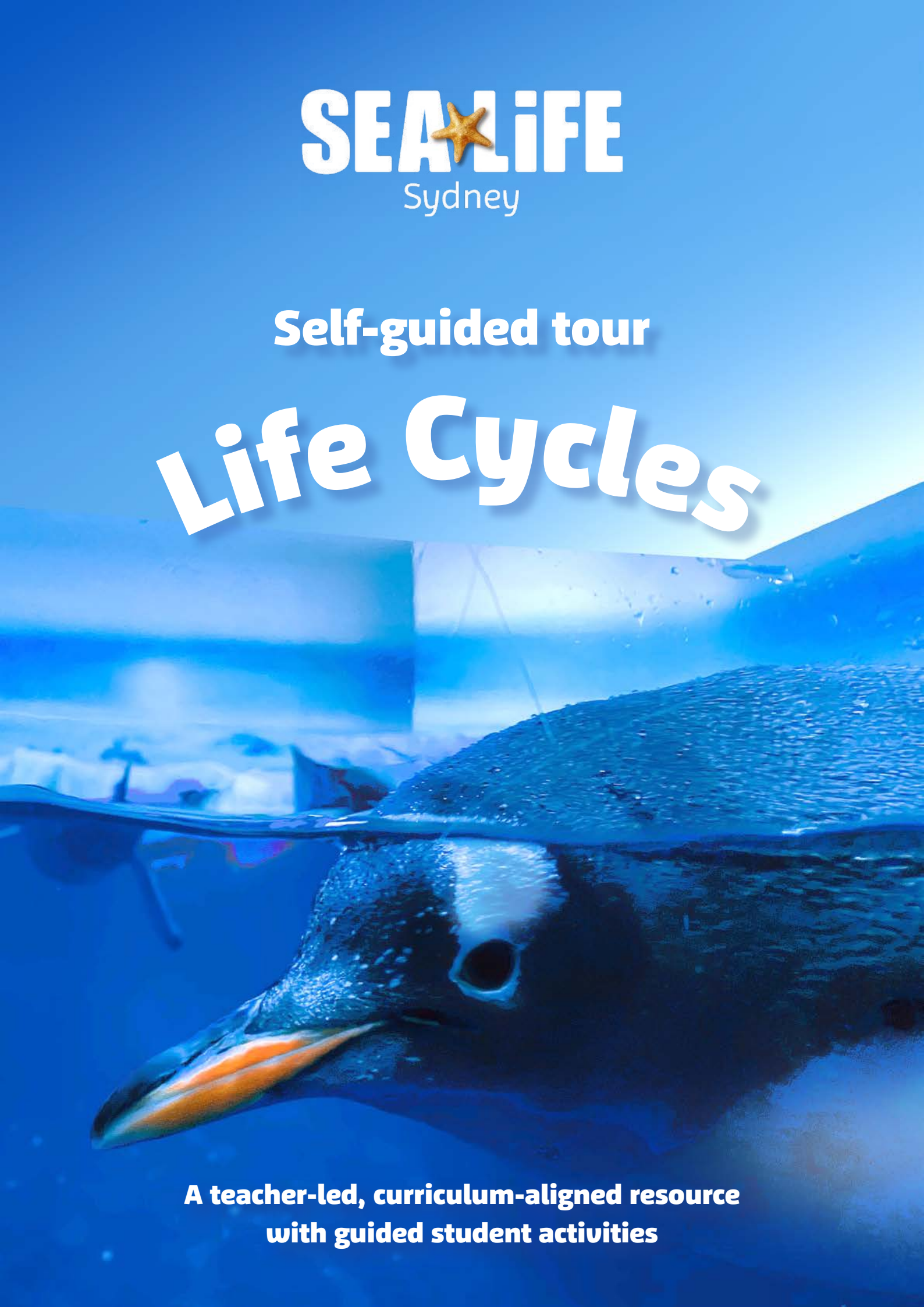
SEA LIFE Sydney

Self-guided tour

Life Cycles



A teacher-led, curriculum-aligned resource with guided student activities

Key Questions

- What is a food chain? What is a food web?
- What are examples of producers, consumers and decomposers and how do they affect one another?
- What features do certain animals have to make sure they can survive within their food chain?
- Why do animals have different life cycles?
- How does the habitat or environment impact an animal's life cycle?
- How do humans impact an animal's life cycle or their food chain? What can we do to help?

Vocabulary

Ecosystem
An ecosystem is made up of all of the living and non-living things in an area. This includes all of the plants, water, rocks, earth, animals and other living things that make up the communities of life in an area.

Producer
Organisms that make their own energy by using an external source (e.g. the sun).

Consumer
Organisms that eat plants or animals in order to create energy.

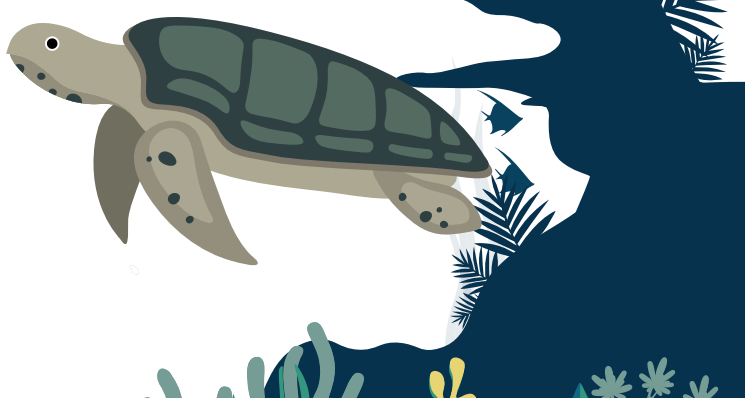
Decomposer
Organisms that cause decay and break down waste products and dead tissue of living things turning them into organic compounds essential to life (e.g. oxygen, carbon, etc).

Food web
Food webs show how plants and animals are connected in many ways. These show the energy flow between a variety of animals and plants as they consume and are consumed by others.

Food chain
The term food chain describes the order in which organisms, or living things, depend on each other for food.

Predator
Animals that eat other animals.

Prey
An animal hunted or caught for food.



Pre-Visit Activities

Activity 1.

KWL chart - What do we already know about underwater animals? What would we like to know? Complete 'What have we learnt' after your excursion.

Activity 2.

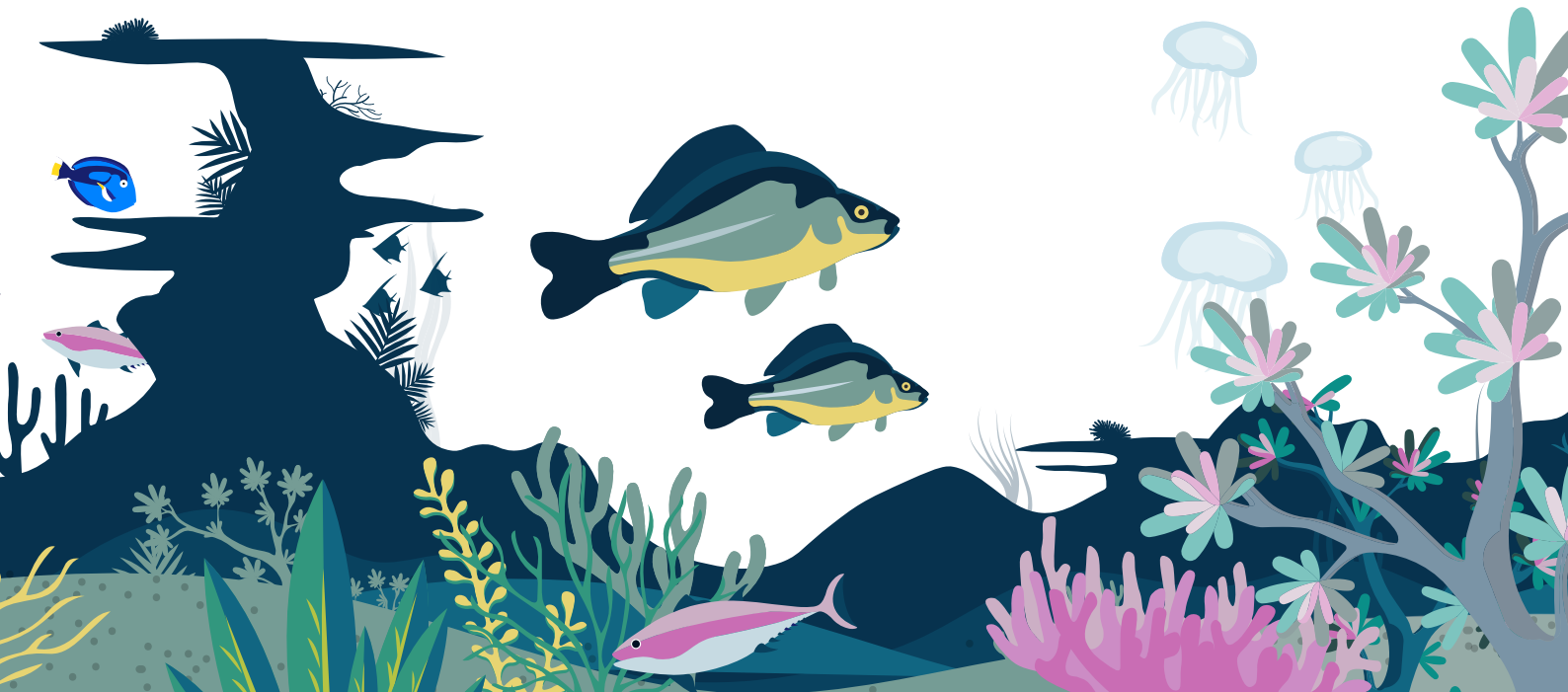
Students select one of our amazing animals from SEA LIFE to complete an animal profile (see template). These are then used to create an information report, which can then be compiled into a class book.

Activity 3.

Students plan a simple STEM investigation by observing the life cycle of a plant. Teacher to provide the groups with various seeds e.g. broad bean or tomato, and ask students to plan an experiment observing the stages of its life cycle. As an extension, ask them to modify the variables such as limiting light, less water etc.

Activity 4.

Students research and create their own parents and young flip book to present to junior levels. They can draw and match juvenile animals to their parent animal.



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: South Coast 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 live in temperate seas with temperatures between 13 and 20 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.

The Port Jackson shark is 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.

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

Common Sydney 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!
These brain cells are mostly found in the tentacles, which makes them very intelligent creatures. They also have amazing eyesight.

Ink Sac
When they feel threatened, the octopus contracts 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 where 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

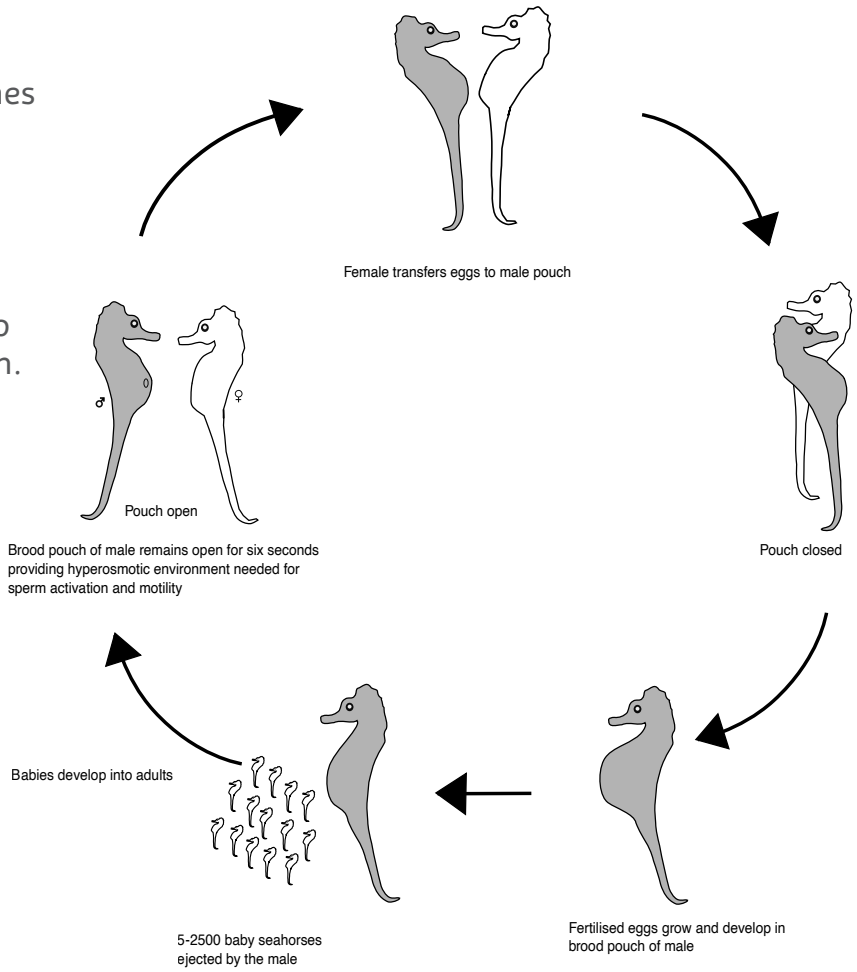
White's Seahorse

'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 seahorse's 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.

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?

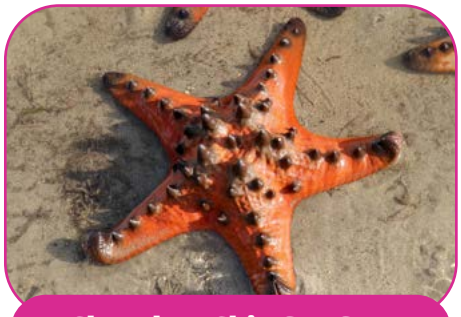
A recovery project to help save a small but mighty endangered species

Following a dramatic decline in numbers over the past two decades, the Southern Pygmy Perch - a small species of native, freshwater fish - is now listed as Endangered in New South Wales. The small but mighty Southern Pygmy Perch plays an important part in the ecosystem 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: Rocky Shores Rockpool

Key creatures to look for in this habitat!



Chocolate Chip Sea Star

Shark egg

Sea urchin

Blue and Green Chromis

Burnt Sea Cucumber

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 provide 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 within 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 a great ability to stick to the rock walls of their habitat.

Zone: Sydney Harbour

Key creatures to look for in this habitat!

Lionfish

Slipper Lobster

Did you know?

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

Lionfish

Well known for its long venomous spines that resemble the mane of a lion, the lionfish is one of the most common aquarium fish species. 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 one of the 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 Feature In Focus

White spotted eagle rays

Adaptations

Pointy snout
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
Their eyes are located on either side of their 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 pray, 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 that live
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 lives in tropical and temperate oceans over the globe. They are a bentho-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 Feature In Focus

Grey nurse shark

Adaptations

BIG TEETH!
The teeth of a grey nurse shark are constantly being replace. 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 of it the dark is searching for food under the sand. The electroreception capabilities of sharks also give them the ability to navigate using the Earth & magnetic field.

Shape of body
Their bodies taper to pionts 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 liver's produce squalene, a fatty oil that helps them remain afloat.

Pectoral fins
Allow them to quickly change direction, diving and swimming upward.

Buoyancy
The grey nurse shark 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 counter-shaded, the dorsal (upper) part is dark, mostly a grey to bronzy colour whereas the ventral (lower) part of the body is pale. Many fish that swim in open water are counter-shaded. 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 also helps to make the fish 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?

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.

What are gentoo penguins up to?

Zone: Day and Night on the Reef

Key creatures to look for in this habitat!

Leopard Sharks

Blue Streak Cleaner Wrasse

Foxface Rabbitfish

Hump Nose Unicorn Fish

Maori Wrasse

Clown Triggerfish

Threadfin Butterfly Fish

Sabre Squirrelfish

Honeycomb Ray (Manuka)

Green Sea Turtle

Flatback Turtles

Queensland Grouper (Beau)

Black Tip Reef Sharks

Zone: Day and Night on the Reef

Creature Feature In Focus

Zebra Shark

Adaptations

Body

These sharks are born with stripes on their body (just like a zebra) to mimic the patterns of a poisonous sea snake to deter any predators whilst they are young. As the zebra shark gets bigger their stripes turn into spots to camouflage with the sea floor (just like a leopard).

Diet

They are oviparous (egg-laying) sharks. Females can lay 30-80 eggs during the 3-month breeding period.

Mouth

Zebra sharks have mouths on the underside of their heads to allow them to feed on bottom-dwelling organisms, such as crustaceans, mollusks, and fish.

Conservation

Zebra Sharks are endangered, meaning there aren't as many of them in the wild as there used to be. Here at SEA LIFE Sydney Aquarium we are a part of a breeding program called StAR Project. We provided viable eggs to the StAR hatcheries in Raja Ampat in Indonesia, to increase the wild population diversity.

Creature Feature in Focus

Green sea turtle

Adaptations

Sharp beak

Turtles have no teeth, their jaws are powerful and shaped like a bird's beak which helps them eat hard-shelled animals as well as their main diet of sea grass.

Forelimbs

Their forelimbs are modified into long, paddle-like flippers for swimming. This allows the green turtle to maintain its speed whilst travelling in the ocean. The cruising speed for green sea turtles is about 1.5 to 9.3 km per hour.

Body shape

Turtles are hydrodynamic, meaning their bodies are shaped to minimise drag and resistance when travelling through the water.

Lungs

Turtles have more than one lung located on the top of their shells for breathing. They also have two sets of muscles for breathing. One set of muscles is responsible for stretching the body outward from the shell, which expands the body cavity of the turtle, allowing it to inhale. The other set draws the body inward to exhale. Sea turtles are cold-blooded reptiles, meaning their body temperature changes with the environment. This helps them stay underwater. The green sea turtle can be submerged for up to 5 hours! Check out the turtles within the Day and Night on the Reef exhibit - do you see any sleeping turtles? When they are in this state, they need to use as little oxygen as possible. Their heart rate gets very slow. Eventually all sea turtles must come up to the surface to get air to breathe.

Zone: Day and Night on the Reef

How can we protect this ecosystem?

Like all ocean habitats, coral reefs are extremely vulnerable to human activity. Even if you don't live near tropical reefs, you can still make everyday choices that help preserve this vital habitat.

Use reef-safe sunblock

Chemical-based sunscreens can harm marine life. Use mineral-based sunblock when swimming, snorkelling, boating or diving. Check ingredient lists and avoid sunscreens that contain oxybenzone and octinoxate — chemicals known to cause coral bleaching.

Look, but don't touch

Coral reefs are delicate environments. Keep your hands, fins and feet off the reef when snorkelling or diving in tropical waters. Avoid stirring up sediments on the tropical seafloor, which can smother corals living nearby.

Don't buy coral souvenirs

Corals take thousands of years to form their intricate reefs. Yet reefs are destroyed in an instant to make souvenirs for tourists. Avoid buying jewellery and other products made from coral, seahorses and other reef animals. Take pictures instead!

Choose sustainable seafood

Coral reefs are home to 25 percent of all marine life, which makes them targets for commercial fisheries. Choose seafood that is responsibly caught. Visit Seafood Watch to learn more.

Post-visit activities

Activity 1.

Students write a recount, draw a comic or develop a poster describing their visit. Ensure that they include information learnt from their excursion.

Activity 2.

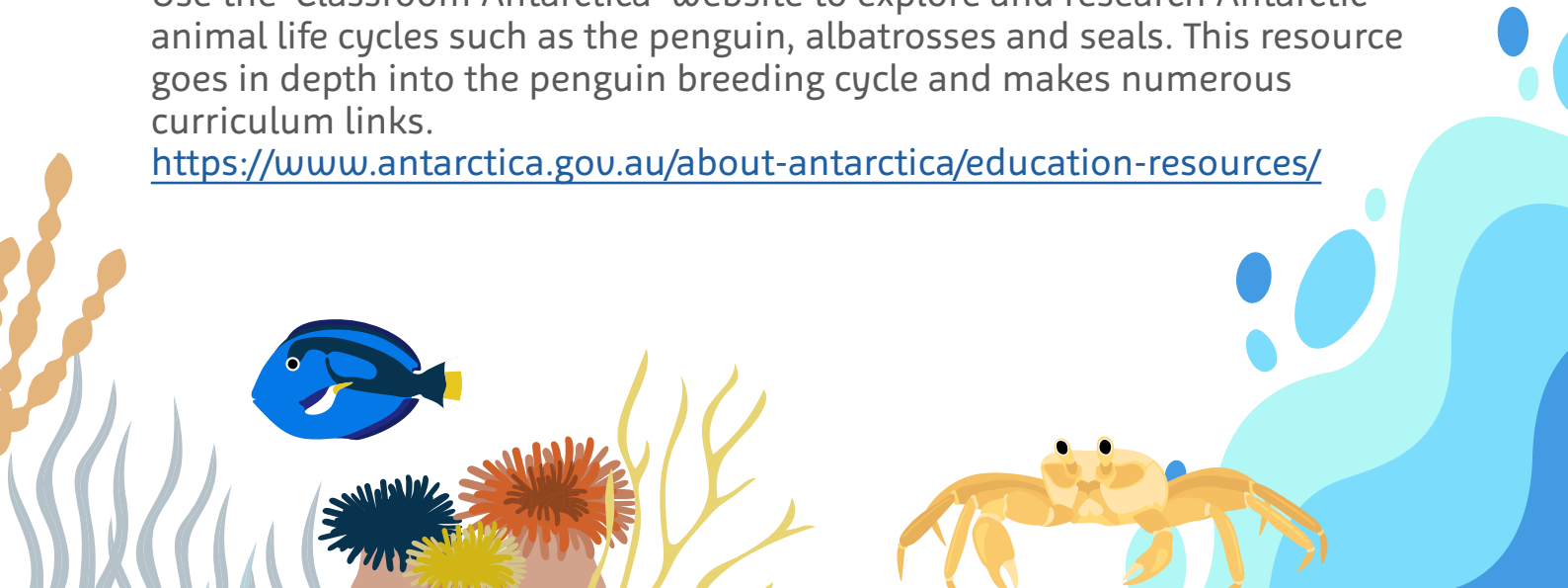
Research animal life cycles where newborns resemble the parents, such as a shark, and others that do not, such as the sea star. Students then investigate their life cycle, from early stages to adult and how they change over time.

Activity 3.

Create your own food chain or life cycle using the template provided. These can be shared and compared. As an extension, students can label whether the organism is a decomposer, producer or consumer. They can extend their food chain into a food web by adding additional organisms and arrows to their chain.

Activity 4.

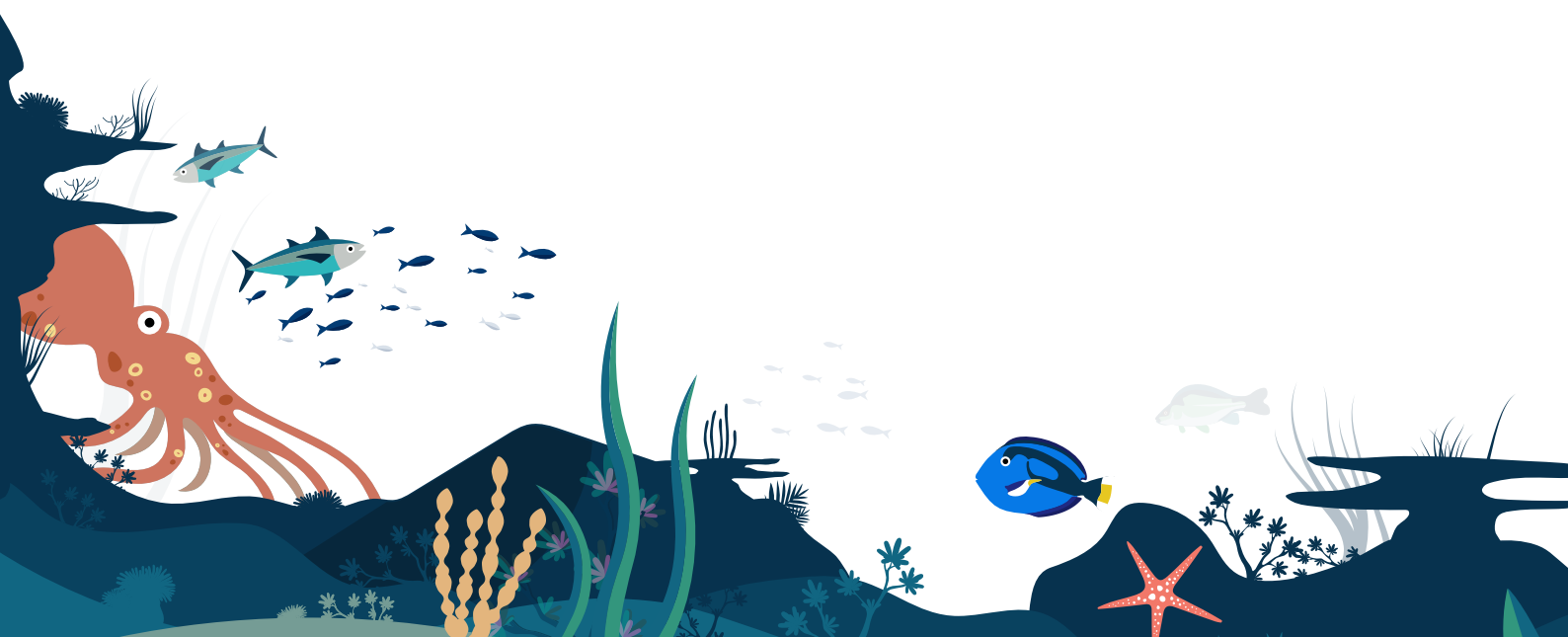
Use the 'Classroom Antarctica' website to explore and research Antarctic animal life cycles such as the penguin, albatrosses and seals. This resource goes in depth into the penguin breeding cycle and makes numerous curriculum links.
https://www.antarctica.gov.au/about-antarctica/education-resources/



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



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Students plan a simple STEM investigation by observing the life cycle of a plant. Teacher to provide the groups with various seeds e.g. Broad bean or tomato, and ask students to plan an experiment observing the stages of its life cycle. As an extension, ask them to modify the variables such as limiting light, less water etc.

Activity 4.

Students research and create their own parents and young flip book to present to Junior levels. They can draw and match juvenile animals to their parent animal.

Resources

Pre-visit activities

Description: Draw & label the animal

Diet: What does it eat?

life cycle: Draw its life cycle

Habitat: Where is this animal found?

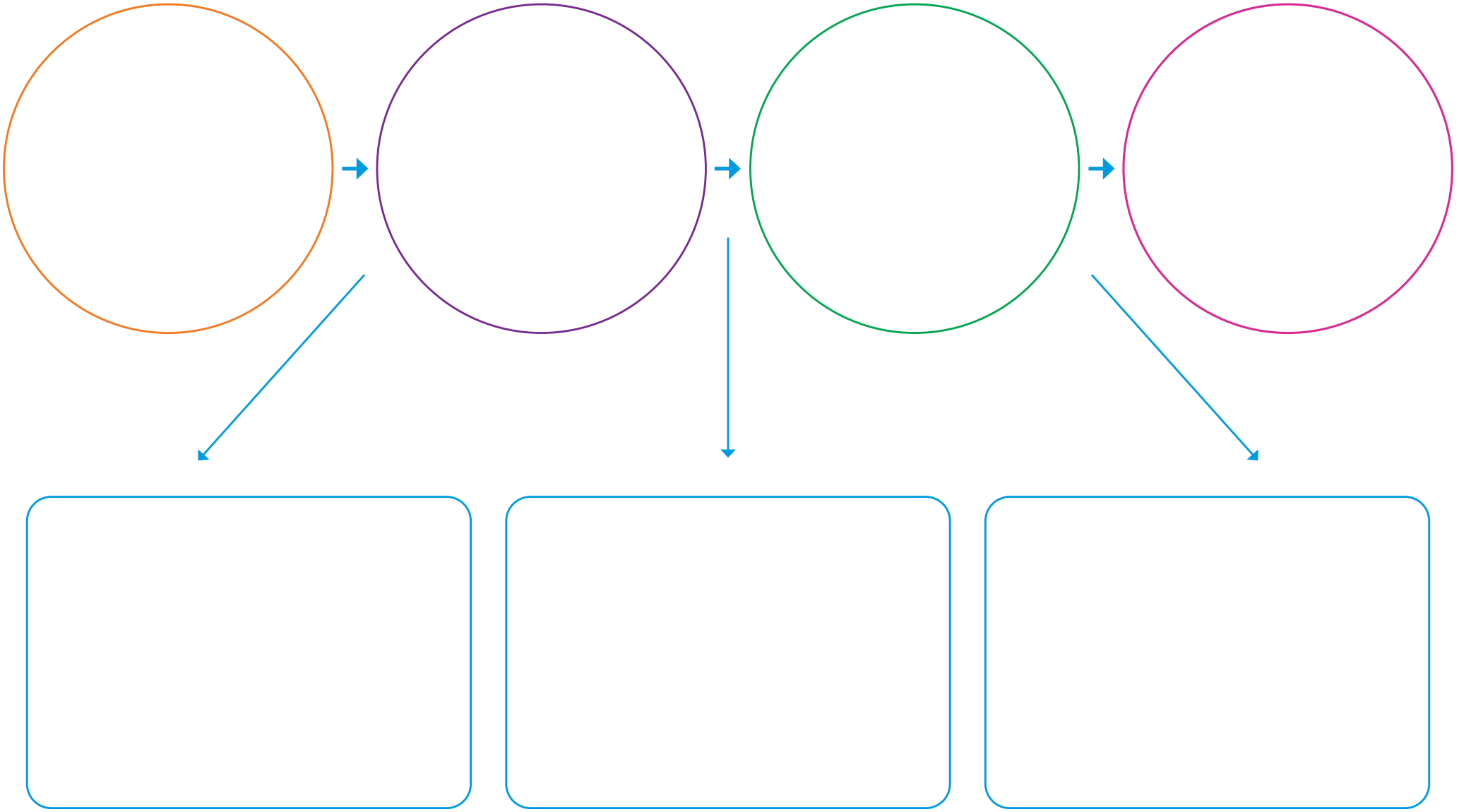
What are its key adaptations?

Interesting facts

Resources

Post-visit activities

Food chain in the _____

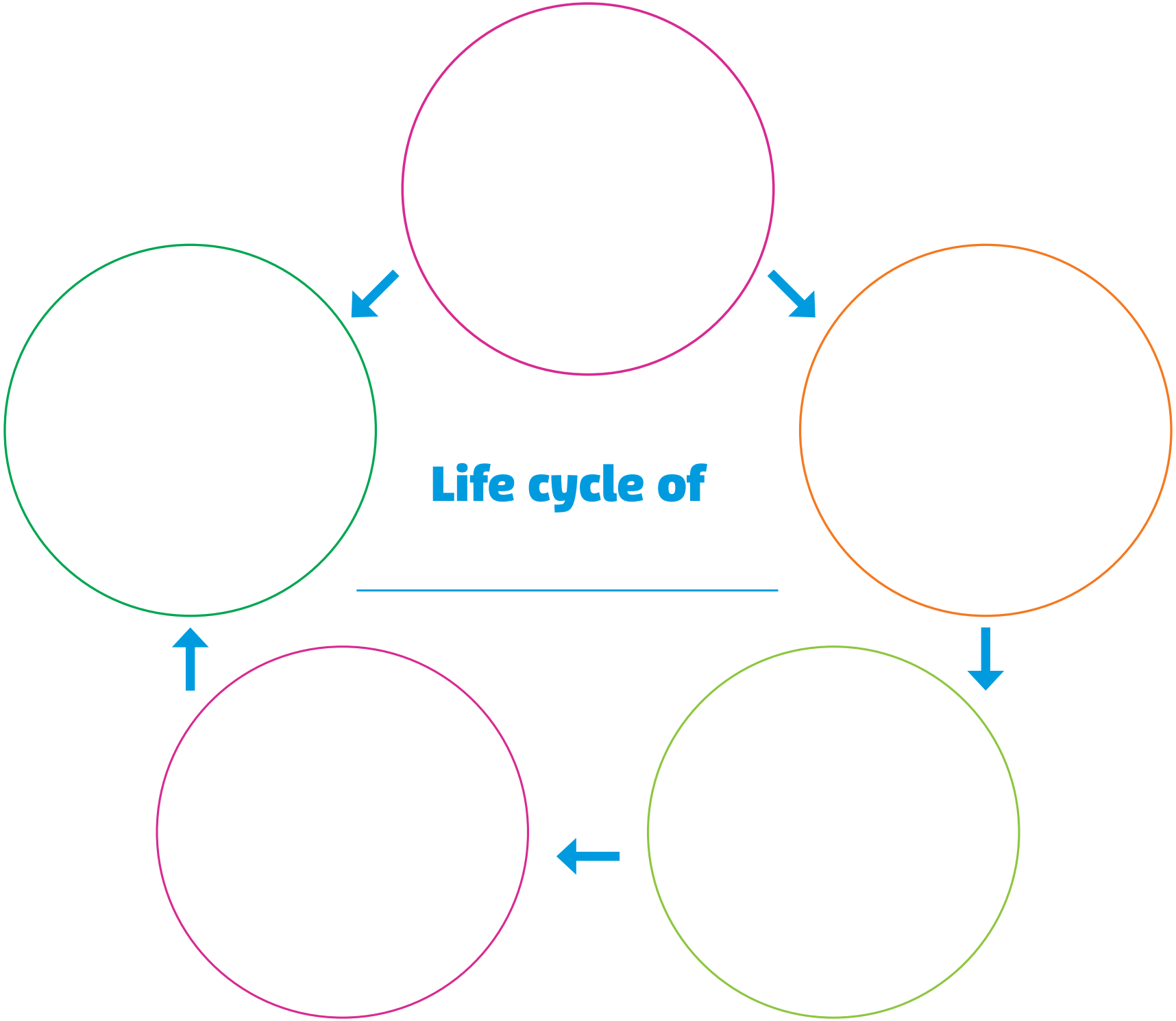


What can affect this food chain? Draw them in the boxes above.

Draw and label a food web

1. Pick an animal or plant and describe what would happen to the food web if it was removed?

2. Introduce a pest species such as the Northern Pacific Sea star that eats almost everything. What happens?


Life cycle of