carnivores and position occupied on the shore by carnivores and herbivores. *Lunella smaragda* shows no reaction to *Cominella maculosa*, which lives in the same zone (about mean low water springs), while *Zediloma digna*, which is found at the level of mean high water springs, reacts violently to being touched by *C. maculosa*, which it must rarely, if ever, meet in Nature.

A single specimen of *Lepsia haustrum* was ground up in a pestle and mortar with ground glass and a few ml. of sea water. This was allowed to settle, the supernatant liquor drawn into a pipette, and a few drops placed on the side of the foot of *Melagraphia aethiops*. This evoked a weak reaction. A similar extract of *Mytilus planulatus* Lam. produced no visible results. This tends to support Bullock's view that the stimulus which evokes these reactions is chemical in nature.

W. C. Clark*

Zoology Department,
Canterbury University College,
Christchurch, New Zealand.
Sept. 26.

* Present address: Entomology Division, Department of Scientific and Industrial Research, Nelson, New Zealand.

[1] Bullock, T. H., *Behaviour*, **5**, 130 (1953).

A Spurious Significance in Genecological Trials

Attention has been directed[1] to the fact that reduplication of individual genotypes in population sampling gives rise to spuriously low values of the standard error, and hence misleadingly high significance of difference between populations. This naturally leads one to wonder whether reduplicated genotypes are at all frequent in population samples. Further work on perennial plants of hill grazings has now suggested that the risk of reduplication is very high in some cases.

Detailed morphological examination of plants isolated from the wild has revealed numerous cases of strikingly similar isolates, and these are always from points relatively close together; isolates from greater distances apart never being so similar. In a few cases the separate isolates within a similar group have been cloned and laid out in a replicated trial, and it is found that they cannot be distinguished by any scored character: a block of twelve isolates each replicated ten times appears like a block of 120 ramets of a single plant. (In cases where an apparently similar yet distinct isolate has been included in a trial, that one can be picked out in every replication.) It is very tempting to regard such a group of similar isolates as being of a single genotype. Clearly such an assertion can never be proved, but the results of certain lines of investigation have no other simple interpretation. For example, it is found that virtually self-sterile isolates set no more seed on crossing with an apparently identical isolate than they do on selfing; yet they set seed freely when crossed with recognizably distinct isolates. If the interpretation is correct, then the experimental results give a clear impression of the extent and abundance of individual genotypes in natural communities, and an indication of the chances of genotype reduplication in sampling.

One genotype of *Festuca rubra* appears to have a spread of 250 yards, and over this range it is abundant, forming 70 per cent of the isolates from central parts falling to 3 per cent at one point on the margin: over some nine acres one-third of the tillers isolated belong to this one clone. At one part of the range a separate collection was made of nearly 1,500 tillers, isolated at 9-in. intervals from within a 10-yard square quadrat. Approximately 47 per cent of the tillers were referable to this one clone. Other 'large' cones accounted for 12, 6 and 4 per cent of the tillers respectively. A further 39 clones were isolated less than 25 times (1·7 per cent) each, while 105 isolates remained ungrouped and possibly represent genotypes isolated only once each. This clearly suggests a log distribution[2]. The second and the third largest clones, both of which were markedly localized within the quadrat, have not been found elsewhere. The fourth largest clone, however, which was scattered over the quadrat, has a total spread of at least 100 yards. If this picture of genotype distribution is typical of the species in general, then population sampling in *Festuca rubra* at a higher rate than one plant per acre is likely to lead to spurious significance.

In *Holcus mollis* (the pentaploid form) the picture appears to be slightly different in that only 'large' genotypes occur. In an area of 300 yards across only three genotypes seem to be present, each of them widespread and isolated many times. This suggests that new genotypes are not being established.

It appears the clones of *Festuca ovina* do not often exceed four yards in diameter. This comparatively meagre spread is in fact a surprising performance when one considers its growth habit: the age of such a clone is probably to be measured in hundreds of years. It seems likely that in this species spurious significance can be avoided by adopting a suitably restrained sampling technique. In fact, genotype reduplication might not occur to a serious extent in normal sampling procedure, and it may be instructive to reflect that in this species no difference has been found between populations from neighbouring but ecologically distinct sites[1].

The assumed age of some genotypes in all three species is not without its genecological interest. The most recent products of breeding and selection are apparently no more suited to the prevailing environment than their forebears of scores of generations back. Furthermore, the territories concerned are non-uniform and in spreading outwards single genotypes of both *F. rubra* and *H. mollis* have been able to enter, and compete successfully in, any habitat which does not actually exclude that species, suggesting that there is little genecological specialization present.

Finally, it should be pointed out that, since it is unlikely that any two seedlings are identical in genotype, one way of avoiding genotype reduplication is to raise population samples from seed. Unfortunately, however, this need not avoid spurious significance since the variance between the seed progeny of a single plant is almost certainly lower than that between plants of different parentage.

A complete account of this work is being prepared for publication elsewhere.

D. J. Harberd

Scottish Plant Breeding Station,
Pentlandfield,
Roslin, Midlothian.
Oct. 18.

[1] Harberd, D. J., *New Phytol.*, **56**, 269 (1957).
[2] Williams, C. B., *J. Ecol.*, **42**, 1 (1954).