Rocky Shore

Teachers

This unit of work has been designed to support your class visit for the 'Rocky Shore' programme at the National Aquarium of New Zealand. Students will participate in a range of level specific interactive activities.

The primary focus of this programme is the Living World Strand of the Science Curriculum, however when planning your unit of work links can be made to other essential learning areas. Similarly, different essential skills can be emphasised depending on the needs of your students.

Programme Overview

The Rocky Shore programme teaches students about the different aquatic animals that inhabit the inter-tidal zones and aquatic environments in the Rocky Shore.

Students will examine the inter-tidal zones and the challenges that aquatic animals face living there. They will discover what special features the animals have to successfully live in this environment and why each animal has adapted to live in its environment.

Essential Learning Area: Science

Strand: Living World

Achievement Aim 2 and 4: Investigate and understand relationships between structure and function in living organisms. Investigate local ecosystems and understand the interdependence of living organisms, including humans, and their relationship with their physical environment.

Level	Essential Learning Area	Strand	Achievement Aim	Achievement Objective
1	Science	Living World	Structure and Function Interdependence of living organisms	Observe and identify parts of common animals.
2	Science	Living World	Structure and Function Interdependence of living organisms	Investigate the responses of animals, including people, to environmental changes in their habitats.
3	Science	Living World	Structure and Function Interdependence of living organisms	Investigate special features of common animals and describe how these help them to stay alive.
4	Science	Living World	Structure and Function Interdependence of living organisms	Use simple food chains to explain the feeding relationships of familiar animals and plants, and investigate effect of human intervention on these relationships.

Rocky Shore Pre-Visit Activities

Pre – visit activities

Prior Knowledge Brainstorm

Have students share their views on what they know about the Rocky Shore.
Encourage the students to think about the animals and seaweeds living there as well as the habitats they live in.
Students can record their brainstorm in the left-hand column of chart similar to the one below. The remaining columns can be filled out during the unit to track and focus student learning.

What Do You Know?	What Do You Want to Know?	What You Learned

Sketch a rocky shore creature

Have the children make a sketch of a rocky shore creature that they know of (e.g. starfish, crab or sea anemone). This activity could be used for pre and post unit assessment. At the beginning of the unit have students draw a Rocky Shore creature that lives within the tidal zones. After your visit to the National Aquarium have the students repeat the activity. The Rocky Shore Drawings worksheet (at back of booklet) could be used for this activity.

Play 'Who Am I'

Ask the children 'who am I'? Below are some examples to be started with (model answers are at the back of the booklet). Ask the children to make their own 'who am I' clues for a marine creature that they know.

A shell is where I live.

I carry my protection as I walk.

I have to find a new home as I grow bigger.

I have nippers.

I am a .....

I look like a flower, but really am an animal.

I can move very slowly.

I reach out with tentacles and grab my food.

I tuck my tentacles away when I am not covered with water.

I am a .....

I have eight legs covered with suckers.

I have excellent eye-sight to spot my prey.

I can change colour to blend in with my surroundings.

I am an .....

I come in many different shapes, sizes and colours.

I move around on my tube feet.

My stomach comes out of my mouth when I eat.

I am a .....

Can you catch my drift?

With the class, match the animals' pictures to their poems. The cut-out pictures of the different animals can be found at the back of the booklet

I'm black and hard with one strong muscle
To get me off a rock is a tussle.
Winter is a grind each year
Because I have ties that bind me here.
When my friends leave, you'll find
I always have to stay behind.

My shell is round, red and green.
Hiding in seaweed is my scene.
I can protect myself with claws raised high.
But I'd rather just sit in a rock pool
'Til you pass by.

You have two feet. I have one.
So you may think I can't have fun.
But we molluscs sure can slide.
We glide down slime trails into the tide.

I glue myself to rocks and stuff.
Try to pull me off if you think you're tough.
But beware, even a mighty heave-ho
Won't pull me out of my volcano!

Seashore riddles

Ask the class to write their own riddles like this one:

At the water's edge where they can't be blown,
Sometimes shells walk on their own!
But if you watch them carefully,
Two eyes and many legs you'll see.
These are animals that dwell
Inside another creatures shell,
And when this shell gets too tight
They find another that's just right.

The Challenges of Marine Environments

Brainstorm activities

As a class list the differences between living in water and living in air. Think about what special environmental challenges aquatic animals face when the tide comes in and goes out each day. Discuss these challenges.
Depending on the level of your students encourage them to use some of the vocabulary below in your discussion.

Survival, salinity, temperature changes, predation, competition, wave action, dehydration, pollution, habitat, invertebrate, vertebrate, plankton, zooplankton

Fabulous Facts …. Do you know your tidal zones?

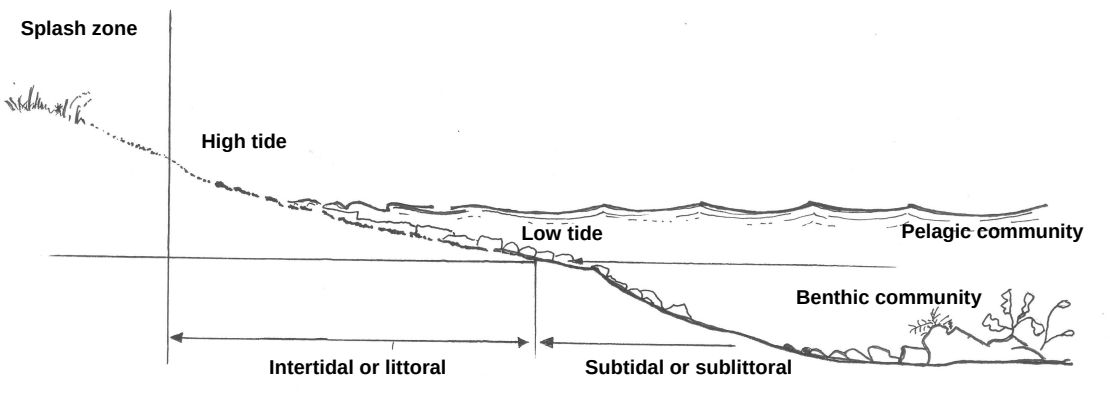
On the rocky shore, zones of seaweeds and animals are often quite distinctive. These zones are often correlated with the range of tides (i.e. the extent to which the tide moves up the shore). The zones of the shore can be split into the following categories:

Splash zone (Supralittoral zone) – this area of the rocky shore occasionally gets sprayed with salt water usually at a high spring tide.*

High tide zone (Littoral fringe) – this area of the rocky shore will be covered with salt water *only* at a high spring tide.

Mid tide zone (Intertidal or littoral zone) – this area of rocky shore is covered with salt water during high tide and exposed during low tide (twice a day).

Low tide zone (Sublittoral fringe) – this area of rocky shore is usually covered with water but during a low spring tide this area can be exposed.



Tidal zones

Learn about the different zones found on the rocky shore (use above fact box) for guidance. Relate the different zones found on the rocky shore with the some of the environmental challenges that the marine creatures face. For example, animals in the high tide zone must survive dehydration, high temperatures and predation from terrestrial animals. Animals in the mid to low tidal zone must be able to withstand wave action, competition and predation from marine creatures.

Fabulous Facts …. What are abiotic factors??

The physical environment (abiotic factors) plays an important role in determining which marine species can live and survive in the different zones of the rocky shore.

At low tide, exposure to the sun (hot temperatures and desiccation) can be very stressful for many marine creatures. As the water evaporates from rock pools, the temperature and salinity of the water increases and the oxygen in the water decreases. Many marine species are able to move into cool damp crevasses during low tide but some animals in rock pools (e.g. twisters and triplefins – collectively known as cockabully fish) are not able to escape the increases in temperature and salinity. These animals are able to physiologically cope with large fluctuations in seawater temperatures and salinity and often hide in rock pool seaweed and limit the amount of swimming they do during low tide.

During high tide, another physical factor, wave action becomes important. Animals and seaweed that live in the mid to low tide zones and below must cope with the crashing and pulling force of waves. Waves can easily dislodge animals and seaweeds that are not fixed tightly to rocks.

Wave in a bottle

Waves are important to tide pool animals. They bring food and oxygen and carry away wastes. Waves, especially winter waves, can also be dangerous to any creature who doesn't have a firm grip on the tide pool. Make a class set of wave tanks:

You need:

Long, narrow bottle with close fitting cap (clear dishwashing detergent bottle or

1 litre orange juice bottle for example).

Mineral oil or vegetable oil

Water

Blue food colouring

Fill the bottle 2/3 fill with water. Add food colouring. Fill rest of bottle to top with oil. Screw on top tightly. Turn bottle on side and rock gently back and forth to create slow motion waves.

Add extra items to different wave tanks. For example, sand, polystyrene balls (found in beanbags) or small pieces of well washed seaweed. Watch how these items move about in the waves. Describe the differences in movement between the different items.

Design a sucky animal or seaweed

Design an animal or seaweed that can cope with wave action. Discuss with the class what features would be good to have, to withstand the crashing and pulling of waves.

Fabulous Facts …. What are biotic factors??

Competition and predation (biotic factors) are very important factors in determining which marine species can live and survive on the rocky shore.

Competition for food, light and space can be important, particularly lower down on the shore where many more marine species are able to survive (i.e. where there are less physical stresses). Seaweeds lower on the shore compete with neighbouring seaweeds for space to grow on the rocks and for light.

Predation is a continual trial for animals on the rocky shore. At high tide, small fishes and crabs must hide from marine predators such as larger fish or crayfish. At low tide, small fish and crabs are able to escape their marine predators (phew!) but then must watch out for terrestrial predators such as seagulls, herons, oyster catchers and humans!

Survival characteristics

Discuss how the physical features or behavioural characteristics of aquatic animals enable them to live in the aquatic environment successfully. What are these physical features or behavioural characteristics? Students could name these features and explain what function they think they perform. Depending on the level of your students, encourage them to use some of the vocabulary below in their discussion.

External Characteristics: ***Fins (caudal, anal, dorsal, pectoral, pelvic), scales, gills, mouth, eyes, shells, operculum ('trap-door' which closes shells during low tide), Exoskeleton, Soft bodies, spines and claws for defence.***

Behavioural characteristics: ***Moving out of the sun into shady areas. Moving with the tides. Shutting up shells or placing tentacles inside body while low tide.***

Make a rocky shore mural

Make a colourful rocky shore mural to be pinned to the classroom wall. Ask the children to draw and colour in their favourite rocky shore animal or seaweed. Before pasting the animals and seaweed to the mural, ask the children to discuss where their rocky shore creature is likely to live and why. Revisit earlier lessons about the tidal zones of the rocky shore and the challenging marine environment (e.g. drying out, wave action, predation and competition).

Design a shell

Think about life in the water. Pretend that you are a creature living in the sea , discuss with the class why you might need a shell. Design an original shell that would provide you with protection form predators or drying out, mobility and room for growth.

Fabulous facts…. Did you know that….

Hermit crabs have soft bodies. That is why they take a seashell for a protective cover. Once the hermit crab gets too big for its shell it will search for a new bigger shell. Next time you are at the rocky shore … see if you can spot a hermit crab looking for a new shell. Gently place a larger shell in front of the hermit crab, what does it do? Maybe it doesn't need a new home just yet!?

Octopus kites

Make an Octopus kite. Before starting out on the activity ask the children what they know about octopuses? Have they seen an octopus before? If so, where did they see it on the rocky shore (e.g. in the low tide zone or a rock pool)? How did it behave to having visitors looking at it? *See the fabulous fact box below on octopuses.*

To make a kite:

Materials: heavy paper (semi-circle)
bamboo rods
masking tape
streamers, ribbons, etc
string

Method: Colour or paint the heavy paper to look like an octopus. Remember that octopus have two eyes and can change their colour.
Tape the bamboo rods to the edge of the heavy paper.
Attach the streamers to the bottom edge of the half circle of paper. Remember octopus have 8 tentacles!
Attach string to the top and bottom two corners and gather it in the middle. Attach a long string for flying.

Fabulous facts…. Did you know that….

An octopus is related to shellfish (molluscs). They have a small remnant shell inside their bodies. Octopuses are quite intelligent creatures, they can work out how to escape aquarium tanks (if given a chance) and they will work out how to undo jam jar lids to get food. Octopus can change colour and it is thought that certain colours can be associated with particular moods. For example, red – angry or aggressive and white - scared or timid.

Adapting to change

Ask the class to look at the rocky shore animals (see back of booklet) and discuss what will they do when the tide goes out? How will they survive drying out in the sun?

Some will **hide in the cool shade under rocks.**
Some will **cover themselves in slime.**
Some will **close shells or doors.**
Some will **crawl under wet seaweed.**

Decide what each will do. Using the activity sheet (back of booklet) write what each will do beside each animal. Some might do more than one thing.

The rock pool story

Imagine you are a sea creature living in a cool shady rock pool. You feel the water slipping away and the hot sun shining on you. Seagulls are circling overhead, ready to eat you. Write a story or poem. Explain what you will do to keep safe from seagulls and the sun.

A close up look

Organise a class visit to a nearby rocky shore. Check the tide tables on the web from Land Information, New Zealand (www.hydro.linz.govt.nz/tides/majports/index.asp, August 2004) or the local newspaper or from your local DOC office. Plan your visit around the time of low tide.

Before taking a trip to the rocky shore… make an underwater viewer.

How to make a underwater viewer spyglass

Can't see below the sea? Make this to take on you next tide pool expedition, it's perfect for looking into deeper parts of the tide pools that are always submerged.

You'll need: Milk carton or coffee can, opened at ends
Strong, tight rubber bands or duct tape
Plastic wrap

How to make: Wrap a large piece of plastic wrap around bottom of can or carton. Secure with rubber band or duct tape. Place covered end underwater to view what's hidden beneath the surface. If your plastic wrap tears while you're at the shore, don't leave it there.

Other useful equipment to take to the rocky shore:

- ☐ Ice cream containers (with lids)
- ☐ Rocky shore identification chart/book
- ☐ Camera
- ☐ Rubbish bag to collect shore litter
- ☐ Underwater viewer spyglasses
- ☐ Thermometers
- ☐ Small aquarium nets
- ☐ Magnifying glass

Please minimise the disturbance of the seashore community during your study. Make sure your students understand the seashore code before taking them down to the shore.

THE SEASHORE CODE

☐ Observe marine species where you find them. You may place them in containers in cool sea water for short periods of time only, then return them to the place of collection.

☐ Make sure you have wet hands when touching marine species. Handle marine species carefully, gently and only when necessary.

☐ Lift rocks rather than roll them to ensure that you don't crush the marine species. Remember to turn rocks back the way you have found them.

☐ Wear appropriate footwear and watch the waves!

☐ Take your rubbish home with you and pick up any left by others.

<u>Up close and personal -A Class Study</u>

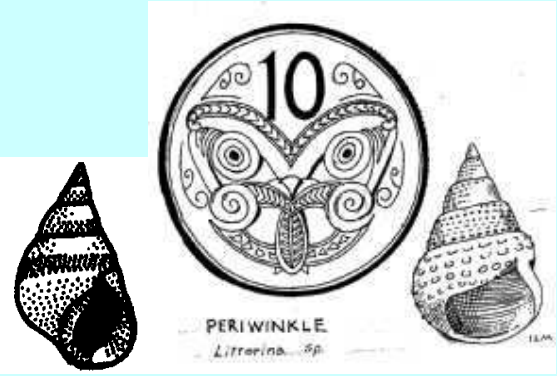
While at the Rocky Shore collect enough periwinkles for each student in the class (see fact box below). The snails will keep well overnight if stored in cold sea water. Each student gets his or her own periwinkle. Observe differences in colour, size, shape, dents in shell and "personality". Some periwinkles open their trap doors (operculum) when you hum to them. After a while return all periwinkles to one or two containers. Each student must find his or her own periwinkle. How can they tell the difference? It is surprising how different individual periwinkles can be, even though they initially looked the same. A further extension task might be to trace the tracks the children's periwinkle makes in a shallow dish covered with a little cold seawater. Encourage the children to describe the movement of the periwinkle, how fast or slow does it go? What type of track does the periwinkle leave? (Hint: putting a small amount of sand in the bottom of the shallow dish can make it easier to see the tracks). Using a ruler, measure the distance of the periwinkle track over a certain period of time (e.g. 1 min). How fast does the periwinkle actually travel? (Hint: distance (cm) per min). Are there any differences between the periwinkles' speeds?

Fabulous Facts …. Do you know?

Best environmental conditions to keep your periwinkle in are a cool, shady container with a small amount of cool seawater and adequate oxygen supply. Do not let the containers get too hot in the sun or classroom.

Some sea creatures live almost the whole year out of the sea. They have adapted to very dry conditions, and may only get splashed with sea water twice a year at very high tides. The tiny black periwinkle has a shell about the size of a five cent piece. It can live high up on the beach where the sea seldom reaches.

Periwinkles are classed in a large group of animals called molluscs, so they are related to other shellfish and creatures such as octopus and sea slugs. Periwinkles feed on algae found on rocks. They use a specialised ribbon-like tongue which has microscopic teeth on it (called a radula) to scrape off the algae.



It is often best to observe marine creatures in their natural environment… Their behaviour is linked to the change in tide and their surrounding habitat. Consider doing most of your class observations at the rocky shore.

Life Cycles

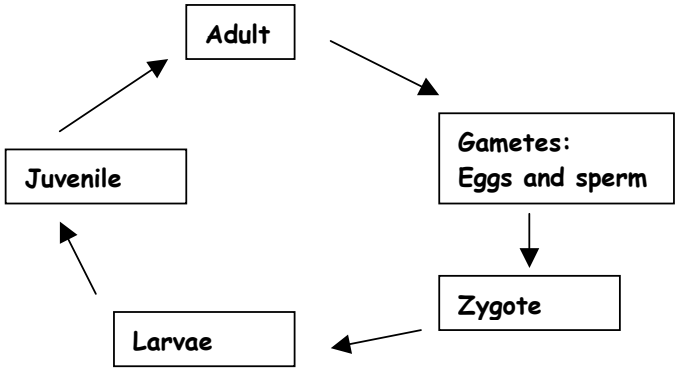
Brainstorm activities

Brainstorm words to do with marine life cycles: **plankton, larvae, adult, juvenile, zooplankton, phytoplankton, eggs and moult**.

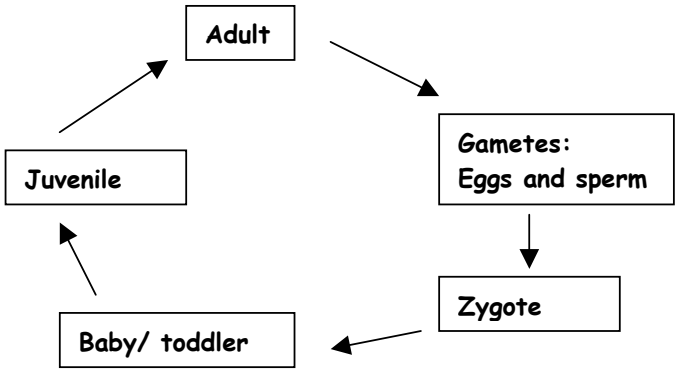
Work out that life cycle

With the class, work out the life cycle of a human, a bird and a fish. How are they similar or different?

Example of fish life cycle:



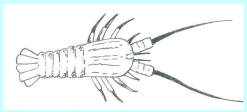
Example of a human life cycle:



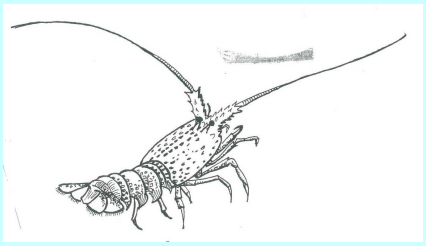
Fabulous Facts …. Do you know?

Unlike humans and birds, the lifecycle of many marine species occurs in different environments. Adult marine species may be found low on the rocky shore or on the reef just off the rocky shore. Larval forms (plankton) grow and develop offshore, sometimes beyond the continental shelf. Juvenile stages swim back to shore and settle for sometime on the rocky shore or rock pools.

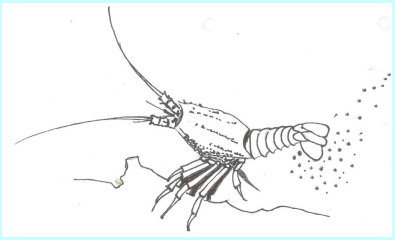
Example: ***The life-cycle of the crayfish***



Puerulus looks more like a small crayfish. After spending 12-22 months in the open ocean, they migrate to the shore within 2-3 weeks.

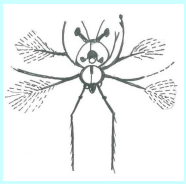


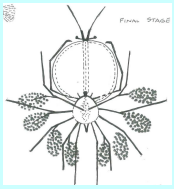
Juvenile crayfish live in rock pools and shallow bays and as they grow older move out on to deeper rocky reefs. Juvenile and adult crayfish scavenge on dead fish, paua, kina and small crabs.



Adult matures in ~5 years. Female can bear 550,000 eggs under its tail. Eggs are held onto for 6 months and then released as spider-like larvae in late autumn.

Early stage phyllosoma floats out past the continental shelf as part of the plankton. Larval stages feed on phytoplankton and small zooplankton.





Final stage phyllosoma.

Marine animals often disperse eggs and sperm into the water. To increase the chances of fertilisation, the number of eggs and sperm produced by one adult is enormous! For example one female paua can produce 10,000 eggs or more in one season. There are many risks for young larvae as well. Predation of larval stages is high and unfavourable climates (strong off shore currents or changes to weather patterns – El Ñino) can often lead to many larvae dying. Also larvae can be very susceptible to temperature and salinity changes. Water temperature and salinity can be affected by increased pollution which in turn leads to larvae mortality or mutation. So the number of larvae which eventually become adult can be few.

Risky life-cycles!

Look at some animal life-cycles (e.g. fish, crab, bird or human). Discuss with the class what some of the risks to the different stages of the life-cycle might be. For example, bird's nest with eggs might be prone to predation by rats. Adult birds might be prey for cats or stoats.

Match up the adults with the larvae!

Use the pictures found in the back of the booklet, match up the larval form with the adult marine creature.

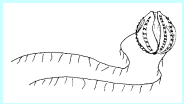
Take a closer look at some phytoplankton and zooplankton

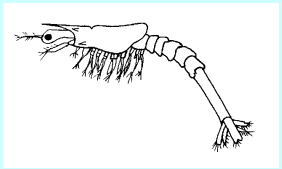
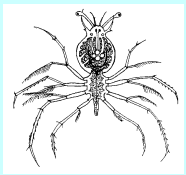
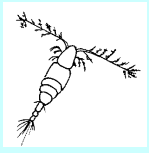
If you have access to a microscope and some glass slides, look at some pond water. You will be surprised how many different micro-organisms there are in just one drop of water!
Compare different water samples (e.g. pond water vs. tap water or pond water vs. river water). There is an identification chart of some of the aquatic creatures at the back of the booklet.

Fabulous facts…. Phytoplankton and zooplankton

So what are phytoplankton and zooplankton? Phytoplankton (phyto – plant, plankton) are microscopic plants such as unicellular algae, diatoms and dinoflagellates. Zooplankton (zoo – animal, plankton) are small microscopic animals, such as larval forms of barnacles, starfish, sea urchins as well as copepods, cilates and krill. There are often other micro-organism swimming or floating around in the water for example, unicellular flagellates, ciliates, multicellular filaments of algae. These types of micro-organisms are commonly found in pond water samples. (See identification chart at back of booklet).

Phytoplankton: **Zooplankton:**

Research project

Have students carry out research on the life cycle of a specific rocky shore organism. Have students present their information in an interesting way, e.g. an oral report, booklet, poster or a mobile.

Food webs

Brainstorm activities

Brainstorm new words: herbivore, carnivore, omnivore and detrivore.

Make a class list of food that the students ate during the day. Work out for each food item whether the children would be classed as an herbivore or a carnivore. Look at the whole food list, are there both animal and plant products … ask the class what they think they can be classed as if they eat both vegetables and meat.

Make posters of herbivores, carnivores or omnivores. Ask the children to find a picture (to be pasted to the poster) of their favourite animal (e.g. cat, horse, bird). Before pasting the pictures to the posters, have a class discussion on what each animal is. Is it a herbivore, carnivore or omnivore?

Facts on food webs…

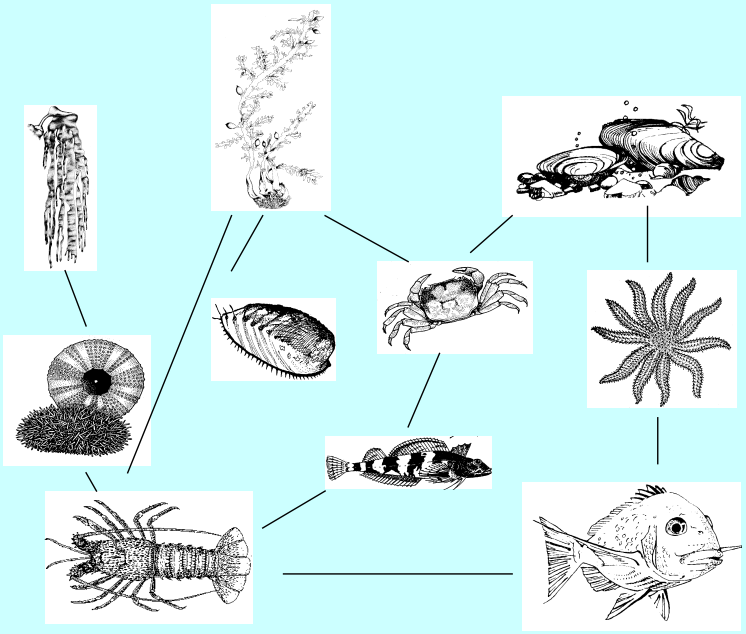
Food webs are a diagrammatic way of expressing how energy flows through different organisms or more simply what eats what?

The most important part of food webs are the **producers** (e.g. plants, seaweed, algae films and phytoplankton). Without **producers** there wouldn't be food webs! Producers obtain their 'food' from sunlight energy, water and nutrients. This process is called photosynthesis.

The rest of the food web can be split up into categories of **herbivores**, **carnivores** and **omnivores**. Animals that eat only plant material (producers) are called **herbivores**. Animals that eat other animals are called **carnivores** and those animals that eat both plant material and animals are called **omnivores**.

But wait there is more….. What are **detrivores**?
Detrivores are organisms that eat dead material. Detrivores play a very important role in food webs. Just imagine if there were no organisms to break down dead material! Some examples of detrivores are; bacteria, fungi, earthworms or hagfish.

So what does a simple rocky shore food webs look like?



Think of all the marine and terrestrial creatures that live on the rocky shore. A real rocky shore food web would be much more complex than this one!!

Seashore food webs

Give each student an identity as a marine plant or animal. They will have to think about predators and prey. Link them all by coloured string. Make the sun the most central part of the food web (remember plants gain their 'food' with the help of the sun's energy). What happens if one species is over fished (i.e. humans eating a marine species e.g. paua), or an oil spill occurs? Indicate this by breaking the string.

Arty food webs

Draw pictures of rocky shore creatures, place the pictures in a food web design or ask the children to design their own rocky shore food web.

Food web snap

Use the snap cards at the back of the booklet. The children have to decide if any of their animal cards are eaten by, or eat the animal of the snap card that is face up on the table.

Fabulous facts…. Fearsome sharks

We often think of sharks attacking humans. However, 'shark attacks' don't happen very often and are usually a case of mistaken identity.
So if humans don't appear on the shark menu what does? Sharks eat a range of foods, such as small fishes, octopus, crabs and even seals.

Food to Go

What would you do if you had to go on a long trip without a picnic or a stop at your favourite McDonald's? Old time seafarers had to bring foods that could last many weeks or months without refrigeration.

Sailors had **hardtack**, a very tough biscuit that could last as long as the sea voyage. It didn't taste very good, but at least it held up well against water, mould, and rats. Think you'd like to be a sailor? Try making hardtack first. Here's what you'll need:

3+ cups unbleached, all purpose white flour
3 teaspoons salt
1 cup water

Preheat oven to 180° Celsius. Mix flour and salt together. Add 1 cup of water and stir until it becomes too hard to continue. Knead dough in bowl with hands, adding more flour to make it very dry. Roll and pull the dough into a one-centimetre thick rectangle big enough to be divided into 16 1-8 cm squares. Use a table knife to cut dough into squares. Hold each square in your hand and punch 16 holes into each with a nail (carefully!). This keeps the hardtack flat and breakable. Place square on un-greased baking tray and bake for 30 minutes until lightly browned and crisp. Allow to cool.

Seaweed Pudding

Are you tired of Jelly for dessert? Make something special tonight. The ingredient that makes Jelly and store-bought puddings thicken is the same ingredient that makes seaweed pudding gel. It's called **carrageenin**. Look for it in the listing of ingredients in puddings, toothpaste and frozen desserts. This recipe uses Irish moss (*Chondrus crispus*), a dark red algae that bleaches to white in the sun. It grows to about 10 cm long with short branches. It can be bought dried at health food stores.

1 cup Irish moss
1 teaspoon vanilla
½ teaspoon salt
½ cup sugar
4 cups milk.

Soak Irish moss in water for a few minutes. Clean and drain in a colander. In a double boiler, cook milk and Irish moss for 20 minutes, stirring constantly. Add salt and sugar. Cool 5 – 10 minutes more. Strain out seaweed. Add vanilla. Chill.

FABULOUS FACTS: Did you know…….

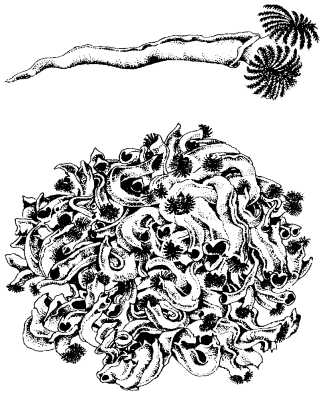
Heard of agar? Agar is a bit like gelatine. It is used in foods and to make agar plates that are often used for culturing microbes. Agar seaweed (*Pterocladia lucida*), is a red seaweed which is found along the coast of the North Island and the top of the South Island, New Zealand. This seaweed has been harvested in New Zealand for over 40 years. It is mainly gathered from beaches in Hawke's Bay, Wairarapa, Poverty Bay and the Hokianga district.

Check out the fancy New Zealand seaweeds: *Seaweeds of New Zealand, Nancy Adams (1994) and Common seaweeds of New Zealand, Nancy Adams (1997).*

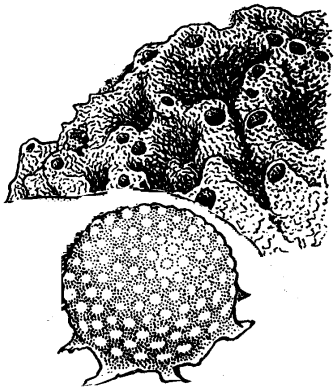
FILTERING YOUR FOOD

The sea is a 'soup of micro-organisms'. Marine species such as tube-worms, mussels, barnacles, sponges and sea cucumbers filter the seawater for food. By waving feather-like tentacles, legs or by sucking water in through their mouths, filter feeders catch small food particles of plankton. Filter-feeders may also catch bits of detritus (dead material).

Pictures of filter feeders:

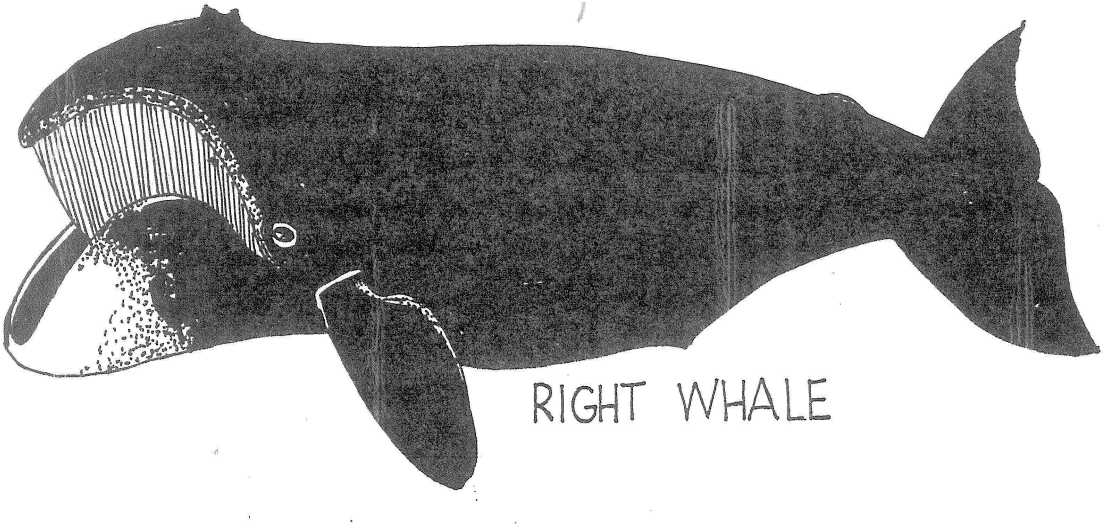


Tube worm



Sponge

Barnacle



FABULOUS FACTS: Did you know…….

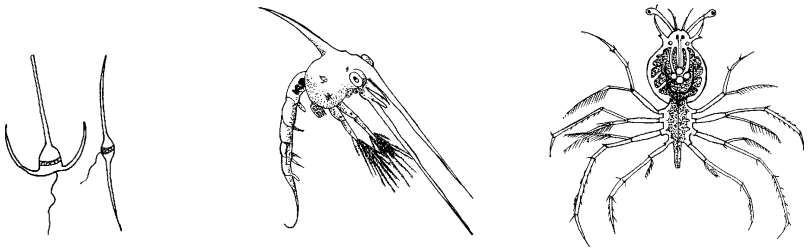
Tube worms and barnacles filter through the water for food particles using a 'comb-like structure', a bit like Baleen whales.

Sea cucumbers and sponges suck water in through their 'mouths', filter the food particles and squirt water out.

Marine worms filter through sand, for bits of food (algae). Sand passes through their gut and out the other end forming little piles of sand. You may have seen this on the beach or at the estuary.

Often when we think of plankton, we only think of krill or shrimp that occasionally get washed up on the shore or the stuff that whales feed on. However, there are many other marine organisms found in the plankton, (e.g. phytoplankton and smaller zooplankton -see definitions in lifecycles section). Krill and shrimp (classed as large zooplankton) along with the larval stages of many marine creatures and microscopic forms of plants, are collectively known as plankton. Plankton can be divided into different categories. Animal plankton is known as *zoo* - (animal), *plankton* - (An aggregate of small organisms that float and drift in great numbers in fresh or salt water) and plant plankton is known as *phyto*- (plant) *plankton*. Plankton can also be classed into two groups, one that spend their whole lifecycle in the plankton (e.g. daphnia, copepods and krill) and another that only spend a small part of their lifecycle (e.g. larval stage) in the plankton (e.g. barnacles, crabs, mussels and starfish).

Pictures of plankton:



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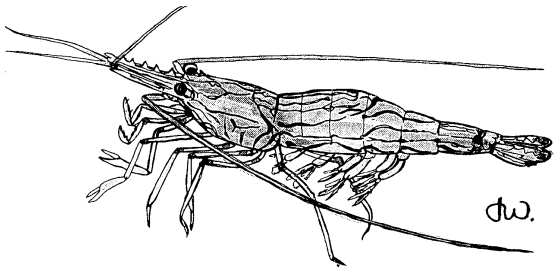

Getting out the bits

Try filtering out some water as sea animals do - they suck water in and filter out the bits of food. Then when they are finished they squirt water out!

You need:
A sieve or colander
A plastic funnel
Two plastic containers
A jug of water
A circle of soft paper; blotting paper is ideal, but you could use a small circle of newspaper or soft drawing paper.
Some 'bits' – pebbles or gravel or sand.

What you do:

Mix your 'bits' with the water. Pour it through the sieve. Watch what happens.
Fold your circle of paper in four, and push your finger between the folds to make a pocket.
Put your pocket in the funnel.
Put the funnel in the top of an empty plastic container.
Carefully pour the 'bitty' water into the pocket.
Watch what happens.

You have separated the 'bits' from the water by *filtering*.

Getting to the bottom of it …..

An extension task…Make a new paper pocket. Use it to investigate what happens if you add other 'bits' like sugar and salt to water. Why do filter feeders not filter the salt from the sea?

Research topic

Ask the children to do a research topic on an animal that lives on plankton or detritus (filter feeders or detrivores). Where does it live? What is its life-cycle? Does it have any predators?

FABULOUS FACTS: Did you know…….

Some of the biggest animals in the world feed on some very small animals! Some whales (e.g. Baleen whale) are filter feeders. They separate tiny hard-shelled animals called krill from the water by straining the water through a bony filter. A whale has to filter many tonnes of krill from the water to live.

You and the environment

Create rocky shore mobiles:

Build a wind chime from shells and beach finds. Ask the children to identify what the beach finds are and where the marine creatures once lived on the rocky shore (i.e. high on the shore, in tidal rock pools or low on the shore). If the beach finds are wood or human-made items ask the children to suggest how the items may have 'arrived' on the coastline.

Plastic Can Pollute

Rubbish on the beach is ugly to us, but it can be deadly to sea animals. Did you know that over 7 billion kilograms of rubbish is dumped into the ocean each year? A large percentage of this rubbish is plastic. Young seals and sea gulls sometimes strangle on plastic 6-pack yokes, the kind that hold 6 cans of fizzy drink together. These rings get caught around their necks and slowly strangle the animals as they grow. Plastic bags and balloons are eaten be sea turtles, fish and other marine animals which mistake the plastic for jellyfish and can eventually suffocate.

What Can You Do To Help?

1. Take a bag to the beach. Bring a bag to pick up rubbish that others have left behind. You may be surprised at what you find. Much of it will be empty cans and plastic food wrappers, but you may also find plastic fishing nets, buoys, lines and even old rubber boots lost from fishing boats.

2. Use biodegradable plastic bags. Most plastic bags take a very long time to break down, or rot. But some bags, like those used by New World supermarkets, break down in three to five years. They feel slightly soapy; they're made with cornstarch. Ask for them when your family goes shopping or you can reuse your old plastic bags.

3. Teach one other person something about the ocean. It may be a friend, a parent or a grandparent. We all tend to take better care of what we understand and appreciate. You can make a difference.

4. Make a class poster about the problems with plastic and the rocky shore/marine environment. Present your class poster to another class or a parent/teacher meeting.

5. Make a play 'A day of life on the rocky shore' or 'Nemo and pollution!' Dress up as marine creatures. A theme for the play could be**…** How the different marine creatures respond to pollution (e.g. drain waste, oil spills or plastic bags) in the environment. Invite other classes or parents to come and see the play!

Where does the water go??

Have you ever wondered where that soapy water that you have used to wash the car goes? Most of the substances that are put into an open drain eventually ends up out at sea.

Do a survey around the school streets or in you neighbourhood (see questionnaire form at the back of the booklet). Ask people what liquids they occasionally pour down drains. Observe the activities along the street, is anyone washing their car? Can you identify any substances in the drain?

From your surveys or questionnaire, have a class discussion about the findings. Do you need to improve the situation or is it a clean neighbourhood? Work out a creative way that the class can inform people in the local neighbourhood about where waste in the drains goes and what some of the effects might be.

Some useful references:

Collins guide to the New Zealand seashore. By Dave Gunson (1983). Collins, Auckland.

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The Mobil New Zealand Nature Series: common shells. By J.R. Penniket and L. Kirby (1982). Reed Ltd, Wellington.

Common seaweeds of New Zealand. By Nancy Adams (1994). Canterbury University Press, Christchurch.

The living reef. The ecology of New Zealand's rocky reefs. Edited by N. Andrew and M. Francis. Craig Potton Publishing, Nelson.

Deep sea New Zealand, blue water, black abyss. By Peter Batson (2003). Canterbury University Press, Christchurch.

The National Aquarium Secondary Schools resource booklet.

Te Angiangi Marine Reserve education resource. By Amelia McQueen for Department of Conservation (2003).

Web site keywords:

Department of Conservation
Ministry of Fisheries
Experiencing Marine Reserves