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Comparative abundance and diversity of Dryininae (Hymenoptera, Dryinidae) in three savannah phytophysiognomies in southeastern Brazil, under three sampling methods

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ABSTRACT. Comparative abundance and diversity of Dryininae (Hymenoptera, Dryinidae) in three savannah phytophysiognomies in southeastern Brazil, under three sampling methods. This study aimed to assess the abundance and diversity of Dryininae in riparian vegetation, Brazilian savannah, and savannah woodland vegetation at the *Estação Ecológica de Jataí*, in Luiz Antônio, State of São Paulo, Brazil, by using Moericke, Malaise, and light traps. The sampling was carried out from December 2006 to November 2009, and 371 specimens of Dryininae were caught, with the highest frequencies in spring and summer. Fourteen species of *Dryinus* Latreille, 1804 and one of *Thaumatodryinus* Perkins, 1905 were identified. The highest frequencies of *Dryinus* in the riparian vegetation differed significantly from those obtained in the Brazilian savannah and savannah woodland vegetation. In the riparian vegetation, the highest number of *Dryinus* was collected using light traps and the interactions between abundance and the collection method used were significant. The number of specimens of *Dryinus* collected in the Brazilian savannah and savannah woodland vegetation using Malaise traps did not differ significantly from those obtained using Moericke traps. Males significantly outnumbered females in the sex ratio of *Dryinus*. The species diversity of *Dryinus* based on females collected using Malaise traps was high in the Brazilian savannah. Furthermore, high species richness of female *Dryinus* was observed in riparian vegetation (six species) and Brazilian savannah (five). The light trap was the most successful method for sampling diversity of Dryininae.

KEYWORDS. Chrysidoidea; Insecta; Neotropical region; riparian vegetation; savannah woodland vegetation.

Dryininae is cosmopolitan, with about 340 species in six genera: *Dryinus* Latreille, 1804; *Gonadryinus* Olmi, 1991; *Hybristodryinus* Engel, 2005; *Megadryinus* Richards, 1953; *Pseudodryinus* Olmi, 1991; and *Thaumatodryinus* Perkins, 1905 (Olmi & Virla 2006; Xu *et al.* 2013; Olmi & Virla 2014). Approximately 120 species have been recorded in the Neotropics, of which 40, in five genera, were reported from Brazil (Olmi 2009; Coelho *et al.* 2011). The species whose biologies are known parasitize Acanaloniidae, Cixiidae, Dictyopharidae, Flatidae, Fulgoridae, Issidae, Lophopidae, Ricaniidae, and Tropiduchidae (Hemiptera, Fulgoromorpha) (Guglielmino & Olmi 1997; Olmi 2006; Guglielmino *et al.* 2013).

The *Estação Ecológica de Jataí* (EEJ) in the Luiz Antonio municipality covers approximately 9,000 ha and is the largest protected area containing Brazilian savannah vegetation in the State of São Paulo, Brazil. Its terrestrial habitats contain mainly Brazilian savannah *sensu stricto*, savannah woodland vegetation, which occupies approximately 60% of its area, as well as semideciduous forest phytophysiognomies (riparian vegetation) and remnants of cultivation of *Eucalyptus* sp. and *Pinus* sp. (Pires *et al.* 2000; Toppa *et al.* 2006).

No previous study has recorded the diversity of Dryinidae genera and species for the Brazilian savannah biome. The few known details about the Dryinidae of Brazil refer to descriptions of species and studies on the diversity of parasitic Hymenoptera, such as those conducted by Azevedo & Santos (2000), Azevedo *et al.* (2002), Perioto & Lara (2003), Azevedo *et al.* (2003), Perioto *et al.* (2005), Alencar *et al*. (2007), and Gnocchi *et al.* (2010) in the Atlantic Rainforest and Sperber *et al.* (2004), Santos & Pérez-Maluf (2012), Ferreira *et al.* (2013), and Klesener *et al.* (2013) in agroecosystems.

This study aimed to characterize the diversity of Dryininae and identify the species collected in areas of riparian vegetation, Brazilian savannah, and savannah woodland vegetation at EEJ and to evaluate the collection methods used to catch this group of parasitoids.

MATERIAL AND METHODS

Sampling of Hymenoptera was performed every two weeks between December 2006 and November 2009 in the Brazilian savannah *strictu sensu* (21°35'17.7"S, 47°47'28.2"W,

~550 m above sea level [asl]), savannah woodland vegetation (21°36'11.6"S 47°36'11.6"W, ~533 m asl), and riparian vegetation (21°37'23.7"S 47°48'27.8"W, ~532 m asl) areas at the EEJ, in the Luiz Antonio municipality, in the State of São Paulo, Brazil. In these environments, the following traps were installed: (a) two Malaise traps (model Townes 1972) with Dietrich solution as a preservative, separated by at least 100 m, which remained active continuously over the study period and (b) two sets of five Moericke traps (disposable plastic yellow dishes, 15 cm in diameter and 4.5 cm height) with a 5% formalin solution and neutral detergent as a preservative, separated from each other by two meters, with each set about 100 m from the next closest, which remained active without interruption in riparian vegetation between December 2006 and November 2009 and in the Brazilian savannah and savannah woodland vegetation between December 2006 and August 2007.

In the riparian vegetation, two light traps built according to Szentkirályi (2002) were also installed, separated from each other by 100 m, and fixed in trees inside the forest so that their circular coverage was approximately 2.0 m in height in relation to soil. The traps were equipped with mixed lamps, mercury vapor, 250 W, and their function was controlled by electronic timer coupled to an electromechanical contactor so that the traps remained active on Mondays, Wednesdays, and Fridays, from dusk to dawn of the next day, between November 2007 and November 2009. In the traps, 5% formalin solution and neutral liquid soap were used as preservative.

In the laboratory, Dryinidae were separated from other Hymenoptera and stored in plastic vials with 70% ethanol and later dried in a critical point dryer (Leica EM CPD030), mounted on cards, labeled, and identified using a stereomicroscope Leica MZ 7.5 APO with a fluorescent light source.

Identifications of subfamilies and genera were performed using keys published by Olmi (2006) and Olmi & Virla (2006). Females of Dryininae were identified to the species level by using keys from Olmi & Virla (2014).

The data analysis of *Dryinus* obtained in each studied phytophysiognomy included the effect of year of collection, sex, and method of collection; the effects were nested within each vegetation type, since the variables are not independent. Malaise, Moericke, and light traps were evaluated in the riparian vegetation; Malaise and Moericke traps in the Brazilian savannah and, savannah woodland vegetation, and Malaise traps in all studied phytophysiognomies.

Abundance data are represented using Poisson distribution, which is a special generalized linear model (McCullagh & Nelder 1989). In this study, the number of Dryinidae over time were analyzed using a logistic model as measures in time by using PROC GENMOD (SAS/Stat 2003). The independent variables included in the model were as follows: type of vegetation (Brazilian savannah, savannah woodland vegetation, and riparian vegetation), trap type (Malaise, Moericke, and light), sex (male and female), year (2007, 2008, and 2009), and interactions between factors. The test for comparison of means was performed by orthogonal contrasts by using the maximum-likelihood method.

The diversity of Dryininae species caught by using Malaise traps in the three studied phytophysiognomies was compared through rarefaction curves, obtained by bootstrapping with resampling (Moreno *et al*. 2008). Bootstrap analyses were calculated using absence/presence data of each species with EstimateS Win9.1.0 (Colwell 2013) by using 2000 randomizations and 95% confidence interval.

RESULTS AND DISCUSSION

A total of 371 specimens of Dryininae, from two genera, were obtained: *Thaumatodryinus* (four specimens; 1.1% of the total captured) and *Dryinus* (367; 98.9%), of which only the females of *Dryinus* (49; 13.2%) were identified (Tables I and IV). All specimens of *Thaumatodryinus* belonged to *Thaumatodryinus macilentus* De Santis & Vidal Sarmiento, 1974. In *Thaumatodryinus*, 31 species have been recognized worldwide, eight of which are found in the Neotropical region and four in Brazil, among which the species of know biologies are associated with Flatidae (Hemiptera) (Guglielmino & Olmi 1997; Olmi & Virla 2014).

Among the females of *Dryinus*, the species identified included *D. bocainanus* (Olmi, 1987) (12 specimens; 24.5% of the total female specimens collected), *D. bicolor* (Olmi, 1984) (7; 14.3%), *D. striatus* (Fenton, 1927) (6; 12.2%), *D. gibbosus* (Olmi, 1984) (5; 10.2%), *D. exophthalmicus* (Olmi, 1984) (4; 8.2%), *D. ruficeps* Cameron, 1888 (4; 8.2%), *D. andinus* (Olmi, 1984) (2; 4.1%), *D. caraibicus* Olmi, 1984 (2; 4.1%), *D. plaumanni* Olmi, 2003 (2; 4.1%), *D. davidsoni* (Olmi, 1991) (1; 2.0%), *D. forestalis* (Olmi, 1984) (1; 2.0%), *D. kimseyae* Olmi, 1984 (1; 2.0%), *D. onorei* Olmi, 1996 (1; 2.0%), and *D. surinamensis* Olmi, 1984 (1; 2.0%) (Table IV).

Few studies have been conducted on the Dryinidae fauna of Brazil, with most of the studies in the country restricted to lists and descriptions of sporadically collected species (Olmi 1984, 1989; Coelho *et al*. 2011; Martins 2013). Martins (2013) reported nine species of *Dryinus* in areas of the Atlantic Rainforest of São Paulo, the following of which were also observed in this study: *D. ruficeps, D. striatus*, and *D. surinamensis* were obtained in the riparian vegetation, *D. onorei* in Brazilian savannah, *D. bocainanus* in riparian vegetation and Brazilian savannah, and *D. gibbosus* in riparian vegetation and savannah woodland vegetation. Coelho *et al.* (2011) reported six species of *Dryinus* at *Floresta Nacional de Caxiuanã*, Pará, Brazil, of which *D. ruficeps* and *D. striatus* also were collected in riparian vegetation at EEJ.

Dryinus forestalis is here recorded from Brazil for the first time; the species also occurs in Costa Rica, Suriname, French Guyana, and Bolivia (Olmi & Virla 2014). Also, the first occurrences of *Dryinus andinus*, *D. bicolor*, *D. caraibicus*, *D. davidsoni*, *D. exophthalmicus*, *D. kimseyae*, *D. plaumanni*, and *Thaumatodryinus macilentus* in the State of São Paulo are here recorded.

Dryinus andinus has been recorded from Mexico, Brazil (Bahia), and Argentina; *D. bicolor* in Mexico, Honduras,

Table I. Genera of Dryininae (Hymenoptera, Dryinidae) collected with Moericke (YPT), Malaise (MAL) and light traps in riparian vegetation (RV), Brazilian savannah (BS) and savannah woodland vegetation (SWV) at *Estação Ecológica de Jataí*, in Luiz Antônio municipality, São Paulo State, between December 2006 and November 2009.

Month-year	*Dryinus*														*Thaumatodryinus*											
	RV				BS			SWW							RV				BS			SWW					
	MAL	YPT	LIGHT	Total	MAL	YPT	Total	MAL	YPT	Total	Male	%	Female	%	Total	MAL	YPT	LIGHT	Total	MAL	YPT	Total	MAL	YPT	Total	Male	%	Female	%	Total
Dec-06	10			10			0	1		1	11	100.0	0	0.0	11				0			0			0		0.0		0.0	0
Jan-07	7			7	1		1			0	6	75.0	2	25.0	8				0			0			0		0.0		0.0	0
Feb-07	5			5		1	1			0	5	83.3	1	16.7	6				0			0			0		0.0		0.0	0
Mar-07				0	2		2			0	1	50.0	1	50.0	2				0			0			0		0.0		0.0	0
Apr-07	3			3			0			0	3	100.0	0	0.0	3				0			0			0		0.0		0.0	0
May-07				0			0			0		0.0	0	0.0	0				0			0			0		0.0		0.0	0
Jun-07				0			0			0		0.0	0	0.0	0				0			0			0		0.0		0.0	0
Jul-07	1			1	1		1			0	1	50.0	1	50.0	2				0			0			0		0.0		0.0	0
Aug-07		1		1			0		1	1		0.0	2	100.0	2				0			0			0		0.0		0.0	0
Sep-07	1			1			0	2		2	3	100.0	0	0.0	3				0			0			0		0.0		0.0	0
Oct-07	12	2		14			0			0	10	71.4	4	28.6	14				0	1		1			0	1	100.0		0.0	1
Nov-07	4	1	10	15	1		1	2		2	15	83.3	3	16.7	18				0			0			0		0.0		0.0	0
Dec-07	18	1	7	26	1		1			0	25	92.6	2	7.4	27				0			0			0		0.0		0.0	0
Jan-08			6	6	2		2			0	6	75.0	2	25.0	8				0			0			0		0.0		0.0	0
Feb-08	1		11	12			0			0	11	91.7	1	8.3	12				0			0			0		0.0		0.0	0
Mar-08	2		9	11			0			0	11	100.0	0	0.0	11				0			0	1		1	1	100.0		0.0	1
Apr-08			9	9			0			0	8	88.9	1	11.1	9				0			0			0		0.0		0.0	0
May-08			4	4			0			0	4	100.0	0	0.0	4				0			0			0		0.0		0.0	0
Jun-08			3	3			0			0	3	100.0	0	0.0	3				0			0			0		0.0		0.0	0
Jul-08			2	2			0			0	2	100.0	0	0.0	2				0			0			0		0.0		0.0	0
Aug-08			14	14			0			0	14	100.0	0	0.0	14				0			0			0		0.0		0.0	0
Sep-08	1	2	16	19			0			0	16	84.2	3	15.8	19				0			0			0		0.0		0.0	0
Oct-08	3	1	30	34	1		1			0	33	94.3	2	5.7	35			1	1	1		1			0		0.0	2	100.0	2
Nov-08	5	1	7	13	2		2			0	13	86.7	2	13.3	15				0			0			0		0.0		0.0	0
Dec-08			6	6	1		1			0	6	85.7	1	14.3	7				0			0			0		0.0		0.0	0
Jan-09		1	9	10	1		1			0	8	72.7	3	27.3	11				0			0			0		0.0		0.0	0
Feb-09				0	1		1			0		0.0	1	100.0	1				0			0			0		0.0		0.0	0
Mar-09			23	23	1		1			0	20	83.3	4	16.7	24				0			0			0		0.0		0.0	0
Apr-09			11	11			0			0	10	90.9	1	9.1	11				0			0			0		0.0		0.0	0
May-09			7	7			0			0	6	85.7	1	14.3	7				0			0			0		0.0		0.0	0
Jun-09			2	2			0			0	1	50.0	1	50.0	2				0			0			0		0.0		0.0	0
Jul-09			2	2			0			0	2	100.0	0	0.0	2				0			0			0		0.0		0.0	0
Aug-09			5	5			0			0	5	100.0	0	0.0	5				0			0			0		0.0		0.0	0
Sep-09	1		36	37	1		1			0	36	94.7	2	5.3	38				0			0			0		0.0		0.0	0
Oct-09	4	2	14	20			0	2		2	15	68.2	7	31.8	22				0			0			0		0.0		0.0	0
Nov-09			8	8	1		1			0	8	88.9	1	11.1	9				0			0			0		0.0		0.0	0
Total	78	12	251	341	17	1	18	7	1	8	318		49		367	0	0	1	1	2	0	2	1	0	1	2		2		4
%				91.9			4.9			2.2	86.6		13.4		98.9				0.3			0.5			0.3	50		50		1.1

Costa Rica, Panama, Trinidad and Tobago, Colombia, Suriname, French Guiana, Ecuador, Peru, Brazil (Rondônia, Goiás, Mato Grosso and Santa Catarina), and Argentina; *D. caraibicus* in Costa Rica, Panama and Trinidad and Tobago, Colombia, Brazil (Paraíba, Bahia and Mato Grosso), and Bolivia; *D. davidsoni* in Brazil (Bahia and Rio de Janeiro); *D. exophthalmicus* in Brazil (Santa Catarina); *D. kimseyae* in Costa Rica, Panama, Colombia and Brazil (Rondônia); *D. plaumanni* in Brazil (Santa Catarina); and *Thaumatodryinus macilentus* in Mexico, Honduras, Costa Rica, Panama, Trinidad and Tobago, Colombia, Suriname, French Guiana, Ecuador, Peru, Brazil (Rondônia, Goiás, Mato Grosso and Santa Catarina), and Argentina (Olmi & Virla 2014).

Because of the small number of *Thaumatodryinus* captured, the analyses of abundance and fluctuations of Dryininae captured in EEJ were restricted to *Dryinus* (Tables I–III). Also, due to the strong deviation toward males observed in the studied population, the analyses of *Dryinus* were done by sex. Identification keys for species of *Dryinus* based on males have poor coverage and are not reliable, which prevented the identification of collected specimens.

The highest frequencies of *Dryinus* were recorded in 2008 (139 specimens; 37.9% of the total collected) and 2009 (132; 36.0% of the total collected), with population peaks

Table II. Analysis of variance of the frequencies of *Dryinus* Latreille (Hymenoptera, Dryinidae) collected with Moericke, Malaise and light traps in riparian vegetation, Brazilian savannah and savannah woodland vegetation at *Estação Ecológica de Jataí*, in Luiz Antônio municipality, São Paulo State, between December 2006 and November 2009.

	df	χ^2	p
Year	3	15.00	0.0018
Sex	1	220.35	<0.0001
Area	2	81.17	<0.0001
Trap (area)	4	392.68	<0.0001

Table III. Contrast of frequencies of *Dryinus* Latreille (Hymenoptera, Dryinidae) through Proc GENMOD collected with Moericke, Malaise and light traps in riparian vegetation, Brazilian savannah and savannah woodland vegetation at *Estação Ecológica de Jataí*, in Luiz Antônio municipality, São Paulo State, between December 2006 and November 2009.

	χ^2	p
2007 x 2008	12.35	0.0004
2007 x 2009	3.86	0.0495
2008 x 2009	3.17	0.0749
Brazilian savannah x savannah woodland vegetation	0.44	0.5071
Brazilian savannah x riparian vegetation	18.54	<0.0001
Savannah woodland vegetation x riparian vegetation	25.44	<0.0001
Brazilian savannah: Malaise x Moericke	2.81	0.0938
Savannah woodland vegetation: Malaise x Moericke	0.68	0.4113
Riparian vegetation: Malaise x light	139.95	<0.0001
Riparian vegetation: Malaise x Moericke	40.40	<0.0001
Riparian vegetation: light x Moericke	135.53	<0.0001
Malaise: Brazilian savannah x savannah woodland vegetation	4.22	0.0400
Malaise: Brazilian savannah x riparian vegetation	35.97	<0.0001
Malaise: savannah woodland vegetation x riparian vegetation	39.49	<0.0001
Male x female	148.54	<0.0001

in October and September (Table I; Fig. 1); in 2007, 85 specimens were obtained with a peak in population in December. The abundance of *Dryinus* in 2007 differed significantly from those recorded in 2008 and 2009 ($p = 0.0004$ and $p = 0.0495$, respectively), but there were no significant differences found between the abundances in 2008 and 2009 ($p = 0.0749$) (Table III). For the three years studied, the highest frequencies of *Dryinus* were observed in spring and summer (Fig. 1).

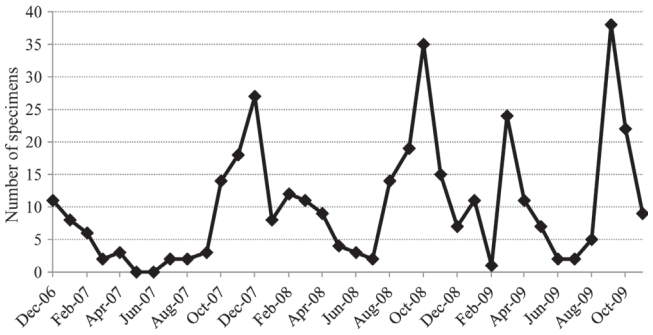

Fig. 1. *Dryinus* Latreille collected with Moericke, Malaise and light traps in riparian vegetation, Brazilian savannah and savannah woodland vegetation at *Estação Ecológica de Jataí*, in Luiz Antônio municipality, São Paulo State, between December 2006 and November 2009.

Dryinus was the most abundant genus found in riparian vegetation, even when the 251 specimens (68.4% of total *Dryinus*) caught by light traps are removed from the analysis. The Moericke and Malaise traps used in the three phytophysiognomies collected 90 specimens (24.5% of total *Dryinus*) in the riparian vegetation; 18 (4.9%) in the Brazilian savannah and eight (2.2%) in the savannah woodland vegetation. The highest frequencies of *Dryinus* recorded in riparian vegetation differed significantly from those obtained in the Brazilian savannah and savannah woodland vegetation ($p < 0.0001$), and no significant interaction between Brazilian savannah and savannah woodland vegetation was found ($p = 0.5071$) (Figs. 2B–2C; Table III).

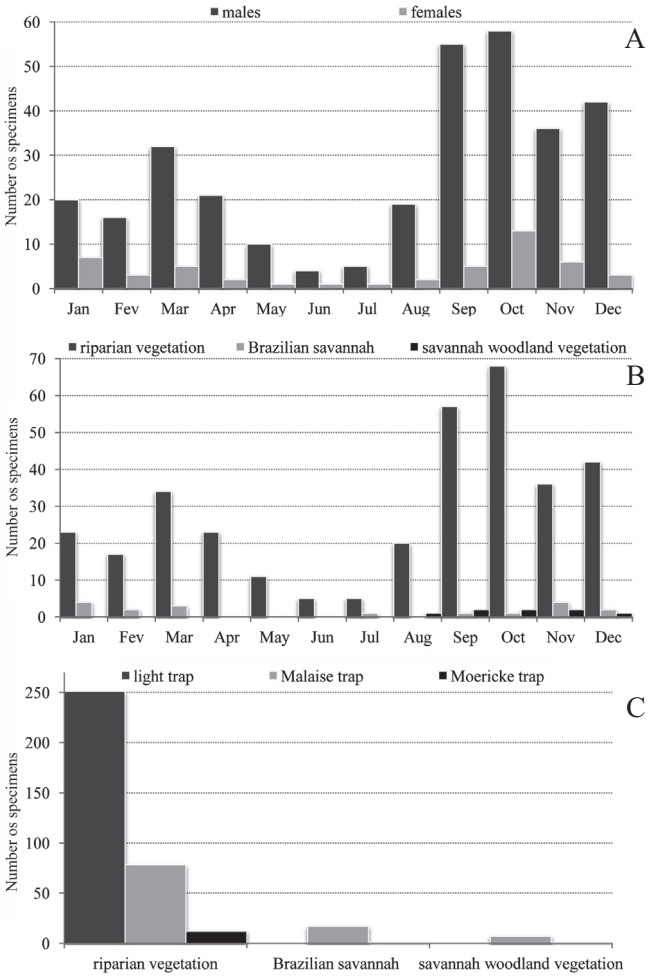

Fig. 2. *Dryinus* Latreille collected at *Estação Ecológica de Jataí*, in Luiz Antônio municipality, São Paulo State, between December 2006 and November 2009, A. males and females; B. by type of vegetation and, C. by collecting method and type of vegetation.

In riparian vegetation, light traps captured the largest number of specimens of *Dryinus* (251), followed by Malaise traps (78), and Moericke traps (12). The interaction between the abundance of *Dryinus* and the capture method used was significant ($p < 0.0001$) (Fig. 2C; Tables I–III). In the Brazil-

ian savannah and savannah woodland vegetation, the Malaise traps captured more specimens of *Dryinus*, 17 and seven, respectively, values that did not differ significantly from those obtained with Moericke traps, which were seven and one, respectively (Fig. 2C; Tables I–III). There was a significant difference in the capture of *Dryinus* with Malaise traps in the three plant physiognomies studied: between Brazilian savannah and woodland savannah vegetation ($p = 0.04$); between riparian vegetation and Brazilian savannah vegetation, and between riparian vegetation and woodland savannah ($p < 0.0001$, for both) (Fig. 2C; Tables I–III).

The joint use of sweep nets, Malaise traps, and Moericke traps to collect parasitic Hymenoptera, including Dryinidae, was reported in many studies, including those by Noyes (1989), García (2003), Azevedo *et al.* (2003), and Perioto *et al.* (2005); the Malaise trap was the most commonly used method in wildland sites (Azevedo & Santos 2000; Alencar *et al.* 2007), while Moericke traps were used the most in agroecosystems (Sperber *et al.* 2004; Ferreira *et al.* 2013).

In this study 318 male and 49 female specimens of *Dryinus* were obtained; and the interaction between males and females differed significantly ($p < 0.0001$) (Fig. 2A; Tables I–III). The significant drift to males in the sex ratio of *Dryinus* (91.9%; 6.9 male:1.0 female) was higher than that observed by Martins (2013) in the Atlantic Rainforest of São Paulo (79.1%; 3.8 male:1.0 female). In that study the author hypothesized that such deviation was a result of using only one collecting method, the Malaise traps. In this study, two other trapping methods were used in addition to Malaise traps, and still the skew in sex ratio toward males was even greater. The information available is not sufficient to determine the cause of the drift to males in the sex ratio of *Dryinus.*

Approximately 70% of the female *Dryinus* were obtained between September and January, with the highest frequency recorded in October (24.5% of the total catch) (Table IV). The riparian vegetation was the environment with the highest number of females collected (33 specimens; 67.3% of the total catch of females), followed by Brazilian savannah (13; 26.5%) and savannah woodland vegetation (3; 6.1%). The Malaise trap captured the largest number of female *Dryinus* (21 specimens; 42.9% of the total collected of females), followed by light traps (15; 30.6%) and Moericke (13; 26.5%) traps.

The species rarefaction curve (bootstrap curve) (Fig. 3) indicated that species diversity of female Dryininae collected with Malaise traps was highest in Brazilian savannah. For the riparian vegetation and the savannah woodland vegetation diversity tended to increase with the addition of samples, however there was no evidence of stabilization with the sample accumulation, indicating that more samples are needed in those areas to better estimate their diversity.

The greater diversity of species observed in the Brazilian savannah may be related to the heterogeneity of vegetation, composed of a discontinuous tree stratum, with trees up to six meters tall, an intermediate stratum, denser, with shrubs up to two meters, distributed in patches and a herbaceous stratum, consisting mainly of grasses less than one meter tall (Toppa *et al*. 2006). This heterogeneity can lead to large numbers of plant-host-parasitoid interactions. It is likely that there are relationships between the structural complexity and the microclimatic conditions of each of the three studied vegetation types and the species diversity of the female Dryininae at EEJ. The data obtained do not necessarily reflect the greater richness and number of exclusive plant species present in the savannah woodland vegetation (121 and 64 species, respectively) and riparian vegetation (51 and 30) at EEJ, while in the Brazilian savannah, these numbers are 41 and seven (Toppa *et al.* 2004).

To better visualize the species richness of females of *Dryinus* collected in the three phytophysiognomies with the three types of traps, the data were represented using Venn diagrams (Figs. 4–5), where the exclusive and shared species for all environments and collection methods can be visualized. The highest species richness of female *Dryinus* was observed

Table IV. Species of *Dryinus* Latreille (Hymenoptera, Dryinidae) collected with Moericke, Malaise and light traps in riparian vegetation, Brazilian savannah and savannah woodland vegetation at *Estação Ecológica de Jataí*, in Luiz Antônio municipality, São Paulo State, between December 2006 and November 2009.

Dryininae	Jan	Fev	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	%
Dryinus bocainanus (Olmi, 1987)	0	0	2	2	2	0	0	0	1	2	2	1	12	24.5
Dryinus bicolor (Olmi, 1984)	1	0	1	0	0	0	0	0	0	3	2	0	7	14.3
Dryinus striatus (Fenton, 1927)	2	0	0	0	0	0	0	0	0	2	1	1	6	12.2
Dryinus gibbosus (Olmi, 1984)	0	0	0	0	0	0	0	1	2	2	0	0	5	10.2
Dryinus exophthalmicus (Olmi, 1984)	0	0	1	0	0	0	1	0	1	0	0	1	4	8.2
Dryinus ruficeps Cameron, 1888	1	0	0	0	0	0	0	1	1	1	0	0	4	8.2
Dryinus andinus (Olmi, 1984)	0	1	0	0	0	0	0	0	0	1	0	0	2	4.1
Dryinus caraibicus Olmi, 1984	1	0	0	0	0	0	0	0	1	0	0	0	2	4.1
Dryinus plaumanni Olmi, 2003	2	0	0	0	0	0	0	0	0	0	0	0	2	4.1
Dryinus davidsoni (Olmi, 1991)	0	1	0	0	0	0	0	0	0	0	0	0	1	2.0
Dryinus forestalis (Olmi, 1984)	1	0	0	0	0	0	0	0	0	0	0	0	1	2.0
Dryinus kimseyae Olmi, 1984	0	1	0	0	0	0	0	0	0	0	0	0	1	2.0
Dryinus onorei Olmi, 1996	0	0	0	0	0	0	0	0	0	0	0	1	1	2.0
Dryinus surinamensis Olmi, 1984	0	0	0	0	0	0	0	0	0	1	0	0	1	2.0
Total	8	3	4	2	2	0	1	2	6	12	5	4	49	100.0
%	16.3	6.1	8.2	4.1	4.1	0.0	2.0	4.1	12.2	24.5	10.2	8.2		100.0

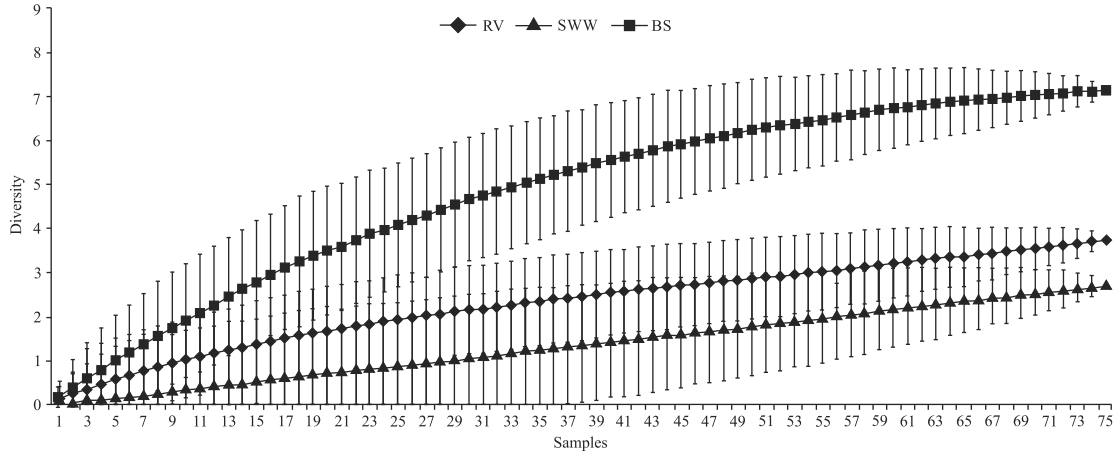

Fig. 3. Diversity (Bootstrap) of Dryininae collected with Malaise trap in riparian vegetation (RV), Brazilian savannah (BS) and savannah woodland vegetation (SWV) at *Estação Ecológica de Jataí*, in Luiz Antônio municipality, São Paulo State, between December 2006 and November 2009.

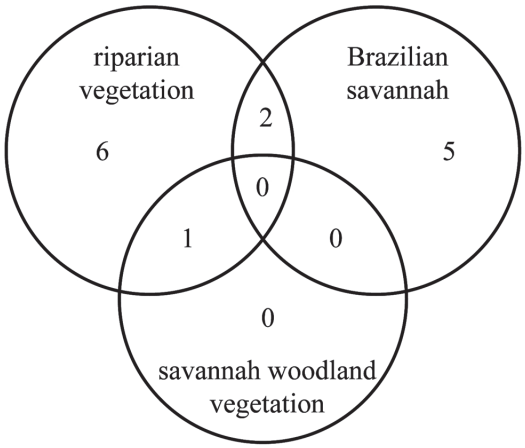

Fig. 4. Venn diagram of the number of species of females of *Dryinus* Latreille, in each studied phytophysiognomy, collected with Moericke, Malaise and light traps at *Estação Ecológica de Jataí*, in Luiz Antônio municipality, São Paulo State, between December 2006 and November 2009.

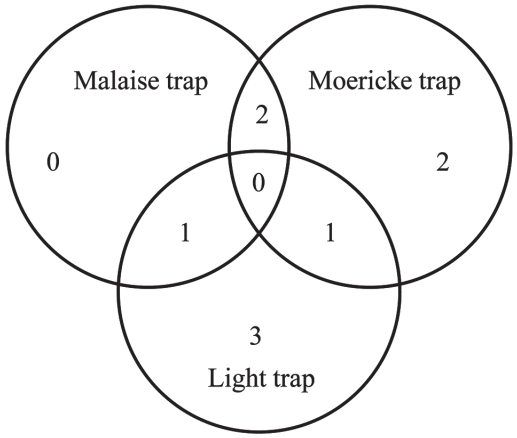

Fig. 5. Venn diagram of the number of species of females of *Dryinus* Latreille collected with Moericke, Malaise and light traps in riparian vegetation at *Estação Ecológica de Jataí*, in Luiz Antônio municipality, State of São Paulo, between December 2006 and November 2009.

in the riparian vegetation (six species) and Brazilian savannah (five); no species was shared by all three vegetation types, whereas two species were shared by the riparian vegetation and Brazilian savannah and one was shared by the riparian vegetation and savannah woodland vegetation (Fig. 4).

Among the species of *Dryinus* captured in the riparian vegetation, three were captured exclusively by light traps and two exclusively by Moericke traps; two were obtained using Moericke and Malaise traps, one by using light and Moericke traps, and another by using light and Malaise traps. No species was captured with all the three types of traps (Fig. 5). The results indicate that the light trap is the most suitable method for sampling species diversity of female *Dryinus* as well as to assess the total number of males and females.

The species richness of female *Dryinus* in the riparian vegetation and Brazilian savannah were similar despite the overall low frequency of specimens collected and the fact that light traps were not deployed in the Brazilian savannah sites. Use of light traps in the Brazilian savannah and savannah woodland vegetation could increase the measured species richness of *Dryinus* in those environments.

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