Biology 3A: Ecology: Point-Quarter Sampling
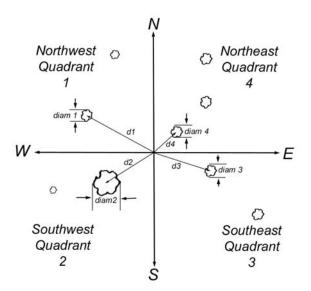
Introduction

There are several methods for sampling organisms in an area. Plot, or quadrat sampling, is a typical example. The results of quadrat sampling are often related to the size and shape of the plots used. The method is also very time consuming. Methods that do not use plots are often useful and much faster for plant (and sessile animal) sampling. Point-quarter method is a favorite method that is "plotless" and useful in areas of different sizes and shapes.

The point-quarter method relies upon a random distribution of the organisms in the area to be sampled. Uniform or clumped distributions will yield erroneous results. However, this method is one of the most favored for sampling in several habitats including intertidal and coastal scrub.

Method

A number of randomly determined points are selected in the area to be sampled. These may be taken using a random number chart and distance along a transect tape, as random numbers corresponding to grid positions in the area, or as random numbers used to select previously arbitrarily determined points in the area. Each point will represent the center of the measurement area. From the center, a compass will be used to define four quadrants. In each of these quadrants you will determine, and measure the distance to, the closest plant from the center point. The center of the stem, or clump of stem, should be used. Be sure to measure all relative close plants to make sure you have the single closest individual. Next, you should measure the diameter covered by the closest plant. This will be used to estimate the area covered by the plant. All of the raw data should be recorded in Table 1. All measurements should be made in meters.

Figure 1. Point to plant distances and plant diameters in each of four quadrants

Calculations

First, calculate the areas covered as shown in column 5, Table 1 (remember that area = (diameter/2)^2 x π). Compute the total of all point to plant distances as directed at the bottom of column 6, Table 1.   Next fill in the data for number of individuals by species on Table 2 and coverage area by species on Table 3. Now you are ready to complete the calculations on Table 4.

In the legend for Table 4 insert the number of points sampled. Next, multiply this by 4 to get the total number of quadrants (4k). Transfer the total of the point to plant

distances from Table 1. Finally, in the legend, compute the Total Density (TD) of plants per square meter as:

$$TD = 1 / (\text{total point to plant distances} / 4k)^2$$

List the species in column 1. In column 2 put the total number of individuals, n_i, (all quadrants) for each species (from column 13, Table 2).

Relative and Absolute Density

The relative density, RD_i, is the number of individuals (column 2) divided by the total number of all plants counted (the sum of column 2, which is also 4k).

$$RD_i = n_i / 4k$$

Absolute density, D_i, is Relative Density x Total Density (as you calculated above).

$$D_i = RD_i \ x \ TD$$

Frequency

In column 5 enter the data from column 12, Table 2. Calculate Frequency, F_i, as number of points having the species divided by total number of points (k from the legend).

$$F_i = j_i / k$$

Next, find the sum of the frequencies and put that number at the bottom of the column in Totals. The relative frequency, RF_i, is the frequency divided by the sum of the frequencies.

$$RF_i = F_i / \Sigma F$$

Coverage

In Table 3, column 12, you calculated the total area covered for all quadrants for each species. Those numbers should be transferred to column 8. Coverage, C_i, is computed as the total area covered by a species (A_i) times the density (column 4) divided by the total number of individuals in that species (column 2).

$$C_i = A_i \ D_i / n_i$$

Relative coverage, RC_i, is the coverage value you just calculated divided by the total coverage for all species (last row, column 8)

$$RC_i = C_i / \Sigma C$$

Importance Value

The importance value, IV_i, of each species can be calculated as the sum of the Relative Density, Relative Frequency and Relative Coverage.

$$IV_i = RD_i + RF_i + RC_i$$

Table 1.   Point-Quarter Transect Raw Data

Point No.	Quad No.	Species	Diameter	Area Covered	Point to Plant
1	1				
	2				
	3				
	4				
2	1				
	2				
	3				
	4				
3	1				
	2				
	3				
	4				
4	1				
	2				
	3				
	4				
5	1				
	2				
	3				
	4				
6	1				
	2				
	3				
	4				
7	1				
	2				
	3				
	4				
8	1				
	2				
	3				
	4				
9	1				
	2				
	3				
	4				
10	1				
	2				
	3				
	4				

Table 2.   Summary of number of individuals from Point-Quarter Sampling

Species	1	2	3	4	5	6	7	8	9	10	No. of points with species	Total for species

Table 3.   Summary of species areas from Point-Quarter Sampling

Species	1	2	3	4	5	6	7	8	9	10	Total area for species

Table 4. Calculations for Point-Quarter Sampling

Date:

Habitat:

Total Points (k):	4k:	Total point to plant distances:	Total Density:

Species, i	n_i	Relative Density RD_i	Absolute Density D_i	No. of points with species j_i	Frequency F_i	Relative Frequency RF_i	Total area covered A_i	Coverage C_i	Realtive Coverage RC_i	Importance Value IV_i
Totals	4k	1.00	//////////////	//////////////	$\Sigma F=$	1.00	//////////////	$\Sigma C=$	1.00	//////////////