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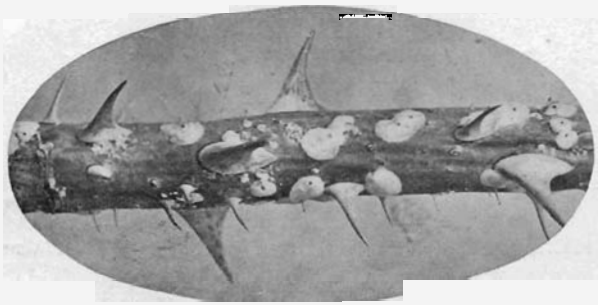
The Chief Injurious Scale-Insects of Connecticut.



Rose scale: twice enlarged.

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The Chief Injurious Scale-Insects of Connecticut.

By W. E. Britton.

The terms "scale," "scale-insect" and "bark-louse" are commonly used to designate insects belonging to the family Coccidae of the order Homoptera. The Homoptera are often included in the Hemiptera, to which belong the true bugs, aphids or plant-lice, and leaf-hoppers. These insects all suck their food, and many of them cause serious injury to cultivated plants. The Hemiptera have incomplete transformations, and the Coccidae are probably the most degraded of the Hemiptera. The males are said to have complete transformations, but possess only two wings in the adult state. Soon after birth the young crawl about for a few hours; otherwise the females are without means of locomotion except in a few species, and are attached to the bark or foliage of trees and plants, from which they suck out the sap for food. Some of our worst pests are scale-insects. The object of this bulletin is to illustrate and describe briefly the more important kinds occurring in Connecticut, so that people will be able to recognize them more readily and combat them more successfully.

As some of these insects secrete a substance which forms a shell or covering for protection, they are called armored scales. Other kinds not forming shells are known as unarmored or soft scales. Most of the unarmored scales secrete honey dew like the plant-lice.

The Latin names and arrangement of the following species are the same as given in Mrs. Fernald's Catalogue of the Coccidae of the World. The illustrations are all original, and show the insects natural size except where otherwise indicated. Figure 5 is from a drawing. All others are from photographs.

UNARMORED OR SOFT SCALES.

1. **THE GREENHOUSE ORTHEZIA.**—*Orthezia insignis* Dougl.

FIG. 1. The greenhouse Orthezia on Lantana leaf. Twice natural size.

This insect is not fixed, but crawls about like the mealy bugs, and is shown in Figure 1. Full-grown specimens are about 1.5 mm long. It attacks a great variety of greenhouse plants, Lantana and Coleus being favorites. The treatment used against mealy bugs is advised against this insect. All breed continuously in greenhouses, and there are probably many generations each year.

2. **PIT-MAKING OAK SCALE**—*Asterolecanium variolosum* Ratz.

This scale is circular, usually greenish-yellow in color, and has a glassy appearance. It forms a pit or depression in the bark where it is situated, and it is about 2 mm in diameter. (See Figure 2.) This species has been sent to the Station several times on English oak, *Quercus robur*, though it is known to attack other oaks. Kerosene emulsion and whale oil soap have been used as a spray with good results in destroying this insect.

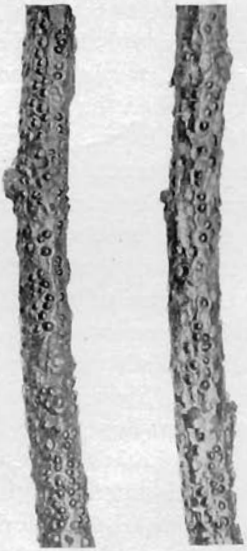

FIG. 2. Pit-making oak scale.

3. **ELM SCALE**—*Gossyparia spuria* Modeer.

A dark-colored oval scale margined by a white cottony fringe is not uncommon upon elm trees about New Haven. It seems to prefer small trees, but is sometimes found on the lower branches of medium sized and large trees. The insect is about 3 mm long, brown or black surrounded by a fringe of white wax, and is shown in Figure 3. The young are born alive, appearing about the middle of June in Connecticut, and settle along the veins of the leaves chiefly on the under sides. Later in the season they return to the larger branches and trunk, and occupy the crevices of the bark, where they remain through the winter. There is but one brood each year. Honey dew is given off profusely by the nearly mature females, and often drips upon the ground. The scales are readily destroyed at any time of the year by spraying with kerosene emulsion or soap and water.

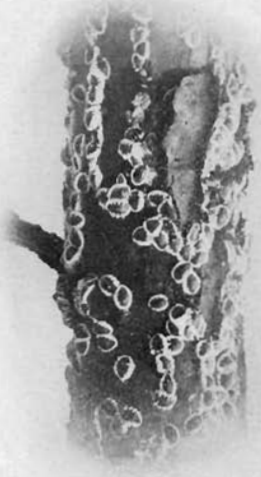

FIG. 3. Elm scale.

4. **WOOLLY MAPLE LEAF SCALE**—*Phenacoccus acericola* King.

White powdery masses of wax 6 or 7 mm long are frequently seen on the under sides of leaves of the sugar maple. The waxy mass contains the mature female (often dead) and a large number of eggs. The young remain on the leaves until winter approaches, when they go into the crevices of the rough bark of the trunk and larger limbs, where they make a sort of nest by lining the crevices with wax. They remain here until May. The white oval cocoons of the males are often abundant on the bark. There are three generations each year. The insect has been collected at New Haven and South Norwalk, but doubtless occurs elsewhere in the state. Very little seems to be known about remedies for this insect, but probably kerosene emulsion will prove effective.

5. **COMMON MEALY BUG**—*Pseudococcus citri* Risso.

The mealy bug is a common pest of plants in greenhouses and dwellings and even out of doors in summer. Unlike most scales, the mealy bugs are not fixed to their food plants, but are able to move about, and they attack nearly all kinds of plants. The full-grown females are about 4 mm long and oval in shape. They are creamy or dirty white, and covered with a wax secretion which gives them a mealy appearance. They usually congregate in the crotches and at the axils of the leaves so as to be somewhat protected. The illustration, Figure 4, shows them gathered along the mid-vein of a leaf. Spraying with soap and water or fir tree oil or dipping the plants in the mixture is the remedy, but hydrocyanic acid gas fumigation is doubtless the most satisfactory for greenhouses.

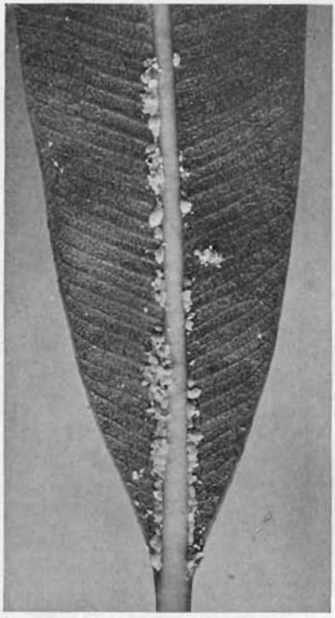

FIG. 4. Common mealy bug on oleander.

6. **LONG SPINED MEALY BUG**—*Pseudococcus longispinus* Targ.

Resembles the preceding, except that the adults bear filamentous appendages at the posterior end of the body. The species is well distributed.

7. **COTTONY MAPLE SCALE**—*Pulvinaria innumerabilis* Rathv.

This scale can be recognized during early summer by the large white egg-masses on the twigs. Nearly all maples as well as many other trees are attacked, but the insect seems to prefer the silver maple. It is not as yet a very serious pest in

Connecticut, but in Chicago, Denver, and some other Western cities the maples are being seriously injured by it, and extensive spraying is practiced. There is one annual brood, with eggs laid in May and June which hatch in July and August. The young first settle on the leaves. The males appear in early fall and mate with the females, which migrate to the twigs, where they remain through the winter. In the spring they increase rapidly in size, and soon deposit their egg-masses and shrivel and die. The brown female with white egg-mass protruding posteriorly is about 12 mm (½ inch) long, and is shown in Figure 5. The species is abundantly attacked by insect parasites.

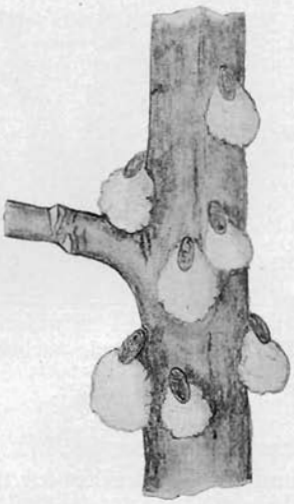

FIG. 5. Cottony maple scale; females and egg-masses.

Kerosene emulsion is used as a remedy.

A closely allied species, *P. acericola* Walsh & Riley, doubtless occurs here, but the writer has not observed it. It seems to be confined almost exclusively to the silver maple, and the egg-masses are laid on the leaves instead of the twigs. This requires two migrations,—from the leaves to the twigs in fall, and from twigs to the new leaves in spring. The females with egg-masses are about ½ inch long, the egg-mass tapering backward, with four longitudinal ridges.

8. **SOFT SCALE**—*Coccus hesperidum* Linn.

Much has been written about this scale, which was formerly placed in the genus *Lecanium*. It is an oval, slightly convex brown species commonly found on citrus trees, oleanders and many other plants in greenhouses. Females are viviparous, but the generations are not well marked. Soap and water or kerosene emulsion will readily destroy these scales at any season of the year.

9. **APRICOT SCALE**—*Eulecanium armeniacum* Craw.

During recent years this species has become common out of doors in Connecticut, and a wide range of plants are attacked. We have observed it on plum, grape, chestnut, ash and rose. It is oval in shape, about 4 mm long, strongly convex, and light or dark brown in color. Figure 6 gives a good idea of its appearance. This scale is sufficiently abundant to cause considerable injury, and remedial measures must be taken against it. There is one brood annually, the eggs hatch about July 1st, and the scale winters in a partially grown condition. Spraying in winter with kerosene emulsion has been successful, but where orchards are treated with lime and sulphur washes for the San José scale, no other treatment need be given.

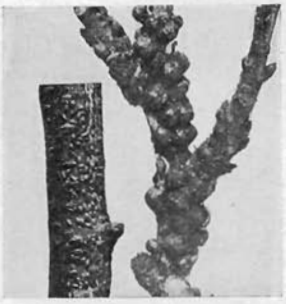

FIG. 6. Apricot scale on plum; immature scales at left, old shells at right.

10. **NEW YORK PLUM SCALE**—*Eulecanium cerasifex* Fitch.

Plum twigs thoroughly infested with this scale were received from Berlin in 1904. Superficially it looks like *E. armeniacum*, which is shown in Figure 6. The writer has made no observations regarding its life history. Where it occurs the same treatment advised for *armeniacum* should be employed.

11. **TERRAPIN SCALE**—*Eulecanium nigrofasciatum* Perg.

The writer has several times collected this scale from the twigs of silver maple, though it is known to infest fruit and other trees. The females are smaller than in any other species of the genus mentioned in this bulletin. The adult female is of a reddish color spotted with dark red or black,

FIG. 7. Terrapin scale on silver maple.

2 mm long, convex, with about twelve radiating ridges, most conspicuous near the margin. There is probably one brood each year, eggs being formed in May and hatching in July. (See Figure 7.)

12. **TULIP SCALE**—*Eulecanium tulipiferae* Cook.

This scale is becoming quite common on wild and cultivated tulip trees throughout the state. It is the largest of all the brown scales, the hemispherical females often reaching a diameter of 8 mm, or ⅓ of an inch. The male scales are much smaller and more elongated. The light grey pupa skins remain on the bark after the adult males have emerged. Both sexes are shown in Figure 8. Apparently there is but one brood each year, the

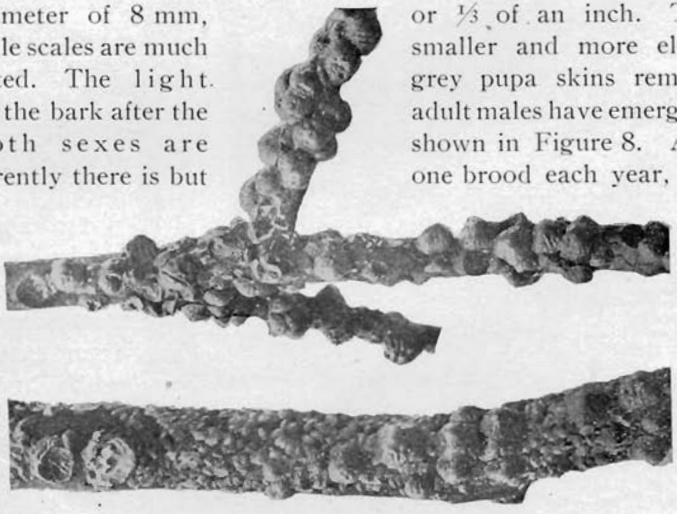

FIG. 8. Tulip scale on tulip tree. Large females are shown above, and small male shells on lower twig.

viviparous females producing young about September 1st. They are partially grown when winter sets in. As a rule the lower branches are first attacked, and often killed, when those next higher will in turn become infested. Linden and magnolia are also attacked by this scale. Kerosene emulsion, and soap and water applied in the form of a spray, in autumn, are the common remedies.

13. **HEMISPHERICAL SCALE**—*Saissetia hemisphaerica* Targ.

This is probably the most common of all the large brown scales found in greenhouses and dwellings. It has a long list of food plants, and may be expected to attack almost any kind

of plant, but chiefly palms, ferns, Cycas and orchids. It is from 3 to 4 mm long, and reddish or dark brown in color. Specimens are found on both leaves and stems. (See Figure 9.) It probably breeds continuously throughout the year.

Kerosene emulsion, fir tree oil and soap and water can be used as sprays and greenhouses can be fumigated with hydrocyanic acid gas to destroy this insect.

FIG. 9. Hemispherical scale on fern.

ARMORED SCALES.

14. **WHITE ELM SCALE**—
Chionaspis americana
Johnson.

This scale attacks the twigs of the elm, and closely resembles the scurfy scale, shown in Figure 11. It is not very abundant in Connecticut.

15. **EUONYMUS SCALE**—
Chionaspis euonymi Comst.

This species was recently sent to the writer from Hartford, where it was abundant on *Euonymus radicans* along

FIG. 10. Euonymus scale on *Euonymus radicans*. The white shells are males. A few larger grey females are present.

a brick wall. The wall was covered with canvas, and the plants fumigated with hydrocyanic gas.

The euonymus scale resembles the scurfy scale, but the females are somewhat smaller and darker in color. It passes the winter in the egg stage, and the different species of *Euonymus* and the orange are attacked. It is shown in Figure 10.

16. **SCURFY SCALE**—*Chionaspis furfura* Fitch.

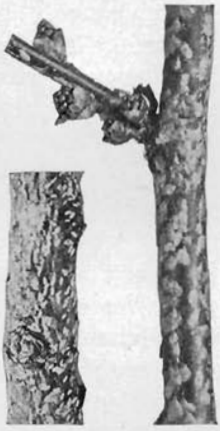

FIG. 11. Scurfy scale on currant; males at left, females at right.

The female shell is broadly pyriform, 3 mm in length, and white or light grey. See Figure 11. The male is much smaller, white, with sides parallel, and three ridges along the back. A single brood is formed each year, and the winter is passed in the egg stage. These eggs are oval in shape, purple in color, and hatch between May 20th and June 1st. Spraying with soap and water or kerosene emulsion soon after the eggs hatch will readily destroy the young. For a more complete history of this insect the reader is referred to Bulletin No. 143 or the Report of this Station for 1903, page 227.

17. **PINE LEAF SCALE**—*Chionaspis pinifoliae* Fitch.

Resembles the preceding, but is attached to the leaves or "needles" of the pine, spruce and other coniferous trees. It has been collected at South Manchester on *Pinus mughus*. There are two broods each year, and the winter is passed in the egg stage. See Figure 12.

FIG. 12. Pine leaf scale. Enlarged about twice.

18. **ROSE SCALE**—*Aulacaspis rosae* Bouché.

A large white scale is sometimes seen on rose bushes, raspberry or blackberry canes, especially where growing in crowded rows or clumps. The female is nearly circular, 2.5 mm in diameter, and is shown on the cover of this bulletin. The male is much smaller, long and narrow, with

three parallel ridges running lengthwise of the shell. Professor John B. Smith of New Jersey has studied this scale recently, and finds that all stages from the egg to the mature female occur at the same time during the winter and throughout the season. Probably there are but three complete broods, but these overlap so that breeding is almost continuous.

As all stages of the insect occur at the same time remedial treatment is somewhat difficult, as the eggs are usually not killed by sprays, and sometimes survive even fumigation. The worst infested canes should be cut out and burned. Kerosene emulsion or soap and water should be used as a summer spray, and the lime and sulphur mixture may be applied to the dormant plants in winter.

19. **PUTNAM'S SCALE**—*Aspidiotus ancylus* Putnam.

This is a small circular scale, 2 mm in diameter, which occurs throughout the state on fruit trees, but perhaps most frequently upon currants, often killing the second year canes or shoots. The shells of this scale are usually not as nearly circular as the San José scale, but it is often difficult to distinguish them in the field. Apparently there is but one brood each year.

20. **CHERRY SCALE**—*Aspidiotus forbesi* Johnson.

This scale closely resembles the preceding, and though not so widely distributed, has been found upon fruit trees in Connecticut. It should be regarded as a serious enemy, and treated in the same way as the San José scale.

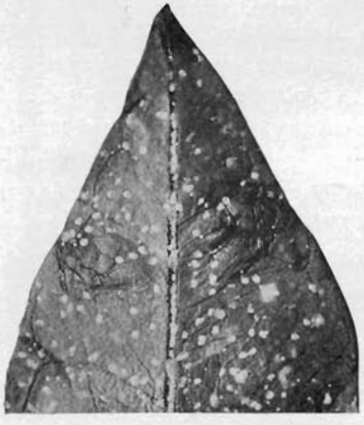

FIG. 13. White or oleander scale on Croton leaf.

21. **WHITE SCALE; OLEANDER SCALE**—*Aspidiotus hederae* Vall.

This scale is a pest of greenhouses, where it attacks oleander, croton, ivy, palms, camellia and many other plants. It is nearly circular in shape, and white or light grey in color, making it conspicuous on the green leaves and stems. (See Figure 13.) It probably breeds continuously in greenhouses. Fumigating the

house with hydrocyanic acid gas, spraying the infested plants with either whale oil or common soap (1 lb. in 8 gallons of water) are the remedies for this scale.

22. **EUROPEAN FRUIT SCALE** — *Aspidiotus ostraeformis* Curtis.

This scale is not known to be established in Connecticut, but will doubtless become so, as it has been found on nursery trees sent into the state. It looks very much like the cherry, Putnam's, and San José scales, and can be distinguished from them only by means of the compound microscope. In fact these four species resemble each other so closely that the fruit grower cannot distinguish between them unless he is an entomologist. The European fruit scale attacks all kinds of orchard trees, and there is probably a single brood each year.

23. **SAN JOSE SCALE**—*Aspidiotus perniciosus* Comst.

This is a circular scale, light or dark grey in color, with concentric markings and a nipple in the center, which is usually darker in color than the surrounding portion of the shell. The winter is passed in a half-grown condition, and there are no eggs. The breeding season begins soon after June 20 and ends about December 1 in Connecticut, three or four broods appearing in a season. For a full account of its life history and spread, see Bulletin No. 135 of this Station.

This scale is the worst pest of the fruit grower in Connecticut, and attacks all kinds of fruit trees, except the sour cherry (*Prunus cerasus*), and many kinds of shade trees and ornamental shrubs are attacked and sometimes killed. A list of trees and plants, showing their susceptibility to attack by this scale, was published in the Report of this Station for 1902, page 130. A thorough spraying in the fall after the leaves drop, or in the spring just before the buds start, using a lime and sulphur mixture, seems to be the best remedy for Connecticut. This mixture is usually prepared by boiling together 20 pounds quicklime and 14 pounds sulphur for 45 to 60 minutes in enough water to keep it a liquid. After boiling, water should be added to make 40 gallons, and the whole applied at once. Satisfactory mixtures can be made without boiling by using potassium or sodium sulphide, caustic soda or sal soda to aid in dissolving the sulphur. Some of these mixtures and the proper outfit for spraying are

described in Bulletin No. 146, and reproduced in the Report of this Station for 1904, pages 240-252.

The accompanying illustration of the San José scale (Figure 14) will serve to show the appearance of the other kinds which so closely resemble it. All can be combatted in the same way, viz: by spraying the dormant orchard trees with the lime and sulphur mixture, and by fumigating nursery stock with hydrocyanic acid gas.

FIG. 14. San José scale on peach twig. Twice natural size.

24. **ELM ASPIDIOTUS**—*Aspidiotus ulmi* Johns.

This is a small circular scale resembling the preceding, which is found on the smooth or inner bark in the crevices of the rough bark of the trunks and larger branches of elm trees. It seems to do very little damage, but may be found on most of the elm trees of New Haven, and doubtless occurs throughout the state.

25. **CIRCULAR SCALE: FIG SCALE**—*Chrysomphalus aonidum* Linn (*ficus* Ash.).

FIG. 15. Circular or fig scale on rubber plant.

Rubber plant, orange, palms, camellias and oleander in greenhouses are often infested by a round dark-colored scale which stands out prominently from the surface of the leaves.

In fact it is almost conical in shape, reddish brown or nearly black, with an orange apex, and is shown in Figure 15. Presumably it continues to breed throughout the year under glass, and continued spraying is necessary to keep it in check.

26. **MORGAN'S SCALE** — *Chrysomphalus dictyospermi* Morg.

This species is a serious pest of palms at Pierson's large commercial greenhouses, Cromwell, and it has also been taken in private plant houses in other parts of the state. It is of about the same color as the preceding species, but is flatter, and projects only slightly from the leaf. Mr. H. E. Hodgkiss studied this scale at the Massachusetts Agricultural College, and found that several generations are produced each year, but these overlap so as to become indistinct. The females bring forth living young, are parthenogenetic, and males are unknown. Fumigating the house with hydrocyanic acid gas, using 7.5 grams potassium cyanide for each 100 cubic feet of space, for forty minutes, after dark, with the plants free from moisture, is the treatment advised by Mr. Hodgkiss after making many experiments. It is probably a safe remedy for nearly all of the greenhouse scales.

27. **OYSTER SHELL SCALE**—*Lepidosaphes ulmi* Linn (formerly *Mytilaspis pomorum* Bouché).

One of the most common and widely distributed of all coccids. It is a pest of fruit trees, especially apple, and many young sprouts and seedlings of birch, poplar, willow, ash and butternut are killed by it each year. Lilac is also infested. There is but one brood annually, and the insect winters in the form of oval white eggs under the female shells. The eggs hatch in Connecticut about the first of June, the young crawl for a few hours, then settle upon the bark and form shells, becoming mature in September. Eggs are laid about the first of October, and the females die. The female scale (or shell), is from 2 to 3 mm long, about the same color as the bark upon which it rests, elongated pyriform in shape, and more or less curved. It is shown in Figure 16. Male shells are much

FIG. 16. Oyster shell scale on poplar.

smaller and less curved than those of the female. The adult male has two wings, and is seldom seen. Spraying with kerosene emulsion or soap and water soon after the eggs hatch will hold this scale in check. For a more complete account see Bulleton 143, or the Report of this Station for 1903, page 229.

28. **THREAD SCALE**—*Ischnaspis longirostris* Sign.

This is a long narrow black scale attacking palms, pandanus and many other plants in greenhouses. It has been taken in Connecticut only at one greenhouse in New Haven, where it

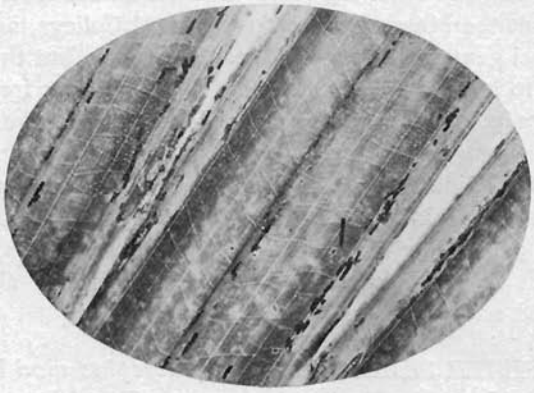

FIG. 17. Thread scale on palm leaf.

was quite abundant. Little is known of its life history, and the male is unknown. The female shell is from 2 to 3 mm long, and about eight times as long as broad, and more or less curved. (See Figure 17.) The writer has had no experience in combating this scale, but the same treatment used for other greenhouse scales will doubtless hold it in check.

29. **CHAFF SCALE**—*Parlatoria pergandii* Comstock.

This is common on various greenhouse plants, especially orange and lemon. It is oval in shape, with the molted skin at one end, and is light yellow in color. It is usually found in clusters. The common sprays used for greenhouse scales seem to be effective against this species.