



Survivor Rocky Shore

Skilfully Determining Parts-Whole Relationships

Scenario

Every second year groups from our school monitor our local rocky shores to see how well life is surviving in this harsh environment. It adds to our understanding of the Hauraki Gulf which is so important to the life of our city. This year it's your turn to make a report. Your task is to become the class experts on a particular animal and using skilful parts-whole relationships report on its special features for survival. As part of this you are to form a question about your chosen species that can be investigated at the shore. How is your species a survivor?



Exploratory Environment

Introduction

This Quest is an investigation into the special features of common rocky shore animals which help them stay alive and survive into the next generation. Its focus is on determining parts-whole relationships so as to better understand the animal being studied. They should finish the Quest with a good understanding of at least one animal and the difficulties of life on the shore.

1 Authenticating the Learning

Initiate a whole class discussion to introduce the scenario and its problem making links to the achievement objective focus. Talk together about what they already know about the animals and plants of the rocky shore and the difficulties of living there. What is their understanding of the scientific meaning of the word 'animals.'

Brainstorm and mindmap their present knowledge. What do we already know about the problem?

Locate the shore you will be visiting on a map of the North Shore.

Complete the Grazers and Predators activities.

2 Constructing Relevant Questions

As you discuss the scenario begin the question formation and planning the research.

During an interactive discussion between the teacher and class these essential research questions need to be drawn out for investigation:

What animals and plants live on the rocky shore?

What difficulties do the animals and plants face on the rocky shore?

Which animal will we study?

What are the special features of our animal that help it survive?

How do you determine parts-whole relationships skilfully?

3 Planning the Research

Discuss with your class and agree on a timetable with checkpoints. Also decide on the concluding performance and look closely at the assessment rubric.

4 Discovering Relevant Information

Introduce the thinking skill of determining parts-whole relationships.

Construct with your class the thinking steps for determining parts-whole relationships skilfully.

Begin the 'discovering relevant information' phase by modelling the use of the graphic organiser with the lesson 'The Kestral.'

For more detail see Chapter 6, page 184 - Determining Parts-Whole Relationships in 'Infusing the Teaching of Critical and Creative Thinking into Content Instruction - A Lesson Design Handbook for the Elementary Grades' Robert J. Swartz and Sandra Parks, The Critical Thinking Co. ISBN 0-89455-481-6

Use the Quest's CD to locate information on the special difficulties animals on the rocky shore have to cope with and the special features of the chosen animal.

5 Constructing Knowledge

Have your students reflect on the Thinking Steps and their notes including their graphic organisers and their investigation at the shore. Use the writing template to organise their thoughts.

6 New Insights and Understandings

Have your students write up their new insights and understandings.

PROBLEM-BASED LEARNING UNIT PLAN - SCIENCE



Title: Survivor Rocky Shore

Weeks: 6

Achievement Objective Focus - Living World - Investigate and describe special features of common animals which help them stay alive and survive into the next generation.

Thinking Skills Focus - Skilfully Determining Parts-Whole Relationships.

Scenario

Every second year groups from our school monitor our local rocky shores to see how well life is surviving in this harsh environment. It adds to our understanding of the Hauraki Gulf which is so important to the life of our city. This year it's your turn to make a report. Your task is to become the class experts on a particular animal and using skilful parts-whole relationships report on its special features for survival. As part of this you are to form a question about your chosen species that can be investigated at the shore. How is your species a survivor?

Learning Experiences	Learning Outcomes Students should be able to:	Organisational Notes																						
<p>1 Authenticating the Learning Introduce the scenario and its problem-making links to the focus achievement objective.</p> <p>Awakening Prior Knowledge What do we already know about this problem?</p> <p><input checked="" type="checkbox"/> Brainstorming <input checked="" type="checkbox"/> Discussion <input checked="" type="checkbox"/> Mindmapping</p> <p>Strengthening Prior Knowledge</p> <p><input checked="" type="checkbox"/> Front Loading Activities - complete the Grazers and Predators activities.</p>	<ul style="list-style-type: none"> • Explain the scenario. • Explain why it is important to solve the problem. • Relate their present understanding of the scenario and its problem. • Identify the black nerita, top shell, cats eye, brown rock whelk and white rock whelk. • Explain the special features that assist the black nerita, top shell, cats eye, brown rock whelk and white rock whelk to survive. 	<ul style="list-style-type: none"> • Check data projector. • Book a computer pod. • Familiarise self with graphic organisers. • Read Grazers and Predators section of this Teachers Guide. • Collect Grazers and Predators shell sets from resource room. • Check tide tables and organise visit to a Rocky Shore for near the end of the Quest as it takes time to research the animal/plant and plan the investigation. 																						
<p>2 Constructing Relevant Questions Clarifying the problem found in the scenario.</p>	<ul style="list-style-type: none"> • List the key questions they need to answer. • Explain the steps in determining parts-whole relationships. 	<p>http://ofu.co.nz/webgraph/index.php</p> <p>Your Team Leader will need to coordinate your visit with the other Teams as this is a whole school activity.</p>																						
<p>3 Planning the Research Developing a plan of action.</p>	<ul style="list-style-type: none"> • Explain the plan of action. 	<p>Best locations in order: Castor Bay - North Rothesay Bay - South Waiake - South Long Bay - South</p>																						
<p>4 Discovering Relevant Information Locating and selecting.</p> <table border="0"> <tr> <td><input type="checkbox"/> teleconference</td> <td><input type="checkbox"/> fax exchange</td> </tr> <tr> <td><input type="checkbox"/> e-mail exchange</td> <td><input type="checkbox"/> bookmarked www sites</td> </tr> <tr> <td><input type="checkbox"/> intranet site</td> <td><input checked="" type="checkbox"/> school library books</td> </tr> <tr> <td><input type="checkbox"/> National Library books</td> <td><input type="checkbox"/> magazines</td> </tr> <tr> <td><input checked="" type="checkbox"/> DVDs, videos</td> <td><input type="checkbox"/> Internet search</td> </tr> <tr> <td><input type="checkbox"/> articles, magazines</td> <td><input type="checkbox"/> school journals</td> </tr> <tr> <td><input type="checkbox"/> visitor</td> <td><input type="checkbox"/> EOTC experience</td> </tr> <tr> <td><input checked="" type="checkbox"/> pictures, posters</td> <td><input type="checkbox"/> interviews, surveys</td> </tr> <tr> <td><input type="checkbox"/> found objects</td> <td><input type="checkbox"/> software, CD ROMs</td> </tr> <tr> <td><input checked="" type="checkbox"/> thinking tools</td> <td><input type="checkbox"/> demonstration</td> </tr> <tr> <td><input checked="" type="checkbox"/> Quest CD</td> <td><input checked="" type="checkbox"/> learning conversation</td> </tr> </table> <p><input checked="" type="checkbox"/> Teacher directed activities – use attached graphic organiser.</p>	<input type="checkbox"/> teleconference	<input type="checkbox"/> fax exchange	<input type="checkbox"/> e-mail exchange	<input type="checkbox"/> bookmarked www sites	<input type="checkbox"/> intranet site	<input checked="" type="checkbox"/> school library books	<input type="checkbox"/> National Library books	<input type="checkbox"/> magazines	<input checked="" type="checkbox"/> DVDs, videos	<input type="checkbox"/> Internet search	<input type="checkbox"/> articles, magazines	<input type="checkbox"/> school journals	<input type="checkbox"/> visitor	<input type="checkbox"/> EOTC experience	<input checked="" type="checkbox"/> pictures, posters	<input type="checkbox"/> interviews, surveys	<input type="checkbox"/> found objects	<input type="checkbox"/> software, CD ROMs	<input checked="" type="checkbox"/> thinking tools	<input type="checkbox"/> demonstration	<input checked="" type="checkbox"/> Quest CD	<input checked="" type="checkbox"/> learning conversation	<ul style="list-style-type: none"> • Identify the special difficulties animals and plants have to cope with when living on the rocky shore, (note-taking). • Explain the identifying features of their chosen animal. • Identify the special features that help their chosen animal survive, (2 graphic organisers Determining Parts-Whole Relationships). • Explain the investigation they plan to carry out on their visit to the rocky shore. • Carry out the investigation on their visit to the rocky shore. 	<ul style="list-style-type: none"> • Complete and have signed off our EOTC forms. • Display the animal list - 'Best Choices for Investigations at the Shore.' • Build an information rich environment by checking off the list in Discovering Relevant Information section. <p>WARNING The Internet is not yet a good source of information on our local rocky shore animals. You can find information that to an uninformed person appears to be accurate but is not. We do not want photographs of tropical sea urchins and details on horning limpets that do not apply to our animals.</p>
<input type="checkbox"/> teleconference	<input type="checkbox"/> fax exchange																							
<input type="checkbox"/> e-mail exchange	<input type="checkbox"/> bookmarked www sites																							
<input type="checkbox"/> intranet site	<input checked="" type="checkbox"/> school library books																							
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<input checked="" type="checkbox"/> Quest CD	<input checked="" type="checkbox"/> learning conversation																							
<p>5 Constructing the Knowledge Forming and applying.</p> <p><input type="checkbox"/> Teacher directed activities</p>	<ul style="list-style-type: none"> • Organise the data including their investigation on the rocky shore. 	<p>Assessment Task</p> <ul style="list-style-type: none"> • Assess quality of the research using the rubric in Teacher's Guide. 																						
<p>6 New Insights and Understandings Presenting and evaluating.</p>	<ul style="list-style-type: none"> • Present the solution to scenario. • Explain how their solution supports their new insights, understandings and how it relates to the scenario. 																							

Unit Evaluation Implications for next unit

ASSESSMENT TASK – SCIENCE – YEAR 7 AND YEAR 8
LIVING WORLD – SURVIVOR ROCKY SHORE



Key Achievement Objective: Investigate and describe special features of common animals which help them stay alive and survive into the next generation.

The scenario is: Every second year groups from our school monitor our local rocky shores to see how well life is surviving in this harsh environment. It adds to our understanding of the Hauraki Gulf which is so important to the life of our city. This year it's your turn to make a report. Your task is to become the class experts on a particular animal and using skilful parts-whole relationships report on its special features for survival. As part of this you are to form a question about your chosen species that can be investigated at the shore. How is your species a survivor?

ASSESSMENT	BELOW EXPECTATIONS	WITHIN EXPECTATIONS	ABOVE EXPECTATIONS	Effort A B C
Your argument shows:	You have mentioned < 3 special difficulties animals and plants have to cope with when living on the rocky shore. You provided < 2 special features that helps your animal or plant survive. None or hardly any information from your investigation at the rocky shore was included.	You have mentioned at least 3 of the special difficulties animals and plants have to cope with when living on the rocky shore. You provided 2 – 3 special features that helps your animal or plant survive. Some information from your investigation at the rocky shore was included	You have mentioned the 5 special difficulties animals and plants have to cope with when living on the rocky shore. You provided 4 or more special features that helps your animal or plant survive. Detailed information from your investigation at the rocky shore was included.	
Student Evaluation				
Teacher Evaluation				
Your new insights and understandings show:	You only explained what kind of thinking you did but not how you did it. You explained only how it connected with your thinking, the things you already knew about the special features that help your animal or plant survive into the next generation.	You explained what kind of thinking you did and how you did it. You also explained how it extended your thinking, how your thinking went in new directions around the special features that help your animal or plant survive into the next generation.	You extended this by saying why this way of thinking helped you, including how you would do it next time. You also explained how your thinking was challenged, the questions you still have about the special features that help your animal or plant survive into the next generation.	
Student Evaluation				
Teacher Evaluation				

TEACHER FEEDBACK - MEDALS AND MISSIONS

Additional Scaffolding Suggestions

- Use a data projector to introduce the exploratory environment of the 'Rocky Shore.'
- Discuss with the whole class the Quest (achievement objective and scenario) before brainstorming and mindmapping.
- If the discussion on the achievement objective and scenario is difficult, and the brainstorming and mindmapping produced show little knowledge of the Rocky Shore put up and discuss the poster 'New Zealand's Rocky Shore.'
- This Quest suits research by co-operative groups of two with access to their own computer.
- The web is not yet a good place for this research. Most sites give very general information or talk about species not found at Castor Bay. Research from this type of site leads to comments like this one found on a capable Year 7 students report, "This species of cushion starfish is a deep-sea bottom dwelling animal."
- The Quest's resources have suggestions for investigations on the shore. When surveying the numbers of a chosen animal remember it is not as simple as large numbers its a survivor low numbers its not. Predators are always going to be in low numbers although they may be flourishing on the shore. Remember to reflect on the 'grazers and predators' activity when discussing numbers found.
- When planning a visit to the rocky shore it is essential that you arrive at the shore **half an hour before low tide**.
- Do not allow any e-mail, fax or phone calls to be made until teacher contact has been made with the expert involved. Set it up for success.
- Remember an expert does not have to be seen in adult terms. It could be another staff member, family friend, parent, grandparent - any knowledgeable adult who has the time to reply.
- Discuss the assessment rubric with the class.
- We have aquariums that can be set up as salt water rock pools. See 'Grazers and Predators' p27 for details on how these can be set up and maintained.
- When organising the field trip check tide times at:
<http://ofu.co.nz/webgraph/index.php>

You need a low tide of **under 1.0** as many more animals will be visible particularly cushion stars. The field trip needs to be planned near the **end** of the unit as possible to allow enough time to research the animal/plant and plan the investigation.

Homework after the Quest

- Stories are another example of wholes that have parts. For a story that you are reading, use your plan for determining parts-whole relationships to figure out how the different story parts function with regard to the whole.

For more detail see Chapter 6, Page 186, Parts-Whole Relationships in 'Infusing the Teaching of Critical and Creative Thinking into Content Instruction - A Lesson Design Handbook for the Elementary Grades' Robert J. Swartz and Sandra Parks, The Critical Thinking Co. ISBN 0-89455-481-6

Determining Parts-Whole Relationships Skilfully

Discuss with your class why determining parts-whole relationships is needed.

'Whole objects or systems are not just collections of their parts. If the parts were combined together in different ways, something different would result.'

'Analyzing parts-whole relationships can have some immediate practical applications. If we know what function each part serves, we are better able to sustain and maintain the whole.'

'Indeed, our knowledge of how parts function can make us much more self-reliant.'

Robert J. Swartz and Sandra Parks

Common Defaults in our Thinking about Parts-Whole Relationships

1. We define parts based only on their appearances. (Our characterization of parts is **hasty**.)
2. We don't think of subdividing parts into other parts. (Our consideration of parts is **narrow**).
3. We don't connect parts together in relation to the whole that they comprise. (Our thinking about parts is **scattered**.)

Develop with your class the thinking steps for determining parts-whole relationships skilfully.

Determining Parts-Whole Relationships Skilfully

1. What smaller things make up the whole?
2. For each part, what would happen to the whole if it were missing?
3. What is the function of each part?

For more detail see Chapter 6 - Determining Parts-Whole Relationships in 'Infusing the Teaching of Critical and Creative Thinking into Content Instruction - A Lesson Design Handbook for the Elementary Grades' Robert J. Swartz and Sandra Parks, The Critical Thinking Co. ISBN 0-89455-481-6

DETERMINING PARTS-WHOLE RELATIONSHIPS

THE WHOLE ANIMAL



PARTS OF THE ANIMAL

--	--	--	--	--	--	--



WHAT WOULD HAPPEN TO THE ANIMAL IF THE PARTS WERE MISSING?

--	--	--	--	--	--	--



WHAT IS THE FUNCTION OF THE PARTS?

--	--	--	--	--	--	--



WHAT IS THE RELATIONSHIP BETWEEN THE PARTS AND THE WHOLE?

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DETERMINING PARTS-WHOLE RELATIONSHIPS

THE WHOLE ANIMAL

PARTS OF THE ANIMAL'S BEHAVIOUR

--	--	--	--	--	--	--

WHAT WOULD HAPPEN TO THE ANIMAL IF THE PARTS WERE MISSING?

--	--	--	--	--	--	--

WHAT IS THE FUNCTION OF THE PARTS?

--	--	--	--	--	--	--

WHAT IS THE RELATIONSHIP BETWEEN THE PARTS AND THE WHOLE?

Integrating Skilfully Determining Parts Whole Relationships into a Description

Teachers

The purpose of a description is to 'record the outcome of close, critical and sensuous observation of specific objects.'* Use the template below to help your students decide what to write in their description. Their description must be clear to the reader and include researched evidence to back up their Information. The template is based on Whiteheads* (2003) model in Writing Frameworks: Book A. Revised edition.

Students

Use your graphic organiser to write your description. When describing how your species is a survivor you need to carefully describe special difficulties animals and plants have to cope with when living on the rocky shore as well as special features that help your chosen species to survive. This is where you show your indepth knowledge of the rocky shore and your chosen species.

Determining Parts-Whole Relationships Skilfully

1. What smaller things make up the whole?
2. For each part, what would happen to the whole if it were missing?
3. What is the function of each part?

Before writing have you gone through the 'Determining Parts Whole Relationships' Thinking Map?

Title

- Give your description a title.

Introduction Paragraph

- Describe the context of the description. This is where you make a link to the scenario.
- Tell your reader why you are making this description.
- Word the introduction in an interesting way so readers will want to continue reading

Body Paragraphs*

- First paragraph: this should describe the special difficulties animals and plants have to cope with when living on the rocky shore
- Paragraphs 2-5: These paragraphs should describe 4 or more special features that helps their chosen species to survive. This is where you give a clear and detailed description of each survival feature using information from the graphic organiser.
- Include detailed information from your rocky shore visit which backs your description up.

Conclusion

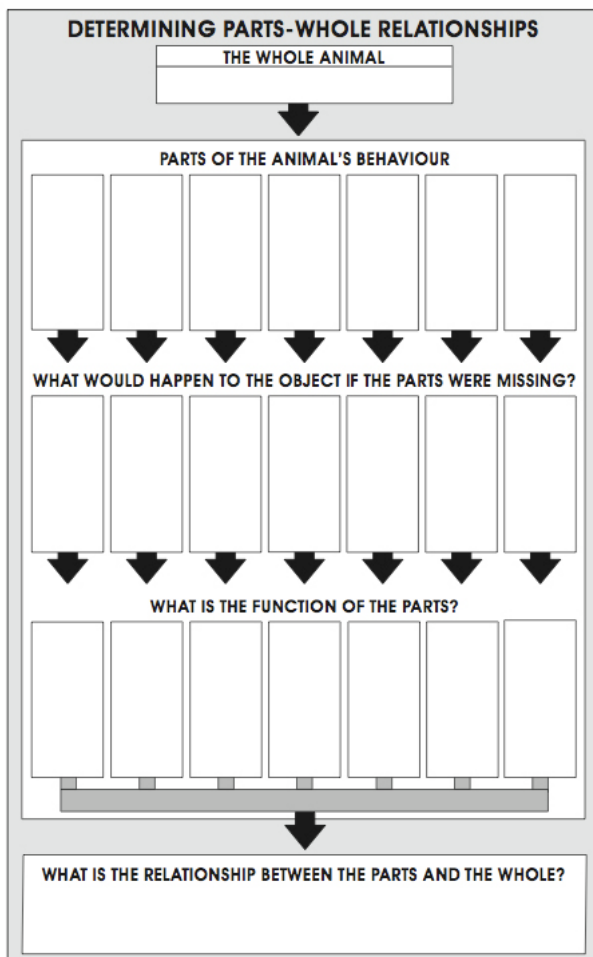
- Here you will write a brief summary of your description of the rocky shore and your species survival features.
- Sentence starters could be 'In conclusion, the rocky shore is an environment which...'
- 'My species is a survivor because of...'

* To get an 'Above Expectations' students will need to write at least 5 paragraphs. See assessment rubric for details.

Now add your:

New Insights and Understandings.

- Use the Ladder of Metacognition to comment on your ability to use skilful parts-whole thinking.
- What have you learnt about special features of animals which help them stay alive and survive into the next generation.



Choose One for Your Research

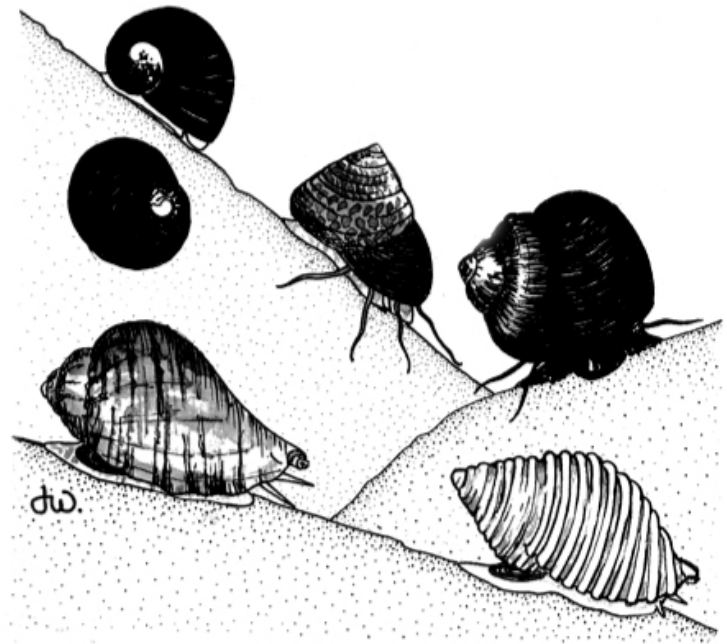
You must choose from this list due to the difficulty of observing animals and plants at the rocky shore when the tide is out.

- Black Mussels
Scientific Name: *Xenostrobus pulex*
- Black Nerita
Scientific Name: *Nerita atramentosa*
- Brown Rock Whelk
Scientific Name: *Haustrum haustorium*
- Cat's Eye Snail
Scientific Name: *Turbo smaragdus*
- Common Shrimp
Scientific Name: *Palaemon affinis*
- Coralline Turf
Scientific Name: *Corallina officinalis*
- Cushion Star
Scientific Name: *Patiriella regularis*
- Hermit Crab
Scientific Name: *Pagurus novaezelandiae*
- Neptune's Necklace Weed
Scientific Name: *Hormosira banksii*
- Oyster Borer
Scientific Name: *Lepsiella scobina*
- Periwinkle
Scientific Name: *Nodilittorina unifasciata*
- Porcelain Crab
Scientific Name: *Petrolisthes elongatus*
- Radiate Limpet
Scientific Name: *Cellana radians*
- Snakeskin Chiton
Scientific Name: *Sypharochiton pelliserpentis*
- Speckled Whelk
Scientific Name: *Cominella maculosa*
- Spiny Tubeworms
Scientific Name: *Pomatoceros caeruleus*

Grazers and Predators - Introduction

Dr John Walsby

An essential set
of four simple
activities before
the Field Trip.



Visits to complicated rocky shores are often difficult to structure in ways children can understand the basic principles through their own investigations. This shell study, Grazers and Predators, is a vehicle for easy understanding.

From a small collection of very common shells many of the important processes of rocky shore ecology are very easily introduced and explained. The unit serves for pre-visit, on-visit and post-visit studies.

The shells used are typical of north east New Zealand but principles involved apply throughout New Zealand and indeed throughout the world, to explain rocky shore ecology. They could be explained anywhere with these shells or similar examples of local shells.

This activity uses sets of shells collected by the teacher from the drift line close to a rocky shore (and therefore has low environmental impact). Sets of rocky shore shells can provide a class with all the exploratory activities needed to generate children's questions. It heightens their observation skills and they become familiar with a number of common rocky shore animals.

Some possible learning outcomes:

Knowledge

At the most basic level the children will be able to:

- recognise basic features of sea shore shells when labelling shell diagrams;
- identify the difference between the shell of a grazer and a predator, by drawing pictures of both types of shells and shell openings;
- indicate on a drawing of the shore the most likely locations of different grazer species;
- explain through cartoon strip drawings a method of attack by a predator on a grazer;
- identify three grazers and two predators by name when shown their shells.

Grazers and Predators - Shell Set Preparation

Visit the drift line on the beaches beside rocky shores to collect shells to make up shell sets. We used one shell set for every two children. It took us four visits over a few weeks to collect the number needed. Some parents may be able to help with the collection of the shells if you are having difficulty.

Each shell set should contain examples of shells of five very common seashore snail species. Each snail species is represented by shells of different size. Avoid shells that are heavily wave damaged.

It included:

Three grazers...

Black nerita Nerita atramentosa
Top shell Melagraphia aethiops
Catseye Turbo smaragdus

Two predators...

Brown rock whelk Haustorium haustorium
White rock shell Thais orbita

Each shell set will need at least:

- 10 Black nerita – various sizes
- 10 Top shell – various sizes
- 10 Catseye – various sizes

Check to see that some of the catseye shells you collect have small holes drilled near the aperture made by the brown rock whelk predator – for more details see the Predation diagram on a following page.

- 3 Brown rock whelk – various sizes
- 3 White rock shell – various sizes

Collect a plastic container for each shell set.

It is good to have a bag of spare shells to make up missing items and to give out to children desperate for keepsakes – “Please don’t take any out of the sets as it spoils them. I have a few spares if you really want them.”



15 shell sets in plastic containers allow students to work in collaborative pairs.

Grazers and Predators - Activities

Activity One – Clarifying Observations

- We divided the class into pairs with a shell set.
- The children were asked to sort the shells into two sets each based on obvious shape differences. A few groups reported on their selections.

The teacher chose a set that had been divided into Grazers – rounded openings (apertures) and Predators – pointed notched openings. This offered a lead into explaining the differences between grazers and predators. For more information on the differences, see pages 'A Scientist's View.'

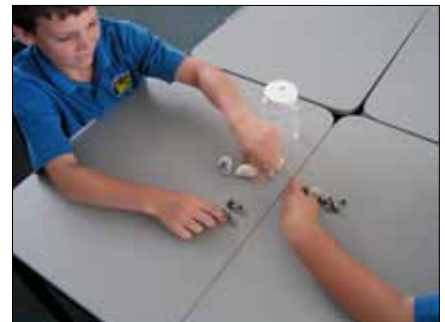
Activity Two – Encouraging Detailed Observations

- The pairs sorted the grazers into three species. Some needed help to group similar shells of different sizes and to distinguish topshells from catseyes.
- They were then asked to describe each type of shell so the grazers could be distinguished from each other. Their work was recorded on pieces of paper then glued on to a class chart. Identification sheets were handed out and discussed.
- Each group was then asked to choose three shells about the same size, one from each type. They were asked to put them in order from the thickest to thinnest. These differences were discussed. For more information on the differences, see 'A Scientist's View.'

Activity Three – Stimulating Thinking

- The children were asked to place one specimen of each grazer shell on a flat surface of a desk then squat down to look at them at desk level.

A discussion developed around the differences they could see (fit to rock, streamlining). For more information on the differences, see 'A Scientist's View.'

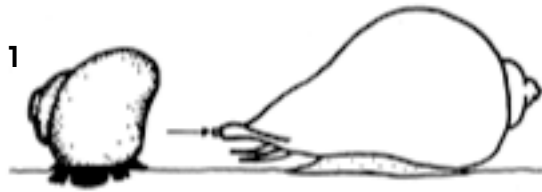


Activity Four – Present a Puzzling Situation

- They were then asked to search through the grazer shells looking for a small extra hole near the openings (apertures). If they found one they put it to one side. Groups without an example were given time to examine one from another group.
- Questions were posed by the teacher. "Where are the holes?" "Which grazer has these holes?" "What might have caused them?" "Why only this grazer?"

The teacher led the discussion into an explanation of the holes as an attack by a predator on a grazer. For more information on the holes, see the following page.

Grazers and Predators - Predation



Sensing



Rearing up



Pouncing



Securing with foot



Turned over and probing



Catseye with a hole in the shell drilled by a whelk.

Grazers and Predators - A Scientists View

From a very simple starting point of a set of mixed shells, a range of simple observations and activities can be encouraged that are fundamental to the study of the rocky shore.

- Rocks are places where plants (algae/seaweed) grow if conditions are right.

Sea shore rocks often look bare but are mown clean by the grazers. New plant films are developing all the time.

Sea shore plants grow best in open, sunny, clean (wave washed) places that are regularly wetted.

- Wherever there are plants, there are plant-eaters (grazers/browsers).

The best places for plant growth are difficult places for animals to live – drying out when the tide is out, bashed by waves when the tide rises and falls.

Grazing snails have the best shell shapes for coping with these difficulties.

They have:

- strong suction foot for hanging on tight,
 - streamlined shells for deflecting crashing waves and waved tossed debris,
 - rounded shells that will roll (eventually to the shelter of a pool, crevice or to deep water) if the animal is washed off rocks.
- Wherever there are plant-eaters (herbivores), they become food (prey) for animal eaters (predators).
- Grazing snails are the sheep and cattle of the rocky shore. Whelks and other carnivores are the lions and tigers of the rocky shore.
- All animals die eventually and (if not killed and eaten by predators) are processed by scavengers.

Grazers and Predators - Animal Identification



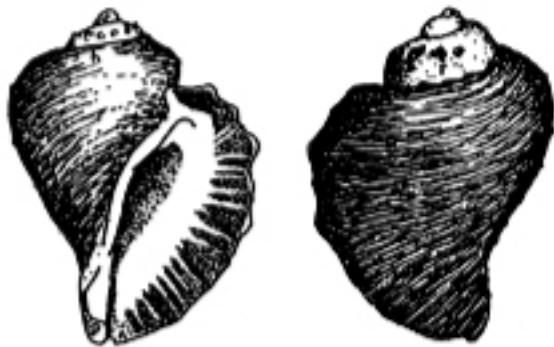
Black nerita - *Nerita atramentosa*



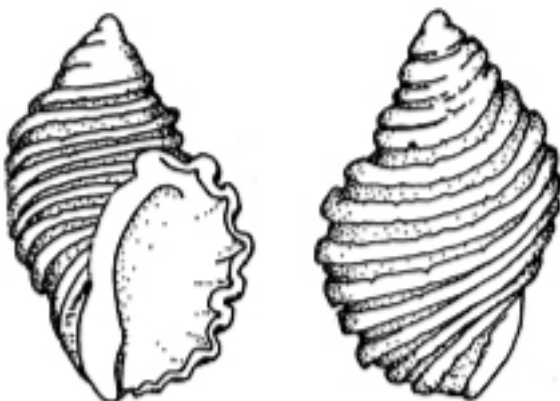
Top shell - *Metagraphia aethiops*



Catseye - *Turbo smaragdus*



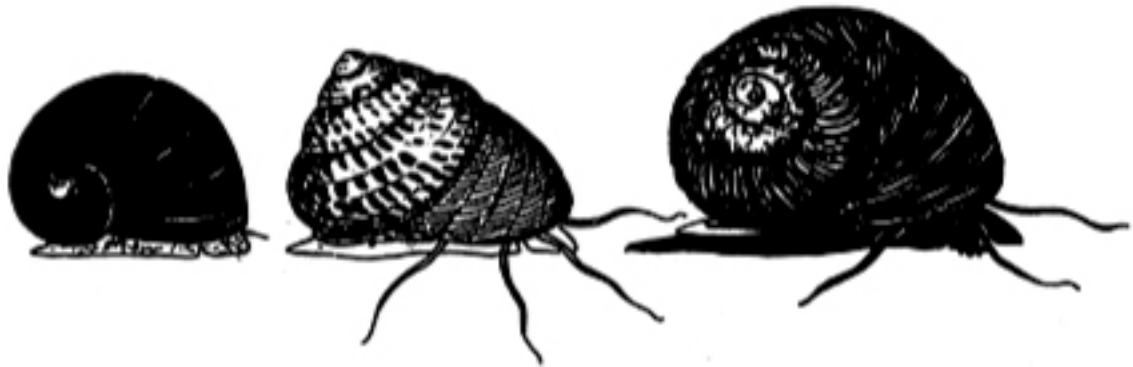
Brown rock whelk - *Haustorium haustorium*



White rock shell - *Thais orbita*



Grazers and Predators - Shell Shape and Structure



Black Nerita

Top Shell

Catseye

A link can be established between shell shape/thickness and an animal's position on the shore.

- All three grazers move up and down the shore when the tide comes in.
- Their distributions overlap at high tide.
- At low tide:

most nerita are found towards the top of the shore.
most catseyes are found towards the bottom of the shore.
topshells overlap in the middle.

- The main stresses on the living animals are:
 - wave action as tide rises and falls.
 - drying out when the tide is out (especially on windy and sunny days).
- Wave action and drying out are both greater towards the top of the shore and they decrease towards the bottom of the shore.
- Nerita has the thickest and best fitting shell and survives in the most stressful part of the shore. The catseye has the thinnest and worst fitting of the three shells (although it is still quite thick and fits quite well) and is lowest on the shore. The topshell is intermediate.
- Thicker shells can take more battering. Better fitting shells lose less water.

Grazers and Predators - Shell Shapes



Grazer



Predator

Shell differences between grazers and predators. Note the oval opening on the predator and the round opening on the grazer.

Rocky Shore Field Trip

Most of your time will be taken up guiding the planning of the investigations but there are other areas you will need to cover with the children.

Safety

If you have visited the site you will have identified the danger points. Photocopy a map for the children and the parent helpers. Set boundaries and discuss these with the children – you will need to go over them again when you first arrive, 'Don't go passed the boat ramp' etc. Remember your first aid kit including plasters and disinfectant.

Ambassadorial Behaviour

A quiet talk before you leave usually works. We have found that if the children have contributed to both the choice and direction of the investigations, behaviour is much improved. Remember to move from group to group quickly to focus attention and solve any problems. Don't get too involved with one group. Stop frequently and scan the class, it helps you to react before problems develop. Ask a few children before you leave to thank any adult helpers.

Equipment

The less gear the children carry with them the better. Ensure that their equipment is relevant to the research.

Care of Plants and Animals

Include this in your quiet talk. If you think it's going to be a problem, I let the children know it will be one of the things you will be watching.

Your Body as a Ruler

There is no need to take metre rules or long tapes, your body offers many measuring sticks, for example my hand has a span of exactly a quarter of a metre, and my three middle fingers held together equal 5cm. Spend a mathematics lesson discovering "the ruler you always take with you!" Once you and your children know a few standard measurements from your body, and the length of your strides, you can leave your tapes and measures in the classroom, and that saves losing them at the beach! For some of our work more precise measurements are need, please us our plastic callipers and digital pocket thermometers (probes type).

What to Wear

Children should be prepared to get wet up to their knees. Sports uniform with sneakers and shorts is best. Mufti is not a good idea as there is usually little time to change unsuitable clothing like jandals that offer little protection against cut feet and jeans that are uncomfortable once wet.



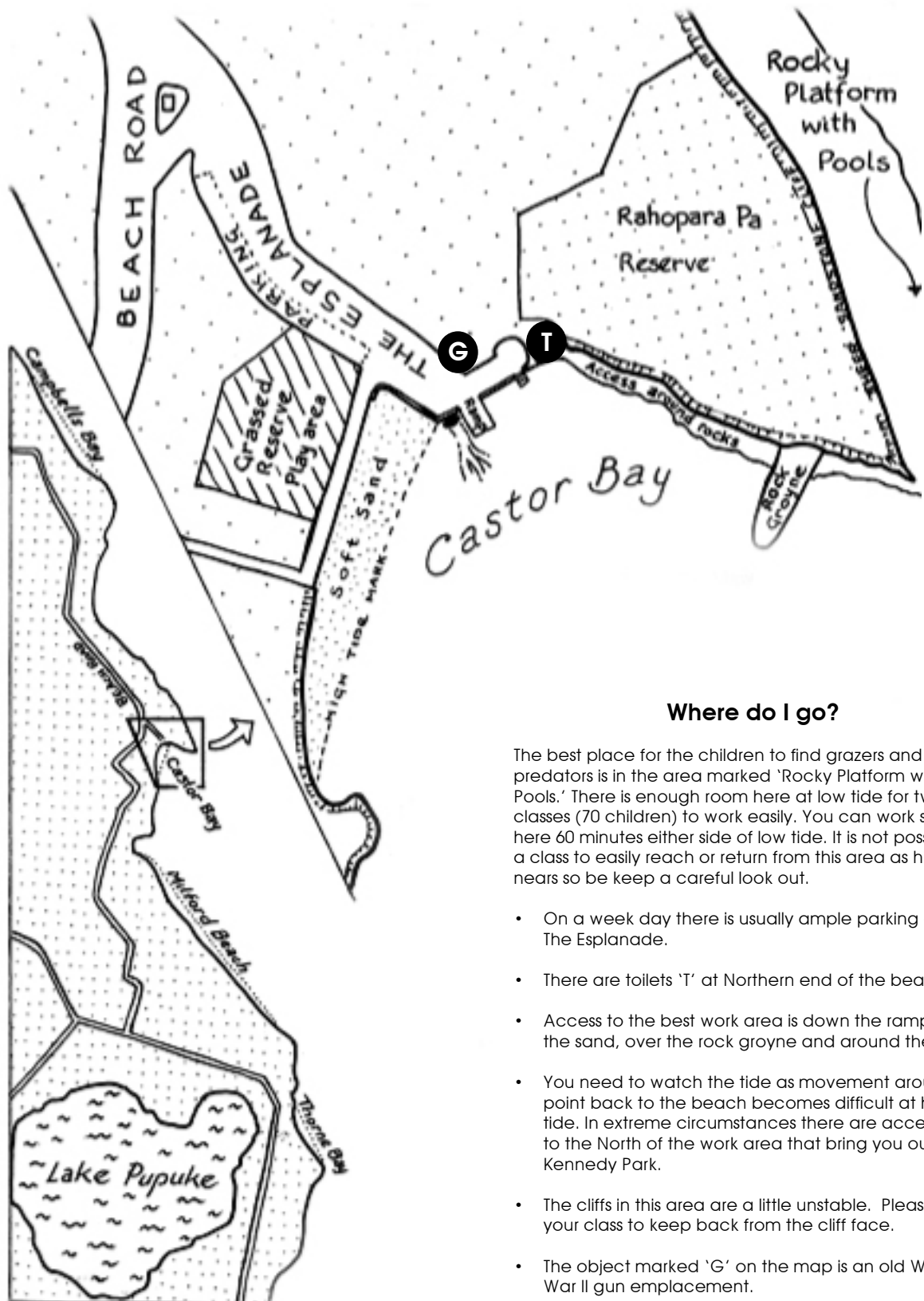
Rocky Shore Field Trip - Checklist

- Check tide tables for your exploratory pre-visit and the up-coming class field trip. You will have about 60 minutes either side of low tide in which to work in the area.
- Check your diary and the school's term planner.
- Complete the school's EOTC forms.
- Visit the shore with our Bird's Eye View guide. Check out each point.
- Read the section 'Your body as a ruler.'
- Arrange for letters to be sent home.
- Check the long range weather report.

Collect Equipment

- Hand lenses.
- Several large plastic rubbish bags.
- Walking stick or similar (pointer).
- First aid kit including plasters and disinfectant.
- Sun block cream and hats or raincoats (depending on the weather).
- Whistle.
- Clipboards with rubber bands to hold paper down.
- A few pencils in case the ball point pens get wet.
- Jacket (if wind looks like being a problem).
- Share with your class any concerns you have over safety, ambassadorial behaviour, care of living things, equipment, what to wear.
- Plastic calipers and temperature probes for those groups needing more accurate measurements
- Field Trip Ready. "Good Luck!"

Castor Bay - Bird's Eye View at Low Tide



Where do I go?

The best place for the children to find grazers and predators is in the area marked 'Rocky Platform with Pools.' There is enough room here at low tide for two classes (70 children) to work easily. You can work safely here 60 minutes either side of low tide. It is not possible for a class to easily reach or return from this area as high tide nears so be keep a careful look out.

- On a week day there is usually ample parking along The Esplanade.
- There are toilets 'T' at Northern end of the beach.
- Access to the best work area is down the ramp, across the sand, over the rock groyne and around the point.
- You need to watch the tide as movement around the point back to the beach becomes difficult at high tide. In extreme circumstances there are access steps to the North of the work area that bring you out at Kennedy Park.
- The cliffs in this area are a little unstable. Please tell your class to keep back from the cliff face.
- The object marked 'G' on the map is an old World War II gun emplacement.

Setting up a Marine Aquarium

- You will need:

aquarium	A plastic aquarium is light, cheap and needs little care but be careful when cleaning – the plastic can scratch leaving a place for algae to grow. One with a plastic lid will keep the grazers in the tank.
air pump	Buy the best (quietest) you can afford.
biological filter	Also called an under gravel filter.
non return valve	Also called a check valve. Make sure it is fitted in the correct direction.
airline tubing	A 3 metre pack is more than enough.
buckets with lids	Two 10 litre buckets to transport the seawater.
fish net	Net size 10 cm. Use to catch a shrimp.
icecream container	A 2 litre icecream container to transport shell grit.
yoghurt container	Small yoguhurt container to transport a red sea anemone.

- Collect sea water/shell grit on your exploratory pre-visit. Pick up the animals on the class trip.
- Place the aquarium in a cool part of your classroom.
- Install a biological filter, the largest you can fit into the aquarium (obtain from a pet shop). Cover the base plate in 1 – 2cm of shell grit.

The Northern side of the Takapuna boat ramp is a good place for this. You need the larger shell grit not fine beach sand.

In our 41x26x30cm Geo Maxi tank you will need 2 litres of shell grit - one icecream container of grit.

- Collect a rock and some small stones from the rocky shore and place at one end. Choose a rock free of plant growth. Do not wash the rock.
- Fill aquarium with seawater to within 5cm of the top.

A plastic bucket with a lid is good for transport, but remember to be very careful as you don't want salt water in the carpet of your car. Water is heavy, so its preferable to use two small containers, rather than one large one.

It is best to ladle the water from the bucket into the aquarium letting the water run down the inside of the tank. You need to do this slowly so as to not dislodge the biological filter (under gravel filter).

In our 41x26x30cm Geo Maxi tank you will need about 15 litres of seawater.

- Let the water stand overnight. In the morning mark the water level on the outside of the aquarium with a spirit based marker. Surface evaporation will cause the water level to fall. To avoid an increase in salinity the pool should be topped up to the

original level with **fresh** water only (if possible – boiled water left to cool).

- Start the pump. This must be kept going at all times. Make sure the non return valve to stop back siphoning should the power fail is fitted.
- The bubbles from the pump increase the gas exchange surface to remove carbon dioxide/ammonia, preventing a build up which would poison the animals.
- Now collect and add some common animals, (only a few – no more than six). Watch your selection as carnivores or your tank may empty of life very quickly.

Add one of each of the following:

topshell

nerita

catseye

common cushion star

red sea anemone

shrimp

If an animal should die remove it immediately.

- **Do not** have seaweeds, they may make it look natural but they have a tendency to rot and foul the water killing the animals.
- It is natural for sea shore animals to survive for long periods on little or no food. You do not need to feed them. There is a danger of contaminating the tank water when food does not get eaten.



Shell grit



Survivor Rocky Shore

Above Expectation

Surviving the Shore

Auckland's Rocky Shore, a daily fight for survival is necessary for the thousands of unnoticed creatures who dwell there. Regular monitoring of the Rocky Shore has proven that these creatures are able to survive in this harsh, demanding and challenging environment. We chose the red sea-anemone because we want to find out how this unusual and delicate creature has the ability to survive in such a harsh environment and uses its adaptations to help its battle of endurance. Using part-whole relationships we want to uncover the mystery - what makes the red sea-anemone a survivor?

The red sea-anemone (*Isactinia Tenebrosa*) looks like a dark red wet blob about the size of a grape. When the sea-anemone is under the water, when the tide is in, it spreads out a crown of reddish pink tentacles. It is mostly blue beads surrounding the bottom of the tentacles. It is found towards the high tide zone. It is usually hanging under large boulders, protected from the burning rays of the sun and the drying wind. This creature is a predator and catches, and eats other tiny animals like shrimp, crab larvae and little fish. It will also gulp down any small snails that drop into the sea-anemone's slimy tentacles when they slip off the rocks. The sea-anemone is a simple animal with a bag shaped body that it uses to hold its babies in while they are still vulnerable to predators and difficulties they may face. The tentacles that surround its slit shaped mouth are useful to catch prey and drop the food into its mouth so it can swallow it down into the bag-shaped gut. They fill their bodies with water so they don't dry out at low tide. The sea-anemones that hang upside down, usually hold a drop of water at the top of their closed mouth to prevent them from getting too hot.

One difficult day followed by another, the animals at the rocky shore have to face several issues. One of these is crashing waves which can break or damage delicate shells such as the cats eyes, black neritas, and any other animals with shells. Waves also pick up and carry some particular sea creatures to different parts of the shore. They can also shove any animals off the rocks if they aren't clinging on tightly. Sudden temperature changes will affect most animals as the sun and wind can dry them out. Around midday the temperature will usually be around 30 degrees but can reach temperatures such as 40-

45 degrees. When night falls the temperature can drop down to 5 degrees from 30 in around 5 minutes. Another issue the creatures face is sand scour which can damage their shell and soft flesh. The wind can blow the sand off the eroding cliffs and mix it with the water which the animals live in. When it rains on the shore the animals are in big risk of swelling up due to rain fall and fresh water getting in contact with them. The final difficulty that some animals face is the big risk of getting eaten, moved or disturbed by predators. Some of these predators include the red sea-anemones, whelks and crabs. Birds and humans are also predators as we eat animals such as mussels, oysters and crabs.



One of the survival features of the red sea-anemone is the crown of pinkish red tentacles that catches the food that drifts past it and shoves it into its mouth. Without these tentacles it would not be able to catch food or eat it which means that it would die.

Another characteristic is the suction foot on the bottom of the sea-anemone which enables it to stay on the rocks and move to find food. If it didn't have the foot it wouldn't be able to stay on the rocks when a wave came so would get knocked off and wouldn't be able to move to find food which means it could not eat and would die. It also would not be able to escape from predators.

A third adaptation this creature has is the bag-shaped body which is probably the most important feature the red sea-anemone uses to survive. If it didn't have this part it wouldn't be able to properly digest its food, hold a drop of water when the tide goes out and hold its young when they are still vulnerable to the challenges of the rocky shore.

The last survival feature that it has is its slit shaped mouth. The sea-anemone uses its mouth to eat its food and hold a drop of water when the tide is out to prevent themselves from getting too hot and drying out, as when water evaporates from them it cools them down.

In conclusion we believe that the red sea-anemone is a survivor in this harsh and difficult environment because of its special adaptations like its strong suction foot, tentacles, mouth and body.

Clear introduction - animal identified and placed within context of the essay

Good level of understanding evident by the level of detail in each body paragraph.

At least 5 difficulties of surviving on the rocky shore identified and explained.

Thinking skill identified, purpose explained.

Clearly explained the function of each of the 4 or more special features.

Beginning to explain the relationship between the parts.

Using some technical language.

ABOVE EXPECTATIONS

Have mentioned the 5 special difficulties animals and plants have to cope with when living on the rocky shore.

Provided 4 or more special features that helps their animal survive.

Detailed information from their investigation at the rocky shore was included.

SOME IDEAS FOR THE NEXT LEARNING STEPS (MISSIONS)

Continue to develop technical vocabulary in writing, e.g: desiccation.

Continue to build use of description language, particularly when explaining how each part functions.

Explain how the parts work together in order for the animal to be survivor.

Ensure all primary functions are included when explaining how the animal survives, e.g. eating, digestion, reproduction.

Include info from personal investigation.



Survivor Rocky Shore

Within Expectation

Cushion Star Description

Introduction

The Cushion Star is one of the most unique and interesting species on the Rocky Shore where the environment it survives on is one of the dangerous. The purpose of this description is to investigate how Cushion Stars live in a harsh environment to adapt its lifestyle on the Rocky Shore. We have been using our thinking skill which is parts-whole relationships I can determine how my sea creature can survive on the rocky shore.

Conditions

Rocky shore life has dangerous conditions that animals of the shore are able to cope with, these conditions include: rapid abrasion from the sand, temperature change caused by sun and wind, sun wind and water that dries them out, impact of waves pounding fiercely against them, or being located to a different place and torn up until it washes away.

Maderporite

The Cushion Star has a water valve placed in the middle of their bodies commonly known as the Maderporite. This helps these creatures to provide water so it doesn't dry out. It also helps provides water that circulates through their leg joints and body.

Habitat

The Cushion Star who survives on the lower part of the Rocky Shore, commonly orange species are often seen in the water usually found between cracks and hidden in water out of the sunlight because orange ones tend to be bigger and eat more than the brown one and there is more food in the shade. During our investigation, brown species were more frequently found out in the sun where their colour helps them camouflage from predators like humans or other creatures on Rocky Shore.

Attaching to the Rocks

By making using it's webbing, it makes an attachment upon a rock so it's securely fastened to the rock. Then when it's glued to the rock they use their hollow tube

legs to silently stroll towards its prey, and then traps its prey under itself so they can't escape or struggle its way out. They then very slowly start eating its prey by making their stomach come out of their mouths and swallows the prey till there's nothing left for the Star to attack. You can often find some Cushion Stars with a pattern or a design on their soft textured body which represents that the are a meat and plant eater, known as a omnivore.

Conditions

Dangers on the Rocky Shore are really hazardous, the wind that blows on the Rocky Shore areas are usually very strong and forceful so that causes massive waves and this effects the animals. When sea animals are in the water the pressure of waves causes the sand to lift and this creates abrasion from the sand which can violently rip and tear into the animals delicate and light bodies, or the waves could pick them up and shift them to a completely different area.

Food

Cushion Stars survive on the Rocky Shore by eating a variety of different foods. Cushion Stars are plant and meat eaters. They are often seen or identified eating Snails, Shrimp, Prawns, Mussels, Fish, Crabs and other unique animals that live on the Rocky Shore. If they don't have anything to eat, they begin to prey on meat because if they don't get enough food into their bodies they would eventually die of starvation.

Cushion Star

In conclusion, the Rocky Shore is an environment where many elegant and unique animals live and survive. My species is a survivor because it sticks thoroughly against the rock. The Cushion Stars sticks to the rocks by using their webs, to stick against a flat surface so it avoids it from falling of rocks due to being hit by waves and abrasion from sand. When the Cushion Star is hungry it creeps up close by their prey and reacts by huddling over so it trapped and pushes its stomach out of its mouth and sucks the prey into its mouth so its firmly attached to the Cushion Star.

WITHIN EXPECTATIONS

Have mentioned at least 3 of the special difficulties animals and plants have to cope with when living on the rocky shore.

Provided 2 - 3 special features that helps their animal survive.

Some information from their investigation at the rocky shore was included.

SOME IDEAS FOR THE NEXT LEARNING STEPS (MISSIONS)

Continue to develop use of technical vocabulary in writing, e.g. desiccation.

Include greater use of description language to draw a picture of the parts in the readers mind.

Include more detail to describe the function of each part.

Essay organisation. Group and combine related paragraphs. For example the conditions.

Clear introduction - animal identified.

Some incorrect information: Challenge during Teacher conference.

Thinking skill identified.

At least 3 difficulties of surviving on the rocky shore identified. Discuss repetition of 'conditions' paragraph with student.

3+ special features identified that help their animal survive.

Some information from the investigation at the rocky shore included.

Explains how the different parts work together.



Survivor Rocky Shore

Within Expectation (Low)

The Cushion Star

We have chosen to investigate the cushion star because it is a very interesting and beautiful creature to study. We like the way that it comes in different colors like orange, blue, brown, purple and red. We will describe the Cushion Star and its special features that help it survive on the rocky shore environment using skilful pats-whole relationships we will also describe the difficulties of living on the Rocky shore.

One of the difficulties of living on the rocky shore is that the Cushion Stars have floods in their homes from the tide and the tide go's in and out so it's unexpected. Another difficulty is when the tide comes in then goes away because sometimes it's hard for the cushion stars to hold on so they get washed out away from their homes and out to the sea. A third difficulty is when the tide goes out the cushion stars tend to dry out and die the heat evaporates the sea water from the cushion stars body so it dries up. Also when waves break on the rocky shore huge amounts of water crashes down on top of the marine life living there and then the waves then explode forwards, shooting across rocks ruining their homes and putting the cushion star in danger because they could get crushed. A last difficulty is when it rains the fresh water mixes with the sea water and the cushion star would get sick because it's used to drinking and being in the sea water like we are used to fresh water.

The cushion star is made of 4, 5, 6 or even 7 arms. The arms on the cushion star traps its prey and also help it move. At the rocky shore we found 31 cushion stars with 5 arms, 1 with 6 arms and 2 with 7 arms but none with 4, the most common had 5 arms. The cushion star also has suction cups which help them stay on the rocks so they don't get pulled away in the tide, out of their homes and into the tide.

The third part of the cushion star is the mouth. If the cushion didn't have its mouth it couldn't be

able to eat its prey so the cushion star would starve to death. ~~Learn~~ but not least the water control valve it keeps the water in the cushion star just right. If the cushion star had too much water in its body it would get sick.

If all these parts were missing it wouldn't be able to eat, move, stick to things and keep the water in the cushion star just right and traps its prey.

During our investigation on the survivor on the rocky shore, out of the 34 cushion stars we found, we turned over 3 and saw bubbles and we thought to ourselves that ~~most~~ mean it was trying to trap its prey and eat it alive. The bubbles are a type of mucus, a gooey substance that gets its prey stuck. We even saw carnivores which means it eats its own kind.

We have investigated the cushion star and found out heaps of facts and about how they survive on the rocky shore.

Clear introduction - animal identified.

Thinking skill identified.

At least 3 difficulties of surviving on the rocky shore identified and explained.

Some information from the investigation at the rocky shore included.

3+ special features identified that help their animal survive.

Attempted to explain the relationship between the parts.

ABOVE EXPECTATIONS

Have mentioned at least 3 of the special difficulties animals and plants have to cope with when living on the rocky shore.

Provided 2 – 3 special features that helps their animal survive.

Some information from their investigation at the rocky shore was included.

SOME IDEAS FOR THE NEXT LEARNING STEPS (MISSIONS)

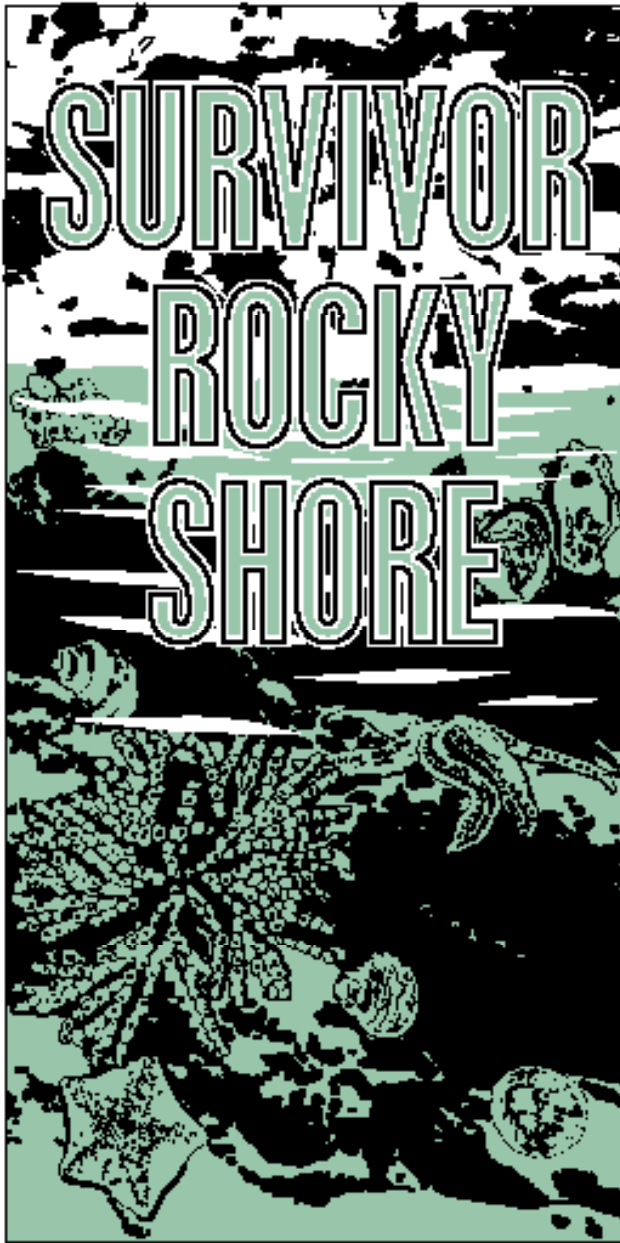
Include technical vocabulary in writing, e.g. desiccation.

Include greater use of description language.

More detail to describe the function of each part.

One part per paragraph.

Explain how the parts work together in order for the animal to be survivor.



Flag Design



Large rocky shore posters from the New Zealand Geographic Magazine are available from the resource room.



Investigations on the rocky shore