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

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 belongs to 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 accidently introduced into southern 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, undergo cold treatment, or be shipped from protocol areas (fly-free or bait-sprayed). The 2005 ban of methyl bromide the high cost of cold treatment, the growing concern for avoiding environmental damage from pesticides, led to more emphasis on biological control. *Diachasmimorpha 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, *Diachasmimorpha longicaudata* was imported into Florida and, released in 1972. It is now established (Baranowski 1987).

Description

Adult

The female body length is 3.6-5.4 mm, not including ovipositor; the male body length is 2.8-4.0 mm. The body is reddish-brown, with brown eyes. The antennae are longer than the body, shading to black from the fourth segment outward. Wings are clear. The gaster of the female often has a dorsal central black band. The gaster of male often has dark brown to black dorsal posterior segments. The ovipositor is 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 *Diachasmimorpha 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 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

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larvae by sound. The larvae of *A. suspensa* make sounds within macerated fruit and laboratory media (Lawrence 1981). When offered the choices of normal, mobile larvae, anesthetized larvae or dead larvae, *Diachasmimorpha longicaudata* females could only readily locate the 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 1. Adult female *Diachasmimorpha longicaudata* (Ashmead), an braconid endoparasitic wasp that parasitizes the Caribbean fruit fly, ovipositing into a fly larva.
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, anesthesia and aspiration (Greany et al. 1976).

Figure 2. Adult female *Diachasmimorpha longicaudata* (Ashmead), a braconid endoparasitic wasp that parasitizes the Caribbean fruit fly, ovipositing into fly larvae in guava.
Credits: Jeffery Lotz, Division of Plant Industry

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. Releases were made by Baranowski in the fall of 1972 (Baranowski 1987). With the cooperation of the public, thousands of wasp releases were made during the next five years and Division of Plant Industry trapping data indicated a 40 percent reduction in the Caribbean fruit fly population compared to trap catches before the releases (Baranowski 1987). *Diachasmimorpha longicaudata* has been produced in Gainesville since 1990 in a joint state / federal mass rearing program. Although this classical biological control technique is effective in reducing Caribbean fruit fly populations, it is not an eradication technique.

Use of *Diachasmimorpha logicaudata* is part of a two-pronged attack that also involves the release of sterile Caribbean fruit flies. 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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