

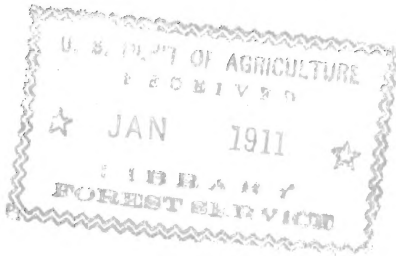


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L. O. HOWARD, Entomologist and Chief of Bureau.

THE OAK PRUNER.

BY

F. H. CHITTENDEN, Sc. D.,

In Charge of Truck Crop and Stored Product Insect Investigations.

BUREAU OF ENTOMOLOGY.

L. O. HOWARD, *Entomologist and Chief of Bureau.*

C. L. MARLATT, *Assistant Entomologist and Acting Chief in Absence of Chief.*

R. S. CLIFTON, *Executive Assistant.*

W. F. TASTET, *Chief Clerk.*

F. H. CHITTENDEN, *in charge of truck crop and stored product insect investigations.*

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TRUCK CROP AND STORED PRODUCT INSECT INVESTIGATIONS.

F. H. CHITTENDEN, *in charge.*

H. M. RUSSELL, C. H. POPENOE, D. K. McMILLAN, E. G. SMYTH, THOS. H. JONES,
M. M. HIGH, FRED. A. JOHNSTON, *agents and experts.*

I. J. CONDIT, WM. B. PARKER, *collaborators in California.*

H. O. MARSH, *collaborator in Hawaii.*

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United States Department of Agriculture,

BUREAU OF ENTOMOLOGY.

L. O. HOWARD, Entomologist and Chief of Bureau.

THE OAK PRUNER.^a*(Elaphidion villosum Fab.)*

By F. H. CHITTENDEN,

In Charge of Truck Crop and Stored Product Insect Investigations.

INTRODUCTORY.

Many sorts of trees, particularly oak and hickory, grown for shade are often noticed with their limbs severed as if with a knife or saw. Underneath these trees numbers of twigs and small branches strew the ground. The severed limbs are from a few inches to 2 or 3 feet long, and on one occasion a limb was seen that measured 10 feet in length and another that was 1½ inches in thickness. Young trees are sometimes felled. An examination of one end, sometimes of both ends, of a severed limb will show a smoothly cut surface near the center of which will be seen a more or less oval opening plugged with fine shavings and sawdust (fig. 1, *e, f*).

DESCRIPTIVE.

If one of these limbs be split open at the proper time a soft-bodied larva, resembling that shown in figure 1 at *a*, will be found. This is the larva of the oak pruner. It is nearly cylindrical, soft and fleshy, of a whitish or light yellowish color, and is provided with rudimentary legs (fig. 1, *g*).

^a Formerly the species under consideration was known under two names, *Elaphidion villosum* Fab. and *E. parallelum* Newm. The writer, however, has seen an abundance of specimens of what are labeled by both names, and while it may be true that there are two species it is certain that the species which breed in the North from the amputated twigs are identical, since the writer has reared both what are known as *villosum* and *parallelum* from such twigs. That which breeds in the portion remaining on the tree has not been investigated, but it is probably not different.

Horn believed the two species identical and his opinion should not be disputed until the contrary can be proved.

The beetle which produces this larva is slender and cylindrical, dark brown, and clothed with grayish, somewhat mottled pubescence. The antennæ of the female are shorter, those of the male (illustrated at *b*) longer, than the body; the proximal joints are armed with small spines. Each elytron terminates in two small spines and the femora or thighs are unarmed. The length of the body varies from about one-half to three-fourths of an inch.

DISTRIBUTION.

Available records show that the typical oak pruner (*Elaphidion villosum* Fab.) occurs from New England westward to Michigan, and probably farther west, and southward through the District of Columbia and Virginia to North Carolina, while there are specimens in the United States National Museum labeled Texas. It is therefore evident that the species covers the greater portion of the eastern United States, with the possible exception of Georgia and one or two of the Gulf States, from which the typical form has not been seen.

FOOD PLANTS AND INJURY.

The list of food plants of this species includes oak, hickory, pecan, chestnut, maple, fir (*Abies*) (doubtful, recorded by Halde-

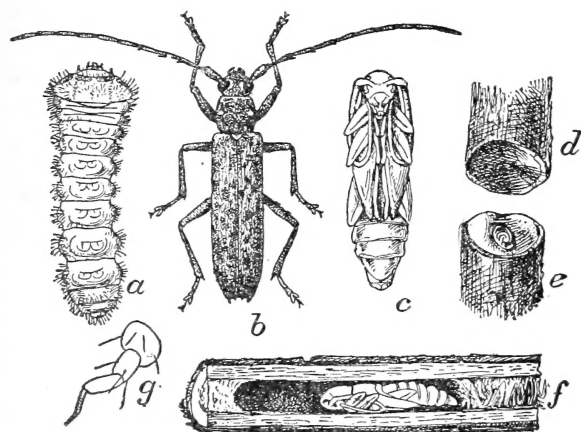


FIG. 1.—The oak pruner (*Elaphidion villosum*): *a*, Larva; *b*, beetle; *c*, pupa; *d*, end of twig cut by larva from tree; *e*, reverse end containing insect; *f*, same from side, split to show pupa within; *g*, leg of larva. *a*, *b*, *c*, About twice natural size; *d*, *e*, *f*, natural size; *g*, greatly enlarged. (Author's illustration.)

man), locust, elm, redbud (*Cercis canadensis*), apple, plum, peach, pear, quince, grape, orange, Osage orange (*Maclura aurantiaca*), wistaria, climbing bittersweet (*Celastrus scandens*), black walnut, sweet gum, and hackberry, according to the records of the Forest Insect Investigations of this Bureau. Indeed, this insect or allied species will attack almost every form of deciduous trees, shrubs, and vines with woody stalks. The pruned twigs of various trees and shrubs are of frequent occurrence, and among those which have been noted by the writer in the vicinity of the District of Columbia and in New York are the spicebush (*Lindera benzoin*), sassafras, sumac, English or white walnut, and beech. Since no other species of insect in the regions

specified is known to have the same pruning habit, it is practically certain that the species under discussion is the culprit.

Of injuries by this species, it has been reported that in 1886 "peach trees in portions of Michigan were seriously injured. The twigs were cut off so as to nearly destroy some of the trees." In 1892 the extraordinary abundance of this pruner in Pennsylvania, New Jersey, and neighboring States attracted considerable attention. At that time carloads of the branches could be gathered up from the ground throughout the oak forests in Bucks County, Pa. One of the striking features noticeable that year in riding through that part of the country lying between Washington, D. C., and New York City was the unusual amount of injury by *Elaphidion* on oaks. In some localities every tree had several dead or dying twigs, and the ground beneath was strewn with branches which had been damaged by this species and later broken off by the wind.

In the writer's experience the oak pruner was extremely abundant in years past in the neighborhood of Ithaca, N. Y., and near South Woodstock, Conn., on the shagbark hickory, the severed twigs and branches occurring by the barrellful under a single tree. In one instance a pear orchard at Ithaca, N. Y., had been very extensively pruned. The insect had apparently attacked healthy living twigs and several trees had every appearance of having been killed outright.

A few of the injurious and other occurrences reported to this Bureau during the past decade may be mentioned: Regarding supposed damage to oak, Mr. R. A. Edwards, of Peru, Ind., wrote on March 27, 1901, that he could not observe that the pruner did actual damage beyond cutting off the smaller branches, some of which do not reach the ground, but hang from the limb or lodge upon limbs below and there die. September 5, 1902, Mr. Edmund L. Tyler, of Anniston, Ala., sent a limb of hickory nearly 5 feet in length which had been pruned 3 feet from the end by the oak pruner. The point at which amputation had taken place was an even inch in diameter. April 25, 1903, Mr. Albert M. Boozer, of Columbia, S. C., sent this species, which he thought to be injurious to pecan in that vicinity. It was probably merely concerned in more serious injury due to the pecan twig-girdler (*Oncideres cingulata* Say) and to branch and trunk borers. Mr. E. J. Vann, of Madison, Fla., stated, in a letter dated July 28, 1905, that what he considered this species had almost ruined dwarf chestnuts in that vicinity. Miss Alice S. Hainsworth, of South China, Me., wrote, July 30, 1906, that this species was destroying the beauty of oak trees in that vicinity. The lawn beneath the oak trees was continually strewn with fallen branches. In 1907 report of injury to oak in South Carolina was received. During 1908 the depredations by this species were widespread and general,

injury having been reported in Massachusetts, Pennsylvania, Virginia, and Kansas to oak, elm, pear, and wistaria. The year following pecans were attacked in Alabama and Mississippi, and hickory and oak in Illinois. In 1910 the oak pruner attracted widespread attention in the States of New York, Connecticut, and Massachusetts and became the subject of many newspaper notices under the name of the "gun-worm."

LIFE HISTORY.

From present knowledge of this species the following brief account of its life history may be given:

In the northern portion of the upper austral life zone the adult appears in early summer. The mother beetle inserts an egg, usually in one of the smaller twigs of a living tree. The young larva hatching therefrom first attacks the wood under the bark, following the grain of the wood and packing its burrow with its sawdust-like castings. The larva, as it grows, bores toward the base, often consuming the wood entirely around the limb and ejecting its castings through holes which it makes in the bark. Later it follows the axis of the twig, boring through the center and excavating a more or less oval channel, sometimes for a distance of several inches. Dr. Asa Fitch^a has said that the larva is only about half grown when it severs the limb in which it is working, but it has more probably attained its full growth at this time. He described this operation, recounting at length how, with "consummate skill and seemingly superterrestrial intelligence, he varies his proceedings to meet the circumstances of his situation in each particular case."

From Fitch's account it would seem that he imputed to this insect a reasoning power, which enables it to modify its operations according to conditions and to judge just how far the limb should be cut off to insure its ultimate amputation by the wind without endangering its own safety. Whether guided by reason or by blind instinct, the insect is actually enabled to accomplish this purpose.

After cutting away the wood in such manner that the winds will in time bring the limb to the ground, the contained larva retreats into its burrow and plugs up the severed end with castings. Here it transforms to pupa (fig. 1, *c*, *f*), sometimes late in the autumn and often not until early spring, assuming the adult stage as early as November and appearing abroad in June and throughout the summer until September.

A larva received from South Woodstock, Conn., transformed to pupa May 3 and to adult May 21, having thus passed the pupal stage in eighteen days, the average temperature having been about 74° F.

^a FITCH, ASA.—Fifth Report on Insects New York, pp. 797–804, 1859.
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Although this species normally completes its transformations in amputated or fallen limbs, it occasionally breeds in limbs that have not been severed. It does not always cut off the twigs in which it lives, and the larva sometimes reverses the order of proceedings and directs its burrow toward the distal end of the branch, which it cuts off at the end of its burrow and remains in the branch attached to the tree.

From the earlier accounts of Fitch and others it would be inferred that the insect requires a single year only for the completion of its life cycle. Dr. John Hamilton,^a however, has stated that a longer period is required, three years being the usual time, and in individual cases four or more years being consumed. The writer is strongly inclined to believe such exceptionally long periods, even three years, to be the result of undue dryness caused by unnatural indoor conditions.

WHY THE LARVA AMPUTATES A LIMB.

The purpose of the larva in cutting away the wood furnishes an interesting topic for speculation. The object attained is its ultimate fall to the ground.

Peck, who wrote of this species in 1819,^b thought that the limb, if permitted to remain attached to the tree, would become too dry and that a certain degree of moisture was required for the development of the insect, and that the limb was accordingly partially severed that it might eventually fall, and that then, lying on the ground amid the autumn leaves and beneath the winter's snow, the requisite degree of moisture was insured. In this belief Fitch concurred. Mr. Frederick Clarkson, however, took issue with Fitch, believing that the main object of the larva is to obtain deadwood and to prevent the flow of sap. Here we have two contrary views expressed—one that the object is to obtain moisture, the other to prevent it.

Such an excess of moisture as is obtained on the ground under the melting snow and the pools of water that collect in winter under the infested trees could hardly be a necessity in the life history of any terrestrial animal. The ease with which these insects may be reared from dry twigs indoors is conclusive proof to the contrary. Why they should require more moisture than fifty or a hundred others that could be named that have similar food habits and do not breed exclusively in fallen limbs it would be difficult to explain. Again, that the small flow of sap of oak or hickory could seriously interfere with development would seem unreasonable when we consider that these insects

^a HAMILTON, JOHN.—Canadian Entomologist, vol. 19, pp. 141-145, 1887.

^b PECK, WILLIAM D.—Mass. Agr. Repos. and Journ., vol. 5, pp. 307-313, Jan., 1819. (Treated as *Stenocoris putator* Peck. Not seen.)

are able to survive the immersion to which they are sometimes subjected for many days together during thaws and rainy spells in winter.

Another explanation of the limb's amputation occurs to the writer. Those who have reared beetles from hard wood can not have failed to observe that the larva before transforming cuts through the wood until it reaches the bark, which is left untouched and serves to protect the insect from marauding birds or other enemies. When the beetle develops it has only to gnaw its way through this thin layer of bark to effect its exit. There are undoubtedly some wood borers which are provided in the beetle state with mandibles sufficiently powerful to enable them to penetrate hard wood (Monohammus, for example), but the majority, among them *Elaphidion*, are not thus favored, and would be utterly unable with their weaker boring organs to escape, and would perish in their burrows had they not while larvæ excavated the necessary channel for their exit. These exit channels usually run at an angle to the axis of the wood. Now, in the case of our *Elaphidion*, which usually lives in a slender limb which it bores longitudinally, there is no room to place a branching, transverse channel; accordingly the larva severs the twig and when it becomes a beetle it cuts its way through the plug of castings.

As to Fitch's claim that the larva varies its operations to suit the different sizes of limbs, the average infested twig is of about the thickness of one's finger, and it is probable that the larva commences proceedings late in the season with the approach of cold weather when it is about full grown and ready for hibernation. To cut off the limb is a labor of some magnitude for so small a creature and may require several days for completion. It has a limited amount of energy, being now toward the end of its active existence as a borer, and the cooler weather serves to repress this energy, which is sufficient for cutting away all the wood in a small twig, but is inadequate for a larger one. The wood of a large branch is harder, and the insect ceases work, perhaps from exhaustion or from cold, or because its instinct impels it to cut a certain amount, and when that is accomplished to cease, its work being ended. At the close of his narrative Fitch says, in spite of a previous assertion that the insect never miscalculates, that—

in at least three-fourths of the fallen limbs no worm is to be found; and an examination of them shows that the insect perished at the time the limb was severed and before it had excavated any burrow upward in its center, no perforation being present except that leading into the lateral twig. It is probable that in many instances the limb broke when the insect was in the act of gnawing it asunder, either from its own weight or from a wind arising whilst the work was in progress.

NATURAL ENEMIES.

As might be inferred from its manner of life, this insect enjoys as nearly perfect exemption from predaceous or parasitic attack as falls to the lot of most wood borers. Fitch, however, has stated that some of our insect-eating birds destroy the larvæ, and the writer has reared the parasite *Bracon eurygaster* Brullé from twigs inhabited by the species.

Among natural enemies of the oak pruner, Mr. F. H. Mosher^a records the downy woodpecker (*Dryobates pubescens*), the blue jay (*Cyanocitta cristata*), and the black-capped chickadee (*Penthestes atricapillus*). Mr. W. L. McAtee, of the Bureau of Biological Survey, states that a species of Elaphidion is preyed upon by the downy woodpecker and by the great-crested flycatcher (*Myiarchus crinitus*). Mr. A. H. Kirkland^a records having found a spider (*Theridium tepidariorum* C. Koch) feeding upon the mature insects.

REMEDIES.

The pruning process is not always in itself especially injurious, since when the pruner occurs in only moderate numbers the vitality of the tree is not impaired. The ultimate effects, however, are likely to be more serious. The fallen twigs serve as a breeding place for hosts of other wood borers, many of which are injurious to shade trees and to standing timber. Some of these do not hesitate, in default of an abundance of dead or injured wood, to attack and damage apparently healthy living trees.

In case this species becomes injuriously abundant, it may be readily controlled by gathering the pruned twigs and burning them. This should be done from time to time, as otherwise they accumulate and make the lawn unsightly. To make this remedy of any value, the cooperation of neighbors is desirable. The work should be as thorough as possible. If the twigs are gathered in numbers during one season, the chances are that the insects will not be nearly so abundant the year following.

Approved:

JAMES WILSON,

Secretary of Agriculture.

WASHINGTON, D. C., October 14, 1910.

^a Forty-fifth Annual Rep. Sec. Mass. State Board Agr. for 1897 (1898), p. 244.

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