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Fir Tree Borer

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The fir tree borer, *Semanotus litigiosus* (Casey), is most common in coniferous forests of the Western United States and Western Canada. But it has appeared as far east as New Jersey and Ontario (fig. 1).

This insect may have been considered beneficial in the past because its boring habit promotes deterioration of dead trees. However, the fir tree borer can be an economic pest by causing lumber degrade and sometimes legal problems for lumber manufacturers.

Hosts

The insect has been reported on many conifers, mostly true firs and spruce. In California, its preferred host is white fir, *Abies concolor* (Gord. & Glend.) Lindl., though it also readily attacks California red fir, *A. magnifica* A. Murr., and Douglas-fir, *Pseudotsuga menziesii* (Mirb.) Franco. Other hosts, according to Linsley and collection records, include grand fir, *A. gran-*

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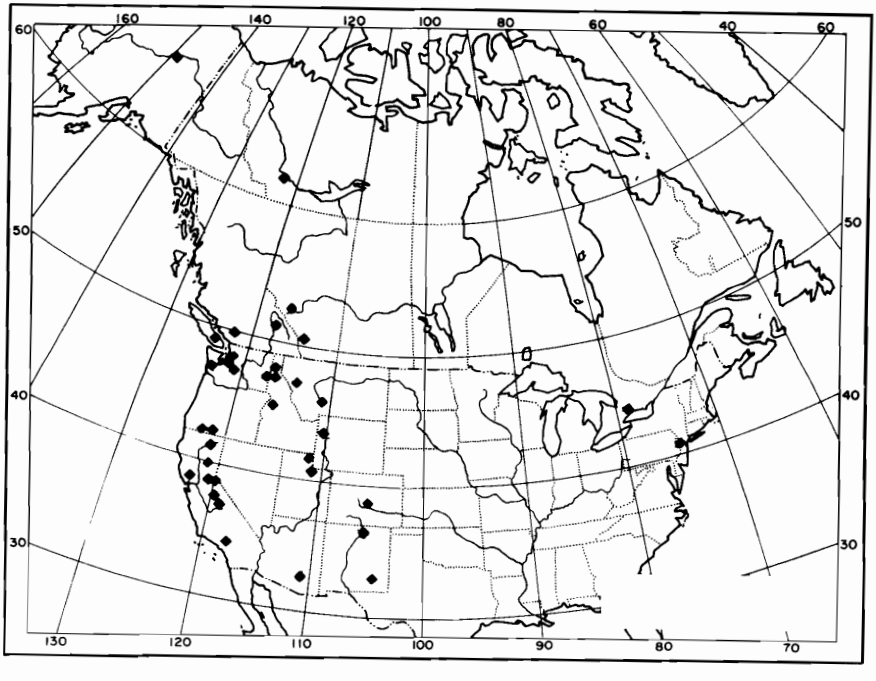

Figure 1.—Distribution of *Semanotus litigiosus* from collections.

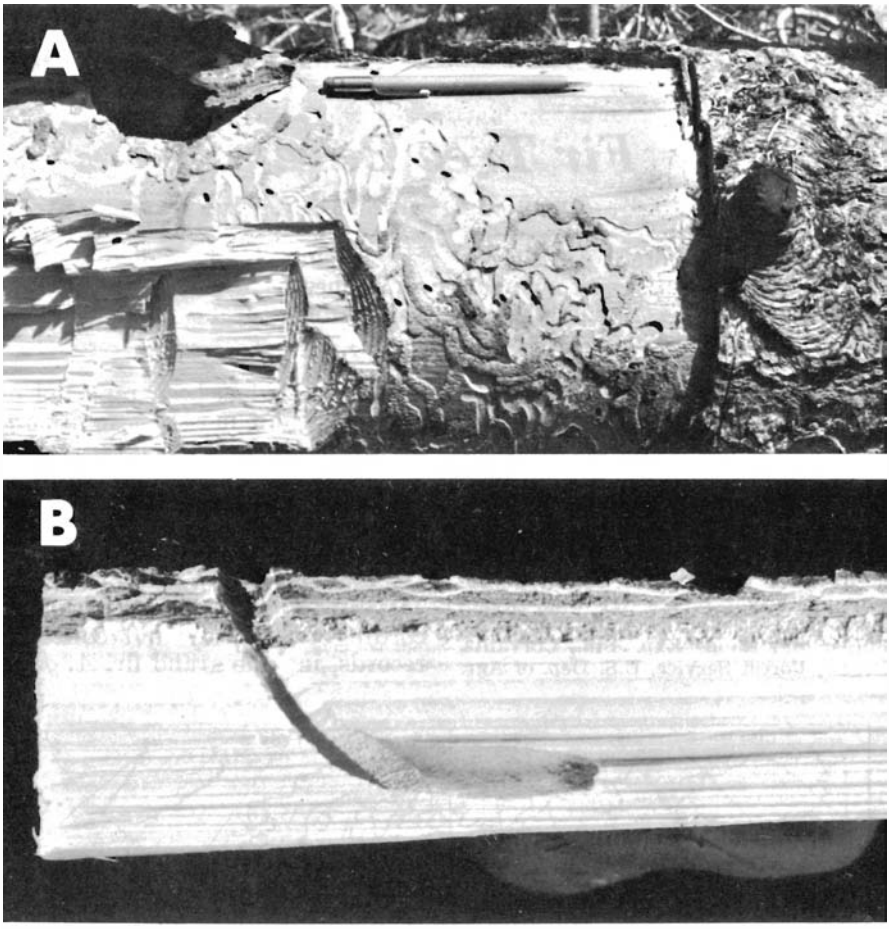

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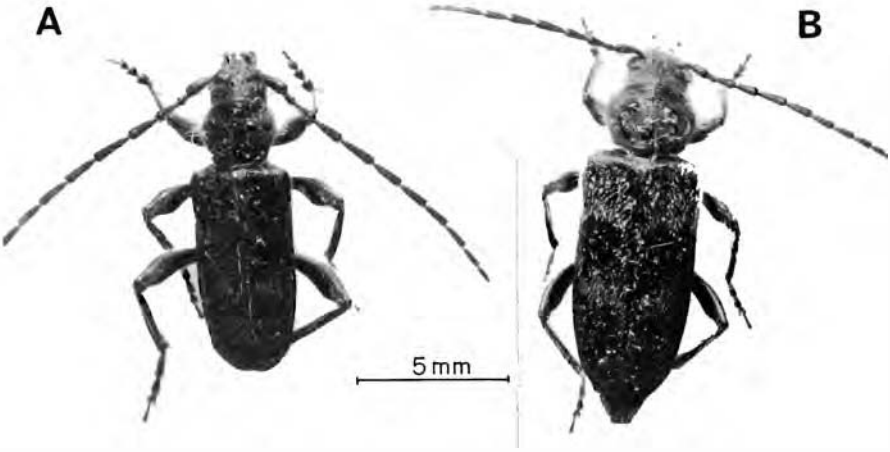
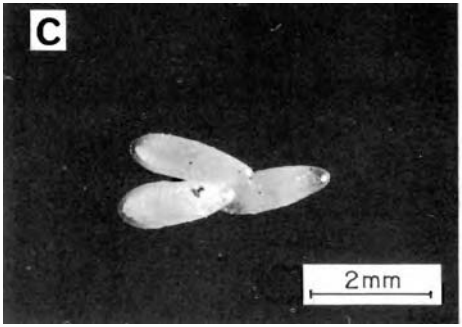
Figure 2.—A, Larval mines etched on the sapwood and larval entrance holes bored into the wood by the fir tree borer; B, a typical gallery of the fir tree borer in the sapwood.

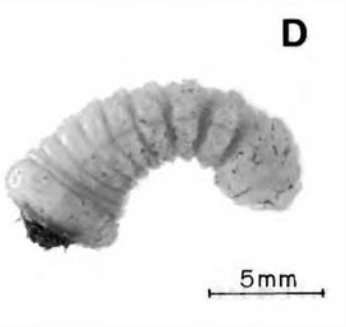
dis (Dougl.) Lindl.; subalpine fir, *A. lasiocarpa* (Hook.) Nutt.; white spruce, *Picea glauca* (Moench) Voss; Sitka spruce, *P. sitchensis* (Bong.) Carr.; Engelmann spruce, *P. engelmannii* Parry; a hemlock, *Tsuga* sp.; and a larch, *Larix* sp. The fir tree borer probably also attacks other firs and spruce within its range.

Damage

The fir tree borer attacks recently dead or dying trees, especially those windthrown or damaged. The larvae extensively mine the inner bark and sapwood (fig. 2). The galleries are 25 to 80 mm. long, averaging 45 mm. At the end of the gallery there is usually an elongation running with the grain. The larvae penetrate in sapwood an average depth of 35 mm., maximum 75 mm. Galleries in the sapwood may be numerous enough to reduce the grade of milled lumber from select and shop grades to Nos. 4 and 5 common, with a value reduction







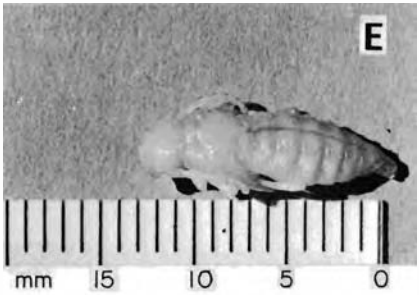


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Figure 3.—Fir tree borer: A, Adult male; B, adult female, about X 4; C, eggs, X 10; D, mature larva, X 3; E, pupa, X 3.

of about $80 to $100 per thousand board feet. Insect boring rarely affects strength. The greatest threat economically arises from the adults chewing through expensive paneling or flooring as they emerge from infested lumber used for studs or sheathing in new buildings. When owners discover this damage, they may sue.

Stages of Development

The adult is 8 to 16 mm. long, about four times longer than wide. Both sexes are black. Sometimes they have a pair of transverse, reddish bands on the wing covers. The female antennae are about half as long as the body (fig. 3, A), while those of the male are body length (fig. 3, B).

The eggs are shiny white, almost translucent, smooth, and elliptical. Somewhat sticky, they are 2 mm. long by 0.5 mm. wide (fig. 3, C).

Larvae are elongate, legless, yellowish grubs, with the thorax nearly one-half as wide as the total length. The head is amber, armed with a pair of short, stout mandibles. Size of the larva varies by age, individual, and sex. A larva just emerging from the egg is 2 mm. long; in about 4 weeks, 10 mm.; and after the normal 60 days of growth, 20 to 25 mm. (fig. 3, D).

Pupae are 12 to 16 mm. long. At first they are entirely creamy white, but the appendages soon darken and become more distinct (fig. 3, E).

Life History and Habits

With few exceptions the fir tree borer has a life cycle of 1 year. Adults spend their first 5 months overwintering in pupal chambers in the wood. They emerge and attack after the first warm weather in early spring. Their flight period extends from 2 to 3 months. Mating occurs on the bark surface in midday during warm, sunny days. Shortly thereafter the female searches for oviposition sites in bark crevices, depositing one to five eggs per site and favoring sides and topsides of windthrown trees. Eggs hatch in 10 to 30 days, depending on temperatures.

Immediately after hatching, lar-

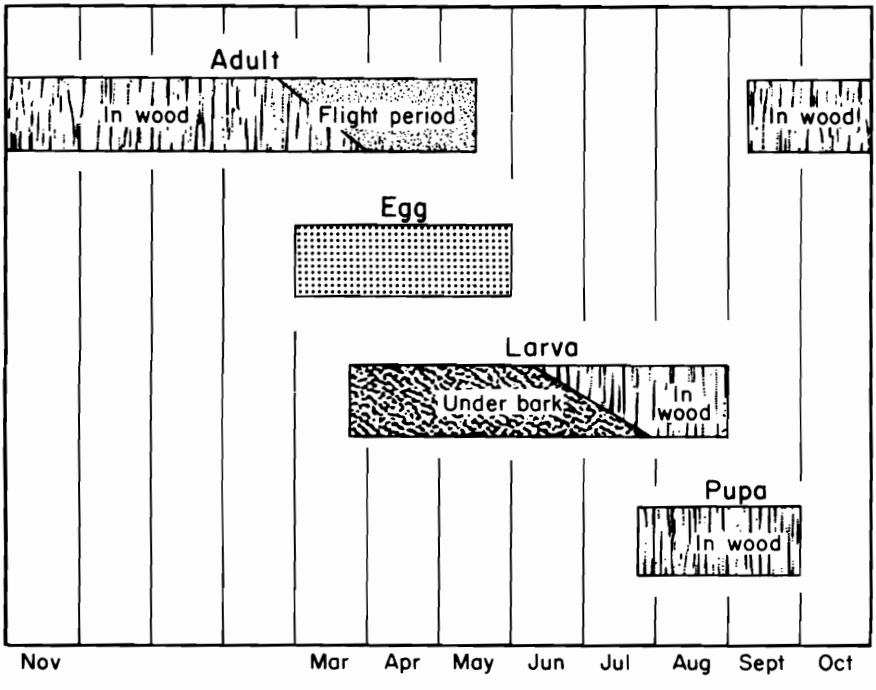

Figure 4.—Generalized life history of the fir tree borer.

vae bore through the bark and into the phloem where they excavate winding galleries, deeply scoring the sapwood. This mining continues for about 2 months during midsummer. The galleries are tightly packed with granular, brown frass. The fully grown larvae enter the wood at a slight radial angle; after penetrating 5 to 40 mm. deep they usually make a right angle and elongate the tunnel with the grain of the wood for 15 to 40 mm. more. This elongation becomes the pupal chamber. The mouth of the tunnel is firmly packed with brown frass. The wood boring takes 1 to 3 weeks.

Only a few larvae do not mature the first summer; these overwinter under the bark or in the wood, pupating and emerging as adults the next summer.

The pupal stage lasts 2 to 6 weeks, with pupation beginning in late July and continuing through early fall. The head of the pupa is pointed toward the end of the gallery packed with frass. By September and October callow adults are formed; they overwinter in the pupal chamber, and after the first warm spring weather, chew to the outside through the packed frass and bark to complete the cycle (fig. 4).

Natural Control

Parasites and predators have reduced borer populations as much as 77 percent. Predators include several species of woodpeckers and an ostomid beetle, *Temnochila virescens* (Fabr.). The beetle larva follows a borer larva into its pupal chamber, devours it there, and uses the chamber for its own pupation.

The most important parasite is a braconid, *Atanycolus anocomidis* Cush. Females oviposit through the bark and lay their eggs on fir borer larvae. After hatching, the parasite larva fastens its mouth to the borer larva and feeds upon it until both are fully grown; then the borer dies (fig. 5, A). The parasite pupates under the bark at the end of the borer gallery (fig. 5, B). Adults emerge the following spring. In a study, cocoons of this parasite were found at the end of 3 of every 5 galleries.

Preventing Attack

Chemical control has not yet been attempted because infested trees are usually so scattered that finding and treating each one is impractical. To avoid damage it is better either to salvage winter blowdown before adults fly and lay eggs in early March, or to mill the logs before the larvae enter the sapwood in mid-June. Cut logs or felled trees should not be left in the field during the egg-laying stage. If logs must be left, then large, tight decks might reduce attack, because the insect prefers sunny spots for oviposition.

Sprinkling infested logs with water or storing them in millponds does not kill all the insects, especially after they have entered the wood. Once the larvae have done this, kiln-treating the infested lumber is the only certain way of preventing them from completing their development and emerging later.

References

The Cerambycidae of North America. E. G. Linsley. Pt. V. Univ. Calif. Publ. Entomol. 22: 21. 1964.

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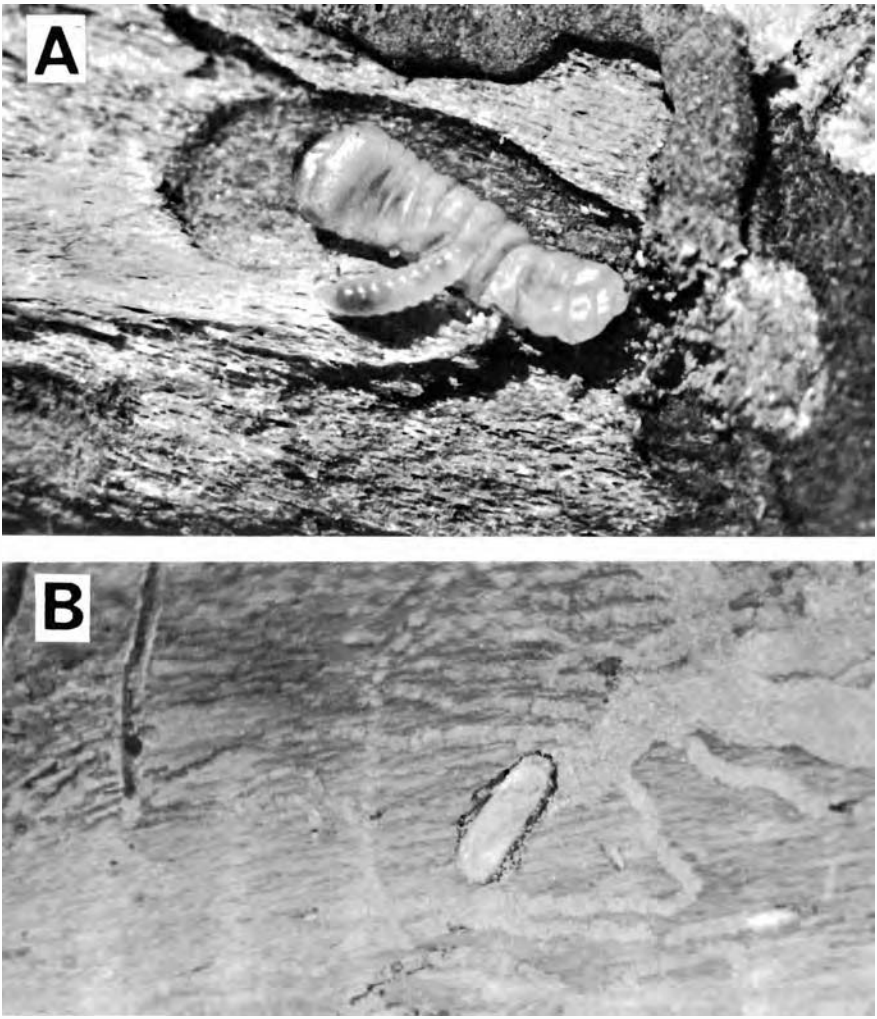

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Figure 5.—*Atanycolus anocomidis:* A, Larva parasitizing a fir tree borer larva under the bark; B, pupal cocoon found at the end of a borer larval gallery in the bark.

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