Intertidal Program

Reef Watch Intertidal Monitoring Program
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Adelaide and Mount Lofty Ranges Natural Resources Management Board

Conservation Council of South Australia Inc

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Introduction to the Reef Watch Intertidal Program

Background

This intertidal monitoring project is an extension of the well-established and popular Reef Watch subtidal program. Reef Watch methods are scientifically proven, non-destructive and educational. Monitoring of intertidal rocky reefs is a unique opportunity to provide further information on the marine environment of South Australia (SA). Intertidal rocky reefs in SA have not been as extensively researched compared to those on the eastern coast, therefore community groups have the chance to play an integral role in obtaining baseline data of our intertidal reefs.

Community-based monitoring allows individuals and groups to develop a sense of custodianship and understanding of the environment. Information gathered can be communicated to the general public to further increase the awareness of possible changes in their local coastal environment. Furthermore, this information is a valuable tool for government and other management agencies, for the effective long-term management of an understudied element of our shores.

Objectives of the Intertidal Program

The philosophy of this program is to gather meaningful and scientifically based data on the state of SA's intertidal rocky reefs in a non-destructive manner. The primary objectives are:

- To engage and educate individuals and community groups about the biological life and dynamics of intertidal rocky reefs;
- To obtain long-term baseline data on reefs around the state that will provide much needed information required for knowledge-based decision-making and management programs;
- To identify human activities and patterns along the coast;
- To characterise plant and animal communities including information on abundances, population size structure and habitat types; and
- To determine the nature and magnitude of changes in species populations and communities over time.

Sampling the Intertidal zone

Where is the intertidal zone?

The intertidal zone is found between the highest and lowest tide marks; it is covered during high tide and exposed at low tide. Intertidal zones do not only include rocky shores but also consist of sandy beaches, mangroves, mudflats and salt marshes. Intertidal reefs support a variety of flora and fauna, such as molluscs, echinoderms and macroalgae, which are found within a mosaic of habitats. There are many species of both fish and invertebrates that depend on the intertidal zone for part or all of their life cycle, as well as for refuge and feeding opportunities. The intertidal zone involves complex relationships of ecological processes, oceanographic and human influences.

Ecological sampling

To be able to protect our environment we need to know what to protect, meaning we need to understand how the ecosystem works and what plants and animals rely on that habitat. It is impossible to count every individual of every single type of plant and animal found in a particular habitat. It would be like trying to count all the different ants in your backyard.

This problem is usually solved by taking samples in a part of the habitat with the assumption that it is representative of the bigger habitat under investigation. Careful thinking and

planning beforehand is essential to ensure that the results gathered represent the habitat as closely as possible. Samples need to be taken so that they balance the collection of accurate information with a reasonable sampling effort. In order to achieve this balance, samples are usually taken within standard sampling unit areas (e.g. quadrats) and also with correct identification of the species.

Intertidal Program methods – why these methods & species?

The methods chosen for this program are well established and commonly used in environmental sampling, in both terrestrial and aquatic environments. Each method provides an insight into different aspects of life on the rocky shore. When results from all the methods are put together, the bigger picture, of the communities and processes occurring, is slowly revealed. The methods allow us to obtain information on the common as well as rarer species, their abundances and the habitats with which they are associated. With regular monitoring and standardised methods, over time we hope to be able to see if there are any changes to the species and habitats surveyed. In addition to surveying the flora and fauna on the reef, human use of the reef is also assessed. This provides a very important insight into how often and what activities occur on the reef and may provide one possible reason to any changes that occur.

Not all species present on rocky reefs are required to be surveyed; even well-trained scientists can have difficulties in identifying some of the more cryptic organisms. Several criteria were used to choose the species:

- Each species represents a different ecological function of the reef and each has an important role in the ecological processes of rocky reefs;
- Species chosen are commonly found on most reefs and are easily identifiable. Some rarer species have also been included as they are as important in providing information on the health of the reef;
- Habitats on a rocky reef provide important food and shelter for species. Any change in the cover and depth of these habitats is of concern for the organisms that depend on them and for the overall diversity of the rocky shore.

IMPORTANT

A closure for the taking of all benthic (bottom dwelling) organisms from intertidal rocky reef areas applies to all coastal waters in South Australia. **No bottom dwelling marine organisms can be taken from the high tide line out to a water depth of two metres from intertidal reefs.** If you do see anyone taking any organisms, please contact: FishWatch 1800 065 522

Occupational Health, Safety & Welfare Issues

If you have doubts about safety, then stop what you are doing and assess the risk.

Wave Action

Ideally you will not be working this close to the waves, but just in case…

- Waves are unpredictable. When first arriving at a study site take a few minutes to observe wave action on the shore. If in any doubt, do not attempt to work there. Become familiar with "escape routes" and high rocks that might allow you to quickly get above any high waves.
- Don't work with your back to the sea. One person must always act as lookout – that person can verbally warn people counting or looking or scribing data when an infrequent, bigger-than-before (so-called "freak") wave approaches. The ideal is two people working (1 to do, 1 to record) and 1 person as lookout. Swap these roles around every 30 minutes or so to keep everyone fresh and to stave off boredom.
- It is usually much safer to brace yourself against a (small) wave than to run away from it – as soon as you lift your foot you have only half as much purchase on solid ground. So, if a small wave coming (e.g. less than waist high to you), plant your feet firmly, turn side-on and bend your knees slightly leaning toward the wave (for balance) - then let it hit you. If the waves become higher than this, then leave. Never run from a wave.

Tides

Anticipate the tides and know how long you have until the tide turns. We usually try to work only when the tide is predicted to be 0.4 m or lower, and then it depends a lot on the weather conditions. When the tide begins to rise, you may have little warning of inundation, so get familiar with how quickly the tide covers the platforms you are working on.

Clothing

- Be prepared to get wet. Also, it is easy to underestimate how cool our winds can be! Make sure you have enough warmth for your upper body (including head) and in layers to remove or add, if need be. The outer layer should be a spray jacket or something else that can withstand both wave splash and rain. Remember - science doesn't demand high fashion!
- Wearing a hat with a wide brim, a shirt with long sleeves and sunscreen lotion is needed to cut down sun exposure and the risk of sunburn. This is true even on cloudy days in summer when unprotected skin can burn in less than half an hour, especially when working around water, which reflects the UV onto your legs.

Footwear

Rocks are tougher than people and you want be free to swiftly move out of harms way, so always wear sturdy footwear that can stand getting soaked by seawater. We recommend: gumboots (winter), sandshoes, river sandals, old runners or reef boots. Never work in: bare feet, thongs, loose sandals.

Falling

Be very careful anywhere near cliffs, especially with our calcarenite or limestone shores. The edge of a cliff may give way under you or boulders may fall down from the face of a cliff, so both below or above could hold danger for you.

Dehydration
High temperatures can lead to sunstroke and it is very easy to become dehydrated (especially in summer) without noticing it. Carry water or some cool drink in a small backpack to refresh you. Small amounts of nibbly food are also good to have along to allow you to work when the conditions are good.

Specific Hazards

- Toxic organisms are reasonably rare along our coastline but you should avoid handling any octopus (especially small ones), cone shells, jellyfish, urchins, fish or anemones. Some people are more sensitive than others to such stings and fatalities have occurred.
- Algae, even when not wet, can be extremely slippery. Good footwear helps but walk cautiously and take care if you feel yourself slipping. Try to keep your feet vertically under your bottom when going down slopes.
- Rocks are sharp and can cut you if you fall or are careless in moving about.
- Do not work during thunderstorms. Lightning is a real issue during storms – as an upright body on a flat platform you may be a target, not to mention the fact that water conducts electricity.
- Using sharp objects on the seashore is always risky and demands extra caution.

Immediate First Aid action

Blue-ring octopus: Initially a person may not feel a bite. Then, within a few minutes, the person may feel tingling sensations in the tongue or lips and soon develop difficulty speaking or seeing. They may vomit and collapse within 10 minutes. Paralysis may cause breathing to stop in this case perform artificial respiration (mouth-to-mouth resuscitation).

Pressure and immobilisation to the bite area is required to limit the movement of the venom from the area. This is similar to treating a snakebite. Apply a compression bandage over the bite, bandaging upwards from the lower portion of the bitten limb. Splint the limb. Keep the victim still. Bring transport to the victim.

Cone shell/snail: The venom causes prolonged weakness of muscles, including the muscles of respiration and disturbance of vision, speech and hearing. Pain, numbness and swelling occur commonly. If untreated, high levels of venom could cause death in a short time.

Pressure immobilisation, using a firm crepe bandage to the limb, particularly over the site, is recommended. Prolonged artificial respiration, even mechanical ventilation, may be required. At this stage, there is no antivenom available for cone shell stings. A tetanus injection may also be needed in case the wound is contaminated. If breathing has stopped, perform artificial respiration (mouth-to-mouth resuscitation).

In either case ring 000 for an ambulance.

If you are monitoring without Reef Watch personnel

Take a mobile phone, a first aid kit, food and water. Have some emergency procedures in place, in case of an accident or emergency. The same precautions apply:

- ! Do not work if conditions do not permit it. Likewise, stopping working because conditions change part way through what you planned to do is also very acceptable.
- ! **Tell someone** where you are going and when you expect to return. If you change your plans then try to inform that person as soon as possible.
- ! It is recommended that at all times one person should be familiar with or have a Senior First Aid Certificate.

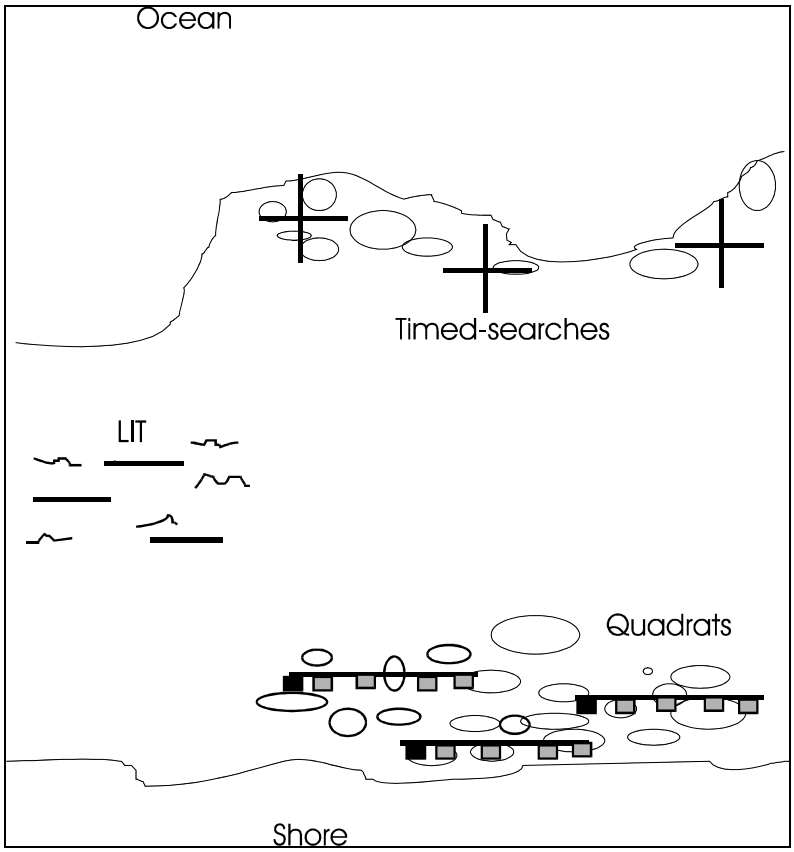
Before you start

How to choose your survey area

Before you start monitoring it is a good idea to familiarise yourself with the reef and the different habitats and species present. Have a walk around on the reef to observe where organisms and also algae are most likely to be found. It would be frustrating and boring if you were to set up the quadrats in an area where there are very low to no organism present and likewise for any of the other methods. Organisms, especially mobile ones, prefer more complex habitats. That is, where there are small boulders for them to shelter under. The organisms listed for the timed-searches (see pg 26) will more commonly be found on the edge of the reef (closer to the water) these are rarer organisms and they prefer wetter conditions but you may be lucky to find a nudibranch in a rock pool or an elephant snail (*Scutus antipodes*) hiding under a boulder.

Note: After you have chosen your survey area for each method, the same general area should be used for each monitoring session. Use fixed landmarks to help relocate that are again for example, the LIT area is situated 200 m directly in front of the last wooden step of the walkway. You can also take a photo from the survey area towards the shore. Have someone make a note of these locations on the sheet provided in the equipment kit. This is important especially for new people joining the group.

Below is an example of how you could set-up the different methods on a reef.



Timed-search plots are located on the edge of the reef where the target organism will be commonly found.

LIT is best placed in an area where algae and other sessile organisms are found.

Quadrats have been placed in a boulder zone. The black square indicates the 1st quadrat with subsequent ones in grey.

Frequency of surveys

Intertidal monitoring over most of SA is limited to the warmer months of the year as the tides are lower during this time and the sea conditions generally calmer and safer to work with. Therefore, from approximately the end of August to the end of April is the best time for monitoring. However, do check your local tide conditions as the season may vary and you may be able to monitor for a longer period.

We recommend that you work on a tide that is 0.40 m or lower as this ensures that a majority of the reef is exposed. Ideally, we would like you to monitor your reef once per month to ensure that we gather meaningful data over the season and years. If this is not possible every two months would be sufficient.

Where to find tide information

Information on tides can be found on the Reefwatch website (follow the links from the Intertidal page), in the local newspaper, Tide Tables book and Bureau of Meteorology (BOM) website. The Tide Tables book which has all tides for SA is published yearly by the Government of SA and is found in fishing shops at the start of each year. The internet site for the BOM also includes tide information for SA and all of Australia and can be found at: http://www.bom.gov.au/oceanography/tides/.

Below is an example of what you will find on the BOM website. There is the option in the drop down menu to find average tide time differences for secondary ports.

Important: During daylight savings time one hour needs to be added to the times stated.

TIDE PREDICTIONS FOR PORT ADELAIDE (OUTER HARBOR) MARCH - 2007

Fri 2		*Sat 3*		*Sun 4*		*Mon 5*		*Tue 6*		*Wed 7*		*Thu 8*	
Time	**Ht**	**Time**	**Ht**	**Time**	**Ht**	**Time**	**Ht**	**Time**	**Ht**	**Time**	**Ht**	**Time**	**Ht**
0441	2.13	0459	2.28	0514	2.34	0529	2.35	0545	2.32	0006	*0.26*	0030	*0.28*
1117	*0.27*	1126	*0.20*	1133	*0.18*	1142	*0.17*	1153	*0.16*	0604	2.24	0623	2.14
1728	1.86	1730	1.99	1736	2.11	1746	2.22	1802	2.33	1206	*0.17*	1220	*0.20*
2257	*0.66*	2310	*0.48*	2325	*0.37*	2344	*0.29*			1821	2.40	1841	2.45

The tide heights (Ht) are in metres above Chart Datum, *red for low water* and blue for high water. Times stated are Australian Central Standard Time (24 hour clock).

How to work with the tides

From the table above you can see that Sunday 18th has a low tide of 0.18 m at 12:33pm (remember to add one hour). This states that at 12:33pm the tide will be at its lowest after which the tide will start to come in, this usually happens slowly but depending on the time of year, the tide can be very quick to come in. So, to have enough time for your monitoring session try and start at least two hours before the stated low tide time. You may start even earlier if the tides are not moving a lot that day.

Introduction to Survey Methods

Visitor Use

Determining the amount of human use on a reef provides important information on potential impacts and may also aid in explaining any changes that occur to the overall characteristics of the reef. Uses of a rocky shore can range from walking, with and without dogs, to harvesting for bait or food and overturning boulders, raising concerns ranging from trampling effects to over harvesting. During these Reef Watch surveys our presence on the reef does have an impact but the methods attempt to minimize this. The data collected will hopefully lead to better management and hence move to offset the impact. Also note that the presence of Reef Watch people on the reef may attract other passers by leading to an overall increase in visitor numbers at the time of the survey.

Some effects of human use on a reef include:

- a change in the cover of macroalgae and sessile aggregate organisms due to trampling, on which many species depend and that are a major component of the biodiversity of the reef;
- a change in mollusc and crustacean abundances and sizes due to harvesting; and
- disturbance to seabirds.

This survey should be conducted at the beginning and end of each method.

Equipment

- Clipboard & pencil
- Data sheet
- Compass (optional)

Method

- Observe activity **on the reef only** at the start and end of each method but only within eye distance.
- Record the number of people undertaking each activity, activities being undertaken and age group.
- Choose activities only from those listed on the survey sheet.
- Include people present on the whole reef being monitored (including yourselves).
- Exclude people you can see that are not on the reef.
- Only one visitor survey needs to be done for the whole group and monitoring session.

Example **VISITOR USE**

Date: 26/08/06 **Time**: 9:00am **Location:** Snapper Point

Time and height of low tide: 11:42am & 0.43m

Please Circle

Weather: (Sunny) Overcast Rain

Wind: Calm (Light) Moderate Strong Gale

Wind Direction: (N) S W E NW NE SW SE

Sea Conditions: Flat (Calm) Moderate Rough

Rainfall: (Nil) Light Moderate Heavy

Activity: surveying, snorkelling, walking, observing, actively searching, collecting bait/food, fishing, rock turning, dogs

Age group: Adult (A) or child (C) <15 years.

	Start & end of method	**No. of people**	**Activity**	**Age Group**
1	Start of method 1	1	Walking	A
		2	Observing	A & C
		12	Surveying	A
2	End of method 1	12	Surveying	A
3	Start of method 2	12	Surveying	A
4	End of method 2	1	Walking	A
		4	Walking	2A & 2C
		2	Fishing	A
		12	Surveying	A
5	Start of method 3	2	Fishing	A
		12	Surveying	A
6	End of method 3	2	Fishing	A
		1	Walking dog	A
		12	Surveying	A

Line Intercept Transects (LIT)

Determining percent cover of sessile organisms is important in understanding major habitat types and substratum characteristics on a rocky shore. Mobile organisms rely on a variety of habitat types for shelter and food. The depth of each habitat type is also an important factor as this can be reduced by trampling.

Any change in the cover and depth of these habitats is of concern for the organisms that depend on them and for the overall diversity of the rocky shore. Many species of algae provide habitat and food for a range of intertidal organisms. Grazers such as limpets and periwinkles (*Turbo undulatus*) depend on algae for food.

LIT is a widely accepted ecological sampling method and in this program aims to provide an overview of the major habitat types of the reef. The method gathers information about the abundance of benthic (bottom) organisms in terms of percentage cover. This is a rapid, simple method that requires no removal of living material, making it a valuable tool for community-based monitoring.

Equipment

- Tape measure
- Clipboard & pencils
- 2 different data sheets (LIT & depth)
- Tent peg (4 mm diameter)
- Ruler (optional)
- Identification sheet

Set-up

- Select an area in the low to mid intertidal region of the rock platform that can be easily accessed and identified. The same general area should be used for each survey.
- In your chosen area haphazardly select a starting point for the first transect and run out a 5 m transect **parallel to the shoreline**.
- You may need to secure either end of the tape measure to avoid movement.

Method
Select one person as data recorder and the other as counter.

Habitat
- At the start of your 'LIT' data sheet, put a zero in the distance column and put "Start" in one of the other columns.
- When each dominant cover changes under the transect, e.g. from algae to rock, take a reading from the tape measure. The minimum patch to consider is a resolution of 2 cm - so, if a patch is smaller than 2 cm then imagine it is not there.

In this image you can clearly see that the benthic habitat changes at 42 cm.

- Always use the same edge of the tape as the cover might be different on either side of the tape. It is easiest to work on the side where the tick marks are located.

Depth
- A second set of data to collect is the depth of cover of macroalgae and sediment at ten already allocated random points within the length of the transect.

- Insert the tent peg into the cover until it touches the rock

- Use your fingers to mark the depth.

- Use the ruler or the tape to measure the depth.

- Note on the ‘Depth’ data sheet whether it is algae, sediment or bare rock.
- Make sure that any algae are in fact growing on the rock, by gently lifting it.

Unattached algae.

Attached algae.

- Repeat both measurements for at least 2-3 transects per group.
- Positioning of subsequent transects will be determined from random numbers (provided in the kit; training in use of random numbers is also provided). Move each transect from start point (0m) - for all subsequent transects, facing the shore. Ensure that the transect is rolled out in the same direction (parallel to shoreline) as the first transect line.
- Return your data sheet to the nominated facilitator.

Example of LIT data sheet

Line-Intercept Sampling: 5m transect parallel to shoreline & dominant substrata recorded

Date: **26/08/06** Time: **9:30am** Location: **Snapper Point** Surveyors: **Jo, Mary**

Distance (mm)	**Immersion** Above (water) - **A** Under (water) - **U**	**Dominant Organisms**	**Notes, e.g. on environment, other species present, etc.**
0	–	**START**	
16	A	Enc	80cm *Bembicium species*
30	U	Rock	
33	A	Enc	*Austrococchlea* nearby
57	U	Enc	
59	A	Rock	
90	U	Rock	
93	U	BFoli	
116	U	Rock	
120	A	BFoli	
122	U	Tur	
192	U	Enc	
196	U	Tur	
200	U	Grass	
215	A	BFoli	
221	U	Rock	
223	A	Rock	
235	U	Tur	
237	A	Tur	
285	U	Tur	
294	U	Rock	
305	A	Rock	
324	U	Rock	
361	A	Rock	
368	U	Rock	
376	A	Rock	
387	U	Enc	
393	A	Enc	
396	U	Rock	
411	A	Rock	
480	U	Tur	
490	A	Grass	
500	–	**END**	

Example of Depth data sheet

Depth of macroalgae and sediment along transects

Date: **26/08/06** Time: **10:00am** Location: **Snapper Point** Surveyors: **Jo, Mary**

Point (m)	**0.27**		**0.37**		**0.44**		**0.90**		**1.76**		**2.11**		**3.02**		**3.71**		**4.16**		**4.28**	
Transect	**Cover**	**mm**	**Cover**	**mm**	**Covr**	**mm**	**Cover**	**mm**	**Cover**	**mm**	**Cover**	**mm**	**Cover**	**mm**	**Cover**	**mm**	**Cover**	**mm**	**Cover**	**mm**
1	Enc	3	BFoli	50	Enc	2	Rock	0	Turf	30	BFoli	40	Grass	0	Rock	0	Rock	0	Rock	0
2																				
3																				
4																				
5																				
6																				

Cover codes:

Organism	**Code**	**Organism**	**Code**
Bare Rock - 0% cover	**Rock**	*Galeolaria caespitosa* (worm tubes)	**Worm**
Sediment	**Sed**	*Xenostrobus pulex* (little black horse mussel)	**Muss**
Rock – encrusting	**Enc**	Foliaceous Brown algae (e.g. *Hormosira* -Neptune's necklace; *Sargassum*, *Cystoseira*)	**BFoli**
Rock - turfing	**Tur**	Foliaceous Green Algae (e.g. *Ulva*-sea lettuce)	**GFoli**
Seagrass	**Grass**	Foliaceous Red Algae	**RFoli**
Other (e.g. barnacles (**Bn**) or tunicates (**Tu**), but only if they form dense communities) clearly state which organism is found.			

Quadrats

Quadrats are another well-recognised ecological sampling method. They are usually used to determine abundance as well as absence and presence of sessile organisms such as algae.

Grazing gastropods are an important part of the food chain on rocky shores. By feeding on algae that grows on the rocks they prevent the shore being dominated by plants. In turn, grazers are eaten by predatory snails (*Dicathais orbita*), fish and birds, which all contribute to the diversity of animals along the coast.

The aim of this method is to provide an indication of what type of organisms live on the reef and also to indicate their abundances. For this experimental design two categories of organisms have been chosen – 'organisms to look for' and 'others of interest'. The first group of organisms has been chosen as they are the most common on rocky reefs. They can provide an indication of the health of the reef and also some can be collected by harvesters for food and bait.

The other 'organisms of interest' are generally not that abundant on the reefs but we are still interested in finding out where they can be found and how many are present. In addition, if any other interesting organisms are found in the quadrats either take a photo or ask someone present who may know and make a note of it.

Equipment

- Tape measure
- 40 × 40cm quadrat divided into a grid of 7x7 perpendicular wires, giving 49 regularly spaced points. By including the bottom right hand corner of the quadrat, the number of points is 50.
- Plastic containers
- Clipboard & pencil
- 2 different data sheets (size & cover)
- Identification sheets

Set-up

- Select an area in the low to mid intertidal region of the rock platform that can be easily accessed and identified. The same general area should be used for each survey.
- In you chose the area haphazardly select a starting point for the first survey and run out a 10 m transect parallel to the shoreline.
- Positioning of subsequent transects will be determined from random numbers. Move each transect from start point (0m).
- You may need to secure either end of the tape measure to avoid movement.
- Place the bottom corner of the quadrat on the tick mark side (see picture below) at the chosen random points (see data sheet). Always place each quadrat along the transect on the same side.

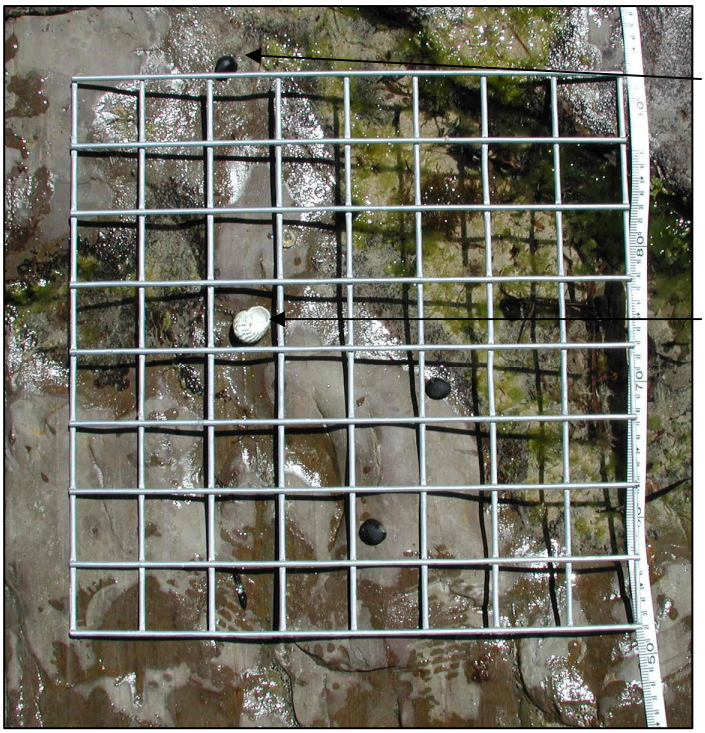
This quadrat has been correctly placed with the bottom right hand corner on the first random number, 0.52 m.

Approximately 2-3 transects with five quadrats per transect should be surveyed per group.

Methods
Select one person as data recorder and the other one as sorter and counter.

Method A - Mobile organisms:

- Using the grid as a guide, collect all organisms of interest in every quadrat.
- Do not count more than 100 individuals of any of the species during your survey. Before starting make a rough estimate of the species' numbers.
- Only count individuals that are greater than 5 mm, if you find a large abundance of juveniles in your quadrat make a note of it on the datasheet, this is important information.
- Either at the end of each transect or at the end of the quadrat survey identify and count the organisms found.
- To minimise impacts over time do not overturn or disturb any boulders.
- Ensure that all animals measured are placed back in the same location from which they were taken, ideally in shallow pools or splashed with water to allow reattachment.
- To reduce harm and potential mortality, **do not remove limpets** from the substrate.
- Count organisms that partially extend beyond the quadrat on only 2 sides (top & left or marked by the zip-lock ties) to avoid over estimates of 'partially' included individuals.
- Do not include empty shells.

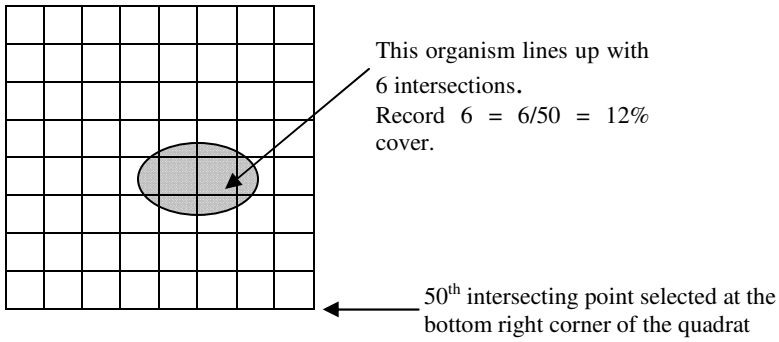


This gastropod is included because it is just overlapping with the top of the grid. If it were on the right side of the grid it would not be included.

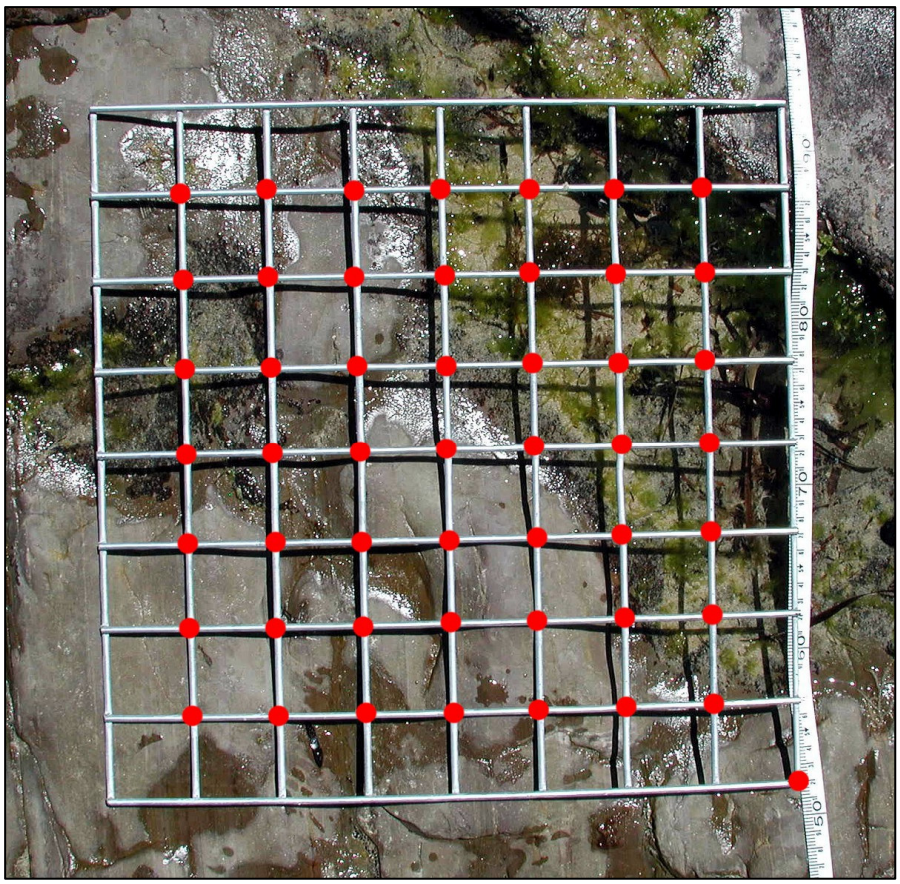
This empty shell is not included in the mobile animal count.

Collecting the mobile organisms.

Method B - Sessile organisms: cover is estimated by counting the number of points falling directly above each species. See figure below for an example of how to use point counts for sessile organisms.



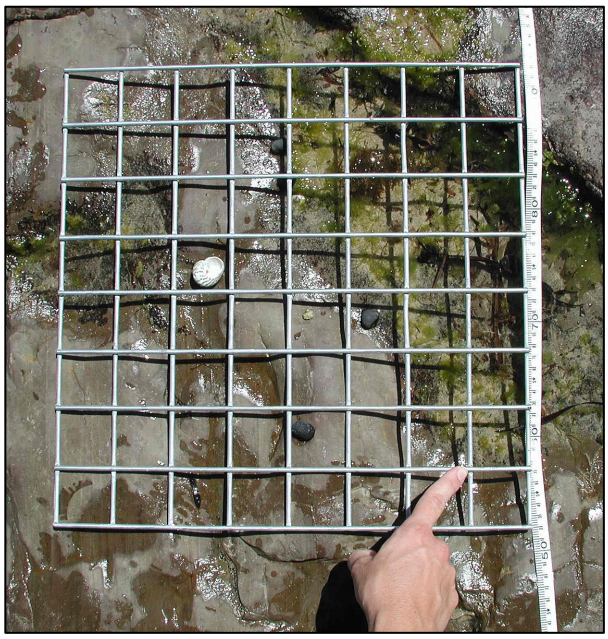
- Stand over the quadrat. When looking down on to the quadrat, the 50 intersecting points fall directly over the organisms: exclude the points around the external edge of the quadrat, this makes 49 internal points and the 50th point is the bottom right corner (see image below).



Each of the red dots represents one of the 50 points used to record the sessile organisms and benthic cover.

- Look at each point in turn and use a pointer such as a pencil if this helps to keep your place.

Looking at point number 1.



Looking at point number 2.

- At each point state whether the cover is an organism or cover such as rock, etc. Keep to the choices in the cover codes.
- **Count only algae that are attached to the substrate.**

Example of abundance data sheet

Method A: Abundance of mobile molluscs

Date*:* **26/08/06** Time: **9:30am** Surveyors*:* **Jo, Mary, Alice**

Organisms to look for	Code	Others of interest	Code
Cellana species (>5 mm)	**Cs**	*Lepsiella* species	**Lv**
Nerita atramentosa	**Na**	*Cominella lineolata*	**Cl**
Austrocochlea species.	**Au**	*Scutus antipodes* (elephant snail)	**Sa**
Bembicium species	**Be**	*Dicathais orbita*	**Do**
		Turbo undulatus (periwinkle)	**Tu**
		Haliotis species (abalone)	**Ab**

– Record the species and abundance of each individual (>5 mm).

Random quadrat positions: 0.52m, 4.32m, 5.12m, 7.53m, 9.47m

Transect	Quadrat position	Species	#'s found	Transect	Quadrat position	Species	#'s found	Transect	Quadrat position	Species	#'s found
1	0.52	Au	5	2	5.12	Na	3	3	9.47	Be	2
1	0.52	Na	3	2	5.12	Au	4	3	9.47	Au	1
1	0.52	Be	4								
				2	7.53	Cs	1				
1	4.32	Au	5	2	7.53	Be	5				
1	4.32	Na	3	2	7.53	Na	2				
1	4.32	Be	7								
				2	9.47	-	-				
1	5.12	Au	2								
1	5.12	Na	3	3	0.52	Au	2				
1	7.53	Au	10	3	4.32	Au	1				
1	7.53	Cs	1	3	4.32	Be	6				
1	7.53	Na	3	3	4.32	Ne	3				
1	9.47	Be	6	3	5.12	Be	5				
				3	5.12	Ne	3				
2	0.52	Au	6								
2	0.52	Na	4	3	7.53	Au	4				
2	0.52	Cs	2	3	7.53	Ne	3				
				3	7.53	Be	2				
2	4.32	Au	5								

↺ ↺

Example of substrate cover data sheet

Method B: Aggregate Sessile organism cover

Organism	Code	Organism	Code
Bare Rock - 0% cover	**Rock**	*Galeolaria caespitosa* (worm tubes)	**Worm**
Sediment	**Sed**	*Xenostrobus pulex* (little black horse mussel)	**Muss**
Rock – encrusting	**Enc**	Foliaceous Brown algae (e.g. *Hormosira* -Neptune's necklace; *Sargassum*, *Cystoseira*)	**BFoli**
Rock - turfing	**Tur**	Foliaceous Green Algae (e.g. *Ulva*-sea lettuce)	**GFoli**
Seagrass	**Grass**	Foliaceous Red Algae	**RFoli**
Other (e.g. barnacles (**Bn**) or tunicates (**Tu**), but only if they form dense communities) clearly state which organism is found.			

- The first row is the transect number. The first column is the location of each quadrat along each transect. Each species cover occupies a separate column.
- In the appropriate quadrat row record the number of points over the species.
- If one of the species is present but not encountered beneath one of the 50 points record a "+" sign, this will at least determine presence/absence data.
- **MAKE SURE THE NUMBER OF POINTS FOR EACH QUADRAT TOTALS TO 50**

Date: **26/08/06** Time: **9:30am** Location: **Snapper Point** Surveyors: **Jo, Mary**

Transect	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Location	**Rock**	**Sed**	**Enc**	**Tur**	**Grass**	**Worm**	**Muss**	**BFoli**	**GFoli**	**RFoli**	**Other**	**Total**
0.52 m	𝍸 𝍸 𝍸 𝍸	𝍸 𝍸 𝍸 𝍸 𝍸			+	+			𝍸			50
4.32 m	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸	𝍸 𝍸 𝍸						II	III			50
5.12 m	𝍸 𝍸 𝍸 𝍸 𝍸 III	𝍸 𝍸 III		III	I	+			III			50
7.53 m	𝍸 𝍸 𝍸 𝍸	𝍸 𝍸 𝍸 I		𝍸	I	+		+	III	II		50
9.47 m	𝍸 𝍸 𝍸 𝍸 III	𝍸 𝍸 III		𝍸 III	I				II	I		50

Timed - searches

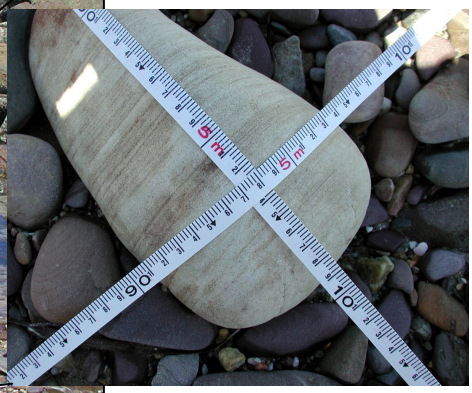
Timed - searches basically involve searching an area within a specified time-frame. Using this method a catch per unit effort (CPUE) can be assessed. In this case the number of organisms found is the 'catch' and the time it takes to search the area is the 'unit effort'. The unit effort for this monitoring exercise is ten minutes.
The aim of this method is to search for rarer or harder to find organisms, especially charismatic ones. This method is effective at finding these rarer organisms, as you are able to target the timed-search in the environment in which these organism prefer to live. The species to specifically target for this survey can be commonly found on South Australia's rocky shores and are also those that prefer to live in very different habitats to where the LIT and quadrats surveys are carried out. An 'other' category has also been included, which lists some very rare organisms that are exciting when found and of keen interest for some researchers.

Equipment

- Tape measures or ropes
- Abalone and crab rulers
- Clipboard & pencils
- Data sheets
- Plastic bags or food containers
- Identification sheet
- Timer (e.g. stopwatch)

Set-up

- Each of the species listed below are found in different habitats, you will have to familiarise yourself with each species-associated habitat.
- Lay out a 10 × 10m area using the tape measures as below or ropes.



Ensure that your tapes overlap at the 5 m mark at the centre of your 10m^2.

Method

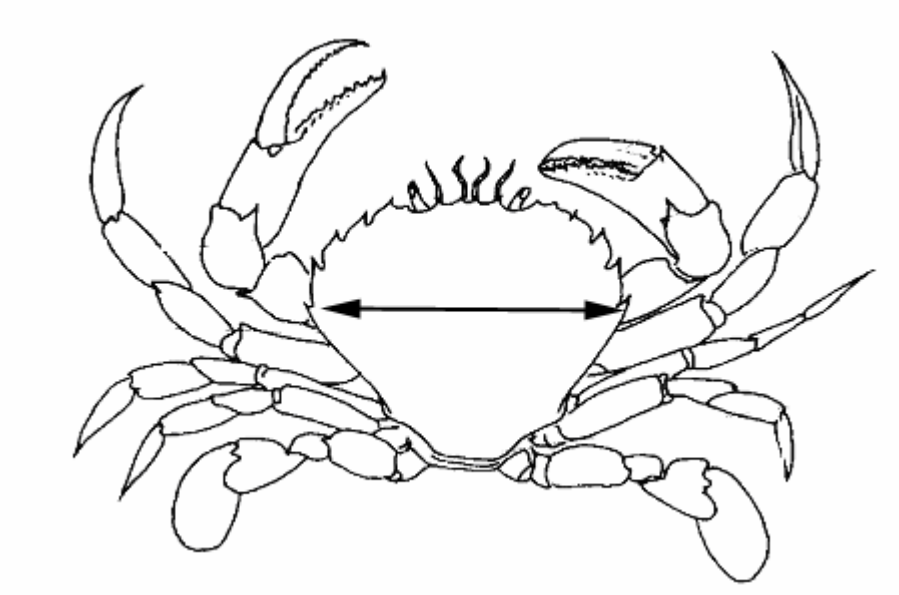
- Simultaneously search for all of the organisms, listed in the table below, within the specified area for 10 minutes:
  - Collect all specimens of the listed species in the specified area that you can find within the ten minute period.
  - Do not count more than 100 individuals of any species during the whole timed-search surveys. If more than 100 individuals are present make a note that the organism was 'Abundant', see example datasheet.
  - Put different species into separate containers so that you do not count the same organisms twice.
  - **Do not remove abalone**, count and measure *in situ*.
  - Make sure you move throughout the zone during the survey, carefully searching under algae or in crevices as you go.
  - To locate some of these species you will have to turn over the smaller boulders, carefully place the boulder in its original position afterwards.

Remember to turn over only hand-size rocks.

At the end of each ten minutes sit down with your buddy and identify the specimens.

- At the end of each 10 minute search, ensure that any abalone or crabs found are measured. Use the rulers and record it in the appropriate section of the data sheet.
- Conduct a minimum of 3 × 10 minutes searches per group. Two people searching at the same time in the same area, counts as 2 × 10 minutes but, be careful to not overlap your search areas and use separate datasheets. Make a note that you were searching in the same areas, see example datasheet.
- Try and avoid having two groups searching one 10 × 10 m plot as it would be more efficient and more reef would be covered if each group has their own plot to search. In this case you need to assign a different Area Number for each plot.
- **Return all individuals to similar habitats to where they were found after measuring.**

How to measure a crab: use the rulers provided and hold up against the widest width across the carapace. A precise measurement is NOT required only note which size class it fits in.



Caution: if you find a blue-ringed octopus or cone shell do not touch or irritate the animal. They are dangerous and potentially deadly. If you are accidently bitten you should immediately stop what you are doing and initiate your emergency plan (see the section on OH & S).

Example of timed - search datasheet

CPUE: 10 min. searches for selected species.

Search Species:

Target Organisms	Code	Other	Code
Dicathais orbita	**Do**	Nudibranchs	**Nb**
Turbo undulatus (periwinkle)	**Tu**	Octopuses (e.g. blue-ringed octopus)	**Oc**
Haliotis species (abalone) Small (**sm**): <13 cm Large (**lg**): >13 cm	**Ab**	*Scutus antipodes (elephant snail)*	**Sa**
Crabs (e.g. *Ozius*) Small (**sm**): <40 mm Medium (**md**): 40-80 mm Large (**lg**): >80 mm	**Cr**	Seastars	**St**
		Brittle stars	**Br**
		Egg masses	**Em**
		White Chitons *(Plaxiphora albida)*	**Ch**

Date: **26/08/06** Time: **10:30 am** Location: **Snapper Point** Surveyors: **Mary, Jo**

Area number: **1** Search number: **1**

Abundance/Size record (record as you find organisms)

Species	**Do**	**Ab**	**Cr**	**Cr**	**St**			
	1	lg	sm	sm	Abundant			
			sm	md				
			sm	md				
			sm	md				
			sm	sm				
			md	sm				
			sm	sm				
			sm	sm				
			md	md				
Total	1	1	9	9	>100			

Area number: **1** Search Number: **2**

Abundance/Size record

Species	**Cr**	**Cr**	**Oc**	**Tu**				
	sm	sm	1	2				
	sm	md						
	sm	md						
	sm	md						
	sm	sm						
	md	sm						
	sm	sm						
	sm	sm						
	md	md						
Total	9	9	1	2				

Photopoint surveys (optional)

Photopoint monitoring is an easy way to record changes at a site over a period of time. This method involves taking photos from a fixed and permanent point so that the area can be revisited over a set period. Over time the archive of photos will provide a history of the large-scale changes that occur at the site. Changes to the cover of algae will be the most obvious aspect to look for with this method.

Photopoint monitoring is an optional method in this program and if your group is willing to participate in this, more training and information can be provided. It is easier if one or two people take on this exercise as this will keep consistency in the data collected.

Equipment

- Camera, if possible use the same camera every time
- Compass and tripod (if available)

Set-up

- Identify an area that best represents the whole site.
- Find a fixed and stable position from which to take the photo. This position needs to be revisited every time so make sure that it is not a rock or platform that will wash away or be removed.
- Once the fixed position is chosen, identify some permanent landmarks (e.g. buildings, poles) so that it is easily found the next time you visit.

Method

- At the fixed point, position the camera and tripod so they are steady.
- Take a horizontal shot of the site. If possible try and include some landmark (e.g. very large boulder, change in landscape/reef or post) in the photo as reference point.
- Take a few photos just in case the quality is the best in the first photo.
- Try and avoid bright and glary skies as this will affect the quality of the image.
- Record date, site location, direction of photo (use the compass to help with this), tide details, and other observations on the data sheet.
- The frequency of monitoring, height at which the photo is taken and, if possible, the time when the photo is taken needs to be consistent between each period.
- During subsequent visits take a copy of the photo to enable finding the same spot again.

What to do with the photos

- Firstly, record the photo's metadata: date, time, time & height of low tide, surveyors, weather, direction of photo, comments and any other details to allow another person to find the same location again.
- To avoid losing all information if one set is lost or damaged, keep a hard copy for yourself and send another copy and all of the photo's metadata to: intertidal@ccsa.asn.au or print and send the photo/s to:

Reef Watch Intertidal Program
c/- Conservation Council of South Australia
120 Wakefield Street
Adelaide SA 5001

What happens to the data?

The best way to report your data is via the online database where you are able to enter the data you have collected. The database is found at: www.reefwatch.asn.au. You can share this task with members of the group by alternating who enters the session's data.

From the home page follow the links from the Intertidal page link to the database. You will need to obtain a username and password, follow the prompts to do so.

The data collected will be important for community groups, councils, scientists and government management agencies.

Below are examples of what happens to the data after it is analysed. The data in the graphs were collected at Snapper Point, on Aldinga Reef during two monitoring sessions. The story of life on the reef will become much more interesting as more data is gathered over time and we may be able to see emerging patterns of life through the seasons and in the longer term.

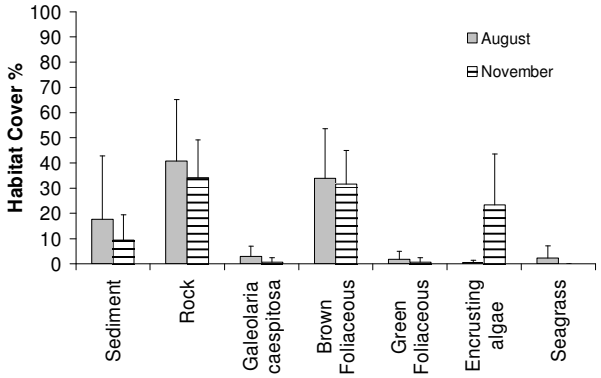


Figure 1: Mean percentage cover (SD) of the most abundant habitat types using line-intercept transects.

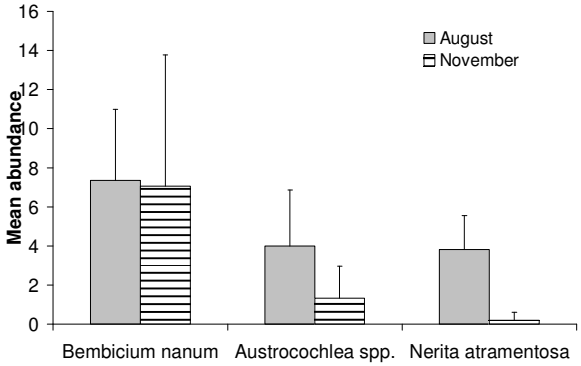


Figure 2: Mean abundance (SD) of organisms found using quadrats.

Feral or In Peril

The Reef Watch *Feral or In Peril* program has been designed to help keep track of a number of marine organisms that are of special concern. As its name implies, *Feral or In Peril* has been designed to identify introduced organisms that are a potential threat to the marine ecosystem as well as local species that are of conservation concern. Most organisms listed are found subtidally but there are still many that you can find on a rocky shore. Some *Feral* species to watch out for on rocky shores are the Northern Pacific seastar, European shore crab and Asian date mussel.

Feral Species

Over the last couple of hundred years, many plants and animals have been introduced into Australia, and of these several have become major problems. Introduced species have entered our marine environment in a number of ways both accidentally and deliberately. Unfortunately we know comparatively little about the way that the marine environment functions and hence it is difficult for us to know exactly what effects these introductions will have. However it would be reasonable to assume that some of the more invasive species could potentially create a similar amount of devastation as that caused by cats, foxes, and rabbits on the land.

In addition, because of the difficulties in operating underwater, it is almost impossible to eradicate a 'pest' once it becomes established in the marine environment. Up until now most work has focused on monitoring the rate of spread and attempting to understand the effects of these introductions.

Recent experience has shown that it is possible to eradicate a 'pest' species, providing the population is discovered early enough, and as relatively few people ever see the underwater environment, it is important that every surveyor keep a look out for these species, and report them promptly.

In Peril Species

Many marine species in Australian waters are virtually unknown. For those that have at least been identified, there is precious little information regarding life history, ecology or population. The South Australian native species included in this kit are those that are considered to be of conservation concern. They are considered by this program to be 'in peril' because scientists do not have enough data to assess whether or not they are threatened or vulnerable.

Monitoring Kits

To aid intertidal monitors and divers in identifying species of concern, Reef Watch produced a kit that consists of three waterproof cards containing photos and basic information on how to spot these organisms. The slates are supplemented by an information brochure that goes into greater detail about the individual species and the program in general.

Each intertidal equipment kit includes a *Feral or In Peril* slate and brochure.
More information can be found at: www.reefwatch.asn.au

Glossary

Algae (plural) – Aquatic plant life that does not flower. They have been divided into three main groups based on their pigmentation: red, green and brown.

Aggregate sessile organism – Organisms that are found in large colonies attached to a substrate.

Benthos – Flora and/or fauna attached to or living on the bottom of the sea (Benthic *adj*.).

Catch per unit effort (CPUE) - The number of organisms found is the 'catch' and the time it takes to search the area is the 'unit effort'. The unit effort can be measured in time (e.g. ten minutes = one unit.)

Control organism – Organisms that provide a standard against which the results can be evaluated. The 'control' species have been included as these are not thought to be harvested. Over time these will allow us to distinguish whether any change in size and abundance of the target organisms is due to changing environmental factors or harvesting impacts.

Biodiversity – The variability among living organisms. This is considered from the gene level through to larger organisms and also includes the habitats and physical conditions in which they live. It incorporates diversity within species, between species and of ecosystems.

Diversity – The total number of species found in an assemblage, community or area.

Fauna – Animal life.

Flora – Plant life.

Foliaceous – Having leafy structures.

Gastropod – A mollusc found in the Gastropoda group. They move along by means of a muscular foot and the body is twisted around in its shell. They are found on land and aquatic habitats. Includes snails and slugs.

Haphazard sampling – A sampling method where the subject or position of sampling is chosen arbitrarily without using systematic or random sampling methods. There is no way to ensure that the estimates derived from a haphazard sample will be unbiased. An example of haphazard sampling would be to throw a quadrat anywhere and sample where it falls.

Intertidal – The shore area found between highest high tide and lowest low tide.

Line-intercept transect – A sampling method usually involving a tape measure and then recording the plants or animals that are found adjacent to the tape. This is a rapid, simple method that requires no removal of living material.

Macroalgae – Algae that is easily visible compared to microalgae, which requires a microscope for identification.

Mobile organisms – An organism that is able to move freely.

Mollusc – The largest of the invertebrates (animals with no backbone). They have a soft body and most have a hard shell; includes cuttlefish, limpets, oysters, mussels, gastropods. The majority are marine, but quite a number are found in freshwater systems.

Quadrat – A sampling method that has an enclosed area, more commonly a square shape. A grid system can also be included within the quadrat to aid in sampling.

Random sampling – The position of the sampling unit is placed using a randomisation procedure, with the position determined (before sampling starts) from random numbers. In our method, the quadrats are placed on the tape at intersections that have already been randomly selected as part of the method design. Randomising the position ensures that all numbers have an equal chance of being included and that no bias is introduced in the data.

Sessile organisms – An organism that is fixed in place.

Substrate – The surface to which an organism is attached or upon which it grows.

Subtidal - The shallow water zone, often only a few feet deep, which is influenced by tides but is never completely drained at low tide.

Target organism – Organisms of specific interest for surveying, many of which have been collected by harvesters for food and bait.

Tides - The periodic rise and fall of ocean water; produced by gravitational effects of the moon and sun on the oceans of the Earth.

Timed-search - Timed searches basically involve searching an area for the organism of interest within a specified time-frame. A CPUE can then be determined.