Habitat Classification

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General Considerations

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There appear to be two approaches to the subject of this symposium; the environment may be broken down into a number of categories to which the habitat of any organism may be referred, or the habitats of particular organisms may be defined and classified in relation to one another.

If the first alternative is used, ecologists are confronted with a continuous portion of space in which organisms live. Are there in fact any units to classify apart from those imposed by the classification chosen? It is evident that the environment is not homogeneous and that very different communities occur in different parts of it. This lack of uniformity can be expressed by positive and negative correlations between the distribution of species and it should be possible to delineate any communities that may exist, without subjective bias. However, because the environment is continuously varying, there will generally be transitions between communities, and although it may be comparatively easy to impose boundaries they are unlikely to be absolute.

On examining this continuously varying environment we find that it does not repeat itself. This is not only true in the sense that no two parts of the globe are precisely alike, but also in a much broader sense. We may think that two localities are very similar if we visit them once, but when we look more closely we find that they are significantly different. In the South Island of New Zealand extreme ecological variations between west and east are obvious, but from north to south climatic changes are not inconsiderable; only within very narrow limits could two areas be considered sufficiently alike to be classified as the same. The position is rather exaggerated in New Zealand, when compared with some vast level plain, but this difference is only one of degree.

If the environment is a continuously varying whole that never repeats itself there seems little point in attempting to divide it into categories, but for practical purposes we may still attempt to do so.

The environment is sometimes classified by physical features, such as seasonal cycles of atmospheric humidity, day length, temperature, light intensity, edaphic factors, etc., but there are two difficulties which arise.

1. The practical difficulty of handling so many variables when the factors which are significant vary from organism to organism. In S.W. Britain, where winters are mild, there are winter annuals characteristic of the Mediterranean together with summer annuals that require moist summers. In one case the winter conditions alone are significant and in the other the summer.

2. The effect of any one variable factor may not be independent of the others. This view of the environment does not refer to the way in which one factor may compensate for another but rather that more favourable conditions of one factor may not be effective unless other factors improve simultaneously. Cain (1) holds this view and Billings (2) considers that definition by physical factors is virtually impossible.

The decision to arrange a discussion devoted to the problem of classifying habitats was inspired by the paper "The Ecological Survey of Animal Communities: with a Practical System of Classification of Habitats by Structural Characters," by C. S. Elton and R. S. Miller, published in "Journal of Animal Ecology," Vol. 42, 1954.

Physical features on their own are not satisfactory and present schemes of classification are based on a mixture of criteria. Elton & Miller begin by considering the element in which the organisms live—marine, fresh water, subterranean, terrestrial. The remainder of this paper is confined to the terrestrial element.

The first criterion, therefore, is a physical feature. Further subdivision is usually based on vegetation—grassland, forest, etc.—although in the sense that these terms are used they are thought of as a kind of physical environment. I believe that the habit of the vegetation is as important a part of the habitat as the climate or the soil, but it is no more important and it cannot therefore be argued that places with similar life forms are necessarily the same. It is generally true that similar vegetation implies similar climates, but there are two reasons why this may occasionally be untrue. Firstly, soil conditions lead to similar climates having dissimilar vegetations, e.g., in the Amazon basin, scrub-like "catinga" forest grows among rain forest where areas of porous sandy soil make the high rainfall ineffectual. The name "catinga" is also applied to similar low rainfall forest in S.E. Brazil. Classification must therefore take edaphic and climatic factors into account. Secondly, the nature of the plants available must be considered. A climate which in North America supports dry grassland, in New South Wales supports tall woodland of eucalypts and acacias, while in North America conifers reach to 9000 ft., and in New South Wales the tree line is 6,000 ft. Beadle (3) attributes these differences to the plants available in the two regions. A classification based on growth-form may therefore be of only local significance.

Further subdivision of habitats is desirable and Elton & Miller do this in a vertical direction. It is also necessary to further subdivide the environment horizontally. This will usually be by means of the floristic composition of the vegetation—whether by reference to dominants, by fidelity, or by correlations between frequency of species. If this method is used, however, the classification must be restricted to specific areas. As a compromise the concept of life-forms might be extended to smaller subdivisions. Greater reliance might be placed on a classification based on the tolerances of the species present, but the amassing of data for such a scheme would be difficult.

Instead of attempting to construct a general scheme of classification, with ingenuity and perseverance it may be possible to define the needs of specific organisms and then make comparisons and classifications. Useful classifications can be made with reference to particular needs, chosen at the discretion of the ecologist. The occurrence of an organism may be limited by only one, or a few of the variables present. So, although no two places are exactly alike, they may be alike as they affect a particular plant or animal.

In conclusion I would suggest that the most hopeful aim of ecologists should be to show what features of the habitat are significant to certain organisms and construct their classification accordingly.

REFERENCES

(1) CAIN, S. A., 1944: *Foundations of Plant Geography*. New York. Harper.

(2) BILLINGS, W. D., 1952: *Quart. Rev. Biol.* 27: 3. 251.

(3) BEADLE, N. C. W., 1951. Ecology. 32: 2. 343.