Introduced Pine Sawfly

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In North America, the introduced pine sawfly (*Diprion similis* [Hartig]) was first discovered in 1914 in a nursery in New Haven, Conn. Since then it has advanced steadily westward, reaching Pennsylvania before 1920 and Ontario by 1931.

The present range in North America is along the Atlantic seaboard from Maine to Virginia, across the Central and Lake States, through parts of southern Ontario and Quebec, and westward to Minnesota. In its homeland in the Eastern Hemisphere, this sawfly occurs throughout most of Eastern and Northern Europe and part of Russia.

Hosts and Injury

Favored hosts of all sizes are susceptible to attack by this sawfly. Both natural and planted pines are attacked. In general, the five-needle pines are preferred, but several species of two-needle pines are fed upon. Common hosts are white pine, Scotch pine, jack pine, and red pine. Eggs are laid and larvae feed on several less common species of pine also.

Austrian pine (*Pinus nigra* Arnold) appears to be fairly resistant to injury by the young larvae. The older larvae, however, will feed readily on its foliage.

White pine is preferred by the female sawfly for egg laying, but egg survival is not as high on this species as on other common pines. However, the greater number of eggs laid on white pine and a very high survival of young larvae contribute toward making it the most injured species.

Injury to trees is caused by the loss of needles. Young larvae consume only the outer, tender parts of the needles, so that the first evidence of damage is the strawlike remains of these needles. Older larvae consume the entire needle and nibble the bark. First-generation larvae feed exclusively on the old foliage because they emerge and feed in the spring before the new needles are fully developed. Later generations feed indiscriminately on old or new needles.

Where the insect population is high enough, the host may be denuded in one season. Later season defoliation, when buds are already formed, is sufficient to kill most conifers; and branch killing is common. Even with occasional high populations locally, the rate of host mortality to date has been low. Trees under heavy larval attack, however, suffer growth loss.

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Description

The egg, when freshly laid, is pale whitish blue, translucent, and shiny. Just prior to hatching it becomes bluish green to dark green. It is nearly oval with blunt-rounded ends. A few days after it is laid, it swells slightly, becoming about 1.5 mm. long by 0.5 mm. wide.

The newly emerged larva has a dull gray body with black legs. When fully grown, it is about 25 mm. (1 inch) long with a shiny black head (fig. 1*A*, *B*). The body is marked on top along the entire length by a dark-brown or black double stripe. Lateral to this is a wide, irregular, yellow stripe broken into oval, yellow patches by numerous, narrow, transverse lines. The background color of the body is dark brown or black, but is nearly inconspicuous because of the numerous yellow and white spots on each segment. The underside of the larva is pale yellow or white.

The cocoon is cylindrical with hemispherical ends (fig. 2). It is finely textured, somewhat glossy, and brown. The average size is 9 mm. long by 5 mm. wide.

The adult is flylike in general appearance but has four shiny, transparent wings. The average length of the female is 8 mm., that of the male is 7 mm. Both sexes have black heads and thoraxes; the abdomen of the female is yellow and black, that of the male is black to brown. The male can be easily dis-

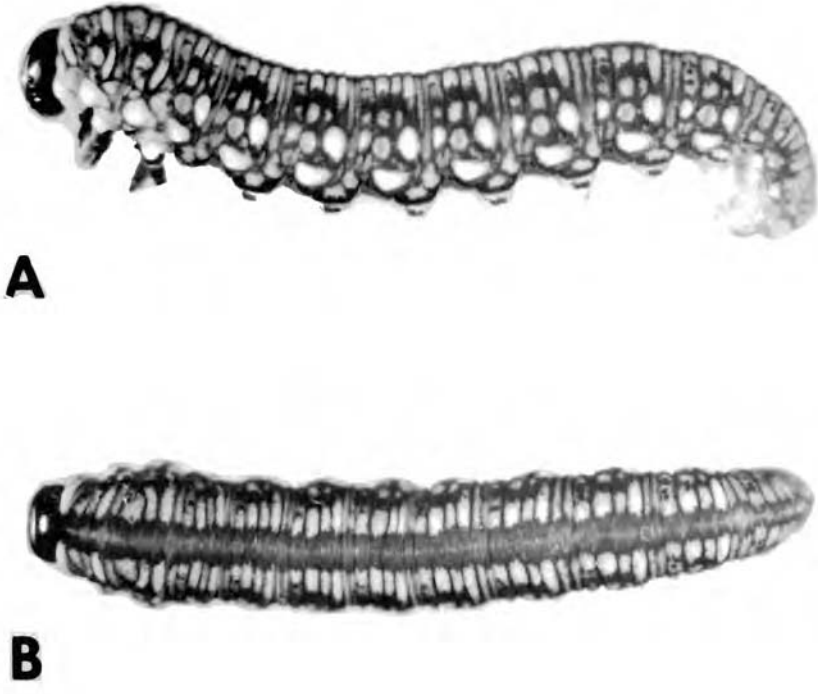

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Figure 1.—Larvae of the introduced pine sawfly: *A*, Lateral view; *B*, dorsal view (×4).

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Figure 2.—Cocoons of the introduced pine sawfly (×6).

tinguished from the female by his broad, feathery antennae.

Life History and Habits

The first eggs of the season are laid from early to mid-May or later, depending on locality. Each female may contain more than 100 eggs, but the average is about 70. The eggs are deposited serially in slits cut in the edge of old needles, and generally about 10 eggs may be found on 1 needle.

Larvae emerge from the eggs in 10 to 14 days. At first the larvae feed gregariously, but as they become older they disperse and become solitary feeders.

Cocoon spinning begins in early July, and pupation occurs shortly after. The peak of pupation takes place in late July. Cocoons are most frequently spun on the host among the needles, at the bases of the small branches, or on the trunk in bark crevices. Occasionally, they are found on nonhost trees, shrubs, or grasses.

Peak adult emergence occurs in early August, and egg laying commences shortly thereafter. Some sawflies do not emerge but remain in the cocoon as prepupae in a resting stage, called diapause. These do not emerge until 1 to 3 seasons later.

Second-generation larvae emerge in 7 or 8 days and feed until sometime in September. Most of the cocoons of this generation are spun in the leaf litter beneath the host. If the weather is favorable, a few of these insects pupate and emerge as adults soon after to produce a partial third generation, which develops until the advent of cold weather. Most, however, overwinter as prepupae in the cocoons and pupate the following season. Adults emerge from April until June. Because of the length of the adult emergence period and local environmental influences, eggs may be deposited from early May to mid-June. As this causes some overlap between the first and second generations, all stages may be found during the season.

Male sawfly adults are usually more common than females. Females that do not mate may lay fertile eggs, which develop into males.

Natural Control

There is considerable evidence that parasites, predators, and low winter temperatures are important in keeping *Diprion similis* populations at tolerable levels. Several hymenopterous and dipterous parasites have been reared from the eggs, larvae, and pupae of *D. similis*. The parasite *Monodontomerus dentipes* (Dalm.), originally introduced from Europe, is undoubtedly the most important; parasitization has ranged as high as 90 percent. Other parasites, too, may cause up to 30-percent mortality in a given stage of the insect.

Little is known about the importance of predators. Various species of insects feed on this sawfly. Larvae have been observed being consumed by species of spiders, and adult sawflies are found occasionally in spiderwebs. Second-generation cocoons suffer heavy predation by rodents burrowing in the litter. Predation by birds, especially the chickadees, appears to be heavy.

Low winter temperature is an important natural control. Up to 50 percent of the larvae of the second generation are commonly killed before they reach the cocoon stage. Cocoons on the tree above snow level suffer complete mortality. Snow cover protects the cocoons in the litter or on the lower parts of the host tree.

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