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Red Bay Psyllid, *Trioza magnoliae* (Ashmead) (Insecta: Hemiptera: Sternorrhyncha: Psyllidae)[1]

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Introduction

The red bay psyllid, *Trioza magnoliae* (Ashmead), was originally called the bay magnolia psyllid (Ashmead 1881) because the host plant from which it was originally described was believed to be the plant that is now known as sweet bay (*Magnolia virginiana* L.) which is in the family Magnoliaceae. However, there are no known verifiable records of this insect on plant species other than native species of *Persea* bay trees (Mead 1967) in the family Lauraceae. This almost certain error is because of the similarity in general appearance of these plants which are all called bays. Sweet bay and the *Persea* bays are commonly confused by those who are not familiar with the diagnostic characters for separating them. Although there are a variety of characteristics to separate species belonging to the genus *Magnolia* from *Persea* species, one that is always observable is the presence on *Magnolia* species of a stipular scar that forms a ring around the stem at the node. This scar is not present in *Persea* species.

There are three forms of native *Persea* bay trees in the southeastern U.S.:

Figure 1. *M. virginiana* with stipular scars

Figure 2. *P. borbonia* without stipular scar.

- red bay, *Persea borbonia* (L.) Spreng.,
- silk bay, *Persea borbonia* (L.) Spreng. var. humilis (Nash) L.E.Kopp,
- swamp bay, *Persea palustris* [Raf.]Sarg.
- (Wunderlin and Hansen 2003, Wunderlin and Hansen 2008).

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There are minor morphological differences, and the three forms are found in soils of different moisture levels with *P. b.* var. humilis being found in drier areas. All are attacked by *T. magnoliae*.

Most, but not all, species of psyllids are narrowly host specific (Hodkinson 1984), and *R. magnoliae* is not known to use even other species of Lauraceae besides *P. borbonia* and *P. palustris* as hosts. Therefore, it will be referred to as the red bay psyllid.

Red bay psyllid galls are almost universally present on *P. borbonia* and *P. palustris*. In fact, they are so omnipresent that Nelson (1994) has suggested using the presence of the galls as an "identification clue" to these species of *Persea*.

Distribution

Red bay psyllids are found throughout the range of their *Persea* host plants which includes the southeastern coastal plain from Delaware to Texas, USA (USDA 2008).

Description

Eggs are not known. Young nymphs are yellow and flattened. Mature nymphs are green with orange wing pads, red eyes, and short black antennae and sparse waxy filaments. Ashmead (1881) and Crawford (1914) give detailed descriptions of the life stages. Adults are described as elongate-oval and pale greenish-yellow with a pointed abdomen. They have yellow ocelli and 10-segmented antennae. The wings are transparent and lanceolate with pale green veins. Legs are pale greenish-yellow with the basal tarsal segment broadly flattened. Sometimes there are brown stripes on the thorax (Johnson and Lyon 1991). Adults are 3 to 4 mm. in length (Ashmead 1881, Mead 1963) and resemble miniature cicadas.

Life Cycle and Biology

Ashmead (1881) speculated that eggs are laid under the epidermis of leaves. As the newly hatched nymphs begin to feed, the margin of the leaf begins to curl and ultimately completely envelops the nymphs in an elongated pocket-like gall. The galls may be over 1/2 inch in length. When the leaves are attacked just as they are opening, they may be severely distorted. There may be more than one gall per leaf. As many as eight galls per leaf and an incidence of up to 80% of leaves with galls has been reported by Moon and Stiling (2004).

Figure 3. Immature nymphs

Figure 4. Mature nymphs

Figure 5. Galls

Figure 6. Galls

Figure 7. Deformed leaves

Figure 8. Fruit and galls

Many species of Sternorrhycha produce honeydew as a mechanism to dispose of excess carbohydrates. For species developing in galls or other confined spaces, the sticky honeydew could potentially pose a suffocation hazard. Typically the nymphs of these species are coated with wax so the honeydew does not stick to them, and they may also hold the honeydew droplet at the tip of the abdomen until they coat it with wax (Mittler and Douglas 2003).

Figure 9. Nymph and honeydew

Psyllids have endosymbiotic microorganisms in association with their gut (Spalding and Von Dohlen 1998) that are presumably beneficial to them in nutrition — possibly providing vitamins and other nutrients not present in the phloem sap upon which they feed.

When the psyllid nymphs are mature, the gall splits along the edge to release them. The cast skins of the last instar nymphs may be seen adhering to the undersides of leaves (Mead 1963). Mead stated that adults seem to emerge from April to June with peak emergence in mid-May. However, the adult shown was photographed on 10 February 2009. Mead (1963) reported that the red bay psyllids are probably single-brooded, but that in Florida there are reports of galls with nymphs for all months. Hodges et al. (2006) also reported that it is univoltine. However, Moon and Stiling (2004) state that it is multivoltine in Florida with at least three overlapping generations.

Figure 10. Adult red bay psyllid, *Trioza magnoliae* (Ashmead). Credits: Donald W. Hall, University of Florida

Figure 11. Cast skin of last instar nymph, red bay psyllid, *Trioza magnoliae* (Ashmead). Credits: Donald W. Hall, University of Florida

In spite of the fact that red bay psyllid nymphs live inside a gall, they are vulnerable to natural enemies. Moon and Stiling (2004) reported parasitism levels of 25 to 45% by *Psyllidephagus* sp., an encyrtid wasp. Parasitized nymphs can be recognized by their darkened color. The cecidomyiid

midge, T*hrypsobremia thripivora* Gagné, preys both on thrips that live in curled leaf shelters and on red bay psyllid nymphs (Gagné and Bennett 1993). Also, small insectivorous birds have been observed opening the galls to feed on the nymphs (Orsorio 2001).

Economic Importance

Fresh leaves of *P. borbonia* and *P. palustris* are aromatic when crushed and can be used in place of commercial bay leaves in cooking (Orsorio 2001). The wood has been used locally as a hardwood in cabinetwork and boat-building (USDA 1990). Both species are valuable as food sources for wildlife. Bears and birds feed on the fruit, and deer browse on the foliage (Haehle and Brookwell 2004, USDA 1990). They also serve as host plants for a variety of native insects including the beautiful palamedes swallowtail butterfly, *Pterourus* (formerly *Papilio*) *palamedes* (Drury) (Minno et al. 2005, Hall and Butler 1998).

Leege (2006) studied the effects of red bay psyllids on *P. borbonia* and found that galled leaves were smaller and aged more rapidly and that shoots with galls did not grow as well and produced fewer flowers. However, in her study, there was no correlation between gall load and seed production. The main impact of the galls is aesthetic for homeowners and park managers. Haehle and Brookwell (2004) recommend using *P. borbonia* in background plantings because of the "disfiguring galls." Orsorio (2001) states, "The galls cause absolutely no harm and no steps should be taken to cure the tree." Red bay psyllids are not believed to attack avocado, *Persea americana* Mill.

Persea borbonia as well as other southeastern U.S. Lauraceae and some of the organisms that are dependent on it are now threatened by a *Raffaelea sp*. lethal wilt-causing fungal symbiont of the recently introduced exotic red bay ambrosia beetle *Xyleborus glabratus* Eichhoff (Scolytinae: Curculionidae) (Mayfield and Thomas 2006, Fraedrich 2008).

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