A 1. *Indigenous insect on an indigenous forest.*

Epidemic outbreaks of caterpillars of the oecophorid moth, *Proteodes carifex* Butl., occur at intervals in forests of *Nothofagus cliffortioides.* These outbreaks have not been studied.

A 2. *Indigenous insect on an exotic forest.*

On 3rd December, 1951, an outbreak of the boarmid moth, *Selidosema suavis* (Butl.) was reported defoliating sixteen-year-old *Pinus radiata* at Eyrewell State Forest in Canterbury. A similar outbreak was reported at Balmoral State Forest in February 1952 which spread over 2,000 acres by September. No conclusive evidence is available to indicate the exact factor responsible for these outbreaks; control was effected through aerial spraying with D.D.T. and on a heavily infested area of 1,000 acres in Balmoral left untreated, control came through disease.

A 3. *Exotic insect on an indigenous forest.*

No outbreaks of this group have yet been reported from New Zealand.

A 4. *Exotic insect on an exotic forest.*

No true outbreak coming within this group has yet been recorded here.

GROUP B—Insects dependent upon some debility within the tree

B 1. *Indigenous insect on an indigenous forest.*

Outbreaks of the buprestid moth, *Nasciodes enysi* Sharp, are of fairly frequent occurrence. The eggs are laid on the bark of the trunks of species of *Nothofagus* and the larvae bore in towards the cambium, which they destroy.

Predisposing causes are:—overcrowding of trees, root injury due to trampling of stock and deer, attack by *Armillaria mellea,* silting, flooding, drought, earthquake, fire and felling operations. Once an epidemic has started, progressively healthy trees may be killed through repeated mass attacks.

Control comes through the elimination of susceptible trees, and, in pole stands, through the temporary relief from severe competition consequent upon the reduction in the number of trees. The return of climatic conditions more favourable to the tree increases host resistance. The buprestid larvae are parasitised by a colydid beetle, *Bothrideres obsoletus,* and a braconid, *Dorycetes pallidus.*

B 2. *Indigenous insect on an exotic forest.*

No outbreak in this group has yet been recorded in New Zealand.

B. 3. *Exotic insect on an indigenous forest.*

No outbreak in this group has yet been recorded from New Zealand.

B 4. *Exotic insect on an exotic forest.*

Outbreaks of the sawfly, *Sirex noctilio* Fabr., occur at intervals in forests of *Pinus radiata* (and other species of the genus *Pinus*). Eggs are deposited, between January and March, in the wood of living trees and at the same time fungal spores are inserted. Successful attack depends on the ability of the fungus to invade the wood and cut off the water supply to the crown. There is one generation each year, at least in the North Island, and an epidemic can develop in three years.

Predisposing conditions are overcrowding and drought conditions continuing for three years. Drought conditions are also favourable to copulation and so increase the proportion of females in the next generation. Populations of between 250,000 and 500,000 per acre may occur.

Control is through the reduction in stocking by 25-30 per cent. and by the return of favourable climatic conditions. *Sirex noctilio* is parasitised by the introduced ichneumonid, *Rhyssa persuasoria* L.; by the cynipoid, *Ibalia leucospoides* Hoch., introduced but not yet established.

Discussion

The discussion was opened by DR. J. T. SALMON who said that Dr Falla's paper had brought out two very important points; one was the rapidity of change in a community and the other the importance of studying the living community as a whole. It was quite wrong to study the ecology of an animal community divorced from the plant community with which it is associated. He congratulated Dr. Batham on stressing the importance of the relationship between animals and plants, and pointed out that many workers overlooked the importance of the relationship between the community under study and other communities. Referring to Mr. Rawlings' paper he said that it was unfortunate that Mr. Rawlings was not present as there were several statements in the paper that were open to criticism from an entomological point of view. Studies abroad have shown that climate plays a very important part in the development of insects. It is recognized that humidity, temperature, etc., are all-important in governing incubation, rate of hatching and survival values of the larvae and nymphs of insects. Mr. Rawlings stated that by the third generation the predators and parasites overtake the increase in the damaging insect species. This was too sweeping a statement in the present state of our knowledge. The biotic potential of an insect depends on two things, the availability of the food plant and climate.

C. M. SMITH, who had read Mr. Rawlings' paper in his absence, said in reply that he must emphasise that Mr. Rawlings was talking strictly of forest plants and forest insects, which were tied to one particular host. Generalizations from work done on omnivorous insects would not apply to forest insects which belong to a different environment.

PROF. V. J. CHAPMAN, reverting to the problem of the community, said that he had hoped that the meeting might apply itself, botanists and zoologists together, to a consideration of what both groups meant by a community. A number of ideas had been put forward as to the nature of a community. There were those who see only one climax community in an area. It had recently been suggested that any community that is in equilibrium with the environment is a pattern of small communities. Dr. Batham might agree that any one particular belt, at one particular level, is better represented as a pattern of small communities. The tussock grassland round the Chateau at National Park, with which he himself was familiar, was another example. Is this a pattern of small communities or is it one community? He had been surprised that no one so far had raised the question of how a community is to be described, and he questioned whether the quadrat was a valid way of dealing with the problem. The real community is the biotic community. "If we are going to accept the concept of the biotic community should we not perhaps make use of the continental system, where they ignore the dynamics of the community, or largely so, and base their concept of the community on the collection together of certain characteristic species."

DR. SALMON remarked that the idea of the pattern of communities is starting to come forward in ecological work in connection with soil fauna. Recent work seemed to indicate a concept of a pattern of small communities inter-acting to build up a whole association.

PROF. CHAPMAN asked, if one accepts the idea of a pattern of small communities, how do we define a community. Do we define the mosiac, or a smaller unit within the mosiac as the community. DR. J. A. RATTENBURY said that the term community was already in popular use to describe any gathering or collection of organisms, and he attempted a definition of a community as a convenient general term of reference to denote a given group of organisms occupying a clearly delimited location at a given time.

K. R. ALLEN did not think that a community should be defined too rigidly. The basic difference between the botanist and the zoologist is the fact that plants are generally stationary and animals generally mobile. The community is a useful general concept, a working concept, not to be defined in terms too hard and fast. He quoted as an example a freshwater lake. In certain circumstances, the whole lake and possibly the tributaries and effluent streams, are one community. Again the whole littoral region could be taken as a community, or it could be subdivided further into different types of shore inhabited by different types of fauna.

PROF. CHAPMAN and DR. R. G. EVERSON objected to Dr. Rattenbury's definition in that it was too general. W. F. HARRIS suggested that with regard to the terms pattern and community, one test could be whether the pattern tends to be repeated in similar situations, or alternatively, whether the pattern tends to regenerate if destroyed.

R. K. DELL said that the concept of a community could be used in a wide variety of senses. He considered that the assemblies of plants and animals that are found are largely accidental. Many create their own environment; some supply a suitable environment for other organisms. The concept may only be man-made, and while the idea of the biological community has been very productive in the past, there is always the danger that when a label is applied and found useful it is taken for granted that the application is sufficient.

V. D. ZOTOV said that he was interested in some of the aspects of community organization in which the mathematicians could be of help. The definition from Dr. Rattenbury involved the concept of area. Other speakers had mentioned the quadrat and the presence and absence of species in a community. He thought that a lot of our problems concerning the definition of a community hinge round the mathematical analysis of the distribution of a species within a certain range of environment. DR. M. MAYER was of the opinion that when it comes to determining the units of vegetation, which we call communities, they had to be picked out by eye, not by mathematical analysis. No two spots in nature are entirely similar as to the composition of species. If we speak of a small community the species which are characteristic will be few; if we take a larger area the number of species will be correspondingly greater. We can thus use this very useful term community for all sizes of units in the same way as we use the term species, although the definition is controversial.

R. M. CASSIE was of the opinion that nobody really agrees with anybody else as to what a community is, and suggested one way to bypass the problem. This was to study a species or even an individual, and to see how the lines of investigation radiated out from there. In such a way something of the nature of a community will be built up.

MISS K. PAVIOUR-SMITH pointed out that the discussion so far had been on the relationship between plants and animals disregarding the inorganic environment. She questioned whether the biotic community is the most satisfactory concept and thought that a consideration of the whole eco-system would be more satisfactory. PROF. H. D. GORDON supported these remarks and thought that the inorganic environment had been largely overlooked. He considered that the community should not be regarded as consisting only of plants and animals, but should include the environment as well; the soil fauna affecting the soil, the soil affecting the vegetation and both affecting the animals. None of these could be separated from each other.

The Chairman, DR. W. M. HAMILTON, in summing up the discussion which had ranged over a wide expanse of territory, suggested that the ecologist might be called a plant geographer, in the sense that he is trying to do the same as the geographer is trying to do with human communities.

We cannot just talk, he said, about the biotic element; we are concerned with the whole environment—soil, climate, everything which affects the animate part of the community. The level to which the ecologist reaches varies greatly; in the first instance, he may be purely descriptive, and the descriptive concept is very useful, in that it enables us, at some future date, to make comparisons, and to measure and to check the changes that have taken place. But this is only the first step; in ecology we are looking for explanations, and the next step comes with the interpretation of what we have described, whether things are changing, and why they are changing—which is deduction and speculation. The third stage is the experimental work on the speculations or hypotheses we have built up. In natural communities there has not been very much experimental work on the underlying causes of changes, and much more is needed. Pasture ecologists have gone much further in such experimental work than other ecologists, and in pasture management workers now have a fairly clear concept of soil fertility, effect of light and shade, etc., on the growth of different species. It might be said that every farmer is a practising ecologist, his aim being to achieve a specific result.

In the long run, in our studies of natural communities, we are aiming at explanations which we try to arrive at by deduction, and by actual experimental proof. Referring to the discussion about the concept of the term "community", DR. HAMILTON said that it was one word which was sufficiently vague for someone who was not a practising ecologist to use fairly safely. "Discussions on definitions," he said, "overlook a major point, in that they do not get us very far in the interpretation of what we are describing. They should be used as a tool, and not as something that has any validity or right of its own."

Other speakers who took part in the discussion were R. I. Kean, Dr. R. A. Falla, G. A. H. Helson, J. S. Edwards, Dr. J. H. Darwin, Miss L. B. Moore, A. P. Druce, D. R. McQueen, G. A. Knox, and Dr. K. Strzemienski.