

EPIDEMICS IN PINUS RADIATA FORESTS IN NEW ZEALAND*

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Although no serious epidemic has yet occurred in forests of *Pinus radiata* in New Zealand, several minor outbreaks have shown that the stands are by no means immune from attack by insects and fungi.

These outbreaks furnish a somewhat ominous foretaste of what might be expected in the future. One feature which deserves special mention is that the outbreaks are seldom repeated, that is, they have not yet occurred more than once during the present life of the stands. Other points of particular significance are the development of an outbreak of a secondary insect (*Sirex*) almost to primary status, and an outbreak of the native primary insect (*Selidosema*) on the exotic host.

Probably the first outbreak of any significance was that of *Pineus b rneri* Annand, an aphid recorded as *Chermes pini*, (Clark 1932), which was a prominent feature of early stands. Past records are scanty, but the insect has now ceased to be significant, owing, possibly to the development of the stands, or to climatic factors, or to the development of natural biological control.

In 1932 considerable alarm was occasioned by outbreaks of two fungi, *Diplodia pinea* (Desm.) Kickx., and *Phomopsis strobi* Syd., which became epidemic in central North Island.

Diplodia pinea, a facultative wound parasite, caused the condition known as "red top" and "stagheadedness." (Birch 1936). Infection takes place through wounds caused by wind, hail, frost or other agency. Damage is usually confined to the tops of trees, spread downwards being prevented by the formation of a resin barrier. The 1932 outbreak was caused by unseasonable spring frosts following a mild autumn which favoured late growth in the trees.

Phomopsis strobi is also a facultative wound parasite, and the 1932 outbreak resulted from the over-optimistic planting of *Pinus radiata* at altitudes of over 2,000 feet, and on areas subject to severe frosts. (Birch 1935.) *Radiata* pine is liable to suffer injury from temperatures lower than 12 degrees F.; such injury is followed by *Phomopsis strobi* attack, and young trees are killed or develop into the "gooseberry bush" form common on frost flats. The disease largely disappeared when planting was restricted to more suitable sites.

In 1933 a severe outbreak of the winter moth, *Hybernia indocilis* (Walk.) Meyr., occurred at Balmoral Forest in Canterbury (Clark 1935). Only a small area was affected but the trees were completely defoliated. It was found that the first instar larvae were incapable of

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feeding on pine foliage but required leaves of tumatakuru (*Discaria toumatu*), briar (*Rubus eglanteria*) or similar plants. The outbreak subsided and has not been repeated.

In about the year 1926 attention became focused on *Sirex noctilio* F., first recorded as *S. juvencus* L. (Clark 1927), and from then on small outbreaks of this species occurred in various parts of the country. But it was not until the period 1946-49 that a full scale and widespread epidemic developed, reducing the numerical stocking of some 600,000 acres of forest by about thirty per cent (Rawlings 1948.) The outbreak subsided in 1950.

In 1949 an outbreak of a scale, provisionally identified as *Lecanium hesperidium* var *pini*, broke out in Canterbury and, though to a much lesser extent, in the Rotorua district. The outbreak subsided in 1951 without doing very great damage.

In 1952 an outbreak of the moth *Selidosema suavis* (Butl.) Hudson occurred in Canterbury and spread over some 8,000 acres by 1953 (Rawlings 1953.) The forests suffered severe defoliation and many deaths occurred. Control came through a virus disease in 1953, while some 6,000 acres were saved from severe damage by aerial spraying with D.D.T. As with the scale there was a population increase in the Rotorua district but no epidemic developed.

In the winter of 1953 there was a moderately severe outbreak of the fungus *Lophodermium pinastri* (Schr.) Chev. throughout the Rotorua forests and severe defoliation was caused in restricted areas. The outbreak was the result of two warm wet winters and a cool wet summer, which conditions favour the development of the fungus.

Outbreaks of Tortricid larvae, particularly *Ctenopseustis obliquana* (Walk) Meyr., have occurred periodically, and have left their mark on the stands, in the form of double leaders and deformed stems. Most of these outbreaks have passed unrecorded, but in the dense regeneration which resulted from the 1946 fires in the Taupo area, *Ctenopseustis* developed ahead of its parasites and considerable damage resulted.

It is probable that these epidemics will recur if conditions again become suitable, and it is inevitable that epidemics of other species will develop when the combination of circumstances, *i.e.*, stand development, weather, and adaptable insect or fungus, becomes favourable.

Epidemics of such species are spectacular but they are transitory in nature and, in the long run, do less damage than the less spectacular species which do continuous damage over longer periods.

Of greater significance is the danger of introducing a new species which will be capable of maintaining its population at an epidemic level until starved out by lack of food, or, if it is an insect, until the balance is restored through the introduction of parasites.

Steps which can be taken to safeguard *Pinus radiata* forests are:

1. Quarantine measures to lessen the risk of importation of undesirable species.

2. The development of chemical control measures so that new species may be checked in the early stages.
3. Biological control, to ensure that parasites are introduced and established with as little delay as possible.
4. Silvicultural control to maintain stands in as healthy a condition as possible. It is inevitable that, sooner or later, an outbreak will arise which will not subside naturally, and it will then be necessary to act quickly if losses are to be avoided which would be disastrous not only to the timber and pulp industries themselves, but also to the innumerable secondary industries dependent upon them for raw material.

REFERENCES

- Birch, T. T. C., 1935. A *Phomopsis* disease of Conifers in New Zealand, N.Z. State Forest Service Bull. No. 7.
1936. *Diplodia pinea* in New Zealand. N.Z. State Forest Service Bull. No. 8.
- Clark, A. F. 1927. The Infestation of *Sirex juvencus* in Canterbury. Te Kura Ngahere Vol. 2, pp. 10-16.
1932. Insects Infesting *Pinus radiata* in New Zealand. N.Z. Journ. Sc. Tech. Vol. 13 (4) pp. 235-243.
1935. The Winter Moth *Hybernia indocilis*. N.Z. Journ. Sc. Tech. Vol. 17 (3) pp. 541-549.
- Rawlings, G. B., 1948. Recent Observations on the *Sirex noctilio* population in *Pinus radiata* Forests in New Zealand. N.Z. Journ. For. Vol. V No. 5.
1953. Insect Epidemics on Forest Trees in New Zealand, N.Z. Journ. For. Vol. VI No. 5.