Techniques and Practice of Ecological Sampling

Background Information

One of the first things a field **ecologist** will want to know about an animal or plant species is: **How dense is the population** [units of density are number of individuals {or colonies etc.} per unit area {or volume}]. Another important question is: **How are the organisms dispersed** [The pattern of distribution in space] within the habitat? In most cases it is impossible to count every individual or plot their location on a map [This would be a **census**] because of the **time**, **effort** or **money** involved. So it would be useful if there were some way that we could get an accurate representation of some spatial characteristics of the population without having to map every organism.

By sampling the population, we can do this, But the sampling must be done properly if we want our representation to be valid. To insure an adequate representation, some guidelines must be followed.

Commonly Used methods for Sampling

The aim of sampling is to select a sample which is representative of the population.

There are three techniques:

1. Random sampling
2. Stratified sampling
3. Systematic sampling

- **Random sampling**

In this type each member of the population is equally likely to be included. Random sampling is used to select a sample that is unbiased. Within each area, every part of the area must have an equal chance of being chosen. Random sampling with quadrats is used to examine differences between contrasting habitats within a habitat. There are many possible questions that could be investigated in this way.

In each habitat you are investigating, mark out a 10m x 10m square on the ground by laying one tape measure 10m lengthways and a second tape measure 10m at right angles to the first. Use a random number table (or random number

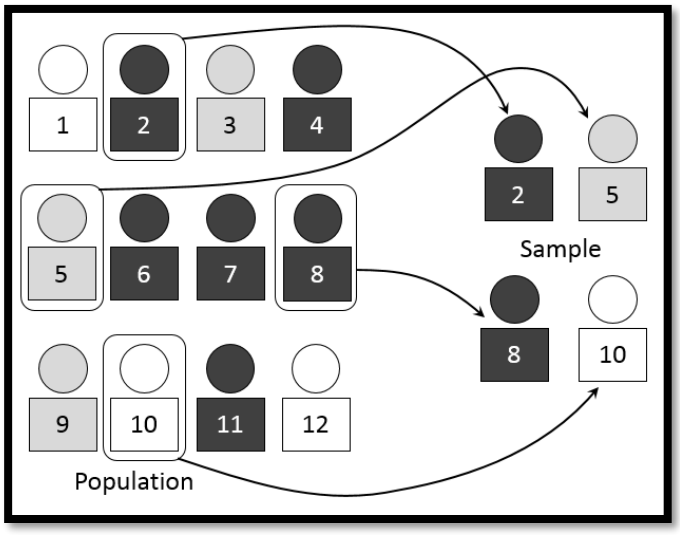
generator on a calculator) to select numbers from 1-10. Each pair of random numbers can be used as x and y co-ordinates, using the metre interval markings on each tape measure. Use these to locate the lower left hand corner of a frame quadrat or use a point quadrat. Take at least 10 quadrat samples in each area.

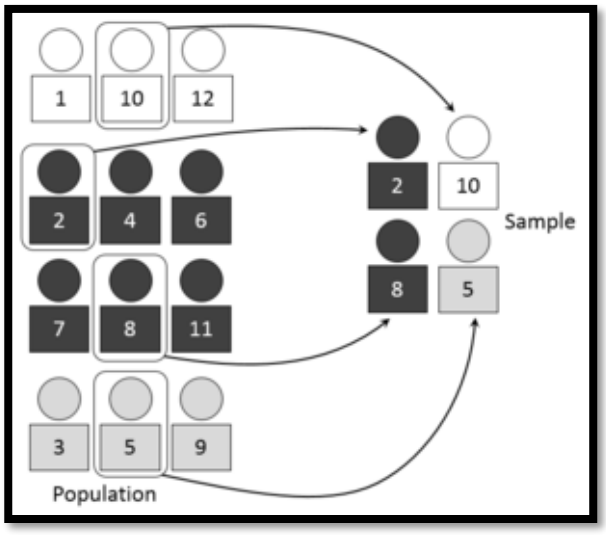
- **Stratified sampling**

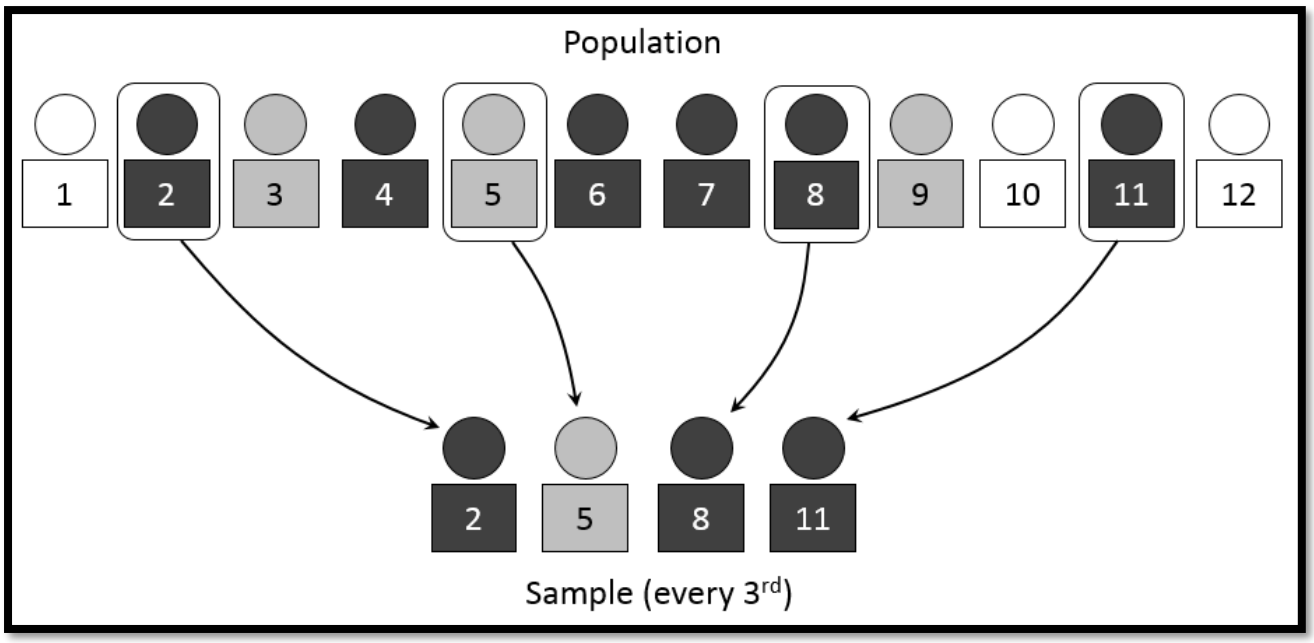
This is where a proportionate number of observations is taken from each part of the population. Divide a habitat into zones which appear different and take samples from each zone. For example, if vegetation cover in an area of heathland is 60% heather and 40% gorse, for a stratified sample take 60% of the samples from within heather and 40% of the samples from within gorse.

- **Systematic sampling**

Systematic sampling is used where the study area includes an environmental gradient. A transect is used to sample systematically along the environmental gradient. For example, every 10 meters along a line running from seashore inland across a sand dune system.

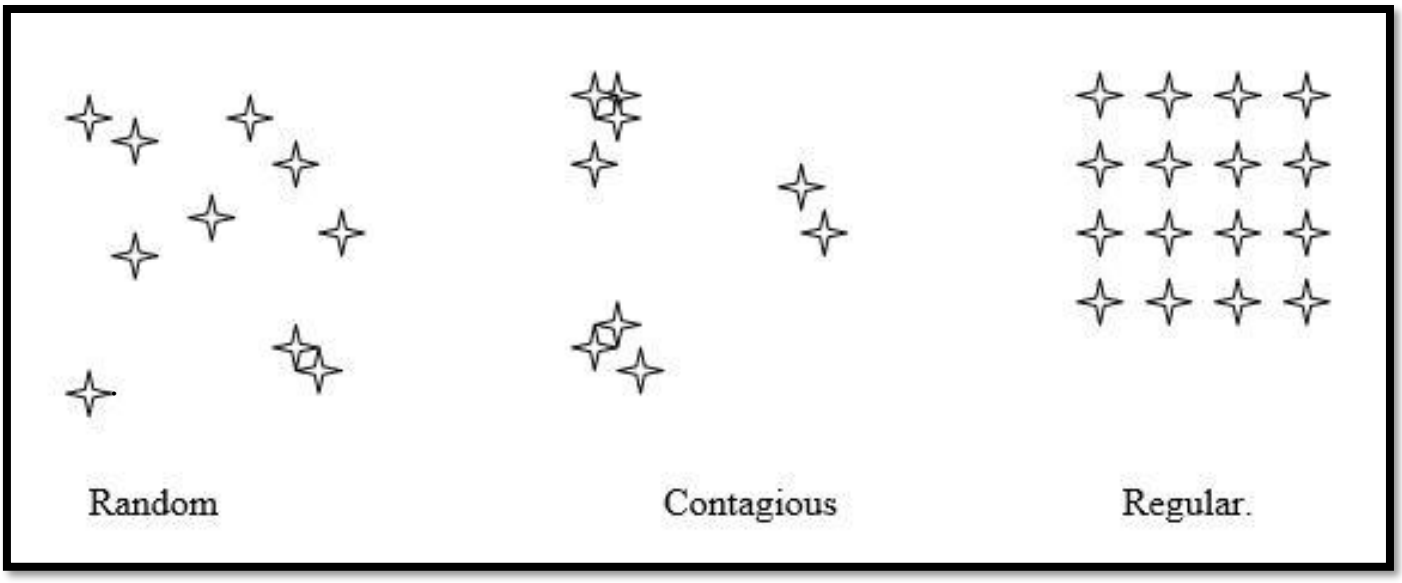






Density and dispersion patterns:

As noted earlier, the number of individuals per unit area is termed the density. Dispersion is the pattern of the distribution of organisms in space. There are three basic dispersion: random, regular and clumped (or contagious).



A random dispersion pattern means that there is an equal probability of an individual occurring at any point in the habitat and that the presence of an individual does not influence the probability of occurrence of another individual. Contagious dispersion patterns are those where the presence of an individual increases the probability of finding another one nearby. Regular dispersion, indicated by more even spacing that would be predicted by a random dispersion may suggest territoriality or some limiting resource. What pattern do you think is most common in nature? Why?

Sample Size:

Hopefully, by now the question of sample size has already occurred to you. How many samples (of any kind) will you need to take before you are confident (how confident?) that your estimate of density or dispersal reflects the true situation? Clearly, the larger the sample the better, but things like time, manpower and money also enter the picture. How can you determine the appropriate sample size? There are many methods some simple and some complex. One easy method is graphical and should be done while you are in the process of sampling. The method consists of plotting a running mean. The X-axis is the number of samples (1, 2, 3, etc.) and the Y-axis is the mean number of individuals per sample (a cumulative value averaged over the continuously increasing number of samples you have taken.) As the number of samples increase (as you move to the right along the X-axis) the running mean should begin to stabilize.