Plant Population Assessment

In many ways plants are much easier to estimate than animals, mainly because they do not move about, either in the short term while you are looking at them, or in the longer term, between samples. However, there is one area of potential difficulty, especially with grasses, and this is the problem of deciding what constitutes an individual, for example consider a clump of blackberry stems or a clump of cocksfoot. This section is about the methods used to assess plant population density, but some of the ideas are relavant to animal studies, especially some of the more or less sedentary animals as found on rocky shores.

4.1 Subjective assessment of abundance

The simplest and most rapid way of describing vegetation is to list the species present within a sample area and to attach to each species a subjective assessment of its abundance. The simplest and widely used system of categories is the DAFOR scale:

D = dominant
A = abundant
F = frequent
O = occasional
R = rare

The main objection is the need to 'know' what amount of material is necessary to qualify for a particular category. Clearly this is not independent of the species, for oaks could be dominant at a low density while dog's mercury is never likely to be dominant in a woodland. In practice an experienced observer is able to form reasonable and repeatable judgements; there are problems of inter-observer comparisons.

The most important set of absolute scale values is due to Braun-Blanquet:

r = solitary, with very small cover value
+ = sparce, or very sparce, cover very small
1 = numerous, and/or scattered, cover up to 5%
2 = any number, cover 5% - 25%
3 = any number, cover 25% - 50%
4 = any number, cover 50% - 75%
5 = any number, cover over 75%

This system also has an additional second part to the scale, which is usually combined as a decimal digit, thus 4.2 - this is intended to indicate the degree of sociability or dispersion, thus:

1 = growing solitary
2 = forming clumps or dense groups
3 = forming small patches or (if small plant) cushions
4 = growing in small colonies or forming large carpets
5 = growing in large, almost pure stands

Another scale system is due to Krajina, but is called the DOMIN scale:

BRAUN-BLANQUET		DOMIN-KRAJINA		COVER %
5		10	any number, with complete cover	≈100
		9	any number, with more than ¾ but less than complete cover	> 75
4		8	any number, with ½–¾ cover	50-75
3		7	any number, with ⅓–½ cover	33-50
		6	any number, with ¼–⅓ cover	25-33
2		5	any number, with 1/10–¼ cover	10-25
		4	any number, with 1/20–1/10 cover	5-10
1		3	scattered, with cover under 1/20	1-5
		2	very scattered, with small cover	< 1
+		1	seldom, with insignificant cover	
r		+	solitary, with insignificant cover	

These approaches were originally used to describe large areas, or even tracts of land. Observers spend a long time walking around the area, making notes, etc. then sit down to assign the values. One advantage of this approach is that it is synthetic, and requires intelligent thought on the part of the workers. However, a little thought should indicate some of the disadvantages.

In practice the distinction between subjective methods and objective methods, to be considered below, is not clear cut. For example, a strict quantitative method could be used to estimate the cover %, then other subjective observations combined to assign a scale value. Sometimes the subjective methods are used for small sample areas, ie. quadrats, and many quadrat records combined to get a more quantitative result.

4.2 Quadrat methods

In this section consideration will be given to the most commonly used objective or quantitative method, that of sampling by quadrats. Various types of quadrat are in use. The original quadrats were rigid rectangular frames, usually square. Sometimes they were folding. Various shapes have been compared, the circle is theoretically best as it has minimum edge/area ratio, but it is impracticable, so squares are preferred. A common variant is the multiple quadrat, being a main frame with sub-divisions, often by strings. Finally the point quadrat has to be considered.

The various types of quadrat are used to estimate different properties of the vegetation, as described below, some methods give a single figure for the area on which all the samples have been made, others can give a group of values, from which a mean and variance can be calculated.

4.2.1 Density

At first sight this is the simplest concept, how many individuals/unit area? For simple structured plants, eg. daisy, flax etc., where the unit is clear, there are few problems. A quadrat of known size is placed at a number of random points in the area to be estimated. The number of individuals in each quadrat location is counted and recorded, using a consistent policy for individuals only partly in the quadrat. A point and interval estimate for the area can then be calculated. Note that this is an estimate of the whole area, as the whole area was not counted.

Several species may be counted at the same time. The method is strictly objective, comparisons between sites and species can be made and accuracy can be high with areful work. The two rpoblems are, first that you may have to count very large numbers of plants, and second that for certain species, as mentioned above, there are problems of defining individuals.

4.2.2 Cover

This is the next most obvious and understandable measure of vegetation, and the concept has been introduced in section 4.1 above. Cover is defined as the proportion (usually percentage) of the ground covered by a perpendicular projection onto it of the aerial parts of the individuals of the species under consideration. In a simple case cover can be investigated by visual assessment, look at the quadrat and decide what proportion is covered by the species in question. Provided that the quadrat is not too big, useful results can be obtained in this way. Repeated samples allow the usual estimates to be obtained. It is sometimes much easier to use a sub-divided quadrat, the sub-divisions aiding the assessment of proportion covered.

The point quadrat is often used to estimate cover (see below). The proportion of points at which a species occurs, being an estimate of the percentage cover. These points may be defined by pins, or the intersection of crosswires in a multiple quadrat.

In dense swards the total of all the cover values for the species present may well exceed 100% or 1, this is because of 'layering' or overlap of species. If the bare ground is recorded (vertical projection of clear spaces between any vegetation), and this is added into data for more open swards the value of 100% will again often be exceeded. This is quite in order, provided the recording of presence in the point methods is based on a single count for a species, even if there are two layers of it at a point, that is, we do not bother to consider how much is present at any particular point on the horizontal plane.