Seasonal Cycle and Habits of the Butternut Woollyworm

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INTRODUCTION

THE SAWFLY *Eriocampa juglandis* (Fitch), commonly called butternut woollyworm, figure 1, was first reported in Alabama in 1974. On July 20 of that year, H.F. McQueen[2] reported larvae defoliating black walnut (*Juglans nigra* L.) in Walker County[3]. In June 1975, larvae were found on black walnut and butternut (*J. cinerea* L.) shade trees at Auburn in Lee County.[4] Previous references[5,6] reported the range of *E. juglandis* as the Northeastern United States and southern Canada. There, the species has one generation per year and larvae feed on foliage of butternut, black walnut, and hickories in July and August. Discovery of *E. juglandis* infestations in Alabama, which is far south of the range previously reported, prompted a study to determine the habits of the species in this area.

STUDY PROCEDURES

The study was conducted in the infestation area at Auburn. Observations began in 1975, and life cycle and habit data were compiled in subsequent years in which sawfly populations were available through 1988. When leaf development began each spring, the infestation area was inspected daily or on alternate days for adult presence, mating, and oviposition. When oviposition was observed, habits of laying females, site of oviposition, and number of eggs deposited per

[1]Associate Professor of Entomology.
[2]Alabama Cooperative Extension Service Survey Entomologist, now retired.
[3]Cooperative Economic Insect Report 25:655.
[4]Hyche, L.L. 1982. Observations on the Biology of the Sawfly *Eriocampa juglandis* in Alabama. J. Georgia Entomol. Soc. 17:417-421.
[5]Baker, W.L. 1972. Eastern Forest Insects. USDA For. Ser. Misc. Publ. 1175. 642 pp.
[6]Craighead, F.C. 1950. Insect Enemies of Eastern Forests. USDA For. Ser. Misc. Publ. 657. 679 pp.

oviposition site were noted. Oviposition sites with eggs of known age were examined daily until hatching occurred. Thereafter, observations on larval habits and development were made at daily to weekly intervals until larvae ceased feeding and moved from foliage to the soil. Samples of soil beneath host trees were collected and examined at 1- to 3-month intervals, and life stage(s) present and state of postlarval development determined. Observations were made throughout the study on host preference and general population trends. Life stages were collected and identified, and the general life history of *E. juglandis* in Alabama was determined.

RESULTS AND DISCUSSION

Hosts and General Population Trends

Butternut woollyworm infestations occurred only on black walnut and butternut. Hickories, which are listed as hosts of *E. juglandis* in the Northeastern States and Canada, were not attacked in the Auburn study area. Adults were seen occasionally on foliage of other broadleaf trees nearby, but there was no evidence of oviposition or larval development on these trees.

Density of the population fluctuated over the study period. Larvae were abundant in 1975-76 and again in 1984-85. Destruction of foliage was moderately heavy during these periods, but no tree mortality or dieback of tree crowns occurred. The population was low to extremely low in most other years represented in the study. In some years there was little evidence of the infestation, damage to foliage was not noticeable, and developmental stages of the sawfly were seemingly absent.

Life Stages

Adults, figures 2,10, have shiny black bodies and white legs. Metathoracic legs usually have dark brown to black bands or areas on the distal portion of the femur, tibia, and tarsus. Mesothoracic legs of some males have dark brown to black spots on the distal one-third of the femur. Females are 8-10 mm[7] long and males are smaller (6-7 mm long).

Eggs, figure 3, are creamy white, cylindrical, elongate, 1¼ - 1½ mm long.

Fully grown larva are densely covered with white, cottony or

[7] 1 inch = 25 mm (millimeters).

woolly filamentous flocculence, figure 1, apparently the reason for the name woollyworm. Fully grown bare larva, figure 4, are about 18 mm long with pale green bodies. The head capsules are white with a pair of black eyespots.

Cocoons, figure 5 (left), are oval, 6-8 mm long, and covered with soil particles. A thin parchment-like lining, figure 5 (right), encloses prepupa, figure 6, or pupa, figure 7.

FIG. 1. Late-instar *E. juglandis* larva (woollyworm), with characteristic white flocculence.

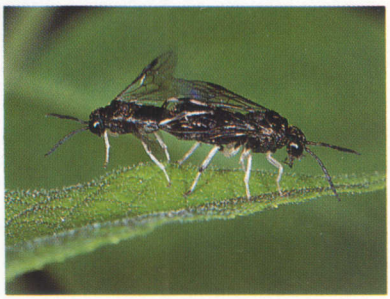

FIG. 2. *E. juglandis* adults, mating: male, L.; female, R.

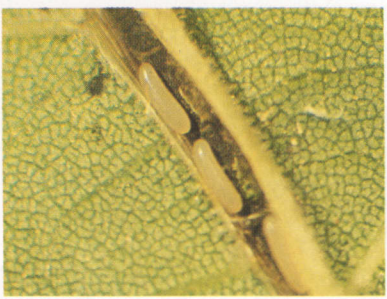

FIG. 3. *E. juglandis* eggs.

FIG. 4. Fully grown butternut woollyworm with white flocculence removed.

FIG. 5. *E. juglandis* cocoon (left) and parchment-like lining (right).

FIG. 6. *E. juglandis* prepupa.

FIG. 7. *E. juglandis* pupa.

FIG. 8. Typical ovipositional damage to leaflet.

Life History

Sawfly adults were common during the high-population period of 1984-85, and mating, figure 2, and oviposition were witnessed in each of those years. In years of low populations, adults were seldom seen but the first appearance of ovipositional damage, figure 8, indicating onset of adult activity, was detected in three additional years, 1982, 1983, and 1988. Data on larval development and habits were obtained for each of 5 years, 1976, 1982, 1983, 1984, and 1985, and beginning of larval activity was observed in two others, 1977 and 1988. Postlarval stages were abundant enough to be collected for study during 1984-85, and development through the postlarval phase was determined during this period. The seasonal cycle for *E. juglandis* in Alabama is presented in figure 9.

In 1985, adults first appeared on host foliage on April 26, figure 9. Mating and oviposition were observed on this same date, and the ovipositional period extended through May 8. In 1984, evidence of oviposition was discovered on May 1; adults were not seen at that time and activity appeared to have ceased. However, on May 18, adults were found on host foliage, and females were observed ovipositing; the ovipositional period in 1984 extended through May 23. For the years of 1982, 1983, and 1988, first sign of oviposition, indicating start of adult activity, was detected on May 13, 16, and 9, respectively.

In the act of ovipositing, the female placed herself on the upper surface of a leaflet, parallel to and slightly to one side of the midrib, figure 10. She slit the tissue of the leaflet with the sawlike ovipositor, figure 11, and placed an egg in the leaflet midrib. She then moved forward repeating the process, depositing eggs end to end in the midrib, generally over the inner one-half to two-thirds of its length, figure 12. The

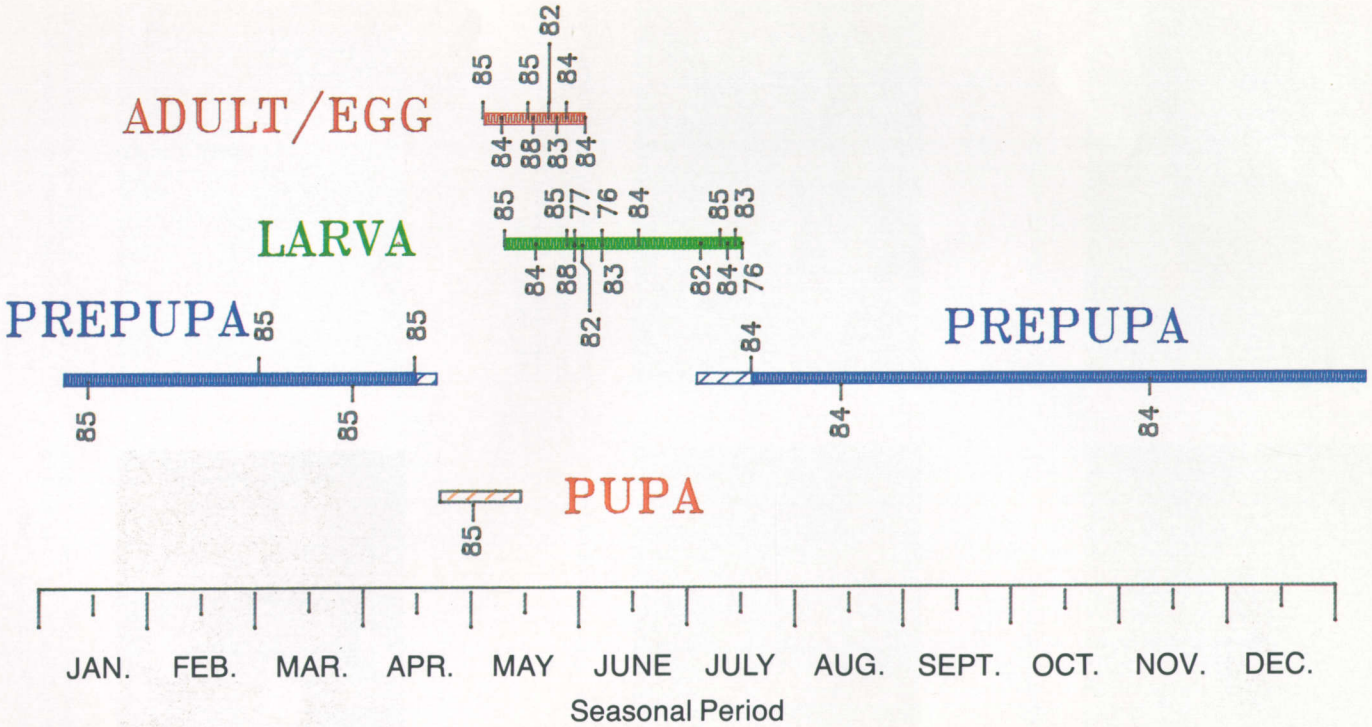

FIG. 9. Seasonal cycle of *E. juglandis* in Alabama. Points on Adult/Egg line labeled 82, 83, 88, and May 1, 1984, are dates on which ovipositional sign was first detected in those years; other points labeled 84 and those designated 85 represent dates when oviposition was witnessed. On the Larva line, points in May are dates newly hatched larvae appeared on leaflets; points in June/July are dates of disappearance of the last larva in those years. Broken portions of the Prepupa line represent estimated extensions of the prepupal period; broken Pupa line represents the pupal period estimated from 1984-85 sampling data.

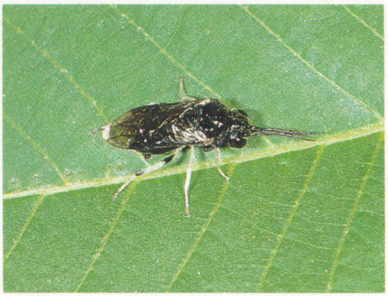

FIG. 10. Ovipositing female.

FIG. 11. Sawlike ovipositor of female sawfly.

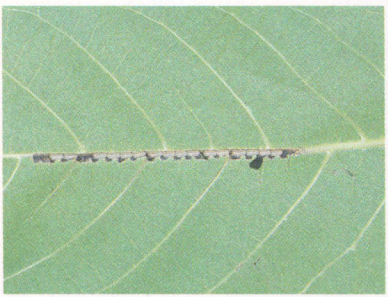

FIG. 12. Row of eggs in leaflet midrib.

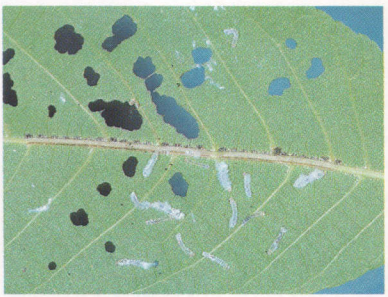

FIG. 13. Leaflet showing newly hatched bare larvae, larvae with white covering beginning to develop, and typical feeding damage caused by young larvae.

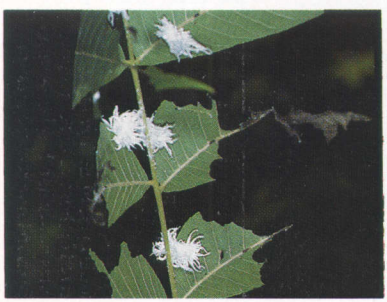

FIG. 14. Newly molted larval skins attached to walnut leaf; leaflets covering feeding damage typical of late-instar larvae.

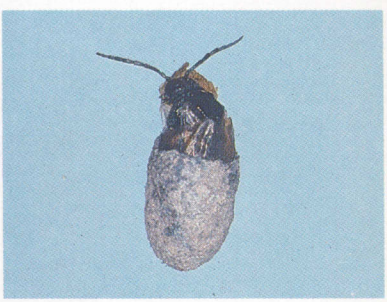

FIG. 15. New *E. juglandis* adult transformed from pupa and ready to emerge from cocoon.

number of egg slits per leaflet varied from 4 to 41, but fell within a range of 20 to 35 in most leaflets; the average for 31 leaflets examined was 27. Dissection of midribs of 10 average leaflets revealed eggs in 86 percent of the slits, or about 23 eggs per leaflet. Eggs hatched in 6 or 7 days. Promptly following oviposition, leaflet tissue at puncture sites began to lose color; subsequently, discoloration appeared over the adjacent length of midrib-containing eggs, figure 8. This discoloration was often the first visible evidence of the start of adult activity.

Newly hatched larvae emerged from the midrib onto the lower surface of the leaflet where they fed gregariously, chewing small holes in tissue between veins, figure 13. Larger larvae generally consumed entire leaflets, but sometimes left stubs of midribs and large veins, figure 14. Newly hatched larvae were bare, but a white covering promptly developed, figure 13. Later instars were heavily covered with the characteristic woolly flocculence, figure 1. Molting occurred on the foliage. The white covering remained attached to molted skin, which was attached to leaf stalks (rachis) and to midribs and edges of leaflets, figure 14, for several days.

Larval activity began May 2, 1985, and May 23, 1976 and 1983, figure 9. In 1984, hatch of some late-laid eggs occurred May 30, but date of first appearance of larvae that year was May 8. In general, larvae were active through June to early July. Fully grown larvae then left trees and entered the soil. In all years, larvae had disappeared from host foliage by the end of the first week of July.

On July 10, 1984, eight days after larvae had disappeared from foliage, fully formed sawfly cocoons containing prepupae, figure 6, were recovered from soil beneath host trees. Thereafter, three or more cocoons were recovered and examined at intervals, figure 9, through April 1985. All cocoons collected through April 9, 1985, contained prepupae. Cocoons removed from the soil on April 26 contained pupae or, in some cases, fully formed adults ready to emerge, figures 7 and 15. Thus, the prepupal period extended through the winter to about mid-April, and pupation occurred during the last half of April to early May, figure 9. Only one generation occurred per year.

SUMMARY

Eriocampa juglandis, the butternut woollyworm, overwinters as a prepupa in a cocoon in the soil. Pupation takes place during the last half of April to early May. Adults emerge, mate, and females oviposit generally during the period from the last week of April through the first 3 weeks of May. Females lay eggs in rows in midribs of leaflets

of butternut and black walnut trees and eggs hatch in 6-7 days. Larvae feed on foliage from about mid-May through June, and into the first week of July. Larvae then enter the soil and form cocoons in which they remain as prepupae until they pupate the following spring. There is one generation per year.

Typically, injurious infestations of *E. juglandis* occur periodically, last for relatively short periods (about two seasons in this study), and remain localized. Infested trees survive these short-term outbreaks, but destruction of foliage by larvae destroys the aesthetic value of host trees. In the typical circumstance, *E. juglandis* is primarily important as a pest of shade trees and the urban forest.

ACKNOWLEDGMENT

Cecil Ward, Jr. assisted in field aspects of the study.

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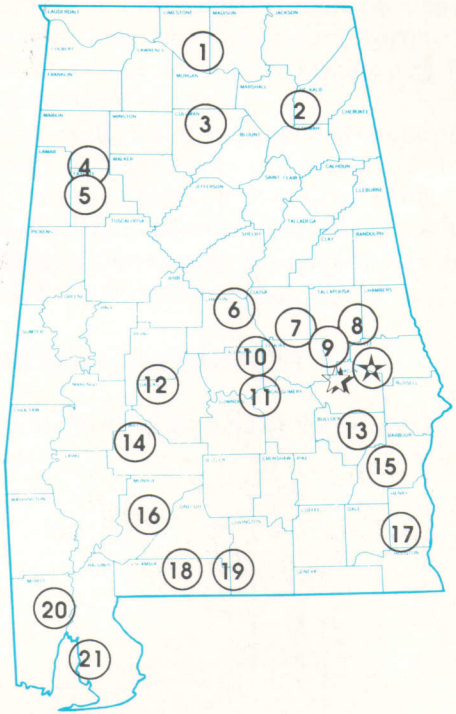

Research Unit Identification

☆ Main Agricultural Experiment Station, Auburn.
☆ E. V. Smith Research Center, Shorter.

1. Tennessee Valley Substation, Belle, Mina.
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. Plant Breeding Unit, Tallassee.
10. Forestry Unit, Autauga County.
11. Prattville Experiment Field, Prattville.
12. Black Belt Substation, Marion Junction.
13. The Turnipseed-Ikenberry Place, Union Springs.
14. Lower Coastal Plain Substation, Camden.
15. Forestry Unit, Barbour County.
16. Monroeville Experiment Field, Monroeville.
17. Wiregrass Substation, Headland.
18. Brewton Experiment Field, Brewton.
19. Solon Dixon Forestry Education Center, Covington and Escambia counties.
20. Ornamental Horticulture Substation, Spring Hill.
21. Gulf Coast Substation, Fairhope.