

Planning

- Intertidal (shore) studies: very tide dependent
- Subtidal (underwater) studies: independent of tides but very reliant on good weather and clear visibility. They are also dependent on availability and maintenance of equipment and very well organised personnel management

Intertidal studies

Few school classes can afford the time and expense to visit a marine reserve shore more than once a year yet remarkably most neglect to check the tide tables before planning educational trips. For example, classes who visit Goat Island Bay (Cape Rodney – Okakari Point Marine Reserve) at high tide times between 10.00 in the morning and 14.00 in the afternoon see very little shore life. Even on the best tides the most exciting and instructive parts of the rocky shores at Goat Island are only exposed for study for about an hour. On neap tides, especially if the atmospheric pressure is low or the wind is blowing on to the shore, they may not be exposed at all.

It is critical for maximum educational benefit that study trips be scheduled for days when there are spring tides with low tide occurring around the middle of the day.

Even when good days are carefully selected the available study time is very limited because of travel time and the short school day.

Goat Island is about 85 km from central Auckland by road with a bus travel time of about 1.5 hours.

A **typical schedule** for Auckland schools visiting Goat Island Bay (GIB) on day study trip:

Depart Auckland 08.30 to 09.00

Arrive GIB 10.00 to 10.30

Break for toilet, class organisation, sunblock cream application etc, (15 mins)

General introduction to the Marine Reserve conducted by teacher or local instructor (in 2 parts):

Part 1 – (ideally at the lookout platform)

Covers the reserve's location, history, benefits, rules and general code of behaviour (15 mins)

Part 2 – (at the covered information display stand)

Covers the underwater and intertidal habitats and the typical creatures found in each (15 mins)

Shore studies

a) exploration (fossicking with instruction) (30 mins to 1 hour)

b) a set shore study (45 mins to 1 hour) (total 1.5 to 2 hours)

Lunch (30 to 45 mins)

Swimming (30 to 45 mins)

Depart GIB 14.00 to 14.15 (to return to Auckland by 15.30 for School buses)

(NB: This schedule can only be met if the lunch and swim periods are shortened or run together or the shore study shortened.)

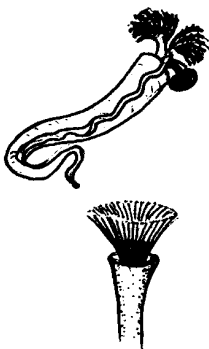
Because of the tight time schedule the set study needs to be carefully pre-planned if the students are to gather useful and stimulating information.

Limited scope of exercises

Realistically student investigations should be able to be completed within a half-hour time frame in a one hour slot. Even this allows only just enough time to organise pairs or groups into sensible positions for sampling / counting / measuring / recording.

Key points

- Exercises must be worthwhile and proven to produce good, usable data
- Exercises must cause no harm or disturbance to marine life (marine reserve restriction)
- Exercises must not involve any collection of specimens (marine reserve restriction)
- Exercises must be pre-trialed or run strictly 'by the book'
- Equipment must be simple to use (for teachers and students), inexpensive and suitable for use in seawater
- Measuring and sampling equipment should be familiar to the students before the visit. They should be used to working with it in the classroom in pre-visit trials using, for example, shell specimens or 1:1 photographs
- Teachers and students must be practised or at least prepared for relating the positions of data collection to easily identifiable parts or levels of the shore. These may be defined by the zone limits of adjacent plants or sessile animals. (Sessile = fixed permanently to the rock, like a barnacle or chalky tubeworm):



- e.g. 'just below the upper limit of barnacles'
- 'at the level where rock oysters are densest' or
- 'at the top of the Neptune's necklace weed zone (on open rock)'

Equipment to take on to the shore

The less gear you take on to the shore the better. The more you or your pupils have, the more you have to lose or worry about. If the students are carrying too much they cannot enjoy a good 'hands on' experience because they become preoccupied with looking after all of their clutter. However, it is important to take enough to do some real work and to create the spirit of engaging in a real investigation.

Safety and first aid

The teacher or a parent helper should carry a standard first aid kit for cuts, sprains and sting relief. A cell phone is a valuable tool for obtaining help in the event of more serious accidents but be aware that reception can be poor on remote beaches shielded by cliffs.

Students should be encouraged to wear hats and use sun block cream as there is little or no shade out on shorelines. The teacher should carry a bottle of sun block cream for students that forget.

Correct student to adult ratios (now set by individual school charters) should be adhered to and it is important to direct parent helpers not to stand together as a group but to disperse among the class so that student care and supervision are effective. Active adult involvement also raises student productivity.

Clip boards

These are usually made to fit A4 paper for no better reason than that is the size paper comes in. However this is too large for the shore where a large board is awkward to use (especially in small hands) and the wind blows the paper up or away.

It is much better to use boards half that size (A5) to fit half an A4 sheet. A single bulldog clip holds the small sheets well and the board is narrow enough for a large rubber band to be stretched easily right around to stop wind blowing up the sheets. Plastic bulldog clips – which are not rusted by salt water – are commercially available.

A class set of these boards is also, of course, half the price of large A4 boards. If you are making some or having them made, ask for 'tempered' hardboard because it lasts very much better in damp or wet conditions.

Writing

Ballpoint pens are unreliable. If they or the paper becomes wet from splash or rain they will not write. An HB pencil is best for writing and short pencil stubs are ideal for use on the shore because they fit easily into the pocket of a pair of shorts and do not break or stab you when you crouch down. Each pupil should carry two stubs – one to write with and a spare in case the lead breaks.

Basic equipment for shore study kit for senior students

Collecting is not allowed in a marine reserve but a little carefully supervised collection is sometimes useful on other shores (see notes below).

Hand lens

Many animals on the shore are very small and difficult to see and large animals often have small parts that are worth examining closely. A good hand lens is expensive and just as easy to lose as the small, cheap plastic lenses, that can often be purchased for less than \$1 at toyshops or bargain stores. These cheap lenses generally give sufficient magnification for general purposes on the shore.

Manipulating small and hidden animals (outside of a marine reserve)

A small folding penknife and a small pair of tweezers (forceps) are very valuable tools for removing animals cemented to the rocks, hanging on by suction or hiding down narrow crevices on shores outside marine reserves.

Solid scalpels and fixed blade knives are dangerous on the shore if you trip and fall but a folded penknife fits safely in a pocket. Cheap plastic disposable tweezers used by health professionals are perfectly adequate for most class exercises.

Containers for collecting (not in marine reserves)

Every student should have a small polythene bag for holding robust specimens and a small plastic, screw topped vial for small or delicate creatures.

A class group needs one or two buckets to serve as temporary aquariums for study on the beach and one or two large plastic bags for collecting rubbish from the shore at the end of the visit.

On sandy shores the class needs one small spade and a 6-mm mesh garden sieve for separating buried animals from the sand.

Measuring

There is no need to take metre rules and long tape measures on to the shore for most school studies; they are something else to carry and lose, an added cost to the school and extra items for the teacher to check.

The ruler you always carry with you...

If you are taking your body on to the shore you are already taking many standard measuring sticks. A large hand will have a span of 25 cm, a smaller one perhaps only 20 cm and the distance between the tips of thumb or index fingers and other fingers will have other useful spans of 10, 15 or 20 cm, while the width of 3 or 4 fingers together at the tips or knuckles will be 5 cm.

Once you and your students know, from a classroom measuring session, a few standard measurements from your own bodies and also the length of your own foot and stride, you can then leave tapes and measures behind.

Useful clothes to wear

If students are not sensibly dressed for the shore they may become uncomfortable or spend more effort worrying about their smart gear than the job in hand. If they are well kitted out they will already be in the right frame of mind to enjoy the beach life and concentrate on their projects.

On the beach students should be prepared to get wet up to the knees. The place for smart dry clothes is in a bag back on the bus. On the beach for both males and females sandals or equivalent (but not expensive trainers) and shorts with pockets are the best wear. Jandals (thongs) are not ideal as they offer little protection from side cuts and abrasions and jeans are most uncomfortable once the legs get wet.

A hooded nylon parka is useful. It can be stuffed into a pocket or hung on a belt and keeps the wind and rain out if the weather turns bad. It can also serve as a kneeling pad or a sorting tray and the hood can sometimes be useful as a temporary aquarium for close inspection of rock pool animals.

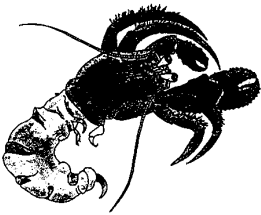
A brimmed hat is important for protecting the face and neck from the sun and can have several other handy uses. If made of absorbent material it serves well as a towel when you need dry hands to make some tidy notes and, back on your head, it dries much better there than a real towel would inside a rucksack. A hat is also a very useful flexible study bowl for holding very active animals like crabs and shrimps which will jump out of your hands before you have the chance to inspect them closely.

Photography

Students should not bring cameras onto the shore. Most cameras are not shockproof or waterproof and are easily damaged on the beach. Carrying one is also a hindrance to students participating fully in the organised activities. If you think some photographs need to be taken, then one student or parent helper should be given that sole task and record the details of the shots that they take on a note pad.

Collecting specimens for a class aquarium

No collecting is allowed in marine reserves, however while studying them it can sometimes be valuable to set up a class aquarium to keep a few live marine animals collected from a non-reserve shore.



Collections should be small, carefully considered and discussed with the class before the visit.

It is only human to collect the rare and unusual and frequently the really common animals are left behind. The less frequent species are either rare because they are at the limits of their ecological tolerance and so are not very representative of the shore being studied or they are genuinely rare species which should be left undisturbed to reproduce.

If there are only two on the whole beach and a student takes one, then one left behind will not be able to mate and the chances of finding the same unusual creature with your next year's class will be lessened. It is good to have simple rules of thumb such as, 'if you can find five of a species for every minute you spend on the shore it is probably acceptable to take a few examples of that species back to study'.

Transporting live animals

A common mistake is to transport animals collected on the shore back to the classroom in water. As they are marine animals it seems logical that they must be bathed in seawater whenever possible and that the water will lessen the physical shocks of transport. After going to this trouble collectors are frequently disappointed to find that their specimens are dead or moribund when they get back to school.

Collected animals only need a few drops of water to keep them moist in the bag or pot they are being transported in. If the pot is filled with water the animals behave as though the tide is in, become active and draw water across their gills to take out the oxygen they need. The important difference from the natural situation is that there is no way for the oxygen consumed to be replaced across the small air / water interface in the closed container. Soon all of the air is used up and the animals die of anoxia.

The situation is generally made worse by the fact that the small volume of water warms up and in the screw-topped pot it cannot cool by evaporation. Most field trips are made in summer when the weather is sunny and with the warmth of the day and the heat of the collector's hand or pocket, the water temperature rises in the pot.

As water temperature increases, its capacity to hold dissolved gases (including oxygen) decreases so there is less oxygen in a given volume of water even at saturation. To make matters worse, as the temperature rises the metabolic rates of cold blooded animals increase and this raises their oxygen demand. The two conditions (less oxygen available and more oxygen required) work together to sicken or kill the contained animals.

Shore animals will generally survive well just by keeping them moist in an airy container or polythene bag as they would on the shore when the tide is out. Back in the classroom they can be placed in seawater brought back separately from the beach. Place the aquarium out of the sun and keep the water aerated using an air pump and diffuser stone.

Mark the water level on the side of the aquarium with a Vivid (waterproof) marker because even after just a few days the level will fall and the seawater will become unnaturally concentrated as the pure water evaporates. To correct this concentration (salinity) add fresh water (rainwater or tap water that has been aerated to remove chlorine) to bring the level back up to the mark.

Learning to look at the beach

Study visits to the seashore are usually made during the day when the tide is out because this is the only time that it is easy to see the animals and plants that live there. Unfortunately this is rather like going to visit friends after they have gone to bed. They can be awakened if you disturb them enough but are seldom at their best and you do not get a warm reception.

Most intertidal animals rest up while the tide is out. Indeed many go into a type of comatose state, remaining quite motionless and scarcely respiring. To move around during low tide would result in the certain loss of water that they are holding beneath their skirts and they would soon dehydrate. It is biologically sensible for them just to wait motionless for the dependable tide to return. They then emerge from the comatose state but are almost 100 percent fit to return to full activity for the high tide period.

It is worth setting up a simple aquarium in the classroom so that students can appreciate what the sleeping shore life does when the tide is in.

Some of the animals on the shore represent stages in the evolutionary movement from the sea to conquer dry land and some of these may be active during the low tidal period. Crabs are the best examples. They are naturally free rangers seeking food and mates and taking advantage of any marine creatures that may have been caught out by the falling tide or suffering from being out of water for too long.

Although crabs can tolerate being out of water for a time, once they are out in the open they too are susceptible to attack by larger animals such as sea birds. For their own survival they are very sensitive to vibrations and moving objects and most are very fleet of foot. Therefore when we go to the shore the crabs and other timid shore life are always aware of our approach before we see them and they scurry deep into a crevice or dive into a pool before we get the chance to enjoy and study them.

As the animals are so sensitive the worst thing to take to the shore if you want to study them is a class of active school children; all of the alert animals hide well away before it is possible to get close to them. It is therefore sound practise to organise students to work in small groups of two or three and to emphasise the benefits of being patient and trying to remain perfectly motionless for several minutes as they squat or kneel beside a pool or crevice. Only after this time will they see tubeworms in a pool display their beautiful feathery indigo feeding crowns, discover shrimps and small fish as they emerge from hiding and witness hermit crabs resume their constant search for food.

Students must learn to watch without moving and be very patient if they are to be rewarded with glimpses of the busy private lives of the seashore residents.

