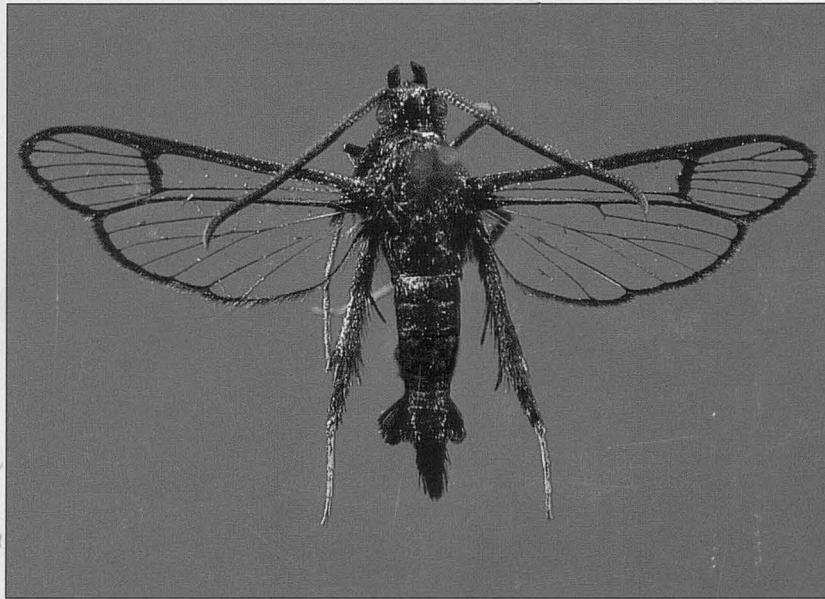


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A Guide to the Clearwing Borers (Sesiidae) of the North Central United States



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A Guide to the Clearwing Borers (Sesiidae) of the North Central United States



By
*William H. Taft, Adjunct Entomological Curator, Michigan State University,
Dave Smitley, Entomology Department, Michigan State University
East Lansing, Michigan*
and
*J. Wendell Snow, U.S. Department of Agriculture
Honolulu, Hawaii*

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Room 10B Ag. Hall
East Lansing, MI 48824-1039
517-355-0240

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3 Coffey Hall
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A Guide to the Clearwing Borers (Sesiidae) of the North Central United States



Introduction

Clearwing borers attack at least 40 genera of trees, shrubs, vines and herbaceous plants in North America. They are important pests of forest, shade and fruit trees, limiting production and use of susceptible trees in certain regions. Many of the 38 species described in this publication are potentially destructive, but horticulture professionals tend to underrate the pest status of clearwing borers, often because borer damage is overlooked or confused with drought stress or disease injury. This publication explains how to identify adult clearwing borers and describes the injury that larval stages cause to host plants.

Adults of the family Sesiidae are known as clearwing moths because part or most of their wings are without scales and, therefore, transparent. Many species mimic bees or wasps so effectively that most people believe they are seeing a wasp instead of a moth. Their ability to hover contributes to this illusion.

Many clearwings have one life cycle per year, although generation time varies from a few months to several years. When examined closely, the striking colorations of the adult moth are quite beautiful.

In contrast, larvae of clearwing moths are ivory white, unmarked and almost legless (Fig. 1). Larvae bore in roots, trunks or branches of trees and shrubs, or in the stems and roots of herbaceous plants. A few species form plant galls or bore into existing galls, mostly on oak trees. Injury from larval tunneling varies from insignificant to devastating. Severe infestations can contribute to the decline or death of host plants.

Sex attractants (pheromones) produced by females are highly attractive to males. Some males can detect pheromones from a half-mile away. In the early 1970s, scientists identified and soon synthesized sex pheromones of the peach tree borer and of the lesser peach tree borer. This breakthrough allowed entomologists to study a number of clearwing species attracted to the same or similar pheromones. We can now monitor adult flight activity of those species whose attractants have been identified and synthesized.

Pheromone-baited traps allow nursery operators, foresters, landscapers and other plant pest management professionals to sample for clearwing moth activity. Clearwing pheromone traps have not been very useful to plant growers, however, because of confusion about how to use and interpret pheromone trap catches. Catching moths in a trap means nothing unless the moth can be identified and traced back to the larval stage that causes plant injury. This publication will help you identify adult clearwing moths and assess the significance of moth catches by studying life history. Learning clearwing moth lifecycles and host plants is critical to determine the proper timing for setting traps and for making management decisions.

Trapping Clearwing Moths

Two kinds of traps can be baited with clearwing pheromones to capture male moths: sticky board traps coated with a thick adhesive material, or boxed funnel traps (Multiplier 1®) that prevent moth escape. The sticky board type is less expensive, but the moths may become imbedded in the adhesive and difficult to identify. Also, sticky board traps are not convenient to transport. Boxed funnel traps (Multiplier 1®) equipped with a small piece of No-Pest Strip™, or another relatively safe insecticide, trap male moths without disfiguring them. Moths caught in these traps can be removed and identified. Black, brown or red traps are recommended because they are more attractive to males than other colors. Yellow and white are least attractive. Traps and pheromones are available from: Great Lakes IPM, Vestaburg, Mich. 48891, (517) 268-5693; Associates Insecting, P.O. Box 969, Santa Paula, CA 93060, (805) 933-1301; Beneficial Biosystems, 1603-F 63rd Street, Emeryville, CA 94608, (415) 655-3928; Better Yield Insect, 13310 Riverside Dr. East, Tecumseh, Ont., Canada; Gurney Seed and Nursery Co., Yankton, SD 57079, (605) 665-1671; John W. Kennedy Consultants, 608 Washington Blvd., Suite 406, Laurel, MD 20707, (301) 490-1600; Professional Ecological Services, 555 Hillside, Victoria, B.C., Canada V8T1Y8; and Trece, Inc., 1143 Madison Lane, Salinas, CA 93907, (408) 758-0204.



Baiting traps is the trickiest part of trapping. When using two or more pheromones, you must be careful not to cross-contaminate because the type of pheromone used helps identify the captured moth. Use forceps for handling pheromone capsules, and always rinse the forceps in alcohol before picking up a different type of pheromone capsule. Pheromone capsules should remain active for six weeks. Examine traps at least once per week to obtain moths in good condition and to note the dates they are active. Various pheromones may be used, depending on the clearwing species you wish to trap. For nursery and landscape plants, two types of pheromones—peachtree borer (ZZA blend) and lesser peachtree borer (EZA blend)—can be used to attract most of the important clearwing pests (Tables 1, 2). When using more than one type of pheromone, place the pheromones in separate traps located at least 25 meters apart and upwind from the orchard or areas being sampled.

Identifying Clearwing Moths

Over 100 species of clearwing moths (Sesiidae) have been found in North America and approximately 45 species have been collected in the north central United States. The species most commonly found in the north central region are described here (Table 2).

Five types of information can be used to identify male clearwing moths:

1. Coloration and shape of body structures.
2. Type of pheromone used as an attractant.
3. Time of year adults are active.
4. Time of day adults are attracted to pheromones.
5. Species of plant in which larvae are found.

(Entomologists may also use characteristics such as wing venation and structure of the genitalia.)

Of these five types of information, the first three can be used to identify moths caught in traps and the last one to develop a list of susceptible plant materials to be checked for borers. Correct identification of most clearwing moths is possible if the specimens are in good enough condition to allow comparisons with photographs of similar species. Similar moths can be separated by key characteristics described in the life history section and illustrated with line drawings or photographs (Fig. 2, 3a, b, c). Identified moths can then be found in Table 2. Double-check your identification by seeing if the identified moth species is listed as being attracted by the pheromone used. If the pheromone used is not listed for that species, you have accidentally contaminated your trap with another pheromone, or you have incorrectly identified the clearwing moth.

Table 1. Pheromones used for trapping clearwing borer males. Clearwing pheromones are commonly referred to as ZZA, EZA, ZZOH or EZOH. These four chemicals are used separately or in combinations. Pheromones 5 and 10 in Table 2 are structural variations of EZA and ZZA.

1. ZZA	(Z,Z) 3,13-octadecadien-1-ol acetate
2. EZA	(E,Z) 3,13-octadecadien-1-ol acetate
3. ZZOH	(Z,Z) 3,13-octadecadien-1-ol alcohol
4. EZOH	(E,Z) 3,13-octadecadien-1-ol alcohol
5. EZA 2,13	(E,Z) 2,13-octadecadien-1-ol acetate
10. Z 13-ODA	(Z) 13-octadeceryl acetate

Life History

This section presents condensed identification and life history information for each clearwing species. Two key characteristics listed in the identification section for each species are wing length and coloration of abdominal segments. Wing length is given as the distance from the base of the wing to the wing tip (Fig. 2). The abdominal segments are referred to as numbers 1-8. The position of each segment can be determined from Figure 2.

When available, information is presented on the preferred host plants, range and life cycle for each species. Most clearwings select only a few types of trees, shrubs or vines for depositing their eggs. The larvae of many develop only on plants in one genus. For example, the lesser peachtree borer, *Synanthedon pictipes*, attacks only trees in the genus *Prunus* (peach, plum, cherry), and the oak clearwing borer, *Paranthrene asilipennis*, attacks only oaks. A few clearwings are known to develop only in one plant species. *Albuna fraxini*, for example, has only been found in Virginia creeper vines (*Parthenocissus quinquefolia*).

Adult moths of each species emerge at a certain time of year, and in some cases their flying is restricted to a specific time of day. Some are serious pests of cultivated plants, others attack only wild plants. The following life history information may help determine the potential pest status of a particular species. It may also be essential for planning management strategies to reduce the amount of plant damage caused by clearwing borers.



Table 2. Species of clearwing moths found in the North Central United States, their known food plants, flight periods and pheromone attractant.

Scientific name	Common name	Food plant	Flight period*	Pheromone**	Wing length
<i>Pennisetia marginata</i>	Raspberry crown borer	<i>Rubus</i>	Aug-Sept		8-16 mm
<i>Paranthrene asilipennis</i>	Oak clearwing borer	<i>Quercus</i>	May-June	10	12-20 mm
<i>Paranthrene dollii</i>	Poplar clearwing borer	<i>Populus, Salix</i>	May-June	2,6	12-18 mm
<i>Paranthrene pellucida</i>	Summer oak borer	<i>Quercus</i>	July	1	11-18 mm
<i>Paranthrene simulans</i>	Oak borer	<i>Quercus</i>	May-June	1,5	12-18 mm
<i>Paranthrene tabaniformis</i>	Dusky clearwing	<i>Salix</i>	June-July	4	8-14 mm
<i>Vitacea polistiformis</i>	Grape root borer	<i>Vitis</i>	July-early Aug	5	12-19 mm
<i>Albuna fraxini</i>	Vir. creeper clearwing	<i>Parthenocissus quinquefolia</i>	Late July-Aug	3	8-15 mm
<i>Albuna pyramidalis</i>	Fireweed clearwing	<i>Epilobium</i>	Late June-July	2	8-14 mm
<i>Melittia cucurbitae</i>	Squash vine borer	<i>Cucurbita</i>	Late June-July	5	12-15 mm
<i>Sesia tibialis</i>	American hornet moth	<i>Populus</i>	July-early Aug	1	12-19 mm
<i>Sesia spartani</i>			June-July	6	8-9 mm
<i>Synanthedon acerni</i>	Maple callus borer	<i>Acer</i>	Late May-July	1,8	7-13 mm
<i>Synanthedon acerrubri</i>	Red maple borer	<i>Acer</i>	June-July	5	6-10 mm
<i>Synanthedon bolteri</i>		<i>Salix</i>	June-July		6-9 mm
<i>Synanthedon decipiens</i>		<i>Quercus</i> galls	July	1,7	8-10 mm
<i>Synanthedon exitiosa</i>	Peachtree borer	<i>Prunus</i>	Late June-Aug	1	6-15 mm
<i>Synanthedon fatifera</i>		<i>Viburnum</i>	July	1	9-11 mm
<i>Synanthedon fulvipes</i>		<i>Betula</i>	Late May-June	1	8-12 mm
<i>Synanthedon pictipes</i>	Lesser peachtree borer	<i>Prunus</i>	Mid-July	2	8-12 mm
<i>Synanthedon pini</i>	Pitch mass borer	<i>Pinus</i>	Mid-July	6	12-15 mm
<i>Synanthedon proxima</i>	Willow borer	<i>Salix</i>	July	1	8-10 mm
<i>Synanthedon pyri</i>	Apple bark borer	<i>Malus, Pyrus, Crataegus</i>	July	5	6-9 mm
<i>Synanthedon refulgens</i>			June-July	5	7-11 mm
<i>Synanthedon rileyana</i>	Riley's clearwing	<i>Solanum carolinense</i> (Horsenettle)	Late Aug-Sept	4,9	7-12 mm
<i>Synanthedon rubrofascia</i>	Black gum borer	<i>Nyssa</i> (Black gum)	Late July	1,7	8-11 mm
<i>Synanthedon scitula</i>	Dogwood borer	<i>Cornus</i> spp., <i>Prunus</i> spp. (many other host species)	July-Sept	1	5-9 mm
<i>Synanthedon sigmoidea</i>		<i>Salix</i>	Late Aug-Sept	5	9-11 mm
<i>Synanthedon tipuliformis</i>	Currant borer	<i>Ribes</i>	May-June	5	7-9 mm
<i>Synanthedon viburni</i>	Viburnum borer	<i>Viburnum</i>	July	2	7-10 mm
<i>Podosesia syringae</i>	Lilac borer	<i>Fraxinus</i> spp., <i>Syringa</i> spp.	May-early Aug	1	10-17 mm
<i>Podosesia aureocincta</i>	Banded ash clearwing	<i>Fraxinus</i>	Aug-Sept	1,8,9	10-17 mm
<i>Carmenta anthracipennis</i>		<i>Liatris</i> (Blazing star)	Late July-Aug	7	7-10 mm
<i>Carmenta bassiformis</i>		<i>Vernonia</i> (Ironweed)	July-Aug	1,8	6-12 mm
<i>Carmenta corni</i>		<i>Aster umbellatus</i> (Aster)	Late June-July	1	6-11 mm
<i>Carmenta ithacae</i>		<i>Helenium</i> spp., <i>Heliopsis</i> spp.	June-Aug	2	6-8 mm
<i>Carmenta pyralidiformis</i>		<i>Eupatorium</i> (Boneset)	Late July-Aug	3,4	5-8 mm
<i>Alcathoe caudata</i>	Clematis borer	<i>Clematis</i>	Late July-Aug	3,7	7-15 mm

* These flight periods may be earlier in the southern part of the north central region.

**Pheromone information should be used only as a general guide. Moths may be attracted to more than one chemical and/or blend. Key to pheromones in table:

- | | | |
|------------------|-------------------------------|----------------------------|
| 1. ZZA or blend | 5. EZA 2,13/ZZA 99:1 or blend | 8. ZZA/ZZOH 50:50 |
| 2. EZA or blend | 6. ZZOH/EZOH 50:50 | 9. ZZA/EZOH 50:50 |
| 3. ZZOH or blend | 7. ZZA/EZA 50:50 | 10. EZA 2,13/Z 13-ODA 96:4 |
| 4. EZOH or blend | | |



Pennisetia marginata (Harris)

Common name: Raspberry crown borer

Identification: A yellow jacket mimic, with a stout abdomen having broad yellow bands on the posterior margin of all segments. Segment 3 is elevated on top with yellow and black hair mixed. Forewings are broadly margined with brown. Wing length is 8 to 16 mm. Note: female illustrated.

Host plants and damage: Larvae tunnel in wild and cultivated blackberry, raspberry and boysenberry canes (*Rubus spp.*). Infested canes become girdled a few inches above the ground and may break off.

Range: The eastern United States, the Pacific Coast states and Canada.

Life cycle: Adults emerge and fly on sunny days in August and September. Young larvae bore into the roots to overwinter. Infested plants turn brown in early summer. Mature larvae ascend into canes during the summer, where most overwinter a second year. Pupation takes place in the hollow cane stump.

Importance/comments: An important pest of blackberries and raspberries.



Paranthrene asilipennis (Boisduval)

Common name: Oak clearwing borer

Identification: A large moth (males 28 to 38 mm). Antennae are strong, rufous brown and orange at the tips. The abdomen is stout, and all segments except the first are narrowly banded with yellow. Segments 1, 2, 3 and 4 are mostly black; segments 5, 6 and 7 are brownish. The forewing is transparent with a red, kidney-shaped mark, irregularly slanting, with dark edges. Wing length is 12 to 20 mm.

Host plants and damage: Larvae bore into the wood of many oak (*Quercus*) species. Trees are usually attacked at the base or on root flares.

Range: The United States and Canada east of the Rocky Mountains.

Life cycle: Adults emerge from May through June. Larvae may tunnel several inches deep into the wood. Two years are required to complete the life cycle. Large numbers are sometimes found in woodlands containing stumps from recently cut trees. Larvae pupate in April or May of the second year. Cast pupal skins are often found protruding from the bases of infested trees or stumps.

Importance/comments: Serious injury to young oak trees has been reported.



Paranthrene dollii (Neumoegen)

Common name: Poplar clearwing borer

Identification: A paper wasp mimic, larger than *P. syringae*.

The occipital fringe is dark orange. The abdomen is brown-black with narrow yellow bands posteriorly on segments two and four; orange-brown posteriorly on segment three, most of segment 4 and all of segments 5, 6 and 7. Legs are dark orange to pale rufous. Wings are dusky brown with only a small basal area transparent. Wing length is 12 to 18 mm.

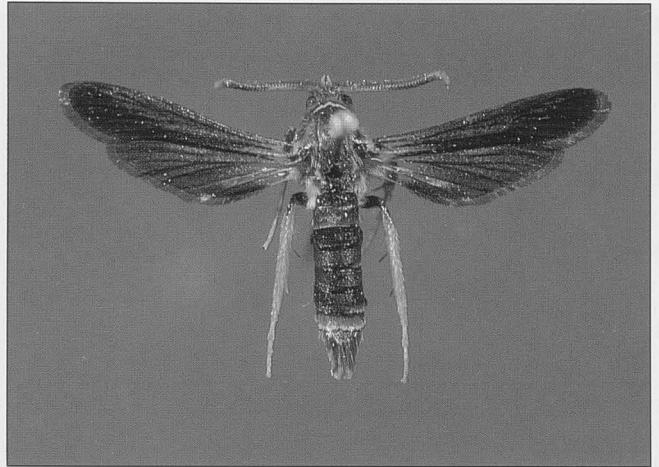
Note: the specimen illustrated has a discolored abdomen commonly found in *Sessid* specimens.

Host plants and damage: Larvae bore into the solid wood of poplars, cottonwood and willow (*Populus* and *Salix*).

Range: The eastern United States.

Life cycle: This borer is most likely to be found where trees are weakened by adverse conditions such as drought stress or mechanical wounds. Adults emerge in May or June and are more common in even-numbered years. Larvae tunneling into the trunk or main branches require two years to complete their life cycle. They form pupal chambers in the fall of the second year, but pupation does not occur until early spring. This borer may be found in association with the long-horned beetle, *Saperda calcarata* (Cerambycidae).

Importance/comments: This borer may hasten the decline of weakened willows and poplars. Many people have reported heavy infestations of stressed street trees. In certain parts of its range, specimens of *P. dollii* vary in pattern sufficiently from the description above to cause confusion. For descriptions of variations see Engelhardt (1946) or Eichlin and Duckworth (1988).



Paranthrene simulans (Grote)

Common name: Oak borer

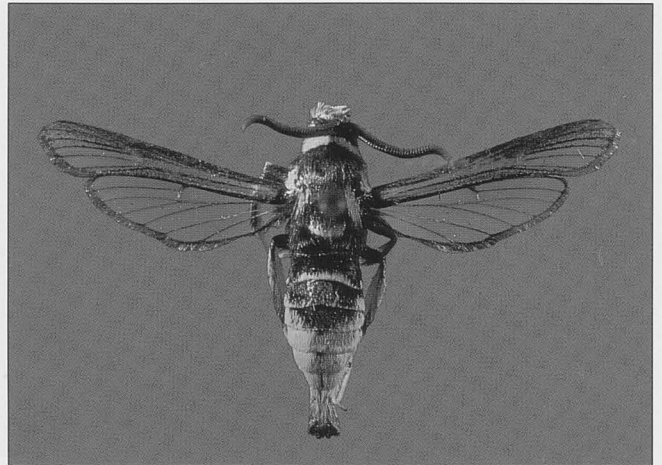
Identification: Closely resembles a hornet. Stout black antennae have reddish tips. The stout abdomen is mostly yellow except for segment 1, which is mostly black, and segments 2 and 3, which are dorsally black. Forewings have the anterior margin shaded with brown scales, and a reddish discal mark. Wing length is 12 to 18 mm.

Host plants and damage: Larvae tunnel into the solid wood of oak trees (*Quercus*).

Range: The eastern United States.

Life cycle: Adults emerge in May and June. Larvae start excavating under bark, then tunnel some 2 inches deep into the solid wood. Pupation occurs in spring of the second year. Large numbers of larvae have been found in clearings where many young oak saplings are growing. Broods are synchronized to emerge in even-numbered years.

Importance/comments: This borer is commonly found damaging oak trees in parks, along streets or in woodlots. Males respond to ZZA blends in late afternoon.



Paranthrene pellucida Greenfield and Karandinos

Common name: Summer oak borer

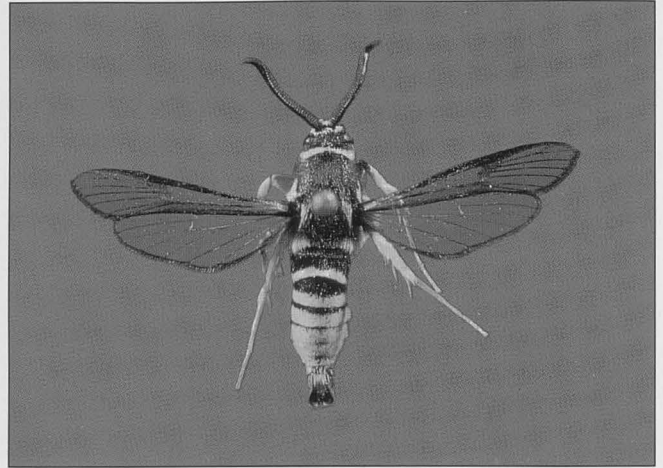
Identification: Similar to *P. simulans* but can be differentiated by the lack of scaling on the forewing. Wing length is 11 to 18 mm.

Host plants and damage: Larvae tunnel into oak trees (*Quercus*).

Range: Recently described. Reported from Michigan, Missouri, New York, Ohio and Wisconsin.

Life cycle: Adults emerge in July. Larvae require two years to mature. Broods may be synchronized to emerge in even-numbered years. Adults are most active from 4 to 6 p.m.

Importance/comments: Large collections of adults have been taken using ZZA pheromone blends.



Paranthrene tabaniformis (Rottemburg)

Common name: Dusky clearwing

Identification: Occipital fringe is bright yellow. The abdomen is black with segments 2, 4, 6 and 7 banded with yellow scales. Forewing is dusky opaque, and hindwing is transparent. Wing length is 8 to 14 mm.

Host plants and damage: Larvae excavate long tunnels in exposed roots, trunks and branches of willows, particularly wild shrubby willow (*Salix*).

Range: The United States and Canada, including Alaska but not California.

Life cycle: Adults emerge in June and July. Larvae tunnel into exposed roots, trunks and branches, and sometimes colonize woody galls and swellings caused by long-horned beetles (*Saperda*: Cerambycidae). Larvae mature in the fall of the second year, requiring two years to complete their life cycle.



Importance/comments: Commonly found infesting stands of shrubby willows. Importance to landscape plants is not known.



Vitacea polistiformis (Harris)

Common name: Grape root borer

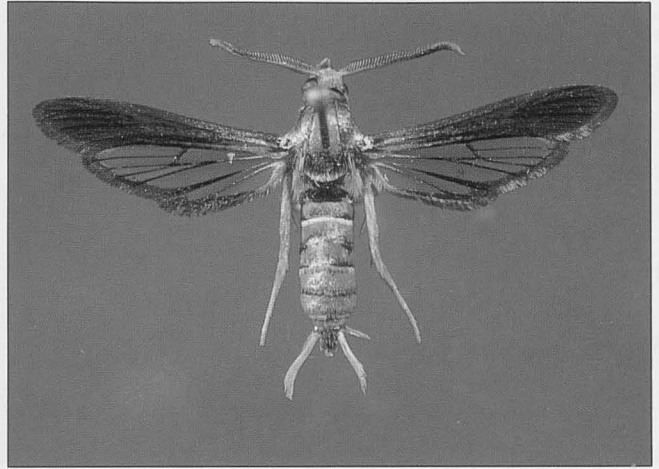
Identification: A paper wasp mimic. Males have four pencil tufts on the last abdominal segment, two long pencils and two about half the length of the long ones. Forewings are mostly brown opaque; hindwings are transparent. Wing length is 12 to 19 mm.

Host plants and damage: Larvae attack roots of wild and cultivated grapes (*Vitis spp.*).

Range: From Wisconsin, Michigan and southern Ontario south to Florida and west to the Mississippi Valley and Texas.

Life cycle: Adult moths emerge in July and early August. Females lay 300 to 400 eggs on foliage, stems or the ground. Young larvae move down to the roots and start galleries under the bark. Tunnels increase in size as the larvae grow. Larvae mature in early summer of the second year.

Importance/comments: This borer injures plants in commercial vineyards. The root damage is difficult to detect and may go unnoticed until the plants are severely damaged. A new pheromone blend, (E,Z) 2-13-ODDA/ZZA 99:1, is used to monitor male flight activity (Table 1).



Albuna fraxini (Hy. Edwards)

Common name: Virginia creeper clearwing

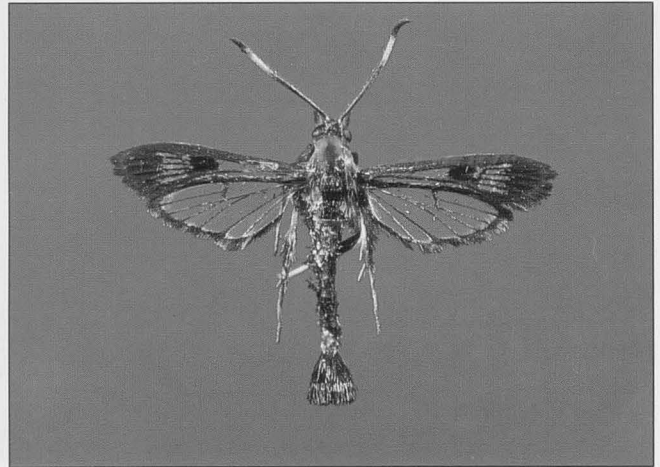
Identification: Males have white antennae tips and a broad black tail fan. The abdomen is entirely black. Forewing is mostly brown-black with the outer margin of discal spot rust-red. Wing length is 8 to 15 mm.

Host plants and damage: Larvae bore into roots of Virginia creeper (*Parthenocissus quinquefolia*).

Range: The eastern United States, including some Rocky Mountain states.

Life cycle: Adult moths emerge from late July through August. Larvae tunnel into roots of Virginia creeper, requiring one year to complete the life cycle. *A. fraxini* prefers plants growing horizontally across the ground to climbing plants.

Importance/comments: May injure wild Virginia creeper.



Albuna pyramidalis (Walker)

Common name: Fireweed clearwing

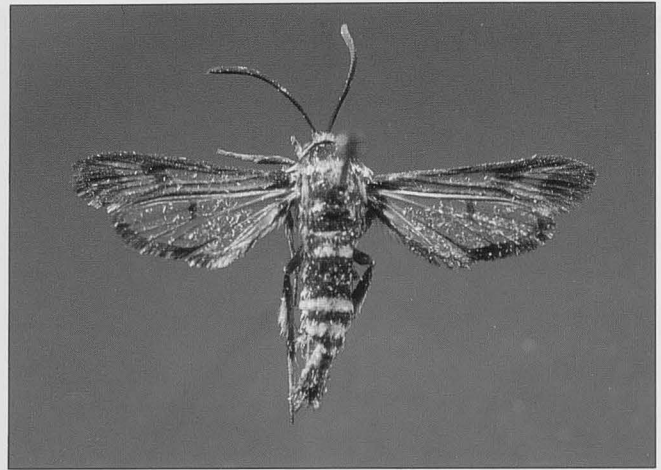
Identification: Variable across the United States. Antennae are black above and rufous below. The thorax is black with grizzly hair. The anal tuft is short, black and broad. The inner margin of the forewing is edged with red basally. Wing length is 8 to 14 mm.

Host plants and damage: Larvae bore into fireweed (*Epilobium angustifolium*).

Range: The upper latitudes of the United States through Canada to Alaska and at moderate to high elevations in Western mountain ranges.

Life cycle: Adults emerge from late June through July. The larvae tunnel into roots in August and feed in fall and early spring before pupating in late spring. The moth is abundant wherever fireweed grows. Moths may be found on flowers or foliage on sunny days.

Importance/comments: Apparently limited to fireweed and *Oenothera biennis* (from Engelhardt, 1946).



Melittia cucurbitae (Harris)

Common name: Squash vine borer

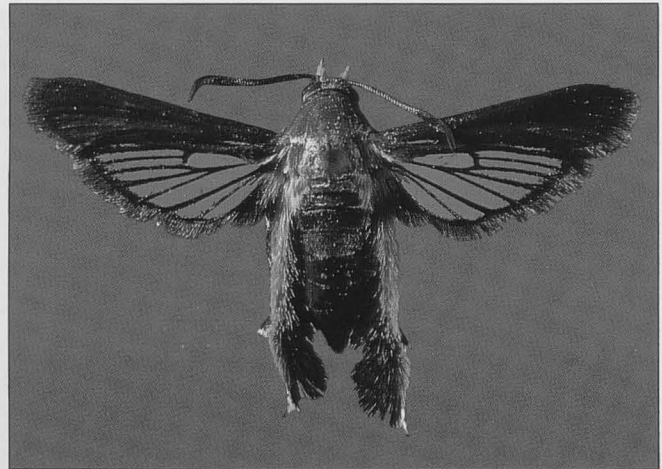
Identification: A stout moth with heavy red scaling on the hind legs. Forewings are black opaque; hindwings are transparent with dark-black veins. Wing length is 12 to 15 mm.

Host plants and damage: Larvae bore into vines of squash, gourds and pumpkin (*Cucurbita*). Sudden wilting of a vine and sawdust-like Frass and holes in the stem are characteristics of attack.

Range: The eastern continental United States and southern Canada.

Life cycle: Adults are active from late June through July. Larvae tunnel into the stems of cultivated cucurbits, including squash, gourds and pumpkins. Larvae maturing in spring leave the vine and pupate in the soil. Usually one generation occurs per year. Moths are commonly found on flowers and foliage.

Importance/comments: An important pest of squash, gourds and pumpkins. Cucumbers and melons are rarely attacked. Some squash varieties are resistant, such as butternut and green-striped cushaw, while others, such as hubbard, are highly susceptible.



Sesia tibialis (Harris)

Common name: American hornet moth

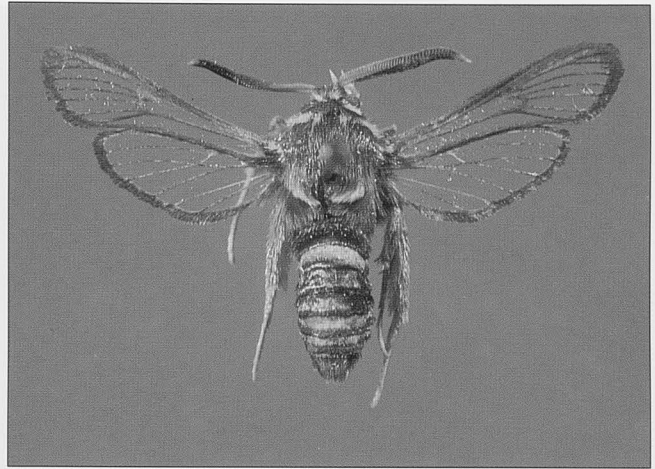
Identification: A stout, bumblebee-like moth. Antennae have a reddish base. The abdomen is stout with segments 1 and 2 brown-black, 3 yellow, 4 and 5 mostly black, and 6 and 7 mostly yellow. Legs have heavy yellow scales. Wing length is 12 to 19 mm.

Host plants and damage: Larvae bore into roots or lower trunks of poplars and cottonwood (*Populus*).

Range: The eastern and western United States and Canada. Most reports are from the northern half of the United States.

Life cycle: Adults emerge in July or early August. Larvae tunnel into the solid wood of roots or the base of the trunk. Pupal skins may be found protruding from the lower trunk. One generation occurs per year.

Importance/comments: Commonly found infesting many poplar species, including cottonwood and trembling aspen. Serious outbreaks have been reported in cottonwood stands. Hundreds of adults have been captured in one trap over several weeks in northern Michigan. Males are highly attracted to ZZA pheromone blends.



Sesia spartani Eichlin and Taft

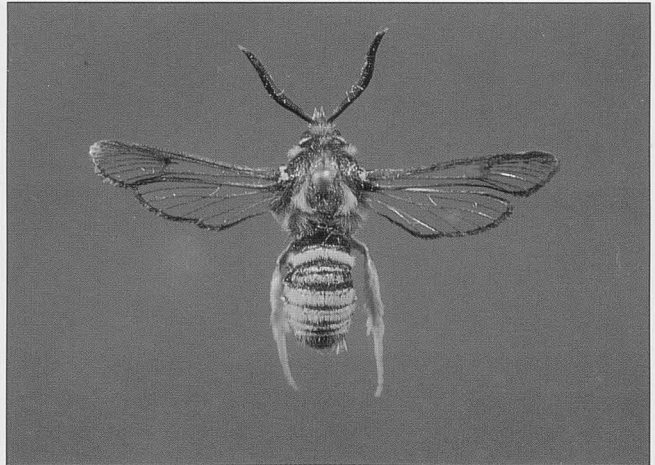
Identification: A heavy-bodied, large, yellow moth. Antennae are black. The abdomen is brown-black with broad yellow bands on segments 5, 6, and 7; less so on 4 dorsally. It has almost no anal tuft. Wing length is 8 to 9 mm.

Host plants and damage: Unknown. It may be associated with poplar and willow stands.

Range: Recently described from central lower Michigan. Specimens have also been found in northern areas of Wisconsin and Michigan.

Life cycle: Unknown.

Importance/comments: Appears to fly in June and July, about 2 to 3 weeks earlier than *S. tibialis*. Adults respond to ZZOH/EZOH 50:50 (noncommercial blend) during midmorning.



Synanthedon acerni (Clemens)

Common name: Maple callus borer

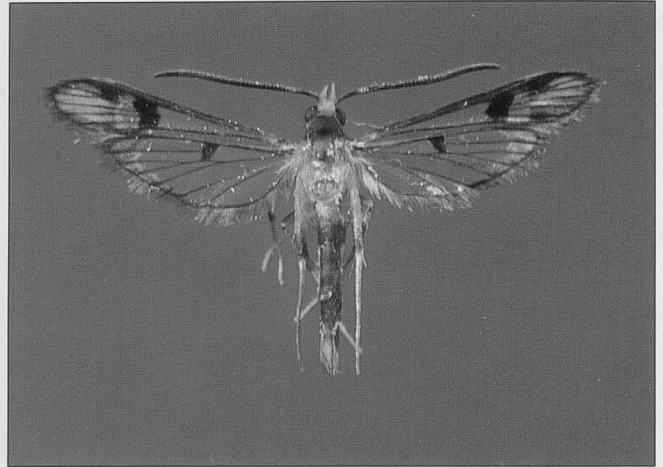
Identification: Has a light-yellow thorax and light-brown abdomen, and a bright-orange anal tuft. Wings have a light yellow shading on the outer margins. Wing length is 7 to 13 mm.

Host plants and damage: Larvae tunnel into the inner bark of maple trees (*Acer*).

Range: The eastern United States and Canada.

Life cycle: Adults emerge from late May through July. They fly during the day and are attracted to lights at night. Larvae tunnel into damaged areas of trunks. The damaged area is reinfested each year and gradually expands. Pupal skins may be found protruding from injured trunks in June or July. One generation occurs per year.

Importance/comments: An important pest of maple trees planted along streets or in yards. These borers gradually weaken already stressed trees and hasten their decline. Adults are commonly found around lights.



Synanthedon acerrubri Engelhardt

Common name: Red maple borer

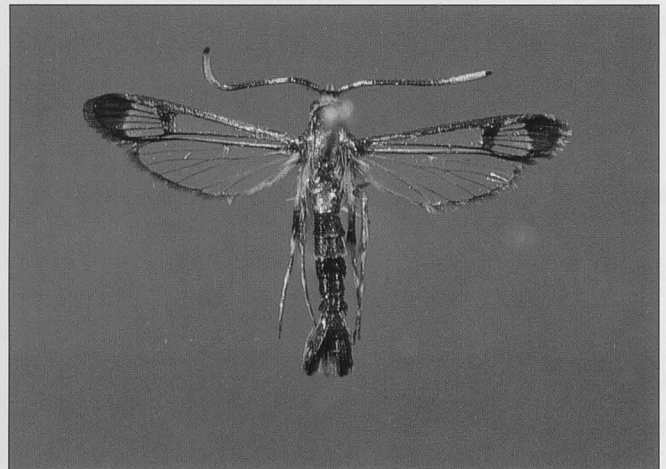
Identification: Antennae are tinged with white scales before the tips. Anal tuft is fan shaped, blue-black dorsally and bright red beneath. Abdomen is blue-black above; segments 2, 4, 5 and 6 are thinly edged with pale yellow. Wing length is 6 to 10 mm.

Host plants and damage: Larvae bore under the bark of maple branches, particularly red and sugar maple (*Acer*).

Range: Eastern North America from the Atlantic coast to Canada.

Life cycle: Adults are active in June and July. Young larvae tunnel under the bark of branches in late summer, causing a slight swelling or roughening. Larvae overwinter in branch tunnels and resume feeding in early spring. They pupate just under the bark in May to early June. One generation occurs per year.

Importance/comments: Apparently not as widespread as the maple callus borer, *S. acerni*. However, localized outbreaks of *S. acerrubri* have seriously damaged maple trees. The pheromone blend for *S. acerrubri* is the same as that for the grape root borer, *V. polistiformis*.



Synanthedon bolteri (Hy. Edwards)

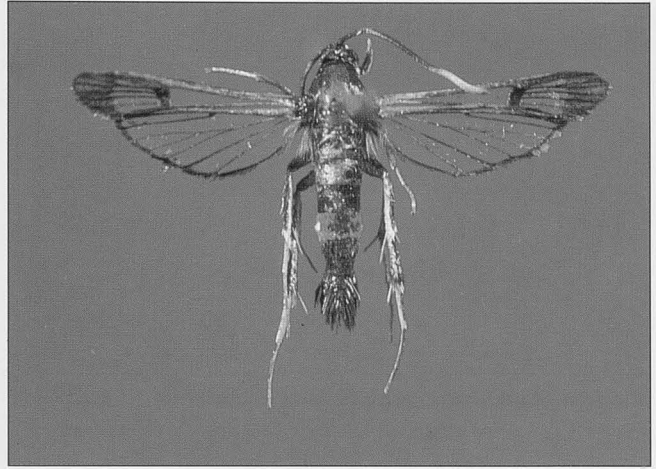
Identification: This species has red banding on abdominal segments 4 and 5 and white tips on the antennae. The outer margin of the forewing is broadly tipped with red scales. Wing length is 6 to 9 mm.

Host plants and damage: Larvae tunnel into swellings on shrubby willows (*Salix*).

Range: Temperate North America.

Life cycle: Adult moths are active in June and July. Larvae bore into abnormal growths of willows during late summer and overwinter in tunnels. They pupate in spring and emerge as moths in June and July.

Importance/comments: This clearwing borer is associated with damage to willows caused by beetle borers. Heavy infestations are apparently unusual. Adults are sometimes found on flowers. This is an uncommon moth.



Synanthedon decipiens (Hy. Edwards)

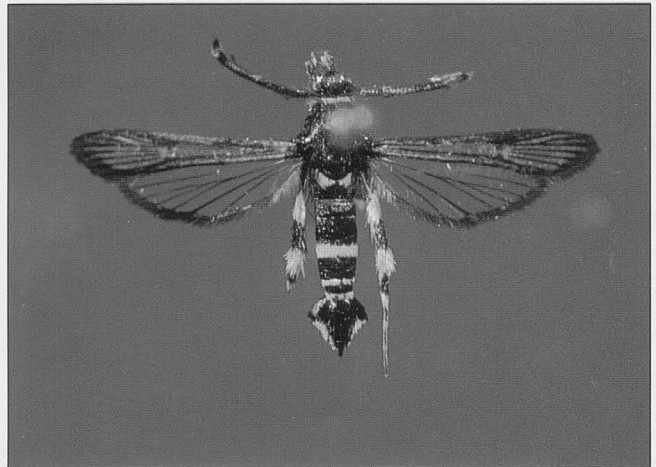
Identification: A dark abdomen, wider centrally, with segments 2, 6 and 7 narrowly banded in yellow. Segment 4 is broadly banded in yellow. The black anal tuft is wedge shaped with yellow posterior margins. Wing length is 8 to 10 mm.

Host plants and damage: Larvae usually develop in woody galls on oak (*Quercus*) made by cynipid wasps.

Range: The Rocky Mountains to the eastern United States and Canada.

Life cycle: Adults are active in July. Larvae tunnel into woody oak galls in late summer. One generation occurs per year.

Importance/comments: Not considered an economic pest. The best pheromone blend for this species appears to be ZZA/EZA 50:50.



Synanthedon exitiosa (Say)

Common name: Peachtree borer

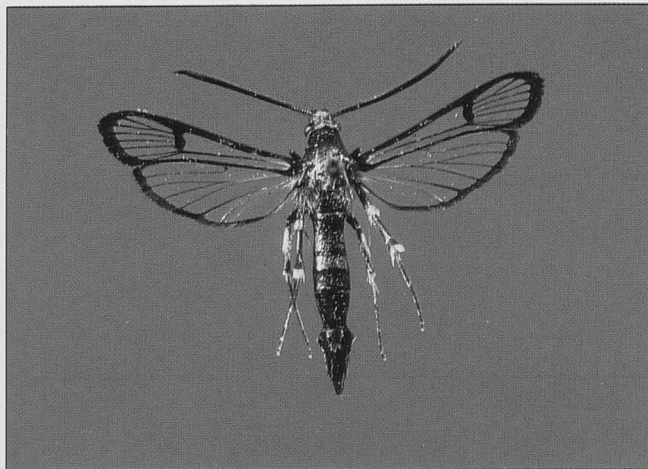
Identification: The abdomen is shiny black with an anal tuft in the shape of an elongated wedge. The transparent amber sheen on the wings is characteristic. Wing length is 6 to 15 mm.

Host plants and damage: Larvae tunnel into the roots and lower trunks of wild and cultivated cherry, plum, peach and other stone fruits (*Prunus*).

Range: The United States and Canada excluding most of the Great Plains, Great Basin and desert Southwest.

Life cycle: Adults are active from late June to early August. Young larvae begin excavating tunnels near the tree crown in late summer. They overwinter as larvae in tunnels. Larvae resume feeding in early spring before pupating in late May or June. Adults fly during the day and are most active from 10 a.m. to 2 p.m. One generation occurs per year.

Importance/comments: This species is one of the most economically important clearwings. Extensive damage to cultivated peaches and lesser damage to other stone fruits has been documented. Many ornamental *Prunus* spp. are also susceptible.



Synanthedon fatifera Hodges

Identification: Very similar to *S. pictipes* (Fig. 3a), with black scaling on face and top of head (Fig. 3b). Wing length is 9 to 11 mm.

Host plant and damage: Larvae bore into *Viburnum* trees and shrubs.

Range: The eastern United States and Canada.

Life cycle: Adult moths are active in July. Larvae tunnel into plants in late summer. One generation occurs per year.

Importance/comments: Commonly found damaging nursery stock. This moth is attracted to ZZA, while *S. pictipes* and *S. viburni* are attracted to EZA.

Synanthedon fatifera is very similar in appearance to *Synanthedon pictipes* found on page 13. See Figure 3, page 27, for physical differences in the species.



Synanthedon fulvipes (Harris)

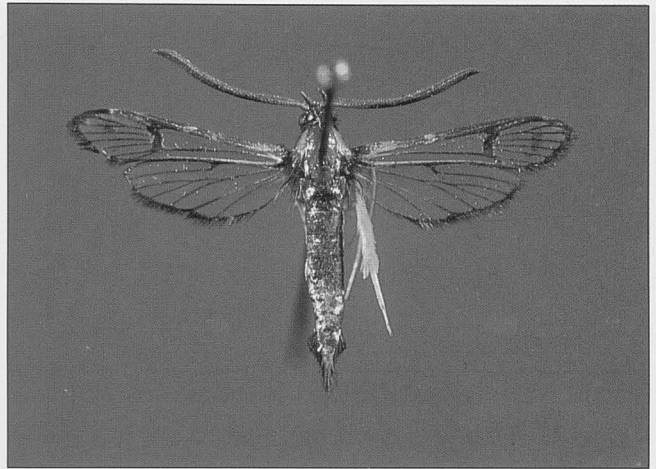
Identification: Moths have bright orange-red hind legs and blue-black bodies. The anal tuft is shaped like an elongated wedge. Wings are almost completely transparent. Wing length is 8 to 12 mm.

Host plant and damage: Larvae are found under the bark of birch trees (*Betula*).

Range: The eastern United States and Canada.

Life cycle: Adults are active in late May and June. Additional information is not available.

Importance/comments: Large numbers of adults have been collected with ZZA blends in some north central locations.



Synanthedon pictipes (Grote and Robinson)

Common name: Lesser peachtree borer

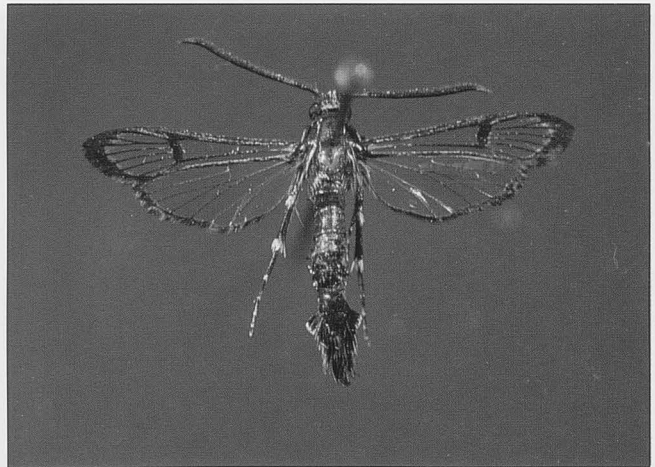
Identification: Males have a white spot on frons adjacent to the eye. (Fig. 3a). It is easily mistaken for *S. fatifera* or *S. viburni* (Figs. 3b and 3c). This moth looks like a small male peachtree borer, but lacks the transparent amber sheen to the wings. Wing length is 8 to 12 mm.

Host plants and damage: Larvae tunnel into branches of wild cherry and plum, cultivated stone fruits and ornamental *Prunus* spp.

Range: East of the Great Plains and north into Canada.

Life cycle: Adults emerge in July. They are most active from 9 a.m. to noon. Larvae tunnel under the bark of *Prunus* branches. They may be associated with black knot galls, tree crotches or injured limbs. Additional injury may result in adventitious growth and suckering. Larvae excavate under the bark in late summer, overwinter in tunnels and pupate in June. One generation occurs per year. This moth and *S. viburni* are attracted to EZA, while *S. fatifera* is attracted to ZZA.

Importance/comments: An important pest of peach and other cultivated stone fruits, it also attacks a wide range of ornamentals, such as purple-leaf plum, flowering almond and cherry. These borers are often found attacking branches injured by wounds, cankers, low temperatures or sunscald. Males are attracted to blends containing mostly EZA (Table 1).



Synanthedon pini (Kellicott)

Common name: Pitch mass borer

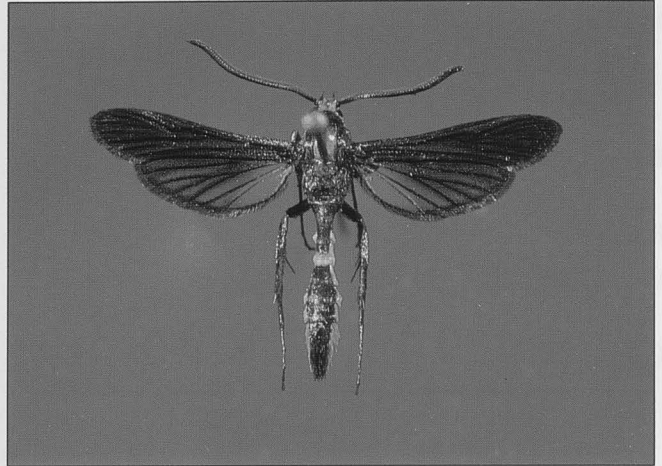
Identification: Has a large red-orange patch beneath the abdomen and some orange on top of segment 4 and along the sides of all segments. Forewings are blue-black and opaque. The front and the outer margin of the hindwings are also shaded. Wing length is 12 to 15 mm.

Host plants and damage: Larvae bore into trunks of pine and spruce (*Pinus*, *Picea*), particularly white pine (*Pinus strobus*).

Range: The northeastern United States and Canada.

Life cycle: Adults emerge, mate and deposit eggs in July. In late summer, larvae tunnel into pine and spruce trunks, usually directly below a branch. Large amounts of pitch seep from the borer wound. Larvae continue to feed and develop the following year. Most larvae are believed to mature after two years, pupating in June and emerging as adults in July. Wounds with active larvae have a white, powdery appearance.

Importance/comments: Larvae injure white pine, Austrian pine, Scotch pine, jack pine, white spruce, Norway spruce and Colorado blue spruce. Healthy trees may be attacked. Parasitism of larvae by natural enemies is common. Males are highly attracted to the pheromone blend ZZOH/EZOH 50:50 (noncommercial blend).



Synanthedon proxima (Hy. Edwards)

Common name: Willow borer

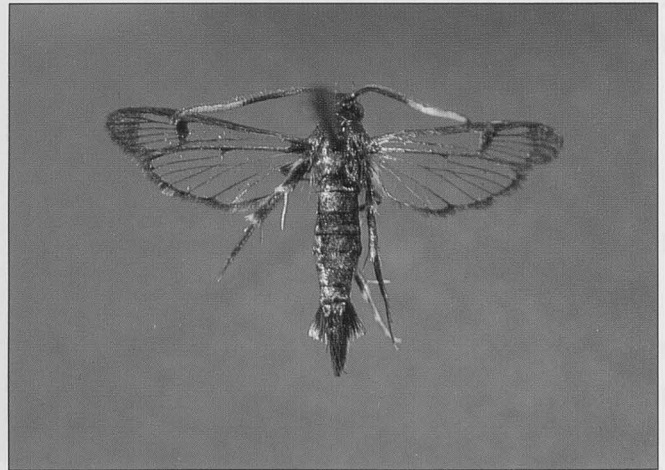
Identification: In the north central region, this small moth usually has white before the antennae tips. The head, thorax and abdomen are blue-black. The anal tuft is wedge shaped. Wings are transparent but the veins, discal marks and outer wing margins are metallic black. Wing length is 8 to 10 mm.

Host plants and damage: Larvae tunnel in canes, branches and exposed roots of brushy willows (*Salix*).

Range: The midwestern and northeastern United States and Canada.

Life cycle: Adults are active in June and July. Larvae bore into low-growing willows in late summer. They overwinter as larvae and pupate in burrows in June.

Importance/comments: Primarily found on wild species of willows. It has been reported as infesting landscape plants.



Synanthedon pyri (Harris)

Common name: Apple bark borer

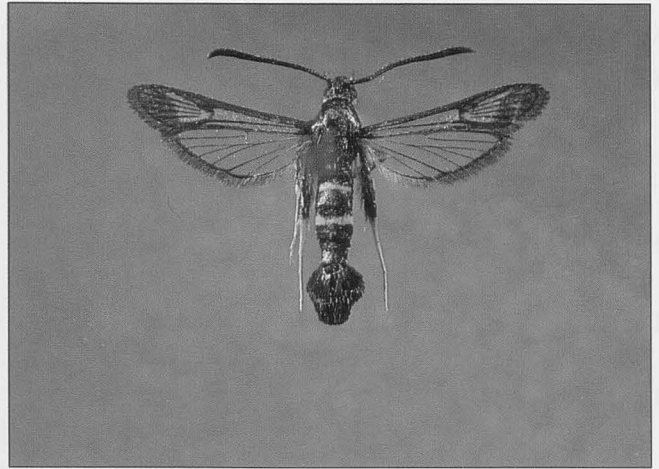
Identification: This small moth is very similar to *S. scitula* but has a distinct discal mark (Fig. 2) and a wedge-shaped anal tuft. The abdomen is brown-black dorsally with segments two and four narrowly banded yellow on the posterior margin. Wing length is 6 to 9 mm.

Host plants and damage: Larvae bore under the bark of apple and crabapple (*Malus* spp.), hawthorn (*Crataegus* spp.) and pear (*Pyrus* spp.).

Range: The eastern United States and Canada.

Life cycle: Adults are active in July. Larvae tunnel under the bark of susceptible trees in late summer and overwinter as larvae in tunnels. Shallow tunneling beneath the bark may cause the bark to blister or peel. Larvae pupate in June. One generation occurs per year.

Importance/comments: Healthy trees are rarely attacked, but trees injured by storms, mechanical injury, disease or drought may be attacked. A heavy infestation may hasten tree decline.



Synanthedon refulgens (Hy. Edwards)

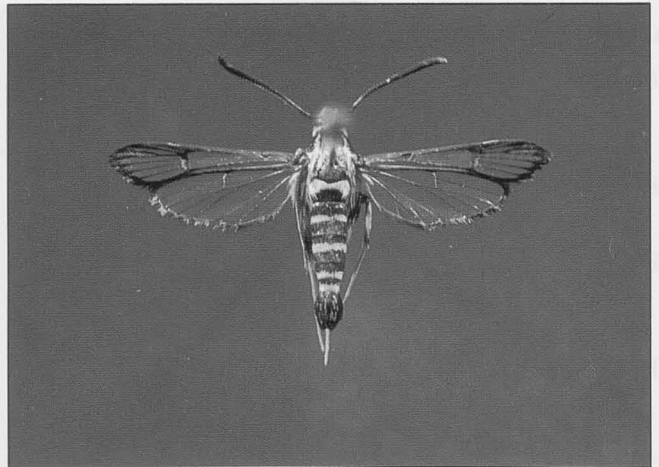
Identification: The abdomen is black, with segments 2, 4, 6 and 7 banded posteriorly with yellow above; segments 3 and 5 are sometimes faintly banded. It is larger than *S. decipiens*. The anal tuft is short and rounded. The transparent forewings are marked with orange between the veins along the outer margin. Wing length is 7 to 11 mm.

Host plants and damage: Unknown.

Range: The known distribution has expanded widely with the development and use of (E,Z) 2,13-ODDA/ZZA 99:1 pheromone. Specimens have been taken from Michigan to Missouri and from the East Coast to the Deep South.

Life cycle: Adults fly in June through August.

Importance/comments: Specimens have been captured in association with oak forests.



Synanthedon rileyana (Hy. Edwards)

Common name: Riley's clearwing

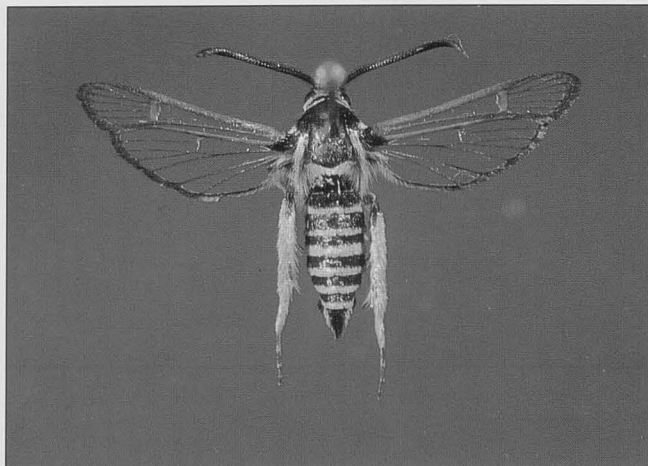
Identification: It mimics hornets. The discal mark is oblong and red (Fig. 2). The stout abdomen is black with a broad yellow band on the posterior of every segment. Hind legs are covered with long yellow scales. Wing length is 7 to 12 mm.

Host plants and damage: Larvae bore into the roots of horse nettle (*Solanum carolinense*).

Range: The United States and Canada east of the Rocky Mountains.

Life cycle: Adults are active from late July through September. Eggs are laid in clusters on leaves and stems or dropped on the ground. Larvae bore into the roots 3 to 10 inches deep to feed and overwinter. Larvae continue developing the following spring and summer. Adults begin emerging in late July in normal years.

Importance/comments: This is the only borer to infest horse nettle.



Synanthedon rubrofascia (Hy. Edwards)

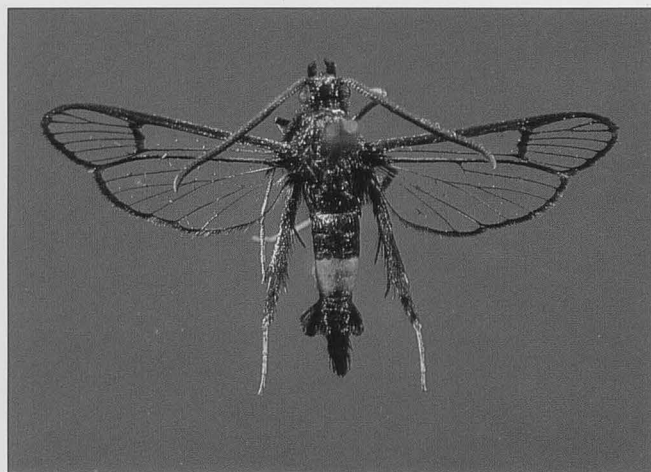
Common name: Black gum borer

Identification: Antennae are black. The abdomen is black with a broad red band. Wings are entirely transparent. Wing length is 8 to 11 mm.

Host plants and damage: Larvae tunnel under bark of *Nyssa* trees (black gum).

Life cycle: Adults begin to emerge in July. Larvae tunnel beneath the bark of large, mature trees with healing wounds. Apparently one generation occurs per year.

Importance/comments: It is reported to attack only native *Nyssa* trees (black gum or sour gum). Heavy infestations are uncommon. It is attracted to commercial ZZA pheromone blends.



Synanthedon scitula (Harris)

Common name: Dogwood borer

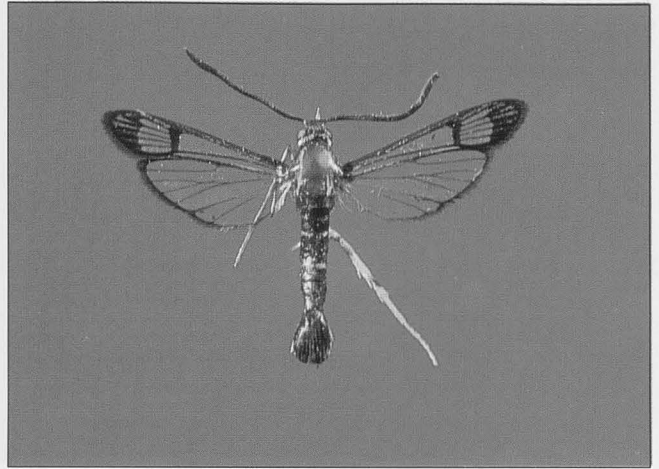
Identification: A small, dark moth with thin yellow abdominal bars. The abdomen has a rounded anal tuft. Legs are mostly yellow. Wings are mostly transparent with broad black tips on the forewings. Wing length is 5 to 9 mm.

Host plants and injury: Larvae are commonly found associated with galls and healing wounds on oak, dogwood, *Prunus* spp., apple, mountain ash, hickory, willow, birch, pecan and other trees.

Range: The Mississippi Valley, the Midwest, the eastern United States and Canada.

Life cycle: Adults are active from July to September and prefer flying from 7 to 9 p.m. Larvae attack a wide variety of tree species if abnormal growths such as galls or cankers or healing wounds are present. Woody galls of cynipid wasps may be heavily infested with dogwood borer larvae. One generation occurs per year.

Importance/comments: A primary pest of flowering dogwood and a secondary pest of many hardwood trees and shrubs. This borer sometimes damages pecan trees in the southern United States. Larvae may cause additional injury around previous wounds.



Synanthedon sigmaidea (Beutenmüller)

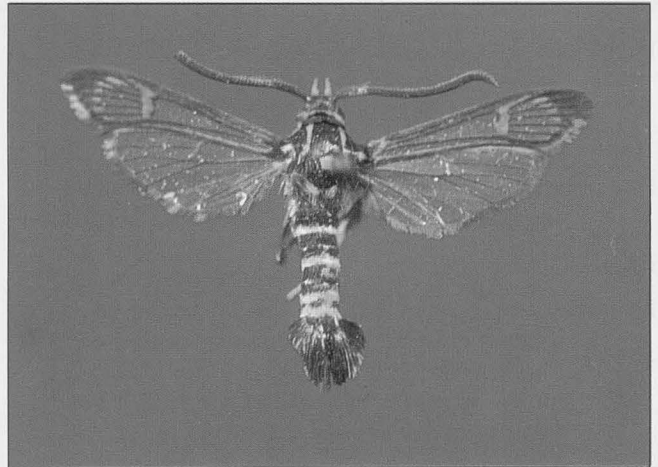
Identification: Antennae are black with dilated tips. Abdominal segments 2, 4, 6 and 7 are narrowly banded with yellow. The anal tuft is broadly wedge shaped. Forewings are transparent with orange discal marks (Fig. 2). Wing length is 9 to 11 mm.

Host plants and damage: Larvae tunnel into branches and canes of low-growing willows (*Salix*).

Range: The Midwest, the Appalachian Mountains and the northeastern United States and Canada.

Life cycle: Adults are active in August and September. Larvae bore into branches and canes to overwinter. Larvae continue feeding the following spring and summer before pupating in August. One generation occurs per year.

Importance/comments: This borer attacks native willows in thickets. Native willows may be very heavily infested.



Synanthedon tipuliformis (Clerck)

Common name: Currant borer

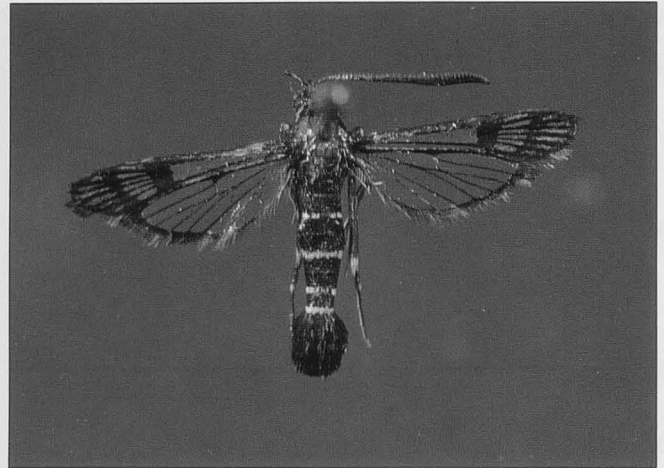
Identification: The abdomen is black with yellow banding on segments 2, 4, 6 and 7. The anal tuft is broad and rounded. The forewing is transparent, and the discal mark is black (Fig. 2). The outer forewing border has golden yellow or coppery scaling between dark veins. Wing length is 7 to 9 mm.

Host plants and damage: Larvae bore into the stems of cultivated currant, gooseberry and raspberries (*Rubus*). Wild *Ribes* spp. are not usually infested.

Range: The temperate regions of North America.

Life cycle: Adult moths are active in May and June. Eggs are laid in crevices of the bark, and larvae burrow into the inner pith. One generation occurs per year.

Importance/comments: It is primarily a pest of cultivated currants. Red currants are the most susceptible. Sometimes infestations are reported on gooseberries and raspberries. Specimens have been collected with (E,Z) 2,13-ODDA/ZZA 99:1 (noncommercial blend).



Synanthedon viburni Engelhardt

Common name: Viburnum borer

Identification: Easily mistaken for *S. pictipes* (Fig. 3a) or *S. fatifera* (Fig. 3b). Males have a white spot between the bases of the antennae (Fig. 3c). Wing length is 7 to 10 mm.

Host plants and damage: Larvae bore under the bark on branches of *Viburnum* shrubs.

Range: The eastern United States.

Life cycle: Adults are active in July. Larvae excavate under the bark of limbs that have wounds or swellings. They overwinter in tunnels, continue to feed in spring and pupate under the bark in June. Larvae are frequently parasitized.

Importance/comments: Many imported cultivars of *Viburnum* grown in nurseries are attacked, as are native shrubs. This moth and *S. pictipes* are attracted to EZA, while *S. fatifera* responds to ZZA blends (Table 2).

Synanthedon viburni is very similar in appearance to *Synanthedon pictipes* found on page 13. See Figure 3, page 27, for physical differences in the species.



Podosesia syringae (Harris)

Common name: Ash/Lilac borer

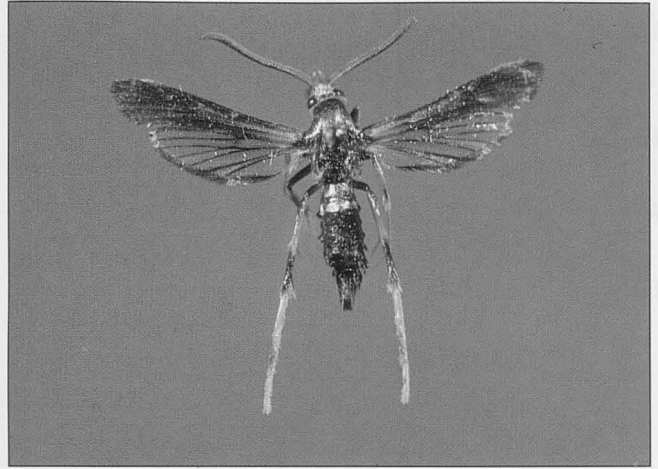
Identification: A paper wasp mimic. Antennae are red with black above. The abdomen is somewhat constricted at the base and black or brown-black. Forewings are black opaque. Hindwings have a black sheen. Wing length is 10 to 17 mm.

Host plants and damage: Larvae bore into the limbs and trunks of lilac (*Syringae*), ash (*Fraxinus*), fringe-tree (*Chionanthus*), privet (*Ligustrum*) and other related species.

Range: Found east of the Rocky Mountains and in scattered locations in the Rocky Mountains, central California and Washington.

Life cycle: Adult moths may be observed from May to early August. Eggs are deposited on the bark of susceptible trees. Larvae bore into the living wood of branches and trunks. Nearly mature larvae overwinter in tunnels in the wood. Pupation occurs in early spring. Males fly from 9 a.m. until early afternoon.

Importance/comments: The ash/lilac borer may cause serious injury to lilac, privet and ash in nurseries or in the landscape. Heavy infestations may kill infested trees and shrubs. Larvae are frequently parasitized. Pale yellow color variations of *P. syringae* are found in the northern plains and Canada.



Podosesia aureocincta Purrington and Nielsen

Common name: Banded ash clearwing

Identification: A paper wasp mimic. Wing length is 10 to 17 mm. This species appears very similar to *Podosesia syringae* (above) but has a distinct yellow-orange band on abdominal segment 4 (Figure 2).

Host plants and damage: Larvae bore into the trunks and limbs of ash trees (*Fraxinus* spp.).

Range: The eastern United States.

Life cycle: Adults emerge in August and September to mate and deposit eggs on the bark of host trees. Young larvae tunnel into the branches or trunks of ash trees, where they overwinter. Larvae continue feeding the following spring and summer, pupating in July or August. One generation occurs per year.

Importance/comments: Tunneling damage may result in swelling or cracking of the bark. Branch dieback may occur if many larvae successfully bore into a tree.

Podosesia aureocincta appears very similar to *Podosesia syringae* (above).



Carmenta anthracipennis (Boisduval)

Identification: A small, dark moth similar to *C. pyralidiformis* but with yellow narrow bands on abdominal segments 2, 4 and 6. Wing length is 7 to 10 mm.

Host plants and damage: Larvae tunnel in roots of blazing star (*Liatris* spp.).

Range: The eastern and midwestern United States and Canada.

Life cycle: Adults are active in late July or August. Young larvae tunnel into *Liatris* spp. roots. They overwinter in roots below ground and become active again in spring. Larvae mature in early summer. One generation occurs per year. Adults commonly sun themselves on vegetation on or around the food plant.



Importance/comments: Known to attack only wild species of *Liatris*.

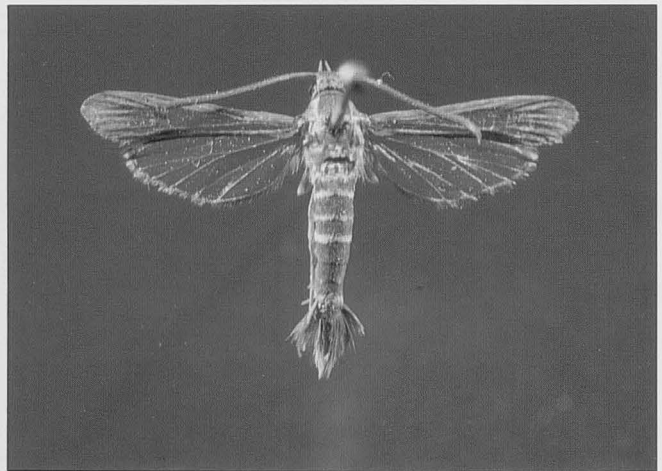
Carmenta bassiformis (Walker)

Identification: A black abdomen with each segment narrowly banded with yellow above. The anal tuft is large and fan shaped, black, and edged with yellow at the sides and yellow in the center beneath. Wing length is 6 to 12 mm.

Host plants and damage: Larvae bore into the roots of ironweed (*Vernonia* spp.).

Range: The eastern United States. Michigan and Wisconsin are the northern range of this moth.

Life cycle: Adults fly in late afternoon in August or September. Females deposit eggs on leaves or drop them on the soil near host plants. Larvae overwinter in the roots, becoming active again in spring. Pupae may be found in stems in late summer. Infested stems may break off several inches above the ground.



Importance/comments: This moth attacks only wild species of ironweed (*Vernonia*).



Carmenta corni (Hy. Edwards)

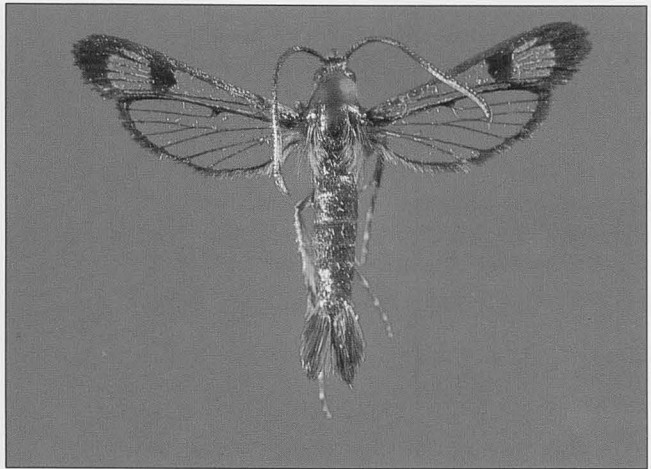
Identification: Similar to *S. acerrubri*, but has yellow powdering on veins just outside the discal spot on the forewing. The anal tuft has red and black scales mixed. Also, the discal mark is broader than in *S. acerrubri*. Wing length is 6 to 11 mm.

Host plants and damage: Larvae bore into the roots of white aster (*Aster umbellatus*).

Range: The eastern and midwestern United States.

Life cycle: Adults are active in late June or July. Males fly on bright, sunny days. Eggs are deposited on the lower stems of food plants, and young larvae tunnel through the stems into the roots. Larvae feed and grow throughout late summer and early fall. Infested stems, weakened by tunneling damage, usually break off a few inches above the soil line during winter storms. Larvae pupate in spring and emerge as adults in June or July. One generation occurs per year.

Importance/comments: Known only to infest wild aster. Males are attracted to ZZA pheromone blends.



Carmenta ithacae (Beutenmüller)

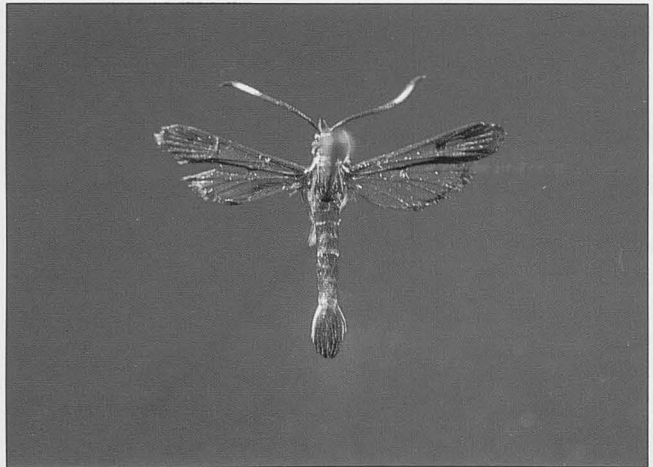
Identification: Similar to *S. pyri* and *S. scitula* but has a white section of scaling below the tips of the antennae. Abdomen is black; segments 2, 4, 6 and 7 have thin, whitish bands above. The anal tuft is broadly fan shaped and edged with white along the sides. Wing length is 6 to 8 mm.

Host plants and damage: Larvae bore into the crown and roots of sneezeweed (*Helenium* spp.) and ox-eye (*Heliopsis*).

Range: The southern Rockies and Mexico to the East Coast.

Life cycle: Adults fly in late morning (10 a.m. to noon) from late June through August. Larvae bore into the lower stem, crown and roots in late summer. They overwinter in tunnels in the roots and pupate in June. Adults are found in wet meadows and river bottoms where the food plants occur.

Importance/comments: Wild *Helenium* and *Heliopsis* are the only known food plants.



Carmenta pyralidiformis (Walker)

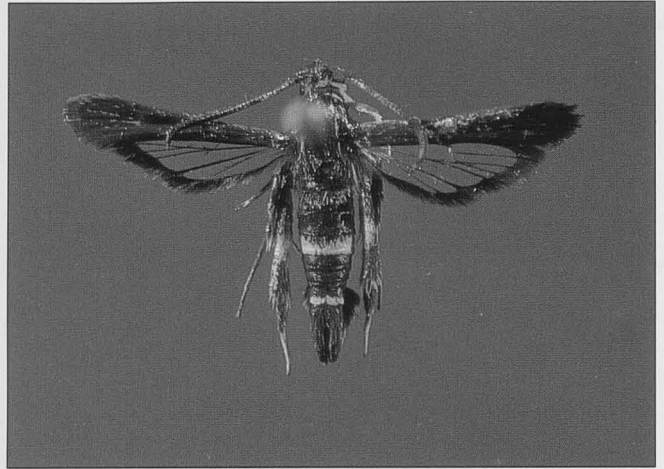
Identification: A small, stout moth with abdominal segment 4 broadly banded and segment 7 narrowly banded in yellow. The anal tuft is wedge shaped. The forewings are thickly covered with black scales. Wing length is 5 to 8 mm.

Host plants and damage: Larvae bore into the roots of wild boneset (*Eupatorium* spp.), particularly *E. perfoliatum*, *E. sessilifolium* and *E. album*.

Range: The southern, eastern and midwestern United States.

Life cycle: Adults are active in July and August. They may be found sunning on the foliage of *Eupatorium* plants. Larvae tunnel into the upper roots of food plants in late summer. They overwinter in roots and continue feeding in early spring. Larvae work into the stem base to prepare pupal chambers in June or early July. One generation occurs per year.

Importance/comments: Wild *Eupatorium* spp. are the only food plants known. Many specimens have been collected with ZZOH pheromone (non-commercial blend).



Alcathoe caudata (Harris)

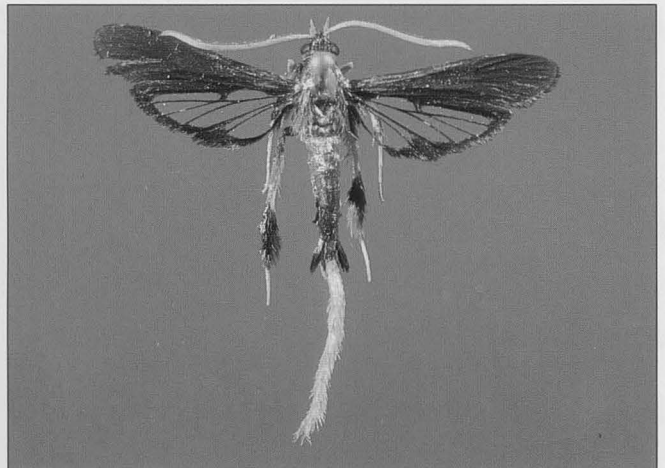
Identification: The male has a distinct yellow tail appendage as long as its abdomen and opaque violet forewings.

Host plants and damage: Larvae bore into stems and roots of *Clematis virginiana* vines. Wing length is 7 to 15 mm.

Range: The eastern and midwestern United States and Canada, south to Florida and Louisiana.

Life cycle: Adults are active in July and August. Larvae tunnel into the stems and roots of *Clematis* plants in late summer. Larvae continue developing in spring after overwintering in roots, then mature and pupate in June or early July. One generation occurs per year.

Importance/comments: Wild *Clematis* spp. are the only known food plants. Adults spend most of the day flying and resting under *Clematis* foliage.



Using Trapping Information to Locate Infested Plants

When a species of clearwing moth is correctly identified, check the list of potential host plants in Tables 3 and 4. For example, if lilac borers are identified from baited traps placed at a particular location, you can quickly surmise that the moths came from infested lilac, privet or ash. Nearby plantings of lilac, privet and ash can then be examined for borer damage. Limb and trunk swellings (Fig. 4), sap running, larval frass (sawdust) from tunnel exit holes, or protruding pupal skins may indicate that borers are present.

Borers are most likely to be found in weakened or injured plants. Many stress factors predispose trees to borer injury. Lack of nutrients, drought stress, poor drainage, incorrect soil type, unsuitable climate, mechanical injury, and insect or disease injury can weaken plants and make them susceptible to borers.

Confirm a suspected infestation by cutting through the bark to expose borer tunnels. The final step to correctly diagnosing clearwing borers as the cause of the plant problem is to find the grublike larvae in their tunnels. You can distinguish clearwing borers from beetle borers by looking for the presence of hook-like crochets on their vestigial prolegs (Fig. 1). Only Lepidoptera larvae have crochets and only two families of Lepidoptera borers are commonly found in woody parts of trees and shrubs. If you find a Lepidoptera borer, it is most likely a clearwing borer, though American plum borer larvae are sometimes found in black knot swellings, cankers and around other tree wounds. American plum borers are in the Pyralidae and can be distinguished from sesiids by the crochet pattern. Sesiids have transverse bands of crochets (Fig. 1), while the plum borer has circular groups of crochets. Also, plum borer larvae are usually dirty greenish white or reddish purple, while sesiids are almost always white or dirty white.

After you confirm infestations by finding tunneling damage and larvae, you can develop management strategies to reduce future damage.

Managing Clearwing Borers

The most important management strategy is to grow the healthiest trees possible. Healthy trees that are properly watered and fertilized are less likely to be attacked by borers. At the same time, try to reduce other stress factors such as root pruning, transplant shock, insect injury, disease injury and herbicide injury. Avoid physical injury to tree trunks caused by rough handling during transport or by careless lawn mowing. A healthy tree is less likely to be attacked by borers, so if you keep trees healthy, you may not need further management strategies.

Even some properly cared for trees and shrubs may become infested with clearwing borers. First, make certain the borers are clearwing borers by checking for crochets on the larvae's abdomens (Fig. 1). Find the plant type in Table 3 or 4 to see what species of clearwing attacks that group of plants. If several species are listed, see if they can be separated by the plant parts infested. For instance, Prunus trees may be attacked by three species of clearwings, but only one species attacks the trunk base and roots (*S. exitiosa*). If several species are suspected, use pheromone trap catches to help determine the most likely pest species. Then read the life history information to see when the adult moths emerge.

You can treat valuable trees with insecticide to help reduce borer injury. A single, well-timed application of a residual insecticide applied to the twigs, limbs or trunk may be very effective in reducing the next generation of borers. Clearwing borers deposit their eggs on the bark of their host plants. Upon hatching, the tiny larvae wander along the trunk, searching for a good site to penetrate into the inner bark. If a residual insecticide is present during the time of egg hatch, young larvae will die before they can penetrate the bark. Read the insecticide label to determine which insecticides are labeled for use on the species of tree or shrubs to be treated.

Adult clearwings of any given species are usually not active for more than 4 weeks after initial emergence. Therefore, one insecticide application to the infested plant parts when adults first emerge should provide good control. You can determine optimum timing by setting pheromone traps and checking them weekly for adult emergence. Be sure to use a pheromone attractive to the pest species you wish to monitor (Table 2). In some cases, a species of clearwing borer may emerge over several months (*Synanthedon scitula* in the southern United States). If borers emerge over a period longer than four weeks, or if more than one species is attacking a planting, then apply an appropriate insecticide if desired to infested woody plant parts once per month during the time of year when the adults are active.



Table 3. Tree and shrub host plants of clearwing borers presented in alphabetical order by host plant genus. Plant parts infested by borers and species of clearwing borers known to attack each genus are listed.

Trees and Shrubs	Plant Parts	Clearwing Species
<i>Acer</i> (Maple)	Inner bark	<i>Synanthedon acerni</i>
	Branches	<i>Synanthedon acerrubri</i>
<i>Amelanchier</i> (Serviceberry)	Branches	<i>Synanthedon pyri</i>
<i>Betula</i> (Birch)	Inner bark	<i>Synanthedon scitula</i>
		<i>Synanthedon fulvipes</i>
<i>Carya</i> (Hickory)	Inner bark	<i>Synanthedon scitula</i>
<i>Cornus</i> (Dogwood)	Inner bark	<i>Synanthedon scitula</i>
<i>Crataegus</i> (Hawthorn)	Inner bark	<i>Synanthedon pyri</i>
<i>Fraxinus</i> (Ash)	Solid wood	<i>Podosesia syringae</i>
		<i>Podosesia aureocincta</i>
<i>Malus</i> (Apple, Crabapple)	Inner bark	<i>Synanthedon pyri</i>
<i>Nyssa</i> (Blackgum)	Inner bark	<i>Synanthedon rubrofascia</i>
<i>Parthenocissus</i> (Virginia Creeper)	Roots	<i>Albuna fraxini</i>
<i>Picea</i> (Spruce)	Trunk	<i>Synanthedon pini</i>
<i>Pinus</i> (Pine)	Trunk	<i>Synanthedon pini</i>
<i>Populus</i> (Poplar) (Cottonwood)	Solid wood	<i>Paranthrene dollii</i>
	Solid wood of roots, trunk	<i>Sesia tibialis</i>
<i>Prunus</i> (Peach, Cherry, Plum)	Inner bark, branches	<i>Synanthedon pictipes</i>
	Lower trunk, roots	<i>Synanthedon exitiosa</i>
	Inner bark	<i>Synanthedon scitula</i>
<i>Pyrus</i> (Pear)	Inner bark	<i>Synanthedon pyri</i>
<i>Quercus</i> (Oak)	Solid wood of trunk	<i>Paranthrene asilipennis</i>
	Solid wood of trunk	<i>Paranthrene simulans</i>
		<i>Paranthrene pellucida</i>
	Bark or galls	<i>Synanthedon decipiens</i>
	Inner bark	<i>Synanthedon scitula</i>
<i>Salix</i> (Willow)	Solid wood	<i>Paranthrene tabaniformis</i>
		<i>Synanthedon bolteri</i>
	Branches, exposed roots	<i>Synanthedon proximia</i>
	Branches and canes	<i>Synanthedon sigmoidea</i>
<i>Sorbus</i> (Mountain Ash)	Inner bark	<i>Synanthedon scitula</i>
<i>Syringae</i> (Lilac)	Solid wood	<i>Podosesia syringae</i>
<i>Viburnum</i>	Branches	<i>Synanthedon viburni</i>
		<i>Synanthedon fatifera</i>



Table 4. Herbaceous and vine host plants of clearwing borers presented in alphabetical order by host plant genus. Plant parts infested and species of clearwing borers known to attack each plant genus are listed.

Vines, herbs and weeds	Plant parts	Clearwing species
<i>Clematis virginiana</i>	Roots, stems	<i>Alcathoe caudata</i>
<i>Cucurbita</i> (Cucumber, squash and gourds)	Vines	<i>Melittia cucurbitae</i>
<i>Aster umbellatus</i> (Aster)	Roots	<i>Carmenta corni</i>
<i>Epilobium</i> (Fireweed)	Roots	<i>Albuna pyramidalis</i>
<i>Eupatorium</i> (Boneset)	Roots	<i>Carmenta pyralidiformis</i>
<i>Helenium</i> (Sneezeweed)	Roots	<i>Carmenta ithacae</i>
<i>Heliopsis</i> (Ox-eye)		
<i>Liatris</i> (Blazing star)	Roots	<i>Carmenta anthracipennis</i>
<i>Parthenocissus quinquefolia</i> (Virginia creeper)	Roots	<i>Albuna fraxini</i>
<i>Rubus</i> spp. (Blackberry, currant)	Canes	<i>Pennisetia marginata</i> , <i>Synanthedon tipuliformis</i>
<i>Solanum carolinense</i> (Horsenettle)	Roots	<i>Synanthedon rileyana</i>
<i>Vernonia</i> (Ironweed)	Roots	<i>Carmenta bassiformis</i>
<i>Vitis</i> (Grape)	Roots	<i>Vitacea polistiformis</i>



Figure 1. The larval stages of clearwing moths can be distinguished from Coleoptera borers by the presence of hooklike crochets on abdominal segments 3, 4, 5, 6 and 10. An enlarged view of abdominal segment 6 shows the pattern of crochets on Sesiidae larvae. The two transverse bands of crochets distinguish Sesiidae larvae from the American plum borer (*Euzophera semifuneralis*; Pyralidae), a wound-infesting borer sometimes found in association with Sesiidae larvae. American plum borer larvae have crochets in circular groups, not transverse bands. (Reproduced with permission from F.W. Stehr, *Immature Insects I*, Kendall/Hunt).

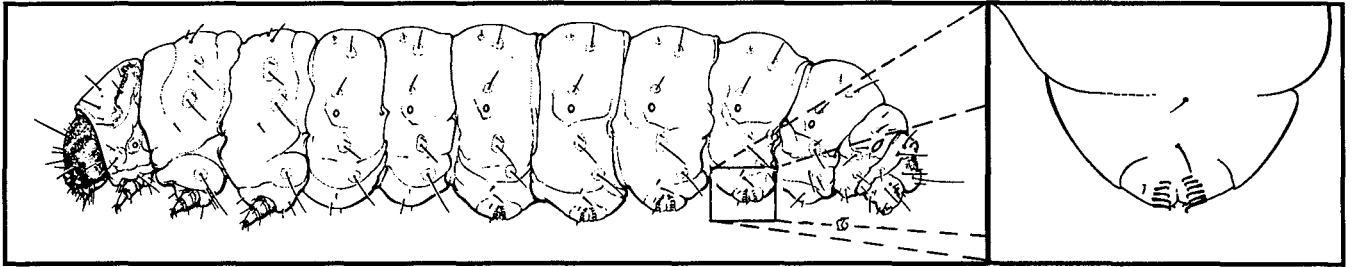


Figure 2. Some characteristics used to identify clearwing adults. This general diagram illustrates where the antenna tip, discal mark, basal area of wings and tufts are located. Abdominal segments are numbered 1-8, as referred to in some species descriptions.

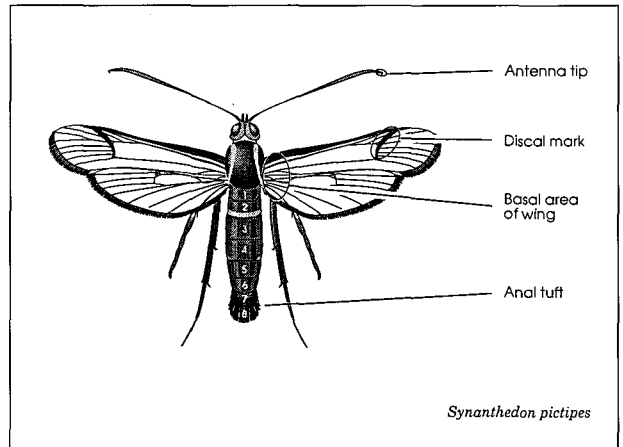


Figure 3a. *Synanthedon pictipes*. Can be distinguished from *S. fatifera* and *S. viburni* by: (A) white or pale yellow patch of scales below antennae and in front of the eyes; (B) sometimes white or pale yellow scales on top of the head; and (C) white outer and black inner scales in a row of elongated scales along the back of the head.

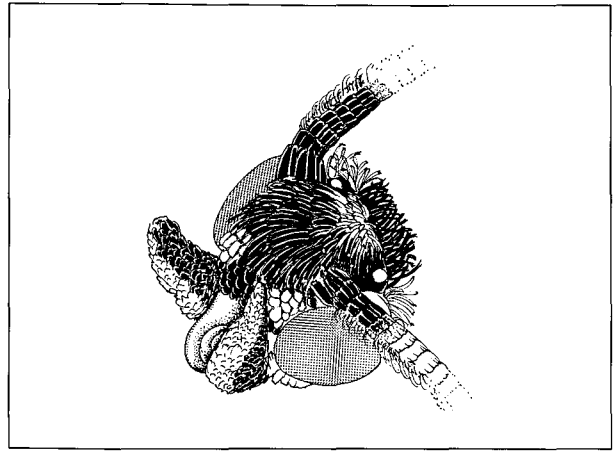


Figure 3b. *Synanthedon fatifera*. Almost no white scales on the face or top of the head.

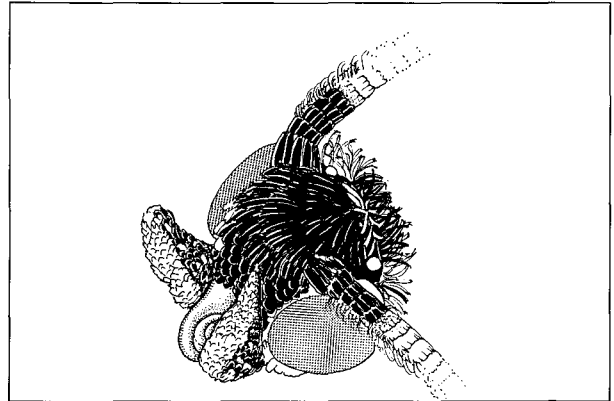


Figure 3c. *Synanthedon viburni*. (A) White patch of scales between the bases of the antennae; (B) row of elongated pale yellow scales along the back of the head not clearly separated into black center and white outer margins.

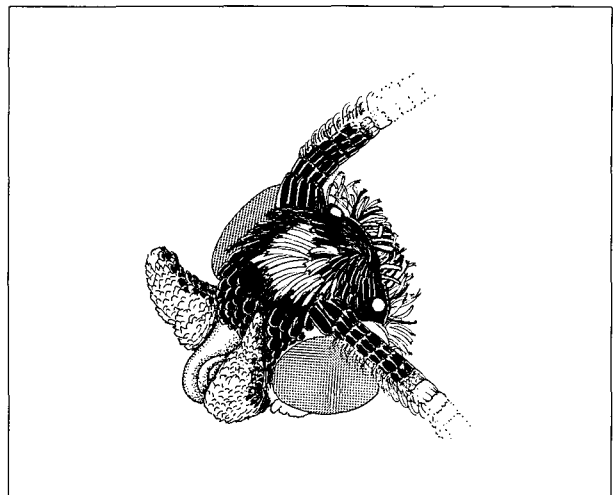
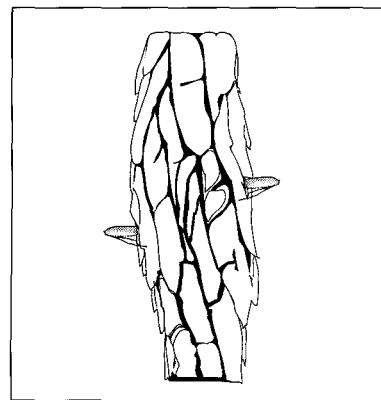


Figure 4. Trunks or branches infested with borers often swell and crack. Some species of clearwings leave empty pupal cases protruding out of limbs after adult emergence.



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