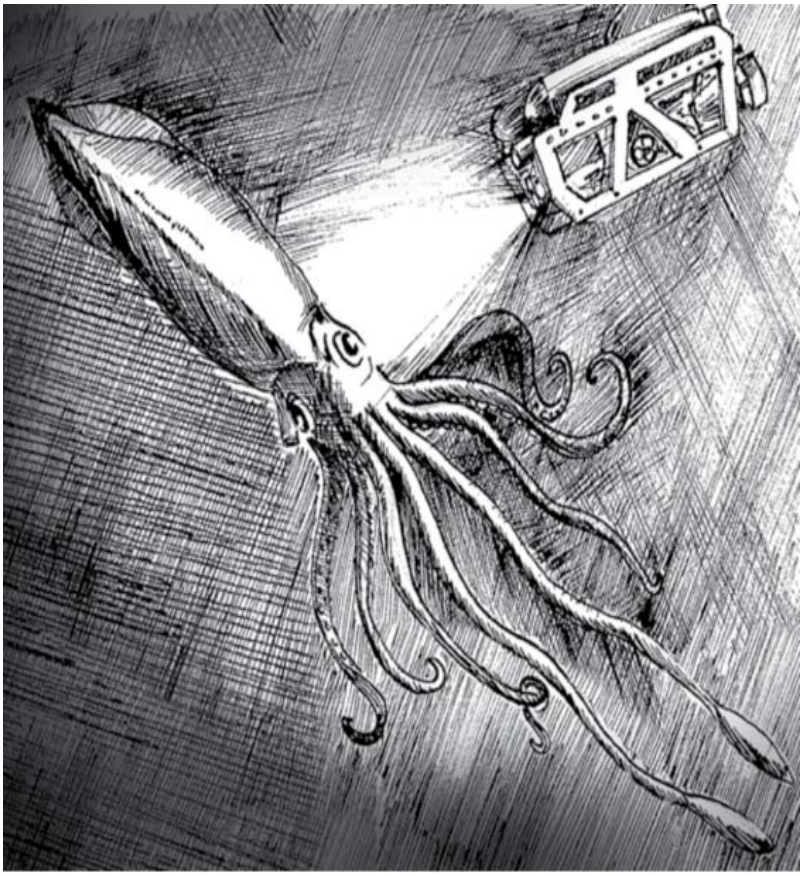
DEEP OCEANS

Education Resource Kit
For teachers and students
visiting *Deep Oceans*



Australian Government

Questacon
The National Science and Technology Centre

Australian museum
nature culture discover

Contents

Deep Oceans' Key Messages

The *Deep Oceans* exhibition contains real animal specimens collected from deep ocean environments, interactive interpretive exhibits and displays of equipment used by scientists to study this fascinating habitat.

The exhibition is woven together using topic threads:
Survive—how life is adapted to the deep ocean and
Explore—how we research the deep ocean.

Survive exhibits highlight adaptations that allow plants and animals to survive and inhabit these environments

- How do living things cope with the high pressure, cold temperatures and darkness (low light levels)?
- What do we understand about how animals find food and reproductive partners under these conditions?
- What threatens deep ocean habitats today?

Explore exhibits uncover how humans have viewed and studied deep ocean environments over time.

- What Myths and Monsters have been inspired by deep ocean creatures over time?
- Deep oceans are the largest habitat on Earth, but why are they the least understood (even less understood than the surface of Mars)?
- How has technology enabled humans to dive to depths once thought impossible?

While deep ocean environments are found across Earth's surface, special attention will be paid to Australian deep ocean exploration research and deep ocean habitats found at depths of 200 metres or more.

Enrich your students' visit to *Deep Oceans*

To achieve the strongest educational value for your students, try the following tasks before, during and/or after their visit.

Before your visit

- Ask students to discuss, write down and draw what they know about scientific research on deep oceans. Collect their work and save it for a later task.
- Students work in pairs and draw whether they'll look at Survive or Explore themed exhibits. Ask student pairs to select an exhibit for their theme from the Summary of Exhibits. Using their exhibit's keywords and exhibit text, ask students to research the exhibit's key message and list questions that they may have about the topic.
- As an alternative to the peer tutoring exercise, students can select or write their own Useful Question to discuss within the gallery.
- Try one or two Hands On Activities.

During your visit

- Direct student pairs to find their exhibit and 'explain' the exhibit to other two other student pairs and vice versa. So one pair of students will explain their own exhibit twice and listen to two other student pairs explain their exhibit. This peer tutoring activity strengthens student understanding and depth of knowledge, but allows students to enjoy and explore the other exhibits according to their own inquiry needs.

After your visit

- Ask students to discuss, write down or draw what they discovered about deep ocean ecosystems and scientific research after visiting the *Deep Oceans* exhibition. Hand back their original documents (produced before their visit). Ask student pairs to report back on any deep ocean ideas that they now think about differently.
- Try one or two Hands On Activities.
- Ask students to describe how they could help to protect deep ocean environments.
- Have students report on their excursion during a school-wide assembly, or demonstrate some of the Hands On Activities to the assembly audience.

Hands-On Activities for Students

Each activity has been designed and tested by education staff at Questacon and Australian Museum to complement the Deep Oceans Exhibit. Each activity has the following information.

- Introduction – Providing background information for the teacher about the science behind the activity.
- Curriculum Links – The links to the Australian Curriculum Science and Mathematics are outlined. Each subject, strand and content description is given.
- Goals – The aim of the activity for the students.
- Materials – The items required to complete one activity. Please adapt the resources to the number of students in your class.
- What to Do – The steps of the activity and questions to think about during the activity.
- Extension – Sometimes included for follow up or extension of the concepts.

The activities have been categorised into *Explore* and *Survive* to align with the content themes of the *Deep Oceans* exhibition.

This table indicates which activities are designed for students in Stages 2 to 5 of the NSW Science Curriculum. You should however not be restricted to these recommendations. Each activity could be adapted to your particular year level and class.

Activity	**Stage 2**	**Stage 3**	**Stage 4**	**Stage 5**
Activity 1			✓	
Activity 2	✓	✓		
Activity 3	✓	✓	✓	✓
Activity 4	✓	✓	✓	✓
Activity 5	✓	✓		
Activity 6	✓	✓		
Activity 7	✓	✓		
Activity 8	✓	✓		
Activity 9	✓		✓	
Activity 10	✓	✓	✓	
Activity 11	✓	✓	✓	✓
Activity 12	✓	✓	✓	✓
Activity 13	✓	✓	✓	
Activity 14	✓	✓	✓	
Activity 15			✓	✓
Activity 16	✓	✓		
Activity 17	✓	✓		

Explore

Activity 1: Buoyancy - Floating and Sinking

Introduction:

An object or vessel floats when the weight of the water it displaces is equal to the weight of the object. This is known as Archimedes' principle. When an object has positive buoyancy, it is floating on the surface. To sink, the object needs to have negative buoyancy. Neutral buoyancy is when the object floats beneath the surface of the water.

Submarines can control their buoyancy by allowing water to enter and exit the ballast tanks in the vessel. The addition of water to the ballast tanks increases the weight of the submarine and the submarine sinks. Compressed air is pumped into the ballast tanks when the submarine needs to rise. The air pushes out the water and the weight of the submarine decreases and floats to the surface. The levels of air and water in the ballast tanks can be controlled so the submarine has and neutral buoyancy and depth of the submarine can be controlled.

Remotely Operated Underwater Vehicles (ROVs) are designed to have neutral buoyancy in sea water. They use foam and other buoyant materials to achieve this. The ROV then uses thruster-motors to manoeuvre horizontally and vertically through the water.

Curriculum Links:

Science

Science Understanding

Year 5 – Chemical Sciences: Solids, liquids and gases have different observable properties and behave in different ways.

Year 8 – Chemical Sciences: The properties of the different states of matter can be explained in terms of the motion and arrangement of particles.

Year 4 – Physical Sciences: Forces can be exerted by one object on another through direct contact or from a distance.

Goals of Activity:

Students will understand that:

- all matter (solids, liquids and gases) has mass and takes up space.
- a fixed volume of air is lighter than the same volume of water.
- an object floats when the weight of the water it displaces is equal to the weight of the object.
- water pushes upwards on the submarine. This force is called buoyancy. Gravity pulls the submarine down into the water.
- submarines can control their buoyancy by changing the amount of water and air contained in the ballast tanks of the submarine. Submarines with more air in the tanks float, submarines with more water in the tanks sink in water.

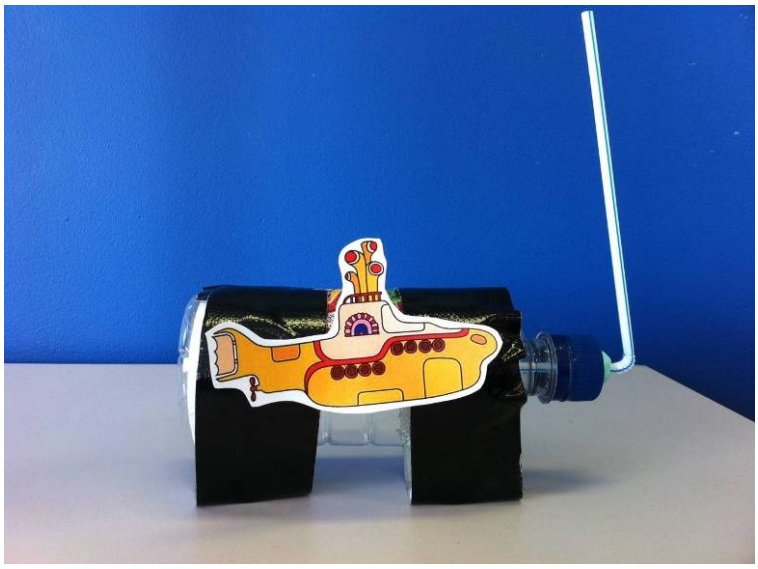
Materials:

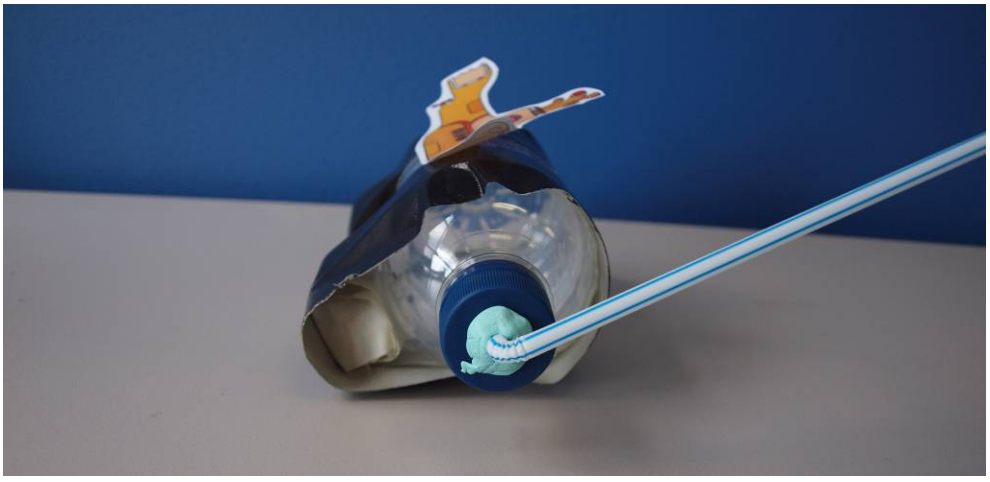
- 600mL plastic bottle and lid
- Hand held drill and bit
- Flexible straw
- Waterproof tape
- Weights or coins
- Tub or sink
- Water
- Plastic tubing

What to do:

1. Drill a hole to fit a straw in the lid of the plastic bottle.
2. Drill 2 or 3 holes in the side of the plastic bottle in a line.
3. Tape the coins or weights next to the holes at either end of the bottle. This will keep the holes facing downward and add mass to the submarine.
4. Insert the short end of the flexible straw into the hole and place plasticine around the straw to make it air tight.
5. Attach the rubber tube to the other end of the straw and use tape to make the join air tight.
6. Place the vessel into a tub or sink of water. Water will enter the holes on the bottom of the vessel and the vessel should sink down to the bottom of the tub.
7. Blow air into the plastic tube gently and observe what happens. Why does this happen? Repeat this process and try and get the vessel to sit just below the surface of the water.

Safety Note: Be careful not to blow into the vessel too often. Be sure that you replace the tube for each new person blowing into the submarine. Please have adult supervision when drilling the holes in the plastic container. An adult may need to complete this task before the beginning of the activity.





Activity 2: Comparing Depths

Introduction:

Scientists say that we know more about the surface of Mars than deep ocean environments here on Earth. Deep oceans are the largest habitat for life on Earth with strange creatures living under inhospitable conditions including lack of sunlight, extremely high pressure and a lack of nutrients.

To explore this mysterious environment, humans have created vehicles with specialised technology that overcomes these harsh conditions. Deep ocean animals have evolved special adaptations to enable them to survive under these conditions.

Curriculum Links:

Science

Science Investigation Skills

Year 3 and 4 – Processing and Analysing Data Information: Use a range of methods including tables and simple column graphs to represent data and to identify patterns and trends.

Year 5– Processing and Analysing Data Information: Construct and use a range of representations, including tables and graphs, to represent and describe observations, patterns or relationships in data using digital technologies as appropriate.

Mathematics

Measurement and Geometry

Year 3 – Using units of measurement: Measure, order and compare objects using familiar metric units of length, mass and capacity.

Year 4 – Using units of measurement: Use scaled instruments to measure and compare lengths, masses capacities and temperatures.

Statistics and Probability

Year 5 – Data representation and interpretation: Construct displays including column graphs, dot plots and tables, appropriate for data type, with and without the use of digital technologies.

Goals of Activity:

Students will understand that:

- the deepest parts of the ocean are deeper than the highest points on Earth are tall.
- there are different regions of the ocean at different depths.
- different organisms live in the different regions of the ocean.
- graphs can be constructed to compare distances and sizes.

Materials:

- Graph paper
- Pencil
- Ruler
- Pens
- Coloured pencils
- Data Sheet
- Computer with graphing software (example Microsoft Excel) and internet access.

What to do:

1. Using a piece of graph paper, or a computer with graphing software, create a column graph of the following data showing the various heights of mountains and landmarks and the depths of the ocean regions.

Heights of Mountains, Landmarks and Ocean Depths

Landmark	Height from Sea Level (m)
Mt Everest	8848
Mt Kosciuszko	2234
Empire State Building	381
Sydney Harbour Bridge	134
Eiffel Tower	324
Sydney Tower	279
Burj Khalifa (tallest building on Earth)	829.84
Great Pyramid	138.8
Sunlight (Epipelagic) Zone	-200
Twilight (Mesopelagic) Zone	-1000
Midnight (Bathypelagic) Zone	-4000
Abyss (Abyssopelagic) Zone	-6000
Trench (Hadalpelagic) Zone	-11000

Note: Negative heights indicate that the distance is below sea level.

2. What do you notice about the deepest part of the ocean and the highest point on the land? If the tallest building on Earth was upside down, which zone of the ocean would the tip of the building reach?

3. Once you have completed your graph, research the animals in each of the different regions of ocean and draw or glue on a picture of an animal that is found in each of the regions.

Extension Activity: Create a wall mural showing the highest points on the surface of the Earth, major landmarks and the depths of the ocean to scale. Include animals that live in each of the regions.

Activity 3: Hydrothermal Vents – Under Pressure

Introduction:

Hydrothermal vents are underwater geysers. The vents form when tectonic plate movement creates crevasses or cracks in the ocean floor. The sea water enters the cracks and goes under the surface of the ocean floor. Under the ocean floor, the magma heats the sea water to temperatures of up to 400 ^{0}C, but the water does not boil because it is under great pressure underneath the surface of the Earth. Under the Earth's surface the surrounding rocks dissolve into the hot sea water.

The water pressure builds up and the water forces out of the vents spewing huge amounts of mineral rich water into the ocean. When the dissolved minerals reach the cold water, they precipitate forming a cloud or smoke of insoluble particles. Black smokers are the hottest type of hydrothermal vents and contain minerals such as iron and sulphides. White smokers are cooler and contain minerals such as barium, calcium and silicon.

Hydrothermal vents are important and scientists think they play a large role in ocean chemical composition, circulation and temperature.

Curriculum Links:

Science

Science Understanding

Year 5 – Chemical Sciences: Solids, liquids and gases have different observable properties and behave in different ways.

Year 8 – Chemical Sciences: The properties of the different states of matter can be explained in terms of the motion and arrangement of particles.

Year 3 – Physical Sciences: Heat can be produced in many ways and can move from on object to another.

Year 8 – Physical Sciences: Energy appears in different forms including movement (kinetic energy), heat and potential energy, and causes change within systems.

Year 9 – Physical Sciences: Energy transfer through different mediums can be explained using wave and particle models.

Goals:

Students will understand that:

- when heated, the particles in liquids have more energy, move faster and take up more space.
- because the particles have more energy they exert a greater force on each other and the vessel that holds the liquid.
- when sea water enters a hydrothermal vent, it is heated by the magma beneath the surface of the Earth. The water is heated to very high temperatures, but because it is under great pressure under the surface of the Earth it does not boil. The water pressure builds up and forces the water out of the hydrothermal vents and back into the ocean.

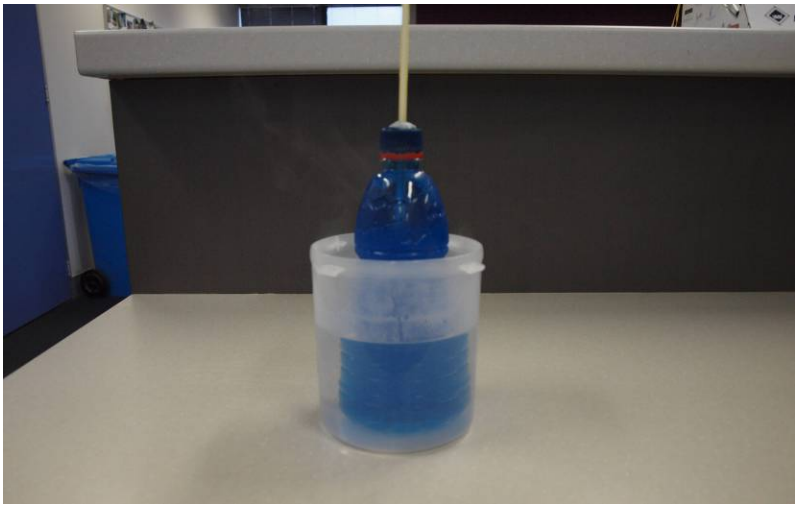
Materials:

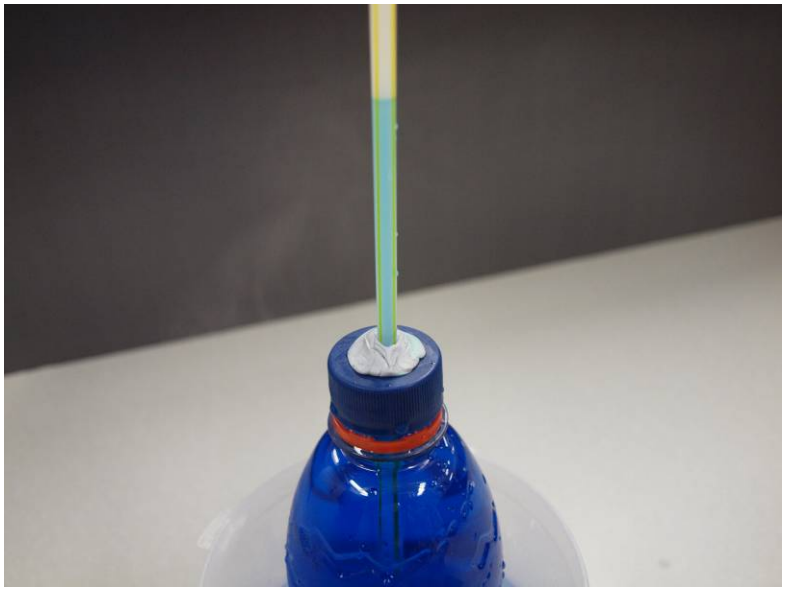
- 600mL plastic bottle with lid
- Straw
- Plasticine or Blu-tack.
- Water
- Food Dye
- Hand held drill
- Plastic ice cream container
- Hot water

What to do:

1. Using a hand held drill, drill a hole for a straw to fit inside snugly.
2. Place the straw into the hole so that one quarter of the straw will be inside the bottle and three quarters of the straw will be outside of the bottle when you put the lid back on the bottle. Place Blu-tack or plasticine around the straw to make the seal air tight.
3. Place a few drops of coloured food dye into the bottom of the plastic bottle.
4. Fill the plastic bottle with water right up to the top (do this inside a sink and keep filling until the bottle overflows).
5. Put the lid on the bottle and screw it on tightly. Can you see the level of the water in the straw? If you can, mark this level on the straw using a pen.
6. Fill up the ice cream container with hot water. Place the water bottle into the water. Observe what happens to the water level in the straw. Why does this happen? How is this related to a hydrothermal vent at the bottom of the ocean floor?

Safety Note: Adult supervision is required when using the drill in the plastic container. An adult may need to complete this task before the activity can begin.





Activity 4: Hydrothermal Vents – Convection Currents

Introduction:

Hydrothermal vents are underwater geysers. The vents form when tectonic plate movement creates crevasses or cracks in the ocean floor. The sea water enters the cracks and goes under the surface of the ocean floor. Under the ocean floor, the magma heats up the sea water to temperatures of up to 400 ^{0}C, but the water does not boil because it is under great pressure underneath the surface of the Earth. Under the Earth's surface the surrounding rocks dissolve into the hot sea water.

The water pressure builds up and the water forces out of the vents spewing huge amounts of mineral rich water into the ocean. When the dissolved minerals reach the cold water, they precipitate forming a cloud or smoke of insoluble particles. Black smokers are the hottest type of hydrothermal vents and contain minerals such as iron and sulphides. White smokers are cooler and contain minerals such as barium, calcium and silicon.

Hydrothermal vents are important and scientists think they play a large role in ocean chemical composition, circulation and temperature.

Curriculum Links:

Science

Science Understanding

Year 5 – Chemical Sciences: Solids, liquids and gases have different observable properties and behave in different ways.

Year 8 – Chemical Sciences: The properties of the different states of matter can be explained in terms of the motion and arrangement of particles.

Year 3 – Physical Sciences: Heat can be produced in many ways and can move from on object to another.

Year 8 – Physical Sciences: Energy appears in different forms including movement (kinetic energy), heat and potential energy, and causes change within systems.

Year 9 – Physical Sciences: Energy transfer through different mediums can be explained using wave and particle models.

Goals:

Students will understand that:

- when heated, the particles in liquids have more energy, move faster and take up more space. The particles are less dense and rise in the water. When the particles cool the reverse happens. This forms a convection current
- when sea water enters a hydrothermal vent, it is heated by the magma beneath the surface of the Earth. The water pressure builds up and forces hot water out of the hydrothermal vents and back into the ocean.

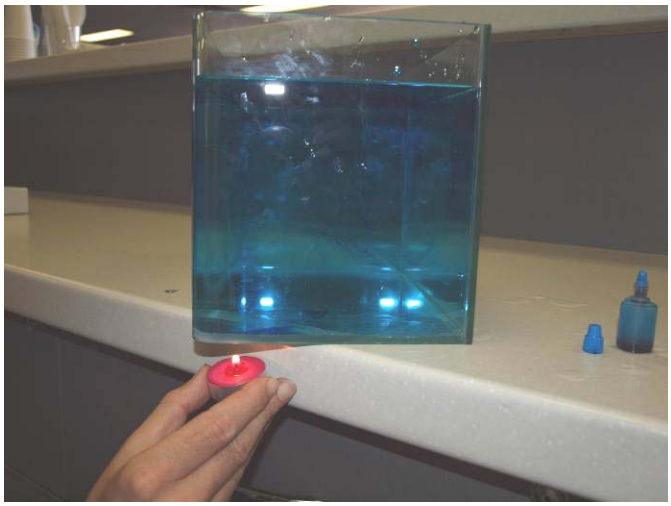
Materials:

- Large clear **glass** container–fish tank or Pyrex dish, but NOT plastic
- Cold water
- Coloured food dye in a squeeze bottle or plastic pipette
- Heat pack

What to do:

1. Fill up the glass container with cold water.
2. Move the glass container so that one corner is overhanging the table edge slightly.
3. Place a good squirt of food colouring into water at the overhanging corner.
4. Place the heat pack underneath the corner of the container with the food dye.
5. Observe what happens to the coloured water. Draw a diagram of the movement of the coloured water. Why does this happen? Can you apply this to the water movement above a hydrothermal vent?

Safety Notes: The container must be made of Pyrex to withstand the heat. Please take care using heat pack and make sure adult supervision is vigilant during the activity to ensure safe behaviour.



Survive

Activity 5: Camouflage using Colours

Introduction:

The deep ocean environment is dark because sunlight is absorbed and scattered by the ocean water. Sunlight cannot reach below 1000 metres. Some sunlight can reach the mid-water or twilight zone between 200 and 1000 metres. The red wavelength of the light spectrum is not able to reach this area.

Many organisms in the deep ocean are coloured red to help them to be camouflaged from their predators. Visible light is made up of many different colours. When light strikes a surface, some of the light is reflected and some is absorbed. Objects appear to be red, because red wavelengths of light are reflected off the object and into your eye. All other wavelengths of light are absorbed by the object. Because the red wavelengths of light are not present in the deep ocean, no red light is reflected into your eye and you cannot see the colour of the object. Using the blue filter simulates the deep ocean light conditions because the red wavelengths of light are absorbed by the blue filter.

Curriculum Links:

Science

Science Understanding

Year 5 – Biological Sciences: Living things have structural features and adaptation that help them to survive in their environment.

Year 5 – Physical Sciences: Light from a source forms shadows and can be absorbed, reflected and refracted.

Science Inquiry Skills

Year 5 and 6 – Planning and Conducting: With guidance, select appropriate investigation methods to answer questions or solve problems.

Goals of Activity:

Students will understand that:

- white light is made up of many different colours.
- when light hits an object it is absorbed, reflected or transmitted.
- objects are seen by the eye as a particular colour because all of the other colours are absorbed by the object. (e.g. Red objects are red because the red wavelengths of light are reflected into the eye and all other wavelengths are absorbed.)
- many animals in the deep ocean are coloured red because there is no red light in the deep ocean and they can be camouflaged from their predators.

Materials:

- Jar
- Blue Food Dye
- Coloured plastic (recycle materials like bottle tops and plastic containers)
- White paper
- Black paper
- Coloured pens or pencils
- Skewers
- Scissors
- Water
- Blue cellophane
- Glasses template (an example can be found here: http://familycrafts.about.com/od/creativepaper/ss/3D_Glasses_3.htm)
- Sticky tape or glue
- Various coloured pictures of deep sea organisms

What to do:

Viewing Fish Underwater

1. Fill a jar or glass with water and add blue food colouring.
2. Place the jar on a black piece of paper.
3. Cut out fish from coloured plastic (red, blue, yellow, orange, purple and green).
4. Using a pen, pierce a hole in each fish and place each fish on the end of a skewer.

5. Place the fish underwater and compare the visibility of each colour. Does the colour of the fish change with the depth of the water it is submerged in?

Colour of fish	Colour fish appears under the water
Red	
Blue	
Yellow	
Orange	
Green	
Purple	

6. Place all of the fish under the water. Try and identify which fish is which colour. Which colour is the most difficult to identify?

Viewing Organisms through Blue Filters

1. Print out the glasses template onto thin cardboard.
2. Cut out the template and attach the arms using glue or sticky tape.
3. Attach at least 4 layers of blue cellophane to the eye pieces of the glasses.
4. View the images of the deep sea organisms through the blue glasses. Which organisms are the easiest to see? Which organisms are the most difficult to see?

Extension Activity

Design organisms and draw them in a deep ocean scene with coloured pens or pencils. You could even use coloured papers, cardboard or foil to create a mosaic art work. Design an animal that would be well camouflaged and hard for predators to spot. Challenge others to find the organisms in the deep ocean scene while they are wearing the blue glasses.

Activity 6: Camouflage using Bioluminescence

Introduction:

The deep ocean environment is dark because sunlight is absorbed and scattered by the ocean water. Sunlight can not reach below 1000 metres. Some sunlight can reach the mid-water or twilight zone between 200 and 1000 metres.

Bioluminescence is light emitted from living organisms. The glow from fireflies or glow worms is a common example of bioluminescence. Some animals use bioluminescence for attracting prey or mates, but others use bioluminescence to confuse other organisms or camouflage from their predators. For example, many species of squid flash to scare off predators. While other fish, like the hatchet fish, use counter-illumination to hide from predators. Many predators hunt their prey by looking up towards the surface of the water. Hatchet fish have glowing spots on the under surface of their bodies to match the glowing light coming from up above. This makes them invisible to their predators.

Curriculum Links:

Science

Science Understanding

Year 5 – Biological Sciences: Living things have structural features and adaptation that help them to survive in their environment.

Year 5 – Physical Sciences: Light from a source forms shadows and can be absorbed, reflected and refracted.

Goals of Activity:

Students will understand that:

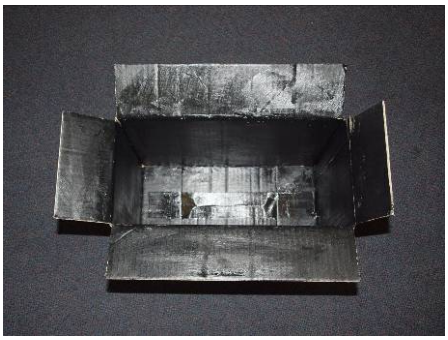
- light from a source forms shadows and can be absorbed, reflected and refracted.
- many animals have special adaptations or features to help them to survive.
- light from bioluminescence can be used to confuse predators.

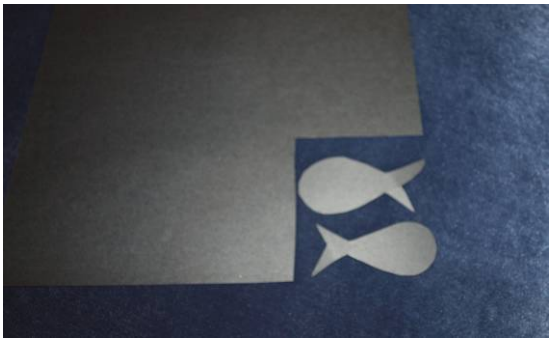
Materials:

- Black paper
- Pencil
- Scissors
- Sticky tape
- 2 wooden skewers
- Black paint
- Paintbrush
- Shoebox
- Newspaper

What to do:

1. Paint the inside surfaces of a shoe box black. Leave the box to dry.
2. Using a pencil, poke holes in one end of the shoe box. This is how the sunlight will enter the deep ocean conditions inside the shoe box.
3. In the opposite end of the shoe box, cut a viewing hole to observe the deep ocean environment.
4. Cut out two fish shapes from the black paper.
5. Poke holes in one of the fish shapes. This is the “bioluminescence” from one fish.
6. Attach a skewer to each fish using sticky tape. Poke a hole using the skewer into the lid of the shoebox. Place the skewer into the hole so that the fish are inside the shoebox. Place the lid on and observe the fish. What is the difference between the fish? How does bioluminescence help fish to be camouflaged in the ocean?





Activity 7: Camouflage using Light

Introduction:

The deep ocean environment is dark because sunlight is absorbed and scattered by the ocean water. Sunlight cannot reach below 1000 metres. Some sunlight can reach the mid-water or twilight zone between 200 and 1000 metres. The red wavelength of the light spectrum is not able to reach this area.

Many organisms in the deep ocean are coloured red to help them to be camouflaged from their predators. Visible light is made up of many different colours. When light strikes a surface, some of the light is reflected and some is absorbed. Objects appear to be red, because red wavelengths of light are reflected off the object and into your eye. All other wavelengths of light are absorbed by the object. Because the red wavelengths of light are not present in the deep ocean, no red light is reflected into your eye and you cannot see the colour of the object. Using the blue filter simulates the deep ocean light conditions because the red wavelengths of light are absorbed by the blue filter.

Some animals merge into the background by having a transparent body. Light passes through the animals and they do not form a shadow. This makes them harder to be seen and caught by their predators.

Curriculum Links:

Science

Science Understanding

Year 5 – Biological Sciences: Living things have structural features and adaptation that help them to survive in their environment.

Year 5 – Physical Sciences: Light from a source forms shadows and can be absorbed, reflected and refracted.

Goals of Activity:

Students will understand that:

- white light is made up of many different colours.
- when light hits an object it is absorbed, reflected or transmitted.
- objects are seen by the eye as a particular colour because all of the other colours are absorbed by the object. (e.g. Red objects are red because the red wavelengths of light are reflected into the eye and all other wavelengths are absorbed.)
- many animals in the deep ocean are coloured red because there is no red light in the deep ocean and they can be camouflaged from their predators.

Materials:

- Clear fish tank or container
- Black paper
- Water
- Blue cellophane
- Glasses template (an example can be found here: http://familycrafts.about.com/od/creativepaper/ss/3D_Glasses_3.htm)
- Sticky tape or glue
- Jelly of various colours (clear, blue, red, etc)

What to do:

1. Make up the jelly as instructed on the packets. Allow to set in a fridge.
2. Make the blue cellophane glasses or filters.
3. Fill up the fish tank with water. Place the black paper or cardboard behind the fish tank to form the dark background.
4. Place small amounts of each coloured jelly into the tank. These are the jelly fish in the ocean.
5. Observe the jelly fish. What colour is the easiest to see? What colour is the hardest to see? What colour would be the best colour to use to camouflage in the light conditions?
6. View the jelly fish through the blue filter. What colour is the easiest to see? What colour is the hardest to see? What colour would be the best colour to use to camouflage in dark conditions?

Activity 8: Angler Fish Mask

Introduction:

There are more than 200 species of angler fish living in the ocean—mostly in the depths of the ocean. The size of angler fish can range between 20 centimetres to 1 metre in length. They have huge crescent shaped mouths filled with sharp translucent teeth. Their mouths are so big and their bodies so pliable, they can eat animals up to twice their own size.

The most distinctive feature of the angler fish is only present on females. It is a dorsal spine above their mouths with a luminous tip. This glowing feature lures in prey close to their mouth, making prey easier to catch.

Males of the species are significantly smaller and they are a parasite on the female angler fish. The males attach themselves to the females' skin and blood supply.

Curriculum Links:

Australian Curriculum – Science

Science Understanding

Year 5 – Biological Sciences: Living things have structural features and adaptations that help them to survive in their environment.

Year 5 – Physical Sciences: Light from a source forms shadows and can be absorbed, reflected and refracted.

Goals of Activity:

Students will understand that:

- angler fish have special structures that help them to attract food (luminous lure) and consume food (large crescent mouth and teeth).

Materials:

- Balloon
- Newspaper
- PVA glue
- Water
- Paint brushes
- Sticky tape
- Black/Brown/Silver paint
- Glow stick (bracelets are the perfect size)
- Ping pong ball
- Cardboard
- White paper

- Aluminium Foil
- Scissors
- Pen
- Large bowl or ice cream bucket
- Plastic containers or cups
- Optional: Glow in the dark paint

What to do:

1. Find a picture of an angler fish to model the features and colours of your mask on.
2. Blow up a balloon.
3. Apply a Papier-mâché layer around the balloon using strips of newspaper covered in a PVA glue mixture (3 parts glue, 1 part water). Dipping the newspaper in the mixture and using a paintbrush to smooth it out is the easiest and most effective way. Place the balloon in a bowl or ice cream bucket to hold the balloon in place.
4. Apply 3 layers of Papier-mâché to the balloon and leave it to dry for at least 24 hours.
5. Cut out fins and a spine from cardboard and attach them to the head using glue and sticky tape.
6. Papier-mâché over these structures. Apply 3 layers to each structure and allow the head to dry for at least 24 hours.
7. Pop the balloon inside the head. The balloon will separate itself from the newspaper.
8. Draw an oval shape on the base of the mask. Cut along this line carefully with scissors. This is the hole for your head. Adjust the size to make sure it fits your head comfortably.
9. Draw on two circles for eyes and a crescent shape for the mouth. Cut these shapes out carefully with scissors.
10. Using scissors pierce a hole above the eyes to insert the lure.
11. Paint the whole mask. Use pictures of angler fish for colour references. Angler fish can range in colours. For our mask, we used black acrylic paint for the base and silver paint for the highlights.
12. Cut out triangles from white paper for the teeth of the angler fish. Glue the teeth on the inside of the mask.
13. Glue pieces of aluminium foil on the inside of the mask for the eyes.
14. Using a pen, pierce a hole in a ping pong ball. The hole needs to be large enough to insert the glow stick. (Optional: Paint the ping pong ball with glow in the dark paint.)
15. When you are ready to wear your mask, break the glow stick so it begins to glow. Insert the glow stick into the mask, and the ping pong ball onto the end of the glow stick.
16. For the best effect, dim the lights and wear your angler fish mask with glowing lure.

DEEP OCEANS

Activity 9: Squid Dissection

Introduction:

Giant squids are the largest of all the living cephalopods and the largest individual invertebrate in the world. There is still little known of the identity, distribution, biology and behaviour of giant squids. Two thirds of the length of these squids is made up by a pair of long feeding tentacles each bearing an elongated club on the tip. These metre-long tips bear large suckers armed with toothed rings. Giant squids have a body to at least 2 metres, total length to at least 15 metres. Little is known of size range of this species due to the limited number of observed specimens, although it is reported to weigh up to at least 220 kilograms.

Giant squids are found in the deep, dark, cold waters of the open ocean - this species has been captured from depths of 400-800 metres. The stomach contents of some specimens have contained pieces of fin rays from large fish and squid suckers almost as large as their own. It is thought the prey is torn into small pieces by both the large beak and their large toothed tongue.

Curriculum Links:

Science

Science Understanding

Year 5 – Biological Sciences: Living things have structural features that help them to survive in their environment.

Year 7 – Biological Sciences: There are differences within and between groups of organisms; classification helps organise this diversity.

Year 8 – Biological Sciences: Multi-cellular organisms contain systems of organs that carry out specialised functions that enable them to survive and reproduce.

Science Inquiry Skills

Year 7 and 8 – Planning and conducting: Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed.

Goals of Activity:

Students will understand that:

- there are many different types of squid, but all of the squid have have a distinct head, bilateral symmetry, a mantle, and arms. Squid have eight arms arranged in pairs and two, usually longer, tentacles.
- squid are from the phylum Mollusc and the class Cephalopods.
- squid have special features that help them to survive.

Materials:

- Squid – obtained from supermarket or fish monger. (Note: Must be whole and not cleaned.)
- Dissection scissors
- Tweezers
- Newspaper
- Plastic tray
- Plastic bag
- Plastic gloves

What to do:

1. Prepare for the dissection by watching a video of a squid dissection (an example can be found here: http://www.kendallhunt.com/detwiler/) and studying diagrams of squids. This will make the dissection and the identification of the different parts of the squid easier.
2. Place the squid on a tray with the eyes facing upwards. Identify the mantle, eyes, arms and tentacles.
3. The coloured spots on the surface of the squid are called chromatophores. These structures help the squid to camouflage from its predators.
4. Turn the squid over and find the siphon. With the siphon facing up, cut the along the mantle to the tip of the squid. Once the cut is complete, open up the mantle to reveal the internal organs of the squid. (Optional: You can place the squid into a shallow tray of water to make the internal organs separate and easier to see.)
5. Identify the reproductive organs. The female will have two white glands in the middle and the male will have a white structure near the top of the mantle.
6. Identify the gills. Make a V with your fingers and run them down the organs. The feathery gills should pop out to the side.
7. Identify the hearts. They are white in colour and there should be three. These are sometimes hard to spot. They are between the two gills.
8. Locate the pen. Fold the head, arms and tentacles over the body pull the "plastic-like" structure out using the tweezers. The squid is a mollusc and this is its shell. It provides structure and support.
9. Identify the silvery coloured ink sac and the brown coloured intestines. Be careful not to break these sacs.
10. Lay the arms and tentacles open. Using the tweezers remove the beak. Carefully lift out the two pieces. The squid uses the beak in the first stages of digestion.
11. Using the scissors and tweezers gently remove the eyes from the squid. Be careful not to pierce the eye. You can remove the lens from the eye using the tweezers.
12. At the end of the dissection, you can open the ink sac and squeeze the ink out of the squid. The squid uses the ink to help protect itself by scaring or confusing predators.
13. Put all of the pieces of squid onto a piece of newspaper. Put all of the gloves onto the paper as well. Wrap up the newspaper and put it into a plastic bag to be disposed.

Note: Scientists complete animal dissections to understand the anatomy of different animals. It is very important to respect the squid and only perform the tasks outlined to help you gain a greater understanding of the organism.

Activity 10: Lungs under Pressure

Introduction:

At sea level, the air in the atmosphere exerts pressure on objects at 101.325 kPa (kilopascals) or 1 atmosphere. Humans don't feel it because the air and liquid in the body is pushing outward with the same force.

The pressure increases the further down into the ocean you travel because there is a larger amount of the water pushing down on you. For every 10 metres of ocean depth, the pressure increases by 101.325 kPa or 1 atmosphere. In the deepest ocean, the pressure is equivalent to the weight of an elephant balanced on a postage stamp, or the one person trying to support 50 jumbo jets!

Many animals have special features to help them survive high pressure environments. Whales can withstand large pressure changes because their bodies are flexible. Their ribs are bound by loose, bendable cartilage, which allows the rib cage to collapse at pressures that would easily break human bones. A whale's lungs can also collapse safely under pressure, which keeps them from rupturing. This allows sperm whales to hunt for giant squid at depths of 2100 metres or more. Humans need to use specially designed vessels that are pressurised to dive to deep ocean environments. When deep ocean animals are brought to the surface, the reduction in pressure can harm the animal by rupturing the air sacs inside the animal or damaging organs and other internal structures. Many animals do not survive the trip to the surface which makes the study of these animals by scientists very difficult.

Curriculum Links:

Science

Science Understanding

Year 4 – Physical Sciences: Forces can be exerted by one object on another through direct contact or from a distance.

Year 5 – Biological Sciences: Living things have structural features that help them to survive in their environment.

Science Inquiry Skills

Year 5 and 6 – Planning and Conducting: With guidance, select appropriate investigation methods to answer questions or solve problems.

Goals:

Students will understand that:

- all matter (solids, liquids and gases) has mass and takes up space.
- water exerts a greater pressure on objects than air.
- the pressure of water increases at greater depths.

- animals have special features to help them to survive at high pressures and avoid damage to their bodies such as collapsed lungs and broken bones.

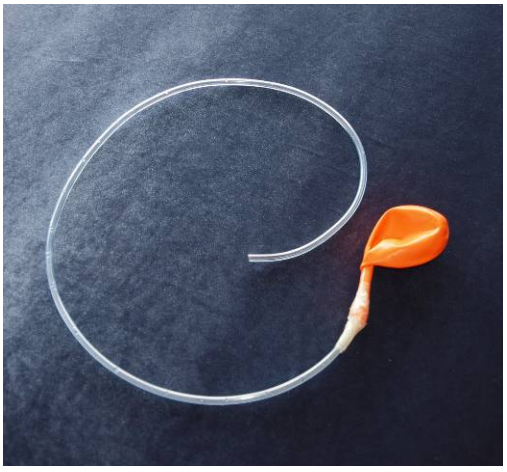
Materials:

- Large tub, sink or pool filled with water
- Rubber tubing
- Balloon
- Sticky tape
- String
- Ruler
- Weight (sinker or coin)

What to do:

1. Attach a balloon to the end of a 1 metre length of plastic tube using sticky tape. Attach the weight to the tube very close to the balloon using string or tape
2. Blow up the balloon through the tube a few times. Remove your mouth from the tube so the tube is open. What happens to the balloon?
3. Blow up the balloon just a little bit, so it is just filled with air without the balloon stretching. Place the balloon under the surface of the water in the pool while holding onto the end of the tube so the tube is open. What happens to the balloon?
4. While the balloon is under the surface of the water, try to inflate the balloon. What do you notice? Can you explain why?
5. Is there a depth of water that you reach that you can no longer blow up the balloon? What depth of water is this? How does this relate to the human body and how humans can survive in deep oceans?

Safety Note: Make sure that each student has their own tube to ensure safe hygiene. Take turns at blowing the balloon to avoid light-headedness or dizziness.



Activity 11: Cartesian Diver

Introduction:

Many fish have swim bladders to control their buoyancy in the water. A swim bladder is a sac-like structure containing gases within a fish. The fish can control the amount of air in the bladder through the diffusion of gases into and out of the blood. When the bladder expands, the fish becomes less dense and becomes more buoyant in the ocean. When the bladder contracts, the fish become denser and sink in the ocean.

Some deep ocean fish have swim bladders to maintain neutral buoyancy in the ocean. When these fish are caught and brought to the surface, the swim bladders expand under the reduced pressure and can push on other organs or even burst thus harming the fish.

A lot of the animals in the deep ocean are filled with water to avoid the problems caused by the pressure of the ocean against the pockets of air inside the body. Animals like squid and jellyfish can move large distances up and down the depths of the ocean without being affected by the pressure.

Curriculum Links:

Science

Science Understanding

Year 5 – Biological Sciences: Living things have structural features that help them to survive in their environment.

Year 5 – Chemical Sciences: Solids, liquids and gases have different observable properties and behave in different ways.

Year 4 – Physical Sciences: Forces can be exerted by one object on another through direct contact or from a distance.

Goals:

Students will understand that:

- all matter (solids, liquids and gases) has mass and takes up space.
- a fixed volume of air is lighter than the same volume of water.
- an object floats when the weight of the water it displaces is equal to the weight of the object.
- water pushes upwards on fish. This force is called buoyancy. Gravity pulls the fish down into the water.
- different animals have different structures to help them survive in the deep oceans.

Materials:

- 1.25 litre clear plastic bottle with lid
- Water
- Cup
- Blu-tack or plasticine
- Small take away soy sauce fish container or plastic pipette
- Food dye

What to do:

1. Empty the soy sauce fish container or cut the long tube off the plastic pipette.
2. Fill the cup with water.
3. Fill the fish half way with water coloured with food dye and test if it floats. The fish should float so the tip of the tail is just out of the water. Adjust the level of the water or add some plasticine around the mouth of the fish to reach this level.
4. Fill up the clear plastic bottle with water.
5. Place the fish into the bottle and top up the bottle with water so it is completely full and screw on the lid of the bottle.
6. Squeeze the bottle. The fish should sink to the bottom of the bottle. Let the bottle go and the fish should rise to the top of the bottle. Why does this happen? How is it the same as how some fish move up and down in the ocean water?

Activity 12: Marshmallows under Pressure

Introduction:

At sea level, the air in the atmosphere exerts pressure on objects at 101.325 kPa (kilopascals) or 1 atmosphere. Humans don't feel it because the air and liquid in the body is pushing outward with the same force.

The pressure increases the further down into the ocean you travel because there is a larger amount of the water pushing down on you. For every 10 metres of ocean depth, the pressure increases by 101.325 kPa or 1 atmosphere. In the deepest ocean, the pressure is equivalent to the weight of an elephant balanced on a postage stamp, or the one person trying to support 50 jumbo jets!

Many animals have special features to help them survive high pressure environments. Whales can withstand large pressure changes because their bodies are flexible. Their ribs are bound by loose, bendable cartilage, which allows the rib cage to collapse at pressures that would easily break human bones. A whale's lungs can also collapse safely under pressure, which keeps them from rupturing. This allows sperm whales to hunt for giant squid at depths of 2100 metres or more. Humans need to use specially designed vessels that are pressurised to dive to deep ocean environments. When deep ocean animals are brought to the surface, the reduction in pressure can harm the animal by rupturing the air sacs inside the animal or damaging organs and other internal structures. Many animals do not survive the trip to the surface which makes the study of these animals by scientists very difficult.

Curriculum Links:

Science

Science Understanding

Year 4 – Physical Sciences: Forces can be exerted by one object on another through direct contact or from a distance.

Year 5 – Biological Sciences: Living things have structural features that help them to survive in their environment.

Goals:

Students will understand that:

- all matter (solids, liquids and gases) has mass and takes up space.
- when gases are put under pressure, they compress or get smaller in size.
- humans must use special vehicles that are pressurised to avoid the effects of great pressure underneath the ocean.
- different animals have different structures to help them survive in the deep oceans.

Materials:

- marshmallow
- large plastic syringe without needle
- shaving cream, instant whipped cream in a can (optional)

What to do:

1. Place the marshmallow inside the large syringe.
2. Push the syringe in and pull it out. What do you observe? Why?
3. Place your finger over the end of the syringe. Push the syringe all the way in. What do you observe? Why?
4. Pull the syringe all the way out? What do you observe? Why?
5. Remove your finger from the end of the syringe and push the syringe in as far as it will go. Place your finger back on the end of the syringe and pull out the syringe. What do you observe? Why? What effect would the increasing and decreasing pressure have on animals and humans as they travel deep into the ocean or return to the surface?

Extension Activity

Try the same thing but this time squirt a small amount of shaving cream into the syringe. What do you notice this time? Explain why this happens.

Activity 13: Shark Shape Swim

Introduction:

Food can be scarce in the deep ocean environment. Some animals rely on speed through the water to catch their prey. The torpedo-like shape of a shark is adapted for fast and sudden movements. Unlike a less streamlined form, the shark's body offers reduced resistance in the water. As the shark moves, water does not pile up ahead of it. Instead, the water slides easily around the shark. This reduces friction, allowing the animal to move more quickly and with less effort.

Curriculum Links:

Science

Science Understanding

Year 5 – Biological Sciences: Living things have structural features that help them to survive in their environment.

Science Investigation Skills

Year 5 and 6 – Questioning and Predicting: With guidance, pose questions to clarify practical problems or inform a scientific investigation, and predict what the findings of an investigation might be.

Year 5 and 6 – Planning and Conducting: With guidance, select appropriate investigation methods to answer questions or solve problems.

Goals:

Students will understand that:

- different animals have different structures to help them survive in the deep oceans.
- predators have adaptations to help them catch prey. One of these adaptations is a streamlined body shape or shapes to help them swim.

Materials:

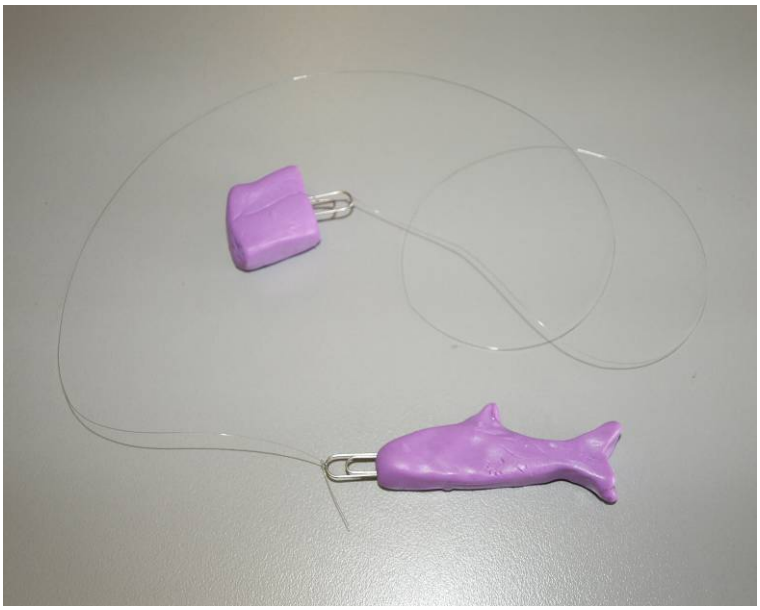
- Blu-tack or plasticine
- Fishing line
- Scissors
- 2 paper clips
- Large tub (a very long tub works best, under bed storage tubs are ideal)
- Water
- Stop watch

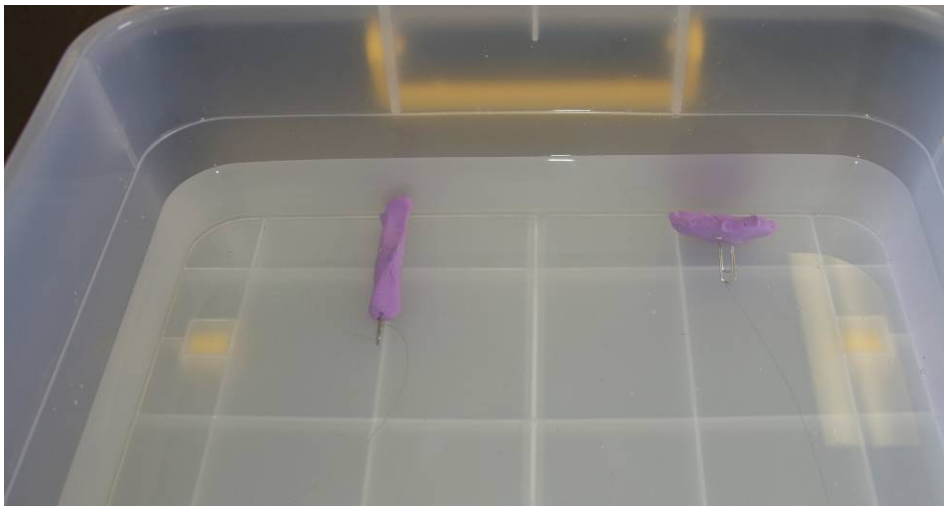
What to do:

1. Place plastic storage container on the desktop so that it is lined up with the table's edge. Fill the container with water.
2. Cut a length of fishing line several centimetres longer than the container.
3. Tie a paper clip to each end of the fishing line.
4. Measure out 2 x 10 gram balls of plasticine.
5. Press one of the 10 gram plasticine balls into a paper clip on one end of the fishing line. This is the weight you will use to pull your shark across the water.
6. Mould 10 grams of plasticine into the shape of a shark or a fish.
7. Press the other paper clip attached to the fishing line into the head end of the shark model so it is anchored in the clay.
8. Submerge the shark model at one end of the container. Hang the other paper clip over the edge of the opposite end of the container.
9. Release the weight. Use a stopwatch to determine how long it takes for the shark to travel across the container. Record the time. Calculate the speed of your shark by measuring the length of the container with the ruler and dividing it by the time it took your shark to cross the distance.
10. Reshape the shark into a less-streamlined form. Follow the same procedures as above and calculate the speed of the less-streamlined mass. Compare the speed of the two models.

Extension Activity

Use what you have learned about design and shape of the model sharks to improve your design. Set up races between various designs. Make sure each design has the same resources assigned (same amounts of plasticine and fishing line)





Activity 14: Giant Tube Worm Tubes

Introduction:

Giant tube worms (*Riftia pachyptila)* live around hydrothermal vents. They live in symbiosis with chemosynthetic bacteria (bacteria that use chemicals as a source of energy instead of sunlight) that provide the worms with food. They have no eyes, no mouth or any other organs to ingest food or excrete waste. The worms do not have any forms of locomotion. Giant tube worms are the fastest growing invertebrates on the Earth and can reach a length of up to 1.5 metres in 2 years.

In comparison, cold seep tubeworms (*Lamellibrachia luymesi)* that live in colder conditions away from the vents can take up to 250 years to reach their height of 2 metres. These tubeworms live near hydrocarbon seeps and obtain nutrients from the sediment of the ocean floor as well as from the bacteria surrounding it. These are much more stable conditions and enable the cold seep tube worms to live for longer periods of time.

Curriculum Links:

Science

Science Understanding

Year 4 – Biological Sciences: Living things, including plants and animals, depend on each other and the environment to survive.

Year 5 – Biological Sciences: Living things have structural features that help them to survive in their environment.

Year 6 – Biological Sciences: The growth and survival of living things are affected by the physical conditions of their environment.

Mathematics

Measurement and Geometry

Year 4 – Using units of measurement: Use scaled instruments to measure and compare lengths, masses, capacities, and temperatures.

Number and Algebra

Year 7 – Real numbers: Multiply and divide fractions and decimals using efficient written strategies and digital technologies.

Goals:

Students will understand that:

- different animals have different structures to help them survive in the deep oceans.
- giant tube worms that grow closer to hydrothermal vents grow much faster than the cold sea tube worms. The hydrothermal vents provide nutrients and bacteria that help the tube worms to grow.

Materials:

- 3 sheets of white A3 paper
- 1 sheet of red A4 paper
- Sticky tape
- Scissors
- Ruler
- Cardboard tube of diameter of approximately 4cm

What to do:

Making your model giant tube worm

1. Fold the A3 sheets of paper in half, lengthways. Cut along this fold.
2. Take one of the half sheets and roll it into a tube of 37 millimetres. You can roll it up and insert it into the cardboard tube and check the diameter is 37 millimetres. Adjust the roll accordingly.
3. Tape the ends of paper so that the paper tube stays rolled once you take it out of the cardboard tube.
4. Repeat this process with the other half sheets of paper.
5. Attach 3 of the rolls you have made together with sticky tape. Insert one tube inside the other so that the tubes overlap. The height should be less than 1.5 metres. This is the body of the tube worm.
6. Roll up the sheet of red A4 paper inside the end of the long white tube. Try to create a fan or trumpet so that one end has a greater diameter than the other. This is the top of the tube worm. Attach the end of the red tube together with sticky tape and attach it to the end of the white tube with sticky tape.
7. Your final tube worm model should be 150 centimetres in height. Adjust the height by cutting the end of the tube worm or by adding an additional tube of white paper.

How does your tube worm measure up? (For younger students)

Giant tube worms grow very fast! Use the height chart to work out how old you would be if you were a tube worm!

How does your Tube Worm measure up? (For older students)

The giant tube worm you have made is found near deep sea hydrothermal oceans vents. The conditions around the vents help the tube worms to grow. The tube worm you have made is a fully grown, mature organism. It reached this size in 2 years.

1. How much does a tube worm grow every month?
2. Measure your height. How old would you be if you were a giant tube worm?

There are another species of tube worm that grow in the very cold conditions of the deep oceans. They can take up to 250 years to reach their full length of 2 metres.

3. How much do the cold sea tube worms grow every year?
4. How old would you be if you were a cold sea tube worm?

Activity 15: Ocean Acidification

Introduction:

Carbon dioxide is a gas emitted by a large number of human activities including burning fossil fuels, industrial processes such as cement production and the destruction of vegetation. Carbon dioxide is absorbed by the oceans and this absorption causes them to be more acidic. The water reacts with the carbon dioxide to form carbonic acid.

The increased acidity of the ocean can cause problems for marine life. Any organisms that have skeletons or shells made out of calcium carbonate can be affected by rising acidity. Acids dissolve the structures made out of calcium carbonate. The survival of these organisms can affect food chains and entire ecosystems.

Curriculum Links:

Science

Science Understanding

Year 6 – Biological Sciences: The growth and survival of living things are affected by the physical conditions of their environment.

Year 9 – Chemical Sciences: Chemical reactions involve rearranging atoms to form new substances; during a chemical reaction mass is neither created nor destroyed.

Year 9 – Chemical Sciences: Chemical reactions, including combustion and the reactions of acids, are important in both non-living and living systems and involve energy transfer.

Year 10 – Earth and Space Sciences: Global systems, including the carbon cycle, rely on interactions involving the biosphere, lithosphere, hydrosphere and atmosphere.

Science as a Human Endeavour

Year 3 and 4 – Use and Influence of Science: Science knowledge helps people to understand the effect of their actions.

Years 4 and 5 – Scientific knowledge is used to inform personal and community decisions.

Years 6 and 7 – Science understanding influence the development of practices in areas of human activity such as industry, agriculture and marine and terrestrial resource management.

Goals of Activity:

Students will understand that:

- carbon dioxide is emitted by human activities such as burning fossil fuels and manufacturing process.
- increased carbon dioxide in the atmosphere is absorbed by the oceans.
- carbon dioxide dissolved in water forms carbonic acid.
- carbonates (such as the calcium carbonate that makes up animal shells and skeletons) dissolve in acids.
- animals that have shells and skeletons are at risk of surviving these conditions.

Materials:

- Glasses or plastic cups
- Water
- Soda water
- Chalk
- Universal indicator or Natural indicator (such as cabbage, beetroot or tea)
- Colour scales for your indicator to show what each colour represents.

What to do:

1. Fill a glass with water and another glass with soda water.
2. Measure the pH of the liquids using indicator. The soda water is acidic and the water is neutral.
3. Place a piece of chalk into each liquid. Observe what happens.
4. Leave the objects overnight and observe the chalk again. What is the difference between the two liquids? What effect could this have in ocean conditions?

Extension: Research the ways that humans are emitting carbon dioxide into the atmosphere. How could this be reduced? How could you reduce your carbon dioxide emissions?

Activity 16: Navigation using Sense of Smell

Introduction:

The deep ocean environment is dark because sunlight is absorbed and scattered by the ocean water. Sunlight can not reach below 1000 metres. Some sunlight can reach the mid-water or twilight zone between 200 and 1000 metres.

Many organisms in the deep ocean have a very powerful sense of smell. Because they cannot rely on their sense of sight in the dark conditions, animals use their sense of smell to navigate, find food, find mates and avoid predators. For example, the chambered nautilus has very poor eyesight as their eyes do not contain lenses. They rely entirely on the sense of smell to catch prey and find mates to reproduce.

Curriculum Links:

Science

Science Understanding

Year 5 – Biological Sciences: Living things have structural features and adaptation that help them to survive in their environment

Goals of Activity:

Students will understand that:

- many animals have special adaptations or features to help them to survive.
- some animals have developed a powerful sense of smell to help them navigate and find food in the dark deep ocean conditions when they cannot use theirs sense of sight to navigate.

Materials:

- Blindfold (scarf or material)
- Various materials with a strong or distinct scent in plastic cups. Cover the materials so that the students cannot see the objects. Have at least 10 materials for each pair of students (examples include: Vegemite, lavender, oranges, eucalyptus oil, flowers, grass, coffee, etc.)

What to do:

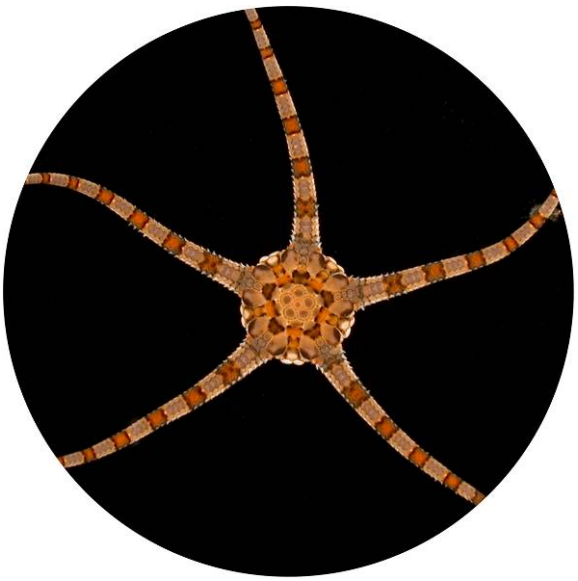
What smell is that?

1. Find a partner and blindfold one person. Make sure they cannot see anything through the blindfold.
2. Place the materials in front of the person with the blindfold on. Have the blindfolded person smell one of the materials and try to identify what it is. Record this observation.
3. Repeat this process for 4 more materials.
4. Take the blindfold off your partner and compare their observations with the actual results. Where there any differences?
5. Swap the roles and repeat the process for 5 materials.

Note: It is very important that no one sees any of the objects before the test.

Can you smell that?

1. Clear a large space in your classroom so there are no obstacles on the floor.
2. Find a partner and blindfold one person. Make sure they cannot see anything through the blindfold.
3. Place a three cups containing vegemite around the cleared space in the classroom. The aim of this activity is for your blindfolded partner to crawl around on the floor and try and find the cups containing Vegemite around the cleared space.
4. When you have finished placing your cups around the room. Explain to your partner what they have to do. Make sure you hold you help your partner stay in the cleared space and keep them safe from running into objects.
5. Start the activity. Did your partner find all of the cups? Did they find them easily?
6. Swap roles and repeat the activity.



Activity 17: Deep Sea Monsters

Introduction:

Scientists say that we know more about the surface of Mars than deep ocean environments here on Earth. Deep oceans are the largest habitat for life on Earth with strange creatures living under inhospitable conditions including lack of sunlight, extremely high pressure and a lack of nutrients.

The animals that inhabit this mysterious environment are sometimes described as monsters. They are very different to the animals in the shallow waters of the ocean or animals found on land. The lack of scientific data and evidence of the deep ocean animals and the difficulty of obtaining more data has led to the creation of mythical creatures or legends that are held in some communities.

Curriculum Links:

Science

Science Understanding

Year 5 – Biological Sciences: Living things have structural features and adaptation that help them to survive in their environment.

Goals of Activity:

Students will understand that:

- many animals have special adaptations or features to help them to survive.
- it is difficult for scientists to gather data and specimens of deep ocean animals because of the harsh conditions faced in the deep ocean. This lack of information can lead to myths or legends about the monsters of the deep.

Materials:

- Photographs or videos of deep ocean animals
- Paper
- Coloured pens and pencils
- Various craft materials (coloured paper, cardboard, aluminium foil, plastic, glue, paints, scissors, clay) to enhance picture, sculpture or collage
- Optional: Computer with internet access and word processing program and printer

What to do:

Study the Deep Ocean Animals

Study a range of real deep ocean animals. Look at pictures, videos and read information on the amazing and different animals that are found in the deep ocean. Select one of the animals that you like and gather as much information as you can about the animal.

Create your own Mythical Deep Ocean Monster

Using the information and images you have collected, create a mythical deep ocean monster based on the real animal you have selected. You are going to create a visual representation (collage, drawing, painting, sculpture) of the animal. You can enhance any of the real features or even add new features that might make the monster scarier or more interesting.

Once you have finished you artwork, write a paragraph describing your monster and its features. How does your animal use its features? How do the features help it to survive?

Extension Activity

Your challenge is to create the ultimate deep ocean animal. Use your imagination and your knowledge of the special features or adaptations of deep ocean animals. Combine all of the best features in one animal. Once you have decided on all of the features you want to include, create a visual representation of your ultimate animal. Include a description of the animal to inform people where your animal lives and how your animal uses its features to help it survive.

Make sure you consider the following features:

- Size
- Body shape
- Eyes
- Mouth
- Camouflage
- Special Structures (e.g. lure, swim bladder)

Further information for teachers and students

Integrated Ocean Drilling Program (IODP) Education page
Mostly audio visual files from IODP: an international marine research program that explores Earth's history and structure recorded in seafloor sediments and rocks, and monitors sub seafloor environments. http://www.iodp.org/education/

CSIRO Oceans and Coasts
Helping Australians enjoy lasting social, environmental and economic wealth from our vast oceans and coasts http://www.csiro.au/science/Oceans.html.

CSIRO Wealth from Oceans Flagship
CSIRO's Wealth from Oceans Flagship aims to provide Australians with enduring social, environmental and economic wealth from our vast ocean territory.
http://www.csiro.au/org/WfO-overview.html

Dive and Discover (Woods Hole Oceanographic Institute)
With Dive and Discover, your students are at the frontline of scientific inquiry as they join scientists—geologists, chemists and biologists—who are exploring the seafloor and making amazing new deep-sea discoveries. Daily updates, photos, videos and email correspondence with scientists from these research vessels allow your students to follow the progress of the scientific missions and find out about life on the floating laboratories at sea. http://www.divediscover.whoi.edu/

NOAA
National Oceanic and Atmospheric Administration, NOAA Research provides better forecasts, earlier warnings for natural disasters and a greater understanding of the Earth. Our role is to provide unbiased science to better manage the environment, nationally and globally.
http://www.oar.noaa.gov/education/