SUSCEPTIBILITY OF NEW ZEALAND PODOCARP TIMBERS TO HYLOTRUPES BAJULUS LINNAEUS (COLEOPTERA: CERAMBYCIDAE)

R. H. MILLIGAN,
Forest Research Institute, Rotorua.

SUMMARY

Hylotrupes bajulus Linnaeus was reared in the laboratory, at temperatures ranging from 65 to 72°F (18-22°C), from eggs laid five years previously on the sapwood of kahikatea **(Podocarpus dacrydioides)**. Eggs laid on the sapwood of rimu **(Dacrydium cupressinum)** hatched and the larvae established themselves in the wood. Partly grown larvae transferred from imported pine casewood to the sapwood of matai **(Podocarpus spicatus)** developed to the adult stage.

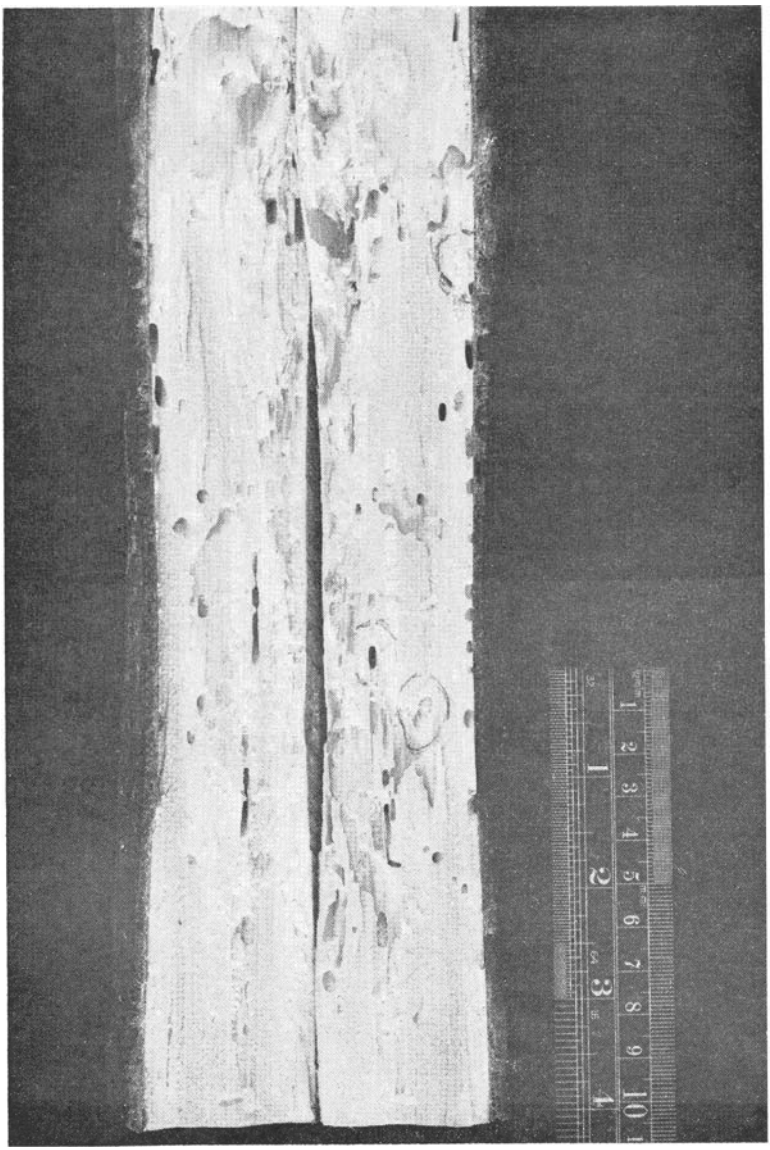
When these observations are considered with the writer's earlier work on the growth of **H. bajulus** larvae in rimu, it is concluded that the sapwoods of rimu and kahikatea are susceptible to attack, and that matai sapwood is suitable for larval development. Whether the sapwoods of rimu and kahikatea are more or less susceptible than that of Scots pine **(Pinus sylvestris)** is still unknown.

INTRODUCTION

Hylotrupes bajulus Linnaeus has emerged from imported pine cases held in bond stores for periods of five to eight years at Wellington, Christchurch, Gisborne, Hamilton, Rotorua and Whakatane (Milligan, 1961);emergence holes and abandoned workings have since been seen in samples from prefabricated houses imported from Austria in the years 1951 to 1954. It is therefore possible that this species might infest building timbers in use. **H. bajulus** larvae usually feed in the sapwood of pine, spruce and fir. Duffy (1963) summarises other host records which indicate that it sometimes infests hardwoods as well as conifers. New Zealand building timbers bearing sapwood, and commonly used without prior preservative treatment, comprise mainly those of the indigenous Podocarpaceae, and rimu is the most widely used of these.

As an aid in estimating the risk of establishment of **H. bajulus** in buildings from foci of imported material in urban areas, information has been collected on the susceptibility to attack of rimu and other podocarps. The only overseas reference to the susceptibility of this family is that of Dürr (1954), who found that larvae did not survive in South African yellow-wood **(Podocarpus** sp.).

Because **H. bajulus** is not yet established here, there has been an inadequate supply of freshly emerged adults for statistically reliable susceptibility tests. Those originally available were reared in the laboratory from larvae cut out of imported casewood and transferred to various host timbers. A few such larvae transferred



Attack by **Hylotrupes bajulus** in kahikatea sapwood. Photo taken 40 months after oviposition.

-N.Z. Forest Service (T. Ransfield).

to the sapwood of kahikatea gave rise to exceptionally large adults. Since kahikatea is particularly favourable for the growth of **Anobium punctatum** De Geer, it was thought worth while to test, on a modest scale, its suitability for rearing laboratory colonies of **H. bajulus,** and at the same time to add to the available information on susceptibility in the Podocarpaceae.

SUSCEPTIBILITY OF KAHIKATEA

Two pairs of adults emerging in the last week of February, 1961, were caged on sapwood billets of kahikatea. The billets consisted of 10 in. lengths of slab wood, roughly triangular in section, with two rough-sawn sides at right angles, the third being formed by an arc of bark-covered outer sapwood. The sawn faces were 1¾-2¾ in. wide. Six billets were tied together in groups of four and two, with the rough-sawn surfaces apposed, providing crevices for oviposition between them.

A glass battery jar, approximately 12 in. high and 8 x 6 in. in cross section, was used as a cage. The top was closed with a loose-fitting porcelain lid.

A few weeks after the adults had died, the cage was transferred to a rearing room maintained at approximately 70°F (21°C). The minimum temperature recorded during rearing of the larvae was 65°F (18°C) and the maximum was 72°F (22°C). A source of water vapour, replenished fortnightly, prevented the wood from drying excessively. Apart from this, the material was not disturbed.

In June, 1964, one of the billets was split in two, disclosing five partly grown larvae and the tunnellings shown in the photograph. As shown there, some of the workings were deep in the wood, while others approached the under side of the bark. Part of the bark on the remaining billets was removed until larval tunnels were disclosed, thus establishing that all six had been infested.

The first adults emerged in early January, 1966—two males on 6 January, a female four days later, and one of each sex on 17 January.

To relieve overcrowding of the remaining larvae, the six billets were dissected in the following April, when more than 60 larvae were transferred to fresh kahikatea sapwood.

INFESTATION OF RIMU

Six billets of rimu slab wood, each 8 in. long and approximately 4 x 1½ in. in cross section, were tied together in pairs, with rough-sawn faces apposed, and placed in cages with a pair of **H. bajulus,** essentially as for the test of kahikatea. One of the first two males available lost part of a foreleg, possibly in battle with the other, before they were removed from the rearing cage. The damaged male was alternated with the undamaged one between two jars on successive days.

Four weeks after the females had died, the billets were examined for the entry holes of newly hatched larvae. In one jar, at least 49 larvae had tunnelled into the wood—28 in one billet and 21 in the other. Although the second female had laid a small group of eggs in the fissures provided, no entry holes were found; most eggs failed to hatch and were covered with moulds. However, naturally occurring crevices, not readily examined without breaking up the wood, were also available, so only later dissection will show whether any larvae entered the wood.

A third female died soon after mating, before any eggs could be laid. A fourth, placed with the male used for the third, laid a group of eggs most of which failed to hatch. However, a few entry holes were found, and others may be present in naturally occurring crevices not yet examined.

REARING OF LARVAE IN MATAI SAPWOOD

A few partly grown larvae cut out of imported pine casewood and transferred at the laboratory to matai sapwood completed their development and emerged 18 months to two years later. On this slender experience it appears that matai sapwood may be no less favourable for larval nutrition than that of rimu.

DISCUSSION

Earlier (Milligan, 1961) the writer compared the growth rate of larvae in rimu sapwood with that recorded for Scots pine sapwood by Becker (1949), and found that larvae grew faster in rimu. The growth rate of larvae is, however, only one facet of susceptibility. To establish unequivocally that rimu sapwood is susceptible, it must also be shown that females accept this material as an oviposition site, and that selective newly hatched larvae establish themselves in the wood. Alternatively, or perhaps in addition, it must be shown that populations can maintain themselves on this host alone.

At that time only three females had laid eggs on rimu, and only a few larvae had entered the wood after hatching. In the present trial three more females have oviposited on rimu and more than 50 newly hatched larvae have entered the wood. The case for susceptibility is strengthened to that extent, but is not regarded as proven until it can be shown that populations are maintained.

The case for the susceptibility of kahikatea rests on the facts that larvae transferred to it have been successfully reared, that two females have laid eggs on it, and that these gave rise to 65 surviving progeny, five of which have now reached the adult stage.

The duration of the life cycle (five years or more) suggests that kahikatea is not a particularly favourable rearing medium. In

South Africa an average life cycle of two years in **Pinus radiata** is recorded by Tooke (1949). In the present instance the rearing temperature was well below the optimum (82°F or 28°C) for larval growth. Still more important, the mean volume of wood available per larva for the five-year period was approximately ½ cu. in. (8.2 cu. cm.), whereas for growth studies in rimu each larva was placed in an individual block 115 cu. cm. in volume and was transferred to fresh material after an average of 185 days, at most 332 days. In these circumstances, excessive competition for food probably accounts for the slow development of larvae in kahikatea.

For the establishment of laboratory colonies, it now appears desirable either to transfer larvae to individual blocks three to six months after hatching, or else to provide each ovipositing female with blocks about 6,000 cu. cm. in total volume (e.g. two 16 in. lengths of sapwood 6 x 2 in. in cross section).

In the writer's limited experience of oviposition by **H. bajulus**, three females died without laying eggs, one laid one egg, and the eggs of several others failed to hatch. In brief, there is an unexpectedly low average fertility which is unaccounted for. Comparable experience does not appear to be recorded by others handling the insect. Possibly too few adults have been available at any one time to ensure effective matings. Although the beetles may copulate readily, in no instance where a male has been mated with a second female has she produced a significant number of viable eggs.

REFERENCES

BECKER, G., 1949: Beiträge zur Okologie der Hausbockkaferlarven. **Z. angew. Ent. 31**: 135-74.

DUFFY, E. A. J., 1963: A Monograph of the Immature Stages of Australasian Timber Beetles (Cerambycidae). British Museum (Nat. Hist.), London.

DURR, H. J. R., 1954: The European house borer **Hylotrupes bajulus** L. (Coleoptera: Cerambycidae) and its control in the western Cape Province. **S. Afr. Dep. Agric. Bull.** 337.

MILLIGAN, R. H., 1961: The European house borer **Hylotrupes bajulus** L., a possible pest to New Zealand. **N.Z. For. Serv. Forestry Res. Note 25.**

TOOKE, F. G. C., 1949: Beetles injurious to timber in South Africa. **S. Afr. Dep. Agric. Bull.** 293.