Euphorbia Pit Scale on *Plumeria rubra*

DONALD R. HODEL, LINDA M. OHARA, AND GEVORK ARAKELIAN

In late September, 2020, Phil Kinoshita, a plumeria grower and collector in Whittier, California about 20 km east of Los Angeles, noticed lesions or necrotic areas and pits on leaf blades, midribs, and petioles on several *Plumeria rubra* cultivars in his garden. Co-author Ohara received affected leaves from Phil and, stating that she had never seen this type of damage, shared them with co-author Hodel, and they detected scales or immature psyllids in several of the pits on the petioles and leaves (**Figs. 1–2**). Ohara and Hodel visited Kinoshita's garden in early October, photographed and collected additional material, upon which we had noticed more of this pest. They shared the new material with co-author Arakelian, who identified the pest as *Planchonia stentae*, the Euphorbia or South African pit scale, and noted that he had detected it before on *Plumeria*. Here we provide an overview of this pest, including its history, damage, description, hosts, and management, mostly as it relates to *Plumeria rubra*.

History

Brain (1920) was the first to name and described the Euphorbia pit scale, naming it *Asterolecanium stentae* and noting it in South Africa on *Caralluma caudata*, *Huernia transvaalensis*, and *Stapelia* sp., all members of the Apocynaceae family, as is *Plumeria* and now *Asclepias*. The epithet honors a Miss S. Stent, who sent Brain specimens from *C. caudata* in July, 1916. Brain noted he had collected additional specimens on *H. transvaalensis* and *Stapelia* sp. in the "Rockery at Division of Botany, Pretoria." He designated all collections of the new pit scale as "Collection No. 29."

Brain's type specimens of his new species consists of four original slides in the Entomological Collection of the United States National Museum (Smithsonian Institute) (USNM), Washington, D C. and six original slides at the National Collection of Insects, Plant Protection Research Institute, Pretoria (SANC), South Africa. Because Brain did not designate a holotype, these original collections are syntypes and Giliomee and Kozar (2008) selected a lectotype from among the material at SANC as the lectotype.

Russell (1941), who also treated this pest as *Asterolecanium stentae*, redescribed the adult female and larva from specimens collected on the same and related Apocynaceous plants in South Africa and Kenya. Borschenius (1960) transferred *Asterolecanium* to Planchonia, renaming the Euphorbia pit scale to *P. stentae*.

1. *Planchonia stentae* on the abaxial or underside of the leaf of *Plumeria rubra*, Whittier, CA. Note the purplish red halos around the pest. © D. R Hodel.

2. *Planchonia stentae* in pits on the petiole of *Plumeria rubra*, Whittier, CA. Note the purplish red halos around the pits and the pest. © D. R Hodel.

3. *Planchonia stentae* and its damage are first noticed on the abaxial surface of these new leaves of *Plumeria rubra*, Whittier, CA. © D. R Hodel.

Planchonia stentae occurs in South Africa and North and South America (Stumpf and Lambdin 2000) and Great Britain (Malumphy 2009). It can be a serious pest on tropical and subtropical ornamental plant material; for example, in Florida it is a serious pest of a wide variety of plants (Stumpf and Lambdin 2000).

Damage

The name pit scale is derived from the fact that as the pest feeds it injects a chemical compound that causes the pit growth response in the host plant (Gill 1993). Thus, *Planchonia stentae* is found in pits in the plant tissue. Damage will likely be detected on the new leaves first because the pits in which *P. stentae* reside are formed most easily on soft, tender, pliable young growth (**Fig. 3**). Light greenish yellow or tiny reddish brown spots surrounded by a swollen, purplish red halo on the petiole, midrib and abaxial (underside) surface of the leaf blade of young, newly unfurled leaves, are signs and symptoms of this pest on *Plumeria rubra* (**Figs. 4–7**). The greenish yellow spot, which can appear whitish because of a white wax fringe, and the tiny reddish brown spots (**Fig. 8**) are the pests, the former adults or young adults and the latter likely a dead nymphal stage, while the swollen, purplish red halo marks host tissue reacting to the infestation. The purplish red color of the swollen halo surrounding the pit might be particular to *Plumeria*, perhaps even to *P. rubra* or even specific cultivars, because we have not observed or read in the literature of such a structure of this color associated with *P. stentae* on other genera of plants.

As the pest develops further, a distinct, mostly superficial pit forms. The inside of the pit is greenish, like the color of normal tissue, while the pit is mostly the result of the surrounding, swollen, purplish red halo. One, or perhaps more, life stages of the pest, from early instar to adult, can typically be found in the pit. When viewed from the adaxial leaf blade surface, damage from the pits on the abaxial surface is greenish with a brownish halo and is devoid of pit scales (**Fig. 5**); it appears that *Planchonia stentae* only inhabit the abaxial leaf blade surface. As pits age and the pit scale dies or departs, pits become tan colored and the tissue appears desiccated.

On the petiole and midrib, the purplish red halos are oval and about 12 × 5 mm. The green, inner area of the pit is about 3.5 mm long. Pits on the abaxial leaf blade are irregularly rounded, much smaller, about 1–3 mm diam., and often touch the midrib or a lateral nerve. The difference in size and shape of pits on the petiole and those on the leaf blade might be a product of the arrangement of the vascular system where the infestation occurred, which, because of its strength, can constrain swelling and affect the size and shape of a pit. Pits on the petiole, where the vascular system is laid down in the same direction as the elongate organ where it occurs, have their longer side arranged in the same direction as that of the petiole; pits are longer than wide because they meet less resistance when they develop in a parallel manner to the vascular tissue. Conversely, pits in the leaf blade are irregularly rounded because the net-veined vascular

4. The abaxial surface of the leaf of *Plumeria rubra* showing the irregularly rounded pit and purplish red halo caused by *Planchonia stentae*, Whittier, CA. © D. R Hodel.

5. The adaxial surface of the leaf of *Plumeria rubra* showing the irregularly rounded damage and brownish halo caused by *Planchonia stentae* on the abaxial surface, Whittier, CA. The pest typically does not inhabit the adaxial leaf surface. © D. R Hodel.

6. *Planchonia stentae* in its elongated pit surrounded by the purplish red halo on the petiole of Plumeria rubra, Whittier, CA. © D. R Hodel.

7. *Planchonia stentae* in its elongated pit surrounded by the purplish red halo on the petiole of Plumeria rubra, Whittier, CA. © D. R Hodel.

8. The tiny reddish brown spots in these elongated pits on the petiole of *Plumeria rubra* are likely dead nymphal stages of *Planchonia stentae*. © D. R Hodel.

9. Heavy infestations of *Planchonia stentae* on *Plumeria rubra* can distort and deform newly developing leaves. Note the yellow nymphs. The orange-brown powdery substance is cinnamon applied unsuccessfully as a control measure. © G. Arakelian.

tissue, which tends to restrict pit development and make if more rounded although irregularly so (**Figs. 4, 6–8**).

Severity of damage to the *Plumeria* plant is mostly unknown. At the least, damage is unsightly and the small areas of necrotic tissue devoid of chlorophyll reduce photosynthetic production slightly. If pest populations remain small and damage is restricted to only a few leaves and is not widespread, negative long-term effects on *Plumeria* would probably be minimal. Heavy infestations, though, with dense, contiguous pits, can distort and deform newly developing leaves, so much so that the pits can be difficult to detect and are primarily visible because of the purplish red halo and the white to greenish color of the inhabiting *Planchonia stentae* (**Fig. 9**).

Description and Biology

The description is from Brain (1920), Gill (1993), Russell (1941), and our field observations. Pit scales have a tough, wax covering, called a test, that is like that of armored scales. They also have marginal and dorsal wax fringes, resembling whitefly pupae. Pit scales are generally larger than whitefly pupae, and carefully turning over a living pit scale will reveal four, radiating spiracular furrows filled with white wax (Gill 1993).

The test of female *Planchonia stentae* is 2–2.5 mm in diam., mostly circular but sometimes slightly longer than wide, convex dorsally with a broad longitudinal median keel-like ridge and sometimes faint transverse striations, sometimes with a slightly upturned posterior extremity, pale yellow or greenish yellow to yellow, translucent to nearly opaque, thick, and slightly punctate. The marginal filaments are whitish, shortest at the posterior end (**Fig. 10**). Dorsal filaments are also whitish but arranged in transverse tufts along the median ridge and in inconspicuous transverse rows elsewhere.

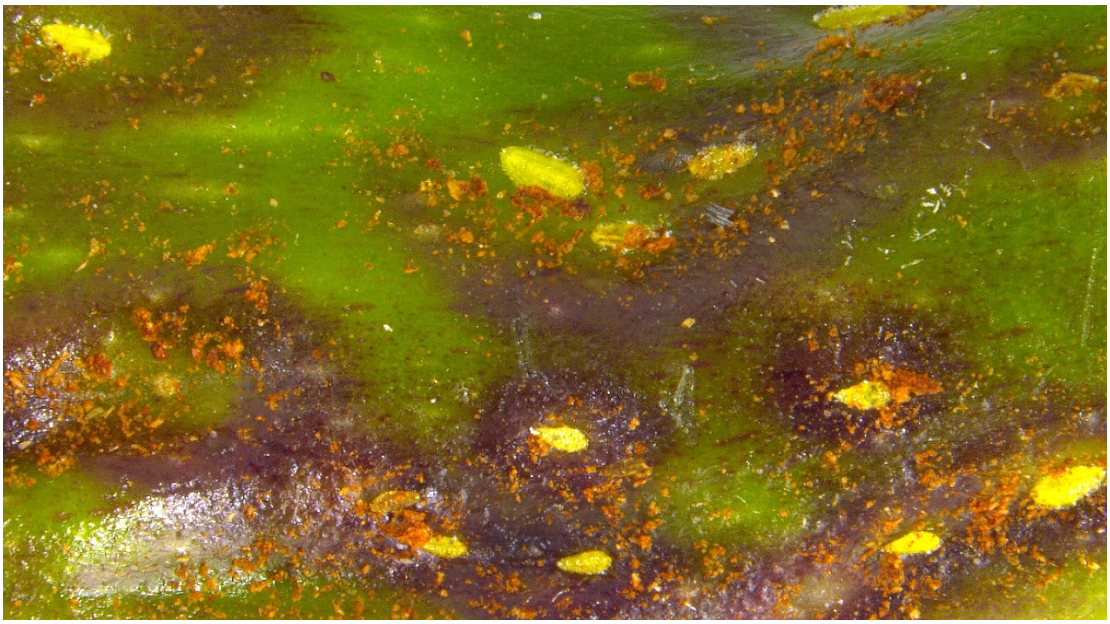
Nymphs are more elongate, elliptical, light yellow or greenish yellow depending on their developmental stage, and show the white, wax fringe around their margin (**Figs. 9, 11–12**).

The males are mostly useless for identification of this pest, have rudimentary wings, and do not settle on the plant and feed and make pits.

The biology of *Planchonia stentae* is largely unknown (UC IPM 2020). In general pit scales develop through three life stages, including egg, nymph, and adult although nymphs might progress through more than one sub-stage. Recently hatched early nymphs are briefly mobile but as they develop, they become immobile and sedentary in their pit where they grow to adults (UC IPM 2020).

10. Adult female *Planchonia stentae* are mostly circular, convex dorsally, pale yellow or greenish yellow to yellow, and translucent to nearly opaque with white marginal filaments. Here they are on *Asclepias curassavica*, a companion plant to the *Plumeria rubra*, Whittier, CA. © G. Arakelian.

11. Nymphs of *Planchonia stentae* are more elongate, elliptical, light yellow or greenish yellow depending on their developmental stage, and show the white, wax fringe around their margin, *Plumeria rubra*, Whittier, CA. © G. Arakelian.



12. Nymphs of *Planchonia stentae* are more elongate, elliptical, light yellow or greenish yellow depending on their developmental stage, and show the white, wax fringe around their margin, *Plumeria rubra*, Whittier, CA. The orange-brown powdery substance is cinnamon applied unsuccessfully as a control measure. © G. Arakelian.

Hosts

The polyphagous *Planchonia stentae* has a wide host range and has been detected on at least 50 genera in 15 families (Stumpf and Lambdin 2000). In California Gill (1993) reported it on plants of the Euphorbiaceae and Asclepiadaceae (now Apocynaceae) families. Stumpf and Lambdin (2000) reported it on *Euphorbia* sp. and *Lantana* sp. in California, and in Florida it has become a major pest of numerous introduced and native plant species.

In California, *Planchonia stentae* has been recorded on *Hoya*, *Mandevilla*, and *Plumeria* (Apocynaceae), *Rhynchospermum jasminoides* (Asteraceae), *Buxus* (Buxaceae), *Kalanchoe* (Crassulaceae), *Hardenbergia* and *Lathyrus odoratus* (Fabaceae), *Jasminum* (Oleaceae), *Penstemon* (Plantaginaceae), and *Lantana* (Verbenaceae). We have also seen it on *Trachelospermum jasminoides* and *Stephanotis floribunda* (Apocynaceae) and *Moringa* (Moringaceae).

At the Whittier, California garden where we collected the infested *Plumeria* material, we also found it on adjacent *Asclepias curassavica* (tropical milkweed, Apocynaceae), an invasive species with yellow, orange, and red flowers much cultivated as a butterfly plant.

Management

No action is necessary if damage from *Planchonia stentae* is slight or insignificant. However, monitor plants regularly and if damage becomes more severe, action might be necessary. A strong stream of water can dislodge early nymphal stages. Encourage beneficial organisms like predators and parasitoids. Cortez-Madrigal et al. (2020) reported finding parasitic wasps in the family Encyrtidae inside specimens of *P. stentae* on *Asclepias curassavica* in Mexico.

Horticultural oil applied to the shoot tips in late winter or early spring before new leaves emerge might provide control. If damage and the infestation become even more severe, consider pesticides like bifenthrin or other pyrethroid materials or a systemic like imidacloprid.

Because *Planchonia stentae* has such a wide host range, monitor not only the *Plumeria* plants but adjacent plants, which also might need to be treated.

Read the label thoroughly and follow all safety precautions judiciously before applying any pesticide. Keep in mind the damage that pesticides can do to the environment and weigh their use carefully against the perceived benefits.

Acknowledgements

We sincerely thank Susan Eubank, librarian, Los Angeles County Arboretum and Botanic Garden, Arcadia, California, for providing some of the difficult-to-obtain literature.

Literature Cited

Brain, C. K. 1920. The Coccidae of South Africa-IV. Bull. Ent. Res. 10: 95–128.

Cortez-Madrigal, H., A. Ramírez-Cruz, and C. F. Stumpf. 2020. First record of *Planchonia stentae* (Brain, 1920) (Hemiptera: Coccomorpha: Asterolecaniidae) on *Asclepias curassavica* Linnaeus, 1753 (Gentianales: Asclepiadaceae) in Mexico, with observations on the parasitic Encyrtidae. Insecta Mundi 0782: 1–6.

Giliomee, J. H. and F. Kozar. 2008. Review of the family Asterolecaniidae (Hemiptera: Coccoidea) in South Africa, with the description of a new species. African Ent. 16(2): 276–286.

Gill, R. J. 1993. *The Scale Insects of California: Part 2. The Minor Families (Homoptera: Coccoidea).* California Department of Food and Agriculture, Sacramento, CA. 241 pp.

Malumphy, C. 2009. A brief review of pit scales (Hemiptera: Asterolecaniidae) recorded in Great Britain. Cecidology 24: 46–49, 64.

Russell, L. M. 1941 A classification of the scale insect genus *Asterolecanium*. U. S. Dept. Agric., Misc. Pub. 424: 1–319.

Stumpf, C. F. and P. L. Lambdin. 2000 Distribution and known host records for *Planchonia stentae* (Hemiptera: Coccoidea: Asterolecaniidae). Florida Ent. 83(3): 368–369.

UC IPM. 2020. Pit scales—Asterolecaniidae family. *http://ipm.ucanr.edu/PMG/GARDEN/PLANTS/INVERT/pitscales.html*

Donald R. Hodel is emeritus landscape horticulture advisor for the University of California Cooperative Extension in Los Angeles. *drhodel@ucanr.edu*

Linda M. Ohara is a biology sciences lab technician at El Camino College in Torrance, CA, a horticulturist, and a former nurserywoman. *lohara@elcamino.edu*

Gevork Arakelian is the entomologist with the Los Angeles County Agricultural Commissioner/Weights & Measures in South Gate, CA. *GArakelian@acwm.lacounty.gov*

Publication Date: 6 November 2020.

PalmArbor: *http://ucanr.edu/sites/HodelPalmsTrees/PalmArbor/*

ISSN 2690-3245
Editor-In-Chief: Donald R. Hodel

Hodel Palms and Trees: *http://ucanr.edu/sites/HodelPalmsTrees/*