

Discovery of a non-native parasitoid, *Marlattiella prima* Howard (Hymenoptera, Aphelinidae) and its non-native host, *Lopholeucaspis japonica* Cockerell (Hemiptera, Diaspididae) in Central Texas

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Abstract

Sampling of crapemyrtle trees (*Lagerstroemia* L.) in central Texas yielded the discovery of an invasive scale pest, *Lopholeucaspis japonica* Cockerell, and its parasitoid natural enemy, *Marlattiella prima* Howard. These discoveries expand the known range of both the scale insect and the parasitoid wasp in the United States. *Marlattiella prima* was not recovered in the absence of *L. japonica*. Of the two counties sampled, Brazos County yielded 26 *M. prima* individuals and Tarrant County yielded neither *M. prima* nor *L. japonica*.

Keywords

biological control, *Marlattiella*, *Marlattiella prima*, *Lopholeucaspis japonica*

Introduction

Members of the genus *Marlattiella* Howard (Hymenoptera: Aphelinidae) are known to parasitize only armored scale insects (Hemiptera: Diaspididae). Two species have been described worldwide (Viggiani 1985; Rehmat et al. 2011): *M. prima* Howard and *M. maculata* Hayat. *Marlattiella prima* is a parasitoid of *Lopholeucaspis japonica* Cockerell (Japanese maple scale) in China and Japan (Rosen and DeBach 1970) and *M. maculata* is a parasitoid of *Aonidiella orientalis* Newstead (Oriental yellow scale) in India (Rehmat et al. 2011). Viggiani (1985) identified chalcidoid wasps collected from sticky traps in Africa and uncovered a possible third species, extending the geographical range of the *Marlattiella* genus to the Ethiopian region.

Marlattiella prima adults closely resemble adults in the genus *Aphytis* Howard, and other genera in the tribe Aphytini (Kim and Heraty 2012). *Marlattiella* spp. individuals are distinguished from the other members of Aphytini by their antennal formula: scape, pedicel, no funicle segments or anelli, and a long, unsegmented clava (Figure 1). Species of *Eretmocerus* Haldeman, a similar and closely related genus (Kim and Heraty 2012), share this antennal formula but have four-segmented tarsi while *Marlattiella* spp. have five-segmented tarsi. Additional recognition characteristics include a short propodeum in *Marlattiella* spp. lacking the marginal crenulae found in *Aphytis* spp. (Rosen and DeBach 1970) (Figure 1).

Lopholeucaspis japonica (Hemiptera: Diaspididae) was first reported in the United States in Connecticut in 1914 (Miller et al. 2005). Currently the reported distribution of this scale in the United States includes Connecticut, Delaware, Georgia, Kentucky, Louisiana, Maryland, New Jersey, New York, North Carolina, Pennsylvania, Rhode Island, Tennessee, Virginia, and Washington DC (Frank et al. 2013; Jeger et al. 2018). It has a host range of approximately 97 plant species from 35 families (Knox et al. 2012; Harsur et al. 2018; Jeger et al. 2018). In the United States, *M. prima* has been reported in Maryland, only one of the fifteen states in which *L. japonica* has been reported (Krombein et al. 1979). This paper describes the first reported occurrences of *L. japonica* and *M. prima* in Texas. This is important because it expands the range of a pervasive pest of 97 tree species as well as the range of one of its known parasitoids.

Methods

Foliage samples were collected from 40 plants of the ‘Natchez’ (*Lagerstroemia indica* L.) crapemyrtle cultivar and 60 plants of other crapemyrtle cultivars in Brazos County and Tarrant County, Texas. Tarrant County is 190 km north of Brazos County, and Brazos County is approximately 158 km NE of Houston, Texas. Ten 30 cm long branch tips randomly distributed along the canopy perimeter of three-meter to five-meter-tall trees were collected using a telescoping pruner with a 2.7 m reach. Branch tips were immediately placed in Sure Fresh rectangular storage containers, 10 cm × 35 cm (Greenbrier International, Inc., 1509 Sam’s Circle Store No 502 Chesapeake, VA 23320-4694



Figure 1. *Marlattiella prima* Howard adult female recovered from *Lopholeucaspis japonica* Cockerell on *Lagerstroemia indica* L. trees. This specimen is in the TAMU insect collection (TAMUIC) as TAMU Vouchers #746. The photograph was taken by JBW with a Macropod system (<https://macroscopicsolutions.com>) using 20× microscope objective, a 200 mm tube lens, and a Canon EOS 5D Mark III camera.

United States, www.dollartree.com, SKU: 236854). Storage containers were labelled by tree. Each tree was given a unique number and GPS data was collected using a cell-phone application (GPS Status & Toolbox Pro version 9.0.183 2019, EclipSim). The GPS coordinates were recorded for the purpose of using the same trees every season from spring 2018 to winter 2018.

The plastic containers containing branch samples were placed in cold storage for 24 to 120 hours at 6 °C to slow down arthropods during the sample processing period. Containers removed from cold storage were opened and branches were carefully examined with the aid of a stereo microscope (Olympus SZ-6045). Scale insects were counted and identified to the lowest taxon possible.

Branches were subsequently placed in sealed, white paper bags (Uline white grocery bags, uline.com model no. S-11541, 19.685 cm × 12.065 cm × 40.64 cm) to allow for parasitoid emergence. After three months, the bags were opened and the contents were shaken into a petri dish containing 70% ethanol. Using a stereo microscope (Olympus SZ-6045), parasitoids were then counted and identified to the lowest taxonomic level possible before being placed in labelled vials with 70% ethanol for preservation. Voucher specimens have been deposited in the TAMU Insect Collection (TAMUIC) as TAMU Vouchers #746.

Table 1. Numbers of *Lagerstroemia indica* trees with *L. japonica* and *M. prima* present.

Collection	Trees with <i>L. japonica</i> ^a	Trees with <i>M. prima</i> present (range of <i>M. prima</i> recovered) ^b	Number of <i>M. prima</i> present
Spring 2018	Data Not Recorded	4 (1–2)	6
Summer 2018	29	4 (1–3)	6
Fall 2018	23	1 (1)	1
Winter 2018	25	5 (1–5)	13

^aA total of 100 trees were sampled for each collection and a total of 35 trees across all collections hosted *L. japonica*. Values within the column are the number of trees infested with *L. japonica* within a collection. ^bRange represents the minimum and maximum of *M. prima* recovered from trees infested by *L. japonica* within a collection.

Results

A total of 26 *M. prima* individuals were recovered from 400 *L. indica* samples in Brazos County (Table 1). Most were recovered from samples collected during winter of 2018. All of the *L. indica* twigs from which *Marlattella* individuals were recovered contained *Lopholeucaspis japonica* individuals, with the exception of those collected in the spring of 2018, for which there are no data on scale presence. *Lopholeucaspis japonica* were frequently recovered from the same locations and trees across all four seasons. No *L. japonica* or *M. prima* were recovered from 400 samples taken in Tarrant County.

Discussion

Our collections represent the first occurrence of both *L. japonica* and *M. prima* individuals in Texas. The range of *L. japonica* around Brazos County may be indicative of a population existing prior to our detection. The fact that it was recovered from the same trees at the same locations may imply that it is not rapidly spreading, though only *L. indica* plants were sampled and it is known that *L. japonica* has a wide host range (Knox et al. 2012; Harsur et al. 2018; Jeger et al. 2018). *Acer* spp. L. (Sapindales: Sapindaceae), *Alnus* spp. Miller (Fagales: Betulaceae), *Ilex* spp. L. (Aquifoliales: Aquifoliaceae), *Liquidambar* spp. L. (Saxifragales: Altingiaceae) and, *Magnolia* spp. L. (Magnoliales: Magnoliaceae) are among the native Texas trees (Texas A&M Department of Horticulture 2019) that *L. japonica* uses as a host, and sampling of these trees may yield more discoveries of *L. japonica* individuals in Texas.

Conclusion

Surveys from Brazos County, TX document the presence of *Lopholeucaspis japonica* and *Marlattella prima*, which have not previously been reported for Texas. This record expands the range of both organisms. The population of *L. japonica* is apparently not spreading, as it remained localized on a set number of trees in Brazos County and was not found in Tarrant County.

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