TREE FRUIT CROPS
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American Plum Borer

Euzophera semifuneralis (Walker) (Lepidoptera: Pyralidae)

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The American plum borer (APB) is a cambium-feeding moth pest of fruit and ornamental trees. It is unusual because it belongs to the pyralid, rather than the sesiid (clearwing) family, which is more commonly associated with this kind of damage. It is the major borer pest of stone fruits in Michigan, causing up to a 33% decline in the life span of tart cherry trees there. Recent studies indicate that it is the most abundant borer in commercial tart cherry orchards in New York. Significant numbers are also found in peach trees infected by canker diseases. Widely distributed throughout most of North America and parts of South America, it has an extensive range of hosts including at least 15 families of fruit, nut, ornamental, and forest trees, and a few woody annuals. Its rise to major pest status in tart cherry can be traced to bark damaged by mechanical harvesters, which provides larvae an entryway to the cambium.

Adults

Male and female APB are identical. Wingspread ranges from 17–28 mm (2/3–1 inch). The forewing is narrow and somewhat triangular; the hind wing is broad and fringed on the trailing edge. The overall color of the moth is a light grayish brown. The forewing is generally reddish brown, marked by wavy black and brown vertical bands about 2/3 of the distance from its base. Those markings may vary considerably in color and intensity. The hind wing is pale brownish gray with a darkened margin at the base of the fringe. Some veins of the hind wing may be darker than the wing (fig. 1).

Figure 1. Adult

Figure 2. Larva

Figure 3. Cocoon

Figure 4. Fresh harvester damage

Figure 5. Cankers in peach

Figure 6. Black knot w/frass

Figure 7. Old/severe trunk damage

There are two moth flights per year in New York State. In the western part of the state, the first begins in mid-May and peaks about 2 weeks later. The second flight peaks near the end of July (fig. 8). APB adults are active at night and seldom seen. However, male activity can be monitored using wing traps baited with a commercially available APB pheromone lure. The female is attracted to gum exuded from wounds in the bark of stone fruit trees. It lays 20–50 eggs in a couple of days on or near this gum.

Eggs

Eggs are oval and covered with a network of triangular facets. They are dirty white when first laid but darken to pink, then deep red, as they mature. They are small (1/3 to 1/2 mm) and are laid singly or in small masses in or near the gummosis caused by bark wounds. Eggs hatch in 8–9 days at a constant temperature of 68°F in the laboratory, and twice as long at 56°F. The first generation egg hatch, in the field, takes a couple of weeks because of cool spring temperatures; the second generation egg hatch, in late July, takes about a week.

Larvae

APB larvae range in color from grayish green to grayish purple; the head capsule, cervical shield, and anal plate are yellow to brown. The cervical shield has dark markings on either side (fig. 2). In contrast, larvae of the peachtree borer and lesser peachtree borer, which may be found along with APB larvae, are creamy white with a yellowish-brown to dark brown head capsule. In addition, APB larvae have two rows of crochets (hook-like spines) at the tips of the abdominal prolegs, while sesiid larvae have only one row. Long primary setae are apparent on APB larvae, but not on the sesiids.

APB larvae pass through seven instars. First generation eggs hatch in late May or early June and larval development is completed 4–5 weeks later. Second generation larvae begin to hatch in late July or early August and develop until sometime in mid-October when they enter diapause. The 1st instar larva is minute (about 0.25 mm or 1/100 inch long), while the last is 18–25 mm (3/4–1 inch) long. After hatching, larvae move into frass from earlier larval feeding or to the edge of the cambium. They feed along this edge throughout their development. Most APB larvae are found within four feet of the ground, although in trees infected with black knot or *Cytospora* canker they may be found in cankers higher in the tree. APB frass is loosely cemented together by a small amount of sap, while sesiid larval feeding is evidenced by frass mixed throughout large amounts of gum. Larvae spin silken cocoons in which they pupate. The cocoon also serves as a hibernaculum for the overwintering larva. In heavily infested trees, seemingly live bark can be pulled away to reveal many of these cocoons (fig. 3). Larvae from the 3rd through the 7th instar can overwinter.

Pupae

APB pupae are found under the bark, within the silken cocoons described above. The pupa itself is 11–12 mm long (slightly less than 1/2 inch), tan to dark brown, with black eyes. The cocoon may be found among its frass, but the frass is not used in its construction, as with the sesiids. Pupation takes about 4 weeks in the spring. The empty pupal skin is found inside the cocoon (sesiid pupal skins are found protruding from exit holes on the outside of the bark). Because larvae can overwinter between their 3rd and 7th instars and must complete development in the spring, pupae of the overwintering generation may be found from early April to early June. This results in an extended emergence of first flight adults. Summer generation pupae are present from late June through early August. Pupation at this time takes about two weeks.

Figure 8. Phenology of American Plum Borer in Western New York State

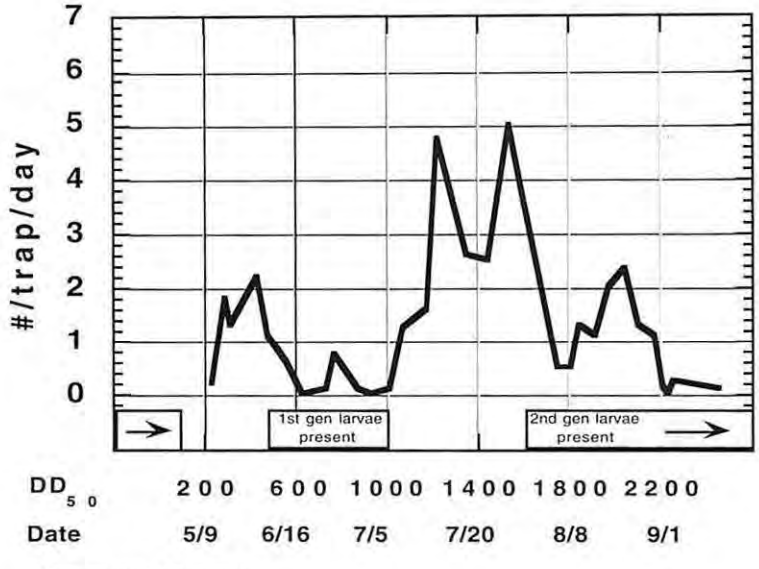


Figure 8. Flight graph

Damage

APB larvae feed on cambium. They can only enter the cambium layer through openings created by mechanical damage, diseases, sunscald, winter injury, etc. Entry is most commonly gained through splits in the bark of tart cherries caused by mechanical harvesters (fig. 4), cankers in peaches caused by Cytospora spp. and other pathogens (fig. 5), and black knot cankers in tart cherries and plums (fig. 6). In western New York, most tart cherry orchards damaged by mechanical harvesting shelter APB larvae, with an average of 8–9 larvae per tree. Trees may harbor 40 or more larvae. The number of larvae per tree is correlated with the severity of bark damage. Mechanically harvested tart cherry trees tend to have more APB larvae than peaches because of the severity of the damage done by shakers.

Because APB larvae feed horizontally, they may eventually girdle the trunk or scaffolds. However, damage may go unnoticed because the outer bark usually remains intact (fig. 7). The negative effect of borer feeding on tree vigor can be greater under droughty conditions. Young trees may be destroyed by APB that gain entry at the graft union.

APB can also spread plant pathogens. Larvae may contribute to the enlargement of *Cytospora* cankers and ovipositing females can carry spores from one tree to another.

Management

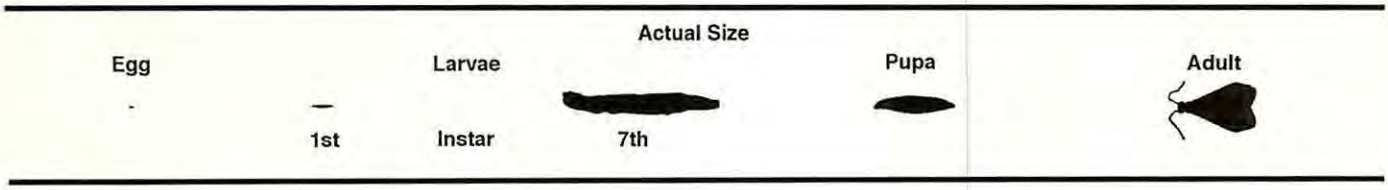
Natural enemies may play an important role in reducing APB larval populations. Birds, especially woodpeckers, feed on larvae throughout the year. A number of species of parasitic wasps, predatory insects, and spiders also feed on APB. Fungi of the *Hirsutella* spp. may be especially important pathogens, attacking larvae of APB and other lepidopterous borers. Cadavers of larvae killed by these fungi appear wooden and often possess hornlike hyphal structures from which spores are released. In trees where borer larvae are heavily infected with the fungus, white hyphal horns may be seen growing through cracks in the bark. *Hirsutella* has been observed to infect up to 50% of the APB larvae present in some Michigan tart cherry orchards.

Sample in the fall or early spring for larvae. Use a hammer and a long screwdriver to pry back the bark where damage is apparent. Remove bark until live cambium is reached and look for larvae feeding along the edge of the live cambium or cocoons attached to the inside of the bark. Use forceps to look under fresh frass.

It is not precisely known what effect APB feeding has on annual yields or on the long-term health of a tree. Consequently, there is no experimentally determined action threshold for its control with insecticides. However, because of the likelihood of severe damage in the long run, few should be tolerated. Control with insecticides should be initiated when it becomes apparent that APB is causing damage. Generally, the greater the amount of existing injury from mechanical harvesting, cankers, and previous borer feeding, the greater the need for control. It is suggested that a representative sample of randomly selected trees be examined for the presence of wounds containing frass to determine whether they are infested by borers. If 30% or more of the trees examined contain frass, and damage is severe enough that 25% or more of the circumference of the trunk of each is girdled, an insecticide application is probably warranted. Consult the latest Cornell Cooperative Extension Pest Management *Recommendations for Commercial Tree-Fruit Production* for the most up-to-date information on insecticide selection and timing.

References

Biddinger, D. J. 1989. "The Biology and Control of the American Plum Borer (Lepidoptera: Pyralidae) on Tart Cherries in Michigan." M. S. Thesis, Michigan State University. 113 pp.



GUIDE TO STAGES

Stage	Timing	Where to Look
Adult		
1st flight	Mid-May through June See graph, figure 8	Pheromone traps
2nd flight	July–early Sept. See graph, figure 8	Pheromone traps
Eggs		
1st generation	Late May to August	In or near gum
Larvae		
Overwintering	Late Sept. to early May	In cocoons under loose bark
Summer	June, August	Feeding on edge of cambium under loose bark
Pupae	May	In cocoons under loose bark

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