International Journal of Odonatology, 2017
Vol. 20, No. 1, 13–26, http://dx.doi.org/10.1080/13887890.2017.1281848

Taylor & Francis
Taylor & Francis Group

Dragonflies and damselflies (Odonata) from the wetland of the Rio Pandeiros, northern region of Minas Gerais State, Brazil, with a description of the male of *Archaeogomphus vanbrinki* Machado (Anisoptera: Gomphidae)

Marcos Magalhães de Souza[a], Epifânio Porfiro Pires[b], Ângela Gomes Brunismann[c], Lucas Rocha Milani[c] and Ângelo Parise Pinto [d]*

[a]*Instituto Federal de Educação, Ciências e Tecnologia no Sul de Minas Gerais, Campus Inconfidentes, MG, Brazil;* [b]*Laboratório de Sistemática e Biologia de Hymenoptera, Departamento de Biologia, Setor de Zoologia, Universidade Federal de Lavras, Lavras, MG, Brazil;* [c]*Curso de Licenciatura em Ciências Biológicas, Instituto Federal de Educação, Ciências e Tecnologia no Sul de Minas Gerais, Campus Inconfidentes, MG, Brazil;* [d]*Laboratory of Biology and Systematics of Odonata (LABIOSIS), Departamento de Entomologia, Museu Nacional, and Laboratory of Entomology (LABENT), Departamento de Zoologia, Universidade Federal do Rio de Janeiro, Rio de Janeiro, RJ, Brazil*

(*Received 28 September 2016; final version received 4 January 2017*)

The Odonata from the Refúgio Estadual da Vida Silvestre do Rio Pandeiros (RVSP), located in the Cerrado domain, Minas Gerais State, Brazil, were rapidly surveyed. Sampling efforts were undertaken along the Rio Pandeiros margins during four sampling periods between the rainy (spring–summer) and dry seasons (autumn–winter) from July 2014 to April 2015. We sampled 97 adult specimens of 48 species from seven families, and there were 21 species of damselflies (Zygoptera), and 27 species of true dragonflies (Anisoptera). The dry season yielded a greater species richness and abundance, with Libellulidae dominant along the overall sampling period. A comparison with other biotas in Minas Gerais bringing together a total list of 204 species is provided. RVSP represents an ecotone between the Cerrado and Caatinga domains at the São Francisco river basin and its assemblage exhibited higher similarity index with other Cerrado areas in that state. Our sampling included rare species, many hitherto known only from their type series, and seven new state records were detected for *Hetaerina proxima* (Selys), *Enallagma novaehispaniae* Calvert, *Oxyagrion fernandoi* Costa, *Telebasis griffinii* (Martin), *Telebasis obsoleta* (Selys), and *Erythrodiplax leticia* Machado. In addition, the first known male of *Archaeogomphus vanbrinki* Machado (Anisoptera: Gomphidae) is described and taxonomic notes presented. The nomenclature status of the specific name "vanbrinki" is revised, and as a consequence all subsequent spellings other than the original are considered unjustified emendations in light of the International Code of Zoological Nomenclature.

http://www.zoobank.org/urn:lsid:zoobank.org:pub:59CE58BF-CCA3-4304-8CAE-A3ABD79F7235

Keywords: Austrogomphinae; Cerrado domain; checklist; deciduous forest; dragonfly; Neotropical; São Francisco basin; taxonomy

Introduction

Dragonflies and damselflies are charismatic insects and important predators in a large number of freshwater environments, showing high diversity in the tropical regions of the world (Kalkman

*Corresponding author. Email: odonata_angelo@hotmail.com

et al., 2008). They are amongst the best known insect orders with roughly 6000 known species in all biogeographical regions (Dijkstra et al., 2013), the Neotropical region being one of their diversity hotspots (Kalkman et al., 2008).

The dragonfly fauna of Brazil deserves to be highlighted, with its 860 species (including subspecies) from 14 families and 145 genera (Pinto, 2016a), the richest fauna of any country of the world, and comparatively being 187% and 310% more than Venezuela and Argentina, respectively, which arguably have the best known odonate faunas in South America (De Marmels, 1990; von Ellenrieder & Muzón, 2008). However, the actual number of species in Brazil is yet to be determined, as demonstrated by the high rate of descriptions of new taxa over the last decade (e.g. Garrison & von Ellenrieder, 2015; Machado, 2009; Machado & Bedê, 2015; Pinto & Lamas, 2010, 2011). Imagines and larvae of odonates are important organisms for ecosystem structure (Benke, 1976; Corbet, 1999; De Marco & Latini, 1998) and are useful to biomonitoring programs because certain species exhibit pronounced sensibility to environmental disturbances (Monteiro-Júnior et al., 2014; Oliveira-Junior et al., 2015) and others are adapted to strongly distressed habitats (Ferreira-Peruquetti & De Marco, 2002; Ferreira-Peruquetti & Fonseca-Gessner, 2003). Indeed, odonates may be considered umbrella species for conservation activities (Oertli, 2008).

Brazil, with its huge land area and six major phytogeographical domains, including the highly diverse forested areas in Amazonia and Atlantic Forest, represents a real challenge to faunal inventories. The southeastern states, where there is a mix of Atlantic Forest and Cerrado domains, are the best sampled (Vianna & De Marco, 2012), while the northeastern states are largely covered by Caatinga formations, and are lesser known (Takiya et al., 2016).

The dragonfly fauna in the state of Minas Gerais in southeastern Brazil has been intensely surveyed since at least the nineteenth century (cf. De Almeida, Pinto, Carvalho & Takiya, 2013) and is one of the few to have a resident odonatologist since the 1950s (Pinto, 2016b). Yet, despite its high diversity and ecological relevance based on natural areas, the state still lacks comprehensive fieldwork, as highlighted by recent discoveries (Machado & Bedê, 2015; Machado & Souza, 2014; Pinto & De Almeida, 2016). The majority of faunal inventories undertaken in the state have focused on natural areas located in its metropolitan or core regions (e.g. Bedê, Machado, Piper, & Souza, 2015; De Almeida et al., 2013; Ferreira-Peruquetti & De Marco, 2002; Santos, 1966; Santos & Machado, 1983; Souza et al., 2013) and most of them have focused on the descriptions of new taxa (e.g. Machado & Bedê, 2015; Pinto & De Almeida, 2016). Certain areas are noticeably undersampled from a dragonfly standpoint and remain virtually unknown, like the northern areas that include biomes referred to as deciduous forest (mata seca).

The goals of this study were to provide the first checklist of odonate species from a protected area in the Rio Pandeiros basin, northern region of the state of Minas Gerais, southeastern Brazil, and compare compositional incidence data (presence/absence) from its assemblage with other known natural areas in that state; to describe the hitherto unknown male of *Archaeogomphus vanbrinki* Machado, 1994 and report new state records, consequently filling in the gaps on respect to the distribution of South American species.

Material and methods

Studied area and sampling effort

The sampled area at the Refúgio Estadual da Vida Silvestre do Rio Pandeiros (RVSP; headquarters at 15.50552°S, 044.75714°W, 503 m asl) is a conservation unit included by the larger area of Área de Proteção Ambiental Estadual do Rio Pandeiros, of the municipalities of Bonito de Minas, Cônego Marinho and Januária, northern region of the state of Minas Gerais, Brazil at

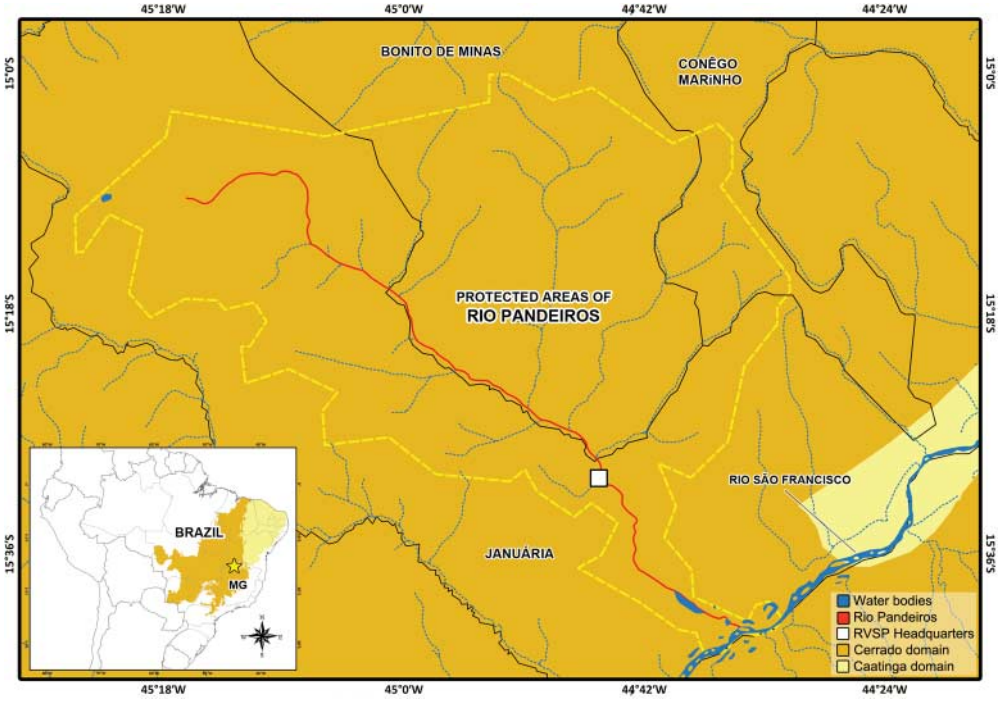

Figure 1. Map with limits of Area de Proteção Ambiental (yellow-dashed line), headquarters Refúgio Estadual da Vida Silvestre do Rio Pandeiros (RSVP) in the municipality of Januária, state of Minas Gerais, Brazil. Inset map of southeastern South America highlighting the Cerrado and Caatinga domains and Minas Gerais State and location of RSVP (star).

the Rio São Francisco basin (Figures 1, 2a, b). This area is considered a high priority for conservation and demands urgent protection (Drummond, Martins, Machado, Sebaio, & Antonini, 2005). The region, although being inserted within the Cerrado, actually corresponds to an ecotone between the Cerrado and Caatinga domains, exhibiting a mixed landscape with unique characteristic physiography in that state, including veredas (palm swamp vegetation), matas de galeria (gallery or riparian forests), mata seca (deciduous forest), and encompasses the largest wetland in Minas Gerais State (Nunes et al., 2009). The climate is predominantly semi-arid, with well-defined dry and rainy seasons, a mean temperature of 25°C, and annual pluviosity of approximately of 1000 mm, the wet period being between October and February (Santos et al., 2007).

Collecting transects took place while walking along the Rio Pandeiros river margins and adjacent areas in four sampling periods during the rainy (spring–summer) and dry (autumn–winter) seasons from July 2014 to April 2015, but without adopting any additional method for sampling effort standardization. Adult dragonflies were collected employing regular aerial nets by three or four collectors, between 08:00 and 15:00, overall totaling 160 h. There were five days of sampling on each expedition, one for every season, totaling 20 days of collecting effort, and in total covering only about of 10% of the RVSP area. All specimens were collected under licenses by IEF (number 039/015) and ICMBio/SISBio (number 49546-1) and deposited in the Museu Nacional, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil (MNRJ, ODO 20–115).

Abbreviations for countries follow the alpha-3 code system, while for the Brazilian states are represented in the 3166-2 code. Both are accepted by the International Organization for Standardization (ISO, 2015). References on the previous distribution data for the species first recorded

Figure 2. Collecting points and species of dragonflies from Refúgio Estadual da Vida Silvestre do Rio Pandeiros, Minas Gerais, Brazil. (a) Rio Pandeiros near the headquarters in a waterfall section; (b) Overview of Rio Pandeiros; (c) *Argia* sp.1, male; (d) *Hetaerina proxima* Selys pair *in copula*; (e) *Perithemis lais* (Perty), male; (f) *Erythrodiplax leticia* Machado, male. Scale bar = 10 mm.

in Minas Gerais were uploaded to the Taxonomic Catalog of the Brazilian Fauna and are freely available online (cf. Pinto, 2016a).

Analysis of similarity (beta diversity)

The asymptotic number of species in RVSP assemblage was estimated through a rarefaction curve based on sample-based (incidence) approach (Colwell et al., 2012). The data were randomized with 1000 replications (observed richness extrapolated up to 1000 individuals); in this way rarefaction is provided in the same curve as interpolated observed richness (S_{obs}) and estimated

richness (S_{est}) (Colwell et al., 2012). Analyses were carried out using the software EstimateS version 9.1.0 (Colwell, 2013).

Comparison amongst dragonfly assemblages in the state of Minas Gerais were undertaken based on incidence data (presence–absence only) through two statistical methods: (1) cluster analysis with unweighted pair-group method using arithmetic averages (UPGMA) by means of the Søresen similarity index (Jost, Chao, & Chazdon, 2011) with bootstrap (10,000 pseudoreplicates) to evaluate the groups was carried out in the program PAST version 3.12 (Hammer, Harper, & Ryan, 2001); and (2) complementarity index (evenness) computed with $C_{jk} = U_{jk}/S_{jk}$ (equation (17) in Colwell & Coddington, 1994). The data from the following localities, arranged in two domains, were utilized for the similarity analysis: Atlantic Forest – Mata do Baú (Souza et al., 2013), Parque Nacional do Itatiaia (Santos, 1970; APP unpub.), Poços de Caldas municipality (Santos, 1966), and Libélulas da Serra de São José Wildlife Refuge (Bedê et al., 2015); Cerrado – Ecological Reserve of the Clube de Caça e Pesca Itororó (Vilela, Guilhermo-Ferreira, & Del-Claro, 2016) and Parque Nacional da Serra do Cipó (De Almeida et al., 2013). Only specimens determined to the level of species were computed, and those with uncertain identities (sp., sp. nov. or variants) were excluded; subspecies were considered full species.

Morphology and taxonomy

Terminology for wing venation follows Riek and Kukalová-Peck (1984) with further additions summarized by Fleck et al. (2003). Terminology for the vesica spermalis (VS) is based on Pfau (2011). The following abbreviations are used in the text: asl = above sea level; Ax = antenodal crossveins; Ax1 and Ax2 = first and second primary antenodals; Fw = forewing; Hw = hind wing; Px = postnodal crossveins; pt = pterostigma; S1–10 = abdominal segments; VS = vesica spermalis; V1–4 = segments of vesica spermalis.

Results and discussion

Checklist, alpha and beta diversity

A total of 97 specimens were collected, representing 48 species in seven families – 21 species of Zygoptera and 27 species of Anisoptera (Table 1, Figure 2). The rarefaction curve shows the area was undersampled and the estimated richness is around 100 species (S_{est}), reaching asymptotic species richness with 600 individuals. Libellulidae was the richest and most abundant family, with 24 species, followed by Coenagrionidae *s.l.*, with 15 species. The other families were significantly less abundant, ranging from two to three species in Calopterygidae, Protoneurinae (Coenagrionidae), and Gomphidae, along with a single species in Lestidae and Aeshnidae (Table 1).

In general, the number of species in a single assemblage (pool) varies strongly in South American habitats, from as small as 30–60 species (Carvalho & Pujol-Luz, 1992; Costa, Lourenço, & Vieira, 2001; Machado et al., 1991; Renner, Périco, & Sahlén, 2013; Souza et al., 2013) to as numerous as 100–200, generally at sites visited several times (Bedê et al., 2015; De Marmels, 1989a, 1989b; Kompier, 2015; Paulson, 1985). Although, the number of species recorded here can be considered high based on the small sampling effort, covering just 10% of the preserve area, it is indicative of a rich pool of odonates in the RVSP (Figure 2) when compared to other faunistic studies conducted in Minas Gerais (Bedê et al., 2015; De Almeida et al., 2013; Souza et al., 2013). Additionally, there are many distinct biotopes found in RVSP with a matrix of numerous types of lentic and lotic environments, alternating between forested areas

Table 1. Species list and number of specimens of dragonflies by season from Refúgio Estadual da Vida Silvestre do Rio Pandeiros, municipality of Januária, state of Minas Gerais, Brazil.

Family/species	Specimen	Rainy season (spring–summer)	Dry season (autumn–winter)
Lestidae			
Lestes minutus Selys, 1862	1♂		X
Calopterygidae			
Hetaerina mendezi Jurzitza, 1982	2♂, 1♀	X	
Hetaerina proxima Selys, 1853*	1♂		X
Hetaerina rosea Selys, 1853	2♂, 3♀		X
Coenagrionidae *s.l.*			
Acanthagrion gracile (Rambur, 1842)	1♂		X
Acanthagrion viridescens Leonard, 1977	1♂		X
Acanthagrion sp.	1?	X	
Argia sp.1 [aff. *A. modesta*]	8♂, 1♀		X
Argia sp.2	1♀		X
Argia sp.3	2♀	X	
Argia sp. [undefined sp.]	1		X
Enallagma novaehispaniae Calvert, 1907*	1♂		X
Ischnura capreolus (Hagen, 1861)	1♂, 7♀	X	X
Ischnura fluviatilis Selys, 1876	1♀		X
Oxyagrion chapadense Costa, 1978	3♂		X
Oxyagrion fernandoi Costa, 1988*	1♂	X	
Nehalennia minuta selysi Kirby, 1890	1♀		X
Telebasis griffinii (Martin, 1896)*	1♀	X	
Telebasis obsoleta (Selys, 1876)*	1♂		X
Coenagrionidae (Protoneurinae)			
Epipleoneura venezuelensis Rácenis, 1955	1♂, 1♀	X	X
Neoneura sylvatica Hagen *in* Selys, 1886	3♂	X	X
Aeshnidae			
Coryphaeschna perrensi (McLachlan, 1887)	1♂	X	
Gomphidae			
Archaeogomphus vanbrinki Machado, 1994*	1♂	X	
Progomphus intricatus Hagen *in* Selys, 1858	1♂	X	
Libellulidae			
Brechmorhoga cf. *praedatrix* Calvert, 1909	2♂	X	X
Brechmorhoga sp. [very likely *B. nubecula*]	1♂	X	
Diastatops obscura (Fabricius, 1775)	3♂, 1♀	X	
Dythemis nigra Martin, 1897	1♂, 1♀		X
Elasmothemis sp. nov.	1♂	X	
Elga leptostyla Ris, 1911	1♀	X	
Erythemis peruviana (Rambur, 1842)	1♀		X
Erythemis plebeja (Burmeister, 1839)	2♂		X
Erythemis vesiculosa (Fabricius, 1775)	1♂		X
Erythrodiplax avittata Borror, 1942	2♀	X	
Erythrodiplax fusca (Rambur, 1842)	4♂, 2♀	X	X
Erythrodiplax juliana Ris, 1911	2♀	X	X
Erythrodiplax latimaculata Ris, 1911	1♂		X
Erythrodiplax leticia Machado, 1996*	1♂	X	
Erythrodiplax ochracea (Burmeister, 1839)	1♂		X
Erythrodiplax paraguayensis (Förster, 1905)	4♂, 2♀	X	X
Macrothemis hemichlora (Burmeister, 1839)	1♂		X
Macrothemis imitans imitans Karsch, 1890	1♀		X
Miathyria marcella Selys *in* Sagra, 1857	1♂		X
Nephepeltia sp.	2♀	X	X
Orthemis aequilibris Calvert, 1909 [red morph]	2♂		X
Pantala flavescens (Fabricius, 1798)	1♂		X
Perithemis lais (Perty, 1834)	3♂		X
Perithemis mooma Kirby, 1889	1♂	X	
Total: 48 spp.	97	23	33

*New state records (see text).

and savanna-like formations, creating a gradient that usually increases the diversity of odonates (Bedê et al., 2015). A sample of specimens obtained subsequent to the completion of this project by another researcher has revealed additional species from previously undetected genera (e.g. *Heteragrion* Selys, 1862, *Micrathyria* Kirby, 1889 and *Tigriagrion* Calvert, 1909) in RSVP.

The high number of species of Libellulidae sampled is in line with other recent investigations into odonate assemblages in Minas Gerais (Bedê et al., 2015; Souza et al., 2013); usually, species of this family dominate almost all faunal studies (see discussion in De Almeida et al., 2013). Indeed, species of this richest Anisoptera family are very common and abundant and thus frequently found in the field. Species of the two other Anisoptera families, Gomphidae and Aeshnidae, exhibit lower richness and abundance, and there are two factors that can explain this: difficulty in capture and secretive habits. It should be noted that both of these hampering influences may be overcome by employing different sampling techniques (De Almeida et al., 2013).

The dry season (autumn–winter period) has the highest species richness of any season, although relatively rare or undescribed species were sampled strictly during the rainy season (spring–summer, Table 1). Excluding more general conditions, such as seasonality and specimen detectability, the higher richness in the dry season can be partially explained because of the reduced size of water bodies during this period, thereby concentrating specimens along available sites and making them easier to sample (Machado & Bedê, 2015).

The beta diversity analysis on the basis of the Søresen similarity coefficient among biotas of dragonflies in the state of Minas Gerais resulted in two groups. The first was composed by Atlantic Forest biotas and the other by the Cerrado; the latter including RVSP (Figure 3). Greater similarity values were observed between the composition of the species of the Libélulas da Serra de São José Wildlife Refuge (RLSS) and Mata do Baú (MTU) at 46%. This is largely because of the similar formation and geographical proximity. RVSP was grouped with the Ecological Reserve of the Clube de Caça e Pesca Itororó (ECCP), another area composed by wetlands, veredas and savanna-like formations, however with a low index of similarity at 26%. The other areas also presented low similarity with a maximum of 36% (Figure 3).

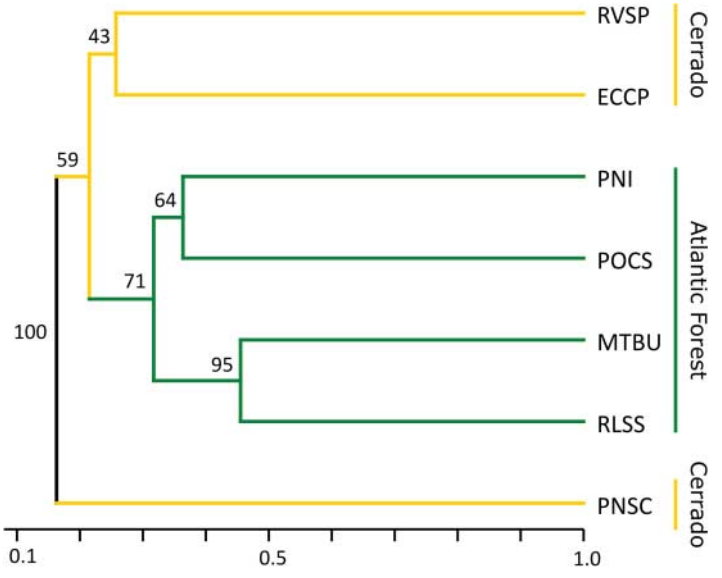

Figure 3. Unweighted pair-group average (UPGMA) cluster tree (Søresen similarity index) among Odonata assemblages from Minas Gerais state, Brazil. Values below branches after 10,000 bootstrapped pseudoreplicates. Abbreviations: ECCP, Ecological Reserve of the Clube de Caça e Pesca Itororó; MTBU, Mata do Baú (Souza et al., 2013); PNI, Parque Nacional do Itatiaia; PNSC, Parque Nacional da Serra do Cipó; POCS, Poços de Caldas municipality; RLSS, Libélulas da Serra de São José Wildlife Refuge; RVSP, Refúgio Estadual da Vida Silvestre do Rio Pandeiros (this study).

In general, low values of similarity between distinct areas would be accounted for by distance, vegetation structure, as well as putative unknown historical and biogeographic factors. It is highly expected that dragonfly communities that are distant geographically, with different climates, vegetation, and topographies, possess low similarity (e.g. Carvalho et al., 2013; Monteiro-Júnior et al., 2013). Conversely, the comparatively uneven knowledge of odonate assemblages from the analyzed areas possibly resulted in a strong bias. For example, the number of species occurring in the Parque Nacional da Serra do Cipó (PNSC) are underestimated at just 23 species, and superficial research in the literature will reveal the occurrences of more species (e.g. Machado, 1994b, 2002; Pessacq & Costa, 2007) that can give rise to misleading results, and this aspect might be reflected in the placement of PNSC not being structured with other Cerrado areas (Figure 3).

The dragonfly community of RVSP shows higher complementarity or level of distinctness with the Atlantic Forest assemblages at Parque Nacional do Itatiaia (PNI) and Poços de Caldas municipality (POCS) and it is more similar in composition with either the assemblages of the Atlantic Forest at RLSS or the Cerrado at ECCP (Table 2). These results should be cautiously interpreted, as previously demonstrated different factors, from undersampling to possibly true compositional distinctness, may be relevant. The low distinctness from the Atlantic Forest biotas of RLSS and MTU can be influenced by widespread species which are easily sampled in rapid assessments and also based on well-known areas, which includes the richness observed in RVSP.

Altogether, all of these areas represent 204 species (excluding new species), an impressive number from a dragonfly perspective, but certainly far from the actual number of species occurring in that state. Machado (1998) estimated approximately 218 species, and since then, 31 species have been described from Minas Gerais (data obtained from Pinto, 2016a), more being eventually recorded for the first time. However, a large part of the species recorded in PNI was from the municipalities of Itatiaia and Resende in Rio de Janeiro State, and could potentially occur in Minas Gerais.

The relative high species richness of RVSP is linked to the new occurrence records for the state, and the undescribed species observed show the relevance of this deciduous forest and wetland for conservation and health of odonate populations in this poorly studied region, endorsing the urgency for conservation actions to be taken (Drummon et al., 2005). High rates of

Table 2. Richness and complementarity index (C %) among Odonata assemblages of distinct domains from Minas Gerais State, Brazil.

	RVSP		ECCP		PNSC		PNI		POCS		MTBU		RLSS
Domain			Cerrado						Atlantic Forest				
Richness[a]	40		30		23		67		43		50		117
Elevation (m)[b]	503		837		805		852		1235		1004		145
							Complementary (C %)						
	C_{index} / shared spp.		C_{index} / shared spp.		C_{index} / shared spp.		C_{index} / shared spp.		C_{index} / shared spp.		C_{index} / shared spp.		
ECCP	85	9											
PNSC	89	6	92	4									
PNI	92	8	89	10	97	3							
POCS	96	3	86	9	92	5	78	20					
MTBU	85	12	87	9	86	9	82	18	81	15			
RLSS	85	21	83	21	91	12	81	30	81	25	71	38	

[a]Excluding taxa determined as sp. or sp. nov.; [b]elevation from coordinates of reference.
Abbreviations: ECCP, Ecological Reserve of the Clube de Caça e Pesca Itororó; MTBU, Mata do Baú (Souza et al., 2013); PNI, Parque Nacional do Itatiaia; PNSC, Parque Nacional da Serra do Cipó; POCS, Poços de Caldas municipality; RLSS, Serra de São José Wildlife Refuge; RVSP, Refúgio Estadual da Vida Silvestre do Rio Pandeiros (this study).

deforestation and the reduced size of areas within this conservation unit can lead to local extinctions, mainly in species with more pristine or specialized habitats, sensitive to removal of general or riparian vegetation (cf. Monteiro-Júnior et al., 2014). For example, this appears be the case with the species of *Archaeogomphus*.

Taxonomic notes

Certain specimens were not well preserved, having been attacked by pests (ants and booklice) and a few were broken, missing parts, or were smashed, inhibiting accurate determination, for instance with the specimens of *Brechmorhoga* Kirby, 1894. However, the study of this material did allow detection of an undescribed species of the genus *Elasmothemis* Westfall, 1988 (Anisoptera: Libellulidae), previously known from a large area in Brazilian Amazonia that will be described elsewhere (APP unpub.). The very species-rich and difficult genus *Argia* Rambur, 1842 (Zygoptera: Coenagrionidae) is currently under revision – our material will be sent to the researchers studying this genus. Additionally, the sample includes rare species, till now known only from their type series which are commented on further down.

The male of Archaeogomphus vanbrinki *Machado*
LSID: http://zoobank.org/urn:lsid:zoobank.org:act:F40D1E70-A0A4-48E1-80A5-EAAE043498D9

The gomphid, *Archaeogomphus vanbrinki* Machado, 1994, was described based on a single female collected in a stream at the Cerrado of Mato Grosso State, Diamantino municipality, Brazil (Machado, 1994a). Beyond its original description, no additional data has been published. Machado (1994a, p. 73) was clear concerning the etymology of the specific name "The species is named after Dr. Janny M[argaretha] van Brink, whose recent death was a great loss to the world of Odonatology and to those who had the privilege of being her friends". The specific name derives from the surname of a woman and also is a modern personal name, which based on arbitrary interpretation on the article 31.1.2 of the International Code of Zoological Nomenclature (hereafter cited as Code) the correct spelling (only if in genitive case) would be "vanbrinkae" adding the *-ae* ending (ICNZ, 1999). This interpretation led the authors to consider a mandatory emendation (e.g. Garrison et al., 2006; Hämäläinen, 2015). However, there are several reasons to consider the original spelling is correct. Therefore, based on the Code it should be conserved. The statements in article 32.5 of the Code define the conditions to be met for an original spelling be considered incorrect (thus must be corrected), which negates this case as a mandatory emendation. Among these statements is "Incorrect transliteration or latinization, or use of an inappropriate connecting vowel, are not to be considered inadvertent errors" (ICZN, 1999, Art. 32.5.1). A few papers have discussed at length almost all involved aspects about mistaken subsequent emendations and we will not repeat here (see Dubois, 2007; Nemésio & Dubois, 2012). Hence the original spelling *A. vanbrinki* is correct and all subsequent spellings are unjustified emendations and consequently, if available names, they are junior objective synonyms (ICZN, 1999, Art. 33.2.3).

The single male of *A. vanbrinki* from RVSP was not well preserved, as the abdominal segments, S7–10, are missing, precluding examining its caudal appendages. Specimens of this genus are not numerous in collections; they form a group of seven very small gomphid species with unique wing venation and unusual morphological traits. Adults presenting several features not observed in other South American Gomphidae, such as spine-like tubercles on the head, hook-like processes on S10 and short, rounded caudal appendages (Belle, 1982). Our single incomplete

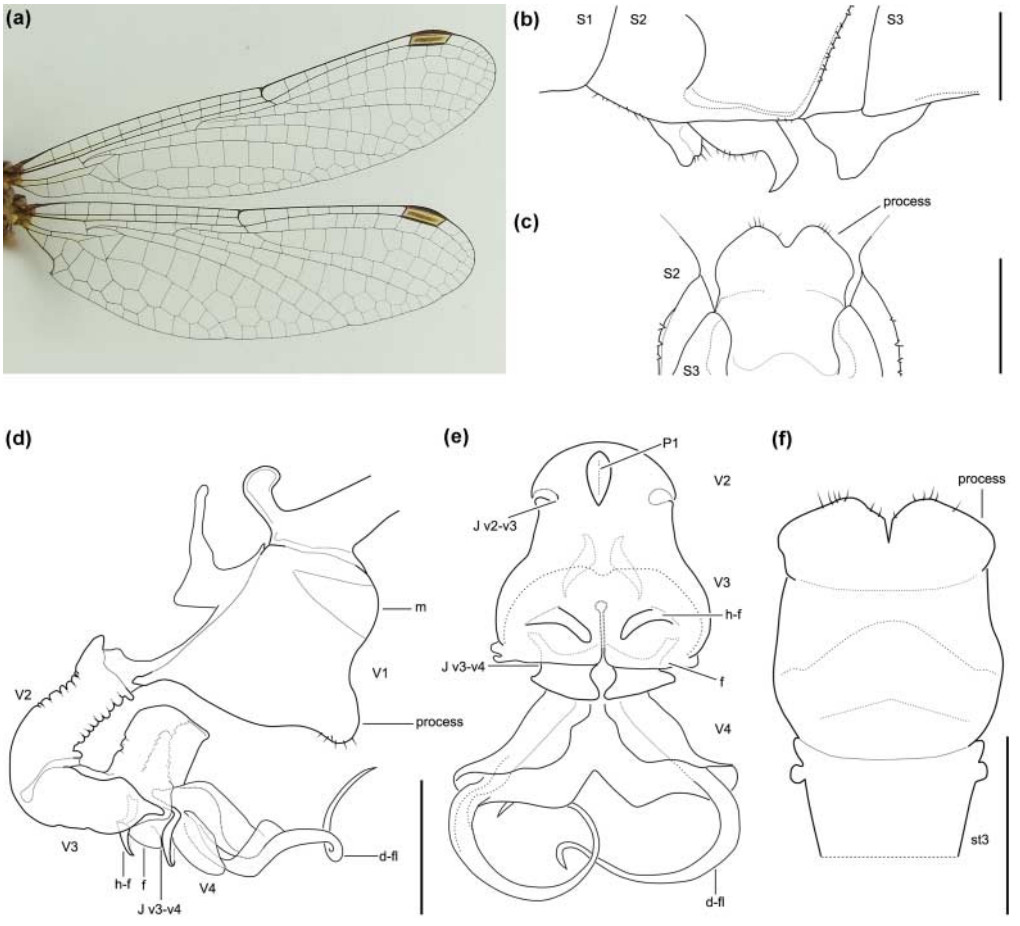

Figure 4. Male of *Archaeogomphus vanbrinki* Machado (Brazil. MG: Januária, MNRJ). (a) wings; (b) secondary genitalia in lateral view; (c–f) vesica spermalis (VS); (c) process on first segment (V1) of the VS in the posteroanterior view; (d) VS in lateral view; (e) second to fourth segment (V2–V4) in the ventral view; (f) first segment (V1) in the ventral view. Scale bars = 0.5 mm. Abbreviations follow Pfau (2011).

male was associated with the female of *A. vanbrinki* based on wing venation and the unique color pattern on the synthorax. As a consequence of the male being still unknown, we provided photos of the wings and illustrations of the secondary genitalia (Figure 4a–f). In the original description, Machado (1994a) considered *A. vanbrinki* similar to *A. furcatus* Williamson, 1923, a species recorded from Mexico to the south in Venezuela and Colombia (Belle, 1982). Unfortunately, the missing caudal appendages in *A. vanbrinki*, as well as the fact that *A. furcatus* was the only species with no illustrations of secondary genitalia, prohibited comprehensive comparisons. Williamson (1923, p. 2) described *A. furcatus* with hook of the posterior hamule as "slightly more recurved" in addition to a ventral margin "slightly elevated and rounded" versus that in *A. hamatus* (Williamson, 1918). There are two illustrations of hamules in the lateral view of *A. hamatus* which are noticeably different (Garrison et al., 2006; Williamson, 1923), but considering *A. furcatus* is "more recurved", its hamule shape might be similar to *A. vanbrinki* first illustrated here. Additionally, the outline of the process on the first segment of vesica spermalis (penial peduncule *sensu* Belle, 1982) in the posteroanterior view is more alike to *A. furcatus*, therefore agreeing with Machado's (1994a) opinion about the similarity between these

two species based on female characters. Much like the holotype female of *A. vanbrinki*, this single male is a primarily pale specimen with a unique synthorax color pattern (see Machado, 1994a, figure 3); however, as first highlighted by Williamson (1923) and discussed by Pinto and De Almeida (2016), coloration in this group of gomphids (*Agriogomphus*-complex) should be interpreted warily. There were not sharp contrasts, with a wide range of variations observed, which, besides the preservation conditions and postmortem changes, make it less reliable as a single guide for species determinations.

Wing venation (Figure 4a) as follows: 11 Ax in Fw, 8–9 Ax in Hw, Ax2 the 5th in Fw and 4–5th in Hw; 6 Px in all wings; pt surmount two cells; maximum of two rows of cells between RP1 and RP2 proximal to marginal cells in all wings; all triangles (also sub and supra) with one cell; MP not coalescent with other veins in the posterior angle of the triangle in Hw; discoidal field with one cell from MP not in contact with MA in Fw, 2–3 in Hw; 1–2 postparanal cells posterior to AA&CuP did not reach the wing margin in Hw.

Measurements (mm). Head maximum width 4.6; Fw length 17.6; Hw length 16–16.3; ratio between length of nodus to pt and pt costal length 3.1–3.7 in Fw; Fw maximum width 3.7–3.8, in Hw 4.6–4.7; pt length 1.5–1.6 in Fw, 1.6 in Hw; length of metathoracic femur 4.4; metathoracic tibia 2.9.

Diagnosis. Males of *A. vanbrinki* can be hard to distinguish from their congeners by unique characters. Their relatively smaller size, Hw with 16–16.3 mm, and reduced number of cells, with 1–2 postparanal posterior to AA&CuP not reaching the wing margin (Figure 4a) permit discriminating it from *A. infans* (Ris, 1913), *A. densus* Belle, 1982 (possibly a junior synonym of *A. infans*, R. Garrison personal communication, 12 April 2011), and *A. globulus* Belle, 1994 (Hw ranging of 17–22 mm and 3–5 postparanal cells in these species); the deep and narrow V-shaped outline of the process on the first segment of the vesica spermalis in posteroanterior view, dividing into two broad rounded lobes (Figure 4b, f) separate it from *A. hamatus* and *A. nanus* Needham, 1944 (shallow wide V- or U-shaped, proportionally with narrower lobes). As discussed earlier, it is most similar to the northernmost member of the genus, *A. furcatus*, except for its more pale general color, and males of *A. vanbrinki* differ from this species by a slightly less deep and rounded excision over the process of the vesica spermalis (Figure 4c; deeper and acute in *A. furcatus*). Finally, the pt surmounting two cells in both sexes of *A. vanbrinki* appear to be unique, within the genus, to this species.

New state occurrence records

Seven new state occurrence records were identified (Table 1) – a full list of references on the distribution of these species is available in the Taxonomic Catalog of the Brazilian Fauna (Pinto, 2016a). In addition to *A. vanbrinki* mentioned earlier, the following species are first recorded in Minas Gerais with previously known records between brackets: 1. *Hetaerina proxima* Selys, 1853 (Figure 2d; COL, ARG, BRA: RJ[?], SP, PR); 2. *Enallagma novaehispaniae* Calvert, 1907 (widespread species recorded for USA, Central America, TTO, VEN, COL, ECU, PER, ARG, BRA: CE, PE, ES, MS, SP, RJ); 3. *Oxyagrion fernandoi* Costa, 1988 (BRA: MT); 4. *Telebasis griffinii* (Martin, 1896) (CRI, PAN, TTO, VEN, COL, ECU, PER, BOL, ARG, BRA: AM, PA, AC, MS, RJ, SP); 5. *Telebasis obsoleta* (Selys, 1876) (COL[?], PER, ECU, BOL, PAR, ARG, Brazil: AM, PA, AC, MT, MS); 6. *Erythrodiplax leticia* Machado, 1996 (Figure 2f; BRA: PI, CE, PB, BA). Nevertheless, *O. fernandoi* was known only from four males of its type series collected in three localities in the Mato Grosso State (Costa, 1988), and the other species are almost all widespread, although unnoticed, in Minas Gerais. This is largely the result of undersampling or most likely from the low interest in publicizing distributional data from natural history collections.

Acknowledgements

We are thankful to our entomologist colleagues who helped with field expeditions: Dr Evando Coelho and undergraduate students João Daló, Fernanda Coltri, Gabriela Santos and Danielle Padua. We also thank ICMBio/SISBio and IEF/MG for collecting licenses and help with the fieldwork. APP thanks Dr Jorge Nessimian for discussions on analysis of diversity. This study was partially supported by postdoctoral fellowship to APP by Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq-PDJ #1, proc. 157592/2015-4) and Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES-PVE #2, A019/2013). IFSULDEMINAS, Campus Inconfidentes helped with the transport during collecting.

ORCID


Ângelo Parise Pinto http://orcid.org/0000-0002-1650-5666

References

Bedê, L. C., Machado, A. B. M., Piper, W., & Souza, M. M. (2015). Odonata of the Serra de São José – Brazil's first Wildlife Reserve aimed at the conservation of dragonflies. *Notulae Odonatologicae*, *8*, 117–155.

Belle, J. (1982). A review of the genus *Archaeogomphus* Williamson (Odonata: Gomphidae). *Tijdschrift voor Entomologie*, *125*, 37–56.

Benke, A. C. (1976). Dragonfly production and prey turnover. *Ecology*, *57*, 915–927. doi:10.2307/1941057

Carvalho, A. L., & Pujol-Luz, J. R. (1992). On the odonate fauna of Ilha Grande and some other coastal islands of the state of Rio de Janeiro, Brazil. *Notulae Odonatologicae*, *3*, 157–159.

Carvalho, F. G., Silva-Pinto, N., Oliveira-Júnior, J. M. B. & Juen, L. (2013). Effects of marginal vegetation removal on Odonata communities. *Acta Limnologica Brasiliensia*, *25*, 10–18. doi:10.1590/S2179-975X2013005000013

Colwell, R. K. (2013). EstimateS: Statistical estimation of species richness and shared species from samples. Version 9. User's Guide and application. Retrieved from: http://purl.oclc.org/estimates

Colwell, R. K., Chao, A., Gotelli, N. J., Lin, S. Y., Mao, C. X., Chazdon, R. L., & Longino, J. T. (2012). Models and estimators linking individual-based and sample-based rarefaction, extrapolation and comparison of assemblages. *Journal of Plant Ecology*, *5*, 3–21. doi:10.1093/jpe/rtr044

Colwell, R. K., & Coddington, J. A. (1994). Estimating terrestrial biodiversity through extrapolation. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *345*, 101–118. doi:10.1098/rstb.1994.0091

Corbet, P. S. (1999). Dragonflies: Behavior and ecology of Odonata. Ithaca: Cornell University Press.

Costa, J. M. (1988). Descrição de *Oxyagrion fernandoi* sp. n. e interpretação filogenética da nervure cúbito-anal (cac) (Odonata: Coenagrionidade). *Boletim do Museu Nacional, Zoologia, Nova Série*, *323*, 1–7.

Costa, J. M., Lourenço, A. N., & Vieira, L. P. (2001). Odonatos coletados no Parque Ecológico Municipal Chico Mendes (Unidade de Conservação Ambiental), Rio de Janeiro, Brasil. *Entomologia y Vectores*, *8*, 431–448.

De Almeida, M. V. O., Pinto, A. P., Carvalho, A. L., & Takiya, D. M. (2013). When rare is just a matter of sampling: unexpected dominance of clubtail dragonflies (Odonata, Gomphidae) through different collecting methods at *Parque Nacional da Serra do Cipó*, Minas Gerais State, Brazil. *Revista Brasileira de Entomologia*, *57*, 417–423. doi:10.1590/S0085-56262013005000042

De Marco, P. Jr, & Latini, A. O. (1998). Estrutura de guildas e riqueza em espécies em uma comunidade de larvas de Anisoptera (Odonata). In Nessimian, J. L., & Carvalho, A. L. C. (Eds.), Oecologia Brasiliensis (pp. 101–112). Rio de Janeiro: PPGE-UFR J.

De Marmels, J. (1989a). Odonata or dragonflies from Cerro de la Neblina and the adjacent lowland between the Rio Baria, the Casiquiare and the Rio Negro (Venezuela). I. Adults. *Boletín de la Academia de Ciencias Físicas*, *Matemáticas y Naturales*, *25*, 11–78.

De Marmels, J. (1989b). Odonata or dragonflies from Cerro de la Neblina and the adjacent lowland between the Rio Baria, the Casiquiare and the Rio Negro (Venezuela). II. Additions to the adults. *Boletín de la Academia de Ciencias Físicas, Matematicas y Naturales*, *25*, 80–91.

De Marmels, J. (1990). An updated checklist of the Odonata of Venezuela. *Odonatologica*, *19*, 333–345.

Dijkstra, K.-D. B., Bechly, G., Bybee, S. M., Dow, R. A., Dumont, H. J., Fleck, G., Ware, J. (2013). The classification and diversity of dragonflies and damselflies (Odonata). In Zhang Z.-Q. (Ed.) Animal biodiversity: An outline of higher-level classification and survey of taxonomic richness (addenda 2013). Zootaxa, 3703, 36–45. doi:10.11646/zootaxa.3703.1.9

Drummond, G. M., Martins, C. S., Machado, A. B. M., Sebaio, F. A., & Antonini, Y. (2005). Biodiversidade em Minas Gerais: um atlas para sua conservacão (2nd ed.). Fundação Biodiversitas, Belo Horizonte.

Dubois, A. (2007). Genitives of species and subspecies nomina derived from personal names should not be emended. *Zootaxa*, *1550*, 49–68.

Ferreira-Peruquetti, O. S., De Marco, P. Jr. (2002). Efeito da alteração ambiental sobre comunidades de Odonata em riachos de Mata Atlântica de Minas Gerais, Brasil. *Revista Brasileira de Zoologia*, *19*, 317–327. doi:10.1590/S0101-81752002000200002

Ferreira-Peruquetti, P. S., & Fonseca-Gessner, A. A. (2003). Comunidade de Odonata (Insecta) em áreas naturais de Cerrado e monocultura no nordeste do Estado de São Paulo, Brasil: relação entre o uso do solo e a riqueza faunística. *Revista Brasileira de Zoologia*, *20*, 219–224. doi:10.1590/S0101-81752003000200008

Fleck, G., Bechly, G., Martínez-Delclòs, X., Jarzembowski, E., Coram, R., & Nel, A. (2003). Phylogeny and classification of the Stenophlebioptera (Odonata: Epiproctophora). *Annales de la Société Entomologique de France (Nouvelle série)*, *39*, 55–93. doi:10.1080/00379271.2003.10697363

Garrison, R. W., & von Ellenrieder, N. (2015). Damselflies of the genus *Argia* of the Guiana Shield (Odonata: Coenagrionidae). *Zootaxa*, *4042*, 1–134. doi:10.11646/zootaxa.4042.1.1

Garrison, R. W., & von Ellenrieder, N., Louton, J. A. (2006). *Dragonfly genera of the New World, an illustrated and annotated key to the Anisoptera*. Baltimore: The Johns Hopkins University Press.

Hämäläinen, M. (2015). Catalogue of individuals commemorated in the scientific names of extant dragonflies, including lists of all available eponymous species-group and genus-group names. *International Dragonfly Fund Report, 80*, 1–168.

Hammer, Ø., Harper, D. A. T., & Ryan, P. D. (2001). PAST: Paleontological statistics software package for education and data analysis. *Palaeontologia Electronica*, *4*, 1–9 [version 3.12, 2016]

International Commission on Zoological Nomenclature (ICZN). (1999). *International Code of Zoological Nomenclature* (4th ed.). International Trust for Zoological Nomenclature, London. Retrieved from: http://www.nhm.ac.uk/hosted-sites/iczn/code/. Accessed 2 August 2016.

International Organization for Standardization (ISO). (2015). Country Codes – ISO 3166. Retrieved from: http://www.iso.org/iso/home/standards/country_codes.htm

Jost, L., Chao, A., & Chazdon, R. L. (2011). Compositional similarity and β (beta) diversity. In Magurran, A. E., & McGill, B. J. (Eds.), Biological diversity: Frontiers in measurement and assessment (pp. 66–84). Oxford: Oxford University Press.

Kalkman, V. J., Clausnitzer, V., Dijkstra, K.-D. B., Orr, A. G., Paulson, D. R., & van Tol, J. (2008). Global diversity of dragonflies (Odonata) in freshwater. *Hydrobiologia*, *595*, 351–363. doi:10.1007/s10750-007-9029-x

Kompier, T. (2015). A guide to the dragonflies and damselflies of the Serra dos Orgaos [sic.] South-eastern Brazil. Brussels: REGUA Publications.

Machado, A. B. M. (1994a). *Archaeogomphus* (*Archaeogomphus*) *vanbrinki* spec. nov. from Western Central Brazil (Anisoptera: Gomphidae). *Odonatologica*, *23*, 73–76.

Machado, A. B. M. (1994b). *Aeshna* (*Hesperaeschna*) *pauloi* spec. nov. from mountain streams in Brazil (Anisoptera: Aeshnidae). *Odonatologica*i *23*, 159–168.

Machado, A. B. M. (1998). Insetos. In Fonseca, G. A. B., Machado, R. B., Aguiar, L. M. S., Lins, L. V. (Eds.), *Livro Vermelho das Espécies Ameaçadas de Extinção da Fauna de Minas Gerais* (pp. 495–511). Belo Horizonte: Fundação Biodiversitas.

Machado, A. B. M. (2002). Description of *Lauromacromia flaviae* spec. nov., with notes on the holotype of *L. luismoojeni* (Santos) (Anisoptera: Corduliidae). *Odonatologica*, *31*, 313–318.

Machado, A. B. M. (2009). *Denticulobasis* and *Tuberculobasis*, new genera close to *Leptobasis*, with description of ten new species (Odonata: Coenagrionidae). *Zootaxa*, *2108*, 1–36.

Machado, A. B. M., & Bedê, L. C. (2015). Two new genera and nine new species of damselflies from a localized area in Minas Gerais, Brazil (Odonata: Zygoptera). *International Journal of Odonatology*, *18*, 269–296. doi:10.1080/13887890.2015.1072113

Machado, A. B. M., Mesquita, H. G., Machado, P. A. (1991). Contribuição ao conhecimento dos odonatos da Estação Ecológica Maracá - Roraima. *Acta Amazonica*, *21*, 159–173 doi:10.1590/1809-43921991211173

Machado, A. B. M., & Souza, M. M. (2014). A remarkable new species of *Heteragrion* from Brazil (Odonata: Megapodagrionidae). *International Journal of Odonatology*, *17*, 95–98. doi:10.1080/13887890.2014.925514

Monteiro-Júnior, C. S., Couceiro, S. R. M., Hamada, N., & Juen, L. (2013). Effect of vegetation removal for road building on richness and composition of Odonata communities in Amazonia, Brazil. *International Journal of Odonatology*, *17*, 1–13. doi:10.1080/13887890.2013.764798

Monteiro-Júnior, C. S., Juen, L., & Hamada, N. (2014). Effects of urbanization on stream habitats and associated adult dragonfly and damselfly communities in central Brazilian Amazonia. *Landscape and Urban Planning*, *127*, 28–40.doi:10.1016/j.landurbplan.2014.03.006

Nemésio, A., & Dubois, A. (2012). The endings of specific nomina dedicated to persons should not be emended: nomenclatural issues in Phalangopsidae (Hexapoda: Grylloidea). *Zootaxa*, *3270*, 67–68.

Nunes, Y. R. F., Azevedo, I. F. P., Neves, W. V., Veloso, M. D. M., Souza, R. A., & Fernandes, G. W. (2009). Pandeiros: o Pantanal Mineiro. *MG.BIOTA*, *2*, 4–17.

Oertli, B. (2008). The use of dragonflies in the assessment and monitoring of aquatic habitats. In Córdoba-Aguilar, A. (Ed.), *Dragonflies and damselflies: Model organisms for ecological and evolutionary research* (pp. 79–95). New York: Oxford University Press.

Oliveira-Junior, J. M. B., Shimano, Y., Gardner, T. A., Hughes, R. M., De Marco, P. Jr, & Juen, L. (2015). Neotropical dragonflies (Insecta: Odonata) as indicators of ecological condition of small streams in the eastern Amazon. *Austral Ecology*, *40*, 733–744. doi:10.1111/aec.12242

Paulson, D. R. (1985). Odonata of the Tambopata Reserved Zone, Madre de Dios. *Revista Peruana de Entomologia*, *27*, 9–14.

Pessacq, P., & Costa, J. M. (2007). Three new species of *Peristicta* Hagen *in* Selys (Odonata: Zygoptera: Protoneuridae) from Brazil. *Neotropical Entomology*, *36*, 46–52. doi:10.1590/S1519-566X2007000100006

Pfau, H. K. (2011). Functional morphology and evolution of the male secondary copulatory apparatus of the Anisoptera (Insecta: Odonata). *Zoologica*, *156*, 1–103

Pinto, A. P. (2016a). Odonata. In Boeger, W. A., Zaher, H., Rafael, J. A., Valim, M. P. (2016). Taxonomic catalog of the Brazilian fauna. PNUD. Retrieved from: http://fauna.jbrj.gov.br/fauna/faunadobrasil/171

Pinto, A. P. (2016b). The dragonfly's face of the multidimensional Dr. Angelo Barbosa Monteiro Machado: a short bio-bibliography *Zootaxa*, *4078*, 8–27. doi:10.11646/zootaxa.4078.1.4

Pinto, A. P., & De Almeida, M. V. O. (2016). A taxonomic synopsis of South American Cyanogomphini Carle with description of *Cyanogomphus angelomachadoi* sp. nov. from the Cerrado of Brazil (Odonata: Gomphidae). *Zootaxa*, *4078*, 38–69. doi:10.11646/zootaxa.4078.1.6

Pinto, A. P., & Lamas, C. J. E. (2010). *Navicordulia aemulatrix* sp. nov. (Odonata, Corduliidae) from northeastern Santa Catarina State, Brazil. *Revista Brasileira de Entomologia, 54*, 608–617. doi:10.1590/S0085-56262010000400012

Pinto, A. P., & Lamas, C. J. E. (2011). *Oligoclada mortis* sp. nov. from Rondônia State, Brazil, and distributional records of other species of the genus (Odonata: Libellulidae). *International Journal of Odonatology*, *14*, 291–303. doi:10.1080/13887890.2011.629942

Renner, S., Périco, E., & Sahlén, G. (2013). Dragonflies (Odonata) in Subtropical Atlantic Forest fragments in Rio Grande do Sul, Brazil: seasonal diversity and composition. *Scientia Plena*, *9*, 1–8.

Riek, E. R., & Kukalová-Peck, J. (1984). A new interpretation of dragonfly wing venation based upon Early Upper Carboniferous fossils from Argentina (Insecta: Odonatoidea) and basic character states in pterygote wings. *Canadian Journal of Zoology*, *62*, 1150–1166. doi:10.1139/z84-166

Santos, N. D. (1966). Odonatas da região de Poços de Caldas, Minas Gerais. *Atas da Sociedade de Biologia do Rio de Janeiro*, *10*, 65–69.

Santos, N. D. (1970). Odonatas de Itatiaia (Estado do Rio de Janeiro) da Coleção Zikan, do Instituto Oswaldo Cruz. *Atas da Sociedade de Biologia do Rio de Janeiro*, *13*, 203–205.

Santos, N. D., & Machado A. B. M. (1983). New records of dragonflies for the state of Minas Gerais, Brazil. *Notulae Odonatologicae*, *2*, 30–31.

Santos, R. M., Vieira, F. A., Fagundes, M., Nunes, Y. R. F., & Gusmão, E. (2007). Riqueza e similaridade florística de oito remanescentes florestais no norte de Minas Gerais. *Revista Árvore*, *31*, 135–144.

Souza, M. M., Souza, B,Pereira, M. C. S. A., & Machado, A. B. M. (2013). List of odonates from Mata do Baú, Barroso, Minas Gerais, Brazil. *Check List*, *9*, 1367–1370.

Takiya, D. M., Santos, A. P. M., Pinto, A. P., Henriques-Oliveira, A. N., Carvalho, A. L., Sampaio, B. H. L., Rafael, J. A. (2016). Aquatic Insects from the Caatinga: checklist and diversity assessment from Ubajara (Ceará State) and Sete Cidades (Piauí State) National Parks, Northeast Brazil. *Biodiversity Data Journal*, *4*, 1–195. doi:10.3897/BDJ.4.e8354

Vianna, D. M., & De Marco, Jr. P. (2012). Higher-taxon and cross-taxon surrogates for odonate biodiversity in Brazil. *Natureza & Conservação*, *10*, 34–39. doi:10.4322/natcon.2012.006

Vilela, D. G., Guilhermo-Ferreira, R., & Del-Claro, K. (2016). The Odonata community of a Brazilian vereda: seasonal patterns, species diversity and rarity in a palm swamp environment. *Bioscience Journal*, *32*, 486–495.

von Ellenrieder, N., & Muzón, J. (2008). An updated checklist of the Odonata from Argentina. *Odonatologica*, *37*, 55–68.

Williamson, E. B. (1923). A new species of *Archaeogomphus* (Odonata). *Occasional Papers of the Museum of Zoology University of Michigan*, *134*, 1–10, pl. I.