Documenting Plants & Animals in Each Habitat

STEP 25: UNDERSTAND THE QUADRAT SURVEY METHOD

It is not possible to count all the plants and animals in a habitat unit, since the habitat unit could be quite large and probably contains thousands (if not millions) of organisms. Therefore, we need to take samples of each habitat unit and identify and count only the most relevant organisms in these samples. From these samples, it is possible to make estimates of the number of relevant organisms in the whole habitat unit.

We use the quadrat survey method, which allows a small section of a habitat to be isolated and looked at more closely. A quadrat is a small area, in this case 25- x 25-cm square or 50- x 50-cm square. By looking closely at the organisms in a quadrat we are sampling, we are assuming that those plants and animals inside the quadrat are representative of (or much the same as) what is outside the quadrat. It is like sampling a piece of cake – you assume the rest of the cake is the same as the sample you tasted. In this step of the survey, you will look closely at a number of quadrats systematically located in each habitat.

It is important to follow the same procedure in all habitats of the same type. If you want the results to be comparable across years, you need to follow the same procedure on each sampling over time. This means sampling the same number of quadrats in all habitats of the same type in all survey years.

HOW TO MAKE A QUADRAT

Quadrat square frames can be made by connecting four equal lengths of PVC pipe or wood, or by bending rigid wire. Check to make sure inner measurements are either 25 cm or 50 cm a side.

Materials Needed

- long rope
- 50-m measuring tape
- quadrat markers that won't blow away, such as spray-painted rocks (use non-toxic water soluble paint) or blocks of wood
- one or more quadrats

HOW MANY QUADRATS SHOULD YOU SAMPLE PER HABITAT?

Each quadrat is one sample. In general, the more quadrats you sample the more likely your data will be a true measure of the whole habitat. For statistical reasons, you should sample at least six quadrats in a habitat; but you need not sample more than 15 quadrats because there is little more accuracy to be gained from further sampling. When deciding on the number of quadrats to sample in a habitat, 15 obviously would be best, but you will need to consider how much time you have and the size of the study team. The advantage of sampling each habitat separately is that you can maximize your efforts in habitats with lots of life by sampling more quadrats (e.g., boulder, sand, mud, and any habitat near the low tide) and minimize your effort in habitats with little or few organisms (e.g., bare bedrock, sand, pebble, shell near the top of beaches). See Table 2 for an estimate of the amount of time required to sample one quadrat.

STEP 26: CHOOSE A QUADRAT SIZE

Use the same quadrat size for all quadrats sampled within a habitat unit.

Record "25" if the quadrat is a 25- x 25-cm quadrat or "50" if it is a 50- x 50-cm quadrat.

The size of the quadrats will be determined by the type of substrate found within the habitat.

If the substrate is soft so that you can dig into it, use a 25- x 25-cm quadrat (inside dimensions). The small size of this quadrat reduces the area you will disturb when digging in the substrate; it also minimizes sorting time.

If the substrate is hard, it is only possible to look at the surface. Use a 50- x 50-cm quadrat (inside dimensions).

WHY IS IT IMPORTANT TO RECORD QUADRAT SIZE ON FORM 3?

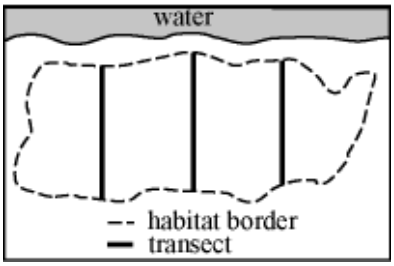
Quadrat size is needed to determine the number or density of plants or animals in a quadrat, and to estimate the number in the whole habitat unit. For example, if you find 10 purple shore crabs in a 25- x 25-cm quadrat, you could say that habitat has four times as many purple shore crabs than if there were 10 purple shore crabs in a 50- x 50-cm quadrat. A 50- x 50-cm quadrat is four times as big as a 25- x 25-cm quadrat, because it is twice as long and twice as wide. You must be consistent about the size of quadrat that you use in all habitats of the same type and in all subsequent surveys of the study area. If you don't, your data cannot be compared across years as readily.

Record quadrat sizes on **Form 3** beside **Quadrat Size**.

Where to Record Data

FORM	HEADING
3	Quadrat Size

STEP 27: LAY OUT TRANSECTS AND QUADRATS



You need to figure out where to place the quadrats in each habitat unit. Quadrats are laid out along straight lines called transects. These transect lines are laid out equal distances apart across a habitat unit, and then the quadrats are placed equal distances apart along each transect line.

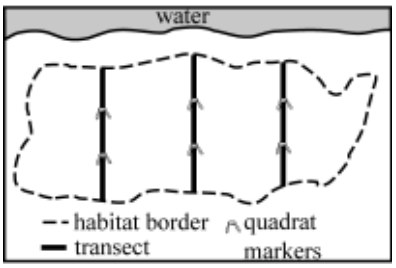
If possible, avoid having transects run through tidepools. The sampling methods you are using are not ideally suited for sampling plants and animals in water. Do the best you can to avoid tidepools, but if you cannot avoid it, make notes of which quadrats end up in tidepools.

- Measure the habitat length.
- Divide the length by four to determine where to put three transect lines that will run the width of the habitat unit. (Divide the length by five to place four transect lines and so on). The transects should be spaced evenly from each other and from the borders of the habitat unit. Use the baseline to help line up transect lines. You don't have to lay out ropes for the actual transect lines. On the beach use the long tape measure as a transect line, and lay out the quadrat markers along it. Then move the tape measure to the next transect position and lay out the quadrats along it.

  Example: You measure your sea lettuce habitat unit and determine that the maximum length is 50 m. To position the three transects, divide the 50 m by 4: $50 \div 4 = 12.5$. The first transect line will be 12.5 m from the border of the habitat, the next at 25 m and the third at 37.5 m.

- Decide the total number of quadrats you plan to sample, and space them equally along each transect. You must have the same number of quadrats on each transect.

Example: If you planned to sample six quadrats and you have three transects, then you will need to place two quadrats on each transect. Divide the width of each transect by three to determine the spacing of the quadrats. For example, if the transects were 12 m, 15 m, and 9 m wide, respectively, then you would place your quadrats roughly 4 m, 5 m, and 3 m apart on each of these transects.



- It takes two to three people to lay out the quadrats. Two people hold a long measuring tape (the transect line) while a third person places a painted rock or block of wood (or some other bright object) at each point along the transect line where sampling should occur.

- Position the centre of the quadrat within 30 cm of each spray-painted rock, block of wood, or small traffic cones. Make sure that quadrats do not overlap.

- Sketch the position of transects and quadrats onto your sketch map, **Form 4**. Record the number of quadrats that you sampled in each habitat unit on **Form 3** beside **Number of Quadrats**.

Lay each quadrat into position only when you are ready to start surveying within that quadrat. If you are working in a habitat unit by yourself, use only one quadrat. Place it in position, assess its contents, then put it at the next point, assess its contents, and so forth. If you have several people conducting the survey, individuals (or teams) can use different quadrats at different survey points at the same time. Be careful not to trample the study area, particularly the quadrat site location.

STEP 28: ASSIGN QUADRAT NUMBERS

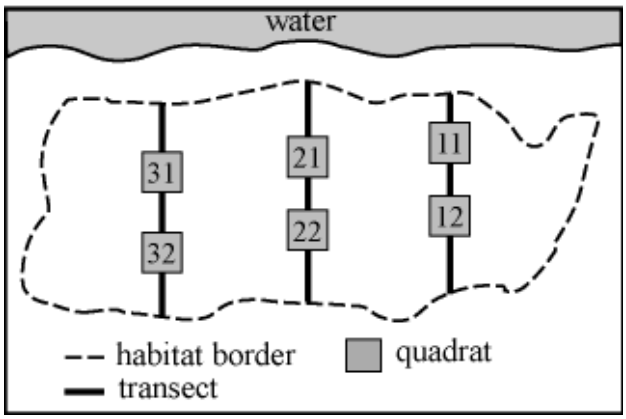
Where to Record Data

FORM	HEADING
3: Part 2	Quadrat Number

Each quadrat needs its own number to indicate where it is located in the habitat unit. Each quadrat number has two digits.

The first digit indicates on which transect the quadrat is located. If you are facing the water, transect number 1 is the furthest transect to your right, the next one being number 2, etc.

The second digit indicates where along the transect the quadrat is located. The quadrat closest to the water is number 1, the next one up is number 2, etc. For example, quadrat number 22 is the second one up from the water on the second transect from the right.



STEP 29: IDENTIFY SUBSTRATE LEVEL

There may be as many as three substrate levels that when you are sampling in a quadrat you will need to search through for plants and animals. These are:

- the surface of the substrate;
- beneath moveable objects;
- down within the substrate.

When you identify a species and estimate its abundance (how much or how many), you need to document how many were on the surface, beneath moveable objects, or within the sand or mud.

Identify and count the organisms on the surfaces of the substrate first, including those on all surfaces of algae. Then look under any moveable objects like rocks and boulders and pieces of wood. Finally, dig down into the substrate if it is loose enough to allow digging.

Respect that this is home to many animals and plants; leave as little trace of your work as possible. When you are finished, carefully replace any excavated materials and organisms back into the hole, smooth out the surface of the substrate, and replace all moveable objects and organisms back into their original positions.

SUBSTRATE LEVELS

On the surface of the substrate (S): The surface of the substrate is all exposed surfaces of all materials that are exposed to sunlight in the quadrat. It includes the base substrate such as sand, mud, gravel, or rock, and the tops and sides of any objects that lie on top, including rocks, algal fronds that become suspended when underwater, and wood that was floating at high tide.

Where to Record Data

FORM	HEADING
3: Part 2	Substrate Level

Materials Needed

- dishpan
- pail
- garden trowel for loose substrates
- short measuring tape
- sieve; 20- x 20-cm with 5-mm (or 1/4") gauge screen, or a white plastic pasta strainer of a similar gauge for loose substrates

Explore all surfaces of all substrates. This includes carefully and gently searching through any vegetation, because many animals crawl on or hide below the fronds of algae.

Beneath moveable objects (B): Moveable objects include rocks and logs that are small enough to be moved easily by one person, but are heavy enough that they are not readily moved by recent wave action. These objects provide important habitat for many intertidal animals that are normally hidden.

Carefully raise the objects within the quadrat one by one.

Identify and count the animals beneath one object and then proceed to the next object. If an object lies partly in and partly out of the quadrat make sure you only identify and count organisms beneath that portion of the object lying inside the quadrat.

Replace the objects as quickly and carefully as you can.

Within substrate (W): If a substrate is loose, such as mud, sand, pebbles, or cobble, search down in the substrate for organisms.

Dig down to at least 10 cm across the whole quadrat using a small trowel. Use a measuring tape to make sure you dig to 10 cm. A depth of 10 cm will allow you to find most burrowing animals. Some species, however, such as ghost shrimp and some clams, are found much deeper than this. You may, therefore, choose to search deeper. Record the depth you plan to dig to on **Form 3**.

You must be consistent and dig to the same depth in each quadrat in this habitat and in any other habitats in your study area that are of the same type. If you are not consistent, it may not be possible to compare your data with future survey data from your study area.

Gently sift through the excavated material using a sieve with a 5-mm (or ¼") gauge screen. The sieve will allow the substrate to pass through the screen while trapping objects 5 mm or larger. If you are digging in mud you may need to add water to help the mud percolate through the sieve.

Sort through the trapped material in search of animals such as clams and worms.

Identify and record the number of each species and then put the animals back as quickly as possible.

HOW TO MAKE A SIEVE

You can make a sieve by attaching a length of 5-mm (or 1/4") gauge metal screening called hardware cloth (available at most hardware stores) to a 20- x 20-cm wooden frame. Make sure the steel is galvanized or it will rust out in a few weeks.

It is important that the sieve mesh size you choose is consistent from year to year at your site.

STEP 30: IDENTIFY PLANTS AND ANIMALS

Where to Record Data

FORM	HEADING
3: Part 2	Mobility Category

In this step you are going to classify what you find in your quadrat. Each organism will be classified by its **mobility** and then identified by **species:**

IDENTIFY PLANT/ANIMAL MOBILITY CATEGORY

Record the mobility category to which a plant or animal belongs using the codes listed below.

Mobility is the degree of movement that an organism has.

Animals: attached to something (**a**), mobile (**m**), dead (**d**).
Plants: attached (a), dead (d).

(m) mobile animals: animals that can move. They can flee from predators, search for food, and roam from place to place.

(a) attached plants and animals: organisms that remain fixed to the substrate as adults. All plants are attached, as are animals such as barnacles, oysters, mussels, and anemones. While mussels and anemones are capable of moving from place to place, their movements are usually extremely slow and limited to a small area, resulting in their attached classification.

(d) dead plants and animals: For the purposes of this Guide, any unattached plant, be it a whole plant or a portion of a plant, is classified as a dead plant even though some algae species may frequently exist in an unattached state. Classifying living mats of unattached sea lettuce and rockweed as dead recognises that they do not form stable structural habitats for other intertidal plants and animals, and so distinguishes them from attached plants.

For a dead animal to be classified as such, at least half of its body must be found. For example, a dead starfish missing two of its arms would be classified as a dead animal, but an arm by itself would not. Empty crab shells are not classified as dead animals because these are often moult shells discarded by crabs as they grow, and empty snail

or clam shells persist for long periods and can be moved by the tides from where the animal actually lived. In the case of shells, these should only be recorded as dead animals if animal tissue is still attached to the shell indicating a recent death.

IDENTIFY PLANT/ANIMAL SPECIES

Species is the term that indicates specifically what plant or animal you have located. Each plant and animal species has its own scientific and often a common name. You will find these names in your field guides. (If not, find a different field guide.) The species category indicates the detailed features of an organism such as size, shape, colour, etc., that distinguishes it from all other organisms. Individuals of a species are very similar to each other and typically can only breed successfully with members of their own species.

Where to Record Data

FORM	HEADING
3: Part 2	• Common Name • Latin Name

WHAT TO DO IF YOU CAN NOT IDENTIFY A PLANT OR ANIMAL IN THE FIELD

If you can not identify a plant or animal in the field, record an "x," followed by a temporary name (for example, black snail), and put one or two individuals into a plastic ziplock bag, freeze it, and keep it frozen until you can get it identified. Label the bag with the temporary name of the plant or animal, the name of the study area, the habitat unit, and the quadrat number. If you are later able to make a positive identification, replace the temporary name with the proper species name. If you cannot positively identify the species, replace the temporary name with the name of the species you think is closest to your sample, followed by a question mark. Since removing plants and animals from the shore usually kills them, you and your team should try your utmost to use all your field resources to identify organisms in the field.

Materials Needed

- field identification guide
- plastic ziplock bags

Where to Record Data

FORM	HEADING
3: Part 2	• Coverage Code • Count

STEP 31: ESTIMATE PLANT/ ANIMAL ABUNDANCE

Abundance is simply the number or amount of plants and animals present. The way you count or estimate the abundance of a plant or animal species depends on the Mobility Category it belongs to. If you have mobile or dead animals that would be mobile if alive, you count them. But, attached animals often occur in patches having thousands of individuals and plants spread out over the surface. In these cases counting is next to impossible, so we estimate the amount of space they take up inside the quadrat. This value is known as percent cover.

The following gives more details.

HOW TO ESTIMATE PERCENT COVER

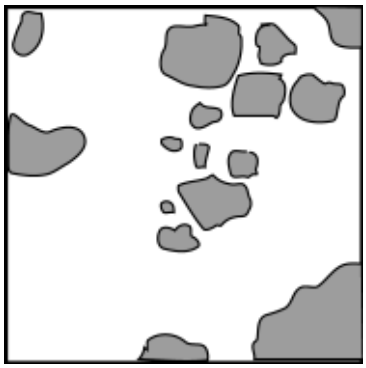
This covers attached plants, attached animals, if numerous, and dead plants.

Estimate the amount of space they occupy on the substrate using the chart below and diagrams beside. For example, any species within a quadrat that covers more substrate than that shown in the first illustration, but covers less substrate than that shown in the second illustration, would be between 25% and 49% cover, and we call that (c) common. Keep your estimates of percent cover to live plants or attached animals separate from estimates of dead ones.

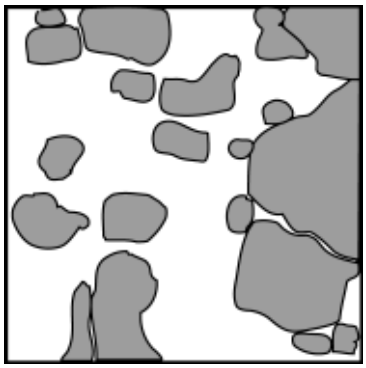
The abundance categories are as follows:

Abundance	Category/Letter Code
less than 25% cover	few (f)
25% to 49% cover	common (c)
50% to 75% cover	abundant (a)
more than 75% cover	dominant (d)

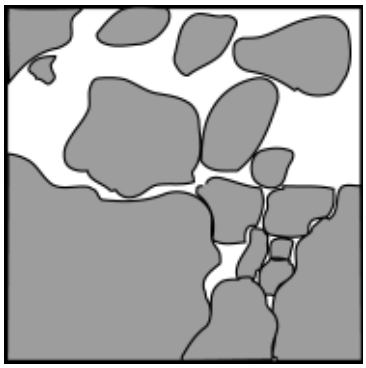
25 % cover



50% cover



75% cover



Assess the percent cover of plants first. When this is complete, carefully move algal fronds so you can look under them for any attached animals. Estimate the percent cover of attached organisms you find underneath.

When you estimate percent cover of attached plants and animals look down on the quadrat from directly above it. If the quadrat is not lying flat, imagine a line that extends from the edge of the quadrat straight down to the ground. Include any portion of an attached species that occurs within the borders of the quadrat in percent cover estimations for that species.

HOW TO COUNT ANIMALS

This is for animals that move around freely. This includes critters that scurry away, as well as slow animals, such as snails.

Count the number of individuals present. Keep your counts of mobile live animals separate from your count of dead animals of the same species.

Count and record the number of mobile and dead animals in each quadrat by counting and recording the number of live individuals of each species you find in each substrate level, and then the number of dead animals. Count and record the number of individuals of each species on the surface of the substrate first; remember to search all surfaces, including both sides of algae fronds. Then count and record the number of individuals of each species beneath moveable objects, and finally count and record the number of individuals of each species within the substrate. Record numbers, e.g. 1, 2, 3, or 4, on **Form 3** under **Count.**

As you identify plants and animals keep a tally on **Form 3** of the number you encounter in each substrate level. When you have finished surveying in the quadrat, tally your count and put the final number on **Form 3** under **Total.**

WHAT IF THERE ARE HUNDREDS OF INDIVIDUALS?

If there are hundreds of individuals, e.g., perwinkles, you will not really be able to count them one at a time. In this case, count the number in one cluster and then estimate how many clusters there are and multiple by the number of animals in the first cluster.

Be careful not to double count individuals that were at the surface at the beginning of the survey, but scurried beneath objects after they were counted. Also be careful that you do not double count animals that crawled from one moveable object to another. Crabs have a tendency to move about during a survey, so put them in a bucket as you count them. Replace them when you are finished surveying the quadrat.

Look down on the quadrat from directly above it while you count. If the quadrat is not lying flat, imagine a line that extends from the edge of the quadrat straight down to the ground.

WHAT IF ONLY PART OF AN ANIMAL IS IN THE QUADRAT?

Only count an animal if more than half of its body is in the quadrat. For example, a sea star with only one of its legs in the quadrat would not be included in the count. This is different from abundance calculations for attached species where any portion of an attached plant or animal that is within the quadrat is included in the estimation.

STEP 32: NOTES

When you get to the beach you will find things that just don't fit into any of the instructions in this module. So, we provide a place for you to make notes. Notes help to clarify the data you record on **Form 3**. Make notes any time, but make them sparingly. Too many notes may confuse rather than help the data interpreter.

Each note should be numbered. Record the number on **Form 3** under **Notes**, and then write the details on a separate sheet of paper. It is best if you have a few sheets of paper specifically for this purpose. When you input your data to the DFO database, type in your notes in the space provided.

That's it for the intertidal zone. It's now time to take a look at the backshore zone.

Remember, when you are planning any of this work, daylight hours, tides, and weather are all going to affect your schedule. You may plan on doing the intertidal zone on a particular day, and end up in the backshore zone instead because of 80-km/hour winds, or because suddenly there are 50 little kids from a day camp on the beach. Be flexible and enjoy whatever is happening.

Where to Record Data

FORM	HEADING
3: Part 2	Notes