



## Checklist of Odonata (Insecta) in the state of Rio Grande do Sul, Brazil with seven new records

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**Abstract:** The regional knowledge of species diversity and distribution is important to support conservation strategies for species and their habitats. The main goal of this work is to present a checklist of Odonata species in the state of Rio Grande do Sul, as well as their known locations in the municipalities. The preparation of the list was based in data gathered from collections of Museu de Ciências da Universidade do Vale do Taquari (UNIVATES), Laboratório de Ecologia e Evolução da Universidade do Vale do Taquari (UNIVATES), Museu de Ciências Naturais da Fundação Zootécnica, Museu de Zoologia da Universidade do Vale do Rio dos Sinos (UNISINOS) plus data extracted from 65 publications and the sites *SpeciesLink*, All Odonata and Puget Sound University. A total of 182 Odonata species were recorded, spanning nine families and 57 genera. The most representative family was Libellulidae (80 species) followed by Coenagrionidae (41 species) and seven species are new records for Rio Grande do Sul. The list of species presented here is a significant advance compared to previous counts for Rio Grande do Sul, however, our list is by no means a final one. Some regions of the state remain poorly explored, such as the border to Uruguay also in the northernmost part of the state. Several families remain poorly sampled, especially those that inhabit small forested streams and probably there are many specimens which are not cataloged and identified yet in scientific collections, both in the state and in the country.

**Keywords:** Anisoptera, Atlantic Forest, Neotropical Region, Pampa, Zygoptera.

## Lista de espécies de Odonata (Insecta) no estado do Rio Grande do Sul, Brasil com sete novos registros

**Resumo:** O conhecimento regional da diversidade e da distribuição das espécies é importante para subsidiar estratégias de conservação tanto para as espécies e seus respectivos habitats. O principal objetivo deste trabalho é apresentar uma lista de espécies de Odonata que ocorrem no estado do Rio Grande do Sul, bem como suas localizações conhecidas nos municípios. Para a elaboração da lista, foram utilizados dados das coleções do Museu de Ciências da UNIVATES, do Laboratório de Ecologia e Evolução da Universidade do Vale do Taquari (UNIVATES), do Museu de Ciências Naturais da Fundação Zoo-Botânica e do Museu de Zoologia da Universidade do Vale do Rio dos Sinos (UNISINOS) somados à dados extraídos de 65 publicações e dos sites *SpeciesLink*, All Odonata e Puget Sound University. Um total de 182 espécies de Odonata foram registradas, abrangendo nove famílias e 57 gêneros. A família mais representativa foi Libellulidae (80 espécies) seguida por Coenagrionidae (41 espécies). Além do mais, sete espécies são novos registros para o Rio Grande do Sul. A lista de espécies aqui apresentada demonstra um avanço significativo em relação às contagens anteriores para o Rio Grande do Sul, no entanto, nossa lista não é de forma alguma final. Algumas regiões do estado continuam pouco exploradas, como aquelas que fazem fronteira com o Uruguai ou estão mais ao norte do Estado. Várias famílias permanecem mal amostradas, especialmente aquelas que habitam pequenos córregos em florestas e, provavelmente, existem muitos exemplares que ainda não estão catalogados e identificados em coleções científicas, tanto no estado quanto no país.

**Palavras-chave:** Anisoptera, Mata Atlântica, Região Neotropical, Pampa, Zygoptera.

## Introduction

Damselflies and dragonflies are a small group of aquatic insects classified as Odonata, which includes about 6280 species (Schorr & Paulson 2018). This order is spread in temperate, tropical and subtropical zones, with more than 600 genera and 39 families belonging to three suborders: Anisoptera, Anisozygoptera and Zygoptera (Schorr & Paulson 2018). Neotropical region is one of the most diverse, presenting 1727 species (Von Ellenrieder 2009), of which 854 species, 146 genera and 15 families were recorded in Brazil (data available in Pinto 2018).

The regional knowledge of species diversity and distribution is important to provide numerical data, related closely to the actual species richness and abundance numbers (Costa et al. 2000), and support conservation strategies for species and their habitats. A quick survey on Brazilian studies concerning Odonata fauna reveals punctual works restricted to Southeastern and Mid-West regions, suggesting an unequal distribution of research regarding this group in Brazil (De Marco & Viana 2005). This lack of information is the main dead-lock in the elaboration of faunal status list, as the IUCN Red list, which represents a serious problem for conservation programs in Brazil (Rodrigues & Roque 2017). The states of Goiás, Mato Grosso do Sul, Minas Gerais, São Paulo and Rio de Janeiro already have a list of species.

The state of Rio Grande do Sul, located in southern Brazil, stands out due to its extensive agricultural areas and large industrial parks near to the metropolitan region, which causes the state to face serious environmental problems, resulting in a long list of endangered species. Two biomes are recognized in Rio Grande do Sul: Pampa Biome which cover about 66% of the state's area, and Atlantic Forest covering 29% of the total state area. The Atlantic Forest is among the five main nature *hotspots* on Earth, given its high biodiversity levels and endemisms. However, it has been subject to big rates of deforestation, what makes it even more vulnerable ecologically. The Pampa Biome which is restricted to Rio Grande do Sul, has the greatest endemism rates among the Brazilian biomes (39%). It is also heavily threatened by the expansion of monocultures and the introduction of exotic species, which in turn, led to the complete change of its natural landscapes (Oliveira et al. 2017).

Until now, works have been dedicated to improve the knowledge about Odonata fauna in the state (Consatti et al. 2014, Hanauer et al. 2014, Kittel & Engel 2014, 2016, Renner et al. 2013, 2015, 2016, 2017), however, such studies are restricted and do not provide information on total number of species. A recent attempt to estimate the diversity of the state (Kittel & Engel 2014, 2016) recorded 108 species of Odonata, representing about 12% of the known species for Brazil (Pinto 2018), though the authors suggest that this number is much higher. Thus, the main goal of this work is to present the species diversity of Odonata (Insecta) in the state of Rio Grande do Sul, as well as their known locations in the municipalities.

## Material and Methods

### 1. Study area

The state of Rio Grande do Sul, which is located in southernmost portion of Brazil, borders the state of Santa Catarina to the North, the Atlantic ocean to the East, Uruguay to the South and Argentina to the West. With a total area of 281,730 km<sup>2</sup>, it covers the two subtropical biomes of Brazil: Atlantic Forest and Pampa. It presents, mostly, low

relief, with 70% of its territory presenting less than 300m of altitude. The highest portion, of more than 600m altitude, is located in the Northeast, comprising 11% of the total surface. Two climatic types characterize Rio Grande do Sul: the humid subtropical climate (Cfa), with well distributed rainfall and hot summers, presenting average annual temperature between 18° and 20°C, and the oceanic climate (Cfb), also with well distributed rains, but with mild summers, presenting an annual average temperature between 13° and 17°C (Kuinchtner & Buriol, 2001).

The subtropical Atlantic Forest is located in the North and East half of the state, with an area of 103,505 km<sup>2</sup>, which corresponds to 37% of the total area of the state, and 1.54% of the total area of Brazil. The dominance of the Atlantic Forest in Rio Grande do Sul consists of dense ombrophylous forest, mixed ombrophylous forest (Araucaria forest), semideciduous seasonal forest, altitude and 'restinga' fields (Marcuzzo et al. 1998). These subdivisions result from the great variation of altitude and climatic characteristics. In Rio Grande do Sul, there is an extremely rugged relief, between 0m and 1200m altitude. The climate presents well defined seasons of the year, and its vegetation is characterized by tall trees of broad crown in the upper stratum and by broad-leaved shrubs in the lower stratum.

The Pampa biome, located in the South and West half of the state (57° to 63° W and 34° to 30° S), presents 178,243 km<sup>2</sup> of total area, corresponding to 63% of the state territory and 2.07% of the Brazilian territory (Crawshaw et al. 2007). The relief in the southern fields is gently undulating, between 500m and 800m of altitude. Plains predominate, but some hills, in the region known as "coxilhas", may be found. Besides the coxilhas, there are also some plateaus. The climate presents the four seasons of the year well defined, and its vegetation is characterized by the presence of grasses, ground plants, shrubs and small trees.

### 2. Elaboration of the list

For the preparation of the list, we gathered data from collections of the Museu de Ciências da Universidade do Vale do Taquari (UNIVATES), Laboratório de Ecologia e Evolução da Universidade do Vale do Taquari (UNIVATES) concerning 39 municipalities. All these specimens were preserved in 96% ethanol, and later determined to species level according to Garrison et al. (2006, 2010), Heckman (2006, 2010) and Lencioni (2006). In addition, data were collected from 65 publications, from 1909 to 2018, of the material cataloged in the Museu de Ciências Naturais da Fundação Zootécnica, Museu de Zoologia da Universidade do Vale do Rio dos Sinos (UNISINOS) and the sites *SpeciesLink*, All Odonata and Puget Sound University. In total, data were collected from 85 localities (Figure 1, Table 1) and 74 data sources. For systematic classification, we followed Dijkstra et al. (2013, 2014).

## Results

The total number of Odonata species recorded for Rio Grande do Sul is 182 (Table 2). Additionally, there are five species cited by Kittel and Engels (2014) which are probably erroneous records: *Hetaerina laesa* Hagen in Selys, 1853 (Calopterygidae) known only from Northern Brazil; *Leptagrion acutum* Santos, 1961 and *Leptagrion capixabae* Santos, 1965 known only from Espírito Santo (Coenagrionidae);

Odonata of Rio Grande do Sul

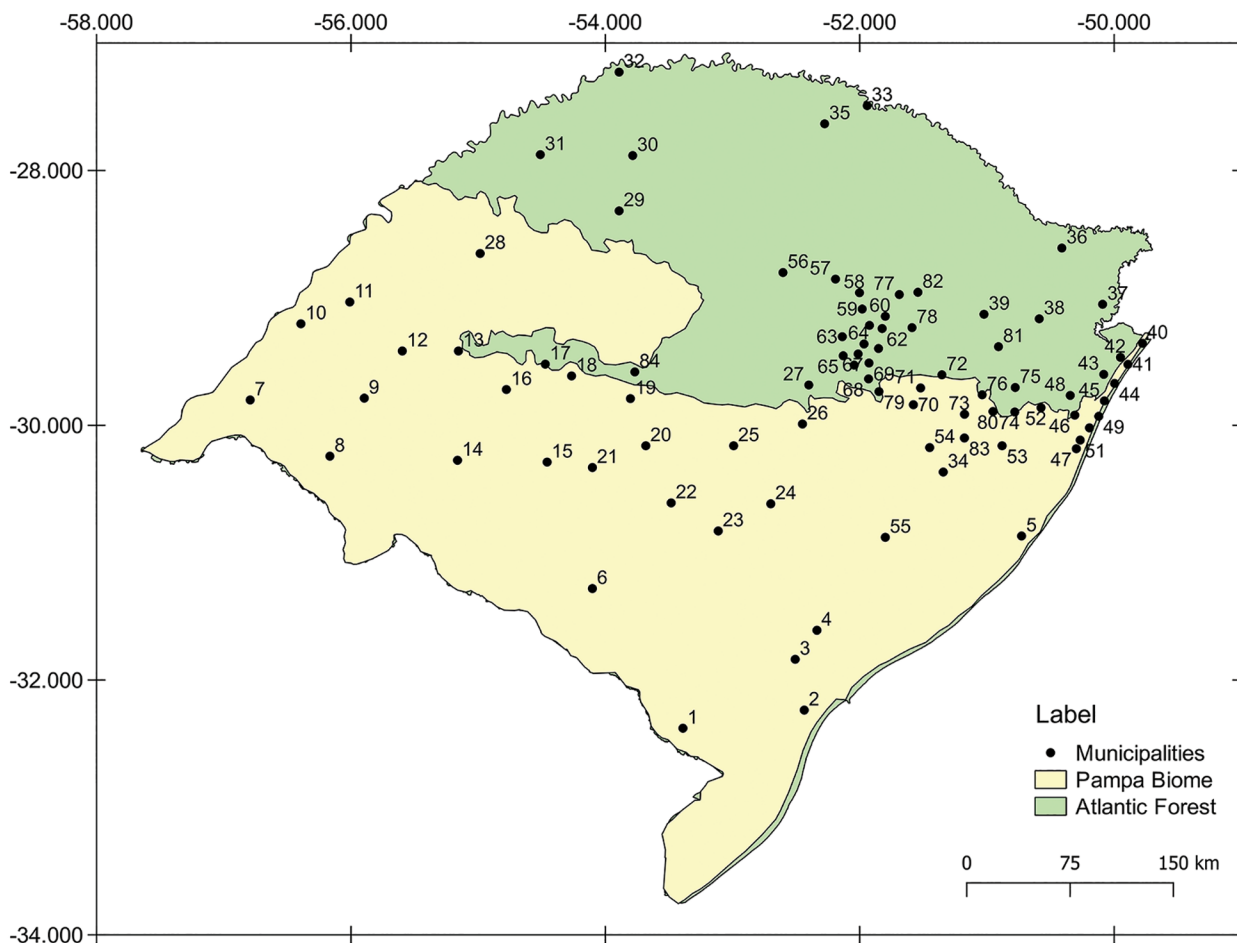


Figure 1. Municipalities with Odonata’s recorded in Rio Grande do Sul State. For code numbers see Table 1.

*Heteragrion ictericum* Williamson, 1919 (Heteragrionidae) known only from Amazonian Biome and *Teinopodagrion meridionale* De Marmels, 2001 (Megapodagrionidae) also cite by Marins et al. (2005), however this species is not recorded from Brazil, just from to mountainous and cloud forest of Andes (IUCN Red List 2018). Both studies didn’t cite the source of the information, so we decide to not add these species to final checklist to avoid mistakes.

The total number of genera recorded for the state is 57, distributed in nine families. Libellulidae is the family with the highest number of records, with 22 genera and 80 species, followed by Coenagrionidae with 13 genera and 41 species. Aeshnidae with nine genera and 20 species, and Gomphidae with seven genera and 18 species. Other families recorded are: Corduliidae (one genera, three species), Calopterygidae (two genera, seven species), Heteragrionidae (one genera, three species), Lestidae (one genera, nine species), Megapodagrionidae (one genera, one species).

Seven species are new records for Rio Grande do Sul state: *Erythemis credula* (Hagen, 1861), *Erythrodiplax avittata* Borror, 1942, *Lestes dichrostigma* Calvert, 1909, *Nephepeltia berlai* Santos, 1950, *Oxyagrion chapadense* Costa, 1978, *Oxyagrion sulmatogrossense* Costa, Souza & Santos, 2000 and *Progomphus intricatus* Hagen in Selys, 1858.

Discussion

The 182 species listed from RS representing about 22% of the species known to occur in Brazil (Pinto 2018). This number increases the species records for the state by 73% (Kittel & Engels 2014, 2016). Odonata fauna of Rio Grande do Sul is similar to the known fauna, published in species lists, of other states. Rio de Janeiro and São Paulo are the states with the highest number of records, presenting 251 and 280 species respectively (Costa & Santos 2000, Costa et al. 2000). Minas Gerais recorded 218 species (Machado 1998), Mato Grosso do Sul recorded 199 species (Koroiva et al. 2017, Rodrigues & Roque 2017) and Goiás, 152 species (Nóbrega & De Marco 2011).

The list of species presented here represents a significant advance compared to previous counts for Rio Grande do Sul, however, our list is by no means a final one. Some regions of the state remain poorly explored, such as southernmost parts, in cities bordering Uruguay, such as Jaguarão or Santa Vitória do Palmar, or even in the northernmost part of the state (Figure 1). Several families remain poorly sampled, especially those that inhabit small forested streams, such as Corduliidae, Heteragrionidae or Megapodagrionidae, and probably there are many specimens which are still not cataloged and identified in scientific collections, both in the state and in the country.

**Table 1.** Numbers and codes for municipalities and references. \*Municipalities sampled by Laboratório de Ecologia e Evolução – UNIVATES.

<b>Municipalities</b>	<b>Code</b>	<b>Number</b>	<b>References</b>	<b>Number</b>
Alegrete*	ALT	9	Calvert, 1909	1
Anta Gorda*	ANG	58	Ris, 1910	2
Arroio do Meio*	ARM	64	Ris, 1911	3
Arroio do Sal*	ART	41	Ris, 1913	4
Arvorezinha*	AVZ	57	Willianson, 1917	5
Bagé	BGE	6	Borrór, 1931	6
Balneário Pinhal*	BLP	47	Navás, 1933	7
Barra do Ribeiro	BDR	34	Navás, 1934a	8
Bom Jesus	BMJ	36	Navás, 1934b	9
Bom Retiro do Sul*	BRS	68	Navás, 1935	10
Bossoroca	BSC	28	Montgomery, 1936	11
Caçapava do Sul*	CDS	22	Quentin, 1967	12
Cachoeira do Sul	CHS	25	Belle, 1970	13
Camaquã	CMQ	55	Costa, 1970	14
Cambará do Sul	CMS	37	Costa, 1971	15
Canoas	CNS	73	Teixeira, 1971	16
Capão da Canoa*	CDC	44	Belle, 1972	17
Capão do Leão	CDL	3	Quentin, 1973	18
Caraá	CRA	48	Leonard, 1977	19
Caxias do Sul	CXS	39	De Marmels & Rácenis, 1982	20
Cidreira*	CDR	51	Belle, 1984	21
Colinas*	CLN	66	Costa, 1986	22
Cruzeiro do Sul*	CZS	85	Wildermuth, 1991	23
Derrubadas	DER	32	Belle, 1992	24
Dr. Ricardo*	DRR	59	Watson, 1992	25
Encantado*	ENC	61	Assis & Costa, 1994	26
Encruzilhada do Sul*	EDS	24	von Ellenrieder & Muzón, 1999	27
Erechim	ECM	35	Costa et al., 2002	28
Estrela*	ETL	69	von Ellenrieder & Costa, 2002	29
Garibaldi	GRB	78	von Ellenrieder & Garrison, 2003	30
Glorinha	GLO	74	Pinto, 2003	31
Gramado	GMD	81	Neiss & Fiorentin, 2004	32
Gravataí	GVI	80	Lencioni, 2005	33
Guaíba	GIB	54	Machado, 2005	34
Ijuí	IJI	29	Pinto, 2005	35
Imbé*	IBE	49	Garrison, 2006	36
Itaara	ITA	84	Heckman, 2006	37
Itaqui*	IQI	10	Lencioni, 2006	38
Jaguarão	JGR	1	Costa & Machado, 2007	39
Lajeado*	LJD	67	von Ellenrieder, 2008	40
Maçambará	MÇB	11	Heckman, 2008	41
Manoel Viana*	MLV	12	Costa et al., 2009	42

Continuation Table 1.

Marcelino Ramos	MCR	33	Marins et al., 2005	43
Marques de Souza*	MDS	63	Pinto & Lamas, 2010	44
Mata*	MTA	17	Dalzochio, 2011	45
Montenegro	MTN	71	Neiss et al., 2011	46
Mostardas	MTD	5	Pinto & Lamas, 2011	47
Muçum*	MÇM	60	Costa et al., 2012	48
Novo Hamburgo	NVH	76	Dalzochio et al., 2012	49
Osório*	OSO	46	von Ellenrieder, 2012	50
Pelotas	PLT	4	Pessacq, 2012	51
Porto Alegre	POA	83	Pinto & Carvalho, 2012	52
Quaraí*	QRI	8	Almeida et al., 2013	53
Rio Grande	RGD	2	Renner et al., 2013	54
Rio Pardo	RPD	26	Consatti et al., 2014	55
Roca Sales*	RCS	62	von Ellenrieder, 2014	56
Rosário do Sul*	RDS	14	Haunaer et al., 2014	57
Santa Clara do Sul*	SCS	65	Kittel & Engels, 2014	58
Santa Cruz do Sul	SZS	27	Renner et al., 2015	59
Santa Margarida do Sul*	SMS	21	Kittel & Engels, 2016	60
Santa Maria	STM	19	Pinto & Almeida, 2016	61
Santa Rosa	STR	31	Renner et al., 2016	62
Santana da Boa Vista*	SBV	23	Garcia Junior, 2016	63
Santo Antônio da Patrulha	SAP	52	Acosta et al., 2017	64
Santo Augusto	STA	30	Renner et al., 2017	65
São Francisco de Assis*	SFA	13	Specis link (2017)	66
São Francisco de Paula	SFP	38	Pinto, 2018	67
São Gabriel*	SGL	15	FZB Collection	68
São Pedro do Sul*	SPS	18	Puget Sound University website	69
São Sebastião do Caí	SSC	72	All Odonata website	70
São Sepé*	SSE	20	Unisinos Collection	71
São Vicente do Sul*	SVS	16	This study	72
Soledade*	SLD	56	Pires et al., 2018	73
Taquara	TQR	75	Werneck-de-Carvalho, 2004	74
Taquari*	TQI	79		
Terra de Areia*	TEA	43		
Torres*	TRS	40		
Tramandaí*	TMD	50		
Três Cachoeiras	TCH	42		
Triunfo	TRF	70		
Uruguaiana	URG	7		
Veranópolis	VRP	82		
Viamão	VMA	53		
Vila Cotiporã	VCA	77		
Xangri-lá*	XGL	45		

**Table 2.** Species recorded for Rio Grande do Sul State, Brazil. For references and municipalities codes, please check Table 1.

Species	Municipalities	References
<b>ZYGOPTERA</b>		
<b>Calopterygidae</b>		
<i>Hetaerina longipes</i> Hagen in Selys, 1853	CDS; CXS; SFP	8; 62
<i>Hetaerina rosea</i> Selys, 1853	ALT; ANG; ARM; AVZ; CDS; CMQ; CDL; CLN; ENC; ETL; LJD; MLV; MDS; MÇM; PLT; POA; QRI; RGD; RCS; SCS; STM; SBV; SFA; SFP; SLD; TQR; TQI; VMA; URG	15; 16; 33; 41; 43; 55; 57; 58; 62; 63; 65; 71; 72
<i>Mnesarete borchgravii</i> (Selys, 1869)	SFP	58; 62
<i>Mnesarete hyalina</i> (Hagen in Selys, 1853)	POA	16
<i>Mnesarete lencionii</i> Garrison, 2006	CDS; MLV; SFA	65
<i>Mnesarete pruinosa</i> (Hagen in Selys, 1853)	ANG; CXS; DRR; PLT; POA; SFP; SLD	1; 8; 16; 33; 36; 41; 58; 62; 66; 72
<i>Mnesarete pudica</i> (Hagen in Selys, 1853)	SFA	22; 36; 38; 41; 58; 65
<b>Coenagrionidae</b>		
<i>Acanthagrion apicale</i> Selys, 1876	BMJ	66
<i>Acanthagrion ascendens</i> Calvert, 1909	CZS; LJD; MLV; MDS; MTA; SPS; SVS; SLD; VMA	19; 43; 54; 58; 59; 72
<i>Acanthagrion cuyabae</i> Calvert, 1909	ALT; BMJ; MLV; SZS; SBV; VMA	19; 33; 41; 43; 58; 65; 66
<i>Acanthagrion gracile</i> (Rambur, 1842)	ALT; ANG; ARM; AVZ; BMJ; BRS; CDS; CDC; CDL; CLN; CZS; DER; GVI; IJI; IQI; MLV; OSO; PLT; POA; QRI; RGD; SZS; STM; SBV; SFA; SFP; SSC; TRS; TMD; VRP; VMA; XGL; SSE	15; 16; 38; 41; 54; 55; 57; 58; 59; 62; 63; 65; 66; 72
<i>Acanthagrion lancea</i> Selys, 1876	ALT; ANG; AVZ; CDC; CDL; CZS; DRR; LJD; MLV; MTA; PLT; POA; QRI; RGD; RDS; SZS; SBV; SFA; SFP; SLD; TQI; SMS; SSE	16; 38; 54; 55; 58; 59; 62; 63; 65; 72
<i>Argentagrion ambiguum</i> (Ris, 1904)	ALT; BMJ; CDL; CLN; CZS; MLV; PLT; RGD; SBV; SFA; SFP	40; 54; 58; 59; 62; 63; 65; 66
<i>Argia albistigma</i> Hagen in Selys, 1865	ALT; ARM; BRS; CDS; CLN; CZS; DRR; ENC; MLV; MDS; QRI; RCS; SCS; SBV; SFA; TQI; URG	38; 41; 55; 57; 58; 65; 72
<i>Argia croceipennis</i> Selys, 1865	ARM; AVZ; BRS; CXS; CLN; CZS; ENC; ETL; LJD; MÇM; RCS; SFP; SLD; TQI	9; 38; 41; 54; 58; 59; 62
<i>Argia cyathigera</i> Navás, 1934	CXS	9; 41
<i>Argia lilacina</i> Selys, 1865	ALT; MLV; SFA; SSE	65; 72
<i>Argia modesta</i> Selys, 1865	ALT; CDS; MDS; QRI; SBV; SFA; URG	65; 72
<i>Argia reclusa</i> Selys, 1865	VMA	41
<i>Cyanallagma corbeti</i> Costa, Santos & I. de Souza, 2009	BMJ; SFP	42; 48; 66
<i>Cyanallagma bonariense</i> (Ris, 1918)	CDS; URG	73
<i>Homeoura chelifera</i> (Selys, 1876)	ALT; ART; BMJ; CDL; CDR; CZS; LJD; MLV; MDS; PLT; QRI; RGD; STM; SBV; SFA; SFP; TQI; TRS; VMA; URG	1; 15; 38; 40; 41; 54; 55; 58; 59; 62; 63; 66; 68; 72
<i>Ischnura capreolus</i> (Hagen, 1861)	ALT; ANG; ART; AVZ; BMJ; BRS; CDS; CDC; CDL; CDR; CZS; MLV; MTA; PLT; POA; QRI; RGD; RDS; SBV; SFA; SFP; TRS; TMD; VMA; XGL; SGL; SMS; SSE; URG	16; 38; 41; 43; 54; 58; 59; 62; 63; 65; 66; 72
<i>Ischnura fluviatilis</i> Selys, 1876	ALT; ART; AVZ; BRS; CDS; CDC; CDL; CDR; CLN; CZS; GVI; LJD; MLV; MDS; MTA; MTD; GLO; PLT; POA; QRI; RGD; RPD; RCS; STM; SBV; SAP; SFP; SPS; SVS; TQI; TRS; TMD; VMA; XGL; SMS; SSE; URG	1; 15; 16; 38; 41; 54; 55; 57; 58; 59; 62; 63; 64; 65; 66; 68; 71; 72
<i>Minagrion mecistogastrum</i> (Selys, 1876)	BDR; BMJ; CMQ; GRB; IJI; ITA; MÇB; MTN; MTD; POA; SFP; TRF; VMA	38; 41; 58; 65; 66



Continuation Table 2.

Species	Municipalities	References
<i>Minagrion waltheri</i> (Selys, 1876)	SFA	65
<i>Neoneura ethela</i> Williamson, 1917	ALT; JGR; PEL; POA; RDS; STM	5; 33; 41; 51; 58
<i>Neoneura leonardo</i> Machado, 2005	ALT; ANG; ARM; BRS; CDS; CXS; CLN; ENC; ECM; LJD; QRI	34; 38; 41; 51; 55; 57; 58; 59; 65
<i>Oxyagrion basale</i> Selys, 1876	CZS; LJD; MTA; STM; SPS; SVS; SLD	15; 38; 41; 55; 58; 59
<i>Oxyagrion brevistigma</i> Selys, 1876	RS	41
<i>Oxyagrion chapadense</i> Costa, 1978	CDS; MLV; MTA; SBV; SPS; SVS; URG	New Record
<i>Oxyagrion hempeli</i> Calvert, 1909	ALT; CDS; MLV; MDS; STM; SBV; SFA; SFP	15; 16; 38; 41; 58; 62; 65; 72
<i>Oxyagrion microstigma</i> Selys, 1876	BMJ; SFP	62; 66
<i>Oxyagrion pavidum</i> Hagen in Selys, 1876	CXS	8; 41
<i>Oxyagrion rubidum</i> (Rambur, 1842)	ALT; QRI; RDS; SBV; SFA; SSE; URG	65; 72
<i>Oxyagrion santosi</i> Martins, 1967	RS	38; 41
<i>Oxyagrion simile</i> Costa, 1978	CDL	38; 41; 63
<i>Oxyagrion sulinum</i> Costa, 1978	RS	38; 41
<i>Oxyagrion sulmatogrossense</i> Costa, Souza & Santos, 2000	ARV	New Record
<i>Oxyagrion terminale</i> Selys, 1876	ALT; ANG; AVZ; CDS; CZS; GMD; LJD; MLV; PLT; POA; RGD; STM; SBV; SFA; SFP; SLD	1; 15; 16; 38; 41; 54; 55; 58; 59; 62; 63; 65; 68; 72
<i>Mecistogaster amalia</i> (Burmeister, 1839)	CXS	45
<i>Mecistogaster ornata</i> Rambur, 1842	SFP	58
<i>Peristicta janiceae</i> Pessacq & Costa, 2007	SFP	51
<i>Telagrion longum</i> Selys, 1876	RS	38; 41
<i>Telebasis carmesina</i> Calvert, 1909	CZS; STR; VCA	38; 52; 54; 58; 59
<i>Telebasis corallina</i> (Selys, 1876)	ART; AVZ; CDS; CDC; STM; SBV; SFA; SVS; TRS; TMD; VMA; XGL; SMS; SSE	15; 38; 41; 52; 58; 65; 72
<i>Telebasis theodori</i> (Navás, 1934)	CXS; CZS; MLV; STR; SBV; SFA; SFP; SLD; VCA	9; 41; 52; 58; 59; 62; 65
<i>Telebasis willinki</i> Fraser, 1948	ALT; CDL; CZS; ENC; LJD; PLT; RGD; SFA; VMA	41; 43; 52; 54; 55; 57; 58; 59; 63; 65
<b>Heteragrionidae</b>		
<i>Heteragrion consors</i> Hagen in Selys, 1862	SFP	58
<i>Heteragrion luisfelipei</i> Machado, 2006	SFP	62
<i>Heteragrion triangulare</i> Hagen in Selys, 1862	AVZ; SFA	59; 65
<b>Lestidae</b>		
<i>Lestes auritus</i> Hagen in Selys, 1862	SFP	58; 62
<i>Lestes bipupillatus</i> Calvert, 1909	CDS; CZS; ETL; MLV; STM; SBV; SFA; SFP	15; 33; 41; 54; 58; 59; 62; 65
<i>Lestes dichrostigma</i> Calvert, 1909	AVZ	New Record
<i>Lestes forficula</i> Rambur, 1842	BMJ	66
<i>Lestes minutus</i> Selys, 1862	RGD	63
<i>Lestes pictus</i> Hagen in Selys, 1862	AVZ; CLN; CZS; MÇM; SFP; SLD; TQI	54; 58; 59; 62; 72
<i>Lestes paulistus</i> Calvert, 1909	ARM; AVZ; CDS	59
<i>Lestes tricolor</i> Hoffmannsegg in Shomburgk, 1848	PLT; POA; RGD	16; 55; 57; 58; 63
<i>Lestes undulatus</i> Say, 1840	BMJ; CDC; CDL; CDR; PLT; POA; RGD; SFP; TRS	1; 33; 41; 58; 62; 63; 66; 72
<b>Megapodagrionidae</b>		
<i>Allopodagrion brachyurum</i> De Marmels, 2001	CRA	46

Continuation Table 2.

Species	Municipalities	References
<b>ANISOPTERA</b>		
<b>Aeshnidae</b>		
<i>Anax amazili</i> (Burmeister, 1839)	BGE; EDS; MTD; POA; STM; SAP	15; 16; 32; 49
<i>Anax concolor</i> Brauer, 1865	CZS; LJD; NVH	32; 54; 59; 60
<i>Castoraeschna decurvata</i> Dunkle & Cook, 1984	CRA, NVH, SFP	32; 74
<i>Castoraeschna januarua</i> (Hagen, 1867)	SFP, STA	16; 74
<i>Coryphaeschna perrensi</i> (McLachlan, 1887)	NVH	32
<i>Coryphaeschna adnexa</i> (Hagen, 1861)	RS	67
<i>Gynacantha bifida</i> Rambur, 1842	NVH	32
<i>Limnetron debile</i> (Karsch, 1891)	NVH; SBV	32; 65
<i>Remartinia luteipennis</i> (Burmeister, 1839)	CDS; CDL; NVH; PLT; RGD; SFA; SVS	32; 37; 60; 63; 65; 72
<i>Rhionaeschna cornigera</i> (Brauer, 1865)	CDL; CXS; NVH	32; 63; 68
<i>Rhionaeschna bonariensis</i> (Rambur, 1842)	ANG; CNS; CDL; MLV; MTN; MTD; NVH; PLT; POA; QRI; RGD; STM; SBV; SFA; SFP; TRS; VMA	15; 16; 32; 37; 43; 6; 62; 63; 65; 66; 68; 71; 72
<i>Rhionaeschna brasiliensis</i> (von Ellenrieder & Martins Costa, 2002)	SFP	29; 57; 60; 62
<i>Rhionaeschna confusa</i> (Rambur, 1842)	PLT	25; 37; 60
<i>Rhionaeschna diffinis</i> (Rambur, 1842)	RS	37
<i>Rhionaeschna eduardoi</i> (Machado, 1984)	SFP	60
<i>Rhionaeschna planaltica</i> (Calvert, 1952)	ALT; AVZ; CZS; LJD; MTA; NVH; POA; SFA; SFP; SVS; SLD	16; 32; 37; 54; 59; 60; 62; 65; 72
<i>Rhionaeschna punctata</i> (Martin, 1908)	NVH	32
<i>Staurophlebia reticulata</i> (Burmeister, 1839)	NVH; SCS; SFA	32; 65; 72
<i>Triacanthagyna nympha</i> (Navás, 1933)	NVH; PLT; POA	30; 32
<i>Triacanthagyna ditzleri</i> Williamson, 1923	LJD	37; 59; 60
<b>Corduliidae</b>		
<i>Neocordulia androgynis</i> (Selys, 1871)	RS	44
<i>Neocordulia fiorentini</i> Costa & Machado, 2007	SFP	39; 44; 60
<i>Neocordulia gaucha</i> Costa & Machado, 2007	SLD	39; 44; 60
<b>Gomphidae</b>		
<i>Aphylla molossus</i> Selys, 1869	MLV	65
<i>Aphylla producta</i> Selys, 1854	CZS; POA	12;
<i>Aphylla theodorina</i> (Navás, 1933)	BSC; PLT; POA; SBV; SFA; SMS	7; 12; 13; 17; 24; 65; 66; 71; 72
<i>Archaeogomphus densus</i> Belle, 1982	SBV; URG	65
<i>Cyanogomphus waltheri</i> Selys, 1873	SAP	61
<i>Phyllocycla argentina</i> (Hagen in Selys, 1878)	CDR; POA	17; 18
<i>Phyllocycla propinqua</i> Belle, 1972	ARM; BRS; ENC	59; 60
<i>Phyllocycla viridipleuris</i> (Calvert, 1909)	POA	12
<i>Phyllogomphoides annectens</i> (Selys, 1869)	RS	12
<i>Phyllogomphoides regularis</i> (Selys, 1873)	QRI; SFP	21; 37; 53; 60; 62; 72
<i>Progomphus aberrans</i> Belle, 1973	RS	37
<i>Progomphus basistictus</i> Ris, 1911	MLV; QRI; STM; SBV; SFA	15; 65
<i>Progomphus complicatus</i> Selys, 1854	PLT	63
<i>Progomphus costalis</i> Hagen in Selys, 1854	POA	16



Continuation Table 2.

Species	Municipalities	References
<i>Progomphus gracilis</i> Hagen in Selys, 1854	SFP	60
<i>Progomphus intricatus</i> Hagen in Selys, 1858	CDR	New Record
<i>Progomphus lepidus</i> Ris, 1911	CDR; CLN; CZS; QRI	18; 37; 54; 59; 60
<i>Tibiagomphus noval</i> (Rodrigues, 1985)	CDR; GIB; JGR; PLT	18; 53
<b>Libellulidae</b>		
<i>Brachymesia furcata</i> (Hagen, 1861)	ALT; SZS; SBV; SFA; XGL	3; 65; 72
<i>Brechmorhoga nubecula</i> (Rambur, 1842)	SFA	65
<i>Dasythemis mincki</i> (Karsch, 1890)	ANG; CXS; CZS; POA; SZS; SBV; SFA; SFP	1; 2; 8; 16; 31; 37; 59; 60; 62; 65; 66; 72
<i>Dasythemis venosa</i> (Burmeister, 1839)	SFA	65
<i>Diastatops intensa</i> Montgomery, 1940	ALT; CDS; CNS; CDC; CDL; LJD; MLV; MCR; PLT; POA; RGD; STM; SBV; SFA	11; 15; 16; 7; 59; 60; 63; 65; 68; 70
<i>Diastatops obscura</i> (Fabricius, 1775)	SZS; ALT	2; 65
<i>Dythemis velox</i> Hagen, 1861	SZS	1
<i>Dythemis nigra</i> Martin, 1897	MTA; SFA; SVS	65; 72
<i>Erythemis attala</i> (Selys in Sagra, 1857)	CDL; PLT; POA; RGD	16; 63; 66
<i>Erythemis credula</i> (Hagen, 1861)	ART; CDC; TRS	New Record
<i>Erythemis peruviana</i> (Rambur, 1842)	ALT; CDC; CDL; CZS; MLV; PLT; QRI; RGD; RDS; SZS; SCS; SFA	3; 55; 59; 63; 65; 66; 72
<i>Erythemis plebeja</i> (Burmeister, 1839)	BMJ; CDL; LJD; MDS; PLT; RGD; SCS; SFA; TQI	55; 9; 60; 63; 65; 66; 72
<i>Erythemis vesiculosa</i> (Fabricius, 1775)	ALT; CDL; MLV; POA; QRI; RGD; SBV; SFA	16; 63; 65
<i>Erythrodiplax atroterminata</i> Ris, 1911	ALT; ANG; AVZ; CDS; CDL; CDR; CZS; MLV; MDS; MTA; PLT; POA; QRI; RGD; RCS; RDS; STM; SBV; SFA; SFP; SPS; SVS; SLD; TMD; VMA; SMS; SZS; URG	4; 15; 16; 31; 37; 54; 55; 57; 59; 60; 62; 63; 65; 66; 72
<i>Erythrodiplax anomala</i> (Brauer, 1865)	CXS; SZS	8
<i>Erythrodiplax avittata</i> Borrer, 1942	CDC; TMD; XGL	New Record
<i>Erythrodiplax basalis</i> (Kirby, 1897)	POA	16
<i>Erythrodiplax chromoptera</i> Borrer, 1942	CHS; CDL; POA; RGD; STM	15; 16; 37; 60; 63
<i>Erythrodiplax connata</i> (Burmeister, 1839)	CDC; SFP; TCH	3; 37; 60; 66
<i>Erythrodiplax diversa</i> (Navás, 1916)	SFP	60
<i>Erythrodiplax fusca</i> (Rambur, 1842)	ARM; AVZ; CDL; CXS; CLN; CZS; ENC; ETL; LJD; PLT; RGD; STM; SFP; SLD; SZS; TQI	8; 15; 37; 54; 57; 59; 60; 62; 63; 66
<i>Erythrodiplax hyalina</i> Förster, 1907	ALT; ARM; CDL; CLN; CZS; ENC; ETL; LJD; MLV; PLT; RGD; SBV; SFA; SFP; SLD; TQI; URG	6; 37; 57; 59; 60; 62; 65; 72
<i>Erythrodiplax juliana</i> Ris, 1911	BMJ; STM; SGL; SZS	3; 15; 66
<i>Erythrodiplax latimaculata</i> Ris, 1911	MLV; MTA; POA; SFA; SVS; SZS	16; 72
<i>Erythrodiplax lygaea</i> Ris, 1911	SFA	65
<i>Erythrodiplax melanorubra</i> Borrer, 1942	ALT; ANG; MLV; SBV; SFA; SSE; URG	16; 65; 72
<i>Erythrodiplax media</i> Borrer, 1942	ALT; ARM; ART; AVZ; BRG; CDS; CDC; CDL; CDR; CLN; CZS; ENC; ETL; MLV; MDS; MTA; PLT; POA; QRI; RGD; RCS; RDS; STM; SBV; SFA; SFP; SVS; SLD; TQI; TRS; TMD; XGL; SGL; SMS; SSE; URG	15; 16; 37; 55; 57; 59; 60; 62; 63; 65; 72
<i>Erythrodiplax minuscula</i> (Rambur, 1842)	GVI; SAP	1
<i>Erythrodiplax nigricans</i> (Rambur, 1842)	ALT; ART; CDS; CDL; GIB; MLV; PLT; POA; RGD; STM; SBV; SFA; SVS; SZS; URG	3; 15; 16; 37; 60; 63; 65; 66; 68; 72
<i>Erythrodiplax ochracea</i> (Burmeister, 1839)	PLT; SFP	60; 66

Continuation Table 2.

Species	Municipalities	References
<i>Erythrodiplax paraguayensis</i> (Förster, 1905)	ALT; ANG; ART; AVZ; BMJ; CDS; CDC; CDL; CDR; MLV; GLO; PLT; QRI; RGD; SBV; SFA; SVS; TRS; TMD; VMA; XGL; SGL; SMS	37; 60; 63; 64; 65; 66; 72
<i>Erythrodiplax umbrata</i> (Linnaeus, 1758)	ALT; BMJ; CDC; URG	37; 60; 66; 72
<i>Gynothemis venipunctata</i> Calvert, 1909	SFA	65
<i>Idiataphe longipes</i> (Hagen, 1861)	SBV; SFA	65
<i>Libellula herculea</i> Karsch, 1889	SFP	65
<i>Macrothemis heteronycha</i> (Calvert, 1909)	ALT; MLV; QRI; SBV; SFA	65; 72
<i>Macrothemis imitans</i> Karsch, 1890	ANG; CDS; DRR; MLV; MDS; SCS; STM; SBV; SFA; URG	15; 65; 72
<i>Macrothemis lutea</i> Calvert, 1909	MLV	65
<i>Macrothemis marmorata</i> Hagen, 1868	ALT; CDS; CXS; MLV; PLT; SBV; SFA; SFP; SZS	1; 4; 8; 62; 65; 69
<i>Macrothemis musiva</i> Calvert, 1898	SZS	1; 4
<i>Macrothemis hemichlora</i> (Burmeister, 1839)	SZS	4
<i>Miathyria marcella</i> (Selys in Sagra, 1857)	ALT; CDL; MLV; MDS; PLT; POA; RGD; SCS; SBV; SZS	1; 4; 31; 35; 63; 65; 66; 72
<i>Miathyria simplex</i> (Rambur, 1842)	RS	35
<i>Micrathyria artemis</i> Ris, 1911	SFP	62
<i>Micrathyria catenata</i> Calvert, 1909	CDL; PLT; RGD	63
<i>Micrathyria hesperis</i> Ris, 1911	ALT; ANG; AVZ; CDR; JGR; MLV; PLT; POA; RGD; SFA	26; 28; 37; 60; 65
<i>Micrathyria hypodidyma</i> Calvert, 1906	CDL; PLT; POA; RGD; SZS	1; 3; 16; 28; 37; 60; 63; 66
<i>Micrathyria laevigata</i> Calvert, 1909	RS	60
<i>Micrathyria longifasciata</i> Calvert, 1909	MLV; POA; SFA	16; 65; 72
<i>Micrathyria ocellata</i> Martin, 1897	ART; AVZ; BRS; CDC; CLN; CZS; LJD; MLV; MÇM; RDS; SCS; SBV; SFA; SVS; SLD; TQI	54; 55; 57; 59; 60; 72
<i>Micrathyria pseudeximia</i> Westfall, 1992	CDL; PLT	63
<i>Micrathyria pseudhypodidyma</i> Costa, Lourenço & Viera, 2002	RGD	37; 63
<i>Micrathyria spinifera</i> Calvert, 1909	RS	28
<i>Micrathyria spuria</i> (Selys, 1900)	RDS; SBV; SFA; SVS; SMS	65; 72
<i>Micrathyria stawiarskii</i> Santos, 1953	ALT; AVZ; CDL; JGR; PEL; RGD; RDS; STA; SVS	26; 28; 37; 60; 63; 72
<i>Micrathyria tibialis</i> Kirby, 1897	ALT; CDS; CDL; CZS; LJD; MLV; MÇM; RGD; SBV; SFA; SLD; TQI; URG	1; 3; 37; 54; 55; 59; 60; 63; 65; 72
<i>Micrathyria ungulata</i> Förster, 1907	RS	28
<i>Nephepeltia berlai</i> Santos, 1950	ANG	New Record
<i>Nephepeltia flavifrons</i> (Karsch, 1889)	ALT; ART; GIB; IBE; MLV; MDS; PLT; QRI; RDS; SFA; TRS; TMD; XGL; SMS	1; 3; 7; 56; 60; 65; 72
<i>Oligoclada laetitia</i> Ris, 1911	CZS; POA; STM; SFP; SLD; VMA	6; 15; 37; 44; 54; 59; 60; 62
<i>Orthemis aequilibris</i> Calvert, 1909	ALT; MLV; SFA	65
<i>Orthemis ambinigra</i> Calvert, 1909	CDS; CDL; MLV; PLT; POA; QRI; RGD; SFA	37; 50; 60; 63; 65
<i>Orthemis attenuata</i> (Erichson in Schomburgk, 1848)	ALT; MLV;	65
<i>Orthemis cultriformis</i> Calvert, 1899	CNS	8
<i>Orthemis discolor</i> (Burmeister, 1839)	ALT; ANG; AVZ; CDS; CZS; DRR; LJD; MLV; QRI; SCS; SBV; SFA; SFP; SLD; SMS; URG	54; 55; 59; 60; 62; 65; 72
<i>Orthemis ferruginea</i> (Fabricius, 1775)	CZS; ENC; POA; STM; SFP; TQI	15; 16; 54; 57; 59
<i>Orthemis nodiplaga</i> Karsch, 1891	CDL; MTN; PLT; POA; RGD; STM; SZS; TMD; VMA	2; 15; 31; 37; 60; 63; 66; 68; 69

Continuation Table 2.

Species	Municipalities	References
<i>Pantala flavescens</i> (Fabricius, 1798)	ALT; BRS; CDS; CDC; CDL; CDR; CZS; ETL; LJD; MLV; MDS; MTD; PLT; POA; RGD; RCS; SCS; SBV; SFA; TQI; TEA; TMD; URG	1;4; 16; 31; 35; 54; 55; 57; 59; 60; 63; 65; 66; 71; 72
<i>Perithemis icteroptera</i> (Selys in Sagra, 1857)	ALT; JGR; MLV; POA; QRI; RPD; SCS; SFP	16; 27; 54; 55; 59; 60; 62; 65; 66; 71; 72
<i>Perithemis mooma</i> Kirby, 1889	ALT; ANG; AVZ; CDS; CDC; CDL; CZS; JGR; MLV; MDS; MTD; PLT; POA; QRI; RGD; RPD; RDS; STM; SBV; SFA; SFP; SPS; SVS; TRS; XGL; SMS; SSE; SZS; URG	2; 15; 23; 27; 54; 59; 62; 63; 65; 66; 71; 72
<i>Perithemis domitia</i> (Drury, 1773)	SZS	2
<i>Planiplax erythrogyga</i> (Karsch, 1891)	QRI; SZS; URG	3; 37; 60; 72
<i>Tauriphila argo</i> (Hagen, 1869)	CZS; MLV; RDS	35; 54; 59; 60; 65; 72
<i>Tauriphila risi</i> Martin, 1896	CDL; PLT; RGD; SZS	1; 4; 63; 65
<i>Tauriphila xiphea</i> Ris, 1913	CDL; PLT; RGD	63
<i>Tholymis citrina</i> Hagen, 1867	MLV	65
<i>Tramea abdominalis</i> (Rambur, 1842)	LJD; MLV	59; 60; 65
<i>Tramea binotata</i> (Rambur, 1842)	ALT; AVZ; CDS; MLV; SBV; SFA; XGL	1; 35; 65; 72
<i>Tramea calverti</i> Muttkowski, 1910	CHS	20
<i>Tramea cophysa</i> Hagen, 1867	ALT; ART; CDS; CDC; CDL; CZS; ENC; LJD; MLV; PLT; POA; QRI; RGD; RPD; SCS; SZS; STM; SFA; SVS; SLD; VMA; URG	4; 10; 15; 16; 20; 31; 35; 43; 54; 59; 60; 63; 65; 66; 71; 72

We found seven species that had not yet been recorded for Rio Grande do Sul. *Erythemis credula*, *Erythrodiplax avittata* and *Progomphus intricatus* were recorded for native areas of coastal plain of RS. The coastal plain is the region which suffers the most due to the advance of urbanization, and protected areas are scarce in this region too. All species were recorded in places with high degree of preservation, as *Erythrodiplax avittata* sampled in Itapeva Conservation Unit. *Lestes dichrostigma*, *Oxyagrion sulmatogrossense* and *Nephepeltia berlai* were recorded on montane forest (600 m), in the center-east portion of state (Perau de Janeiro, Arvorezinha, Anta Gorda). Lastly, *Oxyagrion chapadense* was recorded for seven municipalities of the Pampa biome (see Table 2). These new records emphasize the need of faunal studies for the state and remark the risk of species loss due to the reduction of natural areas and the lack of areas under protection.

In the list, we verified the presence of one species mentioned as endemic to the Pampa biome *Cyanallagma bonariensis* (Ris, 1918). Until recently, there was no record of this species for Brazil, only for localities in Argentina and Uruguay. However, Pires et al. (2018), in a recent work about future climate changes on species distribution in Pampa region, also made its first record, which confirms its endemism for the Pampa region. *Cyanallagma corbeti* described in 2009 by Costa, Santos & Souza occurred only in high altitude fields of São Francisco de Paula and Bom Jesus, being probably endemic from this region. We detected also that some species mentioned as endemic of Pampa biome, were found in Atlantic forest as well, such as *Tibiagomphus noval* (Rodrigues, 1985) and *Castoraeschna decurvata* Dunkle & Cook, 1984 (Pires et al., 2018).

In conclusion, the order Odonata in Rio Grande do Sul State still needs special attention, mostly in non-explored parts of the Pampa Biome and Seasonal forest. These biomes are under intense pressure

and species may quickly disappear. Additionally, for most species, the conservation status is not known (IUCN Red List 2018), which makes it difficult to adopt environmental policies. Thus, we highlight the need of information regarding diversity, distribution, biogeography and ecology of species since biodiversity inventories play a key role in the development of conservation strategies (Renner et al. 2017).

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## Authors' Contributions

Marina Schmidt Dalzochio: Contribution to data collection and species id. Substantial contribution in the concept and design of the study. Contribution to critical revision, adding intellectual content.

Samuel Renner: Contribution to data collection and species id. Contribution to manuscript preparation. Contribution to critical revision, adding intellectual content.

Cleber Sganzerla: Contribution to data collection and species id.

Gabriel Prass: Contribution to data collection and species id.

Gerson Junior Ely: Contribution to data collection and species id.

Luana Carla Salvi: Contribution to data collection and species id.

Contribution to manuscript preparation. Contribution to critical revision, adding intellectual content.

Norton Dametto: Contribution to data collection and species id.

Eduardo Périco: Contribution to data collection and species id.

Substantial contribution in the concept and design of the study. Contribution to manuscript preparation. Contribution to critical revision, adding intellectual content.

## Conflicts of interest

The authors declare that they have no conflict of interest related to the publication of this manuscript.

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