- Tanks checked on regular basis.</li> <li>- Students instructed not to touch tanks.</li> <li>- Installation of ELCB into main switchboard.</li> <li>- Electrical wiring around aquarium area waterproof.</li> <li>- Power points, plugs, cords checked regularly.</li> <li>- Only non-venomous organisms used in touch tank.</li> <li>- Dangerous Instruments / Implements used in Aquarium such as knives stored safely.</li> </ul>	<ul style="list-style-type: none"> <li>✓</li> <li>✓</li> <li>✓</li> <li>✓</li> <li>✓</li> <li>✓</li> <li>✓</li> <li>✓</li> </ul>	<ul style="list-style-type: none"> <li>✓</li> <li>✓</li> </ul>	<p>Refer to and document HBEEC activity specific risks and control measures.</p> <p><a href="#">Handling Marine Organisms</a></p> <p><a href="#">CARA</a></p>							