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Hemerobiidae (Neuroptera) in the midwestern region of Minas Gerais State, Brazil

Hemerobiidae (Neuroptera) en la región del medio-oeste del estado de Minas Gerais, Brasil

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Abstract: This study aimed to identify the Hemerobiidae (Neuroptera) associated to Brazilian savannah and gallery forest, in Minas Gerais State, Brazil. The sampling was carried every two weeks at Brazilian savannah (Cerrado) in Divinópolis and at gallery forest in Pedra do Indaiá, both in Minas Gerais State, Brazil. Collecting was carried out between November 2003 and October 2004, with Malaise traps. A total of 181 specimens of five species of Hemerobiidae were collected. The species *Nusalala tessellata*, *Megalomus impudicus*, *Hemerobius bolivari* and *Notiobiella* sp. were collected in the two sites; the fifth species *Sympherobius* sp. was found only in Pedra do Indaiá. The species of diversity (index of Shannon-Wiener) and the equitability (J) of Hemerobiidae were similar in the areas of Brazilian savannah and gallery forest (H' = 0.47 - 0.49, respectively, and J = 0.78 - 0.69, respectively), and the differences observed between the two locations were not significant.

Key words: Brown lacewing. Biodiversity. Taxonomy. Neotropical.

Resumen: Este estudio tuvo como objetivo caracterizar los Hemerobiidae (Neuroptera) asociados al "Cerrado" *sensu stricto* y bosque de galería, en el estado de Minas Gerais, Brasil. El muestro de hemeróbidos se realizó quincenalmente con auxilio de trampas Malaise entre noviembre de 2003 y octubre de 2004. En las dos áreas de estudio se capturaron 181 ejemplares de hemeróbidos de cinco especies. Las especies: *Nusalala tessellata*, *Megalomus impudicus*, *Hemerobius bolivari* y *Notiobiella* sp., se encontraron en ambos sitios; la quinta especie *Sympherobius* sp. se encontró únicamente en Pedra do Indaiá. La diversidad de especies (índice de Shannon-Wiener) y la equitatividad (J) de Hemerobiidae fueron similares para las áreas Cerrado *sensu stricto* y bosque de galería (H' = 0,47 - 0,49 y J = 0,78 - 0,69) y las diferencias observadas entre los sitios de colecta no fueron significativas.

Palabras clave: Hemeróbidos. Biodiversidad. Taxonomía. Neotropical.

Introduction

Hemerobiidae is one of the most primitive groups among the Neuroptera; they were originated in the Permian (González-Olazo 1981) and has been registered in all continents except at Antartida. The family comprises about 600 species distributed among 25 genera, from which 11 occur in the Neotropical Region (Oswald 1993, 2004; Monserrat 2003).

Hemerobius, the largest Hemerobiidae genera, has about 130 described species and has been recorded in all continents; 50 of this species have been found in the New World, and from those, five in Brazil (Monserrat 1990, 1996). *Megalomus* comprises 32 species, from which 30 occur in the New World and three in Brazil (Monserrat 1990, 1997). *Nusalala* is distributed in the Neotropics and comprises 22 species, from which four have been recorded in Brazil (Monserrat 2000); *Sympherobius* gathers 54 species distributed in the Holartic, Neotropical and Afrotropical regions, and seventeen of those occur in the Neotropical Region (Oswald 1988), and among them, four occur in Brazil (Monserrat 1990; Lara and Perioto 2003).

Several species of Hemerobiidae act as predators of insect pests of commercial crops such as soybean, cotton, citrus, and coffee (González-Olazo 1987; Lara and Freitas 2002; Lara and Perioto 2003). Larvae and adults of Hemerobiidae feed on a great variety of small plant sucking arthropod, especially aphids, soft scales, psyllids, mites, and other soft-bodied species (Penny and Monserrat 1983; Oswald 1993). *Hemerobius* Linnaeus, 1758 (Hemerobiinae), *Megalomus* Rambur, 1842 (Megalominae), *Nusalala* Navás, 1913 (Microminae) and *Sympherobius* Banks, 1904 (Sympherobiinae) are the most common genera found in agricultural and wild environments (Penny and Monserrat 1983; Lara and Freitas 2002, 2003; Lara *et al*. 2008, 2010).

Little is known about the fauna of this group in Brazil: the limited information available comes from taxonomic studies (Penny and Monserrat 1983; Lara and Freitas 2002, 2003), occurrence records (Chagas *et al*. 1982; Lara and Perioto 2003), and biology studies (Souza *et al*. 1990; Souza and Ciociola 1997). The aim of this study was to identify the Hemerobiidae species associated to Brazilian savannah and gallery forest in the Midwest Region of the Minas Gerais State (MG), Brazil.

Material and methods

Sampling was conducted in two locations: one in a 1,2 ha area of Brazilian savannah located in the FUNEDI/UEMG campus (20º08'21"S 44º53'17"W, 712 m) which was surrounded by allotments in the suburbs of Divinópolis, MG; and another one in a gallery forest about 22 meters wide located in Pedra do Indaiá (20º15'53"S 45º09'48"W, 857 m)

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Table 1. Monthly abundance of the Hemerobiidae collected with Malaise traps in areas of Brazilian savannah and gallery forest in Divinópolis and Pedra do Indaiá, Minas Gerais State, Brazil, respectively. Period of collection between November 2003 and October 2004.

Mes/año	*Nusalala tessellata*		*Megalomus impudicus*		*Hemerobius bolivari*		*Sympherobius* sp.		*Notiobiella* sp.		Total	
	PI	D	PI	D	PI	D	PI	D	PI	D	PI	D
Nov./2003	0	0	0	0	0	0	0	0	0	0	0	0
Dec./2003	0	0	1	0	0	0	0	0	0	0	1	0
Jan./2004	0	0	0	0	0	0	2	0	0	0	2	0
Feb./2004	1	2	5	1	0	0	1	1	1	0	8	4
Mar./2004	0	4	0	0	0	0	0	0	0	0	0	4
Abr./2004	0	2	0	0	0	0	0	1	0	0	0	3
May./2004	0	2	0	2	0	1	0	0	0	0	0	5
Jun./2004	5	11	0	0	3	2	0	0	0	0	8	13
Jul./2004	3	4	0	3	2	1	2	1	0	0	7	9
Ago./2004	8	12	1	9	0	3	0	0	0	0	9	24
Sep./2004	33	4	11	2	5	2	0	0	0	0	49	8
Oct./2004	4	4	2	13	2	2	0	0	0	0	8	19
Total	54	45	20	30	12	11	5	3	1	0	92	89
%	58.7	50.6	21.7	33.7	13.0	12.4	5.4	3.4	1.1	0.0	100.0	100.0

also in MG. The gallery forest's canopy can reach up to 18 meters, and hosts in its interior a creek that belongs to the Lambari River basin, which is surrounded by *Brachiaria* sp. (Poaceae) pastures. The Malaise traps were installed 10 m away from the border of the Brazilian savannah area, and 4.5 m away from the creek in the gallery forest.

The collections were conducted every two weeks between November 2003 and October 2004. The traps remained active during all the collection period. The material was taken to the Zoology Laboratory of Fundação Educacional de Divinópolis FUNEDI, where they were screened for insects. The Hemerobiidae obtained were sent to the Laboratorio de Sistemática e Bioecologia de Parasitoides e Predadores da APTA Ribeirão Preto, São Paulo. There they were identified based on articles by Oswald (1993) and Monserrat (1996, 1997, 2000).

Shannon-Wiener (H') and equitability J (ShannonWiener) indexes were used for the analysis of the Hemerobiidae's fauna diversity. To estimate the values from these indexes, a base -10 logarithm was applied, and the calculations were obtained with the software DivEs (Rodrigues 2005). The diversity values obtained were compared by the t-test described by Magurran (1988).

Results and discussion

A total of 181 specimens of Hemerobiidae from five different species were collected in the study plots.

In Divinópolis' Brazilian savannah area, 89 specimens from four species were collected (Table 1): *Nusalalla tessellata* (Gerstaecker, 1888) (45 specimens/50.5% of the total Hemerobiidae collected), *Megalomus impudicus* (Gerstaecker, 1888) (30/33.7%), *Hemerobius bolivari* Banks, 1910 (11/12.3%) and *Notiobiella* sp. (3/3.3%).

In Pedra do Indaiá's gallery forest area, 92 Hemerobiidae from five species were collected (Table 1): *N. tessellata* (54/58.6% of the Hemerobiidae specimens collected), *M. impudicus* (20/21.7%), *H. bolivari* (12/13%), *Sympherobius* sp. (5/5.4%) and *Notiobiella* sp. (1/1%).

In both areas, the greatest Hemerobiidae abundance occurred between June and October. During this period in Divinópolis, 74 specimens were collected, which represents 83.1% of the total collection in that area, a fairly high number that was close to the one registered in Pedra do Indaiá (81/88%); the greatest frequencies occurred in August and September 2004, respectively.

The structure of the Hemerobiidae communities in both studied locations were quite similar. Three species, *N. tessellata*, *M. impudicus* and *H. bolivari*, represented about 95% of the specimens collected. In both environments, *N. tessellata* was the most abundant species, followed by *M. impudicus* and *H. bolivari*, respectively. In Pedra do Indaiá, the frequency peak of *N. tessellate* was observed in September 2004, when 33 specimens were captured (61% of the total collected specimens from that species); in Divinópolis,

Table 2. Shannon-Wiener's (H') diversity index and the Equitability (J) index, and comparison between (H') values using t-test for the Hemerobiidae populations collected in areas of Brazilian savannah and gallery forest in Divinópolis (D) and Pedra do Indaiá (PI) - Minas Gerais state, Brazil, respectively. Period of collection between November 2003 and October 2004.

Collection sites	Diversity (H')	Equitability (J)	$T_{calculated}$
Divinópolis	0,47	0,78	
Pedra do Indaiá	0,49	0,69	
Comparison between H'_D and H'_{PI}			$0{,}0002^{ns}$

^{ns} = not significant.

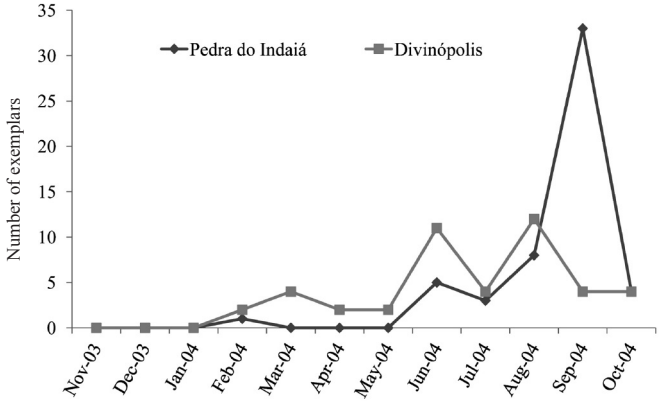

Figure 1. Fluctuation in the population of *Nusalala tessellata* Gerstaecker (Neuroptera, Hemerobiidae) collected in areas of Brazilian savannah and gallery forest in Divinópolis and Pedra do Indaiá, Minas Gerais State, Brazil, respectively. Period of collection between November 2003 and October 2004.

two peaks were observed, one in June and another in August (Fig. 1).

Sympherobius was registered only in Pedra do Indaiá; its low frequency in distinct months difficult the analysis of such behavior.

Lara *et al*. (2010) reported the occurrence of *N. tessellata*, *H. bolivari*, *M. impudicus*, *Simpherobius miranda* Navás, 1920, *M. rafaeli* Penny and Monserrat, 1983, *S. ariasi* Penny and Monserrat, 1983, and *Nomerobius psychodoides* (Blanchard, 1851) in coffee *Coffea arabica* L. (Rubiaceae) crop in Cravinhos, São Paulo. There, the three first species represented about 83% (52.9%, 17.3% and 12.9%, respectively) of the total Hemerobiidae collected, and the highest frequencies of the groups occurred between August and March (end of winter, spring and summer), with a population peak in January (Lara *et al*. 2008). The great number of Hemerobiidae captured by those authors may be due to the use of different types of traps and the greater number of samplings. Lara (comm. pers. 2012) observed that in okra *Abelmoschus esculentus* L. (Malvaceae), soybean *Glycine max* L. Merril (Fabaceae), and citrus *Citrus* sp. (Rutaceae) plantations, *N. tessellata* was the most frequently collected species, which did not happen in coconut *Cocus nucifera* L. (Areaceae) plantations, where *M. rafaeli* was predominant.

Despite the little data available, it is interesting to note that the Hemerobiidae's communities structure are very similar and dominated by only one species – except for the community found in the coconut crop. Hughes (1986) commented that in community samples, most individuals captured belong to a small number of abundant species, while most species are represented by a small number of individuals.

The Shannon-Wiener's diversity index (H') and the equitability (J) index for the Divinópolis (*stricto sensu* Cerrado) and Pedra do Indaiá (gallery forest) areas were similar (H' = 0.47 - 0.49, respectively and J = 0.78 - 0.69, respectively). The t-test proposed by Magurran (1988) to compare two estimated values from the diversity index showed that the differences between the collection areas were not significant (Table 2).

The fact that the gallery forest area did not show a significantly greater diversity value than the Brazilian savannah area can be related to the occurrence of *Notiobiella* sp. only in this environment. It can also be related to the anthropic action near the forest fragment, which is surrounded by an urban community. The most uniform distribution of individuals among the taxa that was observed in the Brazilian savannah area was not significant as well, which can be a reflection of the fact that Hemerobiidae specimens occur in nine out of the twelve months of sampling.

The diversity values obtained in this study are inferior to those reported by Lara *et al.* (2008) in *Coffea arabica* L. crops monitored for two years with different sampling methods. They however, were similar to the values found by Szentkirályi (1989) in an area of corn crops with diverse adjacent vegetation. It is important to highlight the fact that in the experiment by Lara *et al.* (2008), the sampling period was longer and the variety of collection methods was greater.

Literature cited

CHAGAS, E. F.; SILVEIRA NETO, S.; BRAZ, A. J. B. P.; MATEUS, C. P. B.; COELHO, I. P. 1982. Flutuação populacional de pragas e predadores em citros. Pesquisa Agropecuária Brasileira 17 (6): 817-824.

GONZÁLEZ-OLAZO, E. V. 1981. El género *Megalomus* Rambur (Neurop.-Planipennia-Hemerobiidae) en Argentina y Chile. Acta Zoológica Lilloana 36 (2): 97-113.

GONZÁLEZ-OLAZO, E. V. 1987. Los neurópteros asociados con los cultivos cítricos de la provincia de Tucumán y descripción de una nueva especie de *Nomerobius* (Hemerobiidae). CIRPON, Revista de Investigación 1-4 (1): 37-54.

HUGHES, R. G. 1986. Theories and models of species abundances. The American Naturalist 128: 879-899.

LARA, R. I. R.; FREITAS, S. 2002. Caracterização morfológica de adultos de *Nusalala tessellata* (Gerstaecker, 1888) (Neuroptera, Hemerobiidae). Revista Brasileira de Entomologia 46 (4): 523-530.

LARA, R. I. R.; FREITAS, S. 2003. Caracterização morfológica de espécies de *Hemerobius* Linnaeus, 1758 (Neuroptera, Hemerobiidae) associadas a cultivo de café (*Coffea arabica* L.), milho (*Zea mays* L.) e erva-mate (*Ilex paraguariensis* St. Hill.). Revista Brasileira de Entomologia 47 (3): 427-434.

LARA, R. I. R.; PERIOTO, N. W. 2003. Primeiro registro de ocorrência de *Sympherobius miranda* (Navás, 1920) (Neuroptera, Hemerobiidae) para o Brasil. Arquivos do Instituto Biológico 70 (4): 511-512.

LARA, R. I. R.; FREITAS, S.; PERIOTO, N. W.; PAZ, C. C. P. 2008. Amostragem, diversidade e sazonalidade de Hemerobiidae (Neuroptera) em *Coffea arabica* L. cv Obatã (Rubiaceae). Revista Brasileira de Entomologia 52 (1): 117-123.

LARA, R. I. R.; PERIOTO, N. W.; FREITAS, S. 2010. Diversidade de hemerobiídeos (Neuroptera) e suas associações com presas em cafeeiros. Pesquisa Agropecuária Brasileira 45 (2): 115-123.

MAGURRAN, A. E. 1988. Ecological diversity and its measurements. Princeton University Press, Princeton, 179 p.

MONSERRAT, V. J. 1990. A systematic checklist of the Hemerobiidae of the world (Insecta: Neuroptera). 1990. pp. 215-262. In: Mansell, M. W.; Aspöck, H. (Eds.). Advances in Neuropterology. Proceedings of the Third International Symposium on Neuropterology, South African Department of Agricultural Development: Pretoria. [Symposium held in Berg en Dal, Kruger National Park, 1988.] No figures.

MONSERRAT, V. J. 1996. Revision del género *Hemerobius* de Latinoamérica (Neuroptera, Hemerobiidae). Fragmenta Entomológica 27 (2): 399-523.

MONSERRAT, V. J. 1997. Revisión del género *Megalomus* de Latinoamérica (Neuroptera, Hemerobiidae). Fragmenta Entomológica 29 (1): 123-206.

MONSERRAT, V. J. 2000. Revisión del género *Nusalala* (Neuroptera, Hemerobiidae). Fragmenta Entomologica 32 (1): 83-162.

MONSERRAT, V. J. 2003. Contribución al conocimiento de los hemeróbidos de Patagonia y Tierra del Fuego (Insecta, Neuroptera, Hemerobiidae). Graellsia 59 (1): 37-56.

OSWALD, J. D. 1988. A revision of the genus *Sympherobius* Banks (Neuroptera, Hemerobiidae) of America North of Mexico with a synonymical list of the world species. Journal of the New York Entomological Society 96 (4): 390-451.

OSWALD, J. D. 1993. Revision and cladistic analysis of the world genera of the family Hemerobiidae (Insecta: Neuroptera). Journal of the New York Entomological Society 101 (2): 143-299.

OSWALD, J. D. 2004. Review of the brown lacewing genus *Biramus* (Neuroptera: Hemerobiidae: Hemerobiinae), with the description of a new species from Costa Rica and Panama. Tijdschrift voor Entomologie 147 (1): 41-47.

PENNY, N. D.; MONSERRAT, V. J. 1983. Neuroptera of the Amazon basin Part 10-Hemerobiidae. Acta Amazônica 3 (5-6): 879-909.

RODRIGUES, W. C. 2005. DivEs - Diversidade de espécies. Versão 2.0. Software e Guia do Usuário. Disponible en: http://www.ebras.bio.br/dives/index.asp [Review date: 10 October 2010].

SOUZA, B.; CIOCIOLA, A. I. 1997. Efeito de diferentes dietas sobre a fecundidade e longevidade de *Nusalala uruguaya* (Navás, 1923) (Neuroptera: Hemerobiidae). Pesquisa Agropecuária Brasileira 32 (1): 27-32.

SOUZA, B.; MATIOLI, J. C.; CIOCIOLA, A. I. 1990. Biologia comparada de *Nusalala uruguaya* (Navás, 1923) (Neuroptera: Hemerobiidae) alimentada com diferentes espécies de afideos. I. fase de larva. Anais da Escola Superior de Agricultura Luiz de Queiroz 47 (2): 283-300.

SZENTKIRÁLYI, F. 1989. Aphidophagous Crysopid and Hemerobiid (Neuropteroidea) subguilds in different maize fields: influence of vegetational diversity on sub guild structure. Acta Phytopathologica et Entomologica Hungarica 24: 207-211.

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