

ENTOMOLOGY—IS THIS THE FORESTER'S CONCERN?

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SYNOPSIS

The necessity for a practical knowledge of the present and potential pests of New Zealand forests is stressed. Communication is recognized as a problem and suggestions are given on ways to overcome this difficulty. The importance of quarantines, efficient detection surveys and good management practices to prevention of insect damage are emphasized.

INTRODUCTION

A ten months' visit is far too short a time to live in New Zealand and be able to give advice not already known about biological systems. There is always someone, somewhere in the country, who knows far more than a visitor can present. But I do feel it is my responsibility to speak to forest officers about entomology in this country; simply because here, as in every country, one of the major problems is lack of communication. In addition, there appears to be a degree of indifference and a perhaps false sense of security because of the activities of Forest Biology Observers. Perhaps this is an area where a visitor can do a service.

In addition to my teaching and administrative work at the School of Forestry, I have attempted to learn as much as I could about forestry and forest entomology in New Zealand. I have learned that there is a great variety of insects associated with the forest ecosystems and that most of these animals are little known by the majority of foresters and rangers. Perhaps it is unfortunate that the average field man does not know more about these numerous members of the complex of organisms in the forest. Reasons for the lack of knowledge are many; much is unknown, much that is known is scattered in many publications and minds; some feel that there is no need to know the total ecosystem and some feel that it is hopeless to try. Communication is certainly a real problem; the ranger or forester has little time to read dozens of papers about little-known animals, and he has even less time to hunt for a bit of information about some biological oddity.

The first step in communicating present knowledge is to provide a well-illustrated book or monograph which concisely presents information about a large portion of the more common insects of the forest ecosystem. There is one available now but it was published in 1925 (Miller, 1925), and most forest officers have never seen a copy. A new book would provide interest for those concerned with many branches of

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forestry, and many would use it. It would also be a basic source book for New Zealand trained foresters coming from the School of Forestry and rangers from the Forestry Training Centre. Such a book is, I understand, currently being prepared by the Forest Research Institute. I cannot imagine a more valuable and useful product for the immediate future.

I disagree with those who would claim that there are no real problems with insects and diseases in New Zealand. The history of forestry here has been one long series of crises just like everywhere else. A study of the literature reveals one problem following another, even including a fairly disagreeable problem with *Arhopalus ferox* (Hosking, 1970), and another with *Xyleborus saxosus* (Milligan, 1969). Some of these have been quite worrisome at the time but all problems have been met and solutions have been developed. Solutions have varied but have included (1) abandonment of tree species; (2) more intensive silviculture to maintain vigour; (3) forest spraying with chemicals; (4) salvage logging; (5) regular treatment of nursery beds; (6) fumigation of export lumber; and (7) introduction of parasites and predators. Such steps would hardly have been called for if there were no real problems.

Many ideas have been advanced for the continuing appearance of new problems. It is, of course, logical that introductions would be a problem because the major commercial tree species are exotic in origin. Eventually one would suspect that a number of potentially harmful insects would reach New Zealand.

Another reason is often cited as the monoculture of exotic tree species. Everyone recognizes that growing plants over large areas in single species stands is more risky than hiding them as single stems in a vast mixture of species. However, I do not go along with those who might suggest making major changes in the management of radiata pine in New Zealand. Common-sense tells us that monocultures are more risky than mixed forests but common-sense also tells us that despite the "dangers" we have no valid reason to change the management system. We need radiata pine monocultures and we must be willing to pay for the precautions necessary to maintain them. All forest officers must be able to recognize potentially dangerous insects and be ready to act when they appear in the forests. The precautions needed are really rather straightforward.

- (1) The forests must be maintained in a vigorous condition through cultural manipulations and be kept clear of decadent material through general forest hygiene. The large quantities of residual slash resulting from clear-felling untended stands, for example, is potentially dangerous.
- (2) Forest officers should be able to recognize damage by all known pests and potential pests now part of the ecosystem, and to take part in regular appraisals of their abundance.

- (3) They should also know and be watching for those potential pests that might be expected to become problems when and if introduced.
- (4) Inspection of timber and other wood products from overseas should be continued at the ports with an increasing intensity as the acreages of pines increase along with the value of timber to the economy of the nation.
- (5) Above all else, action is required whenever an unhealthy condition is observed or reported to the forest manager by others.

RESEARCH AND DETECTION

New Zealand is very fortunate in having an excellent research unit in the Pathology and Entomology Branch of the Forest Research Institute. This unit has added much to the knowledge of insects and diseases in the country. Unfortunately, much of this knowledge is rather scattered in the literature and most forest officers have not seen it, or if they have seen it they have not read it. This is understandable since many of the papers are not entirely of an applied nature; the communications problem again shows itself. The research group in entomology is quite well staffed with six research officers; this rather good staffing, however, is very recent; for many years only two or three men were present. The productivity of this small group has been extremely high. The work they have done plus additional information from DSIR and the universities will provide ample material for the first edition of the book or monograph mentioned earlier.

De Gryse (1955) presented a report on insects and diseases which included recommendations for an organization within the New Zealand Forest Service. De Gryse in his summary stated: "A good, practical beginning could be made by initiating a suitable system of surveys. In the meantime considerable attention could be devoted to improving and expanding the section of Chemical Control and the all-important Quarantine Service. These three projects would give a measure of relative security against adverse and unpredictable events". His recommendations have not gone unheeded as each of these projects has received attention while a strong research organization has been developed. Nevertheless, I have been surprised at the relatively low level of support for quarantine in relationship to the high value of the exotic forests to the nation.

The New Zealand Forest Service has developed procedures for continuous detection surveys through all forested areas of the country. The men are called Forest Biology Observers and all active New Zealand foresters and rangers are aware of their work although many do not understand the importance of the work to the country. These planned detection surveys are a vital part of the early-warning system on insect and disease problems. Men can be trained to do this work but much of it is not exciting, thus the efficiency with which

the work is done can only be good if the foresters and rangers in the working areas show a persistent interest in what the Observers are doing.

These Forest Biology Observers have other duties, mainly of a research nature, in addition to their survey work. This is good as it maintains interest in entomology and pathology and keeps a high pitch of training, but the surveys should always be the first priority; the other work should be readily dropped if the Observers are needed by forest managers to look at unhealthy stands or to provide training for field men.

We come back again to the forest officers' responsibilities because detection is their responsibility too. There are two aspects of detection surveys: (1) Planned surveys such as those carried out by the Observers; (2) surveillance which is done by all forest field men. Surveillance should account for a large part of detection but such survey work is only effective if done by men who know what they are doing. Rangers and foresters also need to work with the Observers but generally they will only do this to the extent of their own training and interest.

The ranger or forester who travels about with a hand axe and a bottle of alcohol is sometimes a subject of jokes by his associates but he contributes to surveillance with no lost time from his regular assignments. He gains by having a more interesting job, by being a more complete forest officer, and by providing a needed service in the field.

We all must keep our senses in looking at these problems. We certainly should not try to make "mountains out of mole-hills", but neither should we pretend not to see incipient problems because we "think" most of them will go away. Norman Johnson (Furniss *et al.*, 1969) has expressed some of the problems of communicating and lack of interest quite effectively, as follows:

I sense a decline in interest of some foresters with regard to insect and disease problems. Some reasons for this may be:

- the forestry profession is moving rapidly into intensive management of young trees and has left the protectionists still dealing with problems that may not be around in the next decade;
- protectionists have tended to over-dramatise insect and disease problems; maybe not in the amount of damage caused, but in their realism of what could actually be done to relieve the problem;
- protectionists have not related their studies and proposals closely enough to management objectives;
- in some instances there is more to be gained by putting money into other forestry practices, such as thinning and fertilizing, than into forest protection of unmanaged stands.

Most of the above comments are as applicable to New Zealand as to North America. It is vital that research on insects be on significant problems and that research points to the future, not the past. We must obtain accurate figures on insect populations and their impact on the forest and we need to know how to control them when and if necessary. Research results should be publicized to all management

agencies in a fashion that will provide useful benefits. This translation of research results is not generally effectively done by the scientists and it cannot be done by most technically trained biological observers. The position in between is perhaps one of the most difficult and challenging jobs. One could visualize a professional forest entomologist with a flair for this kind of work and administrative responsibility over the Forest Biology Observers.

POTENTIAL PROBLEMS

It is generally impossible to guess as to the next problem that may appear, though our past research, our timber inspection records, and our knowledge of the species we grow all give us clues as to possible problems. These difficulties in our managed forests can come about in at least three ways:

- (1) Outbreaks of native insects may develop in either managed indigenous forests or in exotic forests where they have become adapted. We have had experience with this sort of damage in New Zealand and we can expect an occasional flare-up in the years ahead. The defoliation of Eyrewell and Balmoral Forests in the 1950s by *Selidosema suavis* would be an example of this type of problem.
- (2) Outbreaks will probably develop among some of the introduced insects which have been established for years and are presently at low levels. This kind of problem can be brought on by complacency and a resultant reduction in management standards (either silviculture or hygiene) or by a temporary change in environmental conditions allowing a population increase. An example in 1970 was the flare-up of *Sirex noctilio* on Matakana Island and elsewhere.
- (3) The most serious problems may result from the introduction of additional damaging species which are not at present established in New Zealand. Timber inspectors intercept many potential pest species each year. They are efficient but cannot be expected to keep out all potential pests any more today than in the past. None of the worst possible pests is in New Zealand at present but some of them have been intercepted on numerous occasions.

I will comment on one potential problem which is very likely to reach New Zealand. The bark beetle *Ips grandicollis* is now well established in South Australia where it has become a serious pest problem in radiata pine stands. This insect is a native of eastern North America where it is a secondary pest. There it breeds in slash, particularly of the southern pines, and only during periods where trees are under stress does it cause mortality in living trees. In South Australia the insect is evidently causing more mortality than in its home territory.

We have no idea how soon this insect will become established in New Zealand though the chances of its getting here

are substantial. We also cannot be sure that it will become a pest if it does arrive. We do know we should be prepared for its arrival and we are sure that we can prevent severe losses by action against the insect. Here are some likely points about the insect in relation to radiata pine in New Zealand:

- (1) The insects will have a large volume of slash in which to breed because the quantity of cull material and large limbs is ample in radiata pine logging operations.
- (2) The insect will be able to breed to large numbers because logging operations are continuous throughout the year in contiguous areas.
- (3) The climate is warm enough so that the insect can pass through five or more generations annually.
- (4) Intensive management with thinnings administered before trees become stressed may make the standing trees relatively non-susceptible.
- (5) The high rainfall and general lack of drought years may mean that this insect will never be a serious pest except during the occasional drought year, such as 1970.
- (6) Windfalls are a noticeable part of the radiata pine landscape, especially in the Canterbury Plains. These are excellent breeding sites for populations of these beetles.

It is apparent that the above six points leave us with little to go on and we could add more unknowns. We really do not know what will happen until the problem arises but we could say the same about many other potential pests. We do know how to combat the *Ips* problem and every forest officer should be able to recognize the damage of this insect and should know what to do to prevent losses. If both damage and insect specimens are available, a field man can be taught to recognize *Ips* in less than fifteen minutes.

CONCLUSIONS

I hope that the thoughts I have presented about forest entomology have served the purpose of furthering communication about insects and their relationship to forestry. I believe I have shown that entomology is the forest officer's concern as is any organism that affects or is a part of the forest ecosystem.

Forest managers want to know as much as they can about their forests but it is difficult for them to keep up with all of the different specializations involved. One cannot expect that every forester or ranger will know the insects thoroughly; if he did he would be a forest entomologist. However, everyone concerned with the management and wellbeing of forests should be interested in the subject and be willing to learn as many of the common New Zealand species as possible.

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