Diversity and Abundance of Hymenopterous Parasitoids Associated with Anastrepha fraterculus (Diptera: Tephritidae) in Native and Exotic Host Plants in Misiones, Northeastern Argentina

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DIVERSITY AND ABUNDANCE OF HYMENOPTEROUS PARASITOIDs
ASSOCIATED WITH ANASTREPHA FRATERCULUS
(DIPTERA: TEPRITIDAE) IN NATIVE AND EXOTIC HOST PLANTS IN MISIONES, NORTHEASTERN ARGENTINA

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ABSTRACT

Some major host species used by the tephritid fruit flies Anastrepha fraterculus (Wiedemann) and Ceratitis capitata (Wiedemann), including Acca sellowiana (O. Berg Burrett), Campomanesia xanthocarpa O. Berg, Psidium guajava L., Prunus persica (L.) Batsch, Eriobotrya japonica (Thunb.) Lindl., Citrus reticulata Blanco var. Murcott, C. aurantium L., C. paradisi Macfadyen var. Dalan Dan, and C. paradisi var. Sudashi, were sampled for fruit fly larvae between Feb and Dec 2000 in the northernmost section of the Paranaense forest, in the Province of Misiones, NE Argentina. Both A. fraterculus and C. capitata were obtained from these host plant species, with A. fraterculus accounting for 93% of all tephritid puparia identified. Ten species of larval-pupal parasitoids were recovered from A. fraterculus: Doryctobracon areolatus (Szépligeti), D. brasilensis (Szépligeti), Utetes anastrephae (Viereck), Opius bellus (Gahan), Diachasmimorpha longicaudata (Ashmead) (Opiinae, Braconidae), Odontosema anastrephae Borgmeier, Lopheucoila anastrephae (Rohwer), Aganaspis pelleranoi (Brèthes) (Eucoliales, Figitidae), Asobara anastrephae (Muesebeck) (Alyssinae, Braconidae), and Aceratoneuromyia indica (Silvestri) (Tetrastichinae, Eulophidae). All these parasitoids, with the exception of D. longicaudata and A. indica, are native to the Neotropical region. No parasitoids were recovered from C. capitata puparia. Asobara anastrephae and O. anastrephae are newly recorded in Argentina, whereas D. brasilensis, U. anastrephae, and L. anastrephae are newly reported in Misiones. The eucolines A. pelleranoi was the most abundant parasitoid species. Acca sellowiana and P. guajava harbored the highest parasitoid abundance and diversity.

Key Words: fruit flies, host plants, parasitoids, diversity, abundance, Argentina

RESUMEN

Las especies de plantas hospederas Acca sellowiana (O. Berg) Burrett, Campomanesia xanthocarpa O. Berg, Psidium guajava L., Prunus persica (L.) Batsch, Eriobotrya japonica (Thunb.) Lindl., Citrus reticulata Blanco var. Murcott, C. aurantium L., C. paradisi Macfadyen var. Dalan Dan, y C. paradisi var. Sudashi fueron colectadas entre Febrero y Diciembre de 2000 en la sección más norteña de la selva Paraanaense (Misiones, noreste argentino). De estas plantas hospederas se obtuvieron dos especies de Tephritidae: Anastrepha fraterculus (Wiedemann) y Ceratitis capitata (Wiedemann). La primera especie de tefritido representó el 93% de todos los puparios identificados. Se recuperaron 10 especies de parasitoides larvo-pupales de A. fraterculus: Doryctobracon areolatus (Szépligeti), D. brasilensis (Szépligeti), Utetes anastrephae (Viereck), Opius bellus (Gahan), Diachasmimorpha longicaudata (Ashmead) (Opiinae, Braconidae), Odontosema anastrephae Borgmeier, Lopheucoila anastrephae (Rohwer), Aganaspis pelleranoi (Brèthes) (Eucoliales, Figitidae), Asobara anastrephae (Muesebeck) (Alyssinae, Braconidae), y Aceratoneuromyia indica (Silvestri) (Tetrastichinae, Eulophidae). Todas estas especies de parasitoides, con la excepción de D. longicaudata y A. indica, son nativas de la Región Neotropical. No fueron recuperados parasitoides de puparios de C. capitata. Las especies A. anastrephae y O. anastrephae son nuevos registros para Argentina, mientras que D. brasilensis, U. anastrephae y L. anastrephae son nuevas citas para Misiones. El eucolino A. pelleranoi fue la especie de parasitoide más abundante. Las plantas hospederas Acc. sellowiana y P. guajava manifestaron los valores más altos de diversidad y abundancia de parasitoides.

Translation provided by the authors.
There are 2 tephritid fly species in Argentina that have a major economic impact: the native Anastrepha fraterculus (Wiedemann) (South American fruit fly) and the exotic Ceratitis capitata (Wiedemann) (Mediterranean fruit fly). These pests represent an obstacle for fruit crop expansion and for diversification plans in the northeastern Argentinean provinces of Misiones, Corrientes and Entre Ríos (Guillén & Sánchez 2007). In this Argentinean region there are important Citrus-growing areas and patches of native forest locally known as the “Selva Paranaense” (Cabrera 1976), where A. fraterculus and C. capitata infest both wild and cultivated native and exotic fruit species (Turica & Mallo 1961; Putrevuel 1996; Segura et al. 2006).

Ogloblin (1937) and Turica & Mallo (1961) were the only previous studies of the native parasitoid fauna of A. fraterculus in the northernmost extension of the Argentinean Paranaense forest. Since then, the exotic fruit fly parasitoids, Diachasmimorpha longicaudata (Ashmead) and Acerotoneurymia indica (Silvestri), were recovered from A. fraterculus pupae in Misiones (Schliserman et al. 2003; Ovruski et al. 2006). Both D. longicaudata and A. indica, natives of Southeast Asia, were introduced during the 1960s and released in limited numbers in several fruit-growing areas of Argentina, including Misiones (Ovruski et al. 2000), and these are the only exotic parasitoids currently established in Argentina.

The aim of the present study is to survey wild and cultivated fruit species commonly infested by A. fraterculus and C. capitata with the purpose of providing more detailed information on the diversity, abundance, and distribution ranges of hymenopterous parasitoid species associated with both tephritid species in Misiones, northeastern Argentina, as well as to record the degree of infestation and parasitism in each fruit species.

### Materials and Methods

Fruit collections were made weekly between Feb and Dec 2000 in Caraguatay (26°66'S, 54°75'W, elevation 193 m), Laharrague (26°50'S, 54°77'W, 159 m), and Montecarlo city (26°57'S, 54°45'W, 161 m) localities of the Misiones province, NE Argentina. The region has a temperate-warm humid climate with a summer average temperature of 25°C, and a winter average temperature of 16°C. It rains periodically all year long, and the annual rainfall varies from 1,500 to 2,500 mm (Anonymous 1992). The original native vegetation is the subtropical rainforest locally known as the “Selva Paranaense”, which has been intensely modified into agricultural and managed forest areas (Cabrera 1976).

The fruit samples consisted of fallen ripe fruit (40-50%) and ripe fruit still on the tree (50-60%). Table 1 contains fruit tree species surveyed, with information on mean individual weight of fruit, status (exotic or native and wild or cultivated), common name, and plant family. Fruit were mainly collected in forest patches adjacent to citrus groves covered with wild native vegetation, and orchards located at the experimental station “Campo Experimental Laharrague”, an agricultural area maintained by the National Institute of Agricultural Technology (Instituto Nacional de Tecnología Agropecuaria, INTA). No insecticides were applied in any of the collection sites.

Fruit samples were processed in the laboratory of the Montecarlo Experimental Agricultural Station (Estación Experimental Agropecuaria Montecarlo, EEAM)—INTA located in Montecarlo city. Fruits collected from tree and from the ground were kept separate. All fruits in the sample were weighed and rinsed with a 20% solution of sodium benzoate. Each sample was placed in a plastic tray (55 × 40 × 20 cm) with sand in the bottom.

### Table 1. Plant Family, Fruit Species, Average Individual Fruit Weight, and Number of Trees Sampled in Misiones, NE Argentina, During 1-Year Study (2000).

| Plant Family | Fruit species and (common name) | Status | Mean (± SD) individual fruit weight (g) 
|(n = 100 fruits) |
|---|---|---|---|
| Myrtaceae | *Acca sellowiana* (O. Berg) Burret (feijoa) | Native, Wild | 18.9 ± 2.7 |
| | *Campomanesia xanthocarpa* O. Berg (guabira) | Native, Wild | 4.9 ± 1.6 |
| | *Psidium guajava* L. (guava) | Exotic, Wild | 30.1 ± 2.1 |
| Rosaceae | *Prunus persica* L. (P. persica) (peach) | Exotic, Cultivated | 38.8 ± 6.9 |
| | *Eriobotrya japonica* (Thunb.) Lindl. (loquat) | Exotic, Wild | 8.1 ± 2.9 |
| Rutaceae | *Citrus aurantium* L. (sour orange) | Exotic, Cultivated | 250.8 ± 64.5 |
| | *C. paradisi* Macfadyen var. Dalan Dan (grapefruit) | Exotic, Cultivated | 336.9 ± 46.5 |
| | *C. paradisi* Macfadyen var. Sudashi (grapefruit) | Exotic, Cultivated | 234.5 ± 28.7 |
| | *C. reticulata* Blanco, var. Murtcott (mandarin orange) | Exotic, Cultivated | 99.3 ± 15.3 |
tom as pupation medium for larvae. All trays were kept inside a room at 26 ± 2°C and 65 ± 10% relative humidity for 4 weeks. Afterwards, fruits were dissected to find larvae or puparia in the pulp. Live larvae were allowed to pupate and were then added to the other pupae collected from the same sample. The sand inside trays was sifted 2 times each week to collect tephritid pupae, which were then transferred to glass vials (11 cm high and 6 cm of diameter) containing sterilized humid sand at the bottom. Puparia of C. capitata and Anastrepha Schiner were separated based on pupal characters (White & Elson-Harris 1992).

Parasitoid specimens were identified to species by the authors P. S. O., and R. W. Fruit flies were identified by S. O. using Zucchi’s (2000) taxonomic key. The nomenclature corresponds to Wharton (1997) for the Opiniae and Wharton et al. (1998) for the Eucoilinae. Parasitoid and fly specimens were placed in the entomological collections of the Miguel Lillo Foundation (Fundación Miguel Lillo, FML) (Tucumán, Argentina), EEAM (Misiones, Argentina), and Texas A&M University (Texas, USA). All plant species were identified by author O. De Coll.

The rate of parasitism was calculated by dividing the total number of adult parasitoids emerging from pupae obtained from a fruit sample by the total number of pupae recovered from that 1 fruit sample and multiplying it by 100 (Aluja et al. 2003). Fruit infestation levels were obtained by dividing the total number of pupae obtained from a fruit sample by the total weight of the sample (Aluja et al. 2003).

RESULTS

A total of 261.35 kg of fruit was processed during this study (Table 2). Only A. fraterculus was recovered from P. guajava, A. sellowiana, E. japonica, and C. xanthocarpa, whereas both A. fraterculus and C. capitata were recovered from the remaining fruit species. Ceratitis capitata constituted 93, 38, 15, 20, and 25% of the total recovered fly puparia from C. aurantium, C. reticulata, C. paradisi var. Dalan Dan, C. paradisi var. Sudashi, and P. persica (Table 2).

The highest infestation rates by A. fraterculus were found in P. guajava and A. sellowiana, and the lowest levels in the Citrus species (Table 2). Infestation patterns by C. capitata were low and ranged from 0 to 14 pupae per kg of sampled fruit (Table 2).

Five species of opine Braconidae, 3 species of eucoiline Figitidae, 1 species of alyssine Braconidae, and 1 species of tetrastichine Eucoilinae, all larval-pupal parasitoids, were recovered from A. fraterculus pupae. The parasitoids comprised Doryctobracon areolatus (Szépligeti), D. brasiliensis (Szépligeti), Utetes anastrephae (Viereck), Opius bellus Gahan, Diachasmimorpha longicaudata (Ashmead) (Opiniae, Braconidae), Odontosema anastrephae Borgmeier, Lophecoila anastrephae (Rohwer), Aganaspis pelleranoi (Brèthes) (Eucoilinae, Figitidae), Asobara anastrephae (Muesssebeck) (Alyssinae, Braconidae), and Aceratoneuromyia indica (Silvestri) (Tetristichinae, Eucoilinae). All these parasitoid species, with the exception of D. longicaudata and A. indica, are native to the Neotropical region. No parasitoids were recovered from C. capitata puparia.

Nine parasitoid species were found attacking A. fraterculus larvae in A. sellowiana, which had the most diverse assemblage of parasitoids (Table 3). In 3 of the fruit species, only a single parasitoid species was associated with A. fraterculus larvae (Table 3). Nearly 80% of the figitid parasitoids were recovered from fruit gathered from the ground. On the contrary, approximately 60% of the braconid parasitoids were obtained from fruit collected from the tree canopy (Table 3). Percent parasitism was variable and ranged from 0 to 15% in the different fruit species found to be hosts of A. fraterculus in the study area (Fig. 1).

DISCUSSION

Six findings are noteworthy: (1) a higher proportion of A. fraterculus than C. capitata were found in 90% of the host plants surveyed, (2) the diversity of native A. fraterculus parasitoids was high in the northernmost section of the subtropical Paranaense forest, (3) the data extended the known distribution of A. fraterculus parasitoids, (4) the permanent establishment of A. indica in the Paranaense biogeographical region was confirmed, (5) the eucoiline A. pelleranoi was relatively abundant and had an uncharacteristically wide host plant breadth, and (6) the importance of host plants of the Myrtaceae family, such as the A. sellowiana and P. guajava, harbored unusually high levels of parasitoid diversity and abundance.

Although the number and size of fruit samples surveyed during this study were relatively small, the data suggest that A. fraterculus appears to be more abundant than C. capitata in wild native, “feral” exotic, and cultivated exotic fruit species, with the sole exception of C. aurantium, in the northernmost portion of NE Argentina. Both A. sellowiana and P. guajava wild fruit species were principal reservoirs from which A. fraterculus could spread to Citrus-growing areas. Similar observations have been made by Ovruski et al. (2004, 2005) in NW Argentina. As noted by Norrbom (2000), fruits in the family Myrtaceae are the principal hosts of A. fraterculus.

The alyssine A. anastrephae and the eucoiline O. anastrephae are 2 new native A. fraterculus parasitoid species recorded for Argentina. Before this study, 11 neotropical parasitoid species asso-
TABLE 2. TOTAL NUMBERS OF *A. fraterculus* AND *C. capitata* PUPAE AND ADULTS, AND DEGREE OF INFESTATION RECORDED FOR 8 FRUIT SPECIES COLLECTED IN MISIONES, NE ARGENTINA DURING 1-YEAR STUDY (2000).

| Collection sites and months | Host plant species       | No. of samples | Total No. and weight (kg) | Total No. of recovered *A. fraterculus* pupae and adults | *A. fraterculus* pupae/kg of fruit (mean ± SD) | Total No. of recovered *C. capitata* pupae and adults | *C. capitata* pupae/kg of fruit (mean ± SD) |
|-----------------------------|--------------------------|----------------|---------------------------|-----------------------------------------------------------|-------------------------------------------------|---------------------------------------------------|---------------------------------------------|
| Laharrague (Feb)            | *P. guajava*             | 3              | 142 (3.5)                 | 312 105                                                   | 90.01 ± 10.51                                   | —                                                 | —                                           |
| Laharrague (Feb-Mar)        | *A. sellowiana*          | 12             | 611 (11.9)                | 2.285 559                                                 | 176.74 ± 76.67                                  | —                                                 | —                                           |
| Laharrague (May-Sep)        | *C. aurantium*           | 12             | 191 (44.2)                | 12 2                                                      | 0.17 ± 0.31                                    | 159 58                                            | 4.21 ± 1.82                                |
| Laharrague (Jun-Sep)        | *C. reticulata* var. Murcott | 24           | 327 (33.2)                | 120 35                                                    | 4.90 ± 3.89                                    | 72 34                                             | 1.51 ± 1.55                                |
| Laharrague (Sep-Oct)        | *C. paradisi* var. Dalan Dan | 14           | 257 (80.5)                | 188 88                                                    | 1.72 ± 1.10                                    | 32 12                                             | 0.11 ± 0.26                                |
| Laharrague (Sep-Oct)        | *C. paradisi* var. Sudashi | 11           | 104 (24.3)                | 44 8                                                      | 1.92 ± 0.52                                    | 11 3                                              | 0.39 ± 0.68                                |
| Laharrague (Sep-Oct)        | *E. japonica*            | 11             | 959 (12.6)                | 266 112                                                   | 19.01 ± 14.28                                  | —                                                 | —                                           |
| Laharrague (Oct-Nov)        | *P. persica*             | 7              | 271 (11.1)                | 81 21                                                     | 6.87 ± 1.58                                    | 14 2                                              | 1.68 ± 1.47                                |
| Laharrague (Oct-Dec)        | *C. xanthocarpa*         | 4              | 509 (1.6)                 | 50 27                                                     | 32.09 ± 18.18                                  | —                                                 | —                                           |
| Caraguatay (Mar)            | *P. guajava*             | 12             | 675 (19.9)                | 2.447 748                                                 | 121.62 ± 11.26                                 | —                                                 | —                                           |
| Montecarlo (Oct-Nov)        | *P. persica*             | 9              | 427 (18.5)                | 439 145                                                   | 36.41 ± 27.63                                  | 158 37                                            | 8.92 ± 4.78                                |
| Fruit Species       | Parasitoid Species | Parasitoids recovered from fallen fruit | Parasitoids recovered from fruit still on the tree |
|---------------------|--------------------|----------------------------------------|---------------------------------------------------|
|                     |                    | Total No. | % in sample$^1$ (Mean ± SD) | Mean No. of adults per kg fruit (± SD) | Total No. | % in sample$^1$ (Mean ± SD) | Mean No. of adults per kg fruit (± SD) |
| P. guajava          | A. pelleranoi      | 93        | 15.7 ± 7.2                   | 7.1 ± 2.7                                       | 24        | 5.7 ± 4.4                   | 2.5 ± 2.0                                       |
|                     | D. areolatus       | 43        | 6.5 ± 3.6                    | 3.2 ± 2.0                                       | 59        | 12.9 ± 5.9                  | 6.0 ± 3.8                                       |
|                     | D. brasiliensis    | 20        | 2.9 ± 2.3                    | 1.5 ± 1.2                                       | 30        | 6.3 ± 4.3                   | 3.1 ± 2.5                                       |
|                     | U. anastrephae     | 1         | 0.1 ± 0.3                    | 0.1 ± 0.2                                       | 2         | 0.4 ± 1.2                   | 0.2 ± 0.6                                       |
|                     | O. anastrephae     | 2         | 0.4 ± 1.5                    | 0.2 ± 0.6                                       | 0         | —                          | —                                             |
|                     | L. anastrephae     | 1         | 0.1 ± 0.2                    | 0.1 ± 0.3                                       | 1         | —                          | —                                             |
|                     | O. bellus          | 0         | —                            | —                                               | 1         | 0.3 ± 1.1                   | 0.1 ± 0.5                                       |
| A. sellowiana       | A. pelleranoi      | 91        | 19.6 ± 12.2                  | 18.7 ± 16.6                                     | 30        | 8.4 ± 4.6                   | 6.0 ± 4.2                                       |
|                     | D. areolatus       | 24        | 6.4 ± 4.2                    | 5.3 ± 5.7                                       | 35        | 9.0 ± 6.8                   | 6.5 ± 5.2                                       |
|                     | D. brasiliensis    | 26        | 5.9 ± 4.1                    | 4.8 ± 4.2                                       | 25        | 8.7 ± 8.4                   | 4.9 ± 3.0                                       |
|                     | A. indica          | 7         | 1.2 ± 2.9                    | 1.0 ± 2.4                                       | 0         | —                          | —                                             |
|                     | D. longicaudata    | 4         | 0.8 ± 2.0                    | 0.6 ± 1.7                                       | 1         | 0.2 ± 0.7                   | 0.2 ± 0.6                                       |
|                     | U. anastrephae     | 1         | 0.3 ± 1.2                    | 0.1 ± 0.3                                       | 2         | 0.4 ± 1.0                   | 0.3 ± 0.7                                       |
|                     | O. bellus          | 1         | 0.3 ± 1.2                    | 0.1 ± 0.3                                       | 1         | 0.2 ± 0.7                   | 0.2 ± 0.6                                       |
|                     | A. anastrephae     | 0         | —                            | —                                               | 2         | 0.4 ± 1.4                   | 0.3 ± 1.2                                       |
|                     | O. anastrephae     | 1         | 0.2 ± 0.6                    | 0.3 ± 0.9                                       | 0         | —                          | —                                             |
| P. persica          | A. pelleranoi      | 25        | 20.8 ± 31.4                  | 1.8 ± 3.9                                       | 8         | 1.9 ± 4.4                   | 0.5 ± 1.1                                       |
|                     | D. areolatus       | 4         | 3.8 ± 12.6                   | 0.3 ± 0.9                                       | 7         | 8.1 ± 13.0                  | 0.5 ± 0.8                                       |
|                     | D. brasiliensis    | 1         | 0.2 ± 0.9                    | 0.1 ± 0.3                                       | 1         | 0.2 ± 0.8                   | 0.1 ± 0.2                                       |
|                     | U. anastrephae     | 0         | —                            | —                                               | 1         | 0.3 ± 1.3                   | 0.1 ± 0.3                                       |
| C. reticulata       | A. pelleranoi      | 1         | 1.4 ± 3.8                    | 0.1 ± 0.1                                       | 0         | —                          | —                                             |
| C. paradisi var. Dalan Dan | A. pelleranoi | 7         | 4.5 ± 8.9                    | 0.1 ± 0.1                                       | 0         | —                          | —                                             |
| C. xanthocarpa      | A. pelleranoi      | 2         | 9.8 ± 15.9                   | 1.2 ± 1.4                                       | 0         | —                          | —                                             |
| E. japonica         | A. pelleranoi      | 12        | 18.5 ± 19.5                  | 2.4 ± 2.9                                       | 0         | —                          | —                                             |
|                     | D. areolatus       | 2         | 2.3 ± 5.2                    | 0.5 ± 0.9                                       | 6         | 7.1 ± 7.9                   | 0.9 ± 1.1                                       |

$^1$Proportion in sample considering the total number of adults that emerged (both parasitoids and fruit flies).
associated with *A. fraterculus* on native and exotic host fruit species had been found in Argentina (5 Braconidae, 4 Figitidae, and 2 Diapriidae) (Ovruski et al. 2005). In decades old studies, *D. areolatus*, *O. bellus*, and *A. pelleranoi* were the only native parasitoid species recovered from *A. fraterculus* in Misiones (Ogloblin 1937, Turica & Mallo 1961).

The present detection of *Asobara anastrephae* represents the southernmost collection of this species. It was previously reported in association with *Anastrepha* spp. in Panama, Colombia, and Brazil (São Paulo, Mato Grosso do Sul, Rio Grande do Norte, Goiás, and Amazonas states) (Ovruski et al. 2000; Canal & Zucchi 2000; Souza Filho et al. 2009). Previous to this study, *Odontothesa anastrephae* had only been recorded from *Anastrepha* spp. in Brazil, Costa Rica, and México (Guimarães et al. 2003). Possibly, *O. anastrephae* is widespread throughout the Neotropical Region (Wharton et al. 1998).

This study also corroborates the permanent establishment of the exotic parasitoid species *A. indica* on *A. fraterculus* in northeastern Argentina. Previously, *A. indica* had only been recorded from *A. fraterculus* pupae obtained from guava fruits approximately 38 years after its first release in Misiones (Ovruski et al. 2006). The specimens of *D. longicaudata* recorded in this study had been previously cited by Schliserman et al. (2003) and their collection marks a new southern limit for this species. It was previously reported in association with large-sized, introduced fruit species, such as *Citrus paradisi* and *C. reticulata*, was *A. pelleranoi*. This information is consistent with data published by Schliserman & Ovruski (2004) who collected 2,820 *C. aurantium* fruits in NW Argentina but recovered *A. pelleranoi* as the only parasitoid. Previous studies by Sivinski et al. (1997) in Mexico and Ovruski et al. (2004) in Argentina showed that *A. pelleranoi* mostly parasitized *Anastrepha* larvae in fallen fruit by entering through fissures in the fruit. Large fruits with a thick pericarp allows *A. pelleranoi* to exploit a larval resource that is unavailable to species such as *D. areolatus*, which forages at canopy level (García-Medel et al. 2007) and always oviposits by drilling through the pericarp from the outside of the fruit (Sivinski & Aluja 2003). Data reported in Table 3 corroborated the differences in the foraging patterns between the figitid *A. pelleranoi* and the opiines *D. areolatus* and *D. brasiliensis*. In the cases of the other parasitoid species identified in this study, the total number of adults recovered were quite low (Table 3), and no definitive conclusions can be achieved. However, previous reports by Sivinski et al. (1997), López et al. (1999), and García-Medel et al. (2007) indicated that *O. anastrephae* preferentially attacks larvae in fallen fruit upon the ground, *U. anastrephae* forages at canopy level, and *D. longicaudata* can parasitized larvae at ground level, and also in the canopy.

Two members of the family Myrtaceae, *A. sellowiana* and *P. guajava*, generated 87% of all parasitoid specimens recovered from *A. fraterculus* pupae, and showed the highest diversity values. Similar studies conducted in tropical and subtropical forests of México (López et al. 1999; Sivinski et al. 2000), Brazil (Aguiar Menezes et al. 2001; Souza-Filho et al. 2009), NW Argentina (Ovruski et al. 2004, 2005) and Bolivia (Ovruski et al. 2009) highlighted the importance of wild or “feral” Psidium species and other native Myrtaceae species as reservoirs for native *Anastrepha* parasites. In general, Myrtaceae fruits have several characteristics, such as thin pericarp, soft endocarp, volatiles, color, and size that may favor parasitoid success, either by increasing attractiveness to wasps or by establishing easier host larva detection (Sivinski et al. 1997; Ovruski et al. 2000). Our samples of *C. xanthocarpa*, however, suggest that not all myrtaceans are equally

![Graph](https://bioone.org/journals/Florida-Entomologist/0932-8459/00000932-0000000000.png)

**Fig. 1.** Mean (± SD) parasitism percentage recorded in 7 host fruit species of *A. fraterculus* collected in Misiones, NE Argentina.
attractive. Our data point to the need for more thorough monitoring of fruit fly host plants over several years to assess seasonal and annual variation in impact of parasitoids upon natural populations of C. capitata and A. fraterculus in NE Argentina.

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