Ceroplastes destructor

Scientific Name
Ceroplastes destructor Newstead

Synonyms:
Ceroplastes postperlucidus (Qin & Gullan)
Gascardia destructor (Newstead)
Gascardia postperlucidus Qin & Gullan

Note: Numerous misidentifications are mentioned with synonymy in cited literature but are not included here.

Figure 1. Infestation of *C. destructor* (Image courtesy of Rosa Henderson, Landcare Research, Bugwood.org).

Common Name(s)
White wax scale, citrus waxy scale, soft wax scale, white scale, white waxy scale

Type of Pest
Scale insect

Taxonomic Position
Class: Insecta, **Order:** Hemiptera, **Family:** Coccidae

Reason for inclusion
CAPS Target: AHP Prioritized Pest List for FY 2012

Pest Description
There are three nymphal instars. Early instars are morphologically difficult to distinguish from other *Ceroplastes* species. Wakgari and Giliomee (1998) provide a key to different stages of *C. destructor* and detailed descriptions and illustrations of all nymph and adult stages. The following morphology is taken mainly from Wakgari and Giliomee (1998) for the nymph stages and from Qin and Gullan (1994) and Wakgari and Giliomee (1998) for the adult. These descriptions include details visible only in specimens mounted on microscope slides, examined under high magnification.

First-instar nymph: The first-instar nymph is oval, dorsolaterally flat, 0.32 to 0.50 mm (0.013 to 0.020 in) long; eye-spots heavily pigmented, present dorsolaterally on each side of the head region; marginal setae flagellate, 9 to 12 between anterior spiracular furrows, 2 to 3 between anterior and posterior spiracular furrows, 7 between posterior spiracular furrow and anal cleft; three spiracular setae present in each spiracular furrow; dorsum without setae or pores; anal plates each with a very long, slender apical seta and three other dorsal setae, one fringe seta and one ventral seta; venter without

submarginal setae, one pair of interantennal setae and one pair of prevulvar setae present, a few cruciform pores present in submargin, three quinquilocular pores between spiracle and its corresponding furrow; antennae 6-segmented; legs well developed, without tibiotarsal sclerosis, tarsal digitules equal in size and knobbed, claw denticle absent, claw digitules unequal, one slender and one stout, both apically knobbed.

Second-instar nymph: The second instar is oval, 0.65 to 0.70 mm (0.026 to 0.028 in) long, eye-spots pigmented, present dorsolaterally on each side of the head region; marginal setae flagellate, 8 to 10 between anterior spiracular furrows, 2 between anterior and posterior spiracular furrows, 6 to 7 between posterior spiracular furrow and anal cleft; three spiracular setae present in each spiracular furrow; dorsum without setae, with some bilocular pores along submarginal areas; anal plates each with four dorsal setae, two fringe setae and one ventral seta; venter with bristle-shaped submarginal setae, two pair of interantennal setae (one longer one shorter) and one pair of prevulvar setae present, cruciform pores present in submargin, four to seven quinquilocular pores between spiracle and its corresponding furrow; antennae 6-segmented; legs well developed, similar in structure to that of first-instar nymph.

Third-instar nymph: The third instar is oval, 0.85 to 1.20 mm (0.033 to 0.047) long, eye-spots black, present dorsolaterally on each side of the head region; marginal setae flagellate, occasionally clavate to capitate, 9 to 14 between anterior spiracular furrows, 3 to 5 between anterior and posterior spiracular furrows, 7 to 11 between posterior spiracular furrow and anal cleft; 6 to 10 spiracular setae present in each spiracular furrow; dorsum with one anterior and six lateral dorsal clear areas, setae and pores sparsely distributed over dorsum except lacking in dorsal clear areas, pores bilocular, oval trilocular or triangular trilocular and a few monocular in median area; anal plates each with four dorsal setae, three fringe setae and one ventral seta; venter with bristle-shaped submarginal setae and sparsely distributed ventral setae, two pairs of interantennal setae (one longer, one shorter) and one pair of prevulvar setae present, cruciform pores present in submargin around entire body, 12 to 18 quinquilocular pores between spiracle and its corresponding furrow; antennae 6- segmented; legs well developed, similar in structure to that of first-instar nymph but relatively smaller compared with body size.

Adult female: There is some variation in the number of pores and setae recorded by Qin and Gullan (1994) and Wakgari and Giliomee (1998). This result is due to Qin and Gullan's (1994) use of Australian material, with counts including both young and old specimens, while Wakgari and Giliomee (1998) made use of African material, with counts including only young specimens. From Qin and Gullan (1994) and Wakgari and Giliomee (1998):

Adult females are oval, sometimes with some marginal indentation, 2.5 to 6.40 mm (0.098 to 0.252 in) long, with a strongly sclerotized anal process; eye-spots black, relatively small, present dorsolaterally on each side of the head region; marginal setae bristle-like, 8 to 24 between anterior spiracular furrows, 4-8 between anterior and

posterior spiracular furrows, 7 to 12 between posterior spiracular furrow and anal cleft; 37 to 77 spiracular setae present in each spiracular furrow; dorsum derm membranous in young specimens but becoming sclerotized in old specimens, with one anterior and six lateral dorsal clear areas, dorsal setae cylindrical, some with apex slightly expended, evenly distributed over dorsum except lacking in dorsal clear areas, dorsal pores oval trilocular or triangular trilocular and occasionally quadrilocular or bilocular, preopercular pores numbering 5 to 6 in single transverse row immediately anterior to anal plates; anal plates each with four dorsal setae, four fringe setae and one ventral seta; venter with submarginal setae and sparsely distributed ventral setae, two pair of interantennal setae (one longer one shorter) and one pair of prevulvar setae present, cruciform pores mostly present in submargin around entire body, sparse in other ventral areas, 65 to 110 quinquilocular (a few with 6 or 7 loculi) pores between spiracle and its corresponding furrow; multilocular pores distributed around vulva and in a band across preceding segment, mostly with 10 loculi, tubular ducts present on abdomen; antennae 6-segmented; legs well developed, similar in structure to that of first-instar nymph but relatively much smaller compared with body size.

The adult male is unknown.

Biology and Ecology:
In Australia, *C. destructor* is univoltine. It can occasionally produce a partial second generation in the warmer areas of the northwestern citrus growing areas (Gill, 1987).

Adults can be found from March to September in Western Cape Province, South Africa. Females oviposit from September to mid-December. First instars occur from mid-November to mid-January, second instars from mid-January to February, and then third instars from late February to late March. Overwintering can occur as an adult or third instar (Wakgari and Giliomee, 2000).

In New Zealand, adults begin to lay eggs in November with crawlers, the slow moving mobile stage, emerging in December. From December to January, first and second instars occur. The first instar initially settles on leaves; they move to twigs at either the second or third instar (Davis et al., 2005; Lo et al., 1996).

Figure 2. *C. destructor* on coffee. Females are immobile and covered in a white, waxy layer (Image courtesy of CABI, 2004).

C. destructor can be found on stems, twigs, and branches (Kosztarab, 1997).

Development is dependent on host species, temperature, and water availability (Davis et al., 2005).

Symptoms/Signs

C. destructor attacks the leaves, branches, and stems of host plants, which reduces the vigor and growth of the plants. A large number of young crawlers can be seen on leaves when the eggs hatch, but these do not persist. They usually settle on the leaf surface along midribs or leaf petioles. Once the crawlers settle down, they start secreting white wax (Fig 1 & 2). Gimpel et al. (1974) describes, in detail, the process and shapes of the wax produced by wax scales; *C. destructor* produces wax in a similar way. After 3 to 4 days of settlement, the dorsal wax pad appears as a thin, white marking. The wax rays gradually appear around the body margin. The insects move from their original settlement site to the twigs at the beginning of the third instar. At this stage, the wax builds up like a cone and, when more wax is secreted, the late third instar attains its characteristic oval shape. The adults are completely covered with white wax in irregular shapes. Qin and Gullan (1994) and Wakgari and Giliomee (1998) contain figures showing the wax appearance of the different stages.

Pest Importance

C. destructor was once a major pest of citrus in New South Wales, Queensland, and Western Australia. Documents with regard to insect pests of these states in the 1950s, 1960s and 1970s were devoted to examining the life history and appearance of the insect, in addition to methods for its control using oil and insecticidal sprays. It is now a minor pest in Australia (Smith et al., 1997) due to the control of the pest by natural enemies from Africa. *C. destructor* has been a minor pest in its native range in African countries because there is a complex of natural enemies that have kept the pest under control for over three decades.

This species is also considered a minor pest of avocado in Queensland, Australia (Ebeling, 1959; Smith, 1973) and a minor pest of guava in South Africa (de Villiers and van den Berg, 1987). Pfeiffer (1997) states that this species is considered a minor pest of deciduous fruit trees in temperate zones.

Known Hosts

C. destructor is polyphagous and attacks a large number of plants including *Citrus* spp. (citrus), *Coffea* spp. (coffee), *Cydonia* spp. (quince), *Diospyros* spp. (persimmon), *Mangifera* spp. (mango), *Psidium* spp. (guava), and *Pyrus* spp. (pear). The hosts listed are mostly compiled from De Lotto (1965), Snowball (1969), Williams and Watson (1990), Ben-Dov (1993) and Qin and Gullan (1994, 1999). More host plants are listed by Zeck (1932) for New South Wales and Brimblecome (1956) for Queensland, Australia. In addition to the hosts listed, the following are also host plants of *C. destructor*: *Alyxia ruscifolia* (prickly alyxia), *Bursaria spinosa* (blackthorn), *Conyza* spp. (horseweed), *Cussonia spicata* (common cabbagetree), *Dicliptera* spp. (foldwing), *Elaeodendron*

capense (common saffron)*, Maesa* spp., *Maytenus* spp., *Pavetta revoluta* (dune bride's bush), and *Pittosporum* spp.(karo).

Primary hosts
Citrus spp., *Citrus aurantium* (sour orange), *Citrus maxima* (pummelo), *Citrus reticulata* (mandarin), *Citrus sinensis* (navel orange) (CABI, 2004).

Secondary hosts
Acacia (wattles), *Agave* spp. (agave), *Actinidia deliciosa* (kiwi), *Annona* spp. (annona), *Azadirachta indica* (neem), *Camellia sinensis* (tea), *Canna* spp. (canna), *Cassinia quinquefaria* (sifting bush), *Chrysanthemum frutescens* (marguerite), *Coffea* spp. (coffee), *Coffea arabica* (arabica coffee), *Coffea canephora* (robusta coffee), *Croton* spp. (croton), *Diospyros kaki* (oriental persimmon), *Dodonaea* spp., *Dodonaea viscosa* (switch sorrel), *Ekebergia meyeri* (cape ash), *Eremocitrus glauca* (Australian desert lime), *Euclea crispa* (blue guarri), *Eugenia* spp. (stopper), *Ficus* spp. (fig), *Fortunella japonica* (round kumquat), *Gardenia* spp., *Gerbera jamesonii* (Barberton daisy), *Gymnosporia* spp., *Hibiscus* spp. (rosemallows), *Hippocratea* parvifolia, *Lagerstroemia* spp. (crepe myrtle), *Loranthus* spp., *Magnolia* spp., *Malus* spp. (apple), *Melia azedarach* (Chinaberry), *Microcitrus australis* (Australian round-lime), *Nerium oleander* (oleander), *Nuxia oppositifolia* (water elder), *Persea americana* (avocado), *Pleiogynium cerasiferum* (burdekin-plum), *Plumeria* spp. (frangipani), *Poncirus trifoliata* (Trifoliate orange), *Prunus armeniaca* (apricot), *Psidium guajava* (common guava), *Pyrus* spp. (pears), *Rhus* spp. (Sumach), *Schefflera* spp., *Schinus molle* (California peppertree), *Senecio* spp. (groundsel), *Severinia buxifolia* (Chinese box-orange), *Solanum* spp. (nightshade), *Synoum glandulosum* (bastard rosewood), *Syzygium* spp., *Syzygium malaccense* (malay-apple), *Theobroma cacao* (cocoa), *Trichilia emetic* (mafura), *Uapaca* spp. (sugar-plum), and *Zieria smithii* (sandfly zieria) (CABI, 2004; Davis et al., 2005; Ben-Dov, 2010).

Experimental hosts
Eriostemon myoporoides and *Euonymus japonicus* (Japanese euonymus) (Milne, 1993).

Pathogens Vectored
This pest is not currently known to vector any pathogens or other associated organisms. However, honeydew, a sweet substance excreted by the scale insects, supports the growth of black sooty mold.

Known Distribution
Ceroplastes destructor is native to Africa and introduced to Australia, New Zealand, and other South Pacific islands. Qin (2000) clarified some doubtful and unreliable distribution records of this species in the literature. A record of the pest in India (Avasthi and Shafee, 1986) is a misinterpretation of an earlier publication by Subba Rao (1965).

Specific areas of distribution include: Angola, Australia, Botswana, Cameroon, Congo, Eritrea, Ivory Coast, Kenya, Madagascar, Malawi, Mozambique, New Caledonia, New

Zealand, Norfolk Island, Papua New Guinea, Sao Tome and Principe, Solomon Islands, South Africa, Sudan, Tanzania, Uganda, Zaire, Zambia, and Zimbabwe (Davis et al., 2005; Gill and Kosztarab, 1997; Kosztarab, 1997; Murphy, 1997; Swirski et al., 1997a; Swirski et al., 1997b; Ben-Dov, 1993; Pacific Islands Pest List Database, n.d.).

Potential Distribution within the United States

C. destructor was recorded from Florida and Mexico (Ebeling, 1959; CIE, 1960); however, this was probably a misidentification of *Ceroplastes dugesii* (CABI, 2004).

Pathway

C. destructor has not been intercepted at any United States ports of entry; however interceptions of *Ceroplastes* species have occurred 290 times from August, 1984 to April, 2011 (AQAS, 2011; queried 4-11-2011). The majority of interceptions occurred on host material for consumption in baggage; other interceptions have occurred on general and permit cargo (AQAS, 2011; queried 4-11-2011).

This species cannot move large distances on its own and has most likely spread to new areas through the movement of infested materials through trade.

Survey

CAPS-Approved Method*:

Visual inspection.

Literature-Based Methods:

Infestations of *C. destructor* on citrus and other hosts are easily detected because of their characteristic, white, and thick wax cover. *Ceroplastes destructor* can be detected by examining and inspecting plants, especially shrubs or trees, for white wax covers, or for signs of sooty mold or sticky honeydew on leaves, branches and stems, or ants. To be certain of the presence of *C. destructor*, it is necessary to examine slide-mounted specimens under a compound microscope.

Survey site and selection:

Areas where host material is found should be targeted for surveys; these can include orchards, nurseries, residential areas, and other areas where host plants are used as ornamentals.

Time of year to survey:

In Western Cape Province, South Africa, adults can be found from mid-April to September (Davis et al., 2005; Wakgari and Giliomee, 2000). In New Zealand, adults begin to lay eggs in November (Davis et al., 2005).

Identification

CAPS-Approved Method*:

Morphological. Adult females can be distinguished based on morphological characters in slide mounted specimens.

C. destructor was misidentified as *C. ceriferus* in early literature, which is due to the similarity of the wax test of the two species. *C. destructor* can be morphologically distinguished from *C. ceriferus* in slide-mounted specimens. In slide mounted specimens, the anal process is long in *C. destructor* (short in *C. ceriferus*); the spiracular setae are straight-sided in *C. destructor* (curve-sided in *C. ceriferus*); the stigmatic setae are in a compact cluster in *C. destructor* (more spread out in *C. ceriferus*); and by the absence of tubular ducts on the venter of the head in *C. destructor* (Miller, personal communication).

C. destructor also differs from other species of *Ceroplastes* by the possession of different-sized claw digitules (one slender and one broad) and a large and round group of spiracular setae (De Lotto, 1965; Williams and Watson, 1990; Qin and Gullan, 1994).

A key to species of *Ceroplastes* can be found in Williams and Watson (1990).

*For the most up-to-date methods for survey and identification, see Appendix M in the most recent CAPS Survey Guidelines.

Easily Confused Pests

This species has previously been confused with *C. ceriferus* and *C. sinensis* in Australia (Davis et al., 2005) and *C. dugesii* in the United States and Mexico (Qin, 2000). Other *Ceroplastes* species that occur in the United States that may be difficult to distinguish include *C. cirripediformis*, *C. floridensis,* and *C. sinensis* (Davis et al., 2005). Early instars can be difficult to distinguish from one another (Wakgari and Giliomee, 1998).

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