



Directions

1. From Highway 1 take the Highway 68 West exit towards Pacific Grove. Highway 68 will wind through forests, and then into the town of Pacific Grove where 68 turns into Forest Avenue. Take Forest all the way to its' end at Ocean View Boulevard. Drive west on Ocean View Blvd. After Asilomar Avenue, continue 0.3 miles to where Ocean View Blvd. turns south (left) and becomes Sunset Boulevard. Park in the ocean-side parking area across the road from a dilapidated, cement foghorn building. There is a bench here looking out towards the point next to a large green cement block.

2. The sampling site is out of sight from the parking lot among the rocks that jut out to sea to the northwest. A corroded steel pipe emerges from the sand near the low tide level and extends out into the intertidal; this was Pacific Grove's sewer disposal line that was abandoned in the mid-1980s. Follow the pipe out into the rocks until you can climb up onto the isolated, flat, knoll that is covered with grasses and ice plants. Cross the knoll and descend on the other side, look to the left for a permanent tidepool. On the southwest (left) side of the tidepool is a rocky outcrop with a mussel bed on the south side. That outcrop has the vertical transect and the delineated area that we are sampling. See Figure 3.

3. There are restrooms along Ocean View Blvd. next to Crespi Pond at the golf course, see Figure 2.



Figure 1. The Point Pinos site, is along Ocean View Dr., near the Point Pinos Lighthouse.

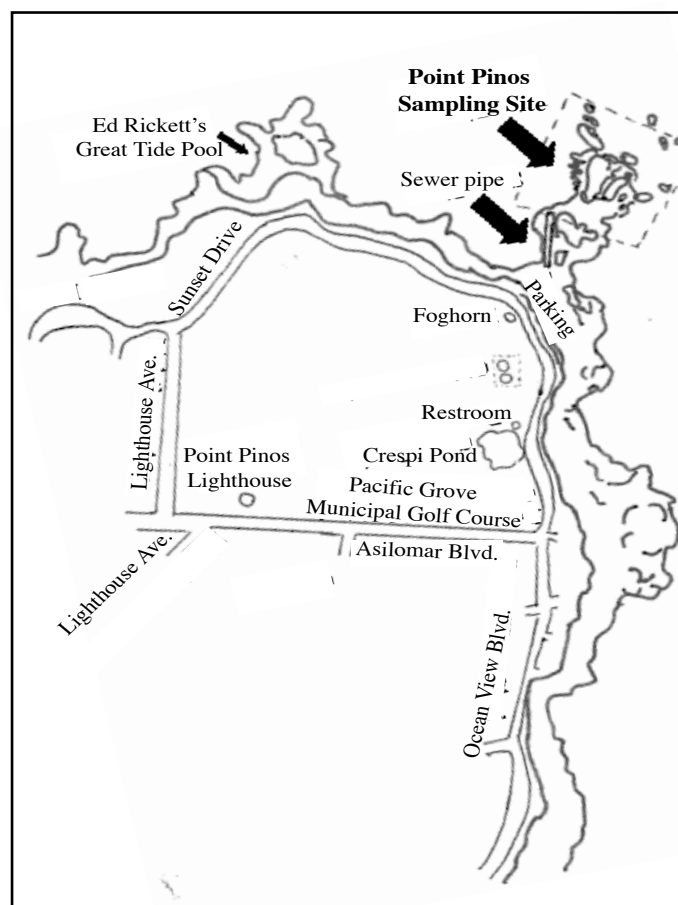


Figure 2. Hand drawn map of the monitoring area

Sampling Procedures

Three procedures are used at Point Pinos: 1) Vertical transect, 2) Size measurements for bat stars and owl limpets in a permanent area, and 3) Total organism counts in a permanent area .

Vertical Transect

The vertical transect is marked with two stainless steel eyebolts at 0 and 12m. The 0m eyebolt, is near the top of the nearly bare outcrop. The other, the 12m eyebolt, is 12 meters south at the beginning of the surfgrass bed. The GPS position of the 0m eyebolt is N 36° 38.281' W 121° 56.277' (dGPS, is N 36° 38.277' W 121° 56.273'). The GPS position of the 12m eyebolt is N 36° 38.282' W 121° 56.281'.

1. Center the quadrats over the transect tape at: 0m, 1m, 2m, 3m, 4m, 5m, 6m, 7m, 8m, 9m, 10m, 11m, and at 12m.
2. Record the species abundance within each quadrat as instructed on the data sheet. For algae, only the square(s) that contain the holdfast should be recorded. Count only live organisms, this may require some close investigation.

Size Measurements for Bat Stars

Bat stars (*Patiria miniata*): The Monterey Peninsula has an abundance of brightly colored 4-7 rayed bat stars. They vary in size, which might reflect age or food conditions (they are omnivorous scavengers) with few if any predators. They do not tolerate high temperatures and are absent in shallow water in southern California. A decline in their numbers could follow episodes of high temperatures while increases in smaller animals could indicate favorable conditions for recruitment.

There is a large pool west of the transect area that has consistently supported a large population of bat stars. These bat stars can be counted, measured, and their ray number recorded. Aberrant ray number (4, 6, or 7 rays) appears to reflect stress or damage when they were juveniles. The pool and area around it are strewn with boulders, and many of the bat stars are hidden under boulders so it will be difficult to get an accurate count. The precise edge of the pool is also difficult to determine, and many bat stars

occur stranded outside the pool. Teams of students should divide up the area of the pool into sectors and count all the bat stars they see, this will give a good estimate of the minimum number of bat stars.

Each team should collect up to 50 bat stars and record the number of rays and length of longest ray (from mouth to ray tip) for each. The bat stars can then be gently returned to where they were found.

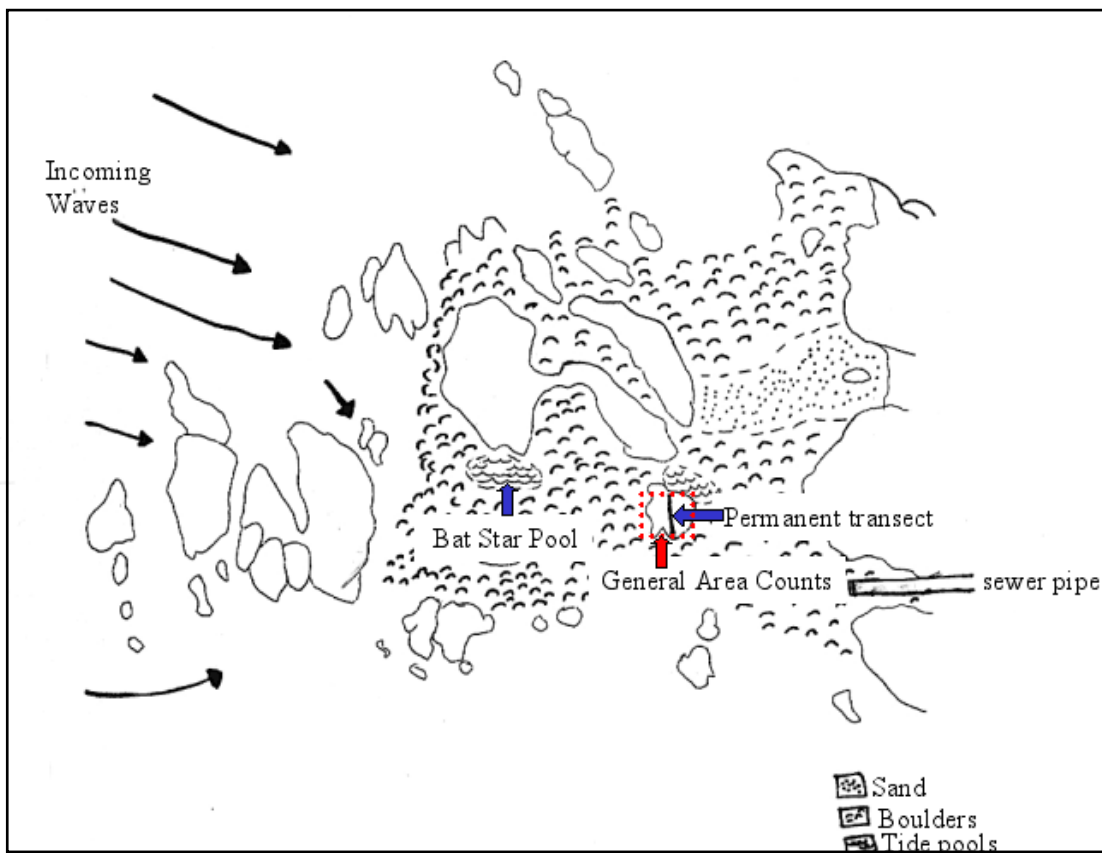


Figure 6. Closeup of monitoring area



Total Organism Counts and Size Measurements in a Permanent Area

Species counted are ochre sea stars, black abalones, and sea anemones. Teams of 2 or 3 students should tackle total organism counts for one species at a time. Systematically search the whole area by moving back and forth across it, searching successive swaths about the width of your outstretched arms.

There are 4 eyebolts marking the corners of the near-rectangle that delineates the areas for counting ochre sea stars and abalones. The GPS positions for these four eyebolts are N 36° 38.237' W 121° 56.276', N 36° 38.280' W 121° 56.277', N 36° 38.284' W 121° 56.281' and N 36° 38.290' W 121° 56.279', respectively. The areas of these delineated areas are, by species counted: abalones and ochre sea stars, 110m²; owl limpets, 40m²; and solitary sea anemones, 32m².

1. Ochre sea stars (*Pisaster ochraceous*): Both sea star color phases (orange and brown/purple) are counted. The orange color phase will be easy to spot, while the purple/brown phase will require close inspection of cracks, overhangs, crevices and under algae.



Ochre sea star

2. Black abalones (*Halitotis cracherodii*): To do an accurate count some scrambling and close investigation will be necessary. Look carefully in deep cracks and crevices and underneath overhangs. Look for the tell-tale black/blue/green shell.



Black abalone shell

3. Giant green (*Anthopleura xanthogrammica*) and sunburst (*Anthopleura sola*) sea anemones: Count anemones that are larger than 5 cm (or 2.5 inches) in diameter, and any that are large and solitary but closed. Count the solitary sea anemones in four 1x8m parallel bands that are placed perpendicular to the vertical transect at the 1.35m, 5m, 6m, and 11.5m marks. These bands were selected because they crossed areas with solitary anemones that were easy to see and count.



Owl limpet closeup



Sunburst anemone



Giant green anemone

Size Measurements in a Permanent Area for Owl Limpets

Owl limpets are counted and measured in a higher portion of the delineated area, above the 3m mark on the vertical transect.

Smaller owl limpets (*Lottia gigantea*) are sometimes difficult to distinguish from other species of limpets, therefore we only count and measure owl limpets equal to and above 2.5 cm in shell length. The length of each limpet is measured with a flexible ruler and recorded.