



# Phylum Echinodermata

Animals such as sea stars, sea urchins and sea cucumbers are all echinoderms. The skeleton of echinoderms is penetrated by many tube feet. The tube feet are hollow muscular tubes a suction cap at one end and a bulb at the other. Water is pumped in and out of the tube foot to lengthen or shorten it. This system is called a water vascular system.

Observe a sea star inhabiting the touch pool in Reef HQ's Interactive Area.

What species of sea star are you observing? .....

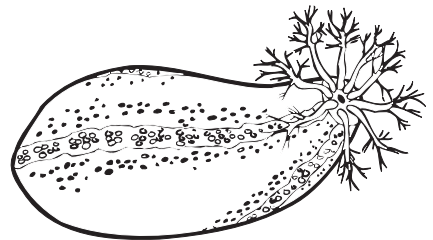
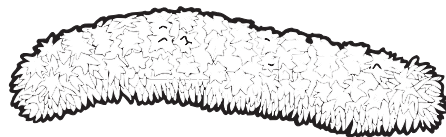
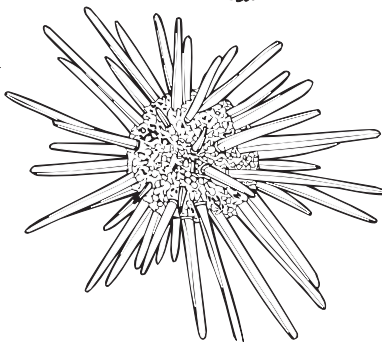
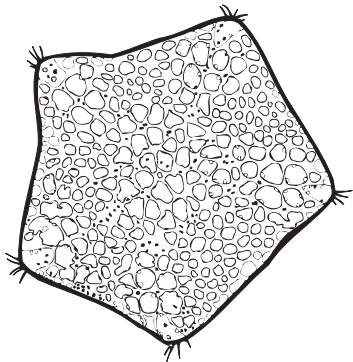
Draw both sides of the sea star in the spaces provided below. Be sure to show the position of the mouth and tube feet:

**Upper surface**




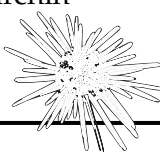
**Lower surface**

Describe how sea stars ingest their food:

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Observe the following echinoderms within Reef HQ and complete the following table:

Echinoderm	Type of Symmetry	Tube feet	Mouth position	How does it obtain food?	Skin surface
Crown of thorns sea star 					
Red prickly sea cucumber 					
Beach ball sea cucumber 					
sea urchin 					

# Phylum Arthropoda

## Class Crustacea

Crustaceans are a class of arthropoda and are the only arthropods to have two pairs of antennae. The Crustaceans like other arthropods, have developed a strong outer casing known as an exoskeleton. Having such a body covering prevents these animals from having consistent growth rates.

Outline the process that crustaceans go through that allows them to grow. Why might crustaceans be vulnerable during these stages in their life cycle?

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One species of crab does not go through this cyclic process and many of them inhabit the Reef HQ ecosystem. What is their common name? Overview their unique behaviour?

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Crustaceans are characterised by segmented bodies and five pairs of limbs. Many of these limbs are highly modified. Observe one of the many prawns, shrimps, crabs or crayfish found in Reef HQ. How is the first pair of limbs modified? What might they be used for?

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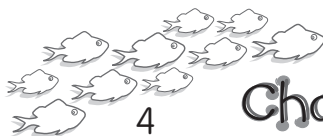
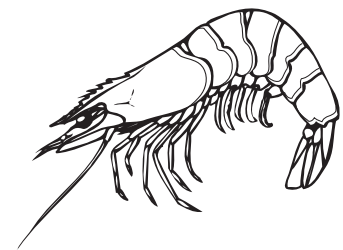
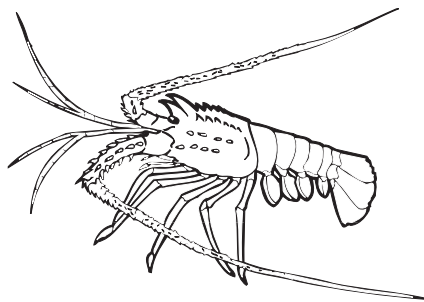
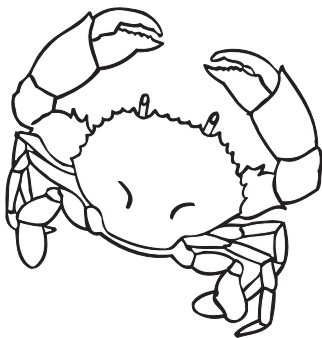
Locomotion in crustaceans can also vary. Prawns and crayfish can walk along the bottom, if they want to move quickly they use their muscular body and tail to propel themselves backwards through the water. Why would this be an advantage?

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# Phylum Chordata

## Class Chondrichthyes

These animals include sharks and rays. They differ from the bony fish (Class Osteichthyes) in that they have a skeleton made of cartilage. What parts of the human body contain cartilage?

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There are two main types of shark: **Bottom dwelling sharks** and **Mid-water sharks**. Both types of sharks have specifically adapted for their particular lifestyles. The bottom dwellers have a body, tail shape and mouth modified for moving about and feeding on the sea floor. They have a hole behind each eye called a spiracle that allows water to be pumped over the gills when stationary. The mid-water sharks do not have a spiracle and must swim constantly to force water over their gills.

Observe the following animals within Reef HQ's predator exhibit and Food Gallery and complete the table:











Feature	Black-tip reef shark	Leopard shark	Whip ray
Tail shape			
Spiracle present?			
Body shape			
Mouth position			
Food			
Locomotion			

# Phylum Chordata

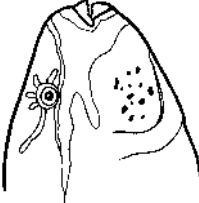

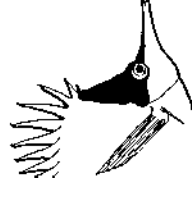
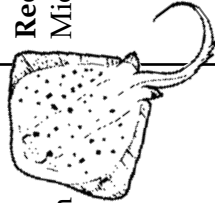
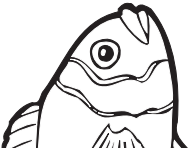

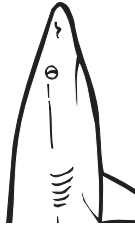
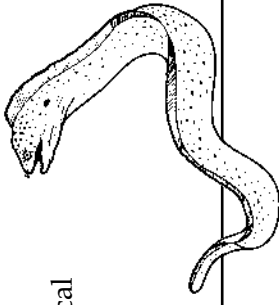
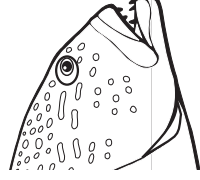

## Class Osteichthyes

There are over 1500 fish species found in the Great Barrier Reef ecosystem, this makes them one of the most highly diverse groups of marine animals.

The shape of the mouth, body and the habitat where fish live can suggest what the animal feeds upon. Marine organisms also utilise a number of different defence mechanisms to prevent them from becoming food. Use the Food Glorious Food Information Sheet to assist you in completing the following table:

Marine Organism	Mouth Shape	Body Shape	Habitat	Special Features	What does it eat?	Defence Mechanisms
Parrot Fish 						
Butterfly Fish 						
Surgeon Fish 						
Coral Cod 						
Goat Fish 						
Anemone Fish 						
Stonefish 						
Sea Horse 						
Lionfish 						
Maori wrasse 						

# Food Glorious Food Information Sheet

Mouth Shape	Body Shape	Habitat
<p><b>Strong beak</b> Scrape hard surfaces</p> 	<p><b>Fusiform</b> Streamlined and torpedo shaped</p> 	<p><b>Benthic</b> Lives on bottom</p>
<p><b>Tubular</b> Pick small food</p> 	<p><b>Dorso-ventrally flattened</b> Flattened from top to bottom</p> 	<p><b>Reef associated</b> Midwater, living close to the coral</p>
<p><b>Small Mouth</b> Suck plankton or algae</p> 	<p><b>Laterally compressed</b> Flattened from side to side</p> 	<p><b>Pelagic</b> Living close to the surface in open water</p>
<p><b>Subterminal</b> Mouth opens below the snout</p> 	<p><b>Elongated</b> Long, cylindrical</p> 	
<p><b>Superior</b> Mouth opens upwards</p> 	<p><b>Compact</b> Round bodied</p> 	

# Phylum Chordata

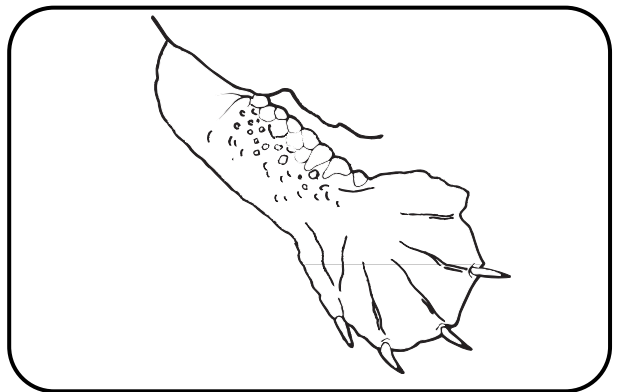
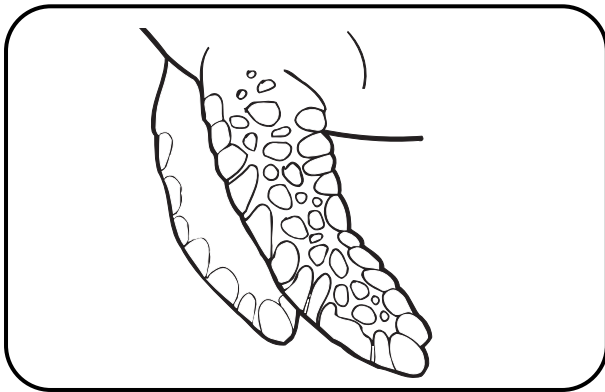
## Class Reptilia

The two major marine reptiles are Turtles and Sea Snakes. As reptiles, they both have lungs and have to surface to breath.

### Turtles

Sea turtles have adapted to a life that is all most entirely spent in the water. Fresh water tortoises are some times incorrectly called turtles and have limbs that have structural adaptations that allow them to move from water on to the land quite easily.

Lable the following appendages as being either sea turtle or tortoise:



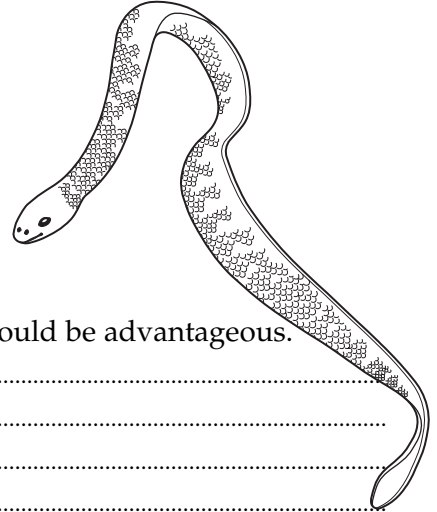
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Observe the turtle in Reef HQ's predator tank. Describe how it uses its front and back flippers for locomotion.

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# Sea Snakes

Sea snakes breath air every 30 minutes to 2 hours. Folds of skin close over the nostrils to help seal the air canals. The body of the sea snake differs from that of a land snake, as it needs to be more **hydrodynamic**.

Observe the sea snakes in Reef HQ’s Hot Topics Gallery. Draw the tail of a sea snake in the space below:



How does it differ from the tail of a land snake? Outline how it would be advantageous.

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The shape of the underside of a sea snake is similar to that of a ship’s keel. How does this adaptation help the sea snake?

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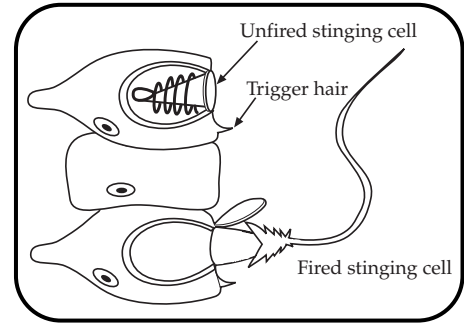
## Phylum Cnidaria

This group contains animals such as corals, anemones and jellyfish. The major features this group have in common are:

Stinging cells (nematocysts)

Radial Symmetry

Hollow gut



Suggest a possible function of the nematocysts?

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Why might water movement be very important to some cnidarians?

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## Hard Corals

Corals are colonies of animals known as 'polyps'. In the hard corals, each coral polyp sits in a cup-like exoskeleton of calcium carbonate. As the colony grows, the new skeletons are laid upon the old ones. In the Light Gallery, investigate how different groups of hard corals lay down their skeletons.

List the different ways hard corals lay down their skeletons and the major reasons why?

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## Soft Corals

Soft corals do not have a solid calcium carbonate skeleton. Instead, they have tiny hard structures called spicules embedded in their tissue. Look at the spicules under the microscope and draw them.



The tissues of some soft corals also contain toxic chemicals called terpenes.

What might be the major function of spicules and terpenes?

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## Zooxanthellae

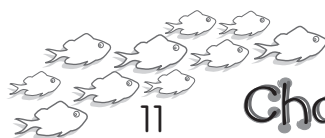
Most corals have a symbiotic relationship with small plant cells called zooxanthellae. Like other plants, zooxanthellae produce simple sugars from sunlight energy through the process of photosynthesis. These sugars are passed on to the coral for its nutrition.

Write the photosynthesis equation below

..... + .....  $\rightarrow$  (Solar Energy)  $\rightarrow$  ..... + .....

What might the coral give to the zooxanthellae in this relationship?

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# Phylum Mollusca

Class Gastropoda

Class Bivalves

Class Cephalopoda

The molluscs are a highly diverse group of animals which include shells, nudibranchs, clams, nautilus, octopus and squids. Some molluscs have shells that are internal; others are external with one or two parts; other molluscs have no shells at all.



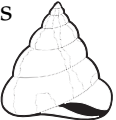
Some molluscs scrape up their food with a special tongue called a radula. Look at the radula under the microscope and sketch it.



Would you expect these animals to be herbivores or carnivores?

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Observe the following animals within Reef HQ and complete the table.

Mollusc	Shell type	How does it feed?	Locomotion
Spider Shell 	single		
Clam 			
Trochus 			Muscular foot
Nudibranch 