Indicator	Intertidal biota
Measure(s)	Transects from high tide line to water
Justification	The intertidal zone is affected by both terrestrial and marine conditions. The organisms within this zone will be some of the first to respond to climate changes and sea level rise.
Description	An area of rocky shore that is 30 metres wide stretching from the high water mark to the water is systematically sampled at low tide for sessile organisms, non-sessile (crabs, snails, etc.) and sea stars.
Measurement Frequency	Every 4 years
Protocol Source	Modified from PISCO - http://cbsurveys.ucsc.edu/sampling/sampling.html
Unit(s) of Measure	Various

Detailed Protocol *[include all relevant diagrams, pictures and worksheets]*

Locate an area of rocky intertidal that is accessible and safe. The best sites for this protocol have an intertidal zone that is between 10 and 40 metres wide. Extremely narrow or wide beaches are not suitable. The intertidal zone should be bedrock with few tidepools. The occurrence of boulders, or areas of cobble, gravels, sands or muds should be very low. Establish a permanent sampling plot that is 30 metres wide along the high water line (vegetative edge) with transects running down slope to the water.

Four permanent pins will demarcate the plot – 2 at the upper corners and 2 more half way to the water. If the slope changes direction, put the pins at the slope change and move the orientation of the plot (see diagram 1). Run a primary baseline tape between the upper pins. Start the tape at the left pin (looking upslope). The primary baseline locates the start of each transect. Next run another tape between the mid-slope pins. This is the secondary baseline, it intersects each transect serving to keep them parallel. Set up each transect by placing a tape starting at the primary baseline running downslope and across the secondary baseline. The first transect (T0) starts at zero metres on the primary baseline and runs passed the zero mark on the secondary baseline to the water. The next transect (T3) starts at 3 metres on the primary, over the 3 m measure on the secondary and so on. Working this out will result in 11 transects 3 metres apart and perpendicular to the high water line.

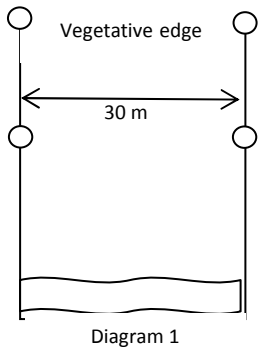


Diagram 1

Take a picture of the location with the tapes in place.

Beginning about 3 hours before low tide, carry out the following three sampling schemes. Plots are surveyed during appropriate lower low tides (<0.50 metre). More transects will be able to be sampled with more people involved and by strategically sampling the lower portion of the transects while the tide is at its lowest.

1. Sessile organisms (organisms that are attached to the substrate):

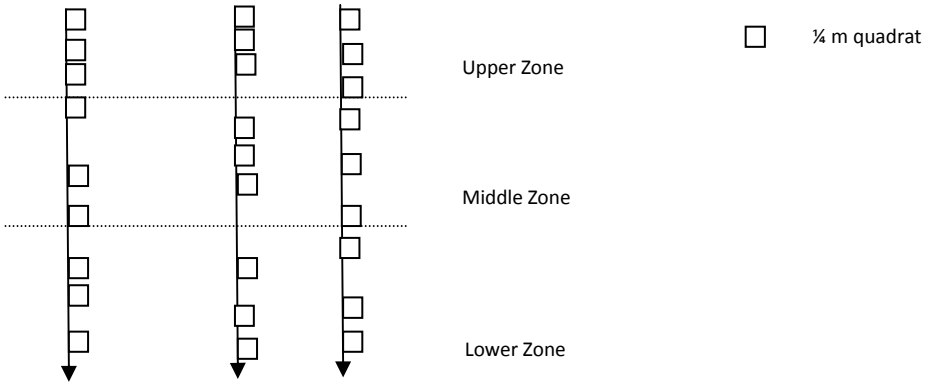
   Point contact method is applied to sample sessile organisms. At each sample point along the transect record the organism directly below the point. Up to 3 layers of observations are recorded as A top-layer, B mid, and C base. If there are less than 3 biotic layers the substrate is recorded and the nearest biota is recorded. Nearest biota has to be within a radius equal to ½ the sample interval. If more than 3 layers are present record just the top 3 layers.

   If the organism is attached the another organism rather than the substrate, indicate that it is an epibiont (E). If it has another organism attached to it, indicate that it is a host (H). If it is not immediately below the point, but just near, indicate near (N).

   The sample interval is predetermined based on the average length of the transects so that about 100 samples are collected on each transect. This means that for a site that is more than 10 m but less than 20 the sample interval is 10 cm, more than 20 m but less than 30 m the sample interval is 20 cm and so on. Choose the Transect Form that matches the interval you have selected.
   Sample points are recorded according to the transect and location. The first sample point on the first transect is T0 0.0 . If the plot is a 20m site then the second sample point is T0 0.2 .

2. Non-sessile (mobile) organisms:

   Divide the transects into upper, middle and low intertidal zones following the general pattern of zonation evident at the site. Randomly place a ¼ m2 quadrat along the transect in 3 random locations in each of the 3 zones (see diagram 2) on the right side of the tape looking shoreward. Count the non-sessile organisms within the quadrats. Identify as closely as possible using the field guide. Take pictures of organisms when necessary to help with the identification.



3. Seastars:

   Seastars are counted using the swath transect method. Standard procedures involve walking each transect searching in a 2 metre wide swath centered on the transect. Care is taken to intensively search cracks and crevices, and carefully counting individual sea stars. Observations

are recorded to the nearest 0.5 metre along each transect. Sea stars have been susceptible to a wasting disease during warm water years. This is usually identified by missing arms with frayed, rotten tissue or just a general look of soft, rotten flesh. Any observations of diseased sea stars should be noted on the data sheet using the disease categories described by the Vancouver Aquarium (http://www.vanaqua.org/files/2813/8636/7742/Disease_Category_Guide_2.0.pdf). All observed seastars are enumerated on a datasheet. Pisaster are counted and measured if any part of the animal is inside the swath. For each Pisaster measure the longest arm.

a. *Pisaster* are measured with a ruler from the center of the disc to the tip of the longest ray to the nearest 5 mm for animals <10 mm and the nearest 10 mm for larger sea stars. Often sizes have to be estimated because sea stars are wedged in tight spots with rays curved. A flashlight is used to see in cracks and overhangs. Sea stars are never "straightened" or removed from the rock.
b. Enter the disease category for all species. See guide: http://www.vanaqua.org/files/2813/8636/7742/Disease_Category_Guide_2.0.pdf
c. The color category (Purple, Brown, or Orange) is recorded for *Pisaster*.
d. Other species of seastars are enumerated only (*Pycnopodia helianthoides*, *Henricia leviuscula*, and *Dermasterias imbricate)*.
e. Observations of Gumboat Chiton, Northern Abalone and any other unusual fauna should also be recorded.

Walk throughout the entire plot looking for unusual organisms. Take pictures.

- Materials
  - Permanent pins and epoxy putty
  - Rock drill for placing pins
  - 7-10 30-50 m tapes
  - 2 1/4m^2 quadrats
  - Forms
  - Camera
  - Field guide
  - Forestry chalk
  - Metric ruler
  -
- Personnel Resources
  - 2 people minimum – more people will make it possible to do more transects in a single tide