New Zealand Ecological Society

Report of Seventh Annual Meeting

The Seventh Annual Meeting of the New Zealand Ecological Society was held in Wellington on Thursday and Friday, 28th and 29th August, 1958. The arrangement of the programme was the same as that which had been tried successfully at Palmerston North in the previous year. The first day was devoted to contributed papers, which were presented by nine speakers and covered topics ranging widely, from the albatross of Campbell Island to the fauna of the sea-bottom off the West African coast. The second day was occupied by a symposium on "The Ecology of the Hutt Valley", in which eight invited speakers gave papers in the morning, and the afternoon was devoted to free discussion. The excursion on the Saturday traversed the Hutt Valley and was closely linked with the symposium; two full bus-loads of members took part. The Annual General Meeting, followed by the Presidential Address and supper, was held on Thursday evening. The greatest attendance at any session of the Conference was 100.

PRESIDENTIAL ADDRESS

Ecology: Observation and Deduction

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The first practising ecologists were undoubtedly the primitive people who depended on the efforts of the majority to find plants and animals which they could use in order to enable them to survive. For these people to be able to do their hunting successfully they had to be conversant with many of the relationships which existed between the various living organisms on which they depended. They had to be keen and accurate observers and had to be able to reach useful and reasonable conclusions based on their observations.

The Maori was a good practising ecologist. He knew his trees and his shrubs. He knew his birds and the trees which they favoured and as the result of his observations he was able to devise the best methods of catching them. He knew his fishes and their distribution and was able to devise the most suitable means of catching them with hook and net. Observation and deduction as well as accumulated wisdom and experience enabled the Maori to become a competent practising ecologist in fact if not in name.

The early settlers owed much to the ecological knowledge of the Maori and many of the early naturalists and scientists gained much useful information from the Maori on the distribution and relationships of living organisms.

After New Zealand was first colonised it was fortunate that over the years a number of distinguished naturalists either visited or

settled in the country. Much of their time was spent in studies of plant and animal ecology. For many of these people the work that they did was a sideline to their main activities. Amongst them were geologists, surveyors, surgeons, sailors, teachers, missionaries, medical practitioners and farmers. The band of full time professional scientists with an ecological bias was small. The band of amateur ecologists was larger.

Today the position has changed. The number of scientists with an ecological bias is large and the number of amateur or part-time ecologists is small. It is however fortunate that we still have some of these enthusiastic part-time naturalists or ecologists with us. It would indeed be a sad day if it should happen that they were no more.

All of these people whether primitive, amateur or part-time ecologists, or professional scientists, have, or should have, several features in common. First they must be able to observe, and observe with care and accuracy, the subjects which they are studying. Second they must be able to make reasonable deductions *from their observations.* Third they must have an absorbing interest and enthusiasm for the work in which they are engaged if their observations and deductions are to be of value not only to themselves but also to other people.

Ecology is becoming more and more a specialised feature of work that is already specialised, with the result that fewer and fewer ecologists know about the aims, objectives and work of other ecologists. This trend, with the present specialised approach to the natural sciences, is probably inevitable. It is, however, when we reach this stage of specialisation that the need for a society such as ours becomes apparent. It was undoubtedly this very thought *that was responsible for the formation of this* society in 1951. The society has so far performed a useful function in bringing together a considerable number of workers in the many fields of ecology.

It has, however, another secondary but important function—one which is only now beginning to develop. This function is the bringing of the significance of ecological studies to the notice of non-ecologists. An example of this is the recent upward trend in the number of school-teacher members of the society. Ecologists will be required in a wide variety of fields for many years to come. These ecologists will be drawn in the main from the University Colleges but their interest in ecology in its widest aspects must be established in the schools where wise teaching and direction of activities can set pupils on the right lines of observing and reaching conclusions.

It is not so many years since school geography consisted largely of the parrot fashion learning of a series of facts of varying importance. These were usually unrelated and therefore of little real value to the pupil who was not forced to *think and reason. This approach to geography* has changed with the result that pupils are taught, first, to think and observe rather than to merely remember, and second, to draw conclusions from their observations.

In a similar way, nature study is slowly undergoing a change from the growing of plants in pots or plots to an understanding of the relationships that exist between various living organisms in varying environments. In some schools ecology is now being discussed as a special subject albeit somewhat limited in scope.

It is, however, from such pupils who are taking enlightened courses in ecology in its widest aspects that our future ecologists will come. They must come from pupils who are taught to observe accurately and to make fair deductions.

This question of observing and making deductions is important because many people are prone to make observations that are not accurate and deductions that are unreasonable. Many of us are familiar with the hills on either side *of the Hutt Valley, a great deal of which is* now more than tinged with the yellow of flowering gorse. One wonders how many of the 85,000 peope who live in the Valley, and who at one time or another must see this gorse, ever stop to observe it closely and to decide why it is there. It is possible that some people consider it is a pretty sight and think no more of it. Others may observe it and consider that it should not be there. Still others probably observe it and consider that it should be replaced by trees. These people are gross observers who are not prepared or able to reason why the gorse is there or to decide just what would be involved in order to replace it with trees. If they were able to reason and to draw reasonable conclusions they would surely conclude that unless the present ecological conditions, including fire, are altered and altered permanently, the gorse is likely to be on the hills almost indefinitely. The gross observer

who reaches an illogical conclusion is often anything but an asset to society.

There are, of course, people who do observe, not necessarily very adequately, and then reach conclusions that are entirely wrong. I remember one occasion a number of years ago when I was a member of a touring party of sightseers. The bus driver did his part well both as a driver and as a guide. He impressed most people with his knowledge of local lore. Our confidence in his competence was, however, somewhat shattered when he stopped the bus and drew our attention to a mistletoe. In a very convincing manner he pointed out that this plant was unique in that it produced its seeds in the leaves. In support of this he pointed out a number of leaves, each of which had a small circular mark on it. His, or perhaps his informant's, powers of observation were good in that he noticed an unusual feature but was bad in that the observation was incomplete and inaccurate. As a result his conclusion was wrong and misleading. The marks on the leaves were caused by a parasitic insect. This is an example of the effect that bad observation and faulty deduction can have on a number of people who, themselves, are either unable or unwilling to observe and deduce accurately.

Somewhat different but equally bad reasoning is not uncommon in farming. A farmer secures a new variety of, say, wheat. This variety has a reputation of giving high yields and he sows it in his best paddock and gives it the best possible treatment. When the wheat is harvested the farmer finds that he has secured a yield considerably greater than he usually does with other varieties and concludes that the new variety is therefore superior. It is only when he sows and harvests this variety in his general run of paddocks that he finds that the yield is disappointingly low, and concludes that it has deteriorated. He has, however, failed to appreciate that his first sowing gave a superior yield only because it received unusually favourable treatment. A surprisingly large number of new varieties have risen and then fallen in this way.

Although observation and deduction are the foundation of ecological studies, the information thus gained can often be criticised because of either its apparent lack of accuracy or because differences cannot be defined mathematically by observers. For this reason many devices have been used to replace observation with measurement and deduction by calculation. It seems to be a fairly common thought with some people that if a result can be produced as the result of measurement and calculation, it must be accurate, and therefore better than observation and deduction.

It must, however, be appreciated that although calculations can be accurate, measurement at best is only approximate. It is therefore necessary, when using measurements, to know the degree of confidence that can be placed on these.

It is unfortunate that many people still do not realise how misleading figures can be when the basic information on which calculations are made is not sound. Examples of this type of misuse of figures abound, where figures provide a false veneer of respectability for something that is basically not respectable.

A survey was conducted to ascertain the proportion of farm land that was used for a particular crop. The area of the district surveyed was 12,585 acres and it was found that the particular crop occupied 783 acres. It was, however, realised that within the district there were considerable areas occupied by roads, buildings and land too steep to crop. This was not measured, but it was estimated that one fifth of the total area fell into this uncroppable class. A corresponding deduction was made, thus reducing the 12,585 acres to 10,068 acres. One this basis it was calculated that 783 out of the 10,068 acres were in this particular crop. The calculation showed that it was 7.78 per cent., and this was the figure that was used. Such a conclusion is most misleading because the estimated one-fifth could easily have been one-quarter or one-sixth, in which case the percentage of the area in the crop would have been appreciably different. Surely instead of quoting the 7.78 per cent. arrived at in such a haphazard manner it would have been more reasonable to have said "about 10 per cent".

In some of our work on tussock grassland we are faced with a problem of putting into figures some changes that can be observed and from which gross deductions can be made. One example is a study that is being made on the effect, if any, that burning has on the vegetation. The effect of burning has been the subject of observation and deduction for many years. Both observations and deductions have tended to be coloured by the attitude of the observers towards burning. Consequently it was decided to endeavour to develop a technique which would enable any changes to be expressed in figures. It would have been very simple to establish two or three transects on sites which could be regarded as typical, to examine these periodically

and to use the resulting figures to show what changes had taken place in the burn as a whole. Before any transects were laid out, however, it was decided to call in the assistance of the statistician. As a result of his assistance several things were found.

A. No technique could be developed that would indicate what had happened to the burn as a whole.

B. A technique could be developed which would at the most indicate within prescribed limits what had happened on transect lines and transect lines only.

C. Eight transect lines would be required for each site (a site being a comparatively uniform area).

D. On each transect 50 readings were required. That is 400 readings were required to give a reasonable but not accurate determination of changes that were taking place on a site.

E. The technique was suitable, provided that observers of approximately equal competence read the transects.

The foregoing does indicate the care that has to be taken in the production of figures. Even so such figures can be outside the limits of reasonable confidence, due to external effects such as extremely cold conditions having an effect on observers. This technique has been in operation for two years and present indications are that it is at least reasonably satisfactory. Its accuracy could be increased but only by the expenditure of a prohibitively large number of extra man hours on observations.

This survey has, I think, highlighted two important points. The first is that to secure reliable figures of changes, a very detailed and painstaking series of observations are necessary. The second is that so long as it is not necessary to express changes in figures, observations and deductions made by a competent and unbiased ecologist can provide at least a reasonable indication and explanation of what is happening.

To sum up, I feel certain that the ecologist's work and knowledge must be founded on competence in observation and deduction and that the statistician should be brought in whenever the ecologist goes beyond observation and deduction into the realms of figures. There is little doubt that observations and deductions made by a competent ecologist are much superior to pseudo-mathematical conclusions founded on inadequate data.

Whichever is ultimately used we will continue to need and use the trained ecologist whose observations and deductions have the confidence of other ecologists. After all there are many aspects of ecology for which there can be no mathematical interpretation and for which observation and deduction are the only methods by which sound information can be gained.