

## Practicing Survey Techniques HIMB Summer program 2013

### Purpose:

The purpose of this lab is to familiarize you with ecological sampling techniques that scientists use in order to estimate the presence and abundance of organisms in a particular area. We will be doing this on land to practice using transects and quadrats to quantify the different species present (species richness) and the percent cover of these species and their relative abundance.

### Introduction:

Field ecology is a great way to introduce students to scientific methodology, as well as concepts like biodiversity, zonation, and invasion biology. It simply isn't possible to examine or count every organism in an area. Sampling is a powerful tool that can allow us to categorize an area, without counting everything. It would be time-consuming, frustrating, and impossible to count every single snail on a beach or flower in the forest. Sampling is the process by which organisms in small areas can be counted, or quantified, to estimate abundance over a larger area. The small areas, or samples, must be representative of the larger area for these estimates to be accurate. The more samples we look at, the more accurately we will be able to describe an area.

**Species richness** is the number of different species in an area. Richness does not tell us anything about the relative abundance of these different species, but simply lets us know how many species are found in an area.

**Transects** and **quadrats** are two ecological tools that allow us to quantify the **relative abundance** of organisms in an area. A transect line is any line, marked at regular intervals, that is easy to use in the field. Transect lines can be purchased commercially, made from measuring tape or rope marked off at regular intervals. A quadrat is a framed area. A frame can be made using PVC pipes, wire hangers bent into squares, hula-hoops, wooden dowels or even cardboard.

**Point-intercept method:** The simplest ecological sampling method is point intercept. Point-intercept can be used to record what is directly under a transect at a given mark on the line. The use of quadrats can help achieve additional levels of complexity. Instead of recording what is underneath each intersection while in the water we will be taking a photo of the quadrats. Once we're back in the classroom we will be using a computer program called Coral Point Count estimate (CPCe) to randomly place 10 points on each photo. You then have to record what is underneath each point.

### **The pros and cons to each sampling method**

- Point-intercept transect is very quick and useful for sampling a very large, relatively uniform area, but it misses a lot of information. It would not work well in a finely grained, heterogeneous area.
- Quadrats gathers more information than point-intercept along a transect line, but it can miss species that aren't very abundant if they are not under a point. However, it is very accurate, easy to replicate, and there is not much room for error as you only count what is under the point.

### **Potential sources of error for each method**

- Point intercept transects may miss out on rare items, because they may never be under a

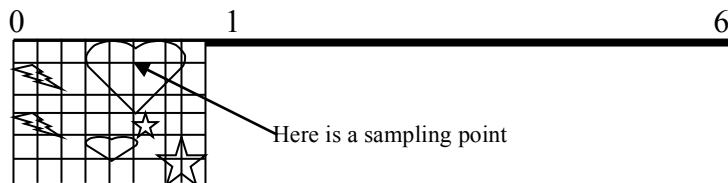
point. Quadrats may overestimate the abundance of larger organisms. Things living under rocks or in crevices or highly mobile things might be missed no matter which method we use.

### **Methods:**

In order to prepare us for the coral reef surveys tomorrow, we will practice the technique we will be doing on the reef. Please stay in your group to go through the different steps of the survey method.

### **Point intercept quadrats:**

1. Secure the end of your transect line and reel it out for 6 meters. We will be doing this twice, once on each side of the channel (left side and right side).
2. From the 0 mark on your transect line, set your quadrat to one side so that it is flush with the transect, see example below:



3. While floating in the water as still as possible take a photograph of the quadrat with your underwater camera. Try and go as close to the quadrat as possible without cutting out the edges (PVC pipe) of your quadrat. Take more than one photograph of the quadrat because it is quite difficult to get a picture that is in focus and not blurry!
4. Do this along 1 meter intervals along the entire transect line. To be able to distinguish between your different quadrats when we're back at the computer, photograph your hand between each new quadrat you photograph.  
You should have photographed 5 quadrats per transect. One transect on the left side of the channel and one transect on the right side of the channel. So in total we will have 10 quadrats to analyze in the classroom.

### **Data Work up (in the classroom):**

After you have taken all of your photographs, we will go back to the classroom and download the photographs onto a computer. Your assignment is to look through the photographs and delete the ones that are blurry or don't show the entire quadrat. Choose the best photograph for each of your different quadrats and transfer them into a separate file labeled transect 1 and transect 2. You can find your transect folders on your computer under Local Disc (C) in the CPCe\_41\_inst file. You should have 5 photographs for each transect we did. Make sure you note down which transect was on which side of the channel!

## Using Coral Point Count estimate (CPCe)

1. Open CPCe 4.1 on your computer.
2. Click *File* and choose the option *Multiple images/file processing* then select *Process multiple images*. A new window will open.
3. From the C drive in the CPCe\_41\_inst folder select the folder *transect 1* and highlight all 5 photographs. Then click *Automatically retrieve header data for all images but the first* (a small tick box on the bottom of the window) and click *Start file processing*.
4. Your first quadrat photograph will open and a new window will pop up. You can just click close without entering any of the information.
5. You will see 10 different cross hairs numbered 1 to 10 that are randomly located on the photograph. On the right side you can see a window called *Point Data* containing a table. Click on the box labeled ID for your first point (1). Then click on the small “sun” symbol on the right located underneath the table. Only your first point will remain and the other points will disappear.
6. Now you have to ID what is directly under the cross. To do this look at the different colored buttons directly beneath your photograph. The short forms stand for different things we can expect to find on a reef. For example PM stands for the coral *Pocillopora meandrina*. Refer to your CPCe abbreviation handout for an explanation of all the abbreviations you can see. Select the appropriate abbreviation and click on it. The abbreviation should then appear in the table on your right under ID for your first point. Now click on the empty ID box for point 2 and you will see that a cross labeled 2 will appear on the photo. Select the appropriate abbreviation and so on until you have done this for all 10 points. If you want to get a better look at what is under the cross, you can right click on the photograph itself and the program automatically zooms in on the point you selected.
7. When all 10 points are IDed click on the small green arrow pointing to the right that is located next to the sun symbol (>). This will open the next quadrat photograph. Repeat step 6 and continue until all 5 photographs are finished.
8. When you are done click *File – Save – Save .cpce file(s) to Excel*. A small window will pop up asking you to close any open Excel sheets. If no Excel sheets are open click *OK*.
9. A new window will open. Click on the file for your appropriate transect (either 1 or 2) and select all files. Then tick the boxes: *New Excel Workbook* and *Place each .cpc file in its own transect*. Then click *Process Files*. A new small window will open named Excel workbook format. The option *.xlsx (Open XML)* should be already selected. Click *OK*.
10. Now the program is exporting the files (you can watch the progress in the pop up window). As soon as it's done another window will open asking you to give your new Excel workbook a name. Call it what you like but make sure you choose a name that is self-explanatory. For example: *Transect 1 left side of channel*. Then click *Save*. A new window will open telling you that the file was successfully saved. Click *OK*.
11. Now repeat steps 2 to 10 with your photographs from transect 2. **Important:** to be able to select your transect 2 file you have to first click on the CPCe\_41\_inst file, only then the file for transect 2 will show up!

## Looking at the data output

1. Open the Excel worksheet “Data analysis” located on your Desktop.

2. Open the Excel workbook for both of your transects. You find them under *Computer - Local disc (C) - CPCe\_41\_inst*
3. On the right side you will see the header *Mean*. The mean is used in mathematics to show the average number of a data set (the sum of the values divided by the number of the values). In this case the mean shows the percent cover of the specific category shown on the left. For example: Coral has a mean percent cover of 65%.
4. Copy and paste the mean numbers for the major categories (%) from your output file (transect 1) into the Data analysis workbook. You can do this by highlighting the appropriate column, then right mouse click and select *copy*. Then open the data analysis workbook click on the empty box beneath transect 1, then right mouse click and select *paste special* and click on *values* then click OK. Do the same for transect 2.
5. Now we will create a graph to visualize our results. Select the *Insert* tab from the top of the workbook and click *Chart*. Highlight the columns: Name, Transect 1 and Transect 2 all the way to the last entry of the main categories. Now click on the *Column* button under *Charts* and click on the first option (clustered column). This will create a graph showing the percent abundance of each of your categories for both transects. Do the bars differ between the two transects (sides of the channel)? And if so what does that mean?
6. Repeat step 3 and 4 for the Subcategories. Do the bars differ between the two transects (sides of the channel)? And if so what does that mean?
7. To get species richness, count the total number of different species found on each side of the channel (each transect). Which side of the channel yielded a higher species richness value? Why do you think this is so?
8. For each side of the channel, what was the most abundant 'thing' present? Does this answer differ between the two channel sides? If so, why?