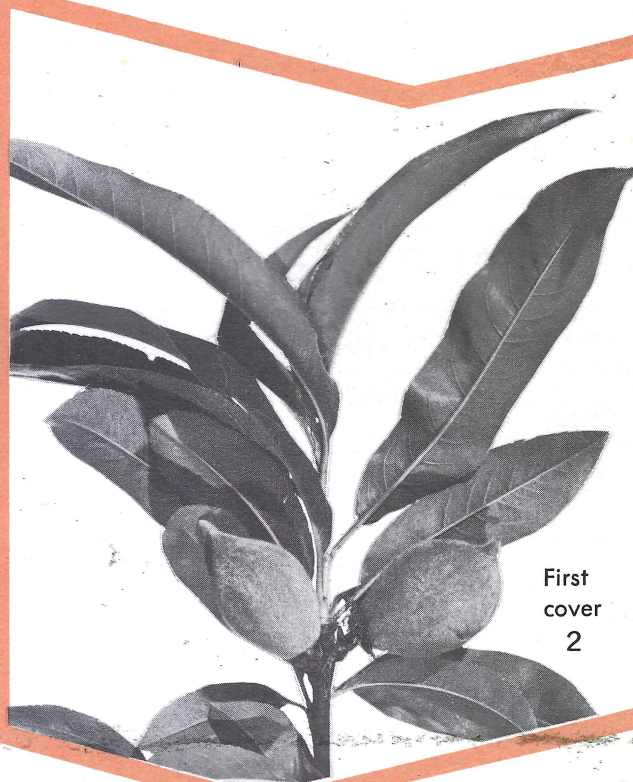


Peach and Plum Insects



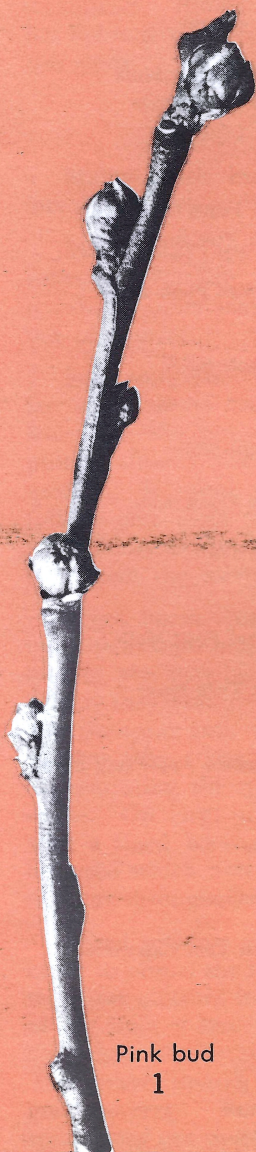
First
cover
2



Shucksplit
3



Petal
fall
4



Pink bud
1

Key to Insects Attacking Peaches and Plums

INSECTS FEEDING EXTERNALLY ON THE FRUIT

Green or brown stink bugs, or plant bugs, 1/5 to 1/2 inch long, sucking the sap from the fruits.....	page 3	Catfacing Insects
Black beetles, about 1/8 inch long, with tan spots on the wingtips, feeding in damaged areas on the surface and inside ripening fruit.....	page 10	Dried-fruit Beetle
Tiny, elongated yellow to black insects up to 1/25 inch long, feeding in groups on shaded portions of ripening fruits causing scraped, silvery areas.....	page 10	Thrips
Greenish beetles about 1/5 inch long with black spots, eating round holes about 1/8 inch in diameter in the surface of ripening fruits.....	page 10	Cucumber Beetle
Green or brown insects usually with long antennae, eating shallow irregular depressions in the surface of ripening fruits.....	page 10	Grasshoppers

LARVAE (CATERPILLARS OR GRUBS) TUNNELING AND FEEDING INSIDE THE FRUIT

White, legless larvae with brown heads, feeding in the fruit.....	page 5	Plum Curculio
Grubs, similar to those above, feeding in the pit.....	page 6	Plum Gouger
Pink-white, active caterpillars with abdominal legs, burrowing in the fruit.....	page 7	Oriental Fruit Moth
Brown caterpillars with yellowish bands, burrowing in the fruit.....	page 8	Peach Twig Borer

INSECTS ATTACKING THE TRUNK AND LARGER LIMBS

White caterpillars, with the hooks on their abdominal legs arranged in two transverse rows, feeding in the upper trunk and large branches.....	page 11	Lesser Peach Tree Borer
Caterpillars, similar to those above, tunneling in the lower trunk.....	page 12	Peach Tree Borer
Dingy-white to brown-gray caterpillars, with the hooks on their abdominal legs arranged in circles, burrowing in the trunk.....	page 13	American Plum Borer
Tiny, black beetles with dull-red markings, usually feeding in the wood of unhealthy trees. Numerous small round holes made in the bark.....	page 14	Shot-hole Borer

STATIONARY INSECTS ON THE TRUNK AND BRANCHES

Light-gray, waxy scales up to 1/16 inch in diameter with raised nipples in the center.....	page 14	San Jose Scale
Bark covered with a white, cottony mass of scales interspersed with grayish ones with yellow-to-orange centers.....	page 15	White Peach Scale
Large, brown, soft-bodied scales, usually on the underside of the twigs.....	page 15	Soft Scales

LARVAE FEEDING INSIDE THE TWIGS

Pink-white, active caterpillars with abdominal legs, burrowing in the terminals causing them to wilt.....	page 7	Oriental Fruit Moth
Brown caterpillars with yellowish bands, habits same as the preceding.....	page 8	Peach Twig Borer
White, legless grubs with constrictions between their body segments, tunneling down the twigs from a point 2 to 4 inches from the ends.....	page 16	Eye-spotted Apple-twig Borer

INSECTS FEEDING EXTERNALLY ON THE FOLIAGE AND TWIGS

Soft-bodied, green or brown insects in colonies, sucking the sap from buds and foliage.....	page 16	Aphids
Insects feeding on the leaves and tender bark of small trees, frequently girdling branches.....	page 16	Grasshoppers
Hairy caterpillars, which construct unsightly webs, defoliating the twigs and branches in early spring.....	page 16	Eastern Tent Caterpillar

ACKNOWLEDGMENTS

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Peach and Plum Insects

Extension Entomologists
Texas A&M University

INJURIOUS INSECTS CAUSE SERIOUS LIMITATIONS in stone fruit production. Before an effective control program is initiated, the individual pests and their damage must be recognized. Too, a knowledge of seasonal life histories and specific control measures is necessary to determine when to apply treatments. Information obtained in recent years has made it possible to include the entire State in this study.

SPRAY APPLICATIONS

Major peach insects can be controlled satisfactorily if the outlined procedures are followed:

Make spray applications at the recommended times. Deviations of a week or 10 days from scheduled times may result in insect pests getting out of control.

For commercial orchards, results may be satisfactory if sprays are applied at a pressure of no less than 400 pounds per square inch. Sprayer pumps should deliver at least 20 gallons per minute. If hand spray guns are used, wet all foliage and fruit thoroughly so that run-off of spray material occurs over the entire tree and not only from the leaves nearest the sprayer.

Fixed boom sprayers, which deliver the spray mixture at high pressure from a series of stationary nozzles, also may be used. Operated by the tractor driver, they eliminate the need for the man who uses the spray gun. Boom sprayers are less flexible in that they cover all areas of the tree without concentrating the spray where the foliage is most dense. On large trees, penetration may be poor with a fixed boom sprayer, because small nozzles are used which may not drive sufficient quantities of spray through the trees.

Speed sprayers are machines which use a blast of air to propel the spray material. They discharge the spray mixture from a fixed boom into a stream of air from a fan. Air from the fan breaks the spray into fine particles and blows it into the tree. The sprayer should move slowly enough to provide good coverage. Because droplet size is small, the spray does not appear to wet the foliage. Consequently, it is difficult to evaluate the spray deposit.

INSECTS ATTACKING THE FRUIT

Catfacing Insects

Several species of insects feeding on peaches early in the growing season cause a gnarling and distortion of the fruits called catfacing. Plant bugs and stink bugs, largely responsible for this type of injury, suck the sap from the fruits. If the peaches do not fall as a result of this attack, fruit development is inhibited in the area of the punctures, while the surrounding healthy tissue continues to grow.

Although catfacing insects invade plum trees early in the season, injury similar to that on peaches does not appear. The damaged plums probably fall before maturing.

Plant bugs and stink bugs in the adult stage overwinter under dead leaves, in ground debris and in cover crops. In the spring, the adults emerge and feed on the buds of peach, plum and other plants. Egg-laying, which begins shortly after adult emergence, occurs principally on vegetables, weeds and legumes. Occasionally, eggs are deposited in peach trees and a few individual insects develop.

PLANT BUGS, *Lygus* spp; principally *lineolaris* P. de B.

These insects appear in peach trees during the pink bud stage. The adults are about 1/5 inch long and range from shades of brown to tan or nearly black. Following their feeding activities, damaged buds, blossoms and small fruits usually fall. Large peaches develop sunken, corky areas. Populations decline shortly after petal fall, as the bugs are attracted to other hosts. Occasionally they are found in peach trees after shucksplit.

SMALL GREEN STINK BUGS, *Thyanta* spp., principally *custator* (F.)

These stink bugs are the first species of economic importance to attack peaches in the spring. The adults are about 3/8 inch long and usually light to dark green. They emerge from hibernation and fly to peach trees in increasing numbers from the late-bloom stage until about the week

after shucksplit. They migrate to other plant hosts during the following 3 weeks, Figure 1.

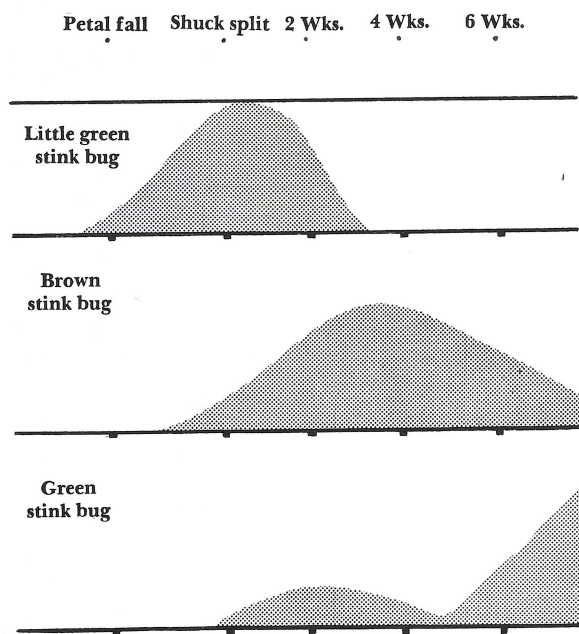


Figure 1. Seasonal abundance on peaches of three species of stink bugs which cause catfacing.

Damage caused by stink bugs is particularly severe, because they attack early in the season when the fruit is small. By harvest time, the injured peaches become folded and distorted, Figure 2. Usually, corky areas do not appear on the fruit.

BROWN STINK BUGS, *Euschistus* spp., principally *servus* (Say)

Brown stink bugs are in the orchard about a week after petal fall. They are $\frac{3}{8}$ to $\frac{1}{2}$ inch long and light to dark brown because of closely spaced indentations which are brown on a yellow or light-gray background.

The adults appear in largest numbers about a month after shucksplit. Unlike the small green stink bugs, many remain in the trees throughout the season.

Fruits attacked at an early stage develop depressed, corky areas similar to those produced by plant bug feeding, Figure 3. Those damaged later in the season become only slightly deformed.

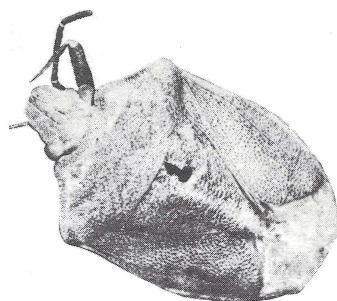
Frequently, the adults of these species are confused with large stink bugs, belonging to the genus *Brochymena*, Figure 4. The latter are dark-gray, stout-bodied insects, $\frac{1}{2}$ to $\frac{5}{8}$ inch in length. They lack the yellow or light-gray background characteristic of the brown stink bugs. They appear early in the season, but do not injure the fruit.

SOUTHERN GREEN AND GREEN STINK BUGS *Nezara viridula* (L.) and *Acrosternum hilare* (Say)

These bright green stink bugs are the last to appear in damaging numbers in peach orchards each season. They are about $\frac{1}{2}$ inch long, appear when the fruits are in the shucksplit stage and increase in number until harvest. Peaches on trees along orchard margins, bordering fields and woodlands, are damaged most severely. The bugs feed in groups, usually attacking some of the fruits but not injuring others on the same tree. Feeding damage is different from that caused by the brown stink bugs. Corky areas and gnarled, mishapen fruit do not develop, but damaged peaches appear watersoaked and dimpled. Frequently, strings of gum exude from the feeding punctures, Figure 5.

Control of Catfacing Insects—Prevention of injury by catfacing insects largely depends on early-season spray applications. Control of these insects as they emerge from hibernation reduces the damage to young fruits. An application at petal fall of one of the sprays recommended in Extension L-245, *Texas Guide for Controlling Insects and Diseases on Fruits and Nuts*, followed by another application at shucksplit, usually provide satisfac-

Figure 2. Typical damage and appearance of small green stink bug.



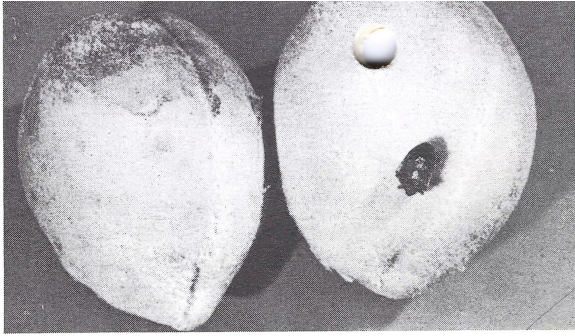


Figure 3. Typical damage and appearance of brown stink bug.

tory initial control of plant bugs, brown stink bugs and small green stink bugs. Succeeding sprays applied for curculio control also prevent the development of destructive populations of green and brown stink bugs.

Fruits which do not escape injury early in the season may be removed during the thinning operation.

Other Fruit-infesting Insects

PLUM CURCULIO

Extensive damage to peaches and plums is caused by the plum curculio, *Conotrachelus nenuphar* (Hbst.) Holes appear in the fruit as the adults feed and deposit eggs. These holes provide entry for the brown rot fungus and produce cat-facing on peaches similar to that caused by stink bugs. The larvae, or worms, tunnel in the developing fruits, Figure 6.

The adults are snout beetles, about $\frac{1}{4}$ inch long, gray to black with lighter gray and brown mottlings, Figure 7. Their wing covers are roughened and bear two prominent humps and two smaller ones.

The larvae are curved, slightly white to yellow-white, legless grubs with brown heads. They measure about $\frac{3}{8}$ inch long when full grown.

Plum curculios, as adults, overwinter in protected places in woodlands, along fence rows and under ground debris. They begin to leave hibernating quarters before wild bush plums bloom and

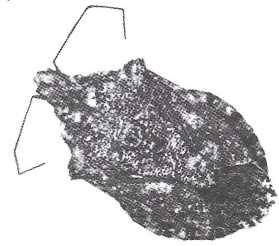
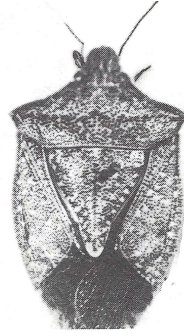


Figure 4. Non-injurious stink bug, *Brochymena* sp., which occurs on peach trees.

migrate to wild plum thickets and plum orchards and to a lesser extent to peach trees. They feed on the foliage and flowers until the small fruits form.

Shortly after the shucksplit stage on plums, plum curculios begin to lay eggs, but the peak of egg-laying is not reached until a month later, Figure 8.

Plums and nectarines are chosen as egg-laying sites by the overwintering generation more frequently than are peach varieties, such as Elberta which matures during or after midseason. However, peach varieties which mature in late May and during June also are attacked.

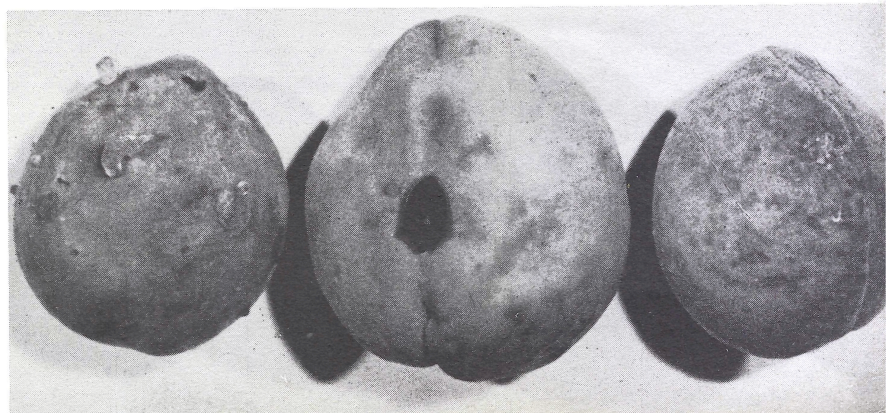
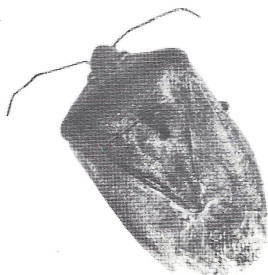
The females eat holes in the fruits and deposit their eggs. After having placed the eggs, they cut a crescent-shaped slit under each egg cavity.

The larvae complete their development in the fruit in 2 to 4 weeks. When full-grown, they crawl out and drop to the soil where they construct an earthen cell, usually 1 to 3 inches below the surface, in which they pupate and transform to adults. These first-generation beetles emerge from the ground in 3 to 4 weeks. The life cycle from egg to emerged adult requires 5 to 8 weeks.

Bruce plum is a more satisfactory host for the larvae than the wild bush plum. Twice as many curculios transform into the pupal stage and emerge as adults if they developed as larvae in Bruce plums, than if they fed in wild bush plums.

Most plum varieties are harvested by the time the first generation is completed and many of the adult curculios migrate to peach orchards. They

Figure 5. Typical damage and appearance of green stink bug.



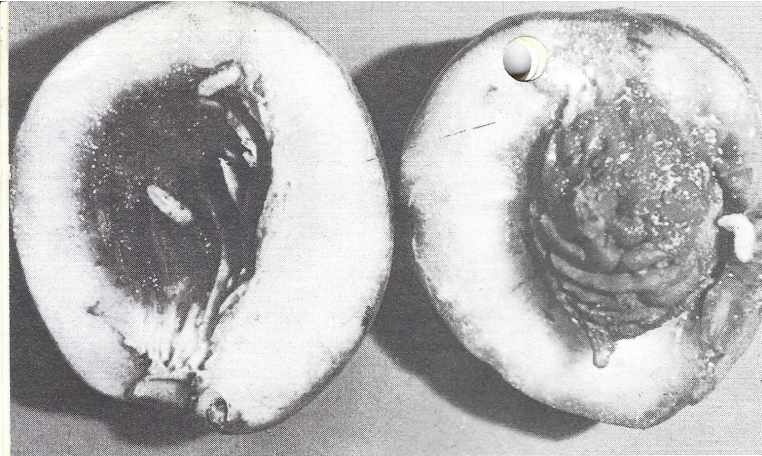


Figure 6. Plum curculio larvae feeding in peaches.

deposit their eggs in the developing fruit of varieties such as Elberta. The second generation larvae may be found in the peaches at harvest time.

After the second-generation larvae have completed development, they pupate in the soil and appear as adults in July and August. They join the first generation adults in feeding on foliage until the advent of cold weather, at which time individuals from both generations seek hibernating quarters.

Annual variations in this life cycle depend on climatic conditions. During hot, dry seasons, fewer individuals of the first generation reach maturity and the second generation rarely becomes large enough to inflict economic injury to peaches. The overwintering population, following a hot, dry season, is composed almost entirely of first-generation adults.

Control. Satisfactory control of the plum curculio depends on the careful application of effective insecticides. Sprays recommended in L-245 will protect the fruit from curculio attack.

Begin application of these materials in the spring when adult curculios leave their hibernating quarters. The time of emergence varies from year to year.

Usually, the beetles appear when plums are in the petal fall stage, at which time sprays should be applied, Figure 8. Make succeeding applications of insecticides at shucksplit and twice at 2-week intervals thereafter.

Begin sprays for curculio control in peaches at shucksplit, Figure 8. Follow this spray by two applications at 2-week intervals. Apply final spray 30 days before harvest to prevent egg-laying by first generation adults, Figure 8.

Figure 7. Life cycle of the plum curculio.

PLUM GOUGER

The plum gouger, *Anthonomus scutellaris* Lec., is primarily a pest of native plums. A few may feed on the buds and blossoms in plum and peach orchards in March and early April. Fruits attacked by this insect become gnarled and distorted as a result of adult feeding and egg-laying punctures. The kernels of the pits are eaten by the larvae.

The adult plum gouger is a snout beetle, resembling the plum curculio. The two species may be separated by the appearance of the wing covers. The plum gouger's wings are smooth and dark brown in contrast with those of the curculio which are mottled gray, roughened and humpy. The head, forepart of the thorax and legs of the plum gouger are yellow-brown. The larva is a legless, white grub with a brown head.

This insect overwinters in the adult stage, emerging in the spring to lay eggs in small holes eaten in the young plum fruits. The larvae feed on the kernel, pupating in the excavated cavities. There is only one generation each year.

Control. Special control measures are not required for the plum gouger in commercial orchards. In small plum plantings, the materials recom-

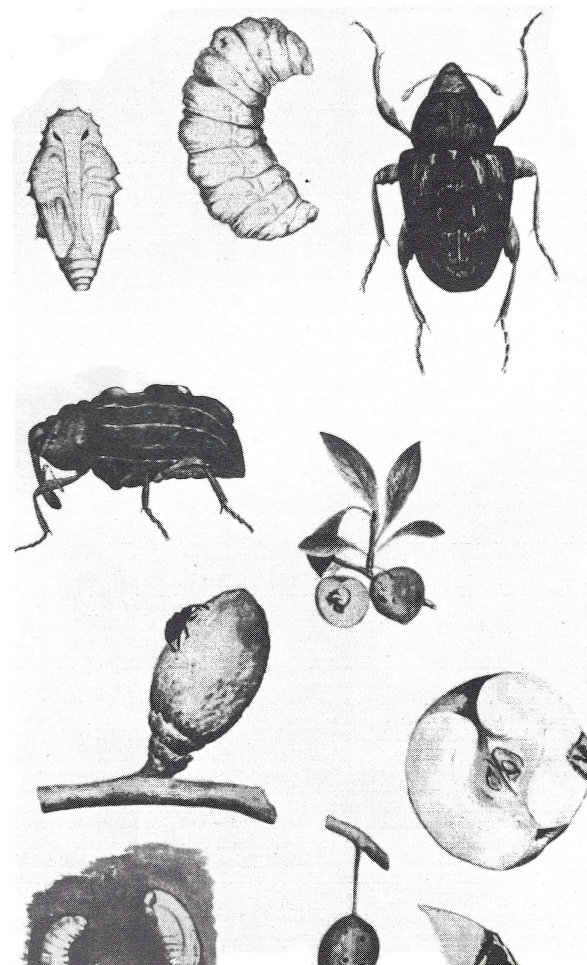
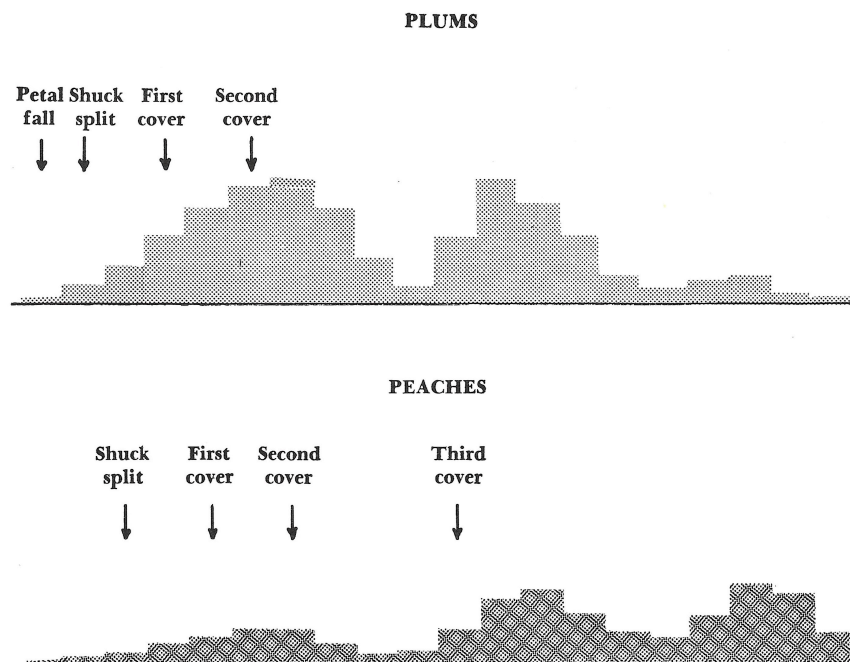


Figure 8. Seasonal life history of plum curculio on peaches and plums.



mended for the plum curculio probably would prove effective against this pest.

ORIENTAL FRUIT MOTH

The oriental fruit moth, *Grapholitha molesta* (Busck), is an important pest of peach varieties which mature fruit later than Hiley and Burbank July Elberta. Some damage to plum tree twigs may occur, but the fruit is not attacked.

In the spring, injury is largely confined to the growing tips of twigs, into which the larvae burrow, Figure 9. As a result, the terminals die and heavily infested trees appear bushy and stunted. Larvae of succeeding generations attack peach fruits, frequently entering through the stem so no external evidence of injury is apparent. They also may enter where two peaches are in close contact or they enter the sides of individual fruits. Infested peaches break down rapidly in shipping and are unfit for consumption because of extensive internal damage.

Adults of the oriental fruit moth are gray with dark-brown bands on their wings. The mature larvae are about $\frac{1}{2}$ inch long. They become active when disturbed, crawling rapidly over the fruit surface. They may be distinguished from curculio grubs by their pinkish color and the presence of distinct legs. Also, plum curculio feeding in the

fruit leave little frass and debris, while the oriental fruit moth is an extremely messy housekeeper.

The winter is passed in the larval stage in a cocoon under the bark, in dried fruit or in ground debris. Following pupation in the spring, the adults emerge and deposit flat, whitish eggs on leaves and twigs shortly after peaches bloom. The larvae feed in the succulent new growth of the twigs. In the summer, when tender growth is no longer available, the larvae of later generations attack the fruit, feeding around the seed. If succulent growth and fruit are absent later in the summer, a "suicide" generation probably occurs, since the larvae cannot find food satisfactory for their development. Consequently, only a few survive and damaging infestations rarely occur the following year.

Injury may be severe in orchards where apples, pears or late-maturing peaches, such as Frank, are available, since egg-laying of later broods is concentrated on these fruits. In years of abundant summer rainfall, succulent twigs of fruit trees and ornamental shrubs such as photinia may be attacked in the fall.

In recent years, the practice of planting varieties of peaches that ripen before Elberta decreases the probability of severe damage by this pest.

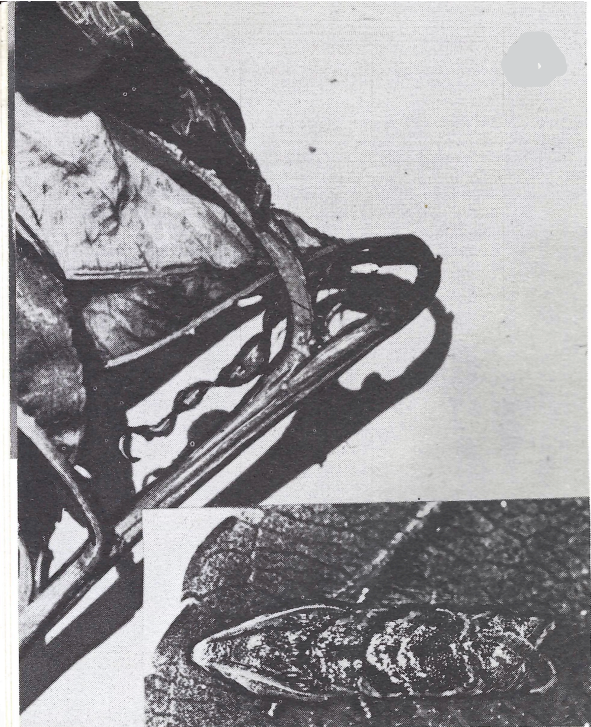


Figure 9. Oriental fruit moth.

Control. Since larvae feed in protected situations, time sprays to control the moths when they are depositing eggs and the young larvae immediately after hatching.

An application at shucksplit of the insecticides listed in L-245, followed by another 2 weeks later, prevents extensive injury. If the infestation is unusually severe, another application 3 to 4 weeks before harvest may be required.

PEACH TWIG BORER

The peach twig borer, *Anarsia lineatella* Zeller, is the major pest of peaches in Central Texas. Although it is present in the eastern portions of the State, it is usually of minor significance. The name of this insect should not be confused with that of the peach tree borer which attacks the trunks of peach and plum trees in East Texas.

Early generations of the peach twig borer larvae feed in the twigs of peach and plum trees. Damage is similar to that caused by the oriental fruit moth in East Texas, Figure 9. Later generations attack peach fruits, either penetrating to the pits or hollowing out areas beneath the skin up to $\frac{1}{4}$ inch in diameter, Figure 10. Varieties which mature fruit late in the season are damaged most severely. Early maturing plums are rarely attacked.

The adults are dark gray moths with lighter gray markings. They have a wingspread of about $\frac{5}{8}$ inch. The young larvae are light brown with black heads. Mature larvae average $\frac{3}{8}$ inch in

length and are reddish brown with yellow-white bands around the body.

As an immature larva, the peach twig borer passes the winter beneath the bark in a hollowed-out cell called a hibernaculum. The larvae become active in early February. After feeding on the bark lining their hibernacula until the trees are in the pink bud stage, usually early March, the larvae move upward to tunnel and mature in the developing shoots. First evidence of larval activity is the appearance of wilted shoots when early flowering varieties are in full bloom and foliage is beginning to emerge.

Upon attaining maturity, the larvae migrate to the larger branches and pupate in roughened areas on the bark. Pupation is initiated in early April and continues into early May. Most adults appear during a 2-week period in late April and early May. First generation egg deposition reaches a peak in the first half of May and continues until early June, Figure 11.

Four to 7 days are required for the eggs to hatch. Even though the vast majority of eggs are deposited on the fruit, the first generation larvae almost invariably leave and move to the shoots to feed. In California, some larvae of this and succeeding summer generations feed in cells constructed beneath the bark before moving to the shoots to complete development. This habit increases the time required for the larvae to reach maturity. Few of these bark-feeding larvae have been observed in Central Texas. In rare instances larvae may feed briefly on the green fruit before moving to the shoots. Apparently the fruit is not attractive until it passes the pit-hardening stage. However, when the fruit of early ripening varieties such as Dixired and Cardinal matures in late May or early June, earlier than usual, it is attacked by the larvae. Approximately 3 weeks are required for the completion of the larval stage. Four to 11 days are passed in the pupal stage in late May and early June. The first generation adults, which emerge during the first half of June, live and continue depositing eggs until mid-July.

The eggs hatch in 5 to 6 days and the second generation larvae become active in mid-June and early July. Peach varieties which ripen in the Burbank July Elberta season frequently suffer heavy damage from this generation of larvae. On trees of other varieties on which the fruit has been harvested or is not yet ripe, the larvae tunnel in the shoots. Pupae of the second generation appear during late June and July. The majority of second generation moths emerge during the last three weeks in July and the peak of egg deposition occurs during the last week in July.

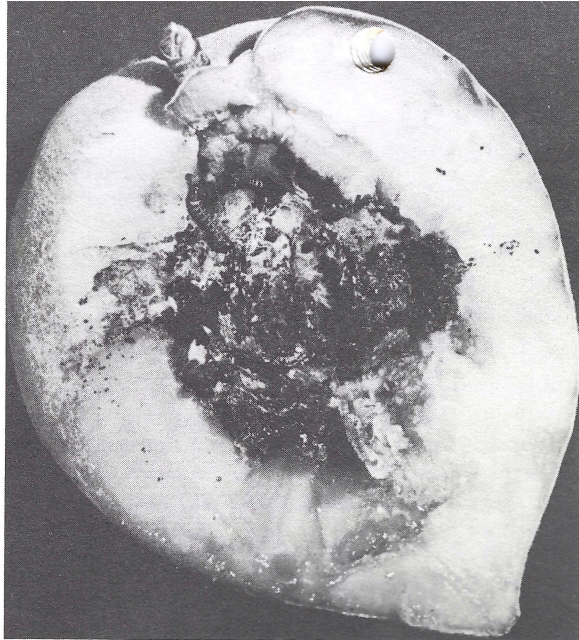


Figure 10. Internal damage of peach twig borer larvae in fruit.

Due to the overlapping of second and third generation larval activity in late July and early August, the fruit of the Elberta types which normally ripen during that season usually are infested with larvae of both generations. In early August, the larvae feed on the fruit of late-maturing varieties and on the tender shoots of early maturing varieties which have recovered from the fruit load and are producing succulent growth. Pupae of the third generation appear during August and early September with the majority appearing in late August. Third generation adult emergence and egg deposition continues from mid-August until mid-September.

During the first 2 weeks of the oviposition period, eggs are deposited on late-maturing peaches. The larvae which hatch from these eggs reach maturity, pupate and emerge as adults of the fourth generation in mid-September. It is probable that eggs deposited by the adults in late September and

October produce larvae of the fifth generation which migrate down the limbs and seek hibernation quarters.

Larvae from eggs, deposited by the third generation moths during the latter half of the oviposition period in early September, feed briefly on the terminals and then move to the hibernacula under the bark where they feed until winter. Beginning in mid-September, hibernacula may be found in crotches of trees.

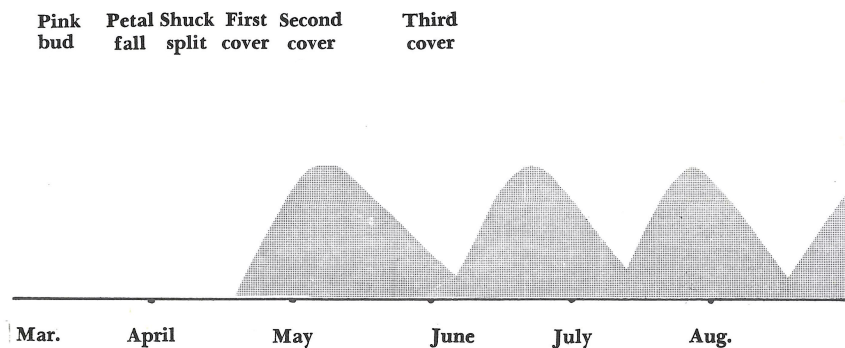
Control. Early-season sprays in the pink bud, petal fall and shucksplit stages are important in the control of this insect. The overwintered larvae move from one shoot to another to complete feeding and to roughened areas on the bark for pupation during the period in which these sprays are applied. Good initial control can be obtained using only the petal fall and shucksplit sprays. However, it is usually best to make the pink bud application also since inclement weather may delay petal fall or shucksplit applications. Poor control results if only one spray is applied. Apply succeeding sprays at the time of egg deposition of later generations to kill the moths and young larvae as they hatch. Satisfactory results may be obtained using one of the sprays recommended in L-245.

Pre-harvest Pests

Increasing emphasis on tree-ripened peach production has emphasized the possibility of injury by certain kinds of insects which are attracted to the fruit a week or two before harvest. Damage is more severe in the central area of the State where there is less rainfall during the harvest season. Many insects move to more succulent crops, leaving their normal host plants which dry up or mature.

The following insects discussed briefly are the principal offenders, although wasps, leaf-footed plant bugs, June beetles and others also are injurious.

Figure 11. Appearance of successive generations of peach twig borer adults in relation to the spray schedule.



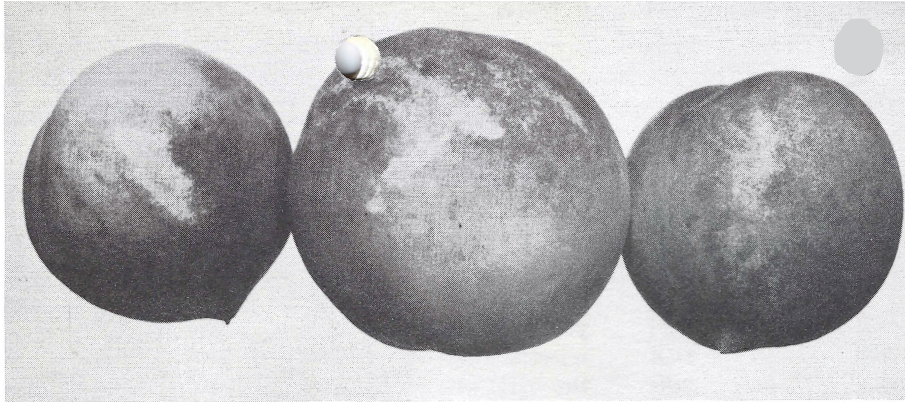


Figure 12. Scraped silvery areas on the skin of peaches caused by thrips.

Preliminary tests have illustrated that injury by this preharvest complex, or group of pests, may be reduced by one or two applications of a spray chemical, as recommended in L-245 for preharvest application, as soon as damaged fruit are observed.

DRIED-FRUIT BEETLE

Dried-fruit beetles, *Carpophilus hemipterus* (L.), are found frequently in ripe or decaying fruit. They are secondary invaders, attacking where the skin of the fruit has been broken by other insects, hail or physiological factors. Bacteria, yeasts and fungus spores, which cause fermentation of the fruit, are transported on their bodies.

The adults, which measure about $\frac{1}{8}$ inch in length, are black beetles with reddish legs. Their wing covers are short so that the rear portion of the abdomen is visible. There is a tan spot near the tip of each wing and a similar, smaller spot near the base. The larvae, which are white with brown heads, bear two tiny, brown, horn-like projections near the tip of the abdomen. They are slender, active larvae, about $\frac{1}{4}$ inch long when full-grown.

Dried fruit beetles rarely are a problem when an adequate spray schedule is followed. Control of other insects, such as the peach twig borer, which invade the fruit and provide points of entry for the dried fruit beetle, usually prevents injury by these pests.

THRIPS

In the Central Texas production areas, the highly colored, early-ripening varieties of peaches

such as Dixired and Cardinal, may be attacked by thrips *Frankliniella* spp., 1 to 2 weeks before harvest. Feeding by these tiny insects results in the appearance of silvery scraped areas on the fruit surface, Figure 12. The skin is never ruptured, but the fruit is unattractive.

Thrips are slender yellow to black active insects up to $\frac{1}{25}$ inch long. They usually feed on shaded areas of the fruit by rasping and scraping the surface and then sucking up the juices which exude.

CUCUMBER BEETLE

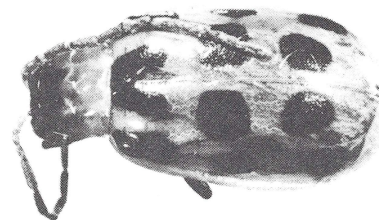
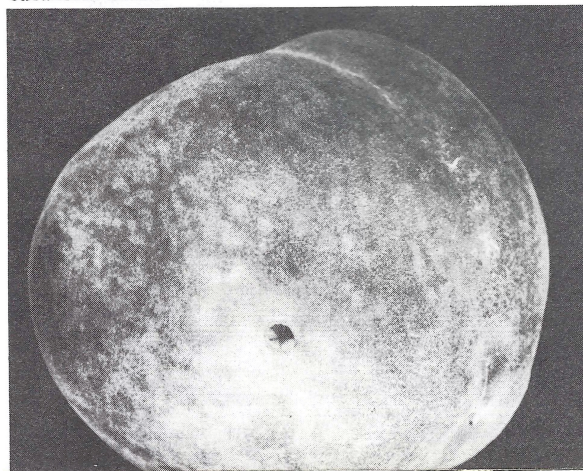
Cucumber beetles, *Diabrotica undecimpunctata howardi* Barber, are greenish insects about $\frac{1}{5}$ inch in length with black spots on their wing covers. They feed on the nearly-ripe fruit, producing almost perfect round holes about $\frac{1}{8}$ inch in diameter, Figure 13. Frequently, the beetles may be found feeding in these holes with only the tip of the abdomen protruding.

Early in the season, as young trees leaf out, these trees may be nearly defoliated by the feeding of these insects. If damage is severe, apply 2 pounds of 50 percent DDT wettable powder or $\frac{1}{2}$ pound of 50 percent dieldrin wettable powder per 100 gallons of water.

LONG-HORNED GRASSHOPPERS

Irregular shallow areas may be eaten in the fruit by several species of grasshoppers, Figure 14. The long-horned grasshoppers and katydids, which have antennae longer than the body, usually are the most destructive. They are green insects which range from 1 to 2 inches in length.

Figure 13. Characteristic injury and appearance of the cucumber beetle.



INSECTS ATTACKING THE TRUNK AND BRANCHES

Lesser Peach Tree Borer

Trunks and limbs of peach and plum trees may be injured severely by the lesser peach tree borer, *Synanthedon pictipes* (G. & R.). The feeding of the larvae, or borers, in the wood weakens or kills the tree or limbs and provides entry for rot-producing organisms and shot-hole borers. Masses of gum mixed with frass and sawdust exude from the feeding areas under the bark, Figure 15.

Lesser peach tree borer adults are metallic blue-black moths, resembling wasps. Usually, yellow bands are on the second and fourth abdominal segments, but the latter band is indistinct on some individuals.

The larvae, or borers, have white bodies and dark-brown heads and are about 1 inch long when full-grown, Figure 16. The hooks on each abdominal leg are arranged in two transverse rows. The larvae feed under the bark around wounds, usually in the upper trunk and large branches, although they may attack near the tree base.

When the larval stage is completed, flimsy cocoons covered with frass are constructed under the bark near the edge of the wounds in which the insects pupate. The light brown, flimsy pupa is shown in Figure 16. Shortly before transforming into moths, the pupae work their way partly out of their hiding places. When the adults emerge, they leave the empty pupal skins protruding from the bark surface. The moths are active during the day. The female deposits eggs on rough bark at the margins of wounded areas.

Figure 17 shows that there is one complete generation and a partial second generation annually. Larvae in each instar, except the first, may be found during the winter, feeding periodically until pupation begins in January. The first adults appear in March, but the peak of emergence is not reached until early May. Larvae hatch from eggs deposited by these adults and feed throughout the summer. Many of the larvae pupate and appear as second-generation adults in late summer and early fall, with most individuals emerging in September. The remainder of the larvae cease development in the sixth instar, pass the winter in their feeding areas under the bark, pupate and emerge as adults the following spring.

Lesser peach tree borers are seldom a problem in well-tended orchards. They are attracted to damaged areas in the bark which usually result from poor cultural practices. Careless pruning

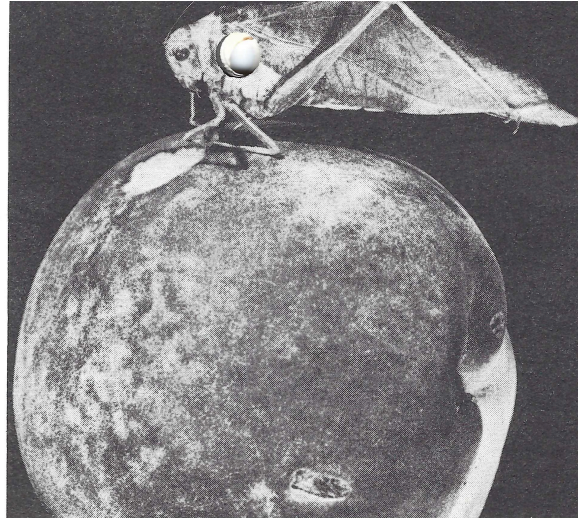


Figure 14. Characteristic damage and appearance of long-horned grasshopper.

provides many favorable sites for egg-laying around the stubs of branches. Shape trees properly while they are young, leaving well-spaced, open crotches and eliminating the need for making large cuts later. Branches broken because of insufficient thinning of the fruit and wounds arising from barking the tree with equipment during cultivation and harvesting also are attractive to the lesser peach tree borer. Prevent sun-scalded areas, which sometimes afford entry for the larvae, by leaving small branches to shade larger limbs. Winter injury of trunk and scaffold branches and cracked limbs, resulting from scale infestation, also provide sites for larval feeding.

Control. Parathion sprays, applied for the control of fruit-infesting insects during March and April, are effective in reducing populations of lesser peach tree borer moths. Established infestations also may be eliminated by painting the entire damaged area with a preparation of 2 pounds of paradichlorobenzene dissolved in 1 gallon of miscible dormant oil and mixed with 2 gallons of water. Cover the wound thoroughly without completely circling the limb or trunk. It is not neces-

Figure 15. Peach limb injured by lesser peach tree borer.



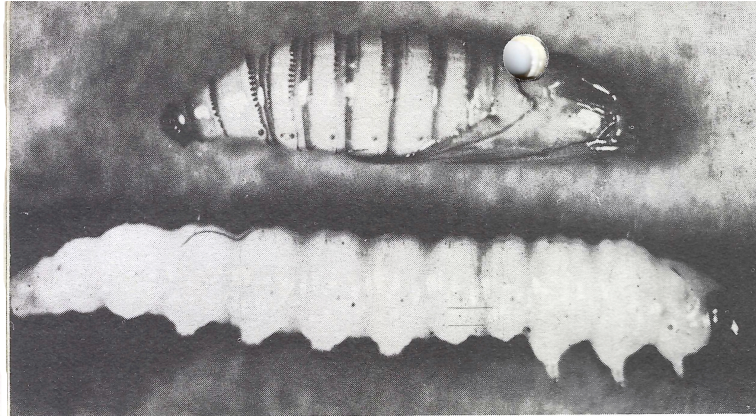


Figure 16. Lesser peach tree borer larva and pupa.

sary to remove the frass, gum or loose bark when this formula is used. Apply the mixture during warm days in November or December when all the lesser borers are in the larval stage. Unfortunately, this treatment does not prevent reinfestation before the wounds are healed.

An alternative method of preventing lesser borer infestations consists of cleaning the damaged areas thoroughly and painting with a mixture of 1 part asphalt and 1 part carbolineum. This material is available as a commercial tree paint. This treatment is time-consuming because the debris and rotten wood must be removed, but the wound is less likely to be reinfested since the paint lasts several months. Some damage to the growing tissue

occurs, prolonging the healing period. Check trees periodically and then repaint wounds at intervals until healing is complete.

PEACH TREE BORER

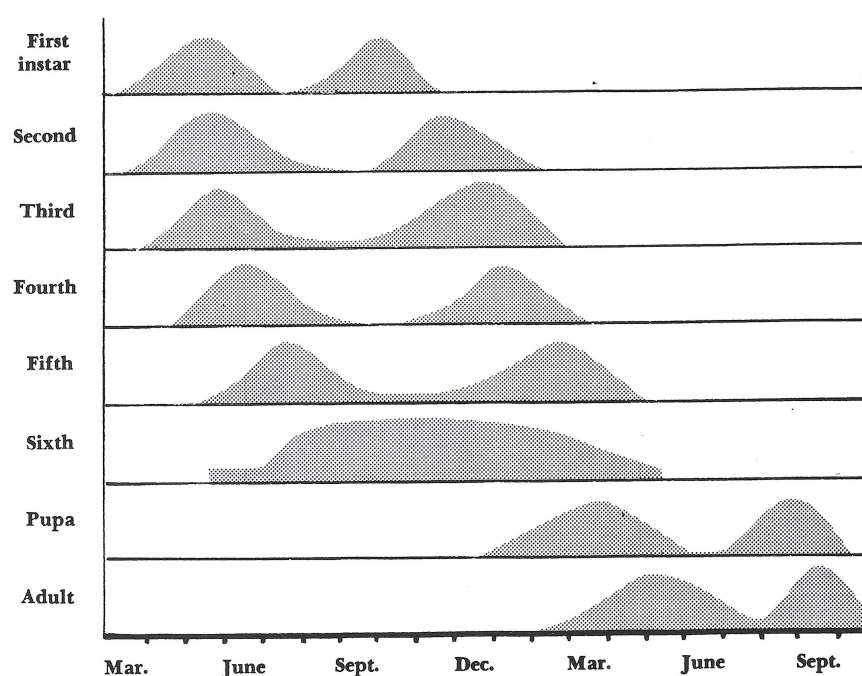
Injury by the peach tree borer, *Sanninoidea exitiosa* (Say), often is minimized or overlooked, particularly in orchards in which weeds and grass are permitted to grow around the tree trunks. Actually, it is one of the most destructive enemies of the peach in East Texas. Plum trees are attacked less frequently, but may be damaged by this pest. This insect is not present in Central Texas.

The larvae usually confine their activities to an area 6 inches above the ground to a similar distance below. During feeding activities, the trunk may be girdled, resulting in the tree's death. Masses of frass and gum exude from the wounds.

Yellow-white larvae of various sizes, up to 1¼ inches in length, may be found tunneling in the wood under the bark of infested trees. Their abdominal, short legs bear hooks arranged in two transverse rows, Figure 18.

The adults are clear-winged moths, resembling wasps in general appearance. The females are dark blue with one or two orange bands around

Figure 17. Seasonal life history of lesser peach tree borer.



the abdomen. The males are a lighter color, slightly smaller and several yellow bands encircle the abdomen, Figure 19.

The moths are active during the day. Females usually deposit eggs on the lower trunk and occasionally on leaves, soil or weeds near the tree. Adult emergence and egg-laying extend from the middle of May to early October.

The eggs hatch in about 10 days, and the tiny larvae burrow directly into the wood, feeding intermittently throughout the winter. Beginning in early April, the mature larvae spin flimsy cocoons covered with fragments of bark and sawdust. The larvae change to dark-brown pupae about $\frac{3}{4}$ inch long in these cocoons which may be found in damaged areas and in the ground at the base of the trunks. When the adults emerge, the empty pupal skins project from the cocoons. There is a single generation each year, Figure 20.

Control. Sprays provide economic control when applied to the tree trunks in the summer during the period of moth emergence. Spray the trunks thoroughly from ground level to about 1 foot above the ground to kill moths before they deposit eggs and young larvae as they hatch. See L-245 for recommended materials.

American Plum Borer

Although the American plum borer, *Euzophera semifuneralis* (Wlk.), is distributed widely, it has never been known to be destructive enough to warrant extensive control measures in Texas. It attacks peach and plum trees in a manner similar to that of the peach tree and lesser peach tree borers. Damaged or diseased areas in the trunk—from 1 or 2 inches below ground level to the scaffold branches—are favorable sites for larval development.

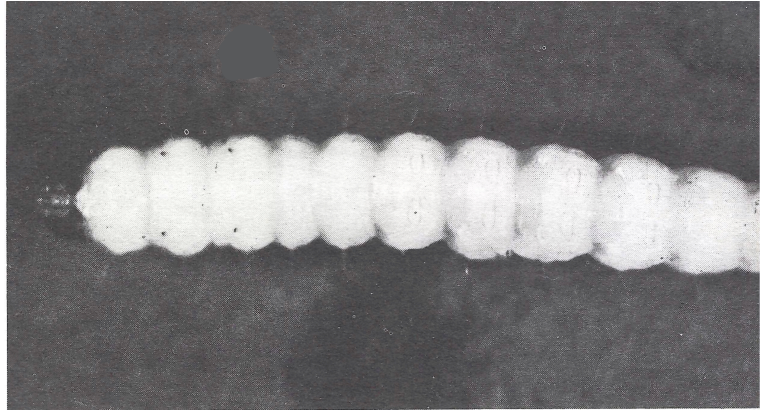


Figure 18. Peach tree borer larva.

The larvae construct broad, shallow burrows just beneath the surface of the bark and may girdle the trunk completely.

The adults are gray-brown moths with a wingspread of about 1 inch. They are active chiefly at night, resting during the day on the bark which their coloration closely resembles.

The full-grown larvae are about 1 inch in length and range from dingy white to brownish gray. They may be differentiated from the larvae of the two species of peach tree borers by color, presence of longer body hairs and arrangement of hooks on each abdominal leg in circles rather than in transverse rows.

The pupal stage is passed in a tough, loosely woven cocoon under the bark.

Since attacks by this insect are limited largely to trees in a declining state of vigor, healthy trees are relatively damage free.

Control. Control measures discussed for the lesser peach tree borer also may be used for this insect. Paradichlorobenzene crystals applied to kill the peach tree borer likewise will control American plum borer larvae feeding at the base of the trunk.

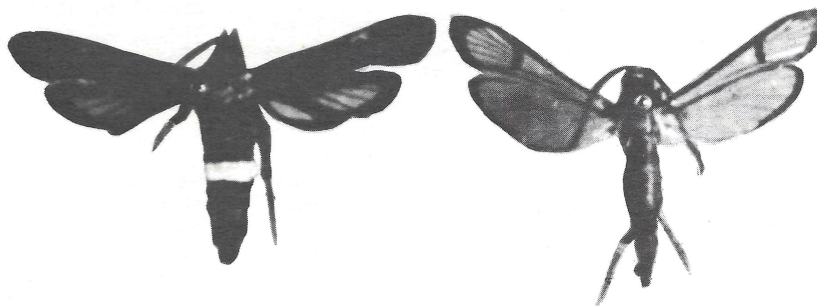
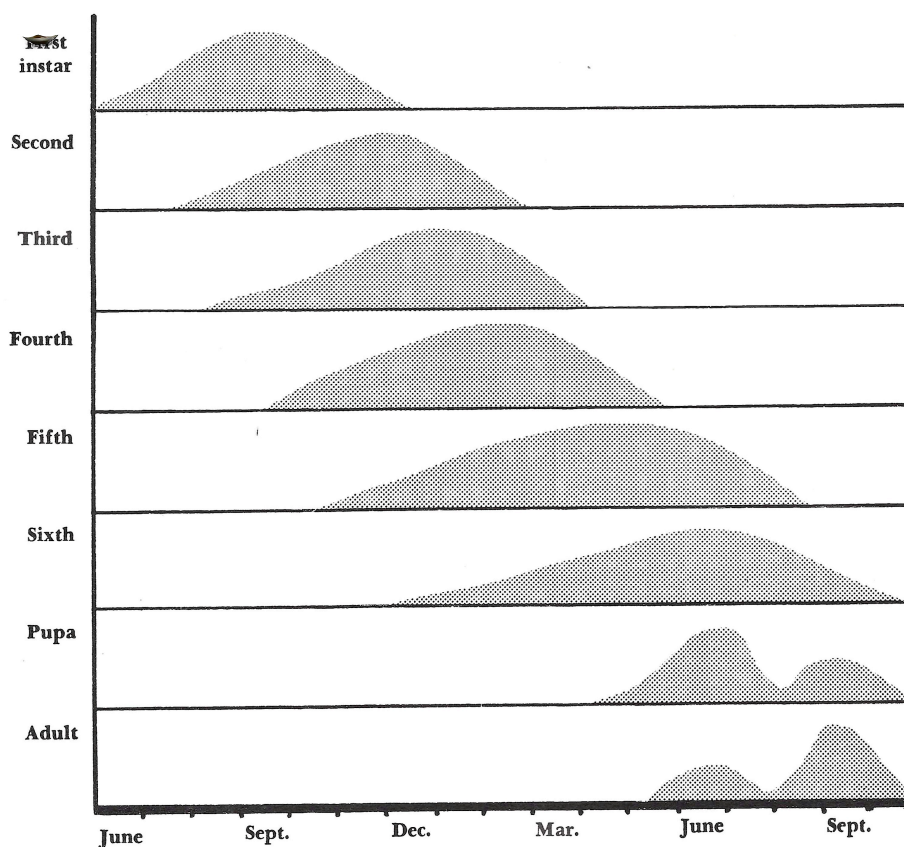


Figure 19. Adult moths of the peach tree borer. The female, left, is dark blue. The male, right, is lighter in color.

Figure 20. Seasonal life history of peach tree borer.



SHOT-HOLE BORER

The attack of this borer, *Scolytus rugulosus* (Ratz.), is shown by clusters of small holes in the bark of peach and plum trees. Gum frequently exudes from the holes in newly-infested trees. A series of small tunnels 1 to 2 inches in length, usually running parallel with the grain of the wood, may be found on the inner bark. Several galleries may radiate from each tunnel. Damage is limited usually to trees which are declining in vigor, although the insect may attack healthy trees.

Shot-hole borer adults are black beetles about 1/10 inch long with dull, red wingtips and legs. The tunnels are eaten in the wood by the adults. Small cavities are made at intervals along each side of the tunnels in which the females deposit eggs. The small, white larvae, or grubs, which hatch from the eggs burrow across the grain away from the parent tunnels. Pupation takes place when the larvae have completed development and the adult beetles tunnel directly out of the galleries, emerging from small exit holes in the bark, Figure 21.

Control. Since the adults are attracted to unhealthy trees to lay their eggs, maintain vigorous trees by cultivation and fertilization. Remove prunings and weakened or dead limbs from the orchard and burn these to reduce the number of egg-laying sites.

SAN JOSE SCALE

San Jose Scale, *Aspidiotus perniciosus* Comst., is one of the most destructive pests of stone fruits in the United States. Damaging infestations develop before growers are aware of the insect's presence, because of the small size and obscure coloration of the scales. The reproductive rate of this insect is exceedingly high and injurious infestations frequently develop in the few months between harvest and the advent of winter. Dry summers usually check the rapid development of this pest.

An initial symptom of scale infestations is a decline in the trees' vigor, characterized by sparse, yellow foliage. Reddish spots may be found on the underside of infested bark around the areas where the insects have inserted their mouthparts. If control measures are not used, reddish spots caused by the feeding of immature scale insects appear on the leaves and fruit. The leaves fall from the terminals and limbs, cracking and bleeding of the limbs occur and the trees die, Figure 22.

Scales are tiny, orange, sac-like insects beneath light gray, waxy coverings. The round coverings of the full-grown females measure 1/16 inch in diameter. Each scale covering is made up of a series of concentric rings, surrounding a raised nipple near the center. The males have smaller, elongate-oval coverings about 1/25 of an inch in

length with the circular, raised dot located near one end rather than near the center.

The females give birth to living young called crawlers. These tiny, yellow insects crawl from beneath the parent scale, find suitable places on the bark, leaves or fruit and insert their threadlike sucking mouthparts. The females never move from the spot selected at this time. After feeding on the sap for 2 or 3 days, the young, or nymphs, secrete their initial scale coverings which are later enlarged. In 2 or 3 weeks the males develop into delicate two-winged insects which emerge from their scales and die soon after mating with the sac-like stationary females.

Scale insects in all stages of development exist throughout the year, except during periods of extremely cold weather. Mature females and nymphs survive the few days of Texas' cold weather which normally occur in December and January. During these periods, embryonic development within the females apparently ceases and adult males and crawlers do not appear.

Control. Thorough coverage of the entire tree with insecticide is required for scale insect control. The spray material should come in direct contact with the scales. Use materials recommended in L-245, *Texas Guide for Controlling Insects and Diseases on Fruits and Nuts*.

In years of abundant summer rainfall, scale populations frequently increase following the harvest of fruit. The growth of heavy foliage and succulent twigs provides ideal conditions for scale development. During these periods, growers should make inspections to determine the need for additional sprays.

WHITE PEACH SCALE

White peach scale, *Pseudaulacaspis pentagona* (Targ.), is a pest of many trees and shrubs. The damage resulting from the feeding activities of this species is similar to that caused by San Jose Scale.

Female scales are circular and grayish with a yellow-to-orange raised center. The male scales are small and more elongated than the females'. In cases of severe infestations, they appear as white, cottony masses encrusting the bark of the tree, Figure 23.

Control. Ordinarily, no control measures are required for this insect, because of the activity of natural enemies. If the infestation attains damaging proportions, the use of dormant oil, as discussed for San Jose Scale, results in satisfactory control.

SOFT SCALES

Several species of soft scales attack plums and peaches in East Texas. Attacks by these insects are infrequent and usually infestations are not severe enough to require control measures.

These pests are brown, soft-bodied scale insects with coverings larger and more convex than those of San Jose scale. Usually, the soft scales are located on the underside of twigs. Young individuals, which may be motionless on the leaves in the summer, migrate to the twigs in the fall. During summer feedings, the young scales secrete a clear, sticky liquid called honeydew which drops on the leaves and fruit. Dark, sooty masses of fungus grow on the honeydew and discolor the foliage and fruit.

Control. Dormant oil, as recommended for San Jose Scale, will control these pests.

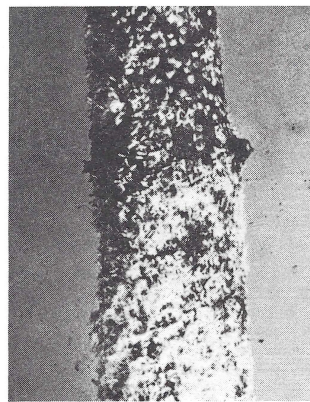
Figure 21. Holes in the bark caused by the shot-hole borer.



Figure 22. San Jose scale damage to peach tree.



Figure 23. Severe white peach scale infestation.



EYE-SPOTTED APPLE-TWIG BORER

The eye-spotted apple-twig borer, *Oberea ocellata* Haldeman, occasionally appears in damaging numbers in Texas orchards. The whitish larvae, about $\frac{5}{8}$ inch long when full-grown, are nearly cylindrical and their bodies are strongly constricted between segments. Injury may be detected by the appearance of dead leaves at the growing terminals of peach and plum trees during the late spring and summer. Damage is similar to that produced by the oriental fruit moth. However, the larvae differ in appearance sufficiently to separate the two species. The larvae of the eye-spotted apple-twig borer feed down from the twigs and burrow in the heartwood of the limbs. On young trees, their tunnels may extend for varying distances down the trunk to the ground. The adults which are $\frac{5}{8}$ inch in length are long-horned, red to orange beetles with brownish-black wing covers. They have two black spots on the thorax.

The adults emerge beginning in early May and deposit their eggs on the young twigs. The larvae feed until fall, spend the winter and pupate in the spring. There is only one generation each year.

Control. This insect is rarely a problem in bearing orchards which are sprayed regularly. Most injury occurs in young trees or in bearing orchards in years when no crop is set and, consequently, sprays are not applied. Limited tests have demonstrated that $\frac{1}{2}$ pound of 50 percent dieldrin wettable powder applied early in May when the adult beetles are emerging will reduce damage by this pest. Removing and burning infested twigs in the pruning operation during the winter will help control succeeding generations.

INSECTS ATTACKING THE TWIGS AND FOLIAGE

Aphids

Several species of aphids, or plant lice, often appear in large numbers early in the season on the buds and young foliage of plum trees. Peach trees are attacked less frequently. These insects suck the juices from the leaves, causing them to curl and stunting the terminal growth. The leaves become covered with a clear, sticky fluid called honeydew which is secreted by the aphids.

Aphids are green or brown, soft-bodied insects that feed in clusters. Immature aphids resemble the adults but are smaller. Winged and wingless adults may be present.

Control. Generally, aphids are of economic importance in orchards only when other pests are not controlled. Apply sprays as soon as infestations appear. The application of one of the following

materials results in satisfactory control: 1 pound of 25 percent parathion or 2 pounds of 25 percent malathion wettable powder or 1 pint of nicotine sulfate plus 3 or 4 pounds of soap.

GRASSHOPPERS

Young peach and plum trees frequently are attacked by several species of grasshoppers during the summer. Orchards often are invaded when nearby pastures dry up. The insects prefer the tender bark to the foliage and usually girdle twigs and small branches. As a result, the leaves beyond the point of injury wilt and die. Frequently, small branches, suitable for scaffold limbs, must be removed in the pruning operation because of this type of injury.

In the egg stage, grasshoppers overwinter in the ground along fence rows and in pastures. As long as field crops and weeds are succulent and green, grasshoppers continue to feed. They attack trees only when other crops mature in the summer.

Control. Inspect weeds around the edges of young orchards frequently during the spring for small grasshoppers. If large numbers of young nymphs are observed, apply sprays or dusts to these margins. Usually, orchard treatment is unnecessary if the grasshoppers are controlled at the edges of the orchard. Control recommendations can be obtained from your county agricultural agents.

EASTERN TENT CATERPILLAR

Webs constructed by the eastern tent caterpillar, *Malacosoma americanum* (F.), are familiar sights in neglected orchards in early spring. Branches and twigs in the area around the webs may be defoliated.

The adults are stout, red-brown moths with two whitish lines crossing the front pair of wings.

The larvae are black, hairy caterpillars with a white stripe along the back. Brown and yellow stripes and a row of blue spots are along each side of their bodies.

This insect passes the winter in the egg stage. The larvae feed for 4 to 6 weeks in the spring and pupate in loose, white cocoons, usually on the trunk or branches. The adults emerge in about 3 weeks and deposit eggs in collar-like masses around twigs. There is only one generation annually.

Control. Obtain larval control by spraying with one of the following compounds: 1 pound of 25 percent parathion, 2 pounds of 50 percent DDT or 5 pounds of 40 percent toxaphene wettable powder per 100 gallons of water. An application of 3 pounds of lead arsenate per 100 gallons of water will also provide effective control.