

A Citrus Blackfly Parasitoid, *Encarsia perplexa* Huang and Polaszek (Insecta: Hymenoptera: Aphelinidae)¹

Ru Nguyen and T. R. Fasulo²

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

Encarsia perplexa Huang & Polaszek is one of the most effective parasitoids of the citrus blackfly, *Aleurocanthus woglumi* Ashby (Hemiptera: Aleyrodidae). It was originally misidentified as *Encarsia opulenta* (Silvestri), but was later determined to be a new species (Huang and Polaszek 1998).

In 1950, *E. perplexa* from Saharanpur (India) were released for the control of *A. woglumi* in Mexico (Flanders 1969). The parasite was then introduced to Texas in 1971 (Summy et al. 1983), and Florida in 1976 (Hart et al. 1978) to suppress and maintain under the economic threshold the population of the citrus blackfly in these states.

Distribution

Encarsia perplexa is reported as native to Asia (Vietnam and India) (Silvestri 1927; Smith et al. 1964), (Huang and Polaszek 1998), and was introduced to Barbados, Cuba, Salvador, Kenya, Jamaica, Oman, Mexico, Venezuela, and the United States (Texas and Florida) to control the citrus

blackfly. In Florida, the parasite is found in south and central Florida where citrus blackfly occurs (Nguyen et al. 1983).



Figure 1. A) Adult *Encarsia perplexa* Huang & Polaszek; and (B) pupal cases of the citrus blackfly, *Aleurocanthus woglumi* Ashby, from which parasitoids have emerged (see roundish black holes). Normal emergence of an adult blackfly would leave a T-shaped split in the pupal case.

Credits: Division of Plant Industry

1. This document is EENY242 (originally published as DPI Entomology Circular 301), one of a series of the Entomology and Nematology Department, UF/IFAS Extension. Original publication date October 2001. Revised April 2010 and May 2021. Visit the EDIS website at <https://edis.ifas.ufl.edu> for the currently supported version of this publication. This document is also available on the Featured Creatures website at <http://entnemdept.ifas.ufl.edu/creatures/>.

2. Ru Nguyen, Florida Department of Agriculture and Consumer Services, Division of Plant Industry; and T. R. Fasulo, Entomology and Nematology Department; UF/IFAS Extension, Gainesville, FL 32611.

Description

The females are small (1.10 mm long) with the thorax whitish to pale yellowish. The antennae are 0.8 mm long, 8-segmented, and the 1st flagellum is shorter than the pedicel or other flagella. The wings are slightly shady in the center. Abdominal segments 3 to 6 are dark brown, with the remainder being yellowish. Ovipositors are dark and 0.5 mm long.



Figure 2. Adult female *Encarsia perplexa* Huang & Polaszek.
Credits: Ron Heu and Walter Nagamine, Hawaiian Department of Agriculture

Male *E. perplexa* are smaller than females, with males averaging 0.75 mm long and are different in color. The body and head of the males is dark brown. Male antennae are 8-segmented, with the 1st flagellum almost round and wider than the succeeding segment (Silvestri 1927; Grissell 1979).

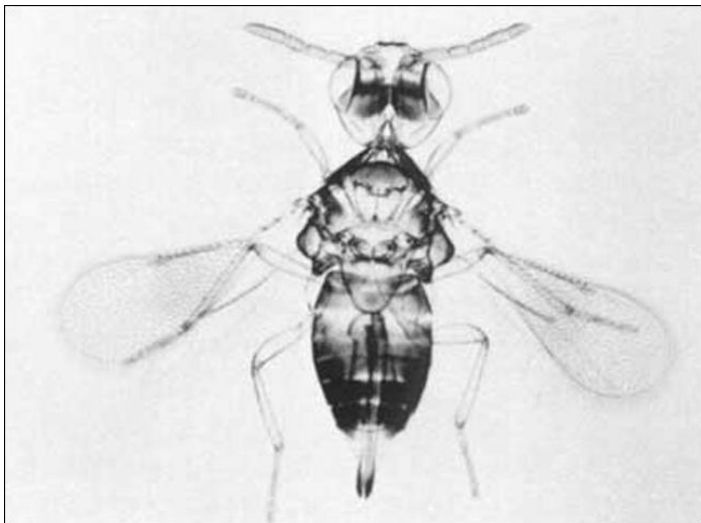


Figure 3. Adult female *Encarsia perplexa* Huang & Polaszek.
Credits: Division of Plant Industry

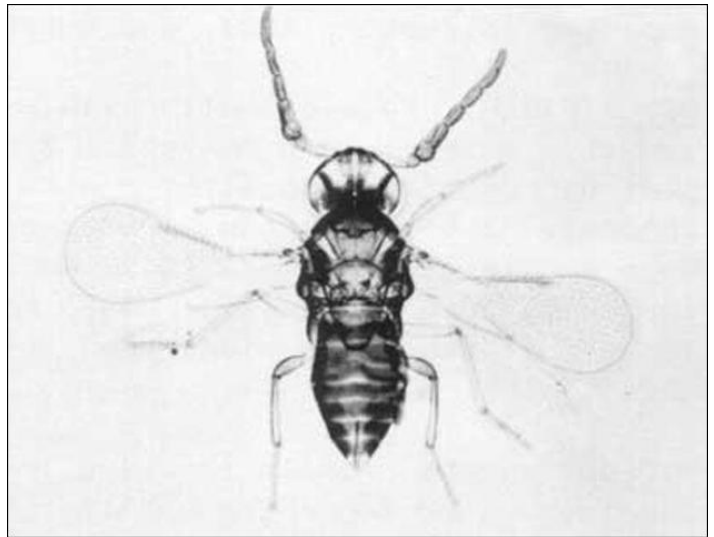


Figure 4. Adult male *Encarsia perplexa* Huang & Polaszek.
Credits: Division of Plant Industry

Life Cycle

The female can live longer than 30 days with adequate nutrition and displays good searching ability. A mated female lays a single diploid egg in any nymphal stage of the citrus blackfly, but prefers the second stage, and this egg will produce a female. Under laboratory conditions (24°C) the development from egg to adult requires 30 to 35 days. Virgin females lay haploid eggs in the fully developed larva of the *E. perplexa* female (their own species) and thereby produce males (adelpho-parasite). The sex ratio in the field is about 1:7 (male:female). *Encarsia perplexa* is hyperparasitized by *E. smithi* (Silvestri) which was accidentally introduced to Florida by 1979.

In Florida, *E. perplexa* and *Amitus hesperidum* (Hymenoptera: Platygastidae) coexist. The latter has a high rate of reproduction and can produce 60 to 70 progeny per female making this species very effective in suppressing high densities of the citrus blackfly. *Encarsia perplexa* reproduces very slowly, but effectively limits *A. woglumi* when populations are at a low level in Florida (Nguyen et al. 1983; Nguyen and Sailer 1987; and Flanders 1969).

Hosts

Aleurocanthus woglumi Ashby and *A. incertus* Silvestri are the only hosts reported (Silvestri 1927; Smith et al. 1964). When the adult parasitoid emerges from the blackfly pupal case, it leaves a roundish black hole. Normal emergence of an adult blackfly would leave a T-shaped split in the pupal case.

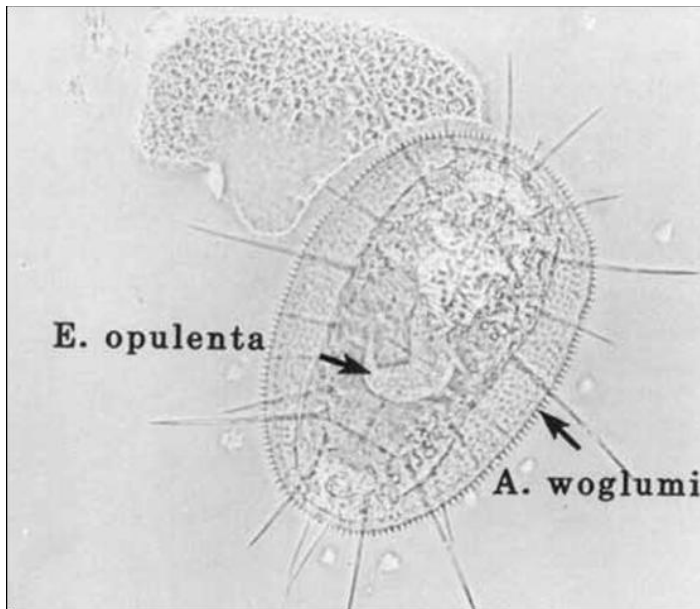


Figure 5. A larva of *Encarsia perplexa* Huang & Polaszek in a nymph of the citrus blackfly, *Aleurocanthus woglumi* Ashby. *Encarsia perplexa* was originally misidentified as *Encarsia opulenta* (Silvestri) but was later determined to be *E. perplexa*.

Credits: Division of Plant Industry

Selected References

Flanders SE. 1969. "Herbert D. Smith's observations on citrus blackfly parasites in India and Mexico and the correlated circumstances." *Canadian Entomologist* 101: 467–480.

Grissell EE. 1979. The *Prospaltella* of Florida (Hymenoptera: Aphelinidae). Florida Department of Agriculture and Consumer Services, Division of Plant Industry Entomology Circular 203.

Hart WG, Selhime A, Harlan DP, Ingle SJ, Sanchez RM, Rhode RH, Garcia CA, Caballero J, Garcia RL. 1978. "The introduction and establishment of parasites of citrus blackfly, *Aleurocanthus woglumi* in Florida (Homoptera: Aleyrodidae)." *Entomophaga* 23: 361–366.

Heu RA, Nagamine WT. (June 2001). Citrus blackfly, *Aleurocanthus woglumi* Ashby (Homoptera: Aleyrodidae). *State of Hawaii, Department of Agriculture*. http://hawaii.gov/hdoa/pi/ppc/npa-1/npa99-03_citrusbf.pdf (17 March 2010).

Huang J, Polaszek A. 1998. "A revision of the Chinese species of *Encarsia* Forster (Hymenoptera: Aphelinidae): parasitoids of whiteflies, scale insects and aphids (Hemiptera: Aleyrodidae, Diaspididae, Aphidoidea)." *Journal of Natural History* 32: 1825–1966.

Nguyen Ru, Brazzel JR, Poucher C. 1983. "Population density of the citrus blackfly, *Aleurocanthus woglumi* Ashby (Homoptera: Aleyrodidae), and its parasites in urban Florida in 1979–1981." *Environmental Entomology* 12: 878–884.

Nguyen Ru, Brazzel JR, Poucher C, Sailer RI. 1987. "Facultative hyperparasitism and sex determination of *Encarsia smithi* (Silvestri) (Hymenoptera: Aphelinidae)." *Annals of the Entomological Society of America* 80: 814–819.

Silvestri F. 1927. "Contribuzione alla conoscenza degli Aleurodidae (Insecta: Hemiptera) viventi su citrus in Extremo Oriente e dei loro parassiti." *Boll. Lab. Zool. Portici*. 21: 1–60.

Smith HP, Maltby HL, Jimenez EJ. 1964. Biological control of the citrus blackfly in Mexico. US Department of Agriculture Technical Bulletin No. 1311: 30 pp.

Summy KR, Gilstrap FE, Hart WG, Caballero JM, Saenz I. 1983. "Biological control of citrus blackfly (Homoptera: Aleyrodidae) in Texas." *Environmental Entomology* 12: 782–786.