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Odonata from La Pampa province, Argentina

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Abstract. In Argentina approximately 280 odonate species have been recorded, which are chiefly found in the north-eastern and north-western regions. With only three previously recorded species, La Pampa province is one of most understudied parts of the country. In the present work we provide a check-list of 17 species from La Pampa, including 14 new records for the province.

Further key words. Dragonfly, damselfly, Neotropical, South America, Espinal, Monte de Llanuras y Mesetas, check-list, new records.

Introduction

The order Odonata can be estimated to comprise more than 6 000 species worldwide, with 1 650 of them found in the Neotropical region (Garrison et al. 2006). Although over the last 20 years concerted fieldwork has resulted in more than 280 species being recorded from Argentina, knowledge regarding the odonate diversity in La Pampa province in the centre of the country is surprisingly poor. Only three species were previously recorded: *Anax amazili* (Burmeister, 1839), *Rhionaeschna absoluta* (Calvert, 1952) and *Erythrodiplax corallina* (Brauer, 1865) (von Ellenrieder & Muzón 2008).

The main feature of La Pampa is a substantial water deficit, resulting from the low retention capacity of the soil, especially in the centre and the west of the province where Entisols and Aridisols are present. The annual water balance is in deficit from October through March because even though this is the time of the year with the highest rainfall, high temperatures increase the evapotranspiration. The period of soil water recharge is generally from May

to July, the season during which there is some water surplus. Water deficit is higher in the west (INTA 2004).

Due to these conditions, almost no fieldwork has been done in the area, with only occasional and opportunistic records so far. The aim of this work is to provide a preliminary list of the odonates recorded from La Pampa province.

Materials and methods

Study area

La Pampa province is located between latitudes 34°S and 39°S and longitudes 63°W and 68°W, totalling an area of 143 440 km² (Cano et al. 1980). The province is part of three ecoregions: Pampa, Espinal and Monte de Llanuras y Mesetas.

Grassland is the dominant ecosystem of the Pampa ecoregion, but almost 50 % of its surface was transformed into agro-ecosystems (Cabrera & Willink 1980; Burkart et al. 1999). The dominant vegetation is represented by the grass genera *Poa*, *Eragrostis* and *Stipa*, the climate is sub-humid and the annual rainfall is 600 to 800 mm (Cano et al. 1980).

The Espinal ecoregion is dominated by characteristic endemic trees – Caldén *Prosopis caldenia*, Tortuous mesquite *Prosopis flexuosa* and Quebracho *Jodina rhombifolia*, with a grass understory chiefly consisting of *Aristida* sp., *Stipa* sp. and *Setaria* sp. (Cabrera & Willink 1980). This ecoregion has a semiarid to semi-humid and temperate climate with an annual rainfall of 400 to 600 mm (Cano et al. 1980).

The Monte de Llanuras y Mesetas ecoregion has an arid to semiarid climate with low annual rainfall of 200 to 400 mm (Cano et al. 1980), and its vegetation is characterized by evergreen shrubs of the genus *Larrea* (Cabrera & Willink 1980).

Data collection

Samples were taken from 15 sites (Table 1; Fig. 1), three from the Espinal ecoregion, nine from the Pampa ecoregion and three from the Monte de Llanuras y Mesetas ecoregion. Adults were netted and stored in paper triangles in the field. Once in the laboratory, the specimens were either preserved in 70 % alcohol or soaked in acetone. The larvae were collected with drag

Table 1. Localities sampled during this study in La Pampa province, Argentina. Left column – locality codes. Collectors' initials: AdP – Alejandro del Palacio, FD – Fernando Diez, YL – Yanela Latini

Code	Locality	Latitude (S)	Longitude (W)	Ecoregion	Collector	Date
GU1	Guatraché, 1,4 km S of Ruta Provincial 24	37°40'44.9''	63°32'21.1''	Espinal	YL	16-iii-2015; 20–21-iii--2015
GU2	Guatraché, 1,3 km N of Ruta Provincial 24	37°39'20.6''	63°31'55.2''	Espinal	YL	27-iii-2015; 30-iii-2015
SR2	Santa Rosa, Municipal Stadium	36°37'36.9''	64°17'42.52''	Espinal	YL	22-i-2016
PU	Puelén	37°20'29.49''	67°37'01.53''	Monte de Llanuras y Mesetas	AdP	21-i-2016
RD	Ruta del desierto, near 25 de Mayo 32.5 km	37°39'35.86''	67°32'17.17''	Monte de Llanuras y Mesetas	AdP	21-i-2016
RSC	Río Salado Chico	36°17'23.20''	66°49'55.88''	Monte de Llanuras y Mesetas	AdP	20-i-2016
CB	7 km of Colonia Barón	36°10'44.25''	63°56'23.39''	Pampa	AdP	18-i-2016
GP	General Pico 9.5 km	35°43'43.06''	63°49'41.73''	Pampa	AdP	18-i-2016
LLA	Laguna La Arocena	35°40'52.37''	63°41'53.31''	Pampa	AdP	18-i-2016
LPG	17.6 km N of La Pava Grande	36°21'46''	63°48'13''	Pampa	FD	20-ii-2015
AN	6 km of Anguil	36°31'58.88''	63°56'39.14''	Pampa	AdP	18-i-2016
SA	Near Sarah 3.2 km	35°02'40.23''	63°40'45.77''	Pampa	AdP	19-i-2016
SR1	Santa Rosa	36°37'39''	64°13'51''	Pampa	J. Breser	27-xii-2015
SR1	Santa Rosa	36°37'39''	64°13'51''	Pampa	FD	22-i-2016
SR3	Santa Rosa, Facultad de Agronomía, Universidad Nacional de La Pampa	36°21'46''	63°48'13''	Pampa	YL	27-iii-2015; 31-iii-2015; 13–15-iv--2015; 23-iv-2015
TR	Near Treborales 6.6 km	35°31'40.05''	63°36'21.29''	Pampa	AdP	19-i-2016

nets and were reared to adults in the lab for proper identification; exuviae were preserved in alcohol 70 % together with the adult. The Museo de Historia Natural de la Provincia de La Pampa (MHNLPam) Odonata collection was also examined and relevant specimens recorded.

All the specimens collected are deposited at the entomological collection of the Laboratorio de Biodiversidad y Genética Ambiental, Universidad Nacional de Avellaneda (BioGeA) and the invertebrate collection of the Facultad de Ciencias Exactas y Naturales, Universidad Nacional de La Pampa (UNLPam).

Results

A total of 174 specimens were collected with a total of 14 new provincial records, bringing the total amount of species for La Pampa to 17 (Table 2). Additional sight records without capture of *Pantala flavescens* were made at Rio Salado Chico (RSC), making it a new record for the Monte de Llanuras y Mesetas ecoregion.

Discussion

We recorded 14 species new to the province, including southerly extensions of known distribution ranges for six species: *Erythemis vesiculosa*, *Miathyria marcella*, *Orthemis nodiplaga*, *Pantala flavescens*, *Tauriphila risi* and *Tramea cophysa*. These species occur elsewhere in Argentina from its northern limits to the north of Buenos Aires and Cordoba provinces. The records provide new information on the distribution of species in the country, with range extensions of more than 400 km in some cases.

Of the species recorded for the province, 12 were recorded for the Pampa ecoregion, five from Espinal and four from Monte de Llanuras y Mesetas. The low number of records in all three ecoregions indicates that more fieldwork in the area is urgently needed.

The delimitation of the Neotropical and Andean regions and the limit of influence of the tropical biota in southern South America have long been of biogeographical interest for researchers, with as many answers suggested as authors who have addressed the issue (Morrone 2004). Due to its geographic location, Argentina has been central to the debate and most studies have been based on terrestrial fauna or/and flora, with very few dealing with freshwater fauna. Among those Ringuelet (1961) proposed a division of the Neotropics into three sub-regions: Guayano-Brazilian (Neotropic), Andean-Patagonian (Andean) and Araucanian (a southern area covered by austral forests). The limit between the first two is a transitional area known

Table 2. Check-list of the Odonata recorded for La Pampa province and the localities where they were collected. Locality codes as in Table 1. * – New record for La Pampa province. Ref. – Reference: (1) Rodríguez et al. (2014), (2) von Ellenrieder & Muzón (2008), (3) von Ellenrieder (2010). Additional general locality codes for Argentina: BA – Buenos Aires; Ca – Catamarca; Ch – Chaco; Cb – Córdoba; Co – Corrientes; Cu – Chubut; ER – Entre Ríos; Fo – Formosa; LR – La Rioja; Ju – Jujuy; Mi – Misiones; Me – Mendoza; Ne – Neuquén; RN – Río Negro; Sa – Salta; SE – Santiago del Estero; SL – San Luis; SJ – San Juan SF – Santa Fe; Tu – Tucumán.

Family / Species	La Pampa material examined	Occurrence in Argentina	Ref.
Lestidae			
**Lestes undulatus* Say, 1839	AN (1♀ 1♂)	BA, ER, Me, RN	2
Coenagrionidae			
**Andinagrion peterseni* (Ris, 1908)	Pu (7♀ 15♂)	BA, Ca, Ch, Me, Ne, RN, Sa, Tu	2
**Ischnura capreolus* (Hagen, 1861)	SR2 (1♀)	BA, Co, ER, Ju, Mi, Sa, SF, Tu	2, 3
**I. fluviatilis* (Selys, 1876)	AN (2♀ 3♂); CB (3♀ 1♂); GU1 (1♀ 1♂); GP (1♂); LLA (5♀ 7♂); LM (1♂); PU (2♀ 3♂); RD (1♂); RSC (3♀ 3♂); SA (1♀ 1♂); TR (1♀ 1♂)	BA, Ca, Cb, Ch, Cu, Co, ER, Fo, Ju, LR, Mi, Me, Ne, RN, Sa, SJ, SF, SE, Tu	2
**Oxyagrion rubidum* (Rambur, 1842)	PU (9♂)	BA, Cu, Cb, Co, ER, Fo, Me, Ne, RN, Sa, SE	2
Aeshnidae			
Anax amazili (Burmeister, 1839)	TO (1♂)	Ba, Ch, Co, ER, Mi, Sa, SE, SF, Tu	
Rhionaeschna absoluta (Calvert, 1952)	CB; GU1; LPG (1♀ 5♂); SR2 (1♂); SR3 (2♀ 3♂)	BA, Ca, Cb, Cu, ER, Ju, LR, Me, Ne, Sa, SC, SE, SF, SJ, RN, Tu	2
**R. bonariensis* (Rambur, 1842)	AN (1♂); CB (1♂); TR (7♀); SR2 (1♀); SR3 (4♀ 1♂)	BA, Ca, Ch, Cb, Co, ER, Fo, LR, Ju, Mi, Me, RN, Sa, SJ, SF, SE, Tu	2
Libellulidae			
**Erythemis vesiculosa* Fabricius, 1775	TO (1♂)	BA, Co, Cb, Fo, Mi, Sa, SE, SF, Ju, Tu	2
**Erythrodiplax atroterminata* Ris, 1911	PU (1♀); SR3 (1♀)	BA, Ca, Cb, Co, ER, Mi, RN, SJ, SL	2
E. corallina (Brauer, 1865)	AN (2♂); CB (4♂); LLA (1♂); PU (2♀); SR1 (1♀ 1♂); RSC (7♀ 2♂); TR (1♀ 2♂)	BA, Ca, Cb, Co, Cu, Ju, LR, Me, Ne, Sa, SE, SJ, RN, Tu	2
**E. nigricans* (Rambur, 1842)	AN (2♂); CB (3♂); PU (2♀); SA (5♀ 8♂); TR (2♀)	Ba, Ca, Ch, Co, ER, Fo, LR, Me, Mi, Ne, RN, As, SE, SF	2, 3

Family / Species	La Pampa material examined	Occurrence in Argentina	Ref.
**Miathyria marcella* (Selys, 1875)	SR1 (1♂)	BA, Ch, Co, Er, Fo, Ju, LR, Mi, Sa, SE, SF	1, 2
**Orthemis nodiplaga* Karsch, 1891	CB (1♂)	BA, Ca, Ch, Co, ER, Fo, Me, Mi, Sa, SE, SF, SL, Tu	2
**Pantala flavescens* Fabricius, 1798	GU1 (2♀ 1♂); GU2 (1♀ 1♂); LLA (1♀); SA (2♀); SR2 (2♀ 2♂); SR3 (8♀ 62♂)	Ba, Ca, Co, ER, Fo, Ju, Me, Mi, Sa, SF, SL, Tu	2
**Tauriphila risi* Martin, 1896	TR (1♀ 1♂)	BA, Ch, Cb, Co, ER, Fo, Sa, SE, SF, Tu	2, 3
**Tramea cophysa* Hagen, 1867	TR (1♀)	BA, Ca, Co, ER, Fo, Mi, Sa	2

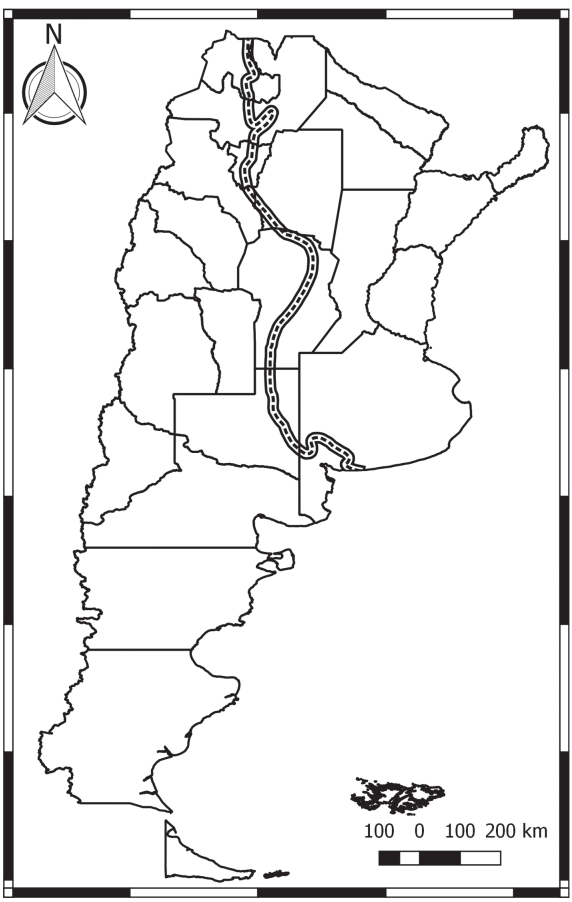

Figure 1. Overview of Argentina depicting the limit – a transitional area known as "Dominio Central" – between the Guayano-Brazilian (North) and the Andean-Patagonian ecoregion (South) as proposed by RINGUELET (1961, modified).

as "Dominio Central" north of the "Arid Diagonal" (Fig. 1), an interface between several elements of atmospheric circulation: mid-latitude westerlies, subtropical high pressure cells of southern Pacific and Atlantic oceans and a summer low on the continent (Abraham de Vázquez et al. 2000).

Our records of *Ischnura capreolus*, *E. vesiculosa*, *M. marcella*, *O. nodiplaga*, *T. risi* and *T. cophysa* support the limit proposed by Ringuelet (1961; Fig. 1) as these species were found on the southern limit of the Guayano-Brazilian influence area. There are numerous studies on Patagonian odonates (Garrison & Muzón 1995; Muzón & Spinelli 1995; Muzón 1995, 1997, 2009;

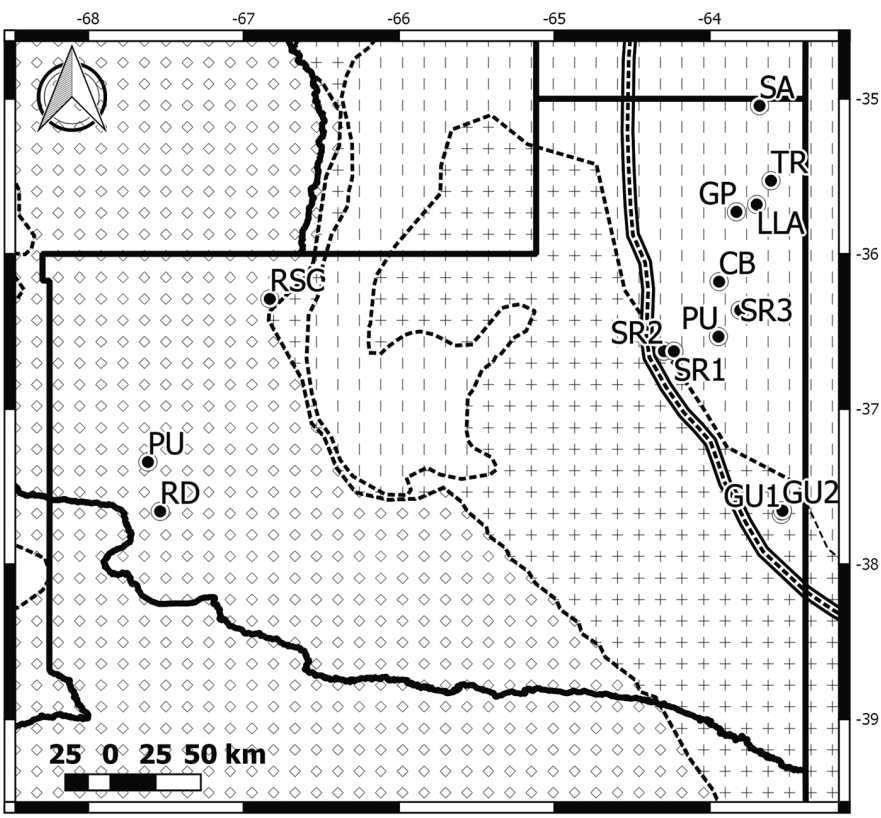

Figure 2. Localities sampled in this study in La Pampa (for details see Table 1) and the transitional limit line proposed by Ringuelet (1961). Ecoregions: + – Espinal; ◊ – Monte de Llanuras y Mesetas; | – Pampa

von Ellenrieder 2001; Muzón et al. 2005, 2010, 2014) providing reliable information on the species distributions in the Andean area, thus the presence of the species mentioned above is unlikely.

Winds in La Pampa province vary between 10 and 15 km/h and blow more frequently from the north and the south-west (Casagrande & Vergara 1996). This lack of strong winds to the south and the harsh conditions between Andean and Guayano-Brazilian areas may hinder the migration of odonates, thus establishing a migratory barrier for the species and a reduced transitional area, evidenced by the lack of records south of the aforementioned limit.

The few Guayano-Brazilian or cosmopolitan species found south of this limit (e.g., *Ischnura fluviatilis, Pantala flavescens, Rhionaeschna bonariensis*) are known to have either high environmental tolerance (*I. fluviatilis*) or/and high vagility (*P. flavescens* and *R. bonariensis*).

Pantala flavescens is a cosmopolitan species with strong migratory tendencies (Troast et al. 2016), for which the globally southernmost record known is the two mature males taken by Corbet (1979) on the South Island of New Zealand. Both males had probably migrated from Australia aided by strong winds. Corbet (1979) suggested that *P. flavescens* is unable to establish permanent populations in New Zealand, hence this species remains very rare there although individual sightings have been reported before and after. Therefore the most southerly locality for populations of *P. flavescens* was considered to be Victoria in Australia (37°14') (Hawking & Ingram 1994). Our new records of *P. flavescens* in Argentina, which included tandems, females ovipositing and larvae, make our new sites the globally most southern breeding records of this species to date (35°02').

Finally, although the new records of *Lestes undulatus*, *Andinagrion peterseni*, *I. fluviatilis*, *Oxyagrion rubidum* and *Rhionaeschna bonariensis* are less remarkable as they were known to occur both south and north of La Pampa province (Muzón et al. 2014), they supplement the known distribution of these species and show that further studies are needed in order to complete the knowledge of the Odonata of the province, since the numbers of species of Coenagrionidae, Aeshnidae are still low altogether compared to those found in bordering provinces and records of Gomphidae are entirely lacking.

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References

Abraham de Vázquez E., Garleff K., Liebricht H., Reigaráz A.C., Schäbitz F., Squeo F.A., Stingl H.E., Veit H. & Villagrán C. 2000. Geomorphology and Paleoecology of the Arid Diagonal in Southern South America. *Zeitschrift für angewandte Geologie*, Sonderheft 1: 55-61

Burkart R., Bárbaro N.O., Sánchez R.O. & Gómez D.A. 1999. Eco-regiones de la Argentina. Administración de Parques Nacionales. Secretaría de Recursos Naturales y Desarrollo Sostenible, Presidencia de la Nación Argentina, Buenos Aires

Cabrera A.L. & Willink A. 1980. Biogeografía de América Latina. 2nd, revised edition. Monografía 13. Serie de Biología. Secretaría General de la Organización de los Estados Americanos, Washington D.C.

Cano E., Casagrande G., Salazar Lea Plaza J.C., Maldonado Pinedo D., Martínez H., Hevia R., Scoppa C.O., Fernández B., Montes M.A., Musto J.C. & Pittaluga A. 1980. Inventario integrado de los recursos naturales de la provincia de La Pampa. Instituto Nacional de Tecnología Agropecuaria, Provincia de La Pampa & Universidad Nacional de La Pampa, Buenos Aires

Casagrande G. & Vergara G. 1996. Características climáticas de la región. In: Buschiazzo D.E., Panigatti J.L. & Babinec F. (Eds), Labranzas en la región semiárida argentina: 11-17. INTA, Centro Regional La Pampa-San Luis, Santa Rosa

Corbet P.S. 1979. *Pantala flavescens* (Fabricius) in New Zealand (Anisoptera: Libellulidae). *Odonatologica* 8: 115-121

Garrison R.W. & Muzón J. 1995. Collecting down at the other "Down Under." *Argia* 7: 23-26

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

Hawking J.H. & Ingram B.A. 1994. Rate of larval development of *Pantala flavescens* (Fabricius) at its southern limit of range in Australia (Anisoptera: Libellulidae). *Odonatologica* 23: 63-68

INTA 2004. Inventario integrado de los recursos naturales de la provincia de La Pampa, 2nd edition. Instituto Nacional de Tecnología Agropecuaria, Subsecretaría de Cultura, Universidad Nacional de La Pampa, Buenos Aires

Morrone J.J. 2004. The South American transition zone: characterization and evolutionary relevance. *Acta entomológica chilena* 28: 41-50

Muzón J. 1995. Los Odonata de la Patagonia Argentina. *Revista de la Sociedad Entomológica Argentina* 54: 1-14

Muzón J. 1997. Odonata (Insecta) from Patagonia; Species richness and distributional patterns. *Biogeographica* 73: 123-133

Muzón J. 2009. Estado actual del conocimiento del orden Odonata en la Patagonia. *Revista de la Sociedad Entomológica Argentina* 68: 163-167

Muzón J. & Spinelli G.R. 1995. Patagonian Odonata in Malaise Traps. *Argia* 7(3): 22-23

Muzón J., Spinelli G.R., Pessacq P., von Ellenrieder N., Estevez A.L., Marino P.I., Pérez Goodwyn P.J., Angrisano E.B., Díaz F., Fernández L.A., Mazzucconi S., Rossi G. & Salomón O.D. 2005. Insectos acuáticos de la Meseta del Somuncura, Patagonia, Argentina. Inventario preliminar. *Revista de la Sociedad Entomológica Argentina* 64: 47-67

Muzón J., Spinelli G.R., Rossi G., Marino P.I., Díaz F. & Melo M.C. 2010. Nuevas citas de insectos acuáticos para la Meseta de Somuncurá, Patagonia, Argentina. *Revista de la Sociedad Entomológica Argentina* 69: 111-116

Muzón J., Pessacq P. & Lozano F. 2014. The Odonata (Insecta) of Patagonia: A synopsis of their current status with illustrated keys for their identification. *Zootaxa* 3784: 346-388. doi:10.11646/zootaxa.3784.4.2

Ringuelet R.A. 1961. Rasgos fundamentales de la zoogeografía argentina. *Physis* 22: 151-170

Rodríguez J.S., Gomez D. & Molineri C. 2014. Nuevos registros de Odonata y Ephemeroptera para el noroeste de Argentina. *Revista de la Sociedad Entomológica Argentina* 73: 85-88

Troast D., Suhling F., Jinguji H., Sahlén G. & Ware J. 2016. A global population genetic study of *Pantala flavescens*. *PLOS ONE* **11: 1**-13**.** doi:10.1371/journal.pone.0148949

von Ellenrieder N. 2001. A synopis of the Patagonian species of the genus *Aeshna* Fabricius (Anisoptera: Aeshnidae). *Odonatologica* 30: 423-434

von Ellenrieder N. 2010. Odonata biodiversity of the Argentine Chaco biome. *International Journal of Odonatology* 13: 1-25

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