**College of Tropical Agriculture and Human Resources**
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**Insect Pests**
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# Insect and Mite Pests of Blueberries in Hawai'i

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Southern highbush blueberries (*Vaccinium corymbosum* x *V. darrowi*) are being investigated as a potential high-value crop for Hawai'i agriculture. One potential area of concern is potential pests and their management. Accurate identification of pests is essential for making sound pest-management decisions. This guide is intended to help Hawai'i blueberry growers by providing photographs and information about pest identification, life cycle, and distribution, as well as crop damage caused by the pest and other host plants.

Pests were studied on blueberry plants growing at the University of Hawai'i at Mānoa-CTAHR's Mealani, Lālāmilo, Volcano, and Kona Research Stations on the island of Hawai'i. Pest samples were identified by the UHM-CTAHR Agricultural Diagnostic Service Center (ADSC). If you suspect pest problems but cannot determine the cause, we suggest that you submit samples to the ADSC for identification. These samples may be taken to the nearest UHM-CTAHR Cooperative Extension Service office.

This guide is organized by the type of pest damage: 1) pests that cause chewing damage, 2) pests that feed on plant sap, and 3) pests that infest fruit.

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## PESTS THAT CAUSE CHEWING DAMAGE

### Chinese rose beetle

*Adoretus sinicus* Burmeister, Coleoptera: Scarabaeidae

Adult Chinese rose beetles are nocturnal and will actively move onto the crop about 30 minutes after sunset. These beetles are strong fliers and can move into blueberry plantings from surrounding areas. The Chinese rose beetle is mainly a pest of field-grown blueberry plants but can also attack greenhouse plants if they are able to gain entry.

***Damage***

The adult beetles chew holes in the leaves and may create skeletonized or lace-like damage where only the large leaf veins remain (Figure 1). Damaged foliage will result in reduced photosynthetic capability. Only the adult stage of the insect damages crops.

***Identification***

Look for beetles beginning about 30 minutes after sunset. The beetles are sturdy, pale reddish-brown, 10 to 12 mm (about 0.5 inch) long (Figure 2). The body is densely covered with minute hairs, which may give it a grayish appearance.

***Hosts***

The host range for this species comprises over 250 plants, including a wide variety of ornamental and cultivated crops such as asparagus, basil, beans, beefsteak plant, broccoli, cabbage, cacao, Chinese broccoli, Chinese cabbage, perilla, corn, cotton, cucumber, eggplant, flowering white cabbage, ginger, grape, green bean, okra, rose, soybean, strawberry, sweet potato, taro, and tea.

***Life cycle***

The larval stages are commonly found in the soil of lawns and gardens where organic matter is present. The grubs are thought to feed on organic matter and do not attack plants (Figure 3). Eggs are laid in soil about 1.5 inches deep. They hatch in about 7–16 days. There are three larval stages. The grubs are whitish with a conspicuous brown head and short legs. When still, they tend to be C-shaped. The larval stage lasts for 3–4 weeks. The pupa is yellowish-white when initially formed and then turns brown. Pupation is completed in 1–2 weeks. The life cycle from egg to adult is completed in 6–7 weeks in the field.

***Distribution***

Originally known from China, Java, and Taiwan, this beetle is widely distributed throughout Southeast Asia and many Pacific islands. The Chinese rose beetle was accidentally introduced into Hawai'i before 1893 and is a common pest on all major islands in the state.

**Figure 1. Chinese rose beetle damage**

**Figure 2. Adult chinese rose beetle**

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**Figure 3. Chinese rose beetle larva**

## Fuller rose beetle

*Naupactus cervinus* Boheman, Coleoptera: Curculionidae

Unlike Chinese rose beetles, Fuller rose beetles are flightless. The adult beetles likely live in the litter and loose soil beneath the blueberry plants during the day. Fuller rose beetles are mainly a pest of field-grown blueberry plants and were rarely encountered on potted blueberry plants grown on benches in the greenhouse.

### *Damage*

Adult Fuller rose beetles climb up the plants at night and feed on leaves. The damage typically appears as a notched or ragged appearance along the leaf margins (Figure 1). The larval stages feed on plant roots, but the importance of the larval stages to blueberry plants in Hawai'i is unknown.

### *Identification*

The adults are brownish to gray and are 6 to 8.5 mm long (~1/3 inch). Eyes are in lateral position and appear bulging. Typical of weevils, the rostrum or snout is slightly curved towards the ground. When handled, the beetles may drop to the ground and play dead. Fuller rose beetles have forewings that are fused and are incapable of flight. Another insect, called the whitefringed beetle (*Naupactus leucoloma* Boheman), is similar in appearance to the Fuller rose beetle. Whitefringed beetles are typically larger than Fuller rose beetles, about 12 mm (about 0.5 inch) in length.

### *Hosts*

This pest has a wide host range. Some examples of affected plants are azalea, begonia, citrus, cucurbits, gardenia, hibiscus, strawberry, beans, guava, olive, peach, plum, potato, rhubarb, rose, and ti plant (*Cordyline fruticosa*).

### *Life cycle*

The eggs are yellowish, cylindrical, 1 mm long. They are laid in flattened batches of 10–16 and are covered with a sticky whitish material. The eggs may be laid in bark crevices just above ground level, under stones, in dead leaves, and beneath the calyx of fruit, as in citrus. It takes 2–6 weeks for eggs to hatch, depending on temperature. The grubs are white with a yellowish head capsule and contrasting black mandibles. There are three larval instars that live in the soil and feed on roots for 8–10 months. The pupal stage lasts for 1.5–2 months. Adults live for 3–8 months.

### *Distribution*

The Fuller rose beetle was first recorded on Maui in 1894 and subsequently spread to the other Hawaiian Islands. It inhabits elevations from sea level to 5,000 feet. This insect is widely distributed in North and South America, Europe, Mediterranean countries, South Africa, and many Pacific islands.

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**Figure 1. Fuller rose beetle and damaged leaf**

## Caterpillars

**Mexican leafroller**
*Amorbia emigratella* Busck, Lepidoptera: Tortricidae

**Light brown apple moth**
*Epiphyas postvittana* Walker, Lepidoptera: Tortricidae

Caterpillars of the Mexican leafroller and the light brown apple moth are leaf-rolling caterpillars that do similar damage to blueberry. These caterpillars affect both field- and greenhouse-grown blueberry plants.

### *Damage*

Folded leaves and chewed or drying shoots, leaves, and flower buds (Figure 1) are signs of the presence of leaf-rolling caterpillars. In the greenhouse, one can also look for the presence of caterpillar droppings (Figure 2) when monitoring for leaf-rolling caterpillars. Occasionally the fruit may also be damaged by caterpillar feeding (Figure 3). Both field- and greenhouse-grown plants are infested by these pests.

### *Identification*

The late-instar larvae of the Mexican leafroller have a short dark horizontal line on the side just behind the head (Figure 4). The larvae of the light brown apple moth do not have this dark line (Figure 5).

- **Mexican leafroller**: The egg cluster is greenish with a white protective covering (Figure 6). Late-instar larvae are yellowish-green with a tan to brown head. Examine the shoot tips for rolled leaves and look for a caterpillar (Figure 7), pupa, or pupal case (Figure 7) that may be inside. Adult moths are pale yellow to brown, have a small pointed head (Figure 8), and may

**Figure 1. Caterpillar feeding damage on shoots and young leaves**

**Figure 2. Caterpillar droppings**

**Figure 3. Caterpillar damage to fruit**

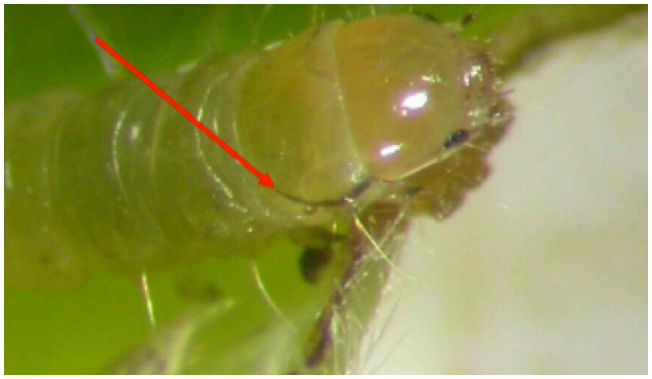

**Fig. 4. Mexican leafroller larva with characteristic dark line**

**Figure 5. Light brown apple moth larva**

**Figure 6. Mexican leafroller egg mass**

**Figure 7. Exposed Mexican leafroller**

be variably mottled with dark brown pigment. The wingspan of female moths is 11.5–12 mm (about 0.5 inch). Males are slightly smaller and paler in color.

- **Light brown apple moth**: Egg masses are flat and translucent and appear pale yellow to white. The larvae are yellowish-green but may vary in color depending on instar and host. The pupae are green after pupation and turn brown within a day. The adult moths are light brown to yellowish and have varying amounts of darker brown coloring on their wings. When resting, the moths are about 10 mm (0.4 inch) long.

### *Hosts*

- **Mexican leafroller**: This pest has a wide host range. It is commonly found on ornamental plants, fruit trees, and some native plants. Some examples include avocado, cacao, citrus, guava, macadamia, ʻōhelo, orchids, papaya, tea, and rose. Vegetables are not common hosts.
- **Light brown apple moth**: This insect has been associated with many plants representing over 290 genera. Some of the common hosts include apple, avocado, blackberry, broad bean, camellia, cherry, chrysanthemum, citrus, clover, eucalyptus, grape, nectarine, peach, pear, persimmon, pittosporum, raspberry, rose, and strawberry.

### *Life cycle*

- **Mexican leafroller**: Eggs are laid in clusters on the upper surfaces of leaves (Figure 6). Each cluster may contain 65–120 eggs. Newly hatched larvae are 2 mm long and grow to about 36 mm (1.4 inch) long in the last instar. The larval stage (Figure 7) lasts about 28–35 days. Pupation often occurs in the folded leaves (Figure 8). The adult moth (Figure 9) emerges in about 10 days. The duration from egg to adult is about 48–55 days.
- **Light brown apple moth**: Eggs are laid in clusters that may contain from 4–96 eggs (average 35 eggs).

**Figure 8. Exposed Mexican leafroller pupa**

**Figure 9. Adult Mexican leafroller**

**Figure 10. Light brown apple moth larva.**

**Figure 11. Light brown apple moth**

The eggs hatch in about 8–9 days at 68°F. The larvae (Figure 10) go through five or six instars during their development. Larval development takes about 25 days at 68°F. Pupation occurs in the folded leaves and lasts for about 10 days at 68°F. The adult moths (Figure 11) are variable in color. Forewing length is typically 7–13 mm in female moths and 6–10 mm in males.

### *Distribution*

- **Mexican leafroller**: This insect has been in Hawai'i since 1900 and is present on all the major Hawaiian islands. It is distributed across the southern U.S. and Central America.

- **Light brown apple moth**: The light brown apple moth is a native of Australia and is widespread in Australia and New Zealand and is present in the Azores, Ireland, Netherlands, Sweden, United Kingdom, and New Caledonia. This insect was reported to be in Hawai'i in 1896. It was first detected in North America in California in 2007.

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## PESTS THAT FEED ON PLANT SAP

### Soft scales

**Brown soft scale**
*Coccus hesperidum* Linnaeus, Hemiptera: Coccidae

**Green shield scale**
*Pulvinaria psidii* Maskell, Hemiptera: Coccidae

**Hemispherical scale**
*Saissetia coffeae* Walker, Hemiptera: Coccidae

***Damage***

Soft scales feed on sap from the phloem and tend to be located along veins on the undersides of leaves and on the stems. Large feeding populations can cause leaf yellowing, defoliation, and reduction of plant vigor. Soft scales excrete honeydew which is fed on by ants (Figure 5) and other insects and serves as a medium for the sooty mold fungus (Figure 6). Certain ant species tend soft scales by carrying them to uninfested plants and protecting them from natural enemies; thus, ant control can be important for managing scales. Sooty mold blackens the leaf, decreases photosynthetic activity, and decreases the vigor of the host plant. When sooty mold occurs on the berries, it may lower their grade or make them unmarketable.

***Identification***

- **Brown soft scale**: This scale is light brown to yellowish with brown stippling. The body shape is oval and the length is 2.5–4 mm (Figure 1).
- **Green shield scale**: The adult scales are oval in shape and color ranges from green to yellow. The adult scales grow up to 4.5 mm in length (Figure 2). This scale produces ovisacs (egg sacs) that appear as a white cottony mass (Figure 3).
- **Hemispherical scale**: The body is oval or slightly elongated and strongly convex or hemispherical in shape and 2–3 mm long. The adult body color is yellow-brown to dark brown. Nymphs have pinkish coloration and H-shaped ridges. (Figure 4).

***Hosts***

- **Brown soft scale**: This scale attacks a wide variety of field, ornamental, and greenhouse plants. Some host plants reported in Hawai'i include citrus, loquat, *Moraea bicolor*, *Moraea iridioides*, orchids, papaya, *Santalum haleakalae*, and tea.

**Figure 1. Brown soft scale**

**Figure 2. Green shield scale**

- **Green shield scale**: The green shield scale attacks a large number of plants including anthurium, avocado, *Bouvardia* sp., citrus, coffee, ferns, flowering ginger, gardenia, guava, lychee, mango, noni, pomegranate, and rose apple.
- **Hemispherical scale**: The hemispherical scale attacks many host plants including aloe, anthurium, bittermelon, breadfruit, coconut, coffee, coleus, dendrobium orchids, guava, lychee, mango, palm, olive, plumeria, and protea.

***Life cycle***: This is a generalized description of the biology of soft scales. They reproduce without fertilization (through parthenogenesis) and either lay eggs or give birth to live young. Eggs are either laid in a cavity under the female's body or in a waxy cover (ovisac) attached to the adult female. The newly born scales (first instar) are known as crawlers. In this stage they are mobile and search for a suitable site to feed. The adult scales generally remain fixed in one location and feed continuously.

***Distribution***

- **Brown soft scale**: This insect was first reported in Hawai'i in 1896 and is present on all major islands. This species is very cosmopolitan and occurs in many countries. U.S. quarantine notes show that this species has been intercepted on a variety of host material originating from over 50 countries.
- **Green shield scale**: It is not known when this pest was introduced into Hawai'i. However, it was observed to severely infest and damage many of the coffee trees in Kona in 1892. U.S. quarantine notes show that this species has been intercepted on a variety of hosts originating from 29 countries.
- **Hemispherical scale**: The year of introduction of this pest into Hawai'i was not recorded. It is present on the islands of Hawai'i, Kaua'i, Lana'i, Maui, and O'ahu. U.S. quarantine notes show that this species has been intercepted on a variety of hosts originating from over 40 countries.

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**Figure 4. Hemispherical scales**

**Figure 3. Ovisacs of the green shield scale**

**Figure 5. Ants tending soft scales**

**Figure 6. Sooty mold growing on honeydew excreted by soft scales**

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## Melon or cotton aphid

*Aphis gossypii* Glover, Hemiptera: Aphididae

### *Damage*

Melon aphids usually live and feed on plant sap from the shoots, flower buds, and underside of leaves (Figures 1 and 2). Aphids excrete honeydew which is fed on by ants and other insects and serves as a medium for the sooty mold fungus. As with scales, certain ant species tend aphids by carrying them to uninfested plants and protect them from natural enemies. Sooty mold blackens the leaf, decreases photosynthetic activity, and decreases the vigor of the host plant. When sooty mold occurs on the berries, it may lower their grade or make them unmarketable. Irregular ripening of the fruit may occur when large numbers of aphids feed directly on the developing fruit (Figure 3).

### *Identification*

Adult melon aphids measure about 0.9–1.8 mm long, and their color varies from yellowish-green to dark green to nearly black. There are both winged and wingless forms.

### *Hosts*

Melon aphids can be found on a wide variety of plants. Some common examples include crops such as asparagus, avocado, beans, burdock, cucumber, eggplant, gourds, guava, hibiscus, okra, orchids, papaya, peppers, potato, protea, pumpkin, spinach, taro, tomato, tea, ti, squash, and watermelon, and weeds such as lamb's quarters, cheeseweed, and Spanish needle.

### *Life cycle*

In Hawai'i, the melon aphid reproduces without mating (through parthenogenesis) where adult females give

**Figure 2. Leaves, flowers, and young fruit severely infested with melon aphids are sticky with honeydew and blackened by the sooty mold fungus. The white specks are cast skins left after aphids have molted.**

**Figure 1. Melon aphids**

**Figure 3. Irregularly ripened fruit due to melon aphids feeding directly on the developing fruit**

birth to live female first-instar nymphs. There are four nymphal stages that total a duration of 4–12 days. Adult females can produce 8–22 young per day and live for 3–4 weeks. There are many generations of this aphid throughout the year in Hawai‘i.

***Distribution***

The melon aphid was first reported on O‘ahu in 1909 and is now present on all islands. It is not known where the melon aphid originated, but it is now found in most tropical and temperate regions throughout the world except in extreme northern areas.

***Reference***

Martin Kessing, J.L., and R.F.L. Mau. 1991. *Aphis gossypii* (Glover). Crop Knowledge Master. <http://www.extento.hawaii.edu/kbase/crop/type/aphis_g.htm>

## Whiteflies

**Giant whitefly**
*Aleurodicus dugesii* Cockerell, Hemiptera: Aleyrodidae

**Greenhouse whitefly**
*Trialeurodes vaporariorum* Westwood, Hemiptera: Aleyrodidae

### *Damage*

Whitefly nymphs and adults feed on plant sap. Large whitefly populations reduce plant vigor. Both the nymphs and adults excrete honeydew, which is fed on by ants and other insects and serves as a medium for the sooty mold fungus. Sooty mold blackens the leaf, decreases photosynthetic activity, and decreases the vigor of the host plant. When sooty mold occurs on the berries, it may lower their grade or make them unmarketable. Whiteflies have been a minor pest of blueberries in Hawai'i. Outbreaks of the greenhouse whitefly may occasionally occur on young blueberry plants in the greenhouse. Giant whiteflies have been observed on field-grown blueberries in Hawai'i but were kept to low levels by natural enemies.

### *Identification*

Adult whiteflies are small whitish winged insects that take flight when disturbed. Giant whitefly adults are up to 3/16 inch (4 mm) long, while greenhouse whitefly measure 1.5 mm (0.06 inch) in length. Giant whitefly eggs are laid in a spiral pattern on the underside of leaves. The nymphs of the giant whitefly produce an abundance of long, white, waxy filamentous material that can cover the leaves of the plant.

### *Hosts*

- **Giant whitefly**: In Hawai'i, giant whiteflies have been found on avocado, cinnamon, citrus, coconut, fiddlewood, guava, hau, hibiscus, orchid tree, and plumeria. However, numerous other hosts have been reported elsewhere.

- **Greenhouse whitefly**: The total world accounting of greenhouse whitefly host plants is approximately 859 species, belonging to 469 genera in 121 families. In Hawai'i, greenhouse whiteflies commonly infest bean, bittermelon, Chinese wax gourd, cucumber, eggplant, lettuce, luffa, pikake, pepper, plumeria, poinsettia, potato, pumpkin, rose, strawberry, sweetpotato, taro, tomato, tobacco, watercress, watermelon, and zucchini. Many weed species serve as hosts for whiteflies. In temperate countries, the most severely affected crops are bean, cucumber,

**Figure 1. Giant whiteflies**

**Figure 2. Greenhouse whitefly adults and nymphs**

eggplant, sweet peppers, tomatoes, and a large number of ornamentals, including species of *Fuchsia*, *Gerbera*, *Pelargonium*, *Solanum*, *Chrysanthemum*, *Poinsettia*, and *Primula*.

### *Life cycle*

Whiteflies have three main life stages: the egg, four nymphal stages, and the adult. The first-instar nymphs are called crawlers. They search for a suitable site to feed and attach to the leaf. The later instars remain attached to the plant. The last nymphal stage, from which the adult emerges, is commonly referred to as the "pupal" stage.

**Figure 3. Greenhouse whiteflies**

### *Distribution*

- **Giant whitefly**: The giant whitefly was first recorded on Oahu in 2002. It is native to Mexico and also occurs in Costa Rica and Guatemala. In the U.S., it has been recorded in Arizona, California, Florida, Louisiana, and Texas.

- **Greenhouse whitefly**: The greenhouse whitefly was first recorded on O'ahu in 1907 and later found on all the Hawaiian Islands. This pest has a nearly worldwide distribution.

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## Greenhouse thrips

*Heliothrips haemorrhoidalis* Bouché, Thysanoptera: Thripidae

### *Damage*

Greenhouse thrips are a minor pest of blueberry in Hawai'i. These thrips are tiny insects that feed on plant sap. Their feeding can cause a silvering or bronzing of the foliage. Severe damage can cause the undersides of the affected leaves to become brown (Fig. 1) and cause the leaves to drop prematurely. The thrips damage the lower leaves first and progress upward on the plant.

### *Identification*

The adult thrips have a dark blackish-brown body (Fig. 2) and measure 1.3 to 1.7 mm (0.05 to 0.07 inch) in length. Young larvae are whitish with red eyes; they turn yellowish with maturity but retain the red eye color. The insect excrement can cause a spotting of the leaves that can help to indicate the presence of thrips. Species-level identification is difficult for the layperson, and samples should be submitted to experts when an accurate identification is needed.

### *Hosts*

In Hawai'i, greenhouse thrips have been reported on noni, tea, various ornamentals, and conifers. Elsewhere, the insect has been recorded on many plants including ardisia, avocado, azalea, cacao, citrus, coffee, coleus, croton, dahlia, dogwood, ferns, grape, guava, hibiscus, magnolia, mango, natal plum, orange, phlox, and viburnum.

### *Life cycle*

Greenhouse thrips are parthenogenetic, which means that the female thrips reproduce without mating. Eggs are laid singly in plant tissue. There are four larval instars that are incapable of flight. The first two larval instars actively feed on plant sap. The next two instars are sometimes called the prepupal and pupal stages, during which the insect does not feed. When the fourth larval stage molts, it is an adult thrips that has fully formed wings and is capable of flight.

### *Distribution*

Greenhouse thrips was first reported in Hawai'i in 1910 on O'ahu and has since been found on all the major islands except Lana'i. It is thought to have originated in tropical America. It is present in Africa, Austria, Brazil, Central America, England, Finland, France, Germany, Italy, Palestine, and the West Indies; it is also found in greenhouses and indoors in other countries. This species is thought to be found throughout the world because of its habit of living in greenhouses.

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**Figure 1. Greenhouse thrips damage.**

**Figure 2. Adult greenhouse thrips.**

ifas.ufl.edu/in232>

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## Torpedo bug

*Siphanta acuta* Walker, Hemiptera: Flatidae

The torpedo bug is a minor pest of blueberry plants grown in the field. It is seldom seen on greenhouse-grown blueberries.

### *Damage*

The torpedo bug feeds on plant sap and produces honeydew. The sooty mold fungus grows on honeydew and can cause the leaves to blacken. Their feeding and the presence of sooty mold fungus can decrease photosynthesis, reduce plant vigor, and downgrade the appearance of the host. It appears that torpedo bugs tend to occupy the lower canopy (older foliage) of the blueberry plant.

### *Identification*

The adult torpedo bug is bright green, about 15 mm (0.6 inch) long, and pointed like a thorn or small leaf (Figure 1). The nymphs have a more flattened appearance and produce a waxy material and filaments (Figure 2).

### *Hosts*

Host plants of the torpedo bug include *Acacia*, banana, blueberry, *Cheirodendron*, citrus, coffee, *Coprosma*, *Eucalyptus*, guava, macadamia, *Myrsine*, ohia, *Rubus*, *Styphelia*, and sumac.

### *Life cycle*

The eggs are laid in masses about 5 mm in diameter that contain more than 100 eggs. The eggs hatch in 10–20 days. There are 5 nymphal instars. The adults live for about 2 months.

### *Distribution*

The torpedo bug is native to Australia and was first observed in Hawai'i in 1898. After its arrival, it was observed destroying certain native trees and severely damaging coffee. An egg parasite was released in 1904 that reduced this insect to low levels.

### *References*

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**Figure 1. Adult torpedo bug**

**Figure 2. Nyphal stage of the torpedo bug**

## MITES

Mites are not insects but belong to the subclass Acari. There are mites that can damage plants by feeding on sap, and there are mites that are predators of other mites or insects. The mites that damage blueberry by feeding on plant sap will be discussed here. The twospotted spider mite is a web-producing mite, whereas the broad mite does not produce webbing.

### Twospotted spider mite

*Tetranychus urticae* Koch, Acari: Tetranychidae

***Damage***

Twospotted spider mites are a minor pest of blueberry. Greenhouse-grown plants appear to be more susceptible than field-grown plants. The mites appear to first damage the upper leaf surface (Figure 1) but will also damage the lower leaf surfaces when levels are high (Figure 2). Their feeding causes a stippling of the leaves and can create a bronzed appearance (Figure 3).

***Identification***

The twospotted spider mites and their eggs are tiny. As a result, growers should become familiar with the plant symptoms created as a result of mite feeding injury (see above). The eggs are 0.13 mm in diameter, spherical and translucent. The larva is pale green and has 3 pairs of legs. The nymphs are also pale green but with darker markings, and they have four pairs of legs. The adult female mite is 0.6 mm long, pale green or greenish-yellow with two darker patches on the body. The adult mites can also be orange-red in color. Webbing produced by these mites may sometimes be visible.

***Hosts***

The twospotted spider mite has a very wide host range. In Hawai'i, some of the affected crops include yard-long bean, carnation, celery, *Dianthus*, peppermint, rose, and tuberose. Elsewhere, this mite has been a problem with greenhouse-grown tomatoes, cucumbers, peppers, chrysanthemums, and orchids. This mite has been a problem with field-grown crops such as apple, cotton, grape, soybeans, and many others.

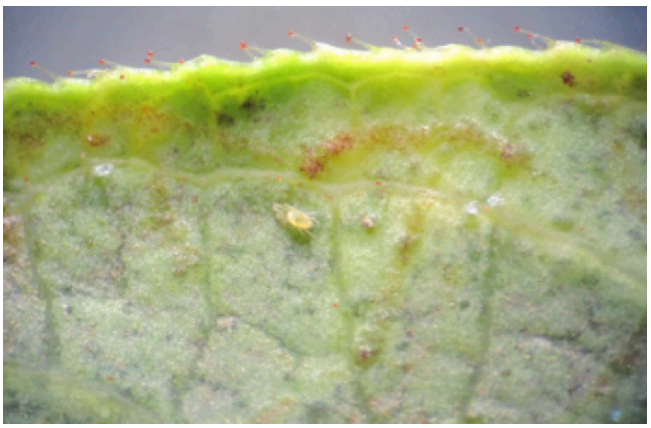

**Figure 2. Damage to underside of leaf**

**Figure 1. Twospotted spider mites and damage**

**Figure 3. Bronzing due to twospotted spider mites**

***Life cycle***

The life stages of the twospotted mite include the egg, larva, two nymphal stages, and adult. Development can be rapid when conditions are favorable. At 86 to 90°F (optimum for development), the total life cycle from egg to adult is completed in 8–12 days. Each female can lay about 90–100 eggs during its 30-day lifetime.

***Distribution***

The twospotted spider mite occurs in most parts of the world. It has been recorded from most countries in Africa, Asia, Australasia, Caribbean and Pacific islands, Central America, Europe, North America, and South America. This mite has probably been in the state of Hawai'i for a long time but was first recorded on O'ahu, Maui, and Hawai'i in 1989.

***References***

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## Broad mite

*Polyphagotarsonemus latus* Banks, Acari: Tarsonemidae

***Damage***

The broad mite typically infests the new growth of the blueberry plant. Young, actively growing plants in the nursery and greenhouse are most susceptible. The mites feed by piercing plant cells and sucking up the sap that oozes from the wound. When the infestation is mild, the affected leaves may become cupped and the underside of leaves slightly discolored (Figure 1). When the infestation is severe, the leaves will appear bronzed and distorted and may drop prematurely (Figure 2).

***Identification***

Broad mites are very tiny, and the signs of their feeding damage on the new growth will likely be the first indication of their presence. The adult female mite is only about 0.2 mm long and translucent yellowish-green when alive. The eggs of broad mites are only 0.08 mm long but are distinctive and can be helpful in identifying broad mite infestations, though a good hand lens (at least 10x) is needed to see them. The oval eggs are translucent and have five to six rows of whitish spots.

**Figure 1. Early signs of broad mite infestation**

**Figure 2. Shoot heavily infested with broad mites**

### *Hosts*

The broad mite can infest a wide range of host plants and has been found on species belonging to 60 different plant families. Some of the crops commonly affected include bittermelon, coffee, edible gourds, eggplant, green bean, grape, guava, hyotan, macadamia, mango, papaya, passion fruit, pepper, pikake, plumeria, poha, pumpkin, soybean, tea, tomato, watercress, and winged bean.

### *Life cycle*

The life stages that the broad mite goes through are egg, larva, nymph, and adult. The developmental period from egg to adult is very short in broad mites. At 77°F the average developmental period is 4.1 days. The adult female longevity averages 11.4 days. Each female lays an average of 25 eggs.

### *Distribution*

The broad mite has a worldwide distribution. It is known to occur in Africa, Asia, Central America, the Caribbean, Europe, North America, Oceania, and South America. It is present on all the major islands of Hawai'i.

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## PESTS THAT INFEST FRUIT

### Spotted wing drosophila

*Drosophila suzukii* Matsumura, Diptera: Drosophilidae

***Damage***

The female spotted wing drosophila (SWD) lays its eggs into fruit using a serrated ovipositor. The eggs can hatch into tiny maggot-like larvae within one day. The larvae feed on the pulp of the berry. In as little as two days, the fruit may begin to collapse around the oviposition site (Figure 1). Affected berries become soft and often exude fluid. Fruit damaged by SWD may be prone to attack by other organisms such as common drosophila flies and secondary fungal and bacterial pathogens.

***Identification***

Adult flies are 2–3 mm long with red eyes, a pale or yellowish-brown thorax, and black stripes on the abdomen. Only the male flies have a dark spot on the top edge of each wing (Figure 2). The females (Figure 3) are larger than the males, and have a serrated ovipositor that is used to deposit eggs into the host tissue. The larvae are white with black mouthparts. Fully grown larvae can reach 5.5 mm long. The pupae are reddish-brown and spindle shaped. SWD look similar to pomace or vinegar flies that are commonly found on and associated with over-ripe or rotten fruits and vegetables. Due to their small size, growers may have difficulty in identifying these insects to the species level. Samples can be submitted to the Agricultural Diagnostic Service Center for identification.

***Hosts***

This insect has a wide host range. In Hawai'i, SWD has been recovered from such fruit as loquat, strawberry, strawberry guava, and Surinam cherry. Elsewhere it is a pest of crops such as apricots, blackberries, cherries, cranberries, grapes, mulberries, nectarines, peaches, persimmon, and raspberries.

***Life cycle***

The total life cycle is rapid and may be completed within one to two weeks, depending on temperature. The flies are most active at 68°F, and activity becomes reduced above 86°F. A female fly can lay 200–600 eggs in her lifetime. One to three eggs are typically laid per site. There are three larval stages.

***Distribution***

In Hawai'i, specimens were first collected on O'ahu in 1980. SWD has also been found on the islands of Hawai'i,

**Figure 1. Collapsed areas around oviposition sites**

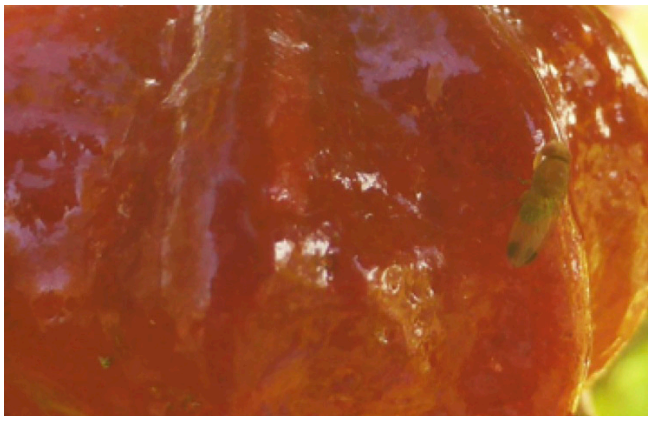

**Figure 2. Male spotted wing drosophila on Surinam cherry**

**Figure 3. Female spotted wing drosophila on Surinam cherry**

Maui, Moloka'i, and Kaua'i. It is thought to be native to eastern and southeastern Asia, although little is known about its geographical origin. It has been introduced into North America and Europe.

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## Tephritid fruit flies

The three economically important invasive fruit fly species established in Hawai'i are the Mediterranean fruit fly, oriental fruit fly, and melon fly. No-choice (caged) tests suggested that blueberry fruits can be good hosts for the oriental fruit fly and Mediterranean fruit fly. However, these fruit flies have not been observed to be important pests of field- or greenhouse-grown blueberries in Hawai'i.

- **Mediterranean fruit fly**
  *Ceratitis capitata* Wiedemann**,** Diptera: Tephritidae
- **Oriental fruit fly**
  *Bactrocera dorsalis* Hendel, Diptera: Tephritidae
- **Melon fly**
  *Bactrocera cucurbitae* Coquillett, Diptera: Tephritidae

***Reference***

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