

A Parasitoid Wasp, *Diachasmimorpha longicaudata* (Ashmead) (Insecta: Hymenoptera: Braconidae)¹

C. R. Thompson²

Introduction

Diachasmimorpha (formerly *Biosteres* or *Opius*) *longicaudata* Ashmead (Wharton 1987) is a solitary braconid wasp parasitoid of Caribbean fruit fly, *Anastrepha suspensa* (Loew), larvae. The Caribbean fruit fly is one of a group of major fruit pests that occur in the new world tropics and subtropics. Caribbean fruit flies, which infest more than 80 species of fruit, were accidentally introduced into south Florida in 1965. This has raised concern because the fly will oviposit in very ripe citrus fruits, threatening foreign markets in countries where the fly has not been detected. It resulted in establishment of quarantines on fruit shipped to Japan, as well as on interstate shipments to Arizona, California, Hawaii and Texas. Fruit must be fumigated with methyl bromide, undergo cold treatment, or be shipped from protocol areas (fly-free or bait-sprayed). The upcoming ban on methyl bromide and the high cost of cold treatment, as well as the growing concern for avoiding environmental damage from pesticides, led to more emphasis on biological control. *D. longicaudata* (Ashmead) was introduced into Hawaii from Asia for control of fruit flies in 1948 (Bess et al.

1961). Following the buildup of Caribbean fruit fly populations, *D. longicaudata* was imported into Florida, released in 1972, and is well established (Baranowski 1987).

Description

Adult: Adult female: length 3.6-5.4 mm, not including ovipositor; male: length 2.8-4.0 mm. Body reddish-brown, eyes brown. Antennae longer than the body, shading to black from the fourth segment outward. Wings clear. Gaster of female often with a dorsal central black band. Gaster of male often with dark brown to black dorsal posterior segments. Ovipositor black-tipped and longer than the female's entire body. This species can be separated from related species using the key of Wharton and Marsh (1978).

Life History and Behavior

Females of *D. longicaudata* are attracted to fermentation products emanating from rotting fruit, the likely location of host larvae. It has been shown that rotting fruit is attractive with or without the presence of host larvae, and the attractant has been

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2. C.R. Thompson, Florida Department of Agriculture and Consumer Services, Division of Plant Industry.



Figure 1. Adult female *Diachasmimorpha longicaudata* (Ashmead), an Braconid endoparasitic wasp which parasitizes the Caribbean fruit fly, ovipositing into a fly larva. Credits: Jeffery Lotz, Division of Plant Industry

attributed to fungal fermentation products rather than to chemical substances produced by the fly larvae (Greany et al. 1977). Having found rotting fruit, the female parasite can detect the larvae by sound. The larvae of *A. suspensa* make audible sounds within macerated fruit or even within laboratory media (Lawrence 1981). When offered the choices of normal, mobile larvae, anesthetized larvae or dead larvae, *D. longicaudata* females could readily locate only normal, moving larvae (Lawrence 1981). The female lays 13 to 24 eggs per day (Lawrence et al. 1978) using her elongated ovipositor to reach the fly larvae inside fruit.



Figure 2. Adult female *Diachasmimorpha longicaudata* (Ashmead), an Braconid endoparasitic wasp which parasitizes the Caribbean fruit fly, ovipositing into fly larva in guava. Credits: Jeffery Lotz, Division of Plant Industry

The eggs hatch in two to five days and progress through four larval instars, emerging as adult wasps from the fly puparia (Lawrence et al. 1976). Eggs laid as the female ages are more likely to be female

(Ashley and Chambers 1979). Eggs laid in third instar larvae require 18 to 23 days at 24-27°C to develop into adults (Lawrence et al. 1976). Research has shown that oviposition experience increases parasitization, and that the more hosts they are given, the more progeny the parasites produce (Ashley and Chambers 1979, Lawrence et al. 1978). The parasites are also quite tolerant of various handling procedures such as chilling, anaesthesia and aspiration (Greany et al. 1976).

Use In Classical Biological Control

Diachasmimorpha longicaudata was imported from introduced populations in Mexico and Hawaii into Florida in 1972 to control Caribbean fruit fly and releases were made by Baranowski in the fall of 1972 (Baranowski 1987). With the cooperation of the public, thousands of parasite releases were made during the next five years and DPI trapping data indicated a 40 percent reduction in the Caribbean fruit fly population compared to trap catches before the releases (Baranowski 1987). Use of *D. longicaudata* is planned as part of a two- pronged attack on the Caribbean fruit fly involving the release of parasites and sterile Caribbean fruit flies.

Diachasmimorpha longicaudata, has been produced in Gainesville since 1990 in a joint state/federal mass rearing program. These tiny wasps attack fruit flies by laying eggs in the fly larvae. When the fly is in the pupal stage, the wasp egg hatches and the larva begins feeding on the fly pupa, killing the fly before it can develop into an adult. Although this classical biological control technique is effective in reducing Caribbean fruit fly populations, it is not an eradication technique.

Sterile male releases, usually preceded by bait sprays, have led to eradication or control of several species of tephritids around the world. However, bait sprays have met with public opposition because of possible property or environmental damage. Mass parasite releases would further suppress the wild fly population while posing no threat to property or the environment.

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