

**QUADRAT/TRANSECT SAMPLING:
habitat characterization in the Santa Cruz inter-tidal**

INTRODUCTION:

Random sampling:

First, a word about random sampling. What is outlined below is a variety of ways to count animals, estimate density and characterize an area. Since we can neither count *everything*, nor map the *entire area*, we are left with a decision: where should we sample, and how often should we do it? The first question is answered in part with random sampling. The second often needs an initial data set to be answered.

Random sampling in theory assures that all areas within a site have an equal opportunity of being sampled. This removes potential bias by the researcher, as we tend to focus our attention on the most beautiful, or most 'different' habitats and organisms. By placing the transect and *randomly* designating an area within it to focus the counts, we limit bias, and get a better representation of the population we are studying. For example, you may be a fish watcher. On an average dive, you may swim quickly looking for fish, and notice schools of them. You may get the impression that fish are quite numerous at that site. If you choose transects though, and limit your field of view, you may soon realize that the fish are actually not very numerous, but are distributed in a clumped or patchy fashion.

All sampling methods described below are non-destructive, and include the collection of *quantitative* and *qualitative* data.

Please be aware of your own comfort and the ocean conditions. The ocean can be unpredictable. Never turn your back to the ocean, and do not get too close to dangerous areas to better count your organism(s). A good habit is to sit for awhile before beginning sampling close to the ocean, and just watch the ocean. Get a feeling for what the waves are doing, time the sets of waves, and wait long enough for the 'big ones' to roll in if there are any (5-10 minutes is a good rule of thumb).

Slates and data sheets

Slates and data sheets need some extra attention in the field. Make sure the data sheet remains attached to the slate. If the sheet becomes unsecured, or if any equipment is dropped, do not bother to chase it if it jeopardizes your safety in any way. You can avoid some potential problems with renegade data sheets by using surgical tubing or strong rubber bands to hold the bottom of your data sheet (the top is usually secured by a large clip etc.). Hold your slate in your hand or secure it close to you. Do not set your slate down near the water and leave it unattended!

Minimizing disturbance

We are attempting to learn about our intertidal world in this project; and that involves leaving as little evidence of our presence as possible. Researchers will always have an impact, but we can minimize it. The best way is to avoid dislodging a plant or animal right after you have counted it, and watch where you place your feet. When counting invertebrates, take care not to displace or dislodge them, and if you do, put them back as you found them if possible.

Random transects. We will be laying our transects by intertidal zone (this is call *stratified* sampling). Start at the lowest zone closest to the water. Lay the transect out 5 meters (~15 feet).

Important points

- Don't walk over the area before you do counts or percent cover
- Don't look away from the ocean when you count
- Look carefully for organisms, making sure to look into any crevices within your transect/quadrat.

MATERIALS NEEDED:

Transect, quadrat, random number table, GPS (if available) clipboard and data sheet, pencil (pens don't work well in the field), good shoes, sunscreen, warm clothes, identification books/keys, collecting buckets and computers.

OBJECTIVES:

When you have completed this lab exercise you should be able to:

1. Define terms and concepts applied to field sampling and habitat characterization
2. Identify major species or phyla found in the field
3. Use a table of random numbers
4. Correctly collect data using the quadrat/transect technique
5. Describe at least two different methods of estimating abundance, and state when it is appropriate to use each.
6. Use computers to analyze and present your results from the field.

METHODS:

Observations

Familiarize yourselves with the environment, and choose target organisms to sample (as a large team since we all need to sample the same organisms the next time we go out). You will:

- Choose the organisms, and spend time learning how to identify them and some of their natural history traits. You will need to come up with why you chose those organisms. Think about functional groups, trophic relationships, predator/prey interactions, niches, and environmental forcing. Place your organisms into a theoretical model reflecting trophic relationships (a food web). You'll need to do this for 3 or 4 intertidal zones (depending on how many we have access to...)
- Notice and write down the major biotic and abiotic factors affecting this community.
- Do some practice transects to make sure you have the right sampling dimensions and protocol
- Do some practice percent cover estimates to make sure we are all getting similar estimates

Data Collection

Percent cover: quadrat/transect method (one meter squared or 1/4 meter squared quadrat is generally used)

Percent cover of algae will be estimated using square quadrats placed randomly along a 5 meter transect line within an intertidal zone. Percent cover will be estimated for algae and encrusting sessile invertebrates.

One quadrat will be used by both investigators (data will be compared to verify consistency between data collectors). Place the quadrat at the first randomly chosen number, corresponding to a distance along the transect. Both of you will independently survey the quadrat for percent cover of organisms. Percent cover will be estimated by both you and your partner independently and then compared (if you are not close, its time to practice a bit). Plants and animals will be placed in general categories such as 'fleshy red algae', 'barnacles' etc. so identification to species will not be necessary in most cases.

Invertebrate counts:

Counts will be used to estimate density of mobile invertebrates or larger sessile invertebrates such as sea stars, crabs, urchins, some mollusks, and solitary anemones. Use the same quadrats as used for percent cover estimate, but count instead of estimate cover. Count the total number of specified invertebrates in the quadrat (or count an area and estimate density for the whole quadrat. For example count 10 individuals, and estimate how many sets of 10 are in quadrat). Pay attention to animals that may be in crevices, or hiding under plants, and be sure to count them too.

WRITE UP: Use the format described (intro, significance, methods, results, discussion, conclusion etc.)

1. Enter your data into the computer in a spread sheet, and calculate mean and standard deviation for each of the categories sampled. *Do this for your data, and the class data lumped together.*
2. Graph the organisms by zone, *using the class lumped data.* (include standard deviation where appropriate) and do some comparisons (this will likely require several graphs as some organisms were assessed using percent cover while others were counted, and of those counted, some were in the 1-10 numbers while others were in the 50-200 numbers). Put as many organisms as appropriate on one graph to be able to compare. Graph appropriate to scale. The organisms assessed with percent cover will be a separate graph than those counted.
3. Explain your graphs. Are there any noticeable trends? What factors could have contributed to these trends? List the major biotic and abiotic factors leading to the characterization of this habitat.
4. Select a few organisms that you feel tell a story about zonation in the intertidal. Use these graphs to tell the story (including *why* we see these trends), and develop your discussion around them. In particular, address the biotic and abiotic factors that contributed to these particular trends. Use the qualitative data (the presence/absence of organisms you saw along your transect line), to help in your discussion.
5. Based on the data you collected, and your analysis of it, propose a question (or two) you could pursue to explain zonation (or at least a component of it).
6. Discuss problems with our sampling methods. What kinds of things are *not* being addressed by our sampling? What assumptions are we making? What inaccuracies were inherent in our methods?

LOOK AT THE LAB REPORT RUBRIC FOR GUIDANCE!