

Directions

1. This site is in Carmel on the south side of town. From Highway 1 take Rio Road towards the coast. Follow Rio Rd. up the hill past the Carmel Mission, to Santa Lucia, turn left. Take Santa Lucia all the way to the end where it turns into Scenic Road. Follow Scenic Road around the coast to the left and look for Ocean View Avenue. The site is in a small cove between the north point of Carmel Point and a large white house on the seaward side of the road called the Seaburst House at 26198 Scenic Road. Park along Ocean View in one of the turn outs. This is not an area for large buses, the roads are very narrow and winding. If you are on a large bus, park at the city's main beach and have the students walk over. See Figure 1.
2. The monitoring site is near the center of the cove, and can be reached by clambering down the slope next to the road and crossing the rocks on the inner part of the cove. The granite outcrop and alga-covered boulders are difficult to traverse; BE CAREFUL! See Figure 2.
3. There are no restrooms at this site. The closest restrooms can be found at Carmel River Beach, south along Scenic Road.

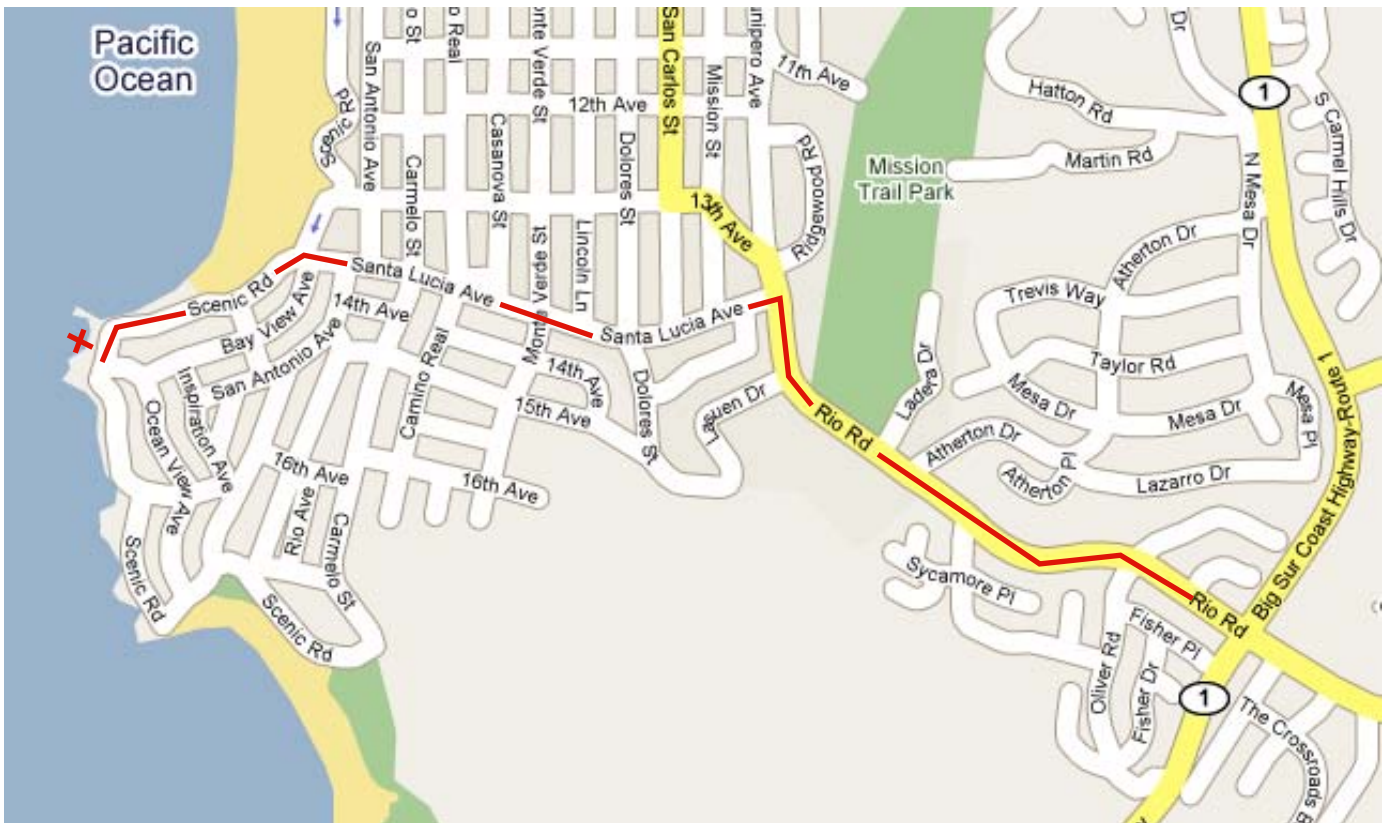


Figure 1. Map to the site at Carmel Point.

Sampling Procedures

Three procedures are used at Carmel Point: 1) Vertical transect, 2) Size measurements in a permanent area, and 3) Total organism counts in a permanent area.



Vertical Transect

The vertical transect is marked with 6 stainless steel eyebolts cemented into the rock. One is close to the center of the cove, in the nearly bare rock just above the extensive cover of rockweeds; it is the 0m mark of the vertical transect line. The others are at 9m, 18m, 24m, 33.5m, and 41m. The GPS locations of these 6 eyebolts are: N 36° 32.636' W 121° 56.033', N 36° 32.635' W 121° 56.039', N 36° 32.634' W 121° 56.048', N 36° 32.634' W 121° 56.056', N 36° 32.633' W 121° 56.057', and N 36° 32.635' W 121° 56.062', respectively.

1. Center the quadrats over the transect tape at: 0m, 4m, 8m, 9m, 11m, 18m, 24m, 29m, 33.5m, 35.5m, 39m, and 41m.
2. Record the species abundance within each quadrat as instructed on the data sheet. For algae, only the square(s) that contain a holdfast should be recorded. Count only live organisms, this may require some close investigation.

Size Measurements in a Permanent Area for Owl Limpets

The permanent area for owl limpets is the same as the Total Organism Count area for sea stars, sea anemones and black abalones. The total area covered is 74.3 m².

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. Most of the owl limpets in the delineated area at Carmel Point are around the 24m eyebolt, others can be within or near other mussel-dominated areas too. Look for cleared areas in the mussels beds, these might be owl limpet “farms”.

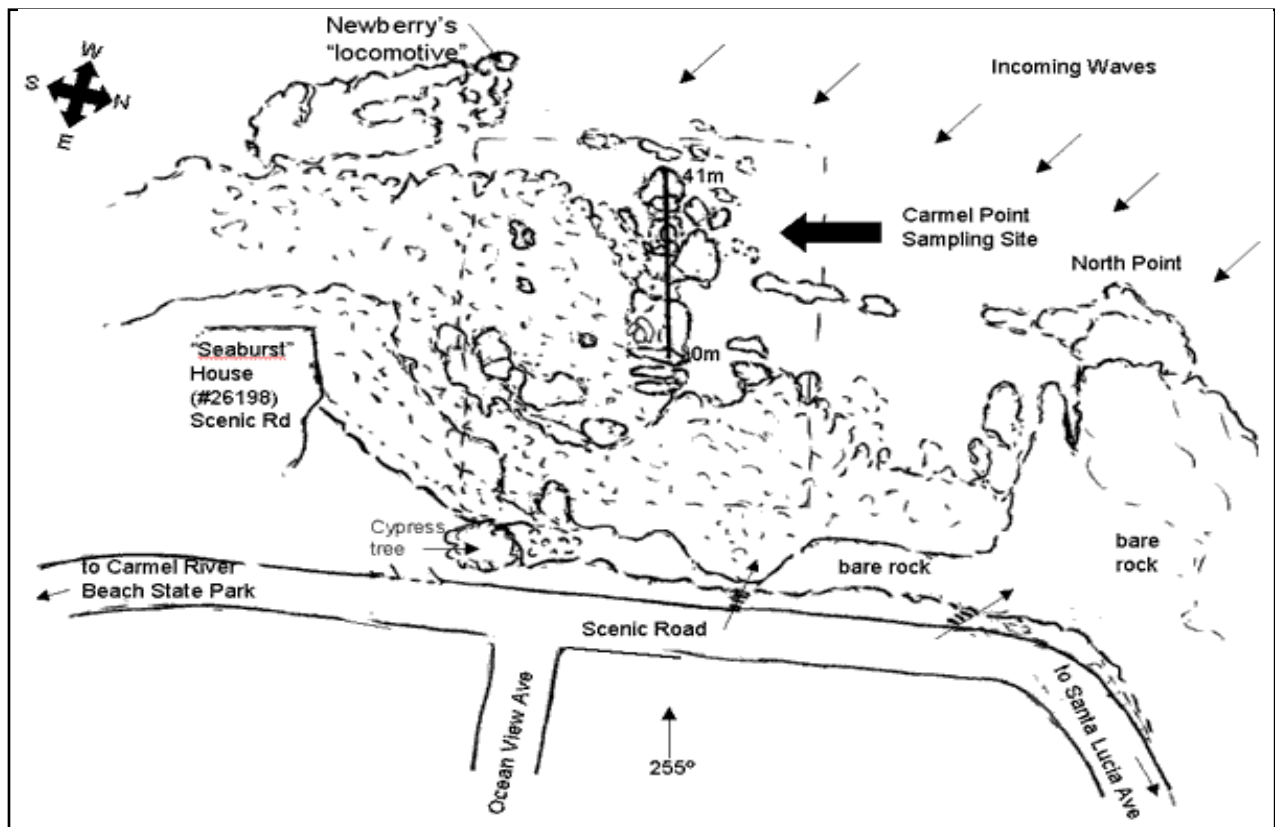


Figure 2: Hand drawn map of the monitoring area

Total Organism Counts 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.

The area where solitary sea anemones, abalones, owl limpets and ochre sea stars are counted is marked by 4 stainless steel eyebolts. Two are on each side of the 22m mark on the vertical transect, 2.35 m to the north and 3.25m to the south. The other two are on either side of the 35m mark on the vertical transect, at 2.35m to the north and 3.25m to the south. The vertical transect bisects the area into north and south plots. The GPS locations of these 4 eyebolts are: N 36° 32.632' W 121° 56.051', N 36° 32.633' W 121° 56.057', N 36° 32.635' W 121° 56.060', and N 36° 32.663' W 121° 56.052', respectively. The total area covered is 74.3 m².

1. Ochre Sea Stars (*Pisaster ochraceus*): 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.

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. We were able to find 80 (45 in the north block, 35 in the south block) in our counts in January 2003.



Figure 3. Ochre sea star (left), and a black abalone (right).



Figure 4. Closeup of an owl limpet.

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. Many of the large anemones that are covered with water will be open, but those out of the water will mostly be closed.

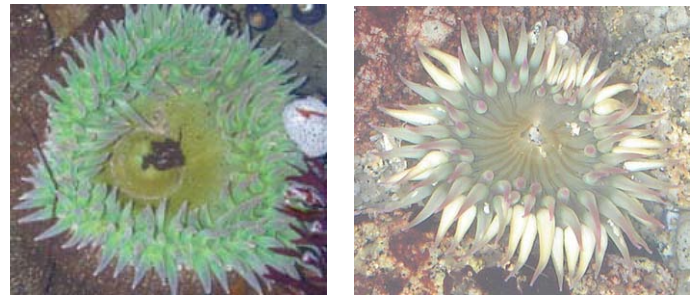


Figure 5. Giant green anemone (left), and sunburst anemone (right).



Figure 6. The Carmel Point site viewed down the vertical transect from the 0m eyebolt to the 22m eyebolt; the transect extends beyond to 41m.