ENDEMIC PARASITOIDS ASSOCIATED WITH *ANASTREPHA* SPP. (DIPTERA: TEPHRITIDAE) INFESTING GUAVA (*PSIDIUM GUAJAVA*) IN SOUTHERN BAHIA, BRAZIL

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Brazil harbors a very high diversity of *Anastrepha* species that infest a wide variety of hosts. Out of the 195 *Anastrepha* species currently described, 95 species are known from Brazil, and these infest fruits in 31 plant families (Zucchi 2000). Many Myrtaceae are important fruit fly hosts, and approximately 25 species in the genera *Psidium*, *Eugenia*, and *Syzygium* are infested (Hernandez-Ortiz 2000). Guava (*Psidium guajava* L.), endemic to the Neotropical region, is the most valuable cultivated species in the Myrtaceae (Thaipong & Boonprakob 2005) and is one of the preferred fruit fly hosts in Brazil (Araujo & Zucchi 2003; Raga et al. 2006). It is also noteworthy that fruit from the family Myrtaceae is particularly attractive to parasitoids in the family Figitidae. This suggests a long-standing tritrophic relationship among these parasitoids, fruit flies, and myrtaceous fruit (Guimarães & Zucchi 2004; Guimarães et al. 1999, 2003).

Recent studies conducted in Central and South America revealed the presence of a large guild of native tephritid parasitoids (Ovruski et al. 2004, for review). Even though native parasitoids are potentially useful biological control agents of fruit flies, the available information on their diversity and abundance is still relatively scant for Brazil, where most systematic parasitoid surveys are restricted to a few locations in the southern and southeastern regions (Canal & Zucchi 2000; Guimarães et al. 2000; Uchôa-Fernandes et al. 2003). There is a considerable gap in these surveys, especially in the northeastern region, which is responsible for significant fruit production in Brazil (Canal & Zucchi 2000; Gonçalves et al. 2006). In the state of Bahia, previous studies have focused on the eastern region, Recôncavo Baiano (between 38°30' and 40°09'S latitude and 12°18' and 13°36'W longitude), approximately 500 km to the north of the current study site (Matrangolo et al. 1998; Canal & Zucchi 2000, for review; Carvalho 2005; Gonçalves et al. 2006).

We present the results of a survey in which we systematically sampled guava fruits in Una, southern Bahia, a region in the coastal zone surrounded by one of the few and largest remnants of the highly endangered mature coastal rainforest in Brazil (Faria et al. 2006). The Brazilian Atlantic rainforest is considered one of the richest biomes on earth, and southern Bahia harbors high levels of endemism and diversity of plants and animals (Thomas et al. 1998; Faria 2006). Little is known regarding tephritid species and their associated parasitoids in southern Bahia wet forest or in agricultural ecosystems surrounded by or next to it. However, it is noteworthy that studies carried out in Mexico confirmed that native host plants in the rainforest area provide an important reservoir of native *Anastrepha* parasitoids (López et al. 1999; Aluja et al. 2003). Our study represents the first report describing the *Anastrepha*-parasitoid guild and the tritrophic relationships among these organisms in southern Bahia.

Our study site was a guava orchard of 0.5 ha within a 30-ha farm located in Una, Bahia, 40 m above sea level at 15°17'36"S latitude and 39°04'31" W longitude. The farm is located in an area surrounded by mature coastal rainforest and the native vegetation is classified as tropical lowland rainforest. Climate is defined as Af (tropical wet) with a mean annual temperature of 24.7°C and 1,827 mm rainfall. There is no distinct rainy season although rainfall is more concentrated from Feb to Apr and a dry period of 1-3 months may occur from Dec to Mar (Faria et al. 2006). The orchard comprised 100 trees of *P. guajava* cv Paluma and has been free of any pesticides for over 3 years. Fruit samples were collected weekly from Feb 2004 to Jan 2005. Samples of 10 ripe or ripening fruit were collected randomly both from the tree canopies and fallen fruit at the ground level. Sample sizes varied due to fruit availability throughout the year. The collected fruit were counted, weighed, and individually placed in plastic containers with a layer of vermiculite and covered with voile cloth until larvae emerged and pupated. All pupae obtained were placed in 30-mL plastic containers with a layer of vermiculite at the bottom and covered with voile cloth until adults emerged. Voucher specimens were depos-

ited at the Laboratório de Moscas-das-frutas, UFERSA (Universidade Federal Rural do Semi-Árido), Mossoró, RN, Brazil.

We collected a total of 505 guavas, weighing 44.5 kg, from which *A. fraterculus* (Wied.), *A. zenildae* Zucchi, and *A. sororcula* Zucchi were identified. A total of 376 guavas (74.5%) were infested by *Anastrepha* larvae and the mean infestation rate was 10.6 ± 13.2 (SD) larvae per fruit or 120.6 pupae per kg of fruit. No specimens of *C. capitata* (Wied.) were recovered. The parasitism rate was 3.8% for all *Anastrepha* pupae recovered from guava fruit. We obtained 142 braconids (78%) (Hymenoptera: Braconidae, Opiinae), 40 figitids (22%) (Hymenoptera: Figitidae, Eucoilinae) and 9 diapriids (4.5%) (Hymenoptera: Diapriidae: Diapriinae). The most common braconid parasitoid recovered was *Doryctobracon areolatus* (Szépligeti) (n = 141), along with a single specimen of *Opius* sp. (n = 1). All figitid specimens obtained were *Aganaspis pelleranoi* (Brèthes) (n = 40). One diapriid species *Trichopria* sp. near *anastrephae* Lima (n = 9) was recovered.

Braconids were recovered from fruit collected from the tree canopies and from recently fallen fruit at the ground level. The most abundant parasitoid found in this survey, *Doryctobracon areolatus*, has been collected throughout Brazil (López et al. 1999; Araujo & Zucchi 2002; Uchôa-Fernandes et al. 2003; Carvalho 2005). *D. areolatus* shows a preference for parasitizing host larvae developing in fruits still hung on the tree (Aguiar-Menezes & Menezes 2002); however it is also noteworthy that some braconids, e.g., *D. areolatus* and *Diachasmimorpha longicauda* (Ashmead) are able to parasitize larvae in fallen fruit (López et al. 1999). Among the figitids, *A. pelleranoi* was the most abundant species and preferentially attacked larvae in fallen fruit (87.7%) over larvae in fruit collected from the canopy (12.3%), consistent with known *A. pelleranoi* oviposition behavior (Guimarães & Zucchi 2004; Ovruski et al. 2004; Souza et al. 2005). *Doryctobracon areolatus* was more prevalent in recently fallen fruit that were still intact while *A. pelleranoi* was recovered mainly from fallen fruit that had been on the ground for a longer time and were extremely ripe or almost rotting.

Previous studies have recorded the presence of one species of *Trichopria*, *T. anastrephae* Lima, associated with *Anastrepha* spp. in Brazil in the states of Rio de Janeiro and Santa Catarina (Aguiar-Menezes et al. 2001; Garcia & Corseuil 2004).

Parasitoid diversity was very similar to the results obtained in surveys involving guava fruit in several regions in Brazil, around 4 parasitoid species (Aguiar-Menezes & Menezes 2002; Guimarães et al. 1999, 2003). Further studies, including more intensive and long term sampling of guava and other *Anastrepha* hosts, mainly native fruit, are necessary to determine the entire guild of native parasitoids in this region.

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Summary

The occurrence of larval-pupal parasitoids (Hymenoptera) associated with *Anastrepha* spp. (Diptera: Tephritidae) is reported in southern Bahia, Brazil, for the first time. The specimens were obtained from pupae reared from infested guava (*Psidium guajava* L.). Two species of Braconidae, 1 species of Figitidae and 1 species of Diapriidae are reported.

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