

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

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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.



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

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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).

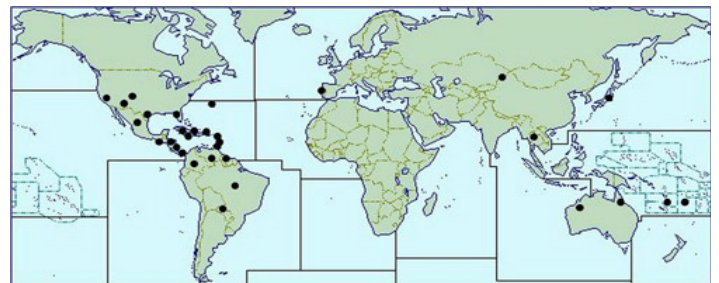


Figure 2. Known *Franklinothrips vespiformis* distribution (after Mound and Reynaud 2005, Greathead and Greathead 1992, Hoddle et al. 2012, Mahaffey and Cranshaw 2010, UK CAB International 2010).

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Description

Franklinothrips 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 long and 0.13 mm 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 (cocoon). Cocoon is white and oval-shaped, about 2.7 mm long and 1.3 mm 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. 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 4. *Franklinothrips vespiformis* newly emerged larva; egg to right.
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Figure 5. *Franklinothrips vespiformis* larva II feeding on nymph of *Scirtothrips dorsalis*.
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Figure 6. Pupa of *Franklinothrips vespiformis* inside cocoon.
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Figure 3. Egg laying of *Franklinothrips vespiformis*, showing ovipositor.
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Life Cycle

Franklinothrips vespiformis is active at temperatures above 18°C, with development from egg to adult completed in approximately 3 weeks at 27°C (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 *Franklinothrips* 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). *Franklinothrips 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.

Throughout its range, *Franklinothrips 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 *Franklinothrips vespiformis* at relatively low densities from plumbago alongside roadways and in sweep net samples from grassland weeds in Central Florida.



Figure 7. Collecting *Franklinothrips vespiformis* from ornamental plumbago shrubs.

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Hosts

Franklinothrips vespiformis and *Franklinothrips* spp. in general prey upon various pest thrips and other small arthropods. Noted prey items include **red banded 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; *Franklinothrips 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, *Franklinothrips 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 *Franklinothrips* 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. *Franklinothrips vespiformis* feeding on adult *Scirtothrips dorsalis*.

Credits: Runqian Mao, University of Florida



Figure 9. *Franklinothrips 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 *Franklinothrips* species are described from tropical and subtropical countries, but amongst these *Franklinothrips vespiformis* is the most widespread (Hoddle et al. 2012, Mound and Reynaud 2005). In California, another species, *Franklinothrips 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 *Franklinothrips vespiformis* and *Franklinothrips 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, *Franklinothrips 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 *Franklinothrips vespiformis* (Larentzaki et al. 2007b).

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