A SPRUCE BORER, *TETROPIUM CINNAMOPTERUM* KIRBY, IN INTERIOR BRITISH COLUMBIA

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ABSTRACT

A spruce borer, **Tetropium cinnamopterum** Kirby, is an important borer in logs of spruce, **Picea** spp., in British Columbia. The L-shaped larval galleries penetrated to depths of 52 mm in the sapwood, and ranged from 26 to 90 mm in length; their average volume was 0.81 cc. Captive adults lived for about 2 weeks and deposited up to 155 eggs per female. Eggs hatched in about 12 days; the larvae fed under the bark for about 8 weeks before boring into the xylem of spring-felled logs. Possible control measures based on this investigation of the borer's life history and larval development are considered briefly.

Introduction

Kirby described the adult *Tetropium cinnamopterum* in 1837; Blatchley (1910) and Craighead (1923) described the larva and pupa. Craighead noted that the larvae feed only in dead trees of *Abies, Pinus* and *Picea* throughout eastern and northwestern North America. In studies of fire-killed white spruce, Richmond and Lejeune (1945) observed that the larvae " - - - enter the wood much as *Monochamus* do, but are shallow borers - - - average depth of penetration ¾ inch - - - ."

Marketing problems arising from borer damage (Fig. 3) and presence of living borers in the wood with subsequent degrading of lumber shipments have led to further investigations of this species at the Vernon Laboratory.

Sections of infested coniferous logs from Prince George Forest District provided numerous adult *Tetropium cinnamopterum* (Fig. 1) for these investigations. The adults were placed, usually in pairs, in small cages containing a short bolt of freshly cut spruce and some sugar solution. Adult activity, egg incubation, larval feeding, construction of gallery and pupation were observed.

Observations

HOSTS: In the interior of British Columbia, this borer was most frequently reared from *Picea glauca* (Moench) Voss. It was also reared from several samples of *P. engelmanni* Parry and *P. mariana* (Mill.) BSP. D. Evans (pers. comm.) reared the species from *Abies amabilis* (Dougl.). Forb. in coastal British Columbia.

DISTRIBUTION: In western Canada, this transcontinental species extends northward to Mile 24 Dawson Road, Yukon Territory, south to Lumby in the northeast Okanagan Valley, and to Fernie in southeastern British Columbia (Fig. 5). Southern records are from high elevations.

ADULT ACTIVITY: Collections of perched adults from Yukon Territory and northern British Columbia were made between 27 June and 11 July. Flight traps, set up near Prince George in 1967, caught 11 adults between 16 June and 4 August, and in 1968 caught two adults, 6 June and 1 July. The emergence period of adults from caged logs collected at northerly

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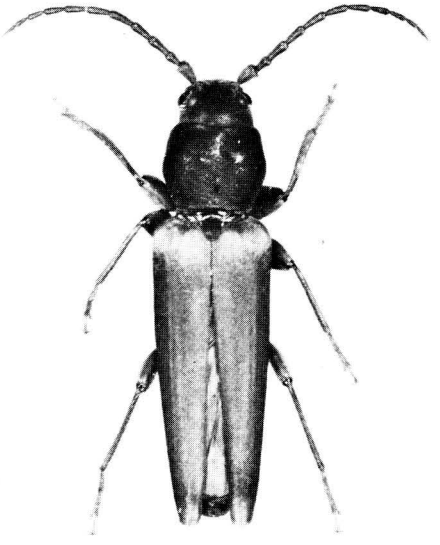

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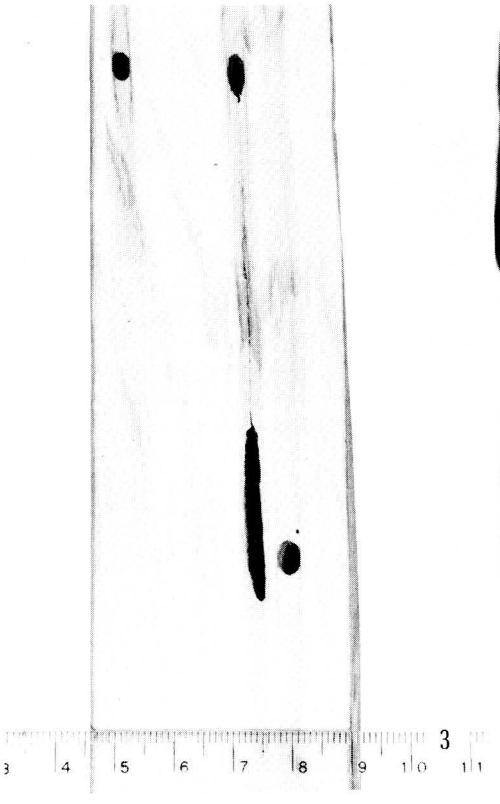

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Figs. 1 to 4. **Tetropium cinnamopterum** Kirby. 1, adult male; 2, two eggs under lifted scale of bark; 3, galleries in spruce board; 4, lead castings of larval galleries in wood.

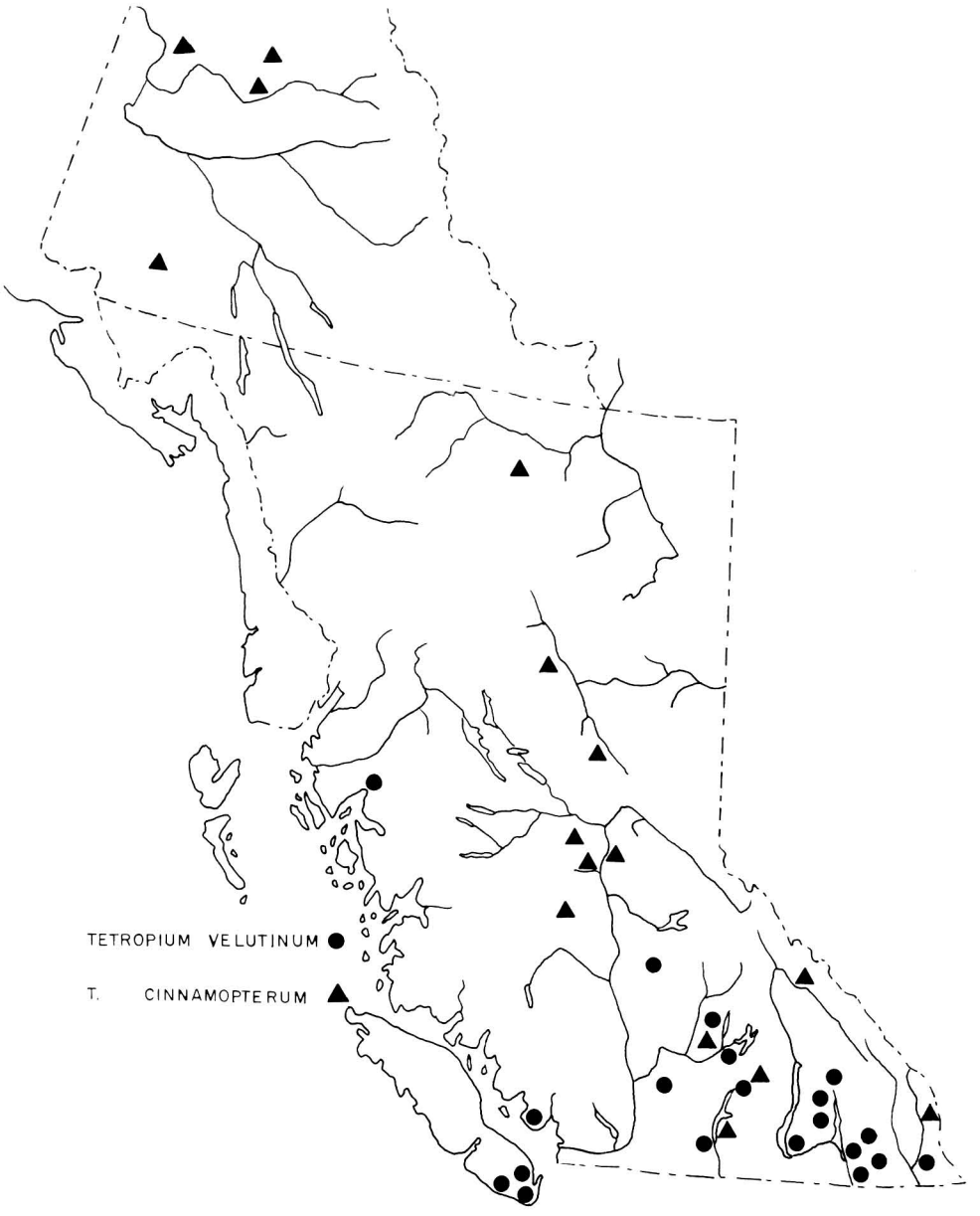

Fig. 5. Localities where **Tetropium** spp. have been collected in British Columbia and Yukon Territory.

points, and reared outdoors at Vernon, ranged from 13 May to 13 June in 1967. Average longevity of 14 pairs of caged adults was 12 days for males and 13 days for females. One male lived for 16 days and two females for 17. Copulation occurred on the day of emergence and continued sporadically for 7 or 8 days. Oviposition began 4 to 8 days after emergence.

The capsule-shaped white eggs (1.2x0.4mm) were inserted deeply between and under bark scales (Fig. 2) on the bole. One female deposited 155 eggs from 28 June to 8 July; her daily egg production was: 17, 5, 17, 17, 27, 19, 13, 0, 30, 5 and 5, respectively.

INCUBATION: Eggs laid on 24 May, 1966 and kept at 70% humidity and 72°F hatched in 12 days. Two hundred eggs laid during June 1967 and placed in petri dishes in an unheated insectary incubated in 8 to 16 days, with an average period of 12 days.

LARVAL ACTIVITY: Newly hatched larvae, placed in the bark of freshly cut spruce bolts, bored into and fed under the bark for about 8 weeks before burrowing into the xylem. At that stage of development body length ranged from 15 to 23 mm; head capsule widths ranged from 3.33 to 3.83 mm.

The elliptical larval entrance holes in the sapwood ranged from 5.0 x 2.5 to 7.0 x 3.0 mm. Galleries generally were L-shaped (Fig. 4). Volumes of the completed galleries in the xylem of white spruce logs at Finlay River, B.C., ranged from 0.23 to 1.46 cc, with an average of 0.81 cc. Total lengths of galleries in the wood ranged from 26 to 90 mm, with an average of 60.2 mm. Depth of penetration varied from 12 to 52 mm, with an average of 26 mm. Galleries were densely packed behind the larvae with shreds of wood and frass, finer than that of *Monochamus* spp.

PUPATION: Duration of the pupal stage at Vernon in June 1968 ranged from 10 to 14 days.

GENERAL: The life cycle in most instances took 1 year to complete although a small proportion of some broods spent two winters in the larval stage.

The maximum recorded number of adult emergence holes in the bark was 16/ ft^2, in a white spruce log 68 cm in diameter at the large end, from Finlay River.

Discussion

Tetropium cinnamopterum may cause damage to at least the outer 52 mm of sapwood of spruce logs since its galleries may penetrate to that depth. Its habits are somewhat similar to those of the western larch borer, *T. velutinum* LeConte (Ross, 1967), except for the host, the spruce borer's more northerly and higher altitude distribution (Fig. 5) and the resultant phenological differences.

Since the adult emergence period begins about the first or second week of June in central British Columbia, the insecticide lindane, when used on logs (Ross and Geistlinger, 1968) to kill adults or newly hatched larvae, should be applied before the egg-laying period which would begin about mid-June.

If this is not feasible, and since eggs took a week or more to hatch and larvae did not enter the wood until they were at least 8 weeks old, peeling of infested spring-felled logs before the third week of August in central British Columbia should prevent major damage to them by *Tetropium*.

It is possible that *Tetropium* larvae may enter the wood of winter-felled spruce earlier than 8 weeks.

Acknowledgment

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Literature Cited

Blatchley, W. S. 1910. An illustrated descriptive catalogue of the Coleoptera or beetles known to occur in Indiana. The Nature Publishing Co., Indianapolis, Indiana. 1386 p.

Craighead, F. C. 1923. North American cerambycid larvae. **Canada Dept. Agric. Bull.** 27 N. S. (Technical), 226 p.

Richmond, H. A. and R. R. Lejeune. 1945. The deterioration of fire-killed white spruce by wood-boring insects in Northern Saskatchewan. **For. Chron. 21**:168-192.

Ross, D. A. 1967. The western larch borer, **Tetropium velutinum** LeConte, in Interior British Columbia. **J. Entomol. Soc. Brit. Columbia. 64**:25-28.

Ross, D. A. and N. J. Geistlinger. 1968. Protecting larch logs from **Tetropium velutinum** LeConte with lindane emulsion. **J. Entomol. Soc. Brit. Columbia. 65**:14-15.

INSECTICIDES, FUNGICIDES AND LIME COMBINED FOR CONTROL OF CABBAGE MAGGOTS, CLUBROOT AND WIRE STEM[1]

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ABSTRACT

Insecticides alone or in combinations with lime, mercurous chloride and quintozene were applied to peat and loam soils for control of clubroot, **Plasmodiophora brassicae** Wor., and cabbage maggot, **Hylemya brassicae** (Bouché), in cauliflower. The effects were assessed by counting the emergent seedlings, by weighing the mature cauliflowers, and by uprooting plants at harvest and grading the maggot damage and incidence of clubroot. Split applications, one at seeding and one 30 days later with Birlane, Dasanit or carbofuran protected cauliflower from maggot damage until harvest. Carbofuran allowed the least maggot damage in both soils. Zinophos was comparatively effective in peat soil but not in sandy loam. The insecticides had no significant effect on germination or clubroot. Quintozene gave satisfactory protection from clubroot and wire stem in sandy loam and had the lowest incidence of clubroot in peat soil. The fungicides had no effect on maggot damage, nor did they appear to influence the insecticides. No significant interactions were observed. The effect of the insecticides and fungicides on yield was somewhat masked by over-seeding.

Introduction

Previous experiments (Finlayson and Noble, 1966; Finlayson *et al.*, 1967; Freeman and Finlayson, 1968; and Finlayson, 1969) have shown that direct-seeded and transplanted cruciferous crops can be protected from maggot damage. However, fungicides and insecticides applied together have damaged crops (Finlayson, 1969 and Ranney, 1964) and when herbicides and insecticides were applied to the same area significant reductions in yields of cabbage were recorded (Freeman and Finlayson, 1968). With the increasing cost of labor, a method for direct-seeding of stem crucifers is needed but this practice requires methods for controlling cabbage maggot (*Hylemya brassicae* (*Bouché*)) and wire stem (*Rhizoctonia solani* Kuhn.) in the young seedlings and clubroot (*Plasmodiophora brassicae* Wor.) throughout the growing season. Furthermore, methods and rates for

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