

Vespiform Thrips *Franklinothrips vespiformis* Crawford (Insecta: Thysanoptera: Aeolothripidae)¹

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The Featured Creatures collection provides in-depth profiles of insects, nematodes, arachnids and other organisms relevant to Florida. These profiles are intended for the use of interested laypersons with some knowledge of biology as well as academic audiences.

Introduction

Franklinothrips vespiformis Crawford (Thysanoptera: Aeolothripidae) is a predatory thrips with a pantropical distribution. The distinctive red, humped-back larvae and fast-moving ant-like adults are predaceous on small arthropods. In addition to being easily mistaken for an ant, this beneficial thrips is unusual in that it constructs a silken cocoon within which it pupates. Males of this species are rare.

Synonymy

Aeolothrips vespiformis Crawford DL, 190

Distribution

Franklinothrips vespiformis is presumed native to Central America, but is now found in many regions, including the United States (Arizona, California, Colorado, Texas, Florida), many Caribbean and South American countries, India, Thailand, Fiji, French Polynesia, Galapagos Islands, New Caledonia, and, most recently, Australia (Queensland

and northern Western Australia) and Japan (Arakaki and Okajima 1998; Mahaffey and Cranshaw 2010; Mound and Reynaud 2005; Hoddle et al. 2012). It is also sold in Europe and Israel as a biological control agent for use in greenhouses. This species was originally described as an easily recognized species, distinct from *Aeolothrips* (Hood 1913). Particularly similar in structure to *Franklinothrips vespiformis* is the Central American species *Franklinothrips orizabensis*, but the latter has the forewings rather broader at the apex and without a pale sub-apical area (Mound and Reynaud 2005).



Figure 1. Female vespiform thrips showing constricted waist and white band.

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1. This document is EENY621, one of a series of the Department of Entomology and Nematology, UF/IFAS Extension. Original publication date March 2015. Revised February 2018, June 2021, and November 2024. Visit the EDIS website at <https://edis.ifas.ufl.edu> for the currently supported version of this publication.
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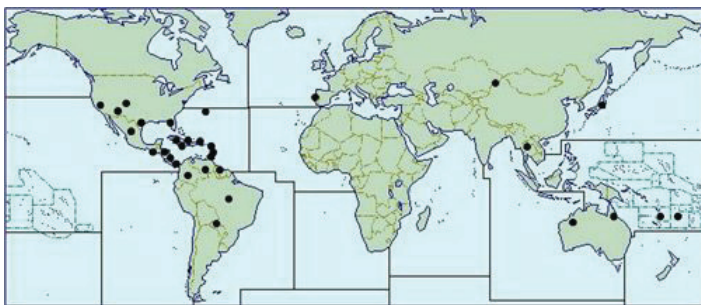


Figure 2. Known *Frankliniothrips vespiformis* distribution (after Mound and Reynaud 2005; Greathead and Greathead 1992; Hoddle et al. 2012; Mahaffey and Cranshaw 2010; UK CAB International 2010).

Description

Frankliniothrips vespiformis undergoes partial metamorphosis, developing through five immature stages: egg, larva I and II, pupa I (pro-pupa) and II (pupa), and adult (Arakaki and Okajima 1998; Hoddle et al. 2012).

Eggs

The eggs are kidney-shaped, translucent white, and about 0.38 mm (0.015 in) long and 0.13 mm (0.005 in) wide. Eggs are oviposited into leaf tissue.

Larva

First instars are pale yellow but quickly develop red bands. Red banding becomes very pronounced in the second instars. All larvae have seven-segmented antennae and the three distal segments are closely fused. Legs are transversely banded with red hypodermal pigments. In larva I, the head, prothorax, and femora are pale (without red pigments); antennal segment III is approximately 4 times as long as broad. In larva II, head, prothorax, and femora are red; antennal segment III is approximately 8 times as long as broad.

Pupa

Second instars pupate inside semi-transparent silken sheaths (cocoons). Cocoons are white and oval-shaped, about 2.7 mm ($\sim\frac{1}{8}$ in) long and 1.3 mm ($\sim\frac{1}{16}$ in) in width. Antennae are folded posteriorly and lay dorsally on the head. There is a pro-pupal stage (pupa 1) followed by a pupal stage (pupa 2). The wing buds are well developed in both stages, but shorter in pupa I.

Adults

Females are myrmeciform with long legs and a constricted waist; body length is 2.5–3.0 mm ($\sim\frac{1}{8}$ in). Adult females are brown to black, with banded black and white wings and a white band at the base of the abdomen. Forewings are slender with a rounded apex. Antennae are

nine-segmented, with segments I–III yellow and segment III approximately as long as head. The abdomen is broadest at segment V or VI just like the pedicels of ants. The constriction is pronounced by white bands on the second and third abdominal segments. Males are very rare and less ant-like in appearance (less constricted waist), smaller than females, with longer, darker antennae, and commonly with paler wings.



Figure 3. Egg laying of *Frankliniothrips vespiformis*, showing ovipositor. Credits: Runqian Mao, UF/IFAS



Figure 4. *Frankliniothrips vespiformis* newly emerged larva; egg to right. Credits: Runqian Mao, UF/IFAS

Life Cycle

Frankliniothrips vespiformis is active at temperatures above 18°C (64.4°F), with development from egg to adult completed in approximately 3 weeks at 27°C (80.6°F) (Larentzaki et al. 2007a). Diapause has not been reported with this species. Females may live for up to 2 months and lay 150–200 eggs. Eggs are inserted individually inside leaf tissue by the female's curved ovipositor (Entocare 2013). A yellowish protective secretion is deposited over the eggs. Larvae and adults move quickly to catch prey, which they hold with their forelegs while feeding. They may become cannibalistic when crowded together in the laboratory (Arakaki and Okajima 1998). Pupae of *Frankliniothrips* are formed inside a silken cocoon on the undersides of leaves

or at ground level, which appears to be an adaptation to predation (Hoddle et al. 2001a). *Frankliniothrips vespiformis* is usually unisexual. Males have been observed in its native South America but not in its introduced range in Asia, possibly since populations exhibiting parthenogenesis spread more easily than sexual forms.



Figure 5. *Frankliniothrips vespiformis* larva II feeding on nymph of *Scirtothrips dorsalis*.
Credits: Runqian Mao, UF/IFAS



Figure 6. Pupa of *Frankliniothrips vespiformis* inside cocoon.
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Throughout its range, *Frankliniothrips vespiformis* has been found on low growing plants and shrubs, including vegetables and fruits (kidney bean, melon, gourd, cucumber, avocado, eggplant, and citrus) and ornamental sunflowers (Arakaki and Okajima 1998; Callan 1943; Cox et al. 2006; Moulton 1932). The authors have collected *Frankliniothrips vespiformis* at relatively low densities from plumbago alongside roadways and in sweep net samples from grassland weeds in Central Florida.



Figure 7. Collecting *Frankliniothrips vespiformis* from ornamental plumbago shrubs.
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Hosts

Frankliniothrips vespiformis and *Frankliniothrips* spp. in general prey upon various pest thrips and other small arthropods. Noted prey items include **redbanded thrips**, *Selenothrips rubrocinctus* Giard; *Caliothrips insularis* Hood; *Dinurothrips hookeri* Hood; **chilli thrips**, *Scirtothrips dorsalis* Hood; **melon thrips**, *Thrips palmi* Karny; onion thrips, *Thrips tabaci* Lindeman; western flower thrips, *Frankliniella occidentalis* Pergande; *Frankliniothrips intonsa* Trybom; **greenhouse thrips**, *Heliothrips haemorrhoidalis* Bouché; and *Scolothrips asura* Ramakrishna & Margabandhu (Callan 1943; Okajima et al. 1992; Arakaki and Okajima 1998; Hoddle 2003a; Pizzol et al. 2008). In laboratory tests, *Frankliniothrips vespiformis* have been shown to take alternative prey items, such as spider mites, immature whiteflies, leafminer larvae and psyllid eggs (Arakaki and Okajima 1998; personal observation). Some *Frankliniothrips* species can sustain themselves for short periods on pollen or sap (Hoddle et al. 2003b, 2001b), which may result in accidental intoxication by systemic insecticides.



Figure 8. *Frankliniothrips vespiformis* feeding on adult *Scirtothrips dorsalis*.
Credits: Runqian Mao, UF/IFAS



Figure 9. *Frankliniopsis vespiformis* feeding on whitefly eggs.
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Economic Importance

Predatory thrips are important natural enemies of pest species in natural and agricultural systems (Ananthakrishnan 1993). At least sixteen predatory *Frankliniopsis* species are described from tropical and subtropical countries, but amongst these *Frankliniopsis vespiformis* is the most widespread (Hoddle et al. 2012; Mound and Reynaud 2005). In California, another species, *Frankliniopsis orizabensis*, is an important predator of thrips pests on avocado trees. This latter species has been the subject of extensive research, including augmentative release (Hoddle et al. 2004). Both *Frankliniopsis vespiformis* and *Frankliniopsis orizabensis* have been introduced in Europe and Israel as a biological control agent against thrips and mite pests in greenhouses (Loomans and Vierbergen 1999; Cox et al. 2006). At the time of writing, *Frankliniopsis vespiformis* is sold for use “in botanical gardens, zoos, interior landscapes, research greenhouses, nurseries with ornamental plants as well as outdoors in subtropical regions” (Entocare 2013). High cost of mass rearing, poor tolerance to low temperature storage, and the lack of research have been cited as potential problems with the larger scale commercialization of *Frankliniopsis vespiformis* (Larentzaki et al. 2007b).

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