

**SEA★LIFE**  
Sydney

**Self-guided tour**

**Classification/  
Adaptation**



# Key Questions



What is an adaptation? What is the difference between a behavioural and a physical adaptation?



What are some examples of marine adaptations?



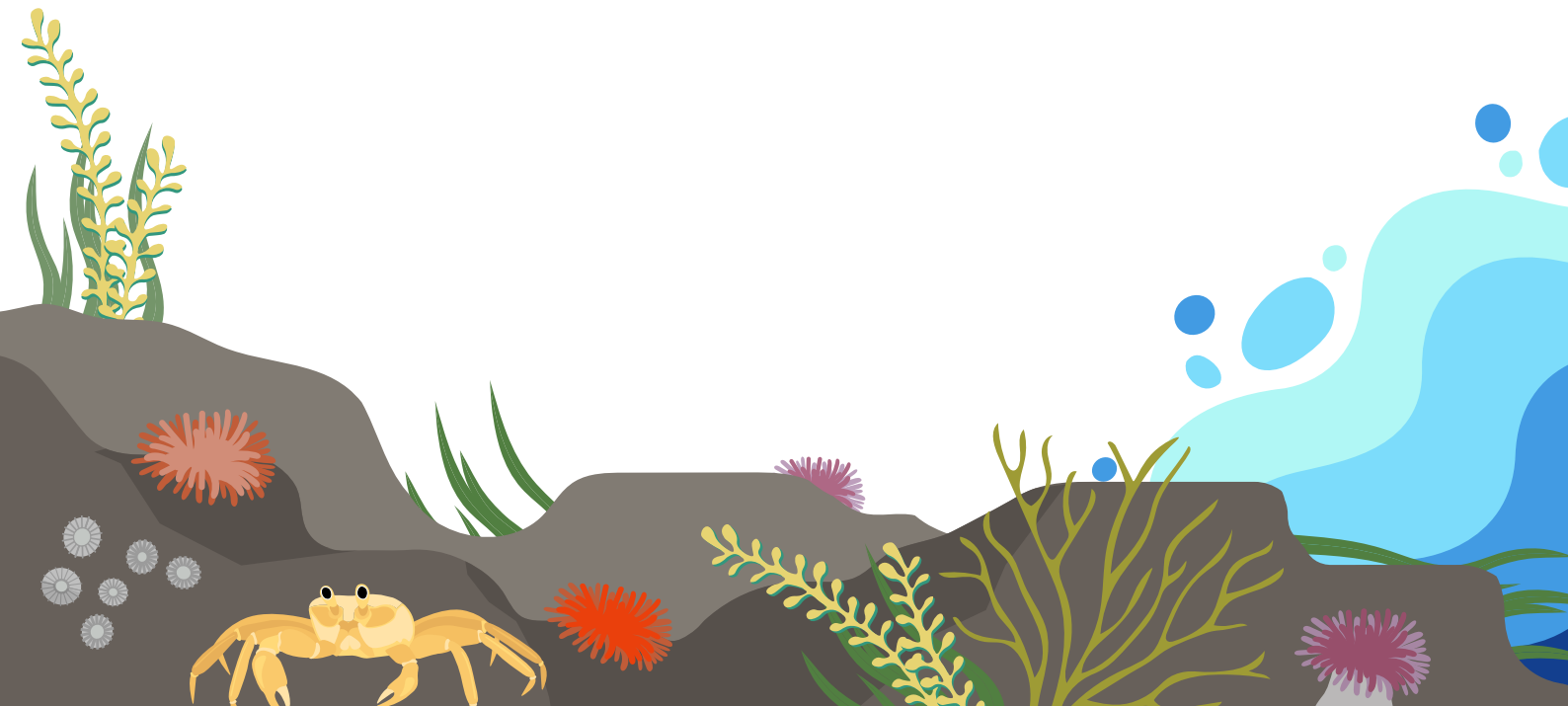
How does an animal's habitat affect what their adaptations are?



What are the similarities and differences in animals and how can we group them?



Why do we classify animals?



# Vocabulary

## Adaptation

A body part, body covering or behaviour that helps an animal survive in its environment.

## Behavioural adaptation

A way an animal behaves or acts to aid its survival.

## Physical adaptation

A type of structural modification made to a part of the body to help aid its survival.

## Camouflage

A colour or shape in an animal's body covering that helps it blend into its environment.

## Mimicry

An adaptation in which a harmless animal looks like a harmful animal in order to protect itself.

## Classification

An organised manner or arrangement in groups.

## Predator

Any organism that exists by preying upon other organisms.

## Prey

An organism hunted for food.



# Pre-Visit Activities

## Activity 1.

Create a KWL chart. What do we already know about marine animals? What do we want to know? Add to and complete 'What have we learnt' after your visit to SEA LIFE.

## Activity 2.

Students use magazines to cut out 10 different items, then sort and classify these into groups. Discuss how and why they were sorted. Ask students to sort them in a different way. Why is it important that there are different ways to classify items and animals?

## Activity 3.

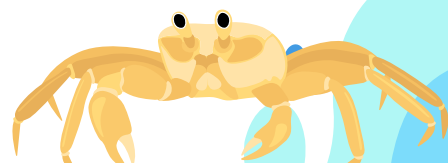
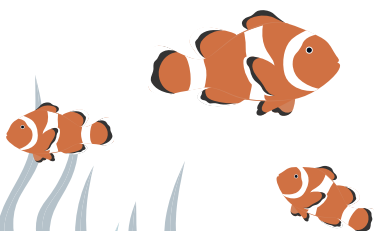
Students play 'Celebrity heads' using names of different marine animals. One student is selected to sit at the front of the class, with another to write an animal above their head out of view. The sitting student needs to guess what animal is written by asking only yes or no questions. This is a great introductory warm up game to open the discussion about classification.

## Activity 4.

Without researching, label the adaptations of various animals. Can we add any new adaptations once we have visited SEA LIFE? See examples.

## Activity 5.

Read 'Animalia' by Graham Base and discuss the animals and their features. Ask students to draw different animals on cards and group them by their features such as if they have fur, scales, feathers etc. These can then be displayed as a word wall and be referred to during topic writing.





# SEA LIFE Fact Tour Guide

Use this SEA LIFE Fact Tour Guide to help you guide your students learning through SEA LIFE Sydney Aquarium! For each themed zone within the aquarium, we have highlighted key creatures you should point out to the students, plus provided you with some unique facts that only our keepers know about our amazing animals!

## Zone: Southcoast Shipwreck

Key creatures to look for in this habitat!



Little penguins



Pig nosed turtle



Sieve Eel



Port Jackson sharks

### How this ecosystem works

This area is a Temperate environment – **Temperate** climates are generally defined as **environments** with moderate rainfall spread across the year or portion of the year with sporadic drought, mild to warm summers and cool to cold winters. Little penguins occur in temperate seas with temperatures between 13 degrees and within this region, the little penguin feeds mainly in inshore waters around the coast. The penguins usually nest in burrows where they set up colonies in sand dune vegetation but can also be found amongst rocks and sea caves. The ocean is the little penguin's natural environment. Their wings help them 'fly' under the water. They generally spend their day swimming while they return to the shore after dark. Beach – are often very sandy areas. Beaches also include rocks dunes and crashing waves.

The Port Jackson shark is a bottom dwelling and is found in the temperate water off of the southern half of Australia. They are found both close to shore and off the shelf in waters as deep as 275 metres.

## **Did you know facts about this habitat!**

### **What's so special about penguin feathers?**

- Their Blue/black feathers on their backs blend into the colour of the ocean. So, when predators from above such as larger birds go in to capture their prey, it is the penguin's fast movement and colouration that helps them escape. It's the same camouflage idea with the white feathers on their underside. Larger predators from below such as seals or sharks see white feathers with a background of light from the sun above which aids escapism and protects birds from the cold.
- Their feathers are much more vital to their survival than just colour. These penguins live in our temperature and like us they get cold in the winter and hot in the summer. How they adapt to changing temperatures is by altering their feathers. At the base of their tails, they have a gland that produces oil. They use their beaks to push the oil through the feathers which not only makes them waterproof for when they are in the water, but they repeat this behaviour out of the water to protect themselves from the elements. In the summer when the temperature is much warmer, they adapt by shedding or moulting layers. This process takes about three weeks and they can't go in the water during this time because their skin is too itchy so before they start to moult, they catch and eat enough food to last until the moulting process has been completed and they can re-enter the water.

### **How do sharks survive under water?**

#### **Breathing:**

- Port Jackson sharks can eat and breathe at the same time. They are a type of shark that doesn't need to keep moving to have the water rush over their gills to gain oxygen. It can lie on the bottom for long periods of time which helps them spot any animal they might be able to grab and eat.

# Zone: Jurassic Seas

Key creatures to look for in this habitat!



Black and white clownfish



Common Sydney Octopus



Lungfish



White's Seahorse

## Creature Feature in Focus!

### Sydney Common Octopus

#### Adaptations

**So many arms!** - They use their eight suckered arms to creep about over rock surfaces in search of food. Marine biologists have recently stated that two of its eight limbs act more like legs helping it push off for swimming and walking on the seafloor. They can also taste with their suckers!

**The power of regeneration** - If a tentacle is lost, they can regenerate that limb.

**Camouflage** - the octopus can change the colour of its skin and shape. The Sydney Common octopus is often seen to imitate seaweed.

**Sharp beak** - most of their food is hard to get to. They use this sharp beak to break through the exoskeleton (shell) of animals such as crabs, snails and mussels. They can inject venom that weakens its prey after using its rasp like tongue to file holes within the hard-shell animals.

**Brain cells EVERYWHERE!** Mostly in the tentacles which makes them very intelligent creatures. They also have amazing eyesight.

**Ink Sac** - that when they feel threatened, they use. When scared they contract the muscles around the sac, releasing a black substance. This adaptation is a defence mechanism used by the octopus to escape predators.

**Very maternal** - To prevent crabs and fish from eating its offspring the female octopus will place rocks and shells in the entrance of the den the eggs were laid.

#### Habitat

The Common Sydney Octopus is found on the intertidal rocky shores and in the ocean. IT has been suggested are more commonly associated with rocky reef habitats during the breeding season but tend to spend a considerable portion of their life in the sandy habitats throughout subtropical eastern Australia and Northern New Zealand.

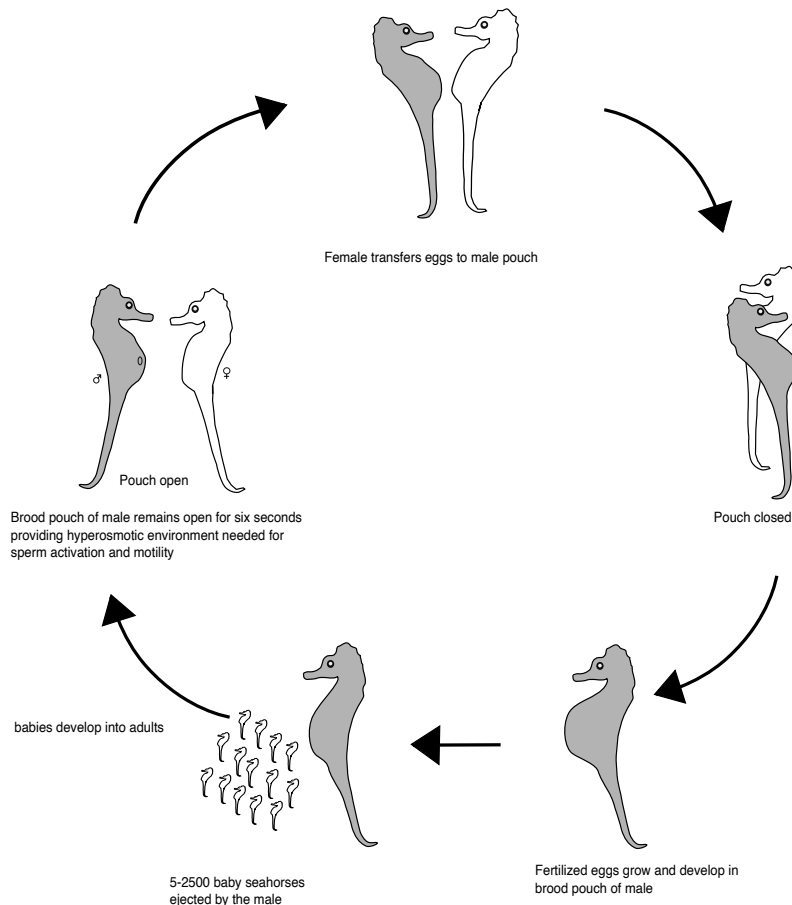
## Creature Feature in Focus!

### White's Seahorse

**Did you know facts about this habitat!** How does a seahorse have a baby?

### Lifecycle

A female seahorse lays dozens, sometimes hundreds, of eggs in a pouch on the male seahorses abdomen. This is called the brood pouch. Depending on the seahorse species, the eggs remain in the brood pouch for up to 45 days, until the eggs are ready to hatch. The new baby seahorses find other baby seahorses and float together in small groups, clinging to each other using their tails. They need to find food and hide from predators as soon as they are born.



### Conservation

#### Seahorse Case Study: why we need to protect them!

The primary cause for the decline in abundance of White's Seahorse is the loss of natural habitats across their range in eastern Australia. The seahorses occur within coastal estuaries and embayments which are areas subject to population pressure. Within Port Stephens, over 90% of the soft coral and sponge habitats have declined at sites where the seahorse used to be abundant. Habitats in Port Stephens have been destroyed through the installation of boat moorings, boat anchors and the inundation of habitat by sand movement. Within Sydney Harbour, population pressure has caused their natural habitats to decline and, as a result the species is now predominantly found on man-made swimming nets within the harbour. These nets are periodically cleaned to remove the marine growth and repair the structural integrity of the nets which can lead to further displacement of seahorses and cause populations to dramatically decline. DPI Fisheries has been working with councils to develop practices which avoid damage to seahorses during net cleaning and repair.

For more on how to protect check out these resources:

<https://youtu.be/CFAt65S6aXE>

<https://youtu.be/xVfbWg-Mocc>



## Zone: Conservation Quay

In this zone check out our Pygmy Perch recovery project.

This is where our curatorial team are working to recover this amazing species of fish.

**Key creatures to look for in this habitat!**



**Southern Pygmy Perch**

### **Did you know the Pygmy Perch is an endangered species?**

**A recovery project to help save a small but mighty endangered species**

Following a dramatic decline in numbers over the past two decades, the Southern Pygmy Perch – a small species of native, freshwater fish are now listed as Endangered in NSW. The small but mighty, Southern Pygmy Perch plays an important part in the eco-system of freshwater streams and wetlands in South Eastern Australia, and to help drive the recovery of this species, SEA LIFE Sydney Aquarium is proud to launch a recovery program in collaboration with the NSW Department of Primary Industries (DPI) Fisheries.

The program aims to establish breeding populations of Southern Pygmy Perch at SEA LIFE Sydney Aquarium, then raise and release the fish into refuges, creating new populations and boosting the number and genetic diversity of existing populations of this species.

## Zone: Sydney Harbour

Key creatures to look for in this habitat!



Lionfish



Slipper Lobster

### Did you know facts about this habitat?

- Like many other crustaceans, the crayfish has a carapace or shield which projects backwards from the head and covers the thorax. There are two functions for their carapace – firstly, it protects the delicate feather- gills that come from the base of the legs, and it also provides a water channel that is a constant flow of oxygenated water to pass over the gills and enables the crayfish to breathe.

### Creature Feature in Focus!

#### Lion Fish

Well known for its long venomous spines that resemble the mane of a lion, the Lionfish is one of the most common aquarium fish. Typically found along the seaward edge of reefs, lagoons and rocky surfaces to 50 metres deep, the red and white striped lionfish prey on small fish and invertebrates. Don't be fooled by the ornate beauty of the lionfish as they are the second most venomous fish in the world after the Estuarine stonefish!

# Zone: Dugong Island

Key creatures to look for in this habitat!



Dugong



White spotted eagle ray

## Creature in focus

### White spotted eagle rays

#### Adaptations:

**Pointy snout** - Spotted Eagle Rays have a long, broad snout, which resembles a duckbill. This comes in handy when digging into the sand to find prey such as clams and oysters (Bester 2014). On occasion, Spotted Eagle Rays will turn over rocks and even poke their heads into caves and other small rock openings in search for food.

**Eyes** - The eyes are located on either side of the head and are useful for viewing immediate threats as well as prey.

**Electroreception**- Spotted Eagle Rays have jelly filled pores along their snout and jaw and around the eyes, creating a network that increases sensitivity to their awareness of prey while hunting. This adaptation means that eagle rays can detect the electrical and magnetic energy fields of prey even when they are buried deep in the sand.

**Jaws and teeth** - Once the eagle ray finds food, it sucks it into its mouth which has a strong jaw as well as broad, flat teeth that form a plate on the top and bottom. The lower jaw has 3-6 anterior teeth, which protrude beyond the upper tooth plate in order to crush shellfish when the mouth is closed. On the bottom and roof of their mouths Spotted Eagle Rays also have a row of six or seven papillae, which remove shells from the prey before it is ingested. The hard parts of the prey, such as shells, are spat out and the soft parts are ingested.

**Countershading** - Spotted Eagle Rays get their name from the white circular pattern on their darkly coloured backs. The eagle ray has a counter shading effect that helps it to be disguised from predators. The dark patterned topside, when viewed by predators from above, camouflages into the reefs. When viewed from the ventral side the light belly colour disappears into the ocean surface.

**Flexible cartilaginous skeleton** - Eagle rays to perform evasive manoeuvres when approached by predators such as sharp turns and sometimes even leaps out of the water if they are being chased.

**Stinging barb** - When predators are close, the Spotted Eagle Ray's final line of defence is the venomous sting from the spines located behind their dorsal fin. There are usually between two and six of these small, barb-tipped spines, which are quite powerful when utilized.

#### Habitat:

The Eagle Ray is a larger species of ray that live in tropical and temperate oceans over the globe. They are a benthic-pelagic species, meaning that they are capable of living in the open water column, called the pelagic zone, and also the deepest area of the ocean, called the benthic zone. Due to this wide geographic range, the Spotted Eagle ray can be found in many habitats.

# Zone: Shark Valley

Key creatures to look for in this habitat!



Grey Nurse sharks



Wobbegongs



Port Jackson sharks



Smooth Ray



Fiddler Ray

## Creature in Focus

### Grey Nurse Shark

#### Adaptations:

**BIG TEETH!** The teeth of a grey nurse shark are constantly being replaced. Older, damaged or blunt teeth on the exterior surfaces of the jaws are replaced with new teeth.

**Electroreception** – The underside of the Grey Nurse Shark's snout is dotted with pores. Each of these leads to an organ (Ampula of Lorenzini) which can detect electricity. Sharks can detect very weak electrical currents. This extra sense gives sharks the ability to detect and attack prey at close range without needing to see the prey item. This can be advantageous in murky water or if the shark is searching for food under the sand. The electroreception capabilities of sharks also gives them the ability to navigate using the Earth's magnetic field.

**Shape of body** – their bodies taper to points at both the snout and the tail, reducing water resistance.

**Cartilage** – Rather than bone, sharks have cartilage, which is much lighter and more flexible. In addition, their livers produce squalene, a fatty oil that helps them remain afloat.

**Pectoral fins** – allow them to quickly change in direction, diving and swimming upward.

**Buoyancy** - The Grey nurse Shark also swallows air at the surface and holds it in the stomach. This provides buoyancy and enables the shark to hang almost motionless above the bottom.

**Countershading** – Grey nurse Sharks are countershaded, the dorsal (upper) part is dark, mostly a grey to bronzy colour whereas the ventral (lower) part of the body is pale. Many fishes that swim in open water are countershaded. This adaptation results in the fish being difficult to see from above because the dark colour of the dorsal surface of the fish blends into the dark colour of the water below. It helps to make the fish also less visible from below because the light colour of the underside of the fish is less noticeable against the light shining from above.

**Habitat** - The grey nurse shark lives in shallow coastal water from the surf zone down to 60 metres. During the day they like to spend time in the vicinity of drop offs, caves and ledges.

**Lifecycle** - Grey nurse sharks only breed once every two years. A pup is about one metre long at birth and will grow to between 2.2 metres and 3.6 metres, weighing in at up to 160 kilograms, as it reaches maturity.



# Zone: Penguin Expedition

Key creatures to look for in this habitat!



King penguins



Gentoo penguins

## How this ecosystem works!

Colonies of King Penguins will occupy beaches, and valleys  
Gentoo penguins – choose shallow coastal areas for their breeding grounds, building nests among tufts of grass and rocky grounds. Their colonies spread across many of the sub antarctic islands as well as the antarctic peninsula.

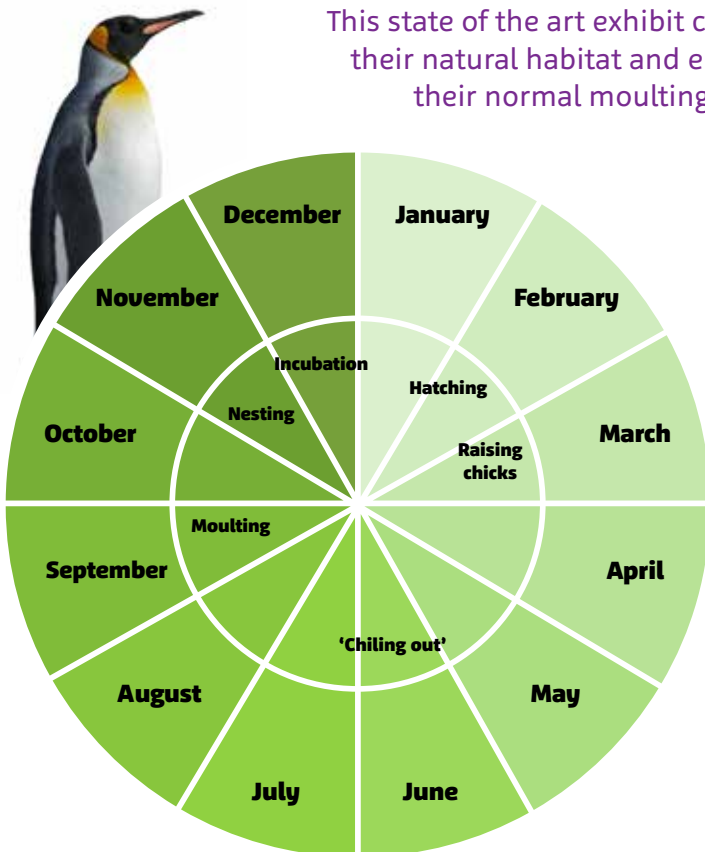
## Why we need to save these species!

Gentoo penguins: The sub-Antarctic populations of Gentoo penguins are listed as Near Threatened. Currently it is thought that commercial fishing practices may be responsible for the falling population due to competition over food. The King penguin is of least concern. During the 19th and 20th centuries, king penguins were harvested for blubber, oil, eggs and feathers until a commercial hunting ban was put into place in 1969.

## What are King Penguins up to?

## What are Gentoo Penguins up to?

This state of the art exhibit changes its lighting to mimic their natural habitat and ensure the penguins follow their normal moulting and breeding cycles.



# Zone: Discovery Rockpool

Key Creatures to look for in this habitat!



Sea Star



Shark egg



Sea urchin



Hermit crabs



Waratah sea anemone

## How this ecosystem works!

You'll find **tidal pools** in the intertidal zone, where land and sea meet. These **pools** usually form where there are areas of hard rock, and parts of the rock have eroded away to form depressions in the rock. At **high tide**, ocean water collects in these depressions. The tides of the ocean tend to change the physical characteristics of the pool and its surroundings

### There are several advantages to living in a tide pool ecosystem.

- Algae and other intertidal plants grow in the abundant sunlight and support an entire food chain of animals.
- Constant wave action supplies the tide pool with nutrients and oxygen.
- Food is abundant.
- There tends to be a lot of rocks, sand and plants which provides hiding places and surfaces to cling to.

### Challenges:

- Exposure to the sun. While this exposure can help grow algae, it can also dry up moisture and increase the water temperature
- There is a lot of competition for space amongst the animals that live with in a pool
- As the tide rises and falls, the level of salt in the water (what we call salinity constantly changes so the animals within this zone need to be well adapted to these extreme levels.
- There are a lot of waves in this zone which can risk animals being washed away. Most of the animals within this zone will have great ability to stick to the rock walls of their habitat.

# Post visit activities



## Activity 1.

Create information report on one of the amazing animals that you visited at SEA LIFE. Plan using the template provided.

## Activity 2.

Students identify the similarities and differences of sharks & rays using the Venn diagram template. Repeat activity and compare another two marine animals. These are then shared as a grade to allow a variety of animals being investigated and discussed.

## Activity 3.

Create your own species of fish - how would it be classified? What would scientist need to know about them? Annotate diagram with its adaptations and create family species name.

## Activity 4.

Display 'Who Am I?' PowerPoint, asking students to guess the animal and the type of animal it is e.g. reptile, mammal, fish. For a challenge, guess while covering the clue and prompts.

## Activity 5.

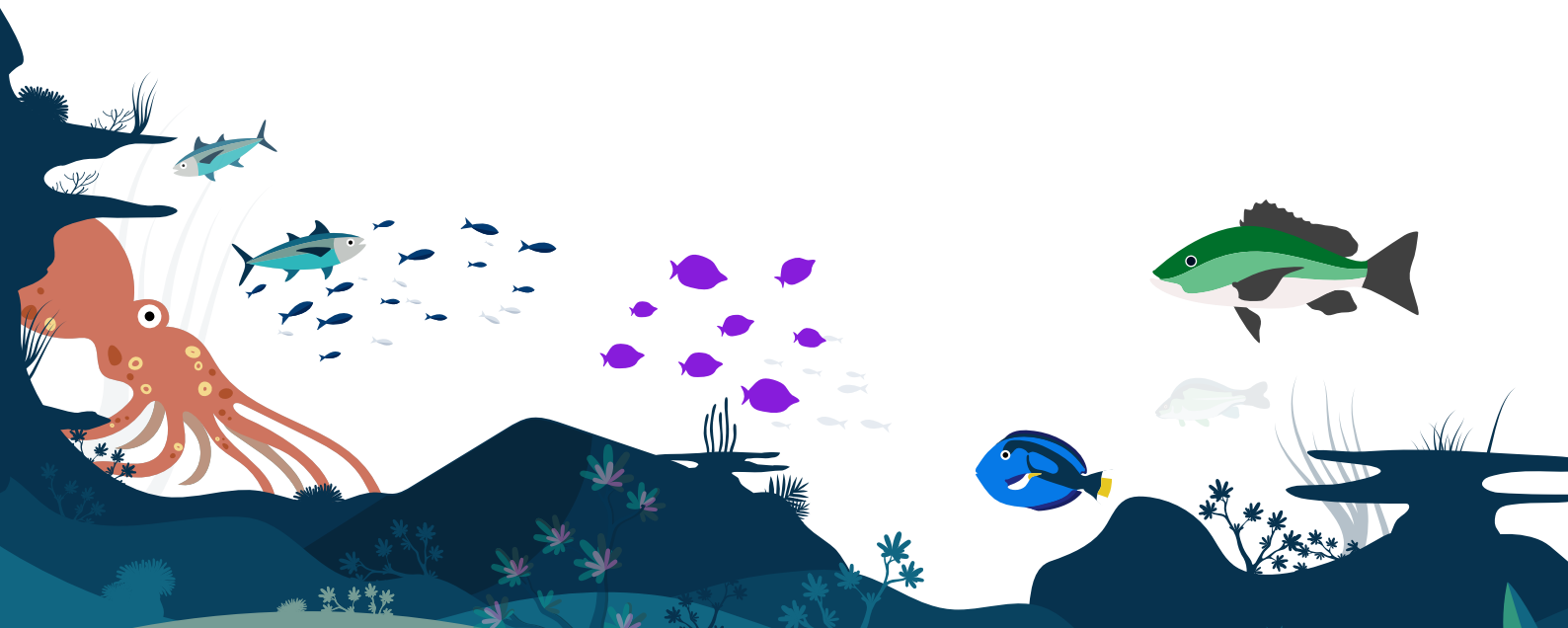
Discuss different animal coverings and how this adaptation could be beneficial for blending in, attracting a mate or warning off other animals. Using the template provided, students draw and decorate the same animal four different times to suit its environment.



# Curriculum links

These SEA LIFE self-guided resources packs can be used and adapted to meet the following K-6 NSW Science and Technology Syllabus.

Early Stage 1	Early Stage 2	Early Stage 3	Early Stage 4
<b>A student: STe-3LW-ST</b> explores the characteristics, needs and uses of living things	<b>ST1-4LW-S</b> describes observable features of living things and their environments	<b>ST2-4LW-S</b> compares features and characteristics of living and non-living things	<b>ST3-4LW-S</b> examines how the environment affects the growth, survival and adaptation of living things
<b>STe-6ES-S</b> identifies how daily and seasonal changes in the environment affect humans and other living things	<b>ST1-5LW-T</b> identifies how plants and animals are used for food and fibre products	<b>ST2-5LW-T</b> describes how agricultural processes are used to grow plants and raise animals for food, clothing and shelter	<b>ST3-5LW-T</b> explains how food and fibre are produced sustainably in managed environments for health and nutrition



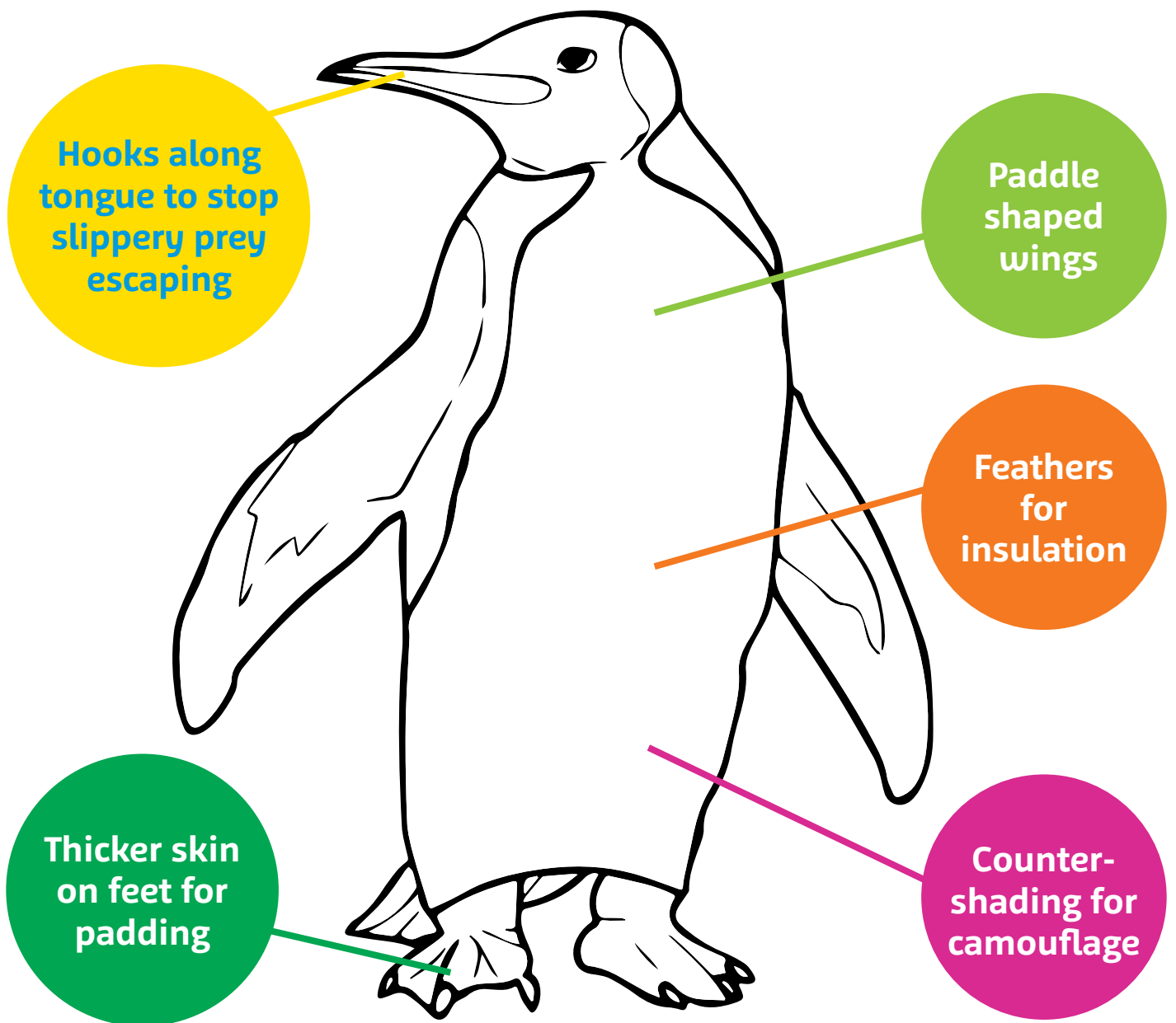


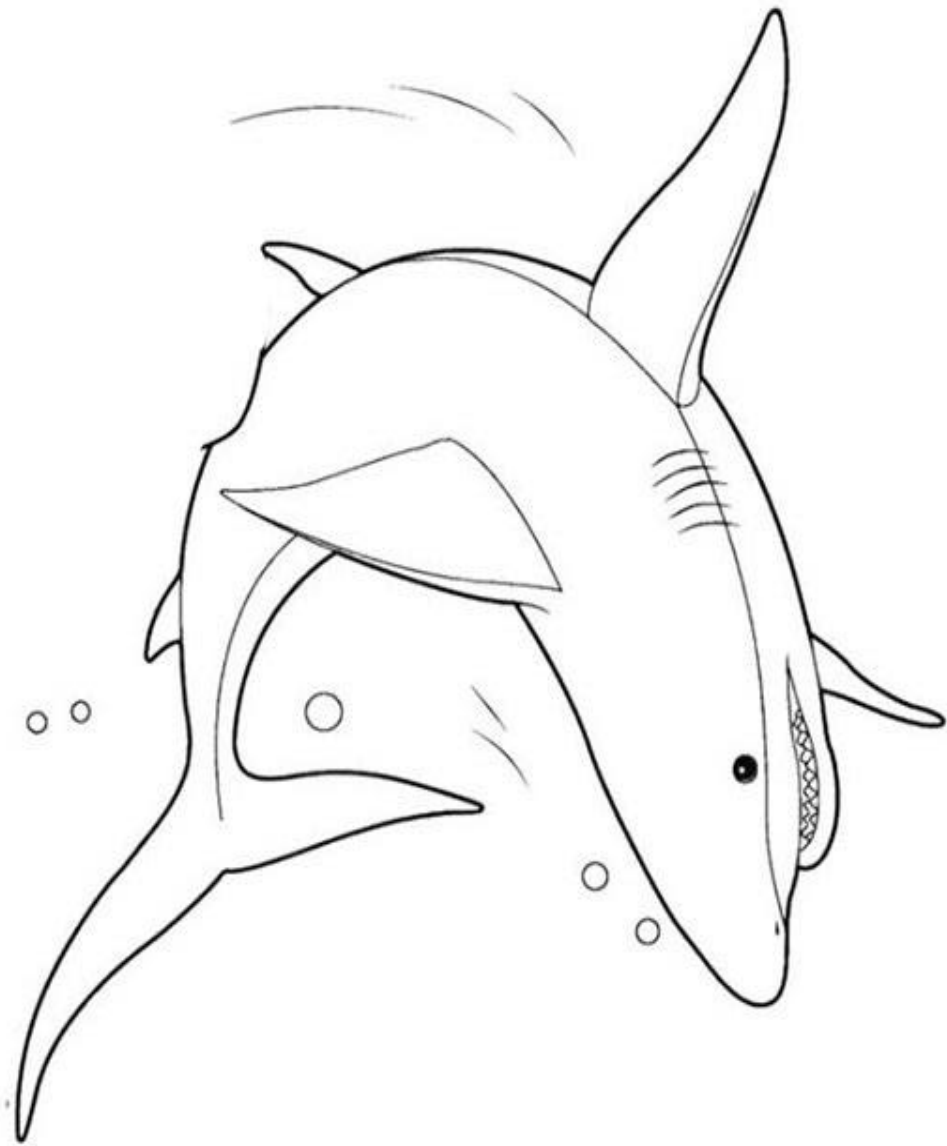


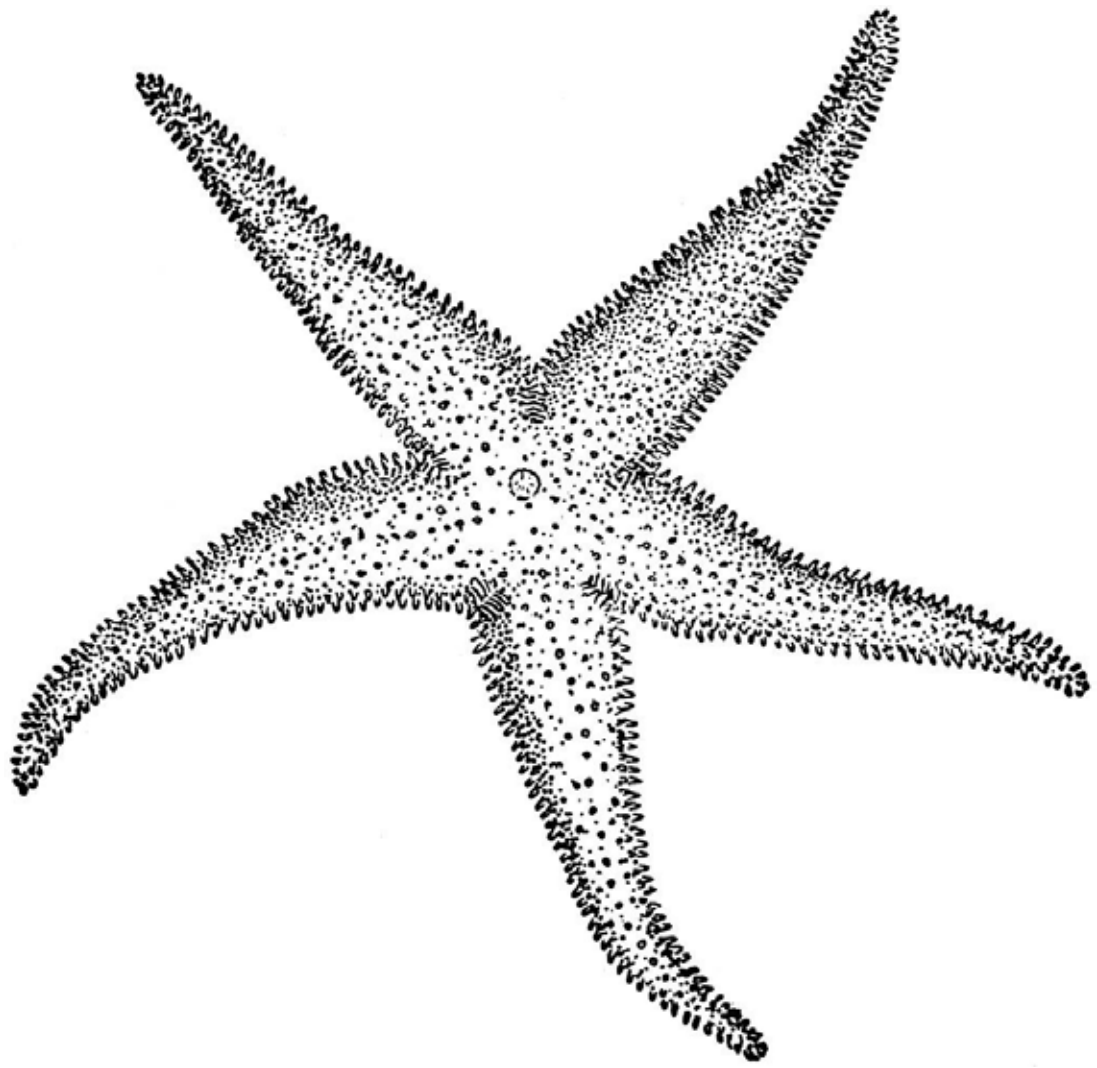
# Resources

**Pre-visit activities**

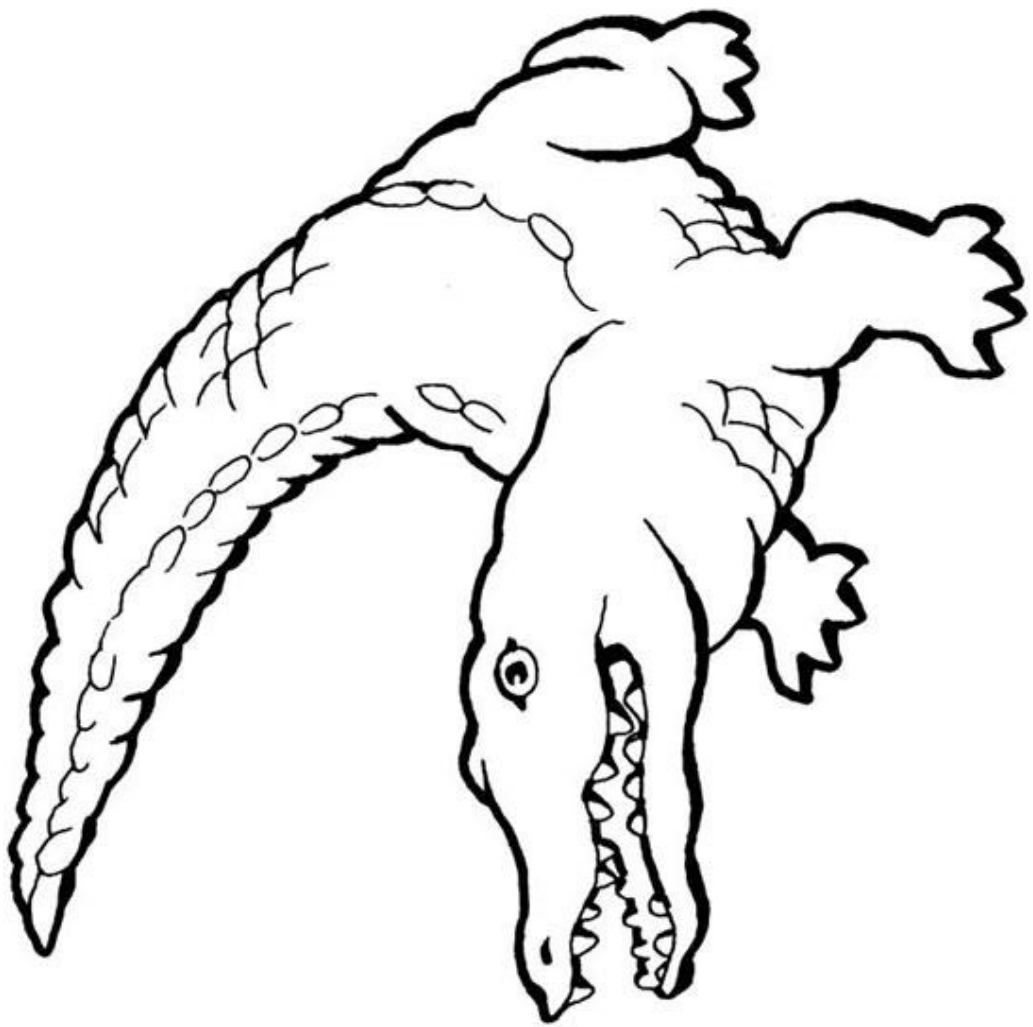
# King Penguin adaptations

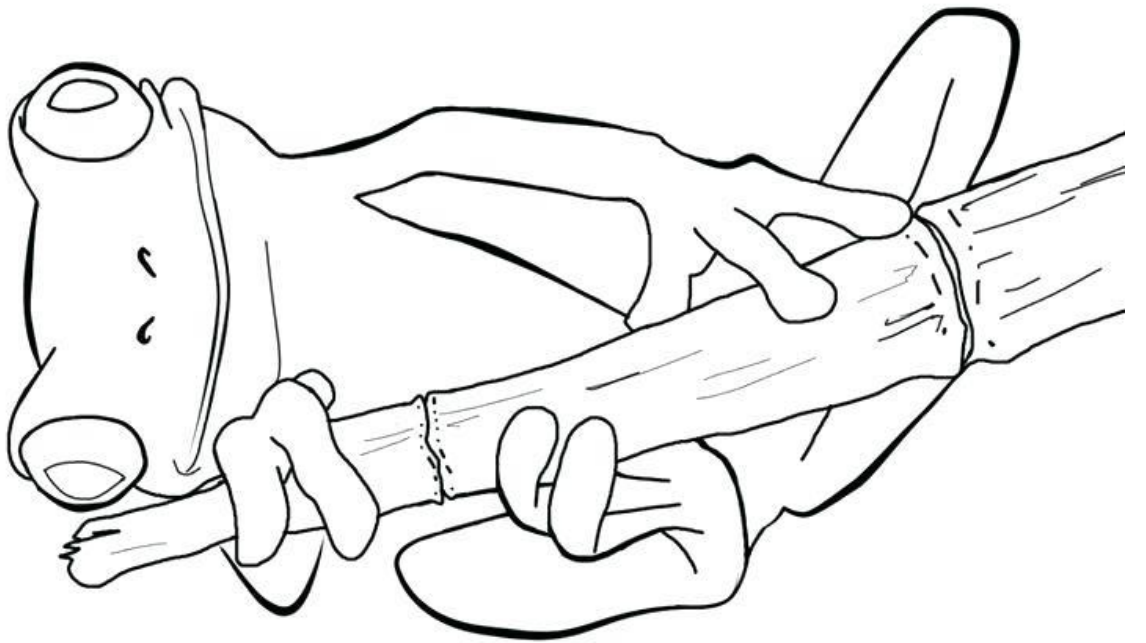














# Resources

**Post-visit activities**

**Description:** Draw & label the animal

**Diet:** What does it eat?

**Lifecycle:** Draw its lifecycle

**Habitat:** Where is this animal found?

What are its key adaptations?

Interesting facts

