

1 m Quadrats

Purpose

To determine the abundance (density) of selected sedentary indicator species

Materials

- 2 dive slates with pencils
- 2 underwater 1 m quadrat data sheets (Appendix K)
- 4 3-sided PVC 1 m square quadrats

Personnel

- 2 SCUBA equipped observers experienced in the identification and search image needed for species listed in Table 4.

Methods

Divers will sample twelve points along the transect line. The points are systematic with a random starting point. At the start of each field season new sampling points must be randomly selected. The initial sampling point (a number between 0-7) is chosen using a randomized selection method. That number will be the meter mark for the first quadrat placement. The subsequent sampling points along the line are at 8.33 m intervals rounded to the nearest whole number (8 m, 17 m, 25 m, etc). Each sampling point is recorded consecutively on the top of the data sheets corresponding to quadrat 1,2,3 etc. This systematic set of numbers with a random start will be the same for all sites sampled throughout a field season.

Each diver is equipped with two three-sided meter square folding quadrats. Divers should work on opposite sides of the transect (A and B in figure 2) using the transect line as the fourth side to each quadrat. Position the quadrat so that one leg is on the predetermined sampling point and place the other leg on the next greater meter number (Figure 2). The divers place one quadrat on the first meter mark (meter #3 below) listed on the data sheet and then proceed down the transect line to the next meter number (meter #11 below) on the data sheet and position the other quadrat in the same manner. The divers then return to the first pair (A₁ and B₁) of quadrats placed along the transect line to begin sampling. Divers may cause island kelp fish and gobies to retreat into crevices, therefore approach the quadrats slowly to minimize disturbance to these indicator species. Count fish first within the quadrat. Once they are counted, do not count additional fish that swim into the quadrat. Be sure to search under ledges and in cracks for organisms but do not conduct invasive sampling.

The purpose of using two quadrats in this methodology is so that while one quadrat is being sampled, the other quadrat is already in place for at least a minute or more allowing for any previously disturbed fish to reemerge for counting. In high surge conditions it may not be possible for a quadrat to remain in place. In these conditions, the lead biologist will decide whether or not to abort this protocol or in some cases where the indicator fish species are extremely rare or not present, one quadrat can be used. In the latter case, divers should take extra caution to sneak up on the quadrat location and look for indicator fish species while the quadrat is being placed so if they are disturbed then can still be counted.

On each quadrat, each diver covers an area of 1 m x 1 m. Add adjacent quadrats (Count A and Count B) from both divers to produce a sampled quadrats of 1 m x 2 m at each of the 12 points.

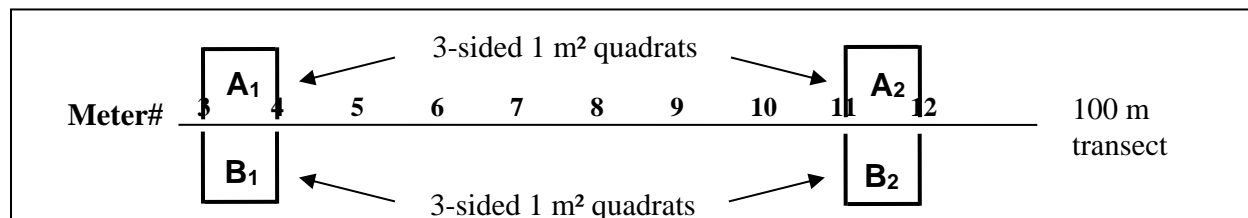


Figure 2. Proper placement of 1 m quadrats.

Sometimes it is necessary to clean off the pebbles and shells that hide organisms in order to identify them, however, do not conduct any invasive sampling (i.e. do not turn over rocks and do not remove organisms unless necessary for identification purposes). Combine counts of adults and juveniles for all species except algae. Record the density of juvenile and adult algae separately. See the “Organisms Sampled” section below for the definitions of adult and juvenile algae.

After the first set of quadrat counts are completed, move the first quadrat to the third meter number listed on the data sheet. Swim carefully around the other set of quadrats, keeping at least one meter to the outside of the quadrats so as not to disturb fish in the quadrats. After positioning the third set of quadrats, return to the second set (A₂ and B₂ in the figure above) and begin by counting the fishes. Repeat this cycle until each diver has sampled twelve 1 m x 1 m quadrats.

After returning to the surface, check your own and each other’s quadrat sheets for readability and data outliers. Rinse the data sheets, allow them to air dry and store them in the completed data sheet notebook. The raw data sheets will be used for data entry in the office.

At the bottom of Table 4 is a list of “write-in” species. These species are only present at a few sites in high enough densities to warrant counting on quadrats. In addition, there is not enough room on the datasheet to include them all. The lead biologist may instruct divers to collect quadrat data for one or two of these species prior to the dive. The divers collecting quadrat data can also decide to count a “write-in” species after assessing the site at the beginning of the dive. However, it is important that the divers communicate to each other to count the write-in species. Both divers must collect density data for the write-in species in all 12 quadrats in order for the data to be used. The species name can be written in the blank row at the bottom of the quadrat data sheet.

Time Required

Approximately 120 minutes of bottom time are needed. Experienced biologists sampling in an area of low species diversity and/or abundance will take less time.

Table 4. Organisms sampled on 1 m quadrats.

Species Name	Common Name
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Fishes

Lythrypnus dalli
Rhinogobius nicholsii
Alloclinus holderi

bluebanded goby
blackeye goby
island kelp fish

Algae

Macrocystis pyrifera
Macrocystis pyrifera
Macrocystis pyrifera
Laminaria farlowii
Laminaria farlowii
Eisenia arborea
Eisenia arborea
Pterygophora californica
Pterygophora californica
Sargassum horneri
Sargassum horneri

giant kelp (juvenile = less than 1 m tall)
giant kelp (adult = greater than 1 m tall)
giant kelp stipe count (greater than 1 m tall)
oar weed (juvenile = less than 10 cm wide)
oar weed (adult = greater than 10 cm wide)
southern sea palm (juvenile = single blade)
southern sea palm (adult = multiple blades)
California sea palm (juvenile = single blade)
California sea palm (adult = multiple blades)
sargassum (juvenile = less than 0.5 m tall)
sargassum (adult = greater than 0.5 m tall or
reproductive receptacles present)

Invertebrates

Astraea (Lithopoma) gibberosa
Megastraea (Lithopoma) undosa
Tegula regina
Centrostephanus coronatus
Cypraea spadicea
Strongylocentrotus franciscanus
Strongylocentrotus purpuratus
Patiria (Asterina) miniata
Pisaster giganteus
Parastichopus parvimensis
Styela montereyensis

red top snail
wavy top snail
queen tegula
Coronado urchin
chestnut cowrie
red sea urchin
purple sea urchin
bat star
giant spined sea star
warty sea cucumber
stalked tunicate

Additional "Write-In" species:

Undaria pinnatifida

Wakame (juvenile = less than 0.5 m tall, reproductive
sporophyll absent)

Undaria pinnatifida

Wakame (subadult = greater than 0.5 m tall and not
reproductive [can have frills on either side of blade
above the holdfast, but lacks mature, dark brown
sporophylls])

Undaria pinnatifida

Wakame (adult = greater than 0.5 m tall with well
developed/reproductive sporophyll)

Agarum fimbriatum/Dictyoneuropsis reticulata

Agarum fimbriatum/Dictyoneuropsis reticulata
