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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 (Norrbom 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 |
|----------|------|----------|------|----------|------|
|          | Males | Females  | Males | Females  | Males | Females  | Males | Females |
| A. edentata |       |          |       |          |       |          |       |          |
| other     |       |          |       |          |       |          |       |          |
| Jan      | ns    | ns       | ns    | ns       | ns    | ns       | ns    | ns       |
| Feb      | 0     | 0        | 0     | 0        | 0     | 0        | 0     | 0        |
| Mar      | 2     | 4        | 0     | 0        | 0     | 1        | 0     | 0        |
| Apr      | 3     | 2        | 0     | 0        | 0     | 0        | 1**   | 0        |
| May      | 0     | 1        | 0     | 7*       | 1*    | 0        | 0     | 0        |
| Jun      | 0     | 0        | 0     | 0        | 0     | 0        | 0     | 0        |
| Jul      | 0     | 0        | 1**   | 0        | 0     | 0        | 0     | 0        |
| Aug      | 0     | 1        | 0     | 1*       | 0     | 0        | 0     | 0        |
| Sep      | 0     | 3        | 0     | 2*       | 0     | 2        | 0     | 0        |
| Oct      | 0     | 0        | 0     | 0        | 0     | 0        | 0     | 0        |
| Nov      | 0     | 0        | 0     | 0        | 0     | 0        | 0     | 0        |
| Dec      | 0     | 0        | 0     | 0        | 0     | 0        | 0     | 0        |

ns = not sampled.
*A. suspensa.
**T. curvicauda.

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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 escallonoides* 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, *Reynosia 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, *Bourerria succulenta*, Jacq. var. revoluta (HBK) P. E. Schultz (1038 fruit; Jan, Feb, 1993; Aug, Sep, 1994); Sapotaceae:

![Phenology of *A. edentata* in Florida](image-url)

Fig. 1. Phenology of *Anastrepha edentata* based on FSCA and NMNH Museum specimens and records, 1934-1994.
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willow bustic, Dipholis salicifolia (L.) Sw. (677 fruit; Sep, 1994; Sep, 1995); Rutaceae: torchwood, Amynris 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 (Norrbom 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 cucuminatus Hering (Diptera: Tephritidae) was consumed by brown pigeons, Macropygia phasianella (Temminck). He concluded that fruiteaters 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 frugivory, 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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