



Reef Roles

TOPIC B: ANIMAL INTERACTIONS
TEACHER RESOURCE



Curriculum Links

Year 4 Science Understanding – Biological Sciences.

Living things depend on each other and the environment to survive.

ANIMAL KINGDOM

Coral reefs are the underwater cities of the sea. A bustling ecosystem made by animals, for animals. In a rainforest, animals live amongst towering plants but on a reef, plants are microscopic and live inside the animals.

Corals aren't your standard animals though. They turn water into rock to build the home that they share and can live for several hundred years!

As corals build their homes, they also build the reef, creating an underwater world that covers 1% of the ocean floor but is home to over 25% of all marine animals.

Below is information to help you explore this underwater city and meet the builders, chefs, rubbish collectors, gardeners, residents, demolition teams and the doctors.

BUILDERS AND ARCHITECTS: CORAL

- The inside of a coral looks like a white rock, as the living part is a thin layer over the top.
- A coral's skeleton is calcium carbonate – or limestone (so it is really a rock).
 - Our skeleton is made up of a soft collagen framework filled with strong and hard calcium phosphate. Due to the calcium similarity, coral skeletons have been used in bone transplants.
- The living layer of coral is made up of polyps; separate animals that are all connected to each other. They share food, send messages to each other and have set jobs such as food production, construction or defence.
- Polyps are like a jellyfish with a cup-shaped body, a mouth that is also its bottom and a rim of stinging tentacles.
- These polyps live together in a house that they build themselves.
- To grow, corals need warm, clear water with few nutrients.
- Coral polyps use minerals in seawater to construct floors, walls and a fence. Each day coral polyps add to their house. As they grow, so too does the reef.
- Different polyps have different design styles for their floors and walls, and the shape of the coral that they create varies with the stillness, clarity and depth of the ocean.
- Three of the main building designs that you see in our exhibits are: branching, plate and mound.

Branching

- This is the fastest to build as there is the least investment in skeleton. They can grow as much as 20 cm a year.

- It is great for shallow water where there is lots of sun – the polyps grow on the side of the branches enabling them to get some shade.
- This design is also perfect for water that has sand stirred up in it – as when the sand settles it doesn't cover all the polyps.
- The branches are quite thin, so they can break easily – but because they are thin they can grow again quickly.

Mound

- The slowest but sturdiest of the corals is mound coral. These take a long time to grow as there is so much skeleton to build on the inside. Once it has grown, it can't be easily broken or knocked over by waves.
- These corals often reproduce later as all their initial energy goes into building.

Plate

- This design is great for sunbaking – everyone gets lots of sunshine – so it is a popular style a little bit deeper in the water (as near the surface there is just too much light).
- This design also blocks out light underneath, meaning no other coral will grow there. This is important, as a coral reef is the busy bustling city of the sea and, like an oasis in the desert, there is often nothing but sand all around, so competition for space is extreme. At night, corals will actually attack their neighbours if they grow too close! By shading underneath, and then growing a bit above the reef, plate corals make sure they don't have any neighbours and can spend less time and energy defending themselves.

PERSONAL CHEFS AND POWER STATIONS: ALGAE

- Living inside coral polyps are tiny plants that use sunlight to make energy.
- The coral polyps provide the tiny plants, called zooxanthellae, with a safe place to live and all the sunlight they need. In return, the algae produce food for the coral.
- The algae produce food by photosynthesis – they use sunlight to make sugars for the coral to eat.
- Corals get nearly all (97%) of the energy they need from eating sugar during the day.
- For a balanced diet, they do extend their stinging tentacles at night to capture their "meat and veg" (plankton) from the water.
- Not having to worry about catching all their food means that a coral has the energy to make their limestone skeleton and build a reef.

THE RUBBISH COLLECTORS: FISH

First of all, let's get an insight into the slimy rubbish disposal system of coral polyps.

- Polyps have a cup-shaped body with just one opening, so their mouth is also their bottom! They can get rid of their scraps from eating by just releasing into the water. But just like our homes, a coral's home can get dirty – sand may settle on top stopping the chefs from getting the light they need – so corals produce slime – and lots of it!
- 1 m² of coral make 4 L of slime a day (that's 2 ice cream tubs full). This slime covers their body and when they ooze and release this slime they also let go of all the rubbish that has settled on them.
- This slime is then eaten by other fish! Making fish the rubbish collectors for the buildings – but who keeps the fish clean?

Day Spa/Carwash/Dentists: Cleaner Wrasse

Cleaner wrasse eat the slime and old scales off other fish. To do this, they set up cleaning stations around the reef that are a carwash, dentist and day spa all in one. To keep the big fish still, the cleaner wrasse uses the fins underneath its body to give them a massage. It pecks off the slime and scales. With a long thin body, it can then fit into the fish's mouth where it acts like a toothbrush and eats all the leftover pieces of food!

Street Cleaners: Starfish and Sea Cucumbers

- With clean buildings and clean residents, all that's needed are clean streets and it is the sea cucumbers that clean the sand. With sticky feet, they pick up the dirty sand and eat it! As the sand goes through their body, the sea cucumbers eat the tiny animals and bits of food or waste, while the sand comes out the other end cleaner than when it goes in!
- While on your excursion, have a look around AQWA to see if you can see a sea cucumber hard at work and if you can see the trail of clean sand that follows behind them.
- Starfish can also help to keep the reef clean. They eat the big leftover pieces of food that fall to the seafloor. Starfish have a very small mouth, so to eat they bring their stomach out of their mouth and onto their food. They suck it all up like it's a milkshake and then bring their stomach back in.

Gardeners: Damselfish

- Algae is a type of plant.
- Some red-coloured algae acts like cement, keeping the reef together, while other types of algae grow very quickly and can take over spaces where coral is trying to grow – or may even grow on the coral itself.
- Excursion – at AQWA, our curatorial staff give the reef a helping hand and will use tweezers, brushes or an underwater vacuum to keep algae under control.
- Most of the little colourful fish you see on a coral reef are called damselfish.
- Some damselfish farm their favourite type of algae and will get rid of the types they don't like just like we weed our garden!
- Damselfish can live until they are over 40 years old and they will always live amongst one piece of coral. So although you see lots of fish on a reef, they aren't all just swimming anywhere – they have a specific place that they call home and will return to. Some may even only swim a few metres away from it.

Let's meet some of the other residents of the reef.

REEF FISH

- Coral reef fish are bright and colourful compared to the silvery blue colours of the open ocean (AQWA's underwater tunnel the Shipwreck Coast) or the sandy whites, browns and oranges of the seafloor.
- Stripes and dots break up a fishes' image, making it harder for a predator to see them.
- Reef fish have bigger side fins compared to the rest of their body, as the role of the side fin is steering and there is much more to steer around on a reef than out in the open ocean. It's like the equivalent of us having small, zippy cars for driving around in the city.
- Fish on a coral reef are also generally quite thin. This helps them to get in and out of small spaces or to slide through gaps in the coral.
- Coral reef fish also have better eyesight than other fish and they can see the UV part of the light spectrum.
 - The water around a coral reef is usually very clear, so it is worth having good eyesight.
 - Divers use the term visibility to describe water clarity. It is a measure of the distance at which an object can be seen. Underwater, things are less visible because less light filters through and it scatters on the way down. Turbidity (particles in the water e.g. sand stirred up from waves, storms or run-off) is the main factor that affects visibility.
 - UV (ultraviolet) light comes from the sun but can't be seen by our eyes.
 - It is also thought of as invisible energy and is what gives us sunburn.
 - Animals such as birds, bees, reindeer and fish can see this part of the light spectrum. The reef would look very different to them than it does to us as they would see lots of glowing patterns.
 - Sharks and other fish can't see UV light so reef fish can send secret messages to each other without fear of a predator seeing them.
 - At AQWA – make a special stop at our Trigg exhibit in the Perth Coast; here we use special black lights so that you can see the UV lights of a coral reef.

Below are some local reef fish to look out for at AQWA.

Boxfish

- These fish have a very funny way of swimming, as they can't bend like other fish. They have flattened bones just under their skin, which creates a rigid box for protection.
- Boxfish can ooze out a poisonous slime and, when eating, they use their mouth like a water pistol – squirting a jet of water at the sand to uncover hidden food.

Footballer Sweep

- Named after their bright striped patterns that look like a football jersey, footballer sweep are inquisitive fish that follow divers and zip around the reef in groups.
- To eat, footballer sweep face into the current and grab their food with tiny bristle-like teeth.

Hulafish

Swimming around in large schools, these thin fish are named for their Hawaiian hula dance-like swimming style! The ones with the blue lines are also only found here in Western Australia – nowhere else in the world!

Wrasse

- There are over 500 different kinds of wrasse. They have a cigar-like shape and use their side fins to row through the water. Most wrasse also change colour as they grow old – some even change from a girl into a boy!
- Western king wrasse – sleep in the sand at night. They swim at the sand, turning on their side to slide in just beneath the surface, where they will lie flat until the morning.
- Maori wrasse – adults have bright blue tattoo-like markings that are thought to look like a Maori tattoo.
- Moon wrasse – named for the yellow crescent on their tail, these narrow fish dart about the reef. Moon wrasse eat animals that live in the sand. To make finding dinner easier, they follow divers or big fish who reveal hidden food by kicking up the sand as they swim.

Rough Bullseye

These fish swim around the reef at night. During the day you will normally see them relaxing in a cave. They have big eyes to help them see in the dark and lots of small rough scales.

CORAL REEF AT NIGHT

- Night on a coral reef is very different to day.
- Corals have their tentacles out to catch food or fight neighbouring corals for territory.
- Fish may also use one part of the reef for feeding during the day and then another part for sleeping at night. Yes, fish do sleep – they don't have eyelids like us but they will rest.
 - The western king wrasse buries itself in the sand.
 - The tasselled leather jacket has a jagged spine on the top of its head which it uses as a hook to wedge itself into the reef to create a secure sleeping position.
 - Fish pyjamas! At night, fish will change colour becoming darker or blotchy– it's just like us putting our night-time clothes on.
 - The parrotfish makes a slime sleeping bag that acts like a force field. It sleeps safely in the slime because night-time fish often use their sense of smell and they can't smell the parrotfish through the slime.

Moray Eels

- Have a look at the picture of the moray eel – can you see their nostrils? They stick out like straws! This gives them a large surface area to sniff out their favourite food.
- Moray eels have sharp teeth for grabbing their food. They even have teeth in their throat so that if they swallow something whole it can't swim back out.
- During the day, they usually swim backward into their cave; leaving just their heads to poke out of a hole in the reef. You'll see them opening and closing their mouths – this can look scary but it is actually just them breathing. When they stay still they need to open their mouth to push water into their gills, which is how a fish breathes.

Octopus

- Also hiding in caves and with the ability to use amazing camouflage are octopuses.
- They have no bones in their body so they can stretch through tiny holes in the reef, like elastic, and hide in the hidden caves behind.

Octopuses are so good at hiding that you can only tell where their home is by the pile of rubbish (mussel and crab shells) outside their door!

Crayfish

Also known as western rock lobster.

- Ocean insects – a crayfish's segmented legs and hard outer covering place them in the same group of animals as insects!
- Their hard outer coating is like armour-plated protection.
- When crayfish get too big for their hard outer shell, they break free and grow a new one!
- Crayfish belong to the spiny lobster family and their back and antennae are covered in hundreds of tiny forward pointed spines.
- Their antennae are used for communication, defence and to find their way around.
- Crayfish have so many legs that they use some for swimming, some for walking and some for eating!
- Crayfish feed by conducting sudden raids on reefs and ocean floors at night.
- To track their food, crayfish feel the water with their long antennae and tiny bristles on their back and taste the water with their feet.
- Space on a reef is limited. A cave the perfect size for one lobster is also the perfect size for one octopus – and an octopus can eat a lobster. As a result, several crayfish will often have to share a big cave rather than have a small one of their own.
- While hiding, crayfish look for predators or prey with kaleidoscope vision and can detect movement in the water with tiny bristles on their back. If under attack, they rely on a body of armour, long spiky antennae (which they beat like a giant club from their cave entrance) and safety in numbers.
- Adults form long orderly lines and march offshore to breed. Females can produce over 100,000 eggs and the young are carried back to shore by ocean currents.
- When the Leeuwin Current is strong, more larvae are carried back to the reef. In years when the Leeuwin Current is weak, less make it back to the reef to grow up.
- Indigenous culture – Birak is the Nyoongar season that includes December and January. This season was spent by the coast as the weather is warm. Seafood was the main part of their diet and crayfish were gathered from coastal reefs in the late afternoons.

DOCTORS

- On the outside of the coral reef you look out into what seems like an endless blue. This is where the sharks and predatory fish patrol.
- Sharks and predatory fish can also be considered the doctors on the reef, as they eat the sick and injured fish. This means that only the healthy survive and that they get rid of diseases.

DEMOLITION TEAMS

- Just like our homes and our cities, the reef is constantly being renovated.

- Helping to make space for new corals to start to grow are the demolition teams – fish such as parrotfish and butterfly fish that eat the coral polyps.
- The butterfly fish pecks at the polyps with its long pointed mouth.
- The parrotfish has 4 hugely powerful teeth that work like bolt cutters breaking of huge chunks of coral, including the hard limestone skeleton. The limestone is crushed into sand, while the ground up polyps are eaten.
- Some parrotfish can take as many as 20 bites per minute.
- Scientists estimate that up to 70% of the sand on white sandy beaches in the Caribbean and Hawai'i has been excreted by parrotfish. That means that when you relax on a beach you're lying on fish poo!

Notes: