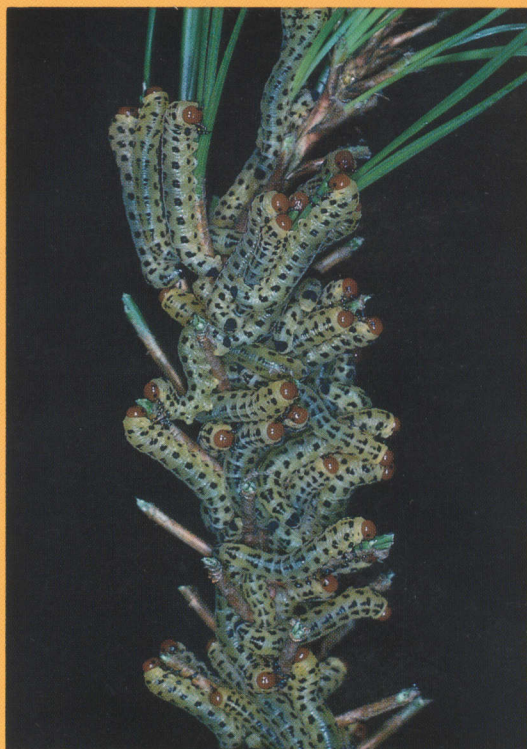


The Redheaded Pine Sawfly:



**A guide
to recognition
and habits**



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Information contained herein is available to all without regard to race, color, sex, or national origin.

THE REDHEADED PINE SAWFLY¹

A Guide to Recognition and Habits

L. L. Hyche²

INTRODUCTION

THE REDHEADED pine sawfly is native to North America and occurs throughout eastern United States west to the Great Plains and in adjacent southeastern Canada.³ It is an important defoliator of pine throughout this region. Hard pines, including southern yellow pines, are preferred hosts. Females normally lay eggs only on hard pines; however, if these primary hosts are defoliated, larvae will move to and feed on other species of conifers nearby.^{3,4,5} The number of generations per year varies within the range; one generation occurs in the North and three or more may occur in the South. The sawfly primarily infests young open-grown pines less than 15 feet in height³; young trees growing in shade or partial shade are particularly susceptible to attack and injury.^{3,4} The common and widespread practice of reforesting pine by the extensive planting of seedlings creates pure stands of young open-grown trees. These stands, figure 1, in their early years provide favorable habitat for the sawfly and injurious infestations develop periodically throughout the range.

¹ *Neodiprion lecontei* (Fitch). Order Hymenoptera; Family Diprionidae.

² Associate Professor of Entomology.

³ Benjamin, D. M. 1955. The Biology and Ecology of the Red-headed Pine Sawfly. USDA For. Serv. Tech. Bull. No. 1118, 57 pp.

⁴ Beal, J. A. 1952. Forest Insects of the Southeast: With Special Reference to Species Occurring in the Piedmont Plateau of North Carolina. Duke Univ. School of For. Bull. 14, 168 pp.

⁵ Wilson, L. F. 1970. The Red-headed Pine Sawfly. USDA For. Serv. For. Pest Leaflet. 14, 6 pp.

In Alabama, the redheaded pine sawfly is the most common and most important insect defoliator of pine. It is commonly associated with young open-grown pines and may be found throughout the State wherever its hosts and suitable habitat are found. Investigations on the biology of the sawfly have been conducted periodically through several years during periods of sawfly activity. Records of occurrence and life history data have been compiled to: provide a guide to recognition of the sawfly, its life stages, and signs of attack; and, define the general life cycle and seasonal activity of the species in Alabama.

LIFE STAGES

Adults, figures 2, 3, and 13, resemble flies somewhat, but have two pairs of wings while true flies have only one pair. In females, figures 2 and 13, the head and thorax are reddish brown and the abdomen is black on the back and whitish along the sides. Antennae are black, serrate, and have 19 segments. Length of the female is reported as 6-9.5 mm;³ mean length of ten females reared from fully grown larvae collected from Virginia pine at Auburn was 8.6 mm (range, 8-10 mm).⁶ The male, figure 3, is smaller, about two-thirds the length of the female, and entirely black. Antennae of males are broad and featherlike.

Eggs, figure 4, are about 1.8 mm long, 0.6 mm wide, whitish and smooth with shining translucent shells⁵. They are placed individually in slits or pockets cut in needles by the female using her ovipositor.

Larvae, figures 5, 6, and 9, have whitish bodies and brown head capsules when first hatched³; second-stage larvae reared from eggs in the laboratory at Auburn were greenish with dark brown heads, figure 5. As larvae feed and grow, coloration changes. Fully grown larva, figure 6, are about 25 mm long. The head is reddish orange with a pair of black eyespots. The body is whitish yellow to yellow to greenish yellow marked with four, six, or eight rows of black spots.^{3,5}

³ Benjamin, D. M. 1955. The Biology and Ecology of the Red-headed Pine Sawfly. USDA For. Serv. Tech. Bull. No. 1118, 57 pp.

⁵ Wilson, L. F. 1970. The Red-headed Pine Sawfly. USDA For. Serv. For. Pest Leaflet. 14, 6 pp.

⁶ One inch equals 26 millimeters (mm).

Six rows, three on each side, extending from the mesothorax to the ninth abdominal segment appear to be most common on larvae observed in Alabama, figures 6 and 9. A double row occurs on the dorsal surface, one row to each side of the midline of the back. These spots are mostly elongate and triangular with the apex of the triangle to the rear. On the top of the tenth, or last, abdominal segment there is a large black spot or patch, which may be solid or divided through the middle by a faint, whitish line. Spots of the second, or subdorsal, row are large, conspicuous and square to rectangular; spots of the third row are smaller and round to oval. Occasionally, a fourth row, consisting of dot-like spots on abdominal segments one through eight, may be evident on some larvae.

Cocoons, figure 7, are tough, papery, reddish-brown, capsule-like structures. They are usually of two fairly distinct sizes, the larger being female and the smaller, male. Dimensions of 20 female and five male cocoons from a colony in Lee County were: female — mean length 9.9 mm (range 8-11 mm), mean diameter 4.7 mm (range 4.3-5 mm); male — mean length 7.6 mm (range 7-8 mm), diameter of all male cocoons was 3.5 mm. Cocoons are constructed by full-grown larvae in the duff or upper layer of the soil.

HOSTS AND DAMAGE

The primary hosts in Alabama are loblolly (*Pinus taeda*), Virginia (*P. virginiana*), slash (*P. elliottii*), longleaf (*P. palustris*), and shortleaf (*P. echinata*) pines. Larvae have been observed feeding on ornamental white pine (*P. strobus*) and probably will also feed on most other introduced and native pine species in the State. Young trees, seedling stage to 2-3 m tall, are preferred but larger trees are sometimes attacked.⁷ Infestations most commonly occur in young reforestation plantations, Virginia pine Christmas tree plantings, pine seed orchards, and on young ornamental pines planted or occurring naturally along roadsides, in parks, on golf courses, and around homes. Occasionally, seedlings in tree nurseries may be attacked.

⁷ One meter (m) equals 40 inches.



FIG. 1. Young loblolly pine plantation — a favorable habitat for the redheaded pine sawfly.



FIG. 2. Redheaded pine sawfly adult female.



FIG. 3. Redheaded pine sawfly adult male.



FIG. 4. Eggs in loblolly in needle.



FIG. 5. Early stage sawfly larvae.



FIG. 6. Full-grown larvae.



FIG. 7. Cocoons: female, L; male, R.



FIG. 8. Typical damage caused by feeding of early stage sawfly larvae.

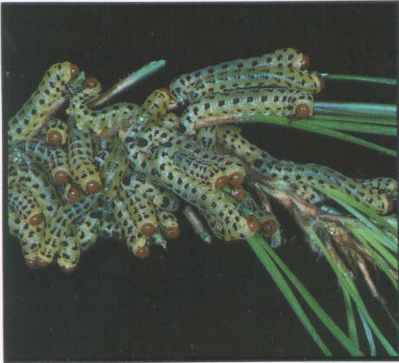


FIG. 9. Typical colony of late-stage larvae consuming entire needles.



FIG. 10. Leader killed by sawfly defoliation, resulting in loss of height growth and poor tree form.



FIG. 11. Branches killed by defoliation, leaving misshapen tree.

Damage is caused by larvae feeding on needles of host pines. Feeding usually begins on needles in which eggs were laid or on those nearby on the same or adjacent twigs. Early stage larvae feed in groups along needle edges leaving a slender central filament which wilts, dies, and turns brown, figure 8, providing a conspicuous early sign of sawfly activity. Larger larvae consume entire needles, both the old and those of the current year. Typically, these larvae congregate in a colony on a single branch or leader, figures 6 and 9, strip it of foliage, then migrate to another branch. In some cases, the tender bark of twigs also may be consumed. If a tree becomes defoliated before larval development is complete, larvae will migrate to another nearby tree and continue feeding.

Injury to trees resulting from loss of needles varies and depends on the degree of defoliation, health and vigor of trees attacked, and conditions under which the trees are growing. A single complete defoliation is sufficient to kill some pines. Vigorous young trees growing in the open on good sites may survive a high degree of defoliation, while weak, or stressed, trees may die. Mortality is generally higher among young pines growing in shade beneath overstory than among those growing in open areas. Partial defoliation of trees is a common occurrence, i.e., only the leader or a few branches are stripped of needles. In such cases, trees may remain alive but defoliated branches and leaders often die leaving stunted, poorly formed trees, figures 10 and 11.

LIFE CYCLE AND SEASONAL ACTIVITY

The basic life cycle of the redheaded pine sawfly is the same throughout the range; however, seasonal occurrence, duration of developmental stages, and number of generations per year vary considerably at different latitudes. The sawfly overwinters as an inactive larva, the prepupa, figure 12, in a cocoon in the duff or upper layer of soil beneath trees previously infested. Pupation takes place in the cocoon following arrival of warm weather. In an overwintering colony studied in Lee County, prepupae were found in cocoons through May, the first pupa was found in early June. However, the time that pupation occurs varies by year and local-

ity, depending on temperature and state of diapause, which is a resting stage in development. Some overwintering larvae pupate promptly in spring; others remain in diapause for varying periods, some for several years.³

Adults emerge from spring pupae within a few weeks, depending on temperature. Females oviposit eggs in needles of host trees and trees growing in shade are preferred for oviposition. Both mated and unmated females lay viable eggs, but eggs from unmated females produce only male offspring.^{3,5} Eggs are laid in both old and current-year needles. The female cuts a pocket in the needle with her ovipositor and deposits a single egg, figure 13. She then moves along the needle and repeats the process, laying several eggs in a uniform row in a single needle, figure 14. The number of eggs per needle varies; 12 loblolly pine needles examined contained 7-20 eggs each, an average of 14 eggs per needle. Each female lays about 120 eggs,^{3,5} all usually in the needles of a single branch or twig. Needle tissue becomes discolored at points where eggs are inserted, figure 14, providing sign of sawfly oviposition.

Eggs hatch in 2-3 weeks, again depending on temperature, and larvae feed in colonies, figures 6 and 9, on host trees for 3½-5 weeks. Full-grown larvae move to the duff and soil and spin cocoons. Adults starting a new generation emerge in 2-3 weeks; in the laboratory at Auburn, adults began to emerge from cocoons after about 17 days. Time required for completion of the entire life cycle is about 2-2½ months. It appears that two generations per year normally occur over most of Alabama; however, three are possible and apparently occur some years, especially in the southern one-half of the State.

Seasonal activity of the redheaded pine sawfly is determined by climate. In Alabama, climatic conditions favorable for sawfly activity may exist for 8 or 9 months in some years in some localities. Larvae have been observed feeding on young ornamental pines as early as April in southeastern Alabama and as late as November in Central Alabama and

³ Benjamin, D. M. 1955. The Biology and Ecology of the Red-headed Pine Sawfly. USDA For. Serv. Tech. Bull. No. 1118, 57 pp.

⁵ Wilson, L. F. 1970. The Red-headed Pine Sawfly. USDA For. Serv. For. Pest Leaflet. 14, 6 pp.

December in South Alabama. However, records⁸ accumulated over several years from throughout much of the State show that infestations are most common from May to mid-September.

Throughout most years, infestations are light and localized, with a few colonies occurring on scattered individual trees or among small groups of trees. Periodically, however, populations buildup and infestations become more widespread. These infestations commonly last for 1-3 years then subside. The redheaded pine sawfly has many natural enemies:³ parasitic insects attack and destroy numerous eggs; diseases and insect parasites kill many larvae; and, rodents and predatory insects destroy large numbers of cocoons. These natural enemies play a major role in regulating sawfly populations.

SUMMARY

The redheaded pine sawfly is an important pest of young open-grown pines. Larvae feed in colonies on needles, causing partial to complete defoliation. Loss of needles may result in loss in growth, stunted and deformed trees, or tree mortality; trees growing in shade or under stress are particularly susceptible to injury.

The sawfly overwinters in the larval stage in cocoons in duff or soil. Pupation and adult emergence occur in spring. Females lay eggs individually in slits cut in needles with the ovipositor; several eggs are deposited in a row in a single needle. Trees in shade are preferred for oviposition. Eggs hatch in 2-3 weeks and larvae feed for 3½-5 weeks. Full-grown larvae move to duff or soil and spin cocoons. New adults emerge in 2-3 weeks. Length of the life cycle is 2-2½ months. Infestations are most common from May to mid-September, but larval feeding has been noted as early as April and as late as December in South Alabama. Two and three generations per year are possible in Alabama. Parasites, predators, and disease are important in natural control of sawfly infestations.

³ Benjamin, D. M. 1955. The Biology and Ecology of the Red-headed Pine Sawfly. USDA For. Serv. Tech. Bull. No. 1118, 57 pp.

⁸ Personal records and records from Alabama Cooperative Extension Service Insect Survey Report, USDA Cooperative Economic Insect Report, and USDA Cooperative Plant Pest Report.



FIG. 12. Redheaded pine sawfly prepupa — the overwintering stage.



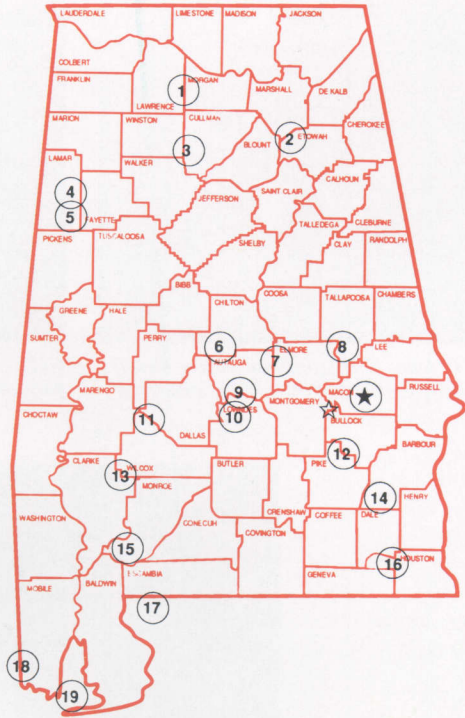
FIG. 13. Female ovipositing in pine needle.



FIG. 14. Pine needle with row of eggs and typical discolored spots indicating sawfly oviposition.

Alabama's Agricultural Experiment Station System AUBURN UNIVERSITY

With an agricultural research unit in every major soil area, Auburn University serves the needs of field crop, livestock, forestry, and horticultural producers in each region in Alabama. Every citizen of the State has a stake in this research program, since any advantage from new and more economical ways of producing and handling farm products directly benefits the consuming public.



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- ☆ E. V. Smith Research Center, Shorter.

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2. Sand Mountain Substation, Crossville.
3. North Alabama Horticulture Substation, Cullman.
4. Upper Coastal Plain Substation, Winfield.
5. Forestry Unit, Fayette County.
6. Chilton Area Horticulture Substation, Clanton.
7. Forestry Unit, Coosa County.
8. Piedmont Substation, Camp Hill.
9. Forestry Unit, Autauga County.
10. Prattville Experiment Field, Prattville.
11. Black Belt Substation, Marion Junction.
12. The Turnipseed-Ikenberry Place, Union Springs.
13. Lower Coastal Plain Substation, Camden.
14. Forestry Unit, Barbour County.
15. Monroeville Experiment Field, Monroeville.
16. Wiregrass Substation, Headland.
17. Brewton Experiment Field, Brewton.
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19. Gulf Coast Substation, Fairhope.