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FOREST Pest LEAFLET

Pacific Forestry Centre

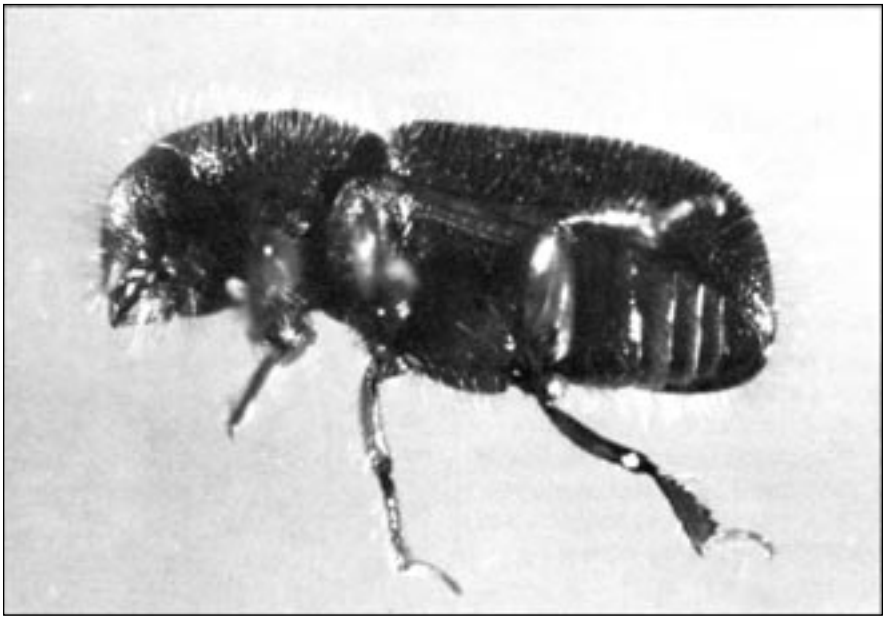
Western Balsam Bark Beetle

R. Garbutt

Introduction

The western balsam bark beetle, *Dryocoetes confusus* (Coleoptera: Scolytidae), in association with the pathogenic fungus *Ceratocystis dryocoetidis*, has been responsible for the loss of millions of cubic metres of alpine fir, *Abies lasiocarpa*, in high-elevation stands throughout the interior of the province.

Infestations of *D. confusus* have been reported since comprehensive forest pest surveys began in the 1930s. Aerial surveys conducted during a major infestation between 1956 and 1965 estimated losses of 12 million m^3 of alpine fir in the Nass, Skeena and Telkwa river valleys of the Prince Rupert Region. During that period the western balsam bark beetle was the most destructive insect pest in the province. In the Kamloops Region, over 2 million m^3 of mortality was recorded between 1948 and 1991, mainly in the North Thompson drainage. In the Prince George Region, over 1 million m^3 of mortality has been recorded, primarily in the areas of Stuart and Takla lakes and Germanson Landing. Similar losses occurred in sub-alpine areas of the Nelson and Cariboo regions. Because of limited and sporadic aerial survey coverage of high-elevation and remote northern stands, however, these figures almost certainly underestimate real losses.



Male western balsam bark beetle

The depletion of low-elevation mature timber throughout the province has directed more attention toward the remaining high-elevation stands. The western balsam bark beetle is among the most important and yet little understood agents of mortality and resultant fiber loss in these stands.

Hosts and Distribution

The range of the western balsam bark beetle overlays that of its primary host, alpine fir, stretching south to Arizona and New Mexico, and east into western Alberta. In addition to alpine fir, the beetle also occasionally attacks amabilis fir, *Abies amabilis.* Rare instances of attacks to white spruce *Picea glauca*, and Engelmann spruce, *P. engelmannii*, have also been recorded.

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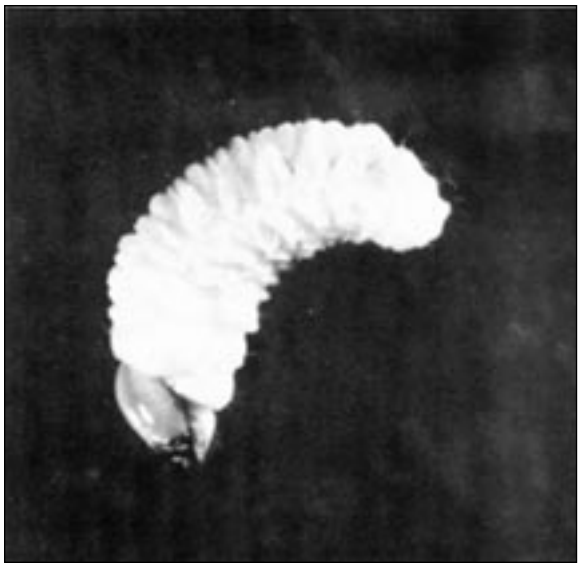


Western balsam bark beetle larva

Description

Egg: Small; pearly-white; oval.

Larva: 3-4 mm long; head pale tan; body yellow-white, curved and wrinkled.

Pupa: 3-4 mm long; yellow-white, with many of the adult parts recognizable.

Adult: 3-4 mm long; mature adult dark brown, with erect red-brown hairs; front of female entirely covered with a dense brush of short red-yellow hairs; front of male sparsely covered with long, red-yellow hairs.

Life History and Habits

Adult beetles emerge in late May or June when the temperature within the stand reaches about 15°C, and the flight period may last until the end of July. Males are drawn by a primary chemical attractant (kairomone) issued by the living tree to attack and bore nuptial chambers beneath the bark. There they release a secondary attractant (pheromone) to attract females. The male normally mates with three or four females. The mated females then bore brood galleries which they line with eggs. Adults overwinter in the galleries. Females extend the galleries and continue egg-laying the following spring before emerging in June and early July to bore new galleries and deposit a third brood, either in the same tree or in a fresh tree. The insect normally requires two years to develop from egg through to adult, but given the right climatic conditions there is evidence to suggest that the beetle can complete its life cycle in a single year.

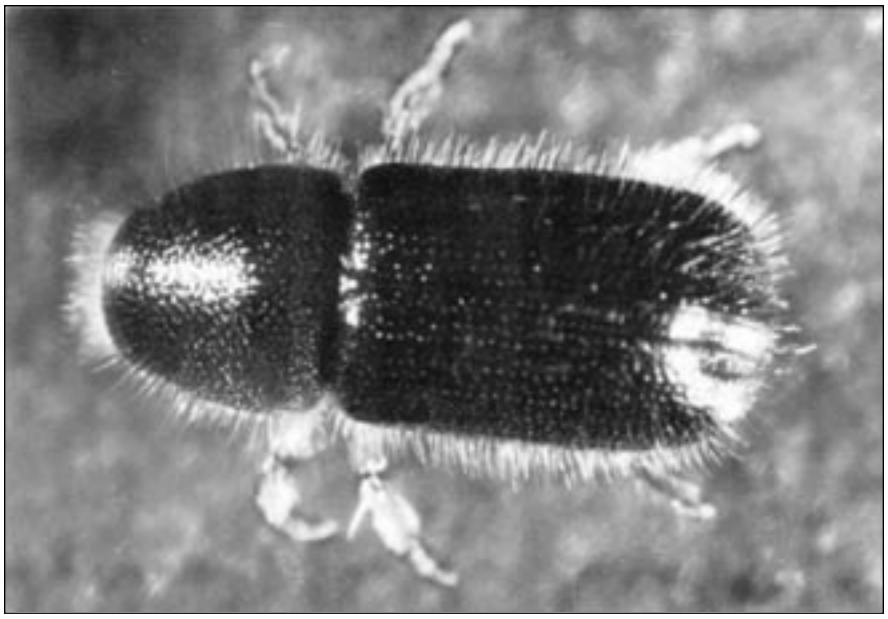
Western balsam bark beetle pupa

Dryocoetes confusus is closely associated with a phytopathogenic lesion-causing fungus, *Ceratocystis dryocoetidis*. The fungus is carried on special repositories called mycangia, located on the beetle's thorax. *Ceratocystis dryocoetidis* is responsible for an estimated 65% of the mortality associated with *D. confusus*. Though initial beetle attacks are often pitched out by the tree, the fungus may be successfully introduced into the phloem, causing subsequent beetle attacks to meet with little or no resistance. Coalescing lesions caused by the fungus may also girdle and kill the trees without any further beetle activity.

Damage and Detection

During the year following a successful beetle attack, the tree's foliage changes from green to a bright brick red color. This red foliage may be retained for up to five years. Accurate assessment of current mortality is therefore only possible if aerial surveys are followed by ground-truthing. Field observations suggest that the majority of attacks occur above 2 m on the bole. This, coupled with overlapping life cycles, and a lack of telltale pitch tubes such as those associated with attacks of other bark beetle species, makes ground-based detection and population assessment difficult. Copious pitch flow is normally considered a sign that the beetles have been pitched out. The most conspicuous sign of recent successful attack is a mixture of boring dust and fecal matter (frass) found in bark fissures and at the base of the bole.

Although occasionally *D. confusus* infestations can kill high numbers of trees in a stand in a single season, successive years of aerial mapping surveys have shown that, more frequently, less than 5% of a stand is attacked in any one year. High beetle populations can persist within a stand for many years until all of the mature and semi-mature alpine fir have been killed.



Female western balsam bark beetle

Galleries formed by the western balsam bark beetle

Control and Prevention

In some areas, infested and recently killed timber has been salvaged by logging, but the vast majority of the infested stands remain inaccessible. As more roads are built into these sub-alpine areas, more infested and recently killed timber will be salvaged.

There is, as yet, no means to directly control balsam bark beetle populations. However, recent research has shown that beetle behavior can be manipulated by the aggregation pheromone exo-brevicomin and the anti-aggregation pheromone endo-brevicomin. By employing the "push-pull" effects of both chemicals, attacking beetles might be directed toward selected small groups of trees, which could then be removed before infestation build-up and spread.

Selected References

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* Copies of this report are available for study at the library of the Pacific Forestry Centre, in Victoria, British Columbia.

Resin flow down outer bark of a pheromone-baited tree following attack by the balsam bark beetle

Balsam bark beetle galleries and development of fungal mycelium two years after initial attack

Additional Information

Additional copies of this and other leaflets in this Forest Pest Leaflets series, as well as additional scientific details and information about identification services, are available by writing to:

Natural Resources Canada
Canadian Forest Service
Pacific Forestry Centre
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