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Thysanofiorinia leei (Diaspididae: Coccomorpha: Hemiptera), lychee leei scale, a new U.S. continental record in Florida and potential pest of Florida lychee

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INTRODUCTION

*S*amples of *Thysanofiornia leei* Williams were submitted by Shannan Webb (FDACS-DPI) on February 28 and April 16, 2019 from Broward County (E2019-1545, E2019-1961). These were identified as a new U.S. continental record and confirmed by Dr. Gregory A. Evans (USDA/ APHIS/ PPQ) and Scott Schneider (USDA/ ARS/ SEL). A sample from another location in Broward County was submitted on May 6, 2019 by Christina Urbina (FDACS-DPI) (E2019-2470) confirming its presence in the county. Three more recent samples represent new county records: Collier County submitted by Leonora Coleman (FDACS-DPI) on April 30, 2019 (E2019-2458); Lee County submitted by Terri Jones (USDA) on May 22, 2019 (E2019-2907); and Charlotte County submitted by Matt Brodie (FDACS-DPI) on June 4, 2019 (E2019-3120). Reevaluating older Florida samples of a closely related species, the longan scale, *Thysanofiorinia nephelii* (Maskell), we discovered first instar specimens of *T. leei* from Broward County (E2004-8090) and Miami-Dade County (E2005-299) collected 15 years earlier. The longan scale was first reported from Florida in 1996 with two independent finds in Miami-Dade County. For the next five years, there were a few records of the longan scale's occurrence in the field (Suh et al. 2007) and it remains a minor pest. The lychee leei scale may have been in Florida at unnoticeable population levels since 2004.

GEOGRAPHCIAL RANGE

Thysanofiorinia leei has been reported from at least three countries in its presumed home range of Southeast Asia (China, India, Taiwan) (García et al. 2016). It was first reported out of its home range from the Hawaiian Islands (Kauai, Oahu) and now from Florida (Broward, Charlotte, Collier and Lee counties). *Thysanofiorinia nephelii* has the same home range as *T. leei* and has been reported from at least 15 countries worldwide. *Thysanofiorinia nephelii* has spread widely in Florida in the last two decades being reported in 17 counties including Alachua, Brevard, Broward, Collier, Hillsborough, Lake, Lee, Manatee, Miami-Dade, Orange, Osceola, Palm Beach, Pasco, Pinellas, Polk, St. Lucie and Suwannee. The spread of *T. leei* to other countries and in Florida is quite possible.

HOST PLANTS

Thysanofiorinia leei is reported from two hosts, namely *Litchi chinensis* Sonn. and *Nephelium sp. (*Sapindaceae) (García et al. 2016), but it has only been detected on lychee in Florida.

FSCA COLLECTION ANALYSIS

So far, we have 45 slides of *T. leei* collected from *L. chinensis* in our collection including E2004-8090 (3 slides), E2005-299 (1 slide), E2019-1545 (17 slides), E2019-1961 (4), E2019-2338 (1), E2019-2458 (6), E2019-3074 (6), E2019-3085 (2), and E2019-3120 (5). There are 145 slides identified as *T. nephelii* in our records since 1995. Most *T. nephelii* were reported from *Dimocarpus longan* Lour. (106 records) and *Litchi chinensis* (32 records). However, there was at least one record of *T. nephelii* from each of following newly reported host plants *Magnolia grandiflora* L. (Magnoliaceae), *Mangifera indica* L. (Anacardiaceae), *Persea borbonia* (L.) Spreng. (Lauraceae), and *Annona* sp. (Annonaceae).

IDENTIFICATION

Species of *Thysanofiorinia* are pupillarial where the adult female resides in the shed skin of the second instar. Therefore, only the first and second-instar shed skins are present in fully mature females. The scale is subcircular to oval, pale yellow brown to green with the prominent exuviae of the first instar of the same color and lying at the anterior end (Fig 1,2,3). The adult female is ovoid, about 0.7 mm long, membranous except for a slightly sclerotized pygidium and an area between the anterior and posterior spiracles that is slightly [sclerotized containing dermal granulations]. The pygidium is rounded without noticeable lobes except for two small, short projections each with a dentate distal edge representing the median lobes, these are separated by a space equal to about twice the width of one lobe, the space forming a wide and shallow notch (Williams 1971). Adult females of *Thysanofiorinia leei* differ from *T. nephelii* (characters in parentheses are those of *T. nephelii*) in lacking the prominent median lobes in the adult female (large and conspicuous) and in possessing six pairs of gland spines on the third and posterior segments (3 pairs on pygidium only) (Williams 1971). The first instar nymphs in both species are oval, have 19 pairs of prominent, spiny, elongate setae marginally, have no marginal processes at the posterior end (Fig. 1), 6 segmented antennae, the terminal segment is as long as the preceding 3 segments combined, and one disc pore near the anterior spiracle. First instar nymphs differ by lacking dorsal ducts on the head (present in *T. nephelii*). Second instar females of *T. leei* have an acute sclerotization projecting anteriorly from the median lobes (rounded sclerotization in *T. nephelii*).

BIOLOGY

The biology of *Thysanofiorinia leei* is most likely similar to *T. nephelii* which is found on leaves and stems of lychee (Mossler 2002).

DAMAGE

In light of the fact that *T. nephelii* is not considered to be a pest (Suh et al. 2007) and because of the similarities in pest potential and biology of *T. leei* and *T. nephelii*, it is assumed *T. leei* is unlikely to be a serious pest, however if unchecked this might become a pest in Florida. Symptoms of armored scale infestation include leaf chlorosis, leaf abscission, stem and limb dieback. Since scale insects are relatively immobile and require at least 2-6 months for the eggs to reach the adult stage, an infestation builds up slowly (in comparison to mites or aphids) and may be hard to spot (Mossler 2002). It is also important to verify scale insects attached to the plant are alive or dead mummies accumulated on the plant over time.

MANAGEMENT

Generally, the most effective control of armored scales is with biological control agents. Chemical control is best implemented when armored scale are crawlers or first instar nymphs. Second instars, eggs and adults are usually recalcitrant to insecticide applications (Crane et al. 2005).

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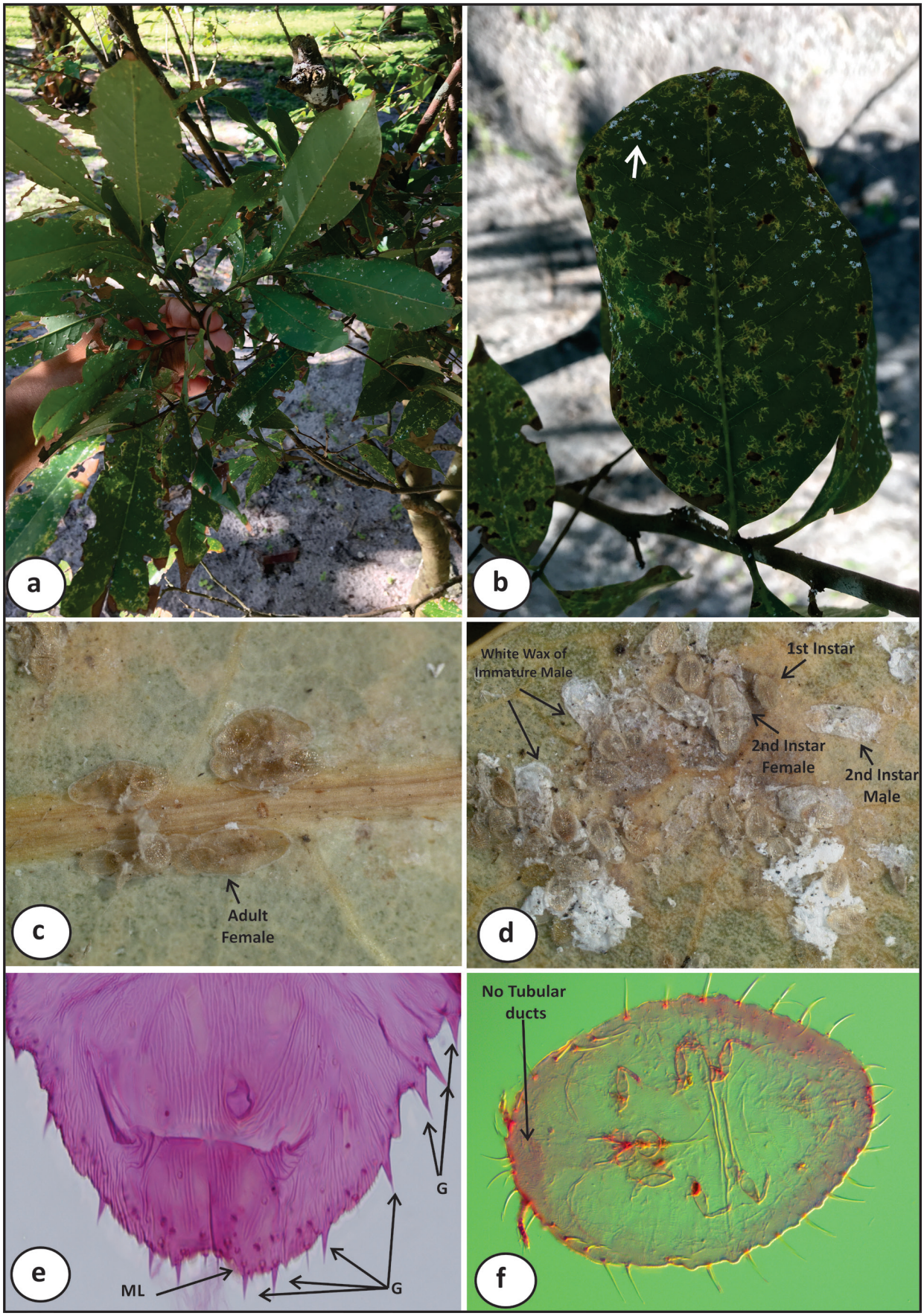

Figure 1. (1a) Infestation of lychee leei scale, *Thysanofiorinia leei* on lychee tree (E2019-1545 and E2019-1961). **(1b)** Close-up of leaf showing white wax. **(1c)** Close-up of adult female inside second instar shed skin along the mid rib of leaf. **(1d)** Infestation containing different life stages of lychee leei scale. **(1e)** Slide-mounted view of pygidium of adult female. **(1f)** Slide-mounted view of first instar. Gland spines=G. Median lobes =ML. Slides prepared by Jessica Awad. Photo by Shannan Webb and Muhammad Z. 'Zee' Ahmed, FDACS-DPI.

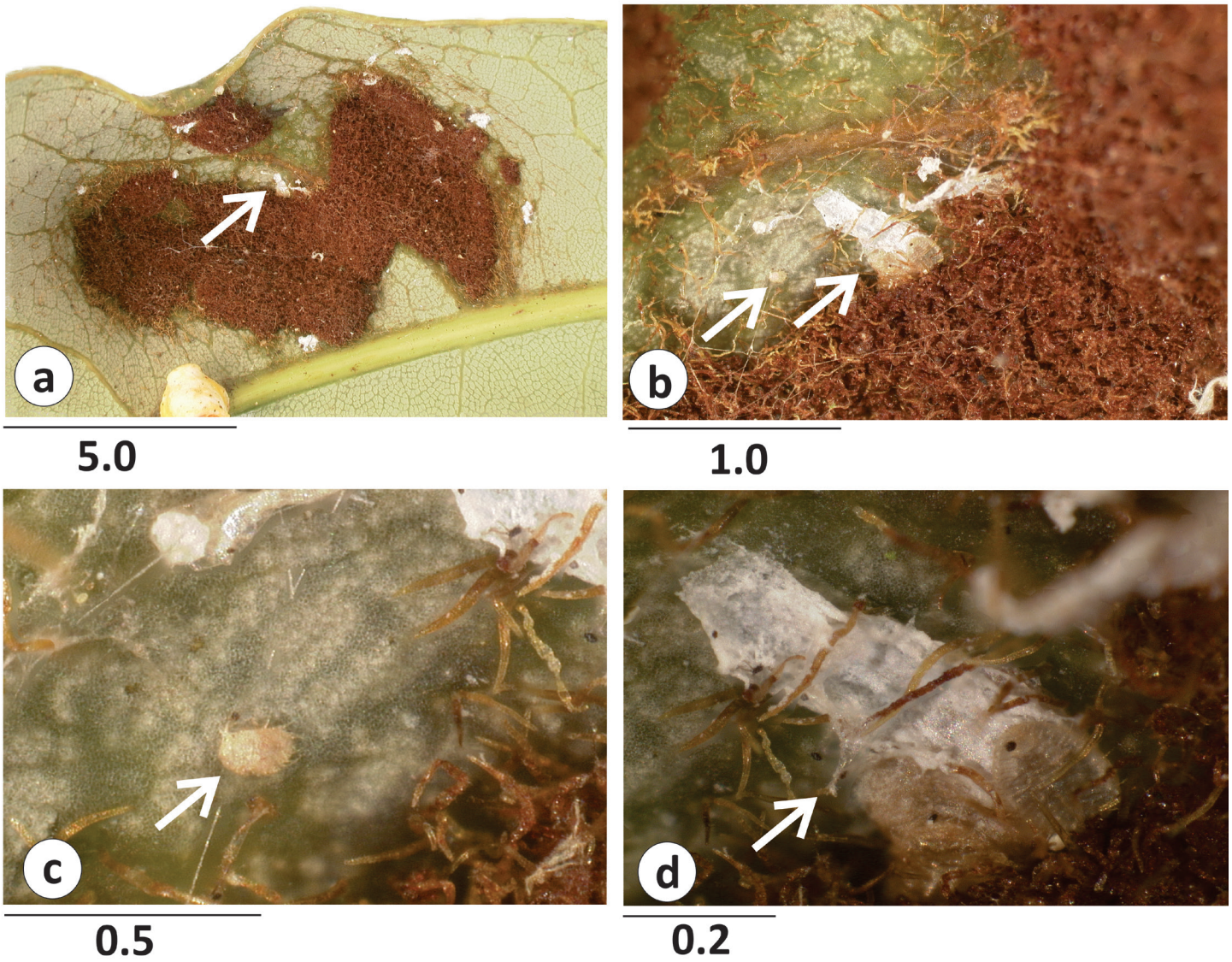

Figure 2. (2a) Infestation of lychee leei scale, *Thysanofiorinia leei* in erineum induced by lychee erinose mite, *Aceria litchii* (E2019-3085). **(2b)** Close-up of immature showing white wax. **(2c)** Close-up of first instar nymph showing long marginal setae. **(2d)** Close-up of second instar male under reddish brown hair mass in erineum. Photo by Muhammad Z. 'Zee' Ahmed, FDACS-DPI.

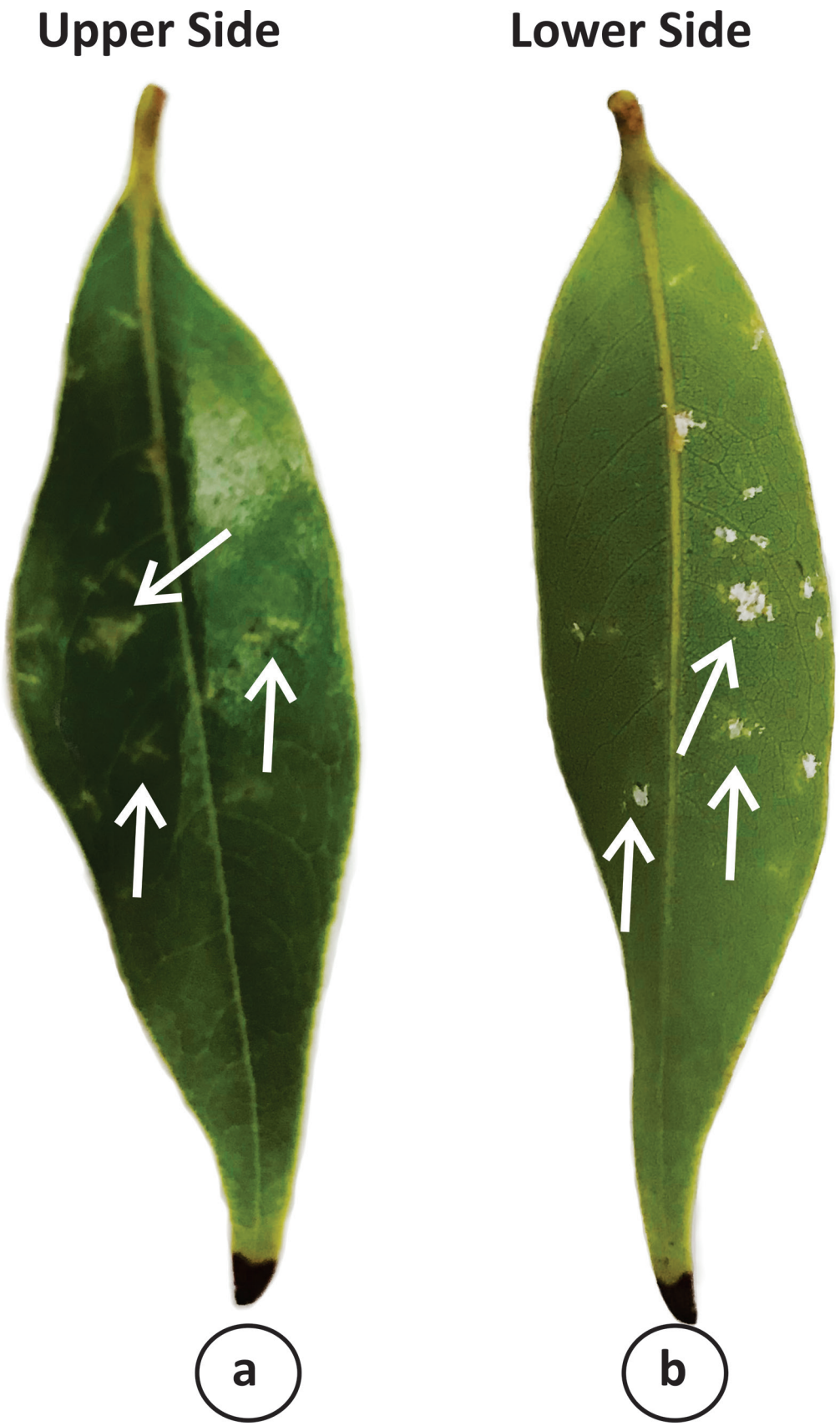

Fig. 3. (3a) Infestation of lychee leei scale, *Thysanofiorinia leei* on leaf (E2019-3074). Upper side showing chlorosis marks. **(3b)** White wax and light yellow to green immature of lychee leei scale. Photo by Muhammad Z. 'Zee' Ahmed, FDACS-DPI.