

THE ALLANDALE MUDFLAT LYTTELTON HARBOUR

A Personal Exploration



A Development Year Project
February – November 1985
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~GUIDE FOR SCHOOLS~



The Allandale Mudflat from the Governors Bay side



The Allandale Mudflat from the Eastern Hillside

THE ALLANDALE MUDFLAT:

What is a Mudflat? Is it the **“end” of the Harbour** or is it an **estuary**?

A small fresh water stream does flow right across the mud and into the seawater of the Harbour, like the furthest point.

But an estuary is defined as “a region containing a volume of water of mixed origin derived partly from a discharging river system and partly from the adjacent sea; the region usually being partially enclosed by a land mass.” (Barnes, 1976). In other words, a “wide tidal mouth of river” (Oxford Dictionary, 1986).

Does the Allandale Mudflat area fit either of these definitions?

In this picture the tide is almost out.



In the early morning as the tide returns the birds assemble to feed. It would seem that where the fresh and salt water meets and mingles is a favourite place to gather.

This heron is a regular visitor.



Another soon joins the heron. They appear to have a thick bill and hunched stance, with very little appearance of white. This means that they may be Reef Herons rather than White Faced Herons. (But positive identification was not easy)



This is also a favourite area for ducks and oystercatchers.



There are over forty South Island Pied OysterCatchers in this flock. They are content to congregate and rest in the mid-tide area of the Mudflat.



At times the light intensity can be high. This photograph was taken at low tide around mid morning.



This group of Primary School Children is observing the birds before beginning their Mudflat study using binoculars. Note that they are wearing suitable old clothes and gumboots, this is very important, but if the mud splashes on clothing it can be brushed off after it has been allowed to dry.



In this picture, just above the high tide line is a natural bank, heavily covered with iceplant and some pasture grasses. Beyond here is a stand of mature *Macrocarpa* trees planted to protect the Allandale Domain from the cool easterly wind. The trees are the habitat of a number of magpies, which can be seen from time to time feeding on the Mudflat.

The bush in the centre is worth noting. It is a Salt marsh Ribbonwood. Note its wiry twiggy stems and small leaves. These are adaptations to prevent wind damage and to reduce water loss.

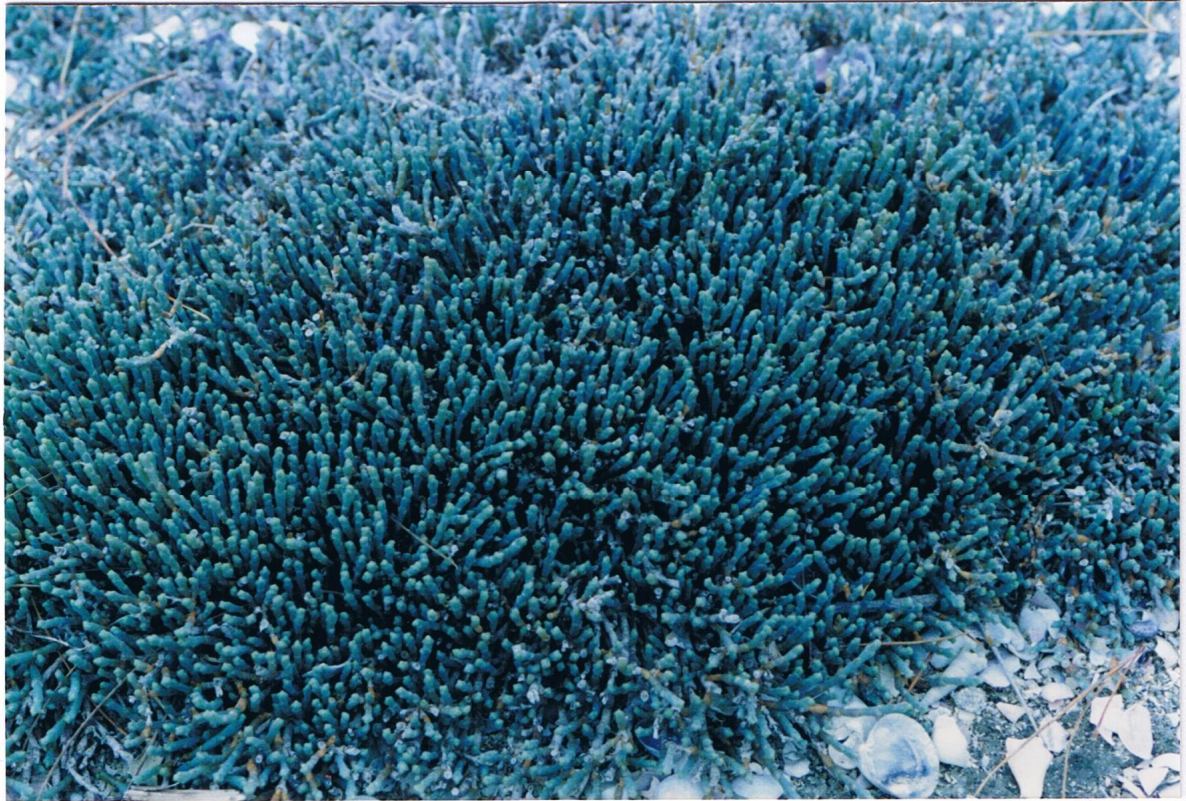




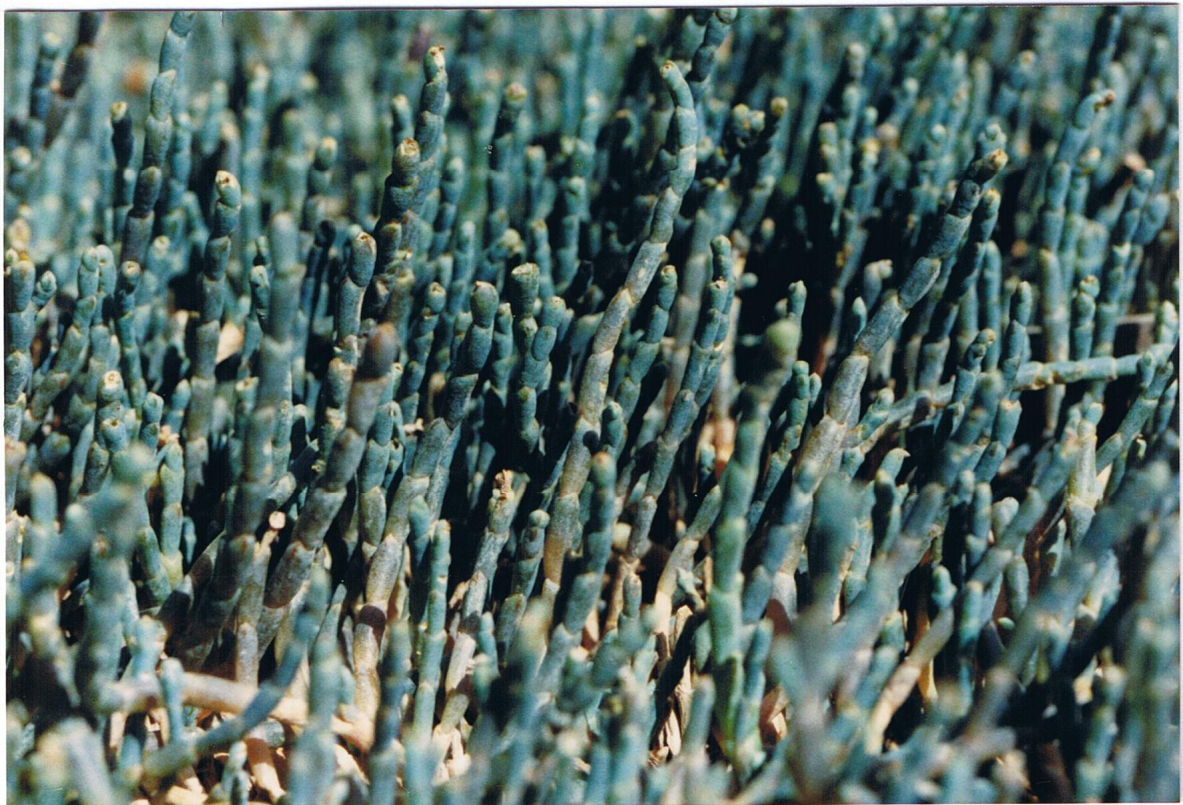
On the banks of the Teddington Salt Marsh, further around the Harbour, the Salt Marsh Ribbonwood forms a more natural plant succession further up the bank from the rushes. This is shown in the lower photograph.



Glasswort (*Salicornia* species) forms a dense mat along much of the margin of the Mudflats just below the litter line left by the last highest tide.



This succulent plant has lost almost all signs of leaves. It has only thin scales at the nodes or joints in the stem.



It was noticed in flower in Mid-March, but the flowers are also very much reduced.



Patches of shells are also found on the mud near the bank. The conical turret shells are a deep-sea species probably washed up on the Harbour by the tides. Most of the others are cockles.



A Kingfisher is a regular visitor and has established a feeding station in the hollow of a driftwood stump. If you examine the remains of the Kingfisher's meal you will be able to determine this birds food preference.



About 20-30 metres away from the bank are large patches of rushes and grass. The stems of these plants slow down the passage of water and as silt and debris collect; the ground around them slowly builds up.



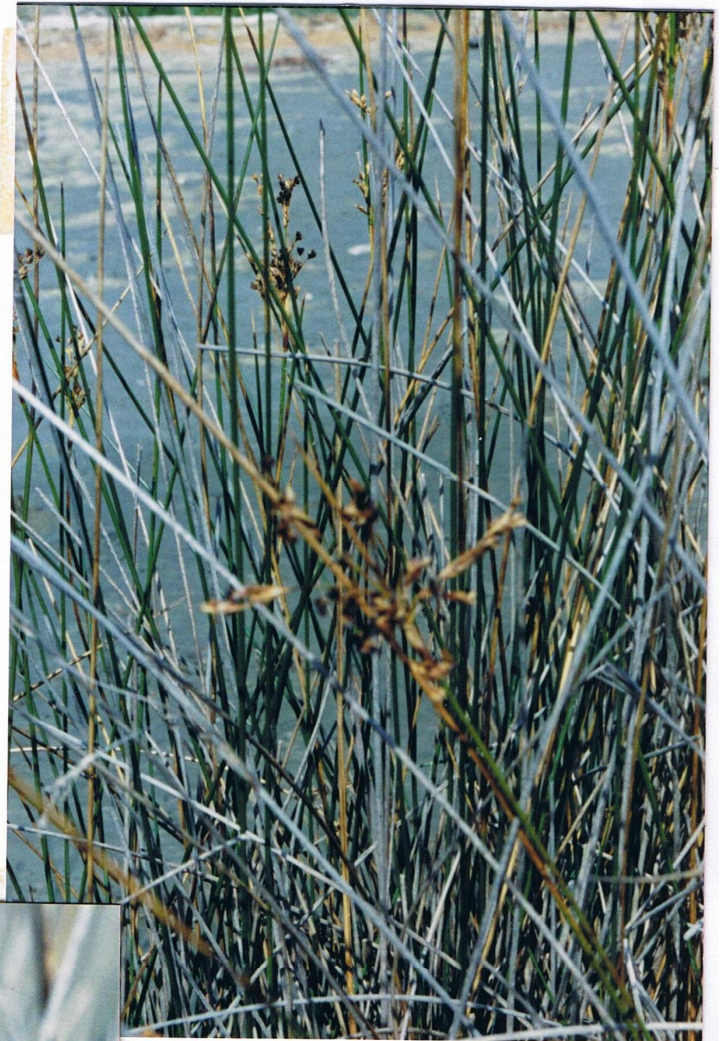
Hérons rest in the rushes. The white around the eye confirms the earlier identification. They are White Faced herons self - introduced from Australia. They may even nest high in the *Macrocarpa* trees.



Standing out, often by themselves, are patches of the sedge "three square". The "three-square" applies to the stem, triangular in cross-section, on which the flowers appear. This is an important pioneering plant in the natural reclamation of the Mudflat. The stems and leaves slow down the passage of water. The ground around them slowly builds up, as silt and debris collect, so that other plants may grow there. "Three-square" also has an extensive root system.



The rushes may be identified by grasping the stem at the base with your hand and sliding your fingers up. The Jointed Rush has dark scale-like leaf remnants that ring the stem at intervals. The Sea-rush is the only rush in the country that lives where it can be occasionally reached by the tides.



These appear to be Sea Rushes. Note that the Sexes are separate in this plant, the female seedhead is on the left.

In "three square" the sexes are separate. There are male and female plants. This mass of plants was noticed near the rubbish tip in early November.



This shows the flower heads close up.



This photograph was
taken in early
November.



This photograph
was taken in
late March.

Bachelor's Button is a plant described in books as being present on the very edges of the Mudflat. This plant was not found until mid-November, in large clumps on wet mud close to the bank.





A dense mass of Bachelor's Button.



Upon close inspection do you think that Bachelor's Button is an appropriate name for this plant?

This grass is *Spartina Maritima* (or Cord Grass), "a rather uncommon grass of muddy tidal salt marshes ... unevenly distributed, rare in some districts" and in others locally abundant.

Cord Grass appears to be quite common to the Allandale Mudflat sharing the higher areas with rushes and three-square or standing alone as in this photo below.



Beside the rushes is an area of baked mud inhabited by a colony of crabs. It has been flooded with seawater during the last high tide. This desiccation (removed moisture), followed by flooding gives an indication of the harsh conditions these animals cope with to survive.



On a drier area near the rushes a digger has been at work. It is safe to poke your finger into the burrow and seek out the occupant. (This is something you could try when you are at the Mudflat yourself).



If you're lucky you will find a tunneling Mud Crab or Short-eyed Mud Crab (*Helice Crassa*).

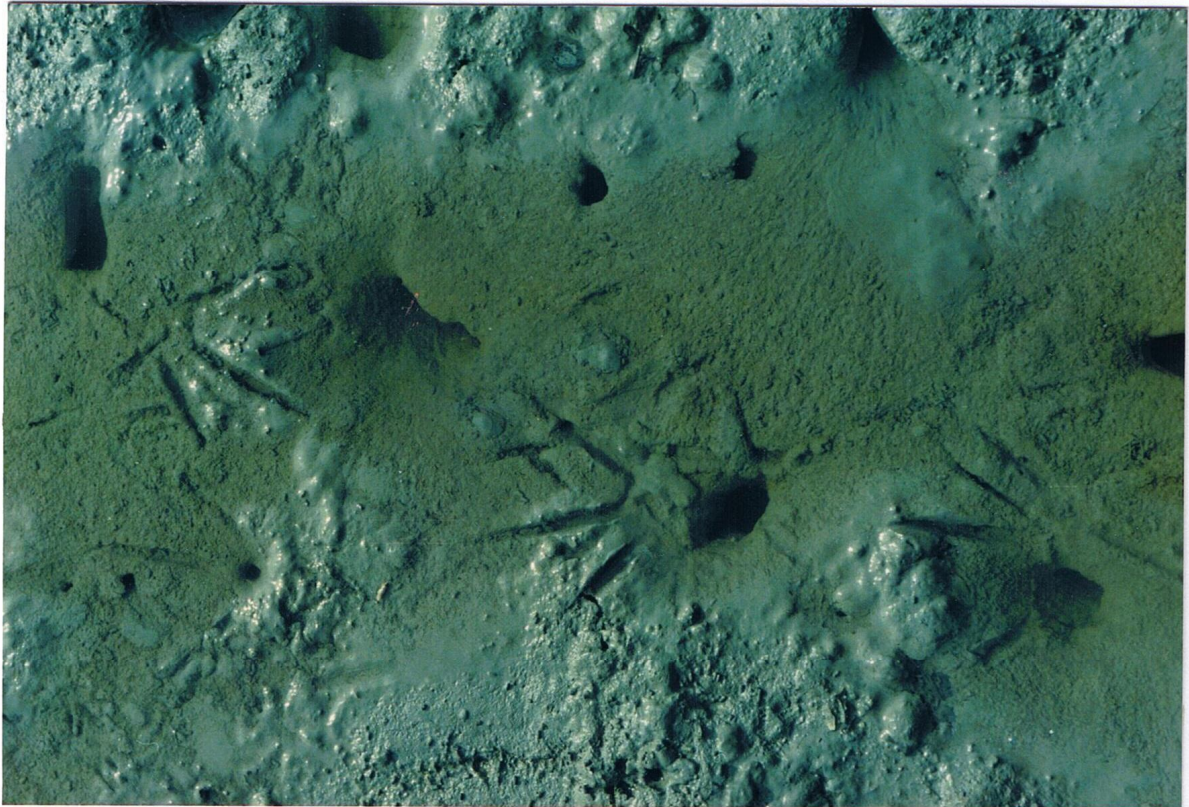
They are able to adapt to wide ranges of salinity (saltiness), and are found above mid-tide level in permanent burrows in well-drained compacted sediments.



As the mud is exposed by the receding tide the Tunneling Mud Crabs move freely on the surface. The slightest disturbance, however, causes them to scuttle for safety down the nearest burrow.



The footprints left by wading birds give us a clue as to why they are so sensitive.



This Tunneling Mud Crab was removed from a burrow and washed. It is identified by the shape of its back or carapace and by the lack of hairiness on the legs.



Despite their ferocious appearance they are not active predators but feed on fine particles of organic matter. The claws are probably used in defense.



As we move out over the Mudflat among the crab burrows we notice a dead cockleshell. Cockles are usually found burrowed 2-4 centimeters deep in the soft substrata of the lower inter-tidal area of sandy shores. The sculpturing of the shell helps the bivalve stay in position. Cockle numbers decrease as seawater becomes more diluted and the sediments more muddy. When salinity falls below 18 parts per thousand, the cockles are unable to feed. They die when the salinity falls below 4 parts per thousand. Cockles are a major part of Mudflat Whelks, Sand Flounders, and South Island Pied OysterCatchers.

We are left with more questions than answers:

- Are live cockles present on the Mudflat?
- How saline (salty) is the water?
- Could watching OysterCatchers feed help?



This photograph shows the shape and patterning of a cockleshell.



The Mudflat Snail is able to tolerate wide variations in salinity and feeds on microorganisms, and organic material on the surface of the mud. Undigested food material is passed from the snail's body as a characteristic faecal string that forms conspicuous trails on the surface beside the trail made by the foot.

This photograph was taken at a distance of around 40cm from the surface. How many snails can you see in the picture?



The Mudflat Snail (*Amphibola Crenata*) is a characteristic “trail marker” on the mudflat. Most snails burrow beneath the mud surface when covered by the flooding tide and emerge to feed when the ebbing tide uncovers them.

They do not have primary gills but obtain oxygen through the mantle cavity, which functions as a lung.

When you visit the Mudflat, pick up a Mudflat Snail and watch the operculum or lid of the shell slowly close to conserve moisture.



Snails mature when the shell is about 2cm high around two years old.

They are hermaphrodite (having the characteristics of both sexes) but each individual at first functions as a male, producing sperm and then later functions as a female producing eggs. This is to ensure that cross-fertilization occurs. Eggs are laid from November to March. They are cemented into a tyre-like rim of mud fashioned by the snail from sediment grains. This is termed a "nidus".

How many "nidus" can you see in this photograph?



A single nidus may contain between 7,000 – 10,000 eggs, with a breeding adult producing a nidus at 5-day intervals during the breeding season. The highest nidus density recorded on the Avon Heathcote Estuary is around 15 per square metre.

Development occurs within the egg and in time a minute free swimming larva emerges. The Larva spends unknown time swimming around in the plankton but when a shell develops it sinks to the bottom and continues life in the adult way.

These photographs show the fine details of Mudflat Snail shells.

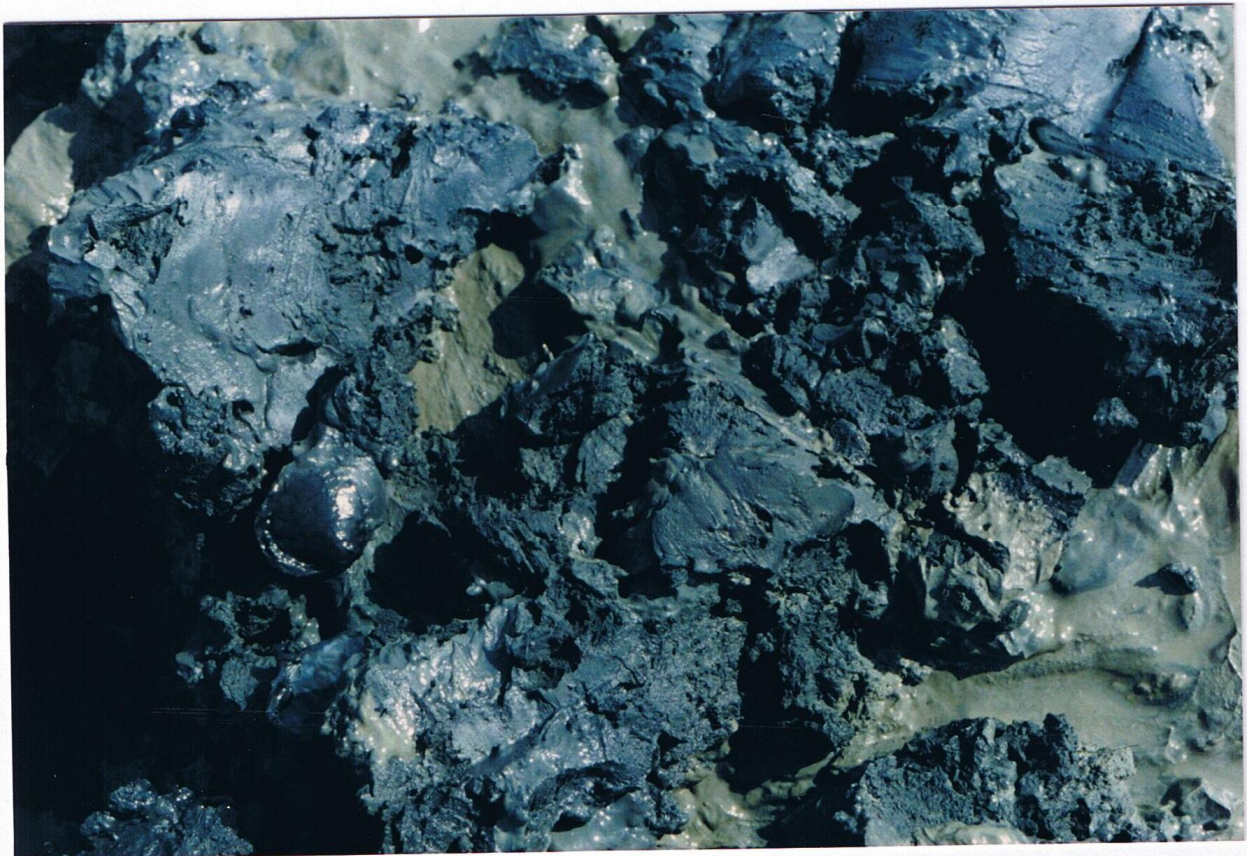


There are interesting mounds and holes amongst the Mudflat snail trails. Digging down with a spade failed to find the inhabitant of this hole but did show the lower layers of the mud.



The colour changes from that of clay to almost black. This is because below the surface the oxygen supplies drop and the bacteria there respire anaerobically using sulphate ions instead of oxygen. This process releases sulphur as hydrogen sulphide – “rotten egg” gas. However, the hydrogen sulphide reacts with iron salts in the mud to form black iron sulphide. If you cautiously smell some of the black mud you will detect a faint fresh sulphur smell, with no trace of hydrogen sulphide. This shows that the system is not polluted and is working normally.

The shell in the picture is probably a Tellina or Wedge shell.



These Mudflat Whelks (*Cominella Glandiformis*) have clustered together to feed on a dead Mudflat Snail or cockle. They were found in the low tide area, as they can only detect food under water, and exhibit feeding behavior only when the tide is in or the mudflat surface is wet. Whelks are both scavengers and active predators. They sense food by a chemoreceptor – the osphradium – and detect chemical signals from the seawater entering the mantle through the muscular mobile siphon. More simply put – they “smell” their prey.

Food detection behavior is complex. At first the Whelk moves at random, with the distinctive black siphon extended and pointed in one direction and then another. Once the osphradium detects food, the Whelk moves towards the stimulus extending the proboscis further and further, and attempts to make contact with the prey. The distance over which food can be detected varies, depending on a number of factors, including the speed and direction of water currents.

Once contact is made with a food organism, the Whelk’s proboscis searches the surface until soft tissue is encountered.

The proboscis is then inserted into the flesh tissue and pumps food torn off by a toothed radula into the gut. Whelks feed on bivalves either by thrusting the proboscis through the siphon opening of the prey, or by using a notch on their shell to lever open the prey shell valves. As many as 50-60 Whelks have been seen feeding on one prey organism.



These Primary School Children are actively exploring the Allandale Mudflat on the Western/Governors Bay side.



The mud is much softer in this area.



These Primary School Children are attempting to count the number of Mudflat Snails within the area of a hoop placed on the mud.



This particular group of Primary School Children is actively exploring a drier area of the mud for crabs. (These are all examples of what you can get your own students to do).



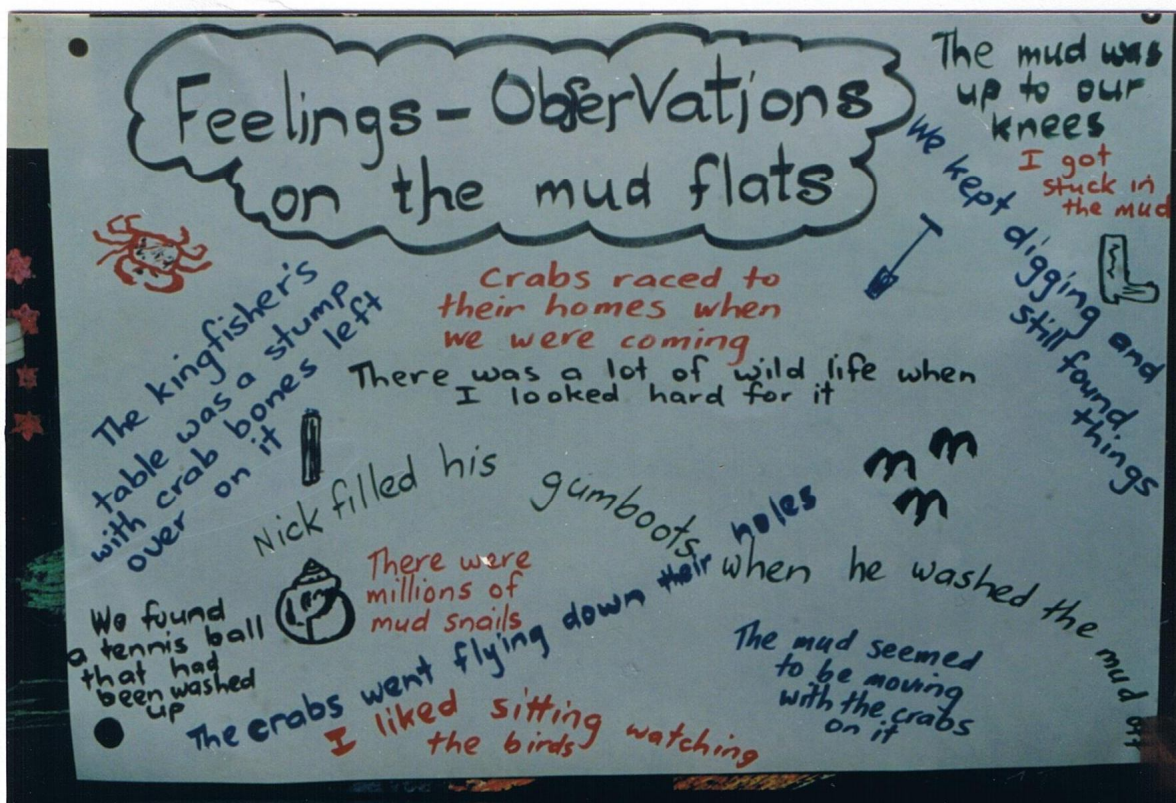
They have been fortunate enough to find a Stalk-eyed Mud Crab (*Macrophthalmus Hirtipes*). It is identified by its eyestalks or more easily by the hairy lower leg joints. It feeds also from organic matter on the surface mud or from fragments of algae growing on the shells of Mudflat Snails.



As the afternoon sun moved over the mudflat the children returned to school



An idea for recording the results of the students active exploration is a Feelings & Observations Chart. This has been put together in a group brainstorm form the following day. This is just a beginning...



In terms of energy capture from the sun, and food production the mudflat is more productive than the best farm land. It is unfortunate that in ignorance this area is treated as a place to throw litter.



It is hoped that once this rubbish tipping is complete the local authority concerned will see fit to adequately cover this area and form a parking area.



Beside the rubbish tip the previous re-claimed are is being eroded by high tides, and previously buried material is being exposed. Must this be allowed to continue?



Researchers Postscript:

"In terms of capturing energy from the sun and food production, the mudflat is more productive than the best farm land.

It is therefore unfortunate that in ignorance this area is treated as a place to throw litter." It is not a rubbish tip.

Lets teach future generations the importance of good litter disposal habits and the preservation of such areas as the Allandale Mudflats.

This original booklet was prepared as a Science Advisers' Development Year Project from regular visits (1 – 2 per month during 1985) to the Allandale Domain and Allandale Mudflat Area.

The following reference booklets have been consulted:

- Animals of the Estuary Shore – Malcolm B Jones
University of Canterbury Publication No. 32
- Places to Explore nature Study Bulletin
Supplement to No. 5 Christchurch Teachers College

Thanks to Canterbury Museum Education Staff, the Canterbury Education Board and the original author himself: Roger Chapman, Science Adviser.

MUDFLATS STUDY



1. Fill in this table

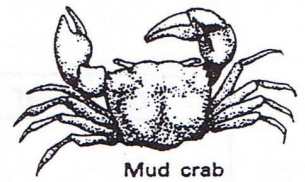
I can hear	I can smell	I can touch	I can see

2. List all the differences between the high tide area and the low tide area of the mudflats.

High Tide	Low Tide

3. **Mud** – dig down into the mud.

Notice the colour changes from a clay colour to almost black.
Why do you think this happens?



Mud crab

4. **Tunnelling Mud Crabs** – if you are lucky you will find a Tunnelling Mud Crab!

How does it get its name?

What part of the mudflats does it live on? Why do you think it lives here?

5. **Cockle Shells** – these may be burrowed 2-4cm deep in the sand at low tide (near the water).

Are there live and dead cockles? Are they in different places on the mudflats?

How did they get to be in these different place?



cockle

Put your hoop on the ground down near the water (low tide area) and count how many cockles you can find.

Now put your hoop on the ground up near the bank (high tide area) and count the cockles.



6. **Mud Flat Snail** – you may find these burrowed beneath the mud surface. Look for the trail it makes on the mud for signs of life.

Why do they live beneath the surface of the mud?

When would they come to the surface? What for?



mudflat snail

Put your hoop on the ground and count how many Mud Flat Snails you can find.

Pick one up and watch the lid of the shell slowly close to save moisture.

7. **Other Life Forms**

If you have time, draw any other types of life forms you can see on or around the beach eg. birds, other shells, seaweed, plants!



Now go back to the two tables on page 1 of your study notes and add anything else you have observed.