

frost cannot therefore be recorded, but the result was a quite appreciable mortality on newly planted areas in the vicinity, whilst the December frosts at Rotorua severely cut back about an acre of lined-out stock.

From the pathological viewpoint, the interesting point is that these and other extremely unseasonable frosts were seemingly even more calamitous to the parasites than they were to the forest stocks.

The absence of November frosts is deemed to be the chief factor in markedly reducing the virulence of *Phomopsis* wilting on areas badly affected the previous season. The fungus undoubtedly effects an entry into the tree tissues principally through minute lesions caused by frost on early flushing shoots (the Mycologist has performed a series of experiments in refrigeration chambers which confirm this). In the past season the frosts, although unseasonable, were so exceptionally late that young growth had hardened appreciably; and it may be, in addition—though this is not known—that the spores are no longer viable as late as January. Similarly, the Forest Entomologist, in reporting the cessation of the small outbreaks in Canterbury of *Hybernia indocilis*, a defoliating caterpillar referred to in last year's report, states that "a series of very late frosts completed the destruction of the insect."

It is apparent, therefore, that the past season, though adverse from the purely silvicultural point of view, brought certain compensations only because of the presence of the small investigational staff maintained. The cases cited emphasize the close relationship that must exist between the study of forest pathology and that of climatology, and the importance of a knowledge of the life-history of every forest pest in all its details. These studies are frequently criticized as purely academic; but they are all of great practical value if they can be oriented towards the discovery of the most vulnerable links in the life-history chain.

The summarized results of work recorded in previous reports as begun may be set out as follows:—

(1) *Hybernia indocilis*.—The arsenical spray programme forecast in last year's report was duly put into force. This definitely reduced the insect population on the small areas of the outbreak; and, as recorded above, exceptional summer frosts completed the work. This insect, however, being an indigeneous species, cannot be deemed to be exterminated. It has merely been reduced to its normal numbers and finds adequate food on its indigenous host plant, *Discaria toumatou*. Laboratory feeding and starvation tests carried out during the past year show that the larva apparently cannot feed upon pine needles until it is at least fifteen days old. *Discaria* is therefore essential to its life cycle, and as the growing pine stands are rapidly suppressing this shrub further epidemics are not to be feared, and *Hybernia* becomes of minor significance as a forest pest.

(2) *Parasitic Insects*.—No definite success can yet be recorded from liberations of imported parasites of *Hylastes ater*, *Sirex noctilio*, or *Pineus pin*.

(3) *Mycology*.—Mycological work on the diseases listed in the last report has gone forward both in the laboratory and in the field. The most interesting and hopeful feature has been narrated earlier in this paragraph.

A new factor that has arisen as a result of the year's work is proof of the frequency of introduction of fungal diseases through tree-seeds, and the necessity for the introduction of an effective yet simple and cheap routine for seed disinfection. Treatments have been devised, which, though seemingly simple in the laboratory, are apparently not wholly applicable to large-scale practice in the nursery. Modifications and further trials will be made in the incoming spring.

3. FOREST PROTECTION AGAINST BROWSING AND GRAZING ANIMALS.

The need for extermination of pests of this nature has not diminished, the chief factor in favour of the animal being the still depressed skin and fur market.

Recorded kills in State forest total 48,000 (49,000 in 1932); and, in addition to this, three extensive poisoning campaigns were carried out, from which numerical results cannot be given. The total cost of this work has been £3,250.

Rotorua inaugurated special work against wild horses which were becoming troublesome, and 263 were killed by the rabbiters in the course of their ordinary duties. This Conservancy also reports that red deer are undoubtedly increasing in the planted areas, where they find almost impregnable harbourage in the dense young stands.

CHAPTER III—UTILIZATION.

Investigations into all the major problems relating to the utilization of forest products have been in progress for many years, and cover the fields of physical and mechanical properties of timber, timber physics, and kiln drying, wood-preservation, pulp and paper, derived products, and industrial uses of timber.

1. INDIGENOUS FORESTS.

Strength and Physical Properties of Woods.—A pre-requisite to the extended utilization of the indigenous timbers by the local wood-using industries is a thorough knowledge of their mechanical and physical properties. Tests to determine these have been carried out over a period of ten years, and the results presented in a number of publications describing the properties and uses of the different woods, leaflets dealing with kauri, miro (*Podocarpus ferrugineus*), matai (*Podocarpus spicatus*), and totara (*Podocarpus totara*) having been completed recently for printing. As a direct outcome of the work, allowable working-stresses for the design of poles and cross-arms were substantially increased during the year.