

Diachasmimorpha longicaudata (Ashmead)
(Hymenoptera: Braconidae),
Biological Control Agent for the Caribbean Fruit Fly¹

C.R. Thompson²

INTRODUCTION: *Diachasmimorpha* (formerly *Biosteres* or *Opius*) *longicaudata* Ashmead (Wharton 1987) is a solitary, endoparasitic braconid wasp which parasitizes larvae of the Caribbean fruit fly *Anastrepha suspensa* (Loew). 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 citrus fruits, threatening foreign markets in countries where the fly has not been detected. It has 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 possibility of a ban on methyl bromide and the high cost of cold treatment, as well as the growing concern for avoiding environmental damage from pesticides, has led to more emphasis on biological control. The parasite *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 female: length 3.6-5.4 mm, not including ovipositor (Fig. 1); 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).

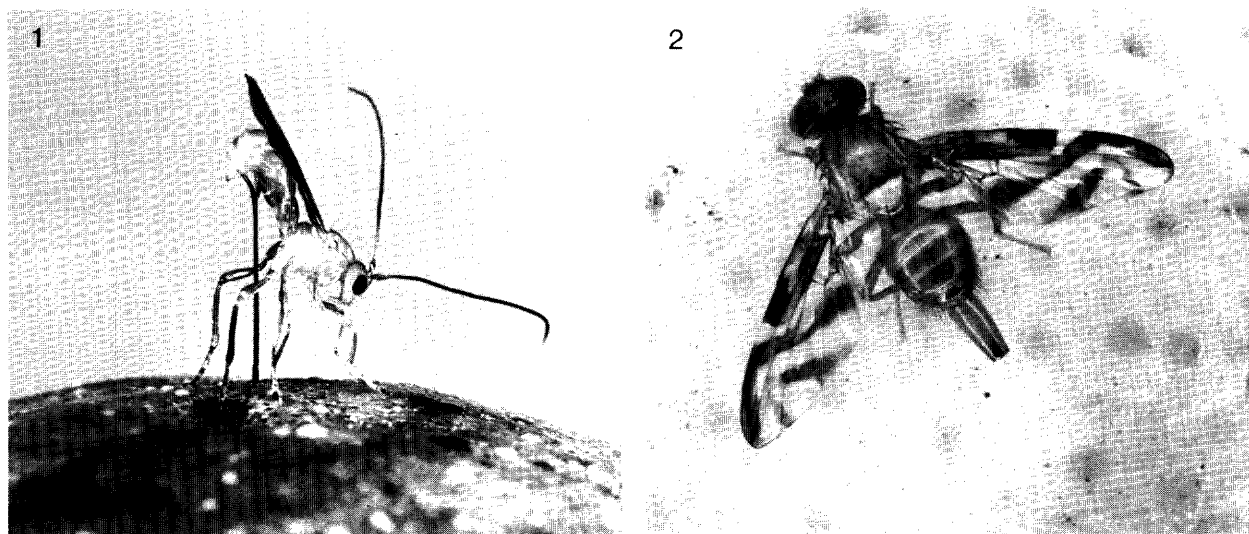


Figure 1-2. 1) Female *Diachasmimorpha longicaudata* ovipositing into fly larva in guava; 2) Adult Caribbean fruit fly, *Anastrepha suspensa*. (DPI Photo Set 89117 by J. Lotz)

¹Contribution No. 727, Bureau of Entomology

²Taxonomic Entomologist, FDACS, Division of Plant Industry, P.O. Box 1269, Gainesville, FL 32602

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 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 13-24 eggs per day (Lawrence *et al.* 1978) using her elongated ovipositor to reach the fly larvae inside fruit. The eggs hatch in 2-5 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 18-23 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).

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. 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.

LITERATURE CITED

- Ashley, T.R. and D.L. Chambers. 1979. Effects of parasite density and host availability on progeny production by *Biosteres (Opius) longicaudatus* (Hym.: Braconidae), a parasite of *Anastrepha suspensa* (Dip.: Tephritidae). *Entomophaga* 24: 363-369.
- Ashley, T.R., P.D. Greany and D.L. Chambers. 1976. Adult emergence in *Biosteres (Opius) longicaudatus* and *Anastrepha suspensa* in relation to the temperature and moisture concentration of the pupation medium. *Florida Entomol.* 59: 391-396.
- Baranowski, R.M. 1987. Wasps sting flies, 60-40. University of Florida, IFAS, Research '87, pp. 12-13.
- Bess, H.A., R. Van Den Bosch and F.H. Haramoto. 1961. Fruit fly parasites and their activities in Hawaii. *Proc. Hawaiian Entomol. Soc.* 17: 367-378.
- Greany, P.D., T.R. Ashley, R.M. Baranowski, and D.L. Chambers. 1976. Rearing and life history studies on *Biosteres (Opius) longicaudatus* (Hym.: Braconidae). *Entomophaga* 21: 207-215.
- _____, J.H. Tumlinson, D.L. Chambers and G.M. Boush. 1977. Chemically mediated host finding by *Biosteres (Opius) longicaudatus*. A parasitoid tephritid fruit fly larvae. *J. Chem. Ecol.* 3: 189-195.
- Lawrence, P.O. 1981. Host vibration-a cue to host location by the parasite, *Biosteres longicaudatus*. *Oecologia* 48: 249-251.
- _____, R.M. Baranowski, and P.D. Greany. 1976. Effect of host age on development of *Biosteres (Opius) longicaudatus*, a parasitoid of the Caribbean fruit fly *Anastrepha suspensa*. *Florida Entomol.* 59: 33-39.
- _____, P.D. Greany, J.L. Nation and R.M. Baranowski. 1978. Oviposition behavior of *Biosteres longicaudatus*, a parasite of the Caribbean fruit fly, *Anastrepha suspensa*. *Ann. Entomol. Soc. America* 71: 253-256.
- Wharton, R.A. 1987. Changes in nomenclature and classification of some opiine braconidae (Hymenoptera). *Proc. Entomol. Soc. Washington* 89: 61-73.
- _____, and P.M. Marsh. 1978. New world Opiinae (Hymenoptera: Braconidae) parasitic on Tephritidae (Diptera). *J. Washington Acad. Sci.* 68: 147-167.