

**Pseudomyrmex Spp. Ant (Hymenoptera: Formicidae)
Predation on *Anaea troglodyta floridalis* Larvae
(Nymphalidae)**

Authors: Salvato, Mark H., Salvato, Holly L., Land, Aerin, and Sadle, Jimi

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PSEUDOMYRMEX SPP. ANT (HYMENOPTERA: FORMICIDAE) PREDATION
ON ANAEA TROGLODYTA FLORIDALIS LARVAE (NYMPHALIDAE)

Additional key words: *Croton*, population regulation, conservation, endangered species

The Florida leafwing, *Anaea troglodyta floridalis* F. Johnson and Comstock (Nymphalidae), historically occurred throughout the pine rocklands of southern Florida (Minno & Emmel 1993, Smith et al. 1994), where it is endemic. However, due to extensive habitat loss across much of its former range *A. t. floridalis* is now largely restricted to Everglades National Park (Salvato and Salvato 2010a). Hennessey and Habeck (1991) and Worth et al. (1996) described many aspects of *A. t. floridalis* natural history. Salvato and Hennessey (2003) and Salvato and Salvato (2010a) also discussed *A. t. floridalis* ecology and provided a review of known parasites and predators for the species. More recently we have conducted extensive ecological studies and monitoring within the Long Pine Key region of the Everglades in order to further identify and measure natural mortality factors for immature stages of *A. t. floridalis*.

On 24 February 2009 an early instar *A. t. floridalis* was observed being predated by a single native twig ant, *Pseudomyrmex pallidus* (F. Smith) (Formicidae) (Fig. 1), as the larva was creating a frass chain. A frass chain is created when the larvae attach their fecal pellets to the mid-vein of a partially eaten croton leaf with silk (Freitas and Oliveira 1996, Minno et al. 2005, Greeney et al. 2012). The larvae crawl to the terminus of the strands to avoid predation. However, early instar nymphalid larvae remain vulnerable to ant predation

while constructing new frass chains (Freitas and Oliveira 1996). Subsequently, on 24 December 2011, *P. pallidus* was observed to actively sting, but not immobilize, a late instar *A. t. floridalis* as that larva was attempting to pupate. During this observation, the larva reared up its body and twisted vigorously to repel the attacking *P. pallidus*, a behavior that has been observed during ant interactions with other nymphalid larvae (Freitas and Oliveira 1992, Machado and Freitas 2001,



FIG. 1. An early instar *A. t. floridalis* being predated by a *Pseudomyrmex pallidus* in Long Pine Key on 24 February 2009 (Photo: A. Land).

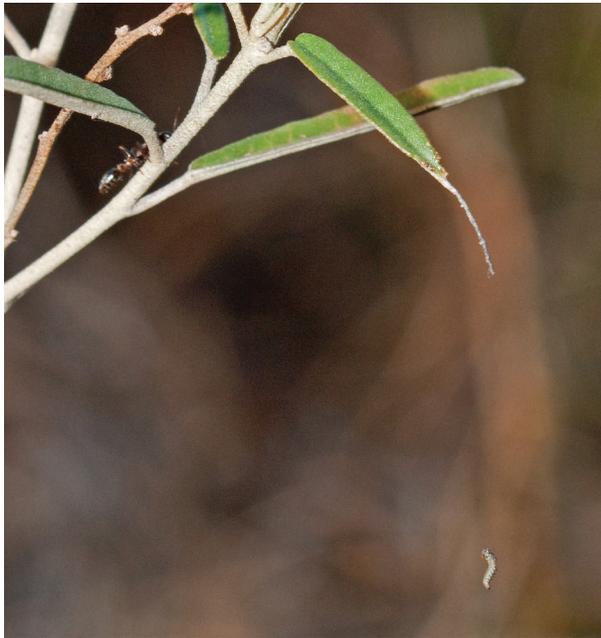


FIG. 2. An early instar *A. t. floridalis* larva evading predation from *Pseudomyrmex gracilis* in Long Pine Key on 26 February 2011 (Photo: H.L. Salvato).

Greeney et al. 2012). *Pseudomyrmex pallidus* occurs commonly from the southern United States to Central America and nests opportunistically within the hollow branches of various herbaceous plants (Ward 1985). We have frequently observed *P. pallidus* patrolling on, and visiting the flowers of, pineland croton, *Croton linearis* Jacq. (Euphorbiaceae), the only known hostplant for *A. t. floridalis*.

On 26 February 2011, an early instar *A. t. floridalis* larva was observed evading predation from a single elongate twig ant *Pseudomyrmex gracilis* Fabricius (Formicidae) by descending off the tip of its frass chain using a silk excretion (Fig. 2). This behavior has been noted for several other tropical nymphalid larvae (DeVries 1987, Freitas and Oliveira 1992). The larva was not re-encountered on subsequent visits, nor was there evidence of further feeding suggesting it may have ultimately been predated by the ant. Two additional observations of *P. gracilis* on 10 July 2013 and 14 February 2015 (Fig. 3), demonstrated that this twig ant is a predator of *A. t. floridalis* larvae. The use of frass chains may reduce ant predation for some species of nymphalid larvae, in that ants do not descend the chain (Freitas and Oliveira 1992, 1996). However, in these observations, the ants climbed down the chain to seize the prey, suggesting frass chain use may be ineffective in preventing *P. gracilis* predation on *A. t. floridalis* larvae. *Pseudomyrmex gracilis* native range spans of much of the New World tropics and subtropics (Wetterer 2010).

First documented in southern Florida in the 1960s, *P. gracilis* is now common throughout the state (Whitcomb et al. 1972, Wetterer 2010).

Although little is known regarding ant predation on Florida butterflies, native ant species, such as *P. pallidus*, have likely had a role in the historic ecology of *A. t. floridalis*. One of the earliest natural history accounts of *A. t. floridalis* (Matteson 1930) reported ants as predators of *A. t. floridalis* eggs in Miami. Conversely, recently introduced non-native ant species, such as *P. gracilis*, may pose an unnatural threat to *A. t. floridalis*. On Big Pine Key, Cannon (2006) reported high mortality of swallowtail eggs (*Papilio cresphontes* Cramer and *P. andraemon* Sharpe) from a nonnative species of twig ant (*Pseudomyrmex* spp.), within habitat formerly occupied by *A. t. floridalis*. Deyrup et al. (2000) indicated that the widespread distribution *P. gracilis* in Florida, combined with its large size and use of varied habitats, poses a threat to phytophagous insects—especially Lepidoptera.

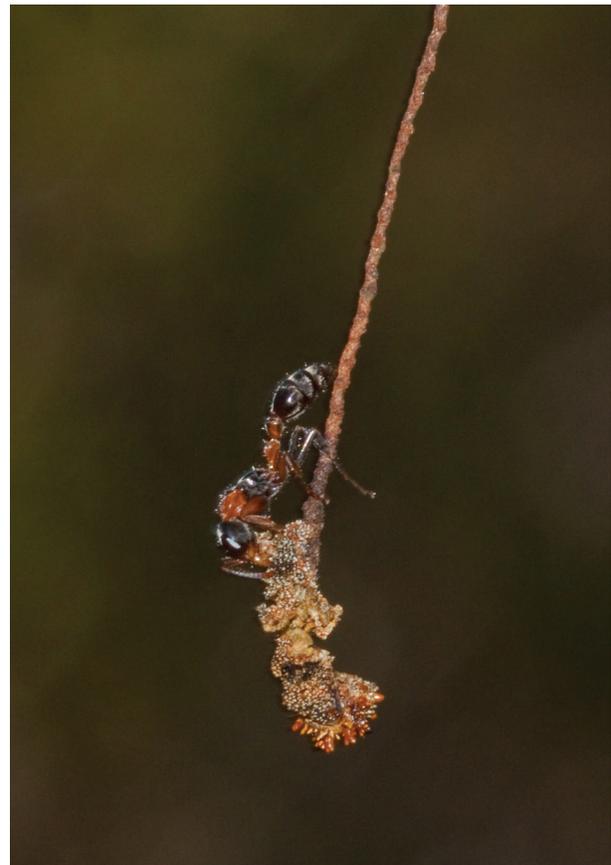


FIG. 3. An early instar *A. t. floridalis* being predated by *P. gracilis* in Long Pine Key on 14 February 2015 (Photo: H.L. Salvato).

We have observed numerous *A. t. floralis* (n = 163) larvae in the field within Long Pine Key during weekly status surveys conducted from January 2006 to February 2015. These studies have previously documented a variety of predators and parasites towards larval *A. t. floralis* including the fly, *Chetogena scutellaris* (Wulp.) (Tachinidae) (Salvato et al. 2009), crab spiders, *Misumenops bellulus* Banks (Thomisidae) (Salvato and Salvato 2010b), orb spiders, *Neoscona* spp. (Araneidae) (Salvato and Salvato 2011), biting midges *Forcipomyia* (*Microhelea*) *fuliginosa* (Meigen) (Ceratopogonidae) (Salvato et al. 2008) and *F. (M.) eriophora* (Salvato et al. 2012). However, direct observations of larval predation or parasitism are infrequent and as a result the data available to fully evaluate the influence of select mortality factors, including *Pseudomyrmex* ants, on *A. t. floralis* natural history, is limited. Additional studies are required to determine the potential influence of ants and other predators, including non-native species, such as *P. gracilis*, towards larvae of the endangered Florida leafwing.

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MARK H. SALVATO, HOLLY L. SALVATO, 1765 17th Ave SW, Vero Beach, FL 32962, anaea_99@yahoo.com, AERIN LAND, Everglades National Park, 40001 State Road 9336, Homestead, FL 33034, aerin_land@nps.gov, and JIMI SADLE, Everglades National Park, 40001 State Road 9336, Homestead, FL 33034, jimi_sadle@nps.gov

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