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NATIVE HYMENOPTERAN PARASITOIDS ASSOCIATED WITH FRUIT FLIES (DIPTERA: TEPHRITIDAE) IN SANTA CATARINA STATE, BRAZIL

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ABSTRACT

A survey of tephritid fruit fly species and their parasitoids was conducted in the western portion of Santa Catarina state, Brazil. A total of 9,197 fruits belonging to 46 plant species in 24 families was collected. The parasitoids recovered were *Aganaspis pelleranoi* (Brèthes), *Lopheucoila anastrephae* (Rhower) (Figitidae), *Doryctobracon areolatus* (Szèpligeti), *Doryctobracon brasiliensis* (Szèpligeti), *Odontosema anastrephae* Borgmeier, *Opius bellus* Gahan, *Opius* sp., *Utetes* (*Bracanastrepha*) *anastrephae* (Viereck) (Braconidae), and *Trichopria anastrephae* Lima (Diapriidae). *Agasnaspis pelleranoi* is the most frequent parasitoid species found in the west region of Santa Catarina. We recorded the first occurrence of *L. anastrephae* in Santa Catarina. Parasitism ranged from 1.2 to 46.9%.

Key Words: Insecta, *Anastrepha*, Braconidae, Figitidae, Diapriidae, parasitoids, fruit flies.

RESUMEN

Se realizo un estudio del reconocimiento de las especies tefrítidas de las moscas de las frutas y sus parasitoides en el área occidental del estado de Santa Catarina, Brasil. Un total de 9,197 frutas que pertenecen a 46 especies de plantas fueron recolectadas. Los parasitoides recolectados fueron: *Aganaspis pelleranoi* (Brèthes), *Lopheucoila anastrephae* (Rhower) (Figitidae), *Doryctobracon areolatus* (Szèpligeti); *Doryctobracon brasiliensis* (Szèpligeti), *Odontosema anastrephae* Borgmeier, *Opius bellus* Gahan, *Opius* sp., *Utetes* (*Bracanastrepha*) *anastrephae* (Viereck)(Braconidae) y *Trichopria anastrephae* Lima (Diapriidae). *Agasnaspis pelleranoi* es el parasitoide encontrado mas frecuentemente en la región oeste de Santa Catarina. El primer registro de la ocurrencia de *L. anastrephae* en Santa Catarina fue obtenido. El rango de parasitismo fue de 1.2 a 46.9%.

Surveys of tephritid fruit flies and their parasitoids are a first step to a better understand of the ecology of these economically important taxa (Zucchi 2000a). The major natural enemies of the fruit flies in Brazil belong to the families Braconidae, Figitidae, and Pteromalidae (Hymenoptera). Pteromalidae, mainly *Pachycrepoideus vindemiae* Rondani, are sporadically collected and specimens of Figitidae are collected in small numbers throughout the country. Typically the most frequent parasitoids collected in Brazil are members of the Braconidae family (Canal & Zucchi 2000).

In Santa Catarina state, Nora et al. (2000) previously found, in order of abundance, *Doryctobracon areolatus* (Szèpligeti), *Doryctobracon brasiliensis* (Szèpligeti), *Opius bellus* Gahan, and *Opius tomoplagiae* Lima. In addition, they obtained unidentified Diapriidae, Eulophidae, Figitidae, and Pteromalidae. Guimarães et al. (2000) added to this list the figitids *Aganaspis pelleranoi* (Brèthes) and *Odontosema anastrephae* Borgmeier, and Leonel, Jr. et al. (1995) and Canal & Zucchi (2000) obtained braconids *Microcrasis lonchaea* (Lima) and *Utetes* (*Bracanastrepha*) *anastrephae* (Viereck).

The present paper describes the parasitoids of fruit flies from the western portion of Santa Catarina state, an area which is a growing producer of citrus in the state (Koller et al. 1999) and which has not been surveyed thoroughly in the past. We collected 9,197 mature fruit from trees or on the soil comprising 46 species belonging to 25 families in the six towns Anchieta (26°53'S and 53°33'W), Chapecó (27°06'S and 53°16'W), Cunha Porã (26°07'S and 53°16'W), Palmitos (27°06'S and 53°16'W), São Carlos (27°07'S and 53°00'W), and Xanxerê (26°87'S and 52°40'W), Santa Catarina. Each fruit was weighed and put in a plastic container with about seven centimeters of sterilized sand, and covered with a net. The containers were kept in the entomology laboratory of the Agricultural and Environmental Science Center at the Universidade Comunitária Regional de Chapecó at 25 ± 3°C, 70 ± 10% and a 12-h photoperiod. After five days, the sand with pupae was transferred to lab Petri dishes containing filter

TABLE 1. PARASITOID SPECIES (HYMENOPTERA) FROM FRUIT FLIES COLLECTED IN SIX DIFFERENT LOCALITIES FROM THE WEST OF SANTA CATARINA, BRAZIL, DURING 1998-2000.

				Hymenoptera parasitoid species and relative frequency (%)			
Vegetal specie	S[1]	N[2]	PaT[3]	Braconidae	Figitidae and Diapriidae	%P[4]	TIP[5]
Fabaceae							
Inga sellowiana	5	246	2		*L. anastrephae* (100.0)	4.1	4.7
Myrtaceae							
Psidium cattleianum	11	635	42	*D. areolatus* (19.0) *D. brasiliensis* (33.3) *Opius* sp. (9.7) *U. anastrephae* (19.0)	*A. pelleranoi* (19.0)	1.9	2.1
Eugenia involucrata	3	446	46	*D. areolatus* (69.6) *Opius bellus* (8.7) *Opius* sp. (4.3) *U. anastrephae* (17.4)		46.9	47.9
Psidium guajava	17	190	147	*D. brasiliensis* (2.0) *Opius bellus* (1.1) *Opius* sp. (2.0)	*A. pelleranoi* (49.0) *T. anastrephae* (45.9)	20.1	20.3
Feijoa sellowiana	2	80	58	*D. areolatus* (48.3) *D. brasiliensis* (48.3) *Opius bellus* (3.4)		11.6	14.3
Myrcianthes pungens	2	52	6	*D. brasiliensis* (100.0)		28.5	46.1
Campomanesia xanthocarpa	4	702	4	*D. brasiliensis* (100.0)		7.7	12.5
Britoa guazumaefolia	6	255	48	*D. areolatus* (16.7) *D. brasiliensis* (37.5)	*A. pelleranoi* (3.5) *O. anastrephae* (8.3)	7.1	8.8
Eugenia pyriformis	5	264	4		*A. pelleranoi* (100.0)	3.0	4.0
Rosaceae							
Prunus domestica	5	109	26	*D. brasiliensis* (23.1) *U. anastrephae* (76.1)		16.1	16.8
Prunus avium	2	18	8	*D. areolatus* (75.0) *U. anastrephae* (25.0)		24.2	50.0

[1]S—sample, [2]n—number of fruit, [3]PaT—parasitoids total, [4]%P—Parasitism percentage, [5]TIP—total index Parasitism.

TABLE 1. (CONTINUED) PARASITOID SPECIES (HYMENOPTERA) FROM FRUIT FLIES COLLECTED IN SIX DIFFERENT LOCALITIES FROM THE WEST OF SANTA CATARINA, BRAZIL, DURING 1998-2000.

				Hymenoptera parasitoid species and relative frequency (%)			
Vegetal specie	S[1]	N[2]	PaT[3]	Braconidae	Figitidae and Diapriidae	%P[4]	TIP[5]
Eriobotrya japonica	9	1166	48	*D. areolatus* (8.3) *D. brasiliensis* (41.6) *Opius bellus* (4.3) *Opius* sp. (4.2) *U. anastrephae* (41.6)		4.3	5.9
Pyrus communis	2	62	4		*A. pelleranoi* (100.0)	14.8	33.3
Prunes persica	16	562	18	*D. brasiliensis* (22.2)	*A. pelleranoi* (66.7) *O. anatrephae* (11.1)	1.2	1.6
Total	89	4787	461				

[1]S—sample, [2]n—number of fruit, [3]PaT—parasitoids total, [4]%P—Parasitism percentage, [5]TIP—total index Parasitism.

paper dampened with distilled water. Flies and parasitoids were counted after seven days.

The relationship between a fly species and its parasitoids was determined only when a single species of fly was held in an emergence container (Canal et al. 1994).

The total index of parasitism (TIP) was calculated as the number of parasitoids emerged × 100/ number of flies emerged + number of parasitoids emerged. The relative frequency of fly species and parasitoids (RF) was defined as number of samples of a given species collected × 100/total number of collected species according to Matrangolo et al. (1998), and the parasitism percentage was calculated as %P = total parasitism × 100/total pupae, which was modified from Silveira Neto et al. (1997).

Species of *Anastrepha* were identified with Steyskal's key (1997) and Zucchi's key (2000b), which includes only Brazil species. The Braconidae were identified according to the key of Canal & Zucchi (2000). The flies and parasitoids belonging to other families were sent to Prof. Dr. Manoel Araécio Uchôa Fernandes, Biologist Jorge Anderson Guimarães, Dr. Allen Norrbom, and Prof. Dr. Roberto Antonio Zucchi for identification.

Of the 46 fruit species collected, 35 were infested by fruit flies, but only 14 of these fruit species contained parasitoids (Table 1). A total of 682 samples of parasitoids belonging to nine species and three families were obtained, as follows: *D. areolatus*, *D. brasiliensis*, *O. bellus*, *Opius* sp., *U. anastrephae* (Braconidae), *A. pelleranoi*, *O. anastrephae* (Figitidae), and *Trichopria anastrephae* Lima (Diapriidae).

Of the 461 hymenopterans associated with a particular fruit fly, *A. pelleranoi* was the most common and represented 25.6% of the total, followed by *D. brasiliensis* (21.1%) and *D. areolatus* (18.6%). These figures differ from those obtained by Salles (1996) for the state of Rio Grande do Sul and Leonel Jr. (1995, 1996) for the state of São Paulo. However, the relative abundance of parasitoids collected in the valley of Rio do Peixe, state of Santa Catarina by Nora et al. (2000) are similar to ours.

All the parasitoids developed in *A. fraterculus*, except for *L. anastrephae*, which was associated only with *Neosilba* sp. Also a lonchaeid was obtained in the samples (Table 2). *D. areolatus* and *U. anastrephae* also parasitized *Neosilba* sp. De Santis (1980) catalogued eleven species of *Trichopria* for Brazil, and believed that only *T. anastrephae* parasitized the genus *Anastrepha*. Aguiar-Menezes et al. (2001) previously reported *A. fraterculus* as the host of *T. anastrephae*. *L. anastrephae* has been recorded previously only in the southern part of the country, in the state of São Paulo and central Mato Grosso do Sul (De Santis 1980).

Parasitoids attacked fruit flies in 14 host-plant species, one Fabaceae, five Rosaceae and eight Myrtaceae (Table 1). Myrtaceae contained 79.6% of the parasitoids and Rosaceae had 21.2%. The total parasitism index and the parasitism percentage were greatest in *Eugenia involucrata*, followed by *Prunus avium* and *Myrcianthes pungens*. These indexes are higher than those obtained by Leonel, Jr. et al (1996), Salles (1996) and Matrangolo et al. (1998), but are similar to those of Guimarães et al. (1999).

TABLE 2. ASSOCIATION BETWEEN COLLECTED PARASITOIDS AND FRUIT FLIES IN SIX DIFFERENT LOCALITIES IN THE WEST OF SANTA CATARINA, BRAZIL, DURING 1998-2000.

Parasitoids	Fruit flies	
	A. fraterculus	*Neosilba* sp.
Braconidae		
D. areolatus	X	X
D. brasiliensis	X	
O. bellus	X	
Opius sp.	X	
U. anastrephae	X	X
Diapriidae		
T. anastrephae	X	
Figitidae		
A. pelleranoi	X	
L. anastrephae		X
O. anastrephae	X	

The high percent parasitism in *E. involucatra* was previously found by Salles (1996) in the Rio Grande do Sul state, and may be due, as he suggested, to the thin peel and small size of the fruit. Guimarães et al. (2000) previously observed affinity of *A. pelleranoi* to the Myrtaceae fruit, which we confirmed. Sivinski (1991), Sivinski et al. (1997, 2000) and Hickel (2002) found that braconid parasitism was negatively correlated to fruit pulp thickness, and we showed that weight data correlated to parasitism.

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