

A NEW SPECIES OF MEALYBUG IN THE GENUS *PSEUDOCOCCUS*
(HOMOPTERA: PSEUDOCOCCIDAE) OF QUARANTINE IMPORTANCE

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Abstract.—A new species of mealybug, *Pseudococcus oederhatti*, is described that has been taken in quarantine on *Aglaonema*, *Citrus*, and other plants and is of concern as a pest. Since it is frequently taken in quarantine at US ports of entry, it is important that the species be described. The adult female and third-instar female are described and illustrated and are incorporated in a key.

Key Words: Mealybugs, Coccoidea, Pseudococcidae, quarantine, citrus, *Aglaonema*

The genus *Pseudococcus* encompasses more than 150 species of mealybugs (Ben-Dov 1994) including several major pests such as the citrophilous mealybug *P. calceolariae* (Maskell), the long-tailed mealybug *P. longispinus* (Targioni Tozzetti), the grape mealybug *P. maritimus* (Ehrhorn), and the obscure mealybug *P. viburni* (Signoret) (hitherto known as *P. affinis* (Maskell) see Ben-Dov and Matile-Ferrero 1995). In recent years an undescribed species of *Pseudococcus* has been intercepted at ports-of-entry in the United States and Japan and has impacted the movement of citrus fruit between Florida and Japan and between the Bahamas and the United States. It has potential quarantine implications on the World movement of ornamentals such as *Aglaonema* (Araceae). The genus *Aglaonema* contains many species grown as ornamentals in subtropical areas and in greenhouses.

The purpose of this research is 1) to describe the morphological characters of this undescribed species so that they can be used to differentiate it from similar species, 2) provide data on hosts and distribution, and 3) incorporate the species in keys to

adult females of *Pseudococcus* so that it can be accurately identified.

METHODS

Terminology in the descriptions follows that of Williams and Watson (1988) and Gimpel and Miller (1996). The cerarii are numbered forward from the anal lobe pair (number 1) to the frontal pair (number 17). The cerarian formula is given as the cerarian number with the number of conical setae in parentheses. For example, the cerarian formula 1–11(2) means that cerarii numbers 1 through 11 each have 2 conical setae. Measurements and numbers are from 10 specimens when available, and are given as an average followed by the range in parentheses. Depositories of specimens are: The Natural History Museum, London (BMNH); California Department of Food and Agriculture, Sacramento (CDA); Florida State Collection of Arthropods, Gainesville (FSCA); Muséum National d'Histoire Naturelle, Paris (MNHN); University of California, Davis (UCD); National Museum of Natural History, Beltsville, MD (USNM).

RESULTS

Pseudococcus odermatti Miller and Williams, new species

Figs. 1, 2

Type data.—The adult female holotype is the right specimen of two on a slide with the left label “*Pseudococcus*/12/ Costa Rica/ ex *Aglaonema* sp./ IV-29-76 leaf/ Miami 13578/ E. B. Lee/ Balsam” right label “*Pseudococcus odermatti* Miller/and Williams/HOLOTYPE” with a map giving the position of the holotype. This slide is deposited in the USNM. In addition there are paratypes that are deposited in BMNH, CDA, FSCA, MNHN, UCD, USNM.

Etymology.—The species epithet is given in recognition of the many contributions of Douglas M. Odermatt, Entomologist, Animal and Plant Health Inspection Service (APHIS), who has not only provided many specimens of this species, but also has added significantly to our knowledge of scale insects through the thousands of identifications that he has provided for APHIS identifiers each year.

Adult female. Slide-mounted characters.—Holotype oval, length 2.6 mm, width 1.6 mm. Paratypes 2.6(1.9–3.1) mm long, 1.5(1.0–1.9) mm wide.

Dorsum with 17 pairs of cerarii, cerarian formula as follows: Left side 1–9(2), 10(3), 11(2), 12(3), 13–14(2), 15(3), 16(4), 17(3); paratypes rarely with 1 conical seta in cerarii 9 and 10, 3(2–4) conical setae in cerarius 12, with 3(2–3) in cerarius 14, with 4(3–5) in cerarius 16, and 3(3–4) in cerarius 17. Cerarius 12 with 4 auxiliary setae (paratypes with 2(1–4) setae), 18 trilocular pores (paratypes with 18(12–22) pores), and 2 discoidal pores (paratypes with 1(0–3) pores). Multilocular pores absent; trilocular pores evenly scattered over surface; discoidal pores of 2 sizes, those associated with oral-rim or oral-collar tubular ducts small, about $\frac{1}{4}$ diameter of trilocular pore, those scattered over surface larger, about $\frac{1}{2}$ size of trilocular pore. Oral-rim tubular ducts each with 1(0–2) associated discoidal

pores, without closely associated setae, oral rims present submarginally posterior of frontal cerarius, absent between cerarii 15 and 16, present between cerarii 13 and 14, also present near cerarii 4–8, 11, and 12 (paratypes also usually with oral rims near cerarii 2 and 9, rarely with oral rim near cerarius 10), also present submedially and medially, with 17 oral rims on abdomen (paratypes with 19(16–22) oral rims). Oral-collar tubular ducts present marginally and submarginally around perimeter of body, also present medially and submedially on anterior abdominal segments, thorax, and head, often with 1 or 2 associated discoidal pores, wall of tube heavily sclerotized, giving bright orange appearance with phase contrast microscopy. Longest submedial seta on abdominal segment VII 57μ long (paratypes 66(49–101) μ); 5 submedial setae on abdominal segment VIII (paratypes 4(2–8) setae), longest seta 52μ long (paratypes 49(37–72) μ).

Anal ring setae 163μ long (paratypes 169(151–195) μ); 1.7 times as long as greatest diameter of ring (paratypes 1.6(1.4–1.9) times).

Venter with multilocular pores in posterior and anterior bands on abdominal segments V–VIII, in posterior band on abdominal segment IV (paratypes sometimes with 1 or 2 pores near anterior margin of abdominal segment IV, rarely with only 1 or 2 pores near anterior margin of abdominal segment III), with 6 pores on thorax (paratypes with 7(1–16) pores). Trilocular pores scattered over surface. Discoidal pores of same 2 sizes as on dorsum, smaller size associated with oral rims, larger size scattered over surface, without a discoidal near eye. Oral-rim tubular ducts usually with 1 associated discoidal, without associated setae, with 5 ducts on submargin from segment II to cerarius 13 (paratypes with 5(4–12) ducts), without duct near frontal cerarius. Oral-collar tubular ducts of 2 sizes, larger size present near posterior band of multilocular pores and on marginal and submarginal areas of abdomen, thorax, and head;

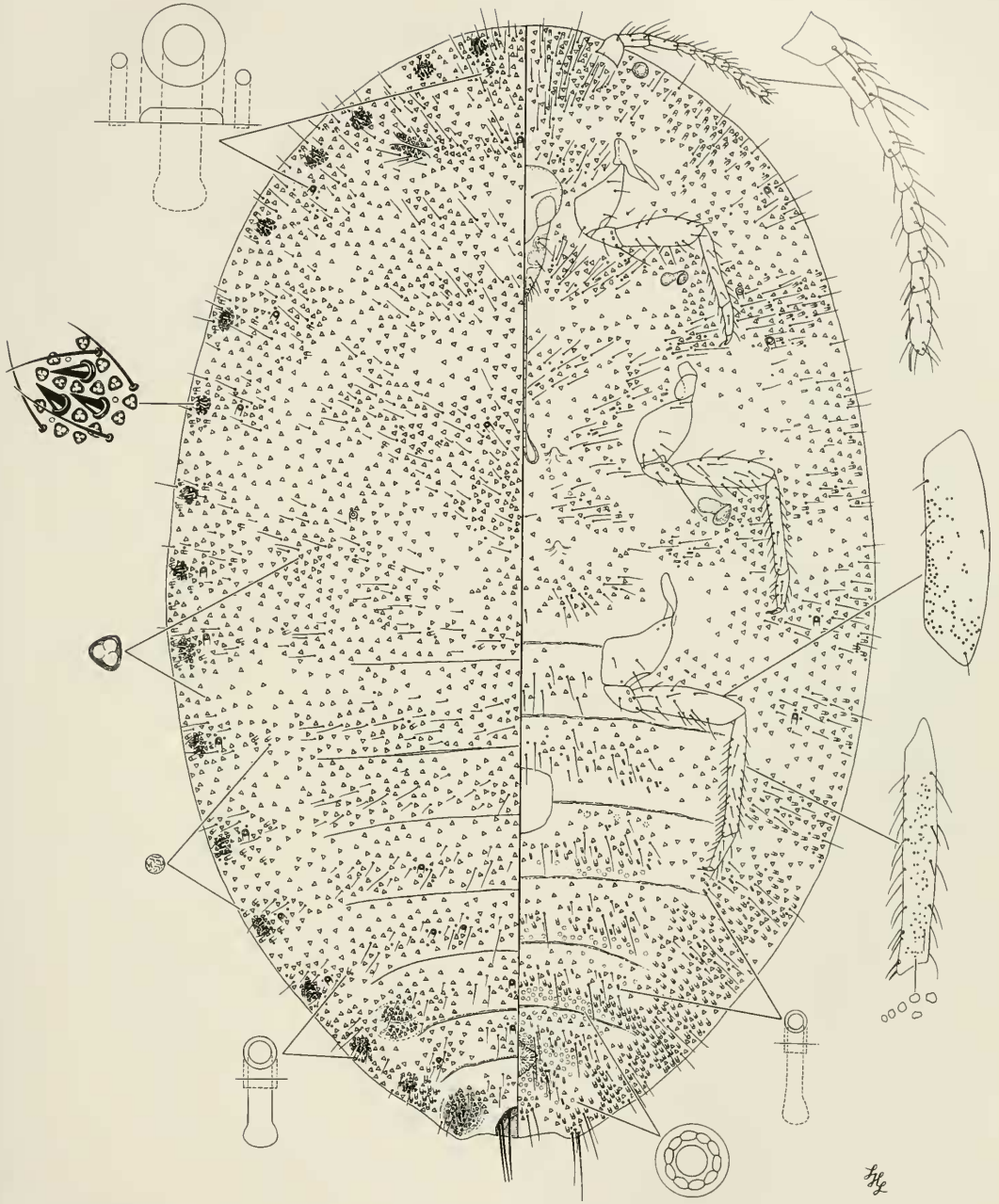


Fig. 1. Adult female *Pseudococcus oedermtti* Miller and Williams. Costa Rica: April 29, 1976, on *Aglaonema* sp. leaf, E. B. Lee (taken in quarantine at Miami, FL).

smaller size near setal bases in medial and submedial areas of abdomen and thorax, 7 oral collars mesad of cerarius 12 (paratypes 4(2-6) ducts). Setae as follows: 4 cisanal, 10(7-13) ducts), 9 associated with cerarii 10 and 11 (paratypes with 12(8-15) ducts),

22 posterior of eye (paratypes 21(16-33) ducts), 8 on each side of head (paratypes 4(2-6) ducts). Setae as follows: 4 cisanal, 10(7-13) ducts), 9 associated with cerarii 10 and 11 (paratypes with 12(8-15) ducts), longest 79 μ long (paratypes 71(52-89) μ); longest anal-lobe seta 143 μ long (paratypes

160(128–190) μ); longest seta on trochanter 148 μ long (paratypes 136(128–163) μ).

Circulus 168 μ wide (paratypes 153(130–170) μ), divided by intersegmental fold. Labium 165 μ long (paratypes 160(148–203) μ). Antennae 8-segmented, 490 μ long (paratypes 431(384–620) μ). Legs with 95 translucent pores on hind femur (paratypes 118(43–222) pores); 55 pores on hind tibia (paratypes 95(41–144) pores). Femur 279 μ long (paratypes 276(229–329) μ); tibia 279 μ long (paratypes 277(242–353) μ); tarsus 114 μ long (paratypes 108(99–124) μ). Tibia/tarsus 2.4 (paratypes 2.6(2.4–3.3)). Hind tibia with 30 setae (paratypes 29(26–35) setae).

Notes.—The adult females are variable in the number of dorsal oral-collar tubular ducts, the size of the legs, antennae, and labium, the number of translucent pores on the hind femur and tibia, and the length of the dorsal setae. In general, New World populations often have shorter dorsal setae, Chinese specimens have more translucent pores, and Japanese populations have longer appendages and a larger tibia/tarsus statistic. However, this variation overlaps sufficiently among specimens collected at various localities to suggest that there is only one highly variable species.

Third-instar female. Slide-mounted characters.—Body oval, length 1.3(1.2–1.4) mm, width 0.8(0.7–0.8) mm.

Dorsum with 17 pairs of cerarii, cerarian formula as follows: 1–11(2), 12(3 rarely 2), 13–14(2 rarely 3), 15(3 rarely 1 or 2), 16(3 or 4), 17(3 rarely 4). Cerarius 12 with 1(0–1) auxiliary setae, 5(3–6) trilocular pores, without associated discoidal pores. Multilocular pores absent; trilocular pores evenly scattered over surface; discoidal pores of 2 sizes, those associated with oral-rim or oral-collar tubular ducts small, about $\frac{1}{4}$ diameter of trilocular pore, those present in medial areas of abdominal segments VII and VIII larger, about $\frac{1}{2}$ size of trilocular pore. Oral-rim tubular ducts with 1(0–1) associated discoidal pores, without closely associated setae, oral rims present submarginally pos-

terior of frontal cerarius, associated with cerarii 12, 8, and 5, rarely 1 duct missing on 1 side of body, also present submedially on 1 or both sides of metathorax with 4(3–4) oral rims on abdomen, 5(5–6) on thorax and head. Oral-collar tubular ducts present marginally and submarginally around perimeter of body, also present submedially on anterior abdominal segments, thorax, and head, often with 1 or 2 associated discoidal pores, wall of tube heavily sclerotized, giving bright orange appearance with phase contrast microscopy. Longest submedial seta on abdominal segment VII 30(28–32) μ long; 2 submedial setae on abdominal segment VIII, longest seta 23(20–27) μ long.

Anal ring setae 109(104–116) μ long; 1.6(1.5–1.8) times as long as greatest diameter of ring.

Venter without multilocular pores; trilocular pores scattered over surface. Discoidal pores same as on dorsum, smaller size associated with oral rims, larger size in submedial line on each side of abdomen. Oral-rim tubular ducts usually with 1 associated discoidal, without associated setae, with 2(1–4) ducts on submargin from abdominal segment II to cerarius 13, without duct near frontal cerarius. Oral-collar tubular ducts of 2 sizes, larger size on marginal and submarginal areas of abdomen, thorax, and head; smaller size near setal bases in medial and submedial areas of thorax, 1(0–1) oral collars mesad of cerarius, 1(0–2) associated with cerarii 10 and 11, 2 posterior of eye, 1(0–1) on each side of head. Setae as follows: 4 cisanal, longest 38(31–42) μ long; longest seta on trochanter 85(72–91) μ long.

Circulus 90(74–99) μ wide, divided by intersegmental fold. Labium 112(104–119) μ long. Antennae 7-segmented, 270(264–273) μ long. Legs without translucent pores. Femur 144(136–149) μ long; tibia 118(109–124) μ long; tarsus 96(96–99) μ long. Tibia/tarsus 1.2(1.1–1.3). Hind tibia with 13(12–15) setae.

Notes.—The description of the third in-

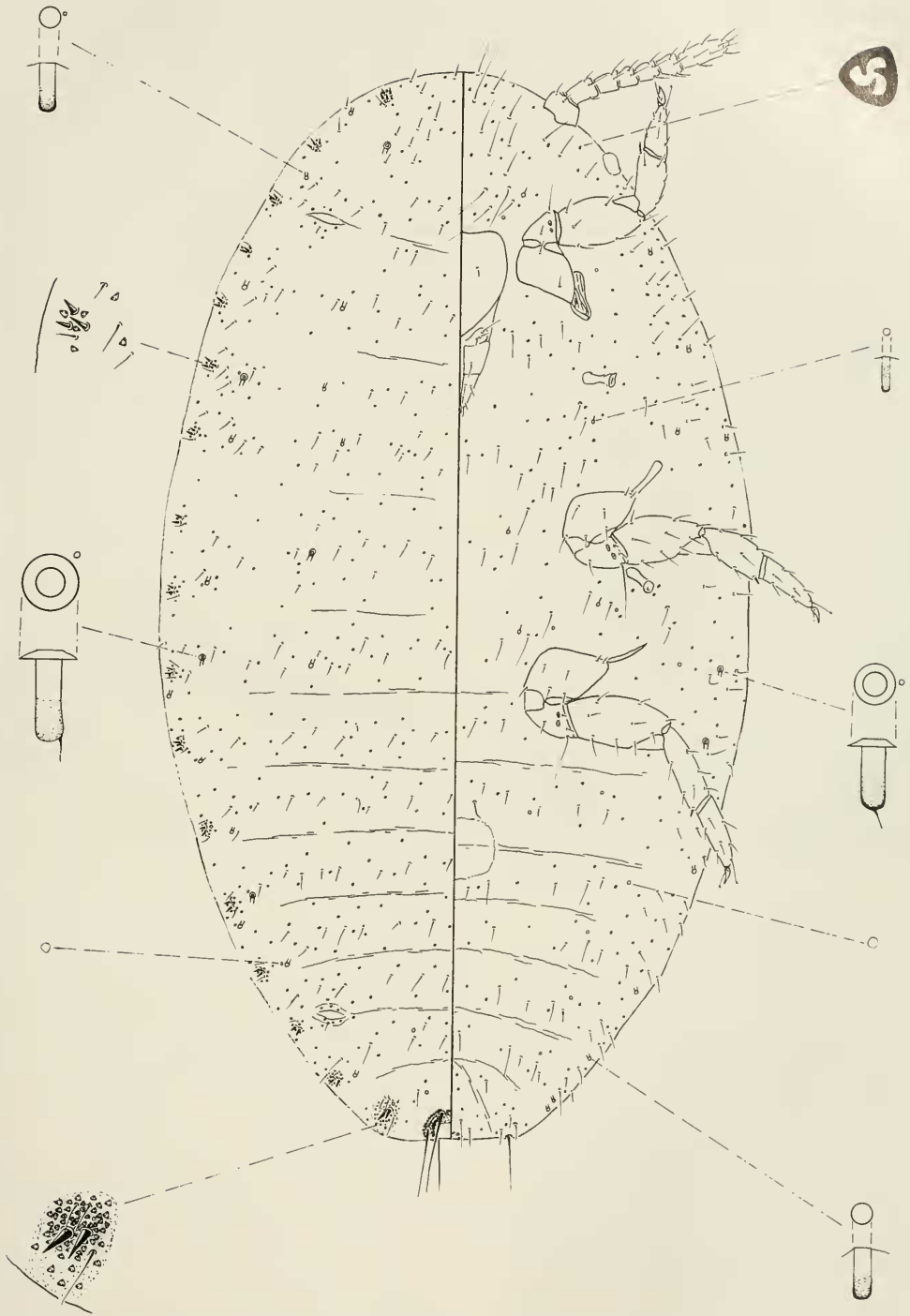


Fig. 2. Third-instar female *Pseudococcus odermatti* Miller and Williams. Belize: April 29, 1976, on *Aglaonema* sp. leaf, E. B. Lee (taken in quarantine at Miami, FL).

star is based on 28 specimens from Belize on *Aglaonema* sp.

Discussion.—*Pseudococcus odermatti* is most similar to *Pseudococcus comstocki* (Kuwana) (see Williams and Granara de Willink 1992) and *P. gilbertensis* Beardsley (see Beardsley 1966). It is easily distinguished from them by the absence of translucent pores on the hind coxae. It also can be distinguished from *P. comstocki* by having no multilocular pores on the ventral surface of abdominal segment II and from *P. gilbertensis* by having more than 5 ventral oral-collar tubular ducts associated with cerarius 12. *Pseudococcus comstocki* has many multiloculars on abdominal segment II and *P. gilbertensis* has fewer than 5 ventral oral-collar tubular ducts associated with cerarius 12.

The area of origin of this species appears to be Old World since its closest relatives seem to be the old world species *P. comstocki* and *P. gilbertensis* and since the most common hosts *Aglaonema* and *Citrus* are from the Old World.

Keys.—The key to adult females of *Pseudococcus* presented by Williams and Granara de Willink (1992) should be modified as follows to accomodate the new species:

Change couplet 7 as follows:

- 7. Oral-rim tubular ducts absent from head near frontal cerarius; dorsal setae short, less than 30µ long *calceolariae* (Maskell)
- Oral-rim tubular ducts on 1 or both sides of head near frontal cerarius; dorsal setae long, at least 40µ long 7A
- 7A. Oral-rim tubular ducts few, present usually next to frontal cerarii, and between cerarii 15 and 16, and with 1 pair near abdominal cerarii only; absent from midline of abdomen and submarginally *agavis* MacGregor
- Oral-rim tubular ducts relatively abundant, present usually next to frontal, and near cerarii 4–8, 11 and 12, and between 13 and 14; without oral rim between 15 and 16; present near midline of abdomen and submarginally *odermatti* Miller and Williams n.sp.

Specimens Examined.—Paratypes. BAHAMAS: Marsh Harbor, Abaco, X-23-92,

on *Citrus paradisi*, R. L. Morris (1 ad ♀ on 1 sl) BMNH; New Providence, XI-8-78, on *Annona squamosa*, C. W. Smith (11 ad ♀, 2 third instar ♀ on 3 sl); no specific locality, II-13-85, on *Aglaonema* sp., H. D. Hannagan (taken in quarantine at Miami, FL)(1 ad ♀ on 1 sl) USNM; no specific locality, I-19-86, on *Annona squamosa*, C. Cohen (1 ad ♀ on 1 sl); no specific locality, II-7-94, IX-25-95, on *Citrus latifolia*, R. Morris (taken in quarantine at Ft. Pierce, FL)(2 ad ♀, 1 third instar ♀ on 3 sl) USNM. BELIZE: VIII-13-75, on *Aglaonema* sp., H. L. Rubin (taken in quarantine at Miami, FL)(16 ad ♀, 26 third instar ♀, 2 second instar ♂ on 6 sl) BMNH, CDA, USNM. CHINA: Canton, V-18-37, V-17-39, on *Aglaonema* sp., (taken in quarantine at Washington, DC)(3 ad ♀ on 2 sl) USNM; IV-23-40, IV-26-40, on *Aglaonema* sp., (taken in quarantine at Seattle, WA)(2 ad ♀ on 2 sl) MNHN, USNM. COSTA RICA: IV-29-76, on *Aglaonema* sp. leaf, E. B. Lee (taken in quarantine at Miami, FL)(4 ad ♀ on 4 sl) BMNH, UCD, USNM. HONG KONG: Sheung Shui, IV-13-93, on *Pittosporum tobira*, C. S. K. Lau (1 ad ♀ on 1 sl) BMNH; IV-3-36, V-21-40, on *Aglaonema* sp., Adams and Limber (5 ad ♀ on 2 sl) USNM.

UNITED STATES: FLORIDA: Homestead, III-22-73, on *Pyracantha* sp., W. H. Pierce (1 ad ♀ on 1 sl) FSCA; I-7-93, III-1-93, V-6-93, on grapefruit, T. Sugimoto (taken in quarantine at Yokohama, Japan)(3 ad ♀ on 3 sl) BMNH, USNM. HAWAII: VIII-16-94, on *Diospyros blancoi*, Hara and Maemoto (2 ad ♀ on 2 sl) USNM.

Other material, not paratypes (all in USNM unless otherwise stated). CHINA: IV-26-40, on *Aglaonema* sp., (taken in quarantine at Washington, DC)(2 ad ♀ on 1 sl); V-23-41, IX-23-41, on *Aglaonema* sp., (taken in quarantine at Blaine, WA and Hoboken, NJ)(3 ad ♀ on 2 sl). BAHAMAS: Marsh Harbor, Abaco, X-23-92, on *Citrus paradisi*, R. L. Morris (3 ad ♀ on 3 sl); III-8-94, on *Citrus latifolia*, R. Morris (taken in quarantine at Ft. Pierce, FL)(1 ad ♀ on 1

sl) BMNH. JAPAN: VI-20-33, on *Fatsia japonica*, W. H. Wheeler (taken in quarantine at Seattle, WA)(1 ad ♀ on 1 sl); IX-13-35, on *Fatsia japonica*, K. E. Miller (taken in quarantine at New Orleans, LA)(2 ad ♀ on 1 sl).

SUMMARY

Pseudococcus oedermtti occurs on a number of agricultural and ornamental hosts and could potentially pose a threat as an important pest. It is reported on *Aglaonema* (Araceae), *Annona* (Annonaceae), *Citrus* (Rutaceae), *Diospyros* (Ebenaceae), *Fatsia* (Araliaceae), *Pittosporum* (Pittosporaceae), *Pyracantha* (Rosaceae), and is known from Florida and Hawaii in the United States and from the Bahamas, Belize, China, Costa Rica, Hong Kong, and Japan.

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