FORESTRY PEST PROBLEMS OF THE SOUTH PACIFIC — THE PRICE OF PROGRESS*

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ABSTRACT

Forestry pest problems in that part of the South Pacific bounded by eastern Australia, New Zealand, French Polynesia and Papua New Guinea, are largely a phenomenon of recent times. They are related to efforts to manage natural forests, and to develop plantations of both native and exotic species.

Present forest pest problems fall into four broad categories: (1) Those associated with the more intensive use of natural forests. (2) Those associated with the plantation planting of native tree species. (3) Those associated with plantation plantings of exotic tree species. (4) Those associated with the establishment of exotic pests.

INTRODUCTION

For the purposes of this brief discussion, the South Pacific will be defined as that area covered by the *Atlas of the South Pacific* (Dept. of Lands and Survey, 1978). The major areas of forestry interest are Papua New Guinea, Tasmania and the eastern half of Australia, Solomon Islands, New Caledonia, New Zealand, Fiji, Samoa and French Polynesia. Forest pest problems in this region (with the exception of Australia and New Zealand) are poorly documented, and to try to discuss all major pest problems for each geographical area is unlikely to be very profitable. It may be of greater interest to discuss the nature of forest pest problems both past and present with reference to specific examples, followed by some speculation as to what, in the writer's opinion, the future holds. More detailed information on specific geographical regions can be found in Zondag (1968), Gray (1972, 1974), and Neumann and Marks (1976).

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From a zoogeographical point of view, the South Pacific is unique, with its major land masses to the west giving way to numerous island groups stretching several thousand kilometres to the east. However, although this physical geography is of major importance in relation to present arthropod distribution patterns, it is largely irrelevant as far as the historical development of forest pest problems is concerned.

THE FORESTS

The natural forests of the region fall into three main types: tropical rainforest as seen in Papua New Guinea, northern Australia and most of the Pacific Island groups; eucalypt forest of continental Australia and eastern Tasmania; and the southern beech-podocarp forests of New Zealand, western Tasmania and central Papua New Guinea. Current natural forest cover varies greatly throughout the area, from over 90% in some of the Solomon Islands to less than 20% in eastern Australia. A number of exotic plantation species have been introduced to the reigon, most notably *Pinus radiata* and Douglas fir (*Pseudotsuga menziesii*) from North America, *Pinus caribaea* and *Swietenia macrophylla* from central America, and several eucalypt species.

FOREST PEST DEFINITION

What is meant by a forest pest? Broadly, it is any insect that places some constraint on the management or utilisation of a forest or its produce. It is important to remember that the pest designation is a human judgement and may have no relevance to the ecological development and structure of a forest (Geier, 1982). Pest status may be attained for a wide variety of reasons — causing unacceptable mortality, reducing growth, affecting tree form, degrading wood quality, reducing seed production, or for aesthetic reasons.

PAST PROBLEMS

Using "past" in the sense of 50 years ago or more, this category can be dismissed in very short order — there are virtually no significant forest pest problems. Abundant reserves of natural unmanaged forests, little plantation forestry, and a largely local demand for forest produce combined to remove any competition between man and insects — *i.e.*, there were no "pests" as previously defined.

PRESENT PROBLEMS

Virtually all present forestry pest problems of the region are directly related to the activities or demands of man. These current problems fall into four broad categories:

(1) Those associated with the more intensive use of natural forest.

(2) Those associated with the modification of a natural ecosystem — *e.g.*, plantation planting of a native tree.

(3) Those associated with plantation plantings of exotic tree species.

(4) Those associated with the establishment of exotic pests.

INTENSIVE USE OF NATURAL FOREST

As demand on a limited natural forest resource increases, pressure for increased yield intensifies. The result is generally a move either to reject fewer trees and logs with defects, or to manage the forest operations for greater productivity.

The following two examples are typical of the problems which may arise:

Ambrosia Beetle Degrade of Peeler Logs in Fiji (Gray, 1974)

Logs not immediately extracted from the forest environment may suffer severe degrade due to ambrosia beetle attack, most commonly by *Xyleborus perforans*, *Platypus gerstaeckeri* and *Platypus externedentatus*. This damage often renders the logs unsuitable for peeling or slicing. With a diminshing resource it is no longer acceptable to extract an excess of logs and reject those heavily attacked or convert them to sawn timber or other produce. Losses of this type can often be greatly reduced by attention to forest sanitation, and the use of more efficient extraction techniques.

Platypus *Attack on Thinned* Nothofagus cunninghamii *in Tasmania*

Attempts to manipulate indigenous forests for greater productivity have also caused entomological problems, for example in Tasmania, where thinning trials in *Nothofagus* stands have resulted in a very high tree mortality as a result of *Platypus subgranosus* attack. Any root or stem damage during thinning results in concentrated attack; indeed, disturbance of almost any

kind precipitates a great increase in *Platypus* activity. It may well prove very difficult to apply such management operations successfully in these highly sensitive stands.

PLANTATION PLANTING OF NATIVE TREES

Some of the most severe forest insect problems, particularly in the tropics, have arisen in plantations of native trees. Plantation planting of rain forest species involves dramatic changes in ecological conditions compared with those in which these species naturally grow.

Shading, competition, soil conditions, exposure and tree density are all greatly altered, not to mention the effects of stand silviculture, which may involve thinning and pruning. We have little information as to how these changes will influence insect populations and their impact on the forest.

Hylurdrectonus araucariae, *a Branchlet Mining Scolytid of* Araucaria cunninghamii *in Papua New Guinea (Gray and Wylie, 1974; Unesco, 1978)*

This native insect, although innocuous in natural stands of hoop pine, becomes epidemic in plantations where young trees are producing juvenile foliage. Growth is severely reduced, and on poorer sites high tree mortality occurs as the weakened trees are attacked by other insects. The problem is of such magnitude that large-scale planting of hoop pine, Papua New Guinea's most important plantation species, was abandoned in 1969.

The Weevil Assiotes notabilis *Attack on* Agathis *and* Araucaria *in Queensland (Wylie, 1982)*

Once again the insect causes little damage in native stands but can be a severe problem in plantations. It is attracted to resin flow following wounding. The larvae mine under the bark and in the wood, and this may lead to tree death. The management operations of pruning and thinning create wounds which attract large numbers of adult weevils into the plantation environment. Attack has been reduced by confining pruning and thinning to the dry cold winter months.

PLANTATION PLANTING OF EXOTIC TREES

The introduction of exotic tree species is very much of a gamble as far as the future impact of native insects is concerned. It is virtually impossible to predict what insects may cause prob-

lems, particularly where the insect fauna is incompletely known, as is the case in most of the areas under discussion in this paper.

Extensive planting of *Pinus caribaea, Swietenia macrophylla, Terminalia* spp. and *Eucalyptus deglupta* has occurred throughout northern Australia and the South Pacific island groups, and in most cases insects have caused serious setbacks to these forestry schemes, sometimes causing their abandonment. Although New Zealand has been more fortunate it has nevertheless experienced periodic problems with *Pseudocoremia suavis* defoliation of *Pseudotsuga menziesii* and *Pinus radiata* (Zondag, 1968; Kay, 1982).

In fact, few exotic plantations have entirely escaped the attention of indigenous insects, and those that have are generally only part way through their first rotation — *e.g., Pinus caribaea* in Fiji.

Amblypelta cocophaga, *a Coreid Bug attacking* Eucalyptus *species in the Solomon Islands (Bigger, 1982)*

Eighteen thousand hectares of exotic plantations have been established of mainly *Eucalyptus deglupta, Terminalia* species and *Campnosperma brevipetiolata. Amblypelta* has emerged as a serious pest of both *Eucalyptus* and *Campnosperma* causing dieback of young trees. Trials with *E. deglupta* show about 40% of the crop will fail to develop into usable logs. The problem is compounded in that dead terminals provide ideal oviposition sites for the cerambycid *Oxymachis horni,* the larva of which mines branches and stems, often causing breakage. Changes in silvicultural practice will almost certainly be an important component of any solution.

Platypodid Attack on Fijian Swietenia *plantations (Roberts, 1973; Gray, 1974)*

Peeling trials in 1971 of 35-year-old *Swietenia macrophylla* revealed a high incidence of ambrosia beetle attack. The central American mahogany had been planted primarily for veneer production, so the discovery suggested a serious problem. Extensive plantings had been carried out through the 1960s, with eleven thousand hectares established by 1972 when further planting was suspended. *Crossotarsus extermedentatus* and *Platypus gerstaeckeri* were primarily responsible for the damage and were breeding in poisoned, windblown, and fallen trees. Planting has resumed under modified silvicultural prescriptions using a wider range of species.

ESTABLISHMENT OF EXOTIC PESTS

One of the major risks in the establishment of exotic plantations is the arrival at some later date of a pest which affects the crop elsewhere. The consequences in these cases are highly unpredictable. The new area invariably involves climatic and ecological changes and almost certainly lacks any normal biological control agents. The potential for disaster is always there and although such disasters have occurred in other parts of the world, thus far the South Pacific has escaped. However, many exotic insects have become established, most moving from one area to another within the South Pacific, and some proving troublesome. Australian eucalypt insects in New Zealand, *Sirex* in Australia and New Zealand, *Ips grandicollis* in South Australia, and several Australian termites in various island groups are examples of such pests.

Sirex noctilio *attacking* Pinus *spp. in Australia and New Zealand* (*Zondag, 1968; Zondag and Nuttall, 1977*)

The European wood wasp story is familiar to most foresters and entomologists in New Zealand, and provides a good example of the immediate impact of a new establishment which arrives without its biological control agents. Up to 40% mortality in *P. radiata* stands in New Zealand and 80% in Australia was recorded at the height of the infestation. With the introduction of a parasitic nematode, other natural enemies, and better silvicultural practice, the insect is now well controlled in most areas. However, drought-prone sites, especially in Victoria, are still subject to serious damage.

Ips grandicollis *attacking* Pinus radiata *in South Australia* (*Morgan, 1967*)

The case of *Ips* in Australia is of particular interest because *Ips grandicollis* belongs to a group of potentially very damaging insects, coniferous bark beetles. *Ips grandicollis* would not be rated high in the group as a potential problem as it is largely secondary, attacking already weakened trees. Australian forests in drought areas do, however, tend to suffer considerable mortality. There is wide scope for forest management to reduce the insect's impact by the timing and way in which forest operations are carried out.

THE FUTURE

There can be little doubt that almost all forest pest problems in the South Pacific have arisen through the relatively recent activities of man. It is almost certain that this trend will continue. If we wish to persist with intensive management of indigenous forest and plantation forestry, both of indigenous and exotic species (and there is little doubt we do) our forest management, in particular our silviculture, will have to adapt to minimise the impact of forest pests. But because of the successional nature of pests on long-rotation crops like forests, it will take at least a complete rotation before we are even aware of all the problems, let alone the solutions.

Of the eight present problems discussed, it is my opinion that five will be relatively simple to solve (ambrosia beetles on peeler logs, *Aesiotes* on *Agathis,* platypodid on *Swientenia, Sirex* and *Ips* in Australia); two could be solved if a real research effort were forthcoming (*Hylurdrectonus* on *Araucaria, Amblypelta* on eucalypts); and only one may defy solution (*Platypus* on beech in Tasmania).

Although the difficulties created by *Sirex* and *Ips* can be overcome, in my opinion much more serious and unpredictable problems will arise from the establishment of exotic pests, and there is a high probability that in most cases this will arise as a result of human activities.

Increased trade and travel, as well as changes in shipping methods and the diversity of goods carried, have all combined in recent years to increase greatly the risk of new introductions occurring. While trade has, and will, no doubt, spread insects within the region, the greatest threat is from material coming into the region from outside.

The impact of a large number of serious Northern Hemisphere forest pests, should they become established, cannot be even guessed at, but there is little doubt some could be devastating to both exotic and indigenous forests. Strong quarantine, vigilance in forest health, and contingency planning are all components of risk reduction, and become essential investments as individual countries make substantial commitments to forestry.

However, in the long term these defences must go hand-in-hand with enlightened forest management. The best protection against pests and diseases is a healthy unstressed tree. Silvicultural solutions to insect problems are in most cases the most reliable, cheapest, and least disruptive to the ecosystem, accepting

that biological control is only likely to succeed in a minority of forest pest situations. There can be little doubt increasing demands will be made on entomologists from Australia and New Zealand to advise and research forest pest problems in other parts of the South Pacific. It is essential this assistance be geared towards silvicultural as well as entomological solutions.

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