

ANASTREPHA EDENTATA AND OTHER FRUIT FLIES (DIPTERA: TEPHRITIDAE) DETECTED ON KEY LARGO, FLORIDA

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Several *Anastrepha* species (Diptera: Tephritidae) are quarantine pests of commercial fruits in the New World. Florida is home to one such pest, the introduced *Anastrepha suspensa* (Loew) (Caribbean fruit fly), plus three other *Anastrepha* species that are not considered of economic importance (Foote et al. 1993; Sutton & Steck 2005). One of these latter species, *Anastrepha edentata* Stone, is particularly mysterious, as no host has ever been reported from anywhere in its known range of South Florida and Puerto Rico (Norrbon 2004). We attempted to document its phenology and discover its host(s) through bait trapping and rearing from fruit collections in Dagny Johnson Key Largo Hammock Botanical State Park, Key Largo, Florida, during 1994-1996. Some fruit samples were also taken from Long Key State Park, Long Key, Florida, during the same period and during earlier periods. Both areas are subtropical West Indian hardwood forests.

Ten to 16 plastic McPhail traps baited with torula yeast/borax tablets dissolved in water were suspended on the branches of small trees. Traps were hung 2 m off the ground, placed at 50-100-m intervals along a narrow, unpaved trail in the park, and were checked weekly from 25 Feb 1994 to 23 Feb 1996. In total, 21 *A. edentata* adults were trapped on 10 different occasions (Table 1). This is the first substantial collection of the species since 1934-1937, when the fly was first discovered and trapped in relatively large numbers during an intensive fruit fly survey in South Florida (Brown 1937; Clark et al. 1996). The fly has been captured on only a handful of other occasions (see Norrbom 2007 and records of the Florida Department of Agriculture, Division of Plant Industry (FDACS/DPI) and Florida State Collection of Arthropods (FSCA)), despite extensive, routine fruit fly trapping in nearby suburban Key Largo plus other Florida Keys and large areas of Monroe

TABLE 1. MCPHAIL TRAP (10-16 TRAPS) COLLECTIONS OF *ANASTREPHA* AND *TOXOTRYPANA* ADULTS IN NATIVE HAMMOCK FOREST, KEY LARGO, FLORIDA

	1994				1995				1996	
	<i>A. edentata</i>		other		<i>A. edentata</i>		other		<i>A. edentata</i>	
	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females
Jan	ns	ns	ns	ns	1	1	0	0	0	0
Feb	0	0	0	0	0	0	0	0	0	0
Mar	2	4	0	0	0	1	0	0	ns	ns
Apr	3	2	0	0	0	0	1**	0	ns	ns
May	0	1	0	7*	1*	0	0	0	ns	ns
Jun	0	0	0	0	0	0	0	0	ns	ns
Jul	0	0	1**	0	0	0	0	0	ns	ns
Aug	0	1	0	1*	0	0	0	0	ns	ns
Sep	0	3	0	2*	0	2	0	0	ns	ns
Oct	0	0	0	0	0	0	0	0	ns	ns
Nov	0	0	0	0	0	0	0	0	ns	ns
Dec	0	0	0	0	0	0	0	0	ns	ns

ns = not sampled.

**A. suspensa*.

***T. curvicauda*.

and Miami-Dade Counties by the FDACS/DPI and the United States Department of Agriculture (USDA).

The accumulated records of the last 70+ years allow us to visualize the phenology of *A. edentata*. This is shown in Fig. 1, which is based on 81 collection records from the U.S. National Museum of Natural History (NMNH) (Norrbom 2007) and the FSCA. As first noted by Stone (1942), the fly is present in every month of the year. The accumulated records indicate a bimodal distribution of abundance. The largest peak occurs in Sep, after which the numbers of monthly records gradually decline to a relative low in Feb, followed by a second, smaller peak in Mar-Apr. The fewest records are in the months of Jun and Jul.

Fruits from 22 identified plant species were collected based on availability from 1992 through 1995. Fruits (mature and immature, damaged and undamaged) were harvested from plants, placed into mesh bags, held in a cooler with ice, and transported to the ARS laboratory at Miami within 4 h of collection. Fruits were counted, placed into trays on vermiculite, and covered with organdy cloth. Vermiculite was sifted weekly until fruit was completely desiccated. Pupae were held in vermiculite in Petri dishes at 23-26°C, 70-80% RH, and a 14:10 light:dark regime until adult emergence. Percentage emergence and sex ratio data were not taken.

Fruit collection months below were from Key Largo except where Long Key or Homestead is noted. Fruit collections included: Olacaceae: hog plum, *Ximenia americana* L. (1684 fruit; Jun, Nov, Dec, 1992; Jun, Jul, Aug, 1994; May, 1995), gulf graytwig, *Schoepfia shreberi* J. F. Gmel. (2356 fruit; Jan, Feb, Mar, Apr, 1993; Feb, Mar, 1994; Long Key, Feb, Mar, 1993); Myrcinaceae: marl-berry, *Ardisia escallonioides* Schlecht. & Cham. (350 fruit; Mar, 1994); Rubiaceae: smooth wild coffee, *Psychotria ligustrifolia* (Northrop) Millsp. (234 fruit; Feb, 1993; Apr, Dec, 1994), White indigo, *Randia aculeata* L. (100 fruit; Mar, 1994), Cheese shrub, *Morinda royoc* L. (92 fruit; Jul, 1994), Rough velvetseed, *Guettarda scabra* (L.) Vent. (289 fruit; Sep, Oct, 1994), Everglades velvetseed, *Guettarda elliptica* Sw. (314 fruit; Sep, 1995), Snowberry, *Chiococca alba* (L.) Hitchc. (2306 fruit; Jan, Feb, 1993; Sep, Dec, 1994; Sep, 1995); Polygonaceae: pigeon plum, *Coccoloba diversifolia* Jacq. (646 fruit; Apr, Dec, 1994; January, Mar, 1995); Rhamnaceae: darling plum, *Reynosa septentrionalis*, Vrb. (542; Jun, Jul, 1994; May, 1995); Passifloraceae: passion fruit, *Passiflora suberosa* L. (31 fruit; Jan, 1993; Jul, Sep, 1994); Polygonaceae: sea grape, *Coccoloba uvifera* (L.) L. (711 fruit; Jul, Sep, 1994); Ehretiaceae: rough strongbark, *Bourreria succulenta*, Jacq. var. *revoluta* (HBK) P. E. Schultz (1038 fruit; Jan, Feb, 1993; Aug, Sep, 1994); Sapotaceae:

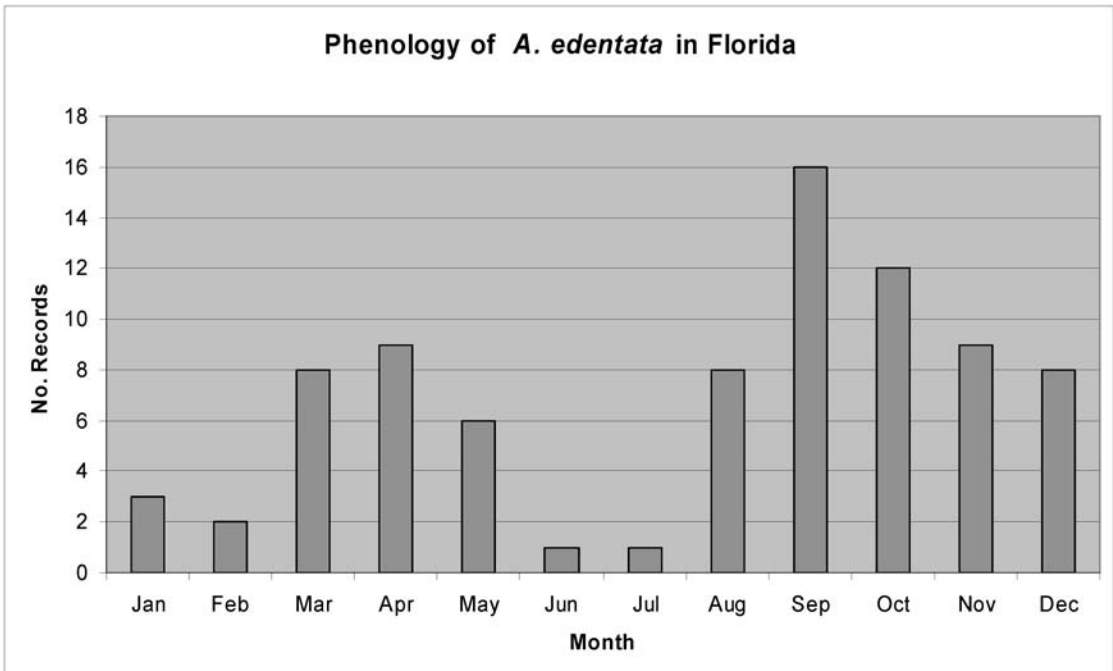


Fig. 1. Phenology Of *Anastrepha edentata* based on FSCA and NMNH Museum specimens and records, 1934-1994.

willow bastic, *Dipholis salicifolia* (L.) Sw. (677 fruit; Sep, 1994; Sep, 1995); Rutaceae: torchwood, *Amyris elemifera* L. (25 fruit; Oct, 1994); Moraceae: shortleaf fig, *Ficus citrifolia* Mill. (316 fruit; May, Sep, 1994); Sapindaceae: white ironwood, *Hypelate trifoliata* Sw. (415 fruit; Sep, 1994); Myrtaceae: Surinam cherry, *Eugenia uniflora* L. (1126 fruit; Homestead, May, 1995); Myrtaceae: white stopper, *Eugenia axillaris* (Sw.) Willd. (121 fruit; Mar, 1995); Caricaceae: papaya, *Carica papaya* L. (12 fruit; Apr, 1995); and Malpighiaceae: Barbados cherry, *Malpighia emarginata* DC. (60 fruit; Homestead, May, 1995). None of the fruit collections yielded *A. edentata* specimens. *Anastrepha suspensa* adults were reared from hog plum for the first time. Eight adults emerged from 315 fruits collected VI/17/1994. Previously, *A. suspensa* had been reared from over 80 other fruits, including papaya, Barbados cherry and Surinam cherry which we sampled (Norrbon 2004). There were 149 and 44 *A. suspensa* adults reared from Barbados cherry and Surinam cherry, respectively, and none from papaya. The infestation rate in hog plum was low, with only one infested fruit out of 11 collections. Additionally, only 11 *A. suspensa* were trapped (Table 1). This widespread and abundant pest of residential, agricultural, and other disturbed areas clearly is not a common denizen of the native subtropical West Indian hardwood hammocks of Florida. Another common fruit pest in Florida, *Toxotrypana curvicauda*, was trapped on two occasions but none was reared from papaya fruit. It is an important pest of papaya in Florida and other areas of the Neotropics (Weems 1969; Norrbom 2004).

The failure to rear *A. interrupta* Stone was surprising, as we collected fruits of its host, gulf graytwig, on numerous occasions during its known flight period (Pereira et al. 2007). We regularly found few mature gulf graytwig fruits but many immature fruits on the plants. We assumed that birds and other wildlife regularly consumed the fruits as they matured, leaving the immature fruits behind. Thus, fruit-eating vertebrates could be important natural enemies of *A. interrupta* larvae in Florida. This phenomenon was also observed by Drew (1987) who noted that up to 77% of *Solanum mauritianum* Scop. fruits, the host of *Dacus cacuminatus* Hering (Diptera: Tephritidae) was consumed by brown pigeons, *Macropygia phasianella* (Temminck). He concluded that fruit-eaters were the major natural enemies of tephritid flies in endemic habitat in Queensland. Pereira et al. (2007) discovered that *A. interrupta* larvae are seed-feeders in gulf graytwig fruits and infested fruits do not mature, thus, they would appear unripe (green) on the plant and they may well drop prematurely. Nearly all of the gulf graytwig fruit that we sampled were mature (purple) and, therefore, possibly infested green fruits were under-sampled. Under-sampling, along with fru-

givity, may explain not detecting *A. interrupta* larvae in the fruits. Ripe hog plums (*X. americana*), another Olacaceae species that we sampled, were not infested with *A. interrupta* larvae, but were infested with *A. suspensa* larvae.

From the adult phenology, we can surmise that *A. edentata* is at least bivoltine and more likely multi-generational in Florida. In this regard, it is similar to *A. interrupta*, which also has been found in all months of the year and at lowest frequency during Jun-Jul. Even though *A. interrupta* is restricted to a single host, its populations can persist year-round probably due to long adult lifespan (up to nearly half a year in the laboratory) and at least sporadic fruiting of the host throughout the year (Pereira et al. 2007). As the host(s) of *A. edentata* has not yet been discovered, we cannot say whether its populations persist in like manner to *A. interrupta*, or whether it makes use of multiple host plants to span the seasons.

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SUMMARY

A concerted effort was made to collect *Anastrepha edentata* Stone with McPhail traps in native hammock forest of Key Largo over a 2-year period, which yielded the largest collection in over 70 years. The phenology of the fly, based on all known Florida collection records, is illustrated and indicates that the fly is at least bivoltine and probably multivoltine. Fruit (9000 total) obtained from 22 different potential host plants failed to produce adults of *A. edentata*, and its host remains unknown. *Anastrepha suspensa* (Loew) and *Toxotrypana curvicauda* Gerstaecker were also trapped, and *A. suspensa* was reared from *Ximenia americana* L. (Olacaceae) for the first time. Comments on *Anastrepha interrupta* Stone are also included.

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