

PROVISIONAL CATALOGUE AND BIOGEOGRAPHICAL ANALYSIS OF THE ODONATA OF LA RIOJA (SPAIN)

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Abstract: The first conclusions are here presented of a research project about the Odonata of La Rioja (Spain) promoted by the Research Institute of La Rioja. 49 species are included (23 Zygoptera and 26 Anisoptera) in the provisional catalogue, of which 22 species are recorded from La Rioja for the first time. A biogeographical analysis of these taxa is also provided.

Key words: Odonata, catalogue, biogeography, Spain, La Rioja.

Catálogo provisional y análisis biogeográfico de los odonatos de La Rioja (España)

Resumen: Se presentan las primeras conclusiones del Plan de Investigación del Instituto de Estudios Riojanos “Insectos del Orden Odonata en la Comunidad Autónoma de la Rioja”. Se ha elaborado el catálogo provisional de los odonatos de La Rioja compuesto por 49 especies (23 zigópteros y 26 anisópteros) de las que 22 se citan por primera vez de la región. Se aporta un análisis biogeográfico de las especies localizadas.

Palabras clave: Odonata, catálogo, biogeografía, España, La Rioja.

Introduction

The Odonata first known data in La Rioja were provided by Longinos Navás (Navás, 1902, 1906, 1907, 1914 and 1924) who published several notes related to nine species: *Calopteryx virgo*, *Pyrrhosoma nymphula*, *Onychogomphus forcipatus*, *Cordulegaster boltonii*, *Libellula quadrimaculata*, *Libellula depressa*, *Orthetrum brunneum*, *Sympetrum flaveolum* and *Sympetrum striolatum*. Many years later, Compte Sart (1975) added *Sympetma fusca* to La Rioja’s list and Ocharan Larrondo (1987) collected *Anax imperator* and *Sympetrum fonscolombii*.

After their visit to the Iberian mountain system, Anselin & Hoste (1996) provided two new species for La Rioja: *Onychogomphus uncatatus* and *Orthetrum coerulecens*. Furthermore, they cited the capture of a male *Coenagrion pulchellum* in La Rioja, an eurosiberian taxon that becomes rare in southern areas far from its distribution range (Boudot *et al.*, 2009), being the reason why it has not been considered in the present study, although Torralba-Burrial & Alonso-Naveiro (2007) include it in their La Rioja Odonata catalogue.

To these 14 species, Galante & Verdú (2000) added *Coenagrion mercuriale*, Rodríguez (2008) added *Onychogomphus costae* and Torralba-Burrial & Alonso-Naveiro (2009) increased the La Rioja Odonata provisional catalogue with ten more species: *Lestes barbarus*, *Lestes dryas*, *Coenagrion caerulecens*, *Coenagrion puella*, *Ischnura graellsii*, *Ischnura pumilio*, *Ceriagrion tenellum*, *Aeshna mixta*, *Aeshna cyanea* and *Sympetrum sanguineum*. Recently, Torralba-Burrial & Ocharan (2010) have cited *Anax parthenope*.

All these already mentioned researches integrated a catalogue of 27 species (11 Zygoptera and 16 Anisoptera) with proved presence in La Rioja, 34.6% of those distributed in the Iberian Peninsula.

The lack of deep Odonata biogeographical studies in the whole La Rioja territory motivated the constitution of Zaladrana Odonatology Group and the beginning of its

2008-2010 Research Plan: “Order of Odonata insects in the autonomous region of La Rioja” (unpublished), granted by the Institute of La Rioja Studies (Instituto de Estudios Riojanos - IER-). The first results of this Research Plan are presented.

Study area

La Rioja is a small region (5,045 km²) located in the northern of the Iberian Peninsula (fig. 1) within the Mediterranean biogeographical region. It receives two main climatic influences: the Mediterranean one which is felt especially in the Ebro river great depression, in the northern part of the region, and the Atlantic one that is evident in the Iberian mountain system located in the south. Thus, the Ebro valley stretch located in La Rioja is the entry area of species that prefer hotter temperatures and dry environments, while Iberian mountain areas (La Demanda, Urbiión, Cebollera and Cameros) are the species locations linked to Atlantic, Continental-European and even Boreo-alpine conditions of highest climbs.

Methodology

For the elaboration of the Odonata provisional catalogue in La Rioja a bibliographical review was firstly realized and whose results have been already mentioned. Secondly, the La Rioja territory was divided into a 10x10 km UTM geographical grid (referred to European Datum 1950_UTM 30N projected coordinates system) and systematic samplings were done in the best periods for imago detection, covering the whole grid during the 2008-2010 period.

The main sampling method was the active capture of adult individuals with entomological nets and the live specimens’ identification was conducted using the keys proposed by Dijkstra & Levington (2006).

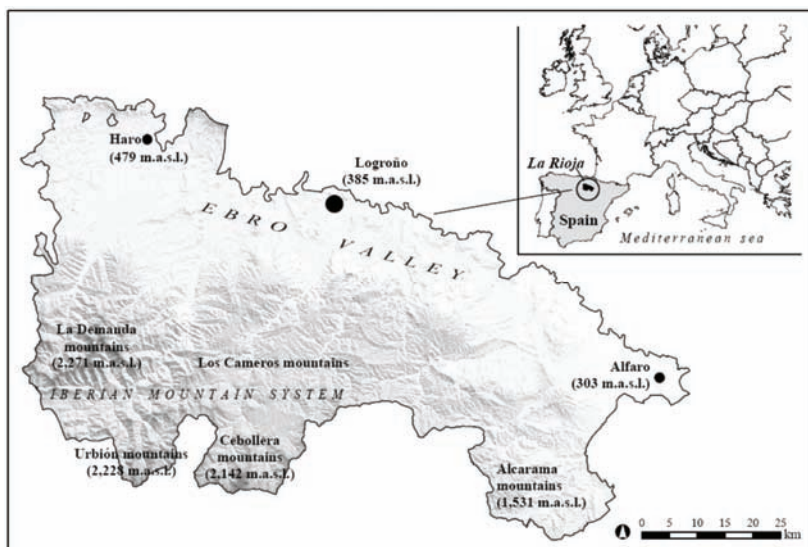


Fig. 1. La Rioja in the European context and its main relief units. / *La Rioja en el contexto europeo y sus principales unidades de relieve.*

Data obtained in the field work were added to a data base where each sampling site includes information about geographical location (referred to the UTM grid and with an 1 km accuracy range) and altitude, date and capture method used, researcher name, and a list of captured and observed species. The taxonomic classification used is referred to Boudot *et al.* (2009).

A total amount of 4,200 records were obtained and used in the elaboration of the provisional catalogue (unpublished). Explicit references included in this paper only correspond to the Odonata first citations in La Rioja, not yet mentioned in the literature.

For the Odonata biogeographical analysis, elements defined by Ocharan (1988) and its later reclassification applied to the Iberian Peninsula (Torralba-Burrial & Ocharan, 2007) have been followed. This systematic distinction includes seven biogeographical elements and the zoogeographic pattern assigned to polytypical species is referred to the subspecies present in the Iberian Peninsula. Obtained data have been compared with other region more influenced in order Mediterranean conditions (Andalucía) and with the Iberian Peninsula in order to characterize them biogeographically.

Results and Discussion

Provisional catalogue

The Odonata provisional catalogue in La Rioja is formed by 49 species (23 Zygoptera and 26 Anisoptera), representing 62.8% of the whole Odonata diversity in the Iberian Peninsula, currently composed by 78 species (Sánchez *et al.*, 2009). 22 from these 49 species have been cited for the first time in La Rioja (Table I; see also the Annex for the most relevant citations in the context of this study).

Attending to global climatic trends and their influence on odonates (Ott & Samways, 2010) it is not rejectable the presence of species like *Trithemis annulata* Palisot de Beauvois, 1805, among others, in the most arid zones of the Ebro valley stretch that have been increasing their distribution range (very low by the moment but probably more widespread in the near future), in the same way that *Onychogomphus costae*, *Crocothemis erythraea*, and other species in Europe (Ott, 2001) have recently done.

Due to the same climatic scenario, it could be also those taxa like *Aeshna juncea* and *Sympetrum flaveolum* - absent in the most part of La Rioja except in the highest altitudinal areas of the Iberian system mountains- will reduce their distribution range and even disappear.

On the other hand, it is not also rejectable the presence in La Rioja of other rare taxa in the Iberian Peninsula as e.g. *Sympetrum vulgatum ibericum* Ocharan, 1985; *Oxygastra curtisii* Dale, 1834 or *Gomphus graslinii* Rambur, 1842. In that case, their presence must be low due to the negative results achieved during the sampling period of three years that has been carried out in the present study.

Biogeographical analysis

In La Rioja (Tables I and II) there are represented the seven biogeographical elements types defined by Ocharan (1988) and updated by Torralba-Burrial & Ocharan (2007).

Among them (Table II), Iberian-Maghrebian distribution taxa (24.5%) highlights; they and the West Mediterranean taxa account almost 41% of the Odonata diversity in La Rioja.

Attending to the comparison of La Rioja biogeographical elements with the Iberian Peninsula and other further south region (Andalucía) (Tables II and III), we conclude that Odonata diversity in La Rioja is more or less the expected. In comparison with Andalucía, the most remarkable fact is that Odonata in La Rioja have less Ethiopian taxa (6.1% vs. 15%) and some more Holarctic and Eurosiberian ones.

Combinated data (Table II and III) shows that Odonata in La Rioja is essentially Mediterranean (75.5%), with two complementary components: a Nordic one (18.4%) similar to the average percentage observed in the Iberian Peninsula (21%), although slightly lower due to the absence of taxa from the Pyrenees or the Cantabrian coast, whose southern distribution range limit don't reach La Rioja; and an Ethiopian component (6.1%) lower than the Iberian Peninsula average ratio percentage (13%) due to the less extreme Mediterranean climatic conditions in La Rioja than in the eastern and southern part of Spain.

Table I. Odonata provisional catalogue, first records and biogeographical characterization in La Rioja (biogeographical elements as Torralba-Burrial & Ocharan, 2007). / *Catálogo provisional de los odonatos de La Rioja, incluyendo las primeras citas y su caracterización biogeográfica (según Torralba-Burrial & Ocharan, 2007)*

Taxa	First record in La Rioja	Biogeographical element
Fam. CALOPTERYGIDAE		
<i>Calopteryx xanthostoma</i> (Charpentier, 1825)	this study	Iberian-Maghrebian
<i>Calopteryx virgo meridionalis</i> Selys, 1873	Navás (1907)	West Mediterranean
<i>Calopteryx haemorrhoidalis haemorrhoidalis</i> Vander Linden, 1825	this study	West Mediterranean
Fam. LESTIDAE		
<i>Lestes sponsa</i> (Hansemann, 1823)	this study	Eurosiberian
<i>Lestes dryas</i> Kirby, 1890	Torralba-Burrial & Alonso-Naveiro (2009)	Holarctic
<i>Lestes barbarus</i> (Fabricius, 1798)	Torralba-Burrial & Alonso-Naveiro (2009)	Pontic-Eastern
<i>Lestes virens virens</i> (Charpentier, 1825)	this study	Iberian-Maghrebian
<i>Lestes viridis</i> (Vander Linden, 1825)	this study	West Mediterranean
<i>Sympecma fusca</i> (Vander Linden, 1820)	Compte-Sart (1975)	Holomediterranean
Fam. COENAGRIONIDAE		
<i>Ischnura elegans</i> (Vander Linden, 1820)	this study	Eurosiberian
<i>Ischnura graellsii</i> (Rambur, 1842)	Torralba-Burrial & Alonso-Naveiro (2009)	Iberian-Maghrebian
<i>Ischnura pumilio</i> (Charpentier, 1825)	Torralba-Burrial & Alonso-Naveiro (2009)	Pontic-Eastern
<i>Enallagma cyathigerum</i> (Charpentier, 1840)	this study	Holarctic
<i>Coenagrion puella</i> (Linnaeus, 1758)	Torralba-Burrial & Alonso-Naveiro (2009)	Pontic-Eastern
<i>Coenagrion mercuriale mercuriale</i> (Charpentier, 1840)	Galante & Verdú (2000)	Iberian-Maghrebian
<i>Coenagrion scitulum</i> (Rambur, 1842)	this study	Holomediterranean
<i>Coenagrion caerulescens caerulescens</i> (Fonscolombe, 1838)	Torralba-Burrial & Alonso-Naveiro (2009)	Iberian-Maghrebian
<i>Erythromma viridulum</i> (Charpentier, 1840)	this study	Holomediterranean
<i>Erythromma lindenii</i> (Selys, 1840)	this study	Holomediterranean
<i>Pyrrhosoma nymphula</i> (Sulzer, 1776)	Navás (1907)	West Mediterranean
<i>Ceriagrion tenellum</i> (Villers, 1789)	Torralba-Burrial & Alonso-Naveiro (2009)	West Mediterranean
<i>Platycnemis acutipennis</i> Selys, 1841	this study	Iberian-Maghrebian
<i>Platycnemis latipes</i> Rambur, 1842	this study	Iberian-Maghrebian
Fam. AESHNIDAE		
<i>Aeshna mixta</i> Latreille, 1805	Torralba-Burrial & Alonso-Naveiro (2009)	Eurosiberian
<i>Aeshna affinis</i> Vander Linden, 1820	this study	Pontic-Eastern
<i>Aeshna cyanea</i> (Müller, 1764)	Torralba-Burrial & Alonso-Naveiro (2009)	Holomediterranean
<i>Aeshna juncea</i> (Linnaeus, 1758)	this study	Holarctic
<i>Anax imperator</i> Leach, 1815	Ocharan Larrondo (1987)	Ethiopian
<i>Anax parthenope</i> Selys, 1839	Torralba-Burrial & Ocharan (2010)	Pontic-Eastern
<i>Anax ephippiger</i> (Burmeister, 1839)	this study	Ethiopian
<i>Boyeria irene</i> (Fonscolombe, 1838)	this study	West Mediterranean
Fam. GOMPHIDAE		
<i>Gomphus simillimus</i> Selys, 1840	this study	Iberian-Maghrebian
<i>Gomphus pulchellus</i> Selys, 1840	this study	Iberian-Maghrebian
<i>Onychogomphus uncatus</i> (Charpentier, 1840)	Anselin & Hoste (1996)	Iberian-Maghrebian
<i>Onychogomphus forcipatus unguiculatus</i> (Vander Linden, 1823)	Navás (1907)	West Mediterranean
<i>Onychogomphus costae</i> Selys, 1885	Rodríguez (2008)	Iberian-Maghrebian
Fam. CORDULEGASTRIDAE		
<i>Cordulegaster boltonii</i> (Donovan, 1807)	Navás (1907)	West Mediterranean
Fam. LIBELLULIDAE		
<i>Libellula quadrimaculata</i> Linnaeus, 1758	Navás (1906)	Holarctic
<i>Libellula depressa</i> Linnaeus, 1758	Navás (1906)	Pontic-Eastern
<i>Orthetrum nitidinerve</i> (Selys, 1841)	this study	Iberian-Maghrebian
<i>Orthetrum cancellatum</i> (Linnaeus, 1758)	this study	Holomediterranean
<i>Orthetrum coerulescens</i> (Fabricius, 1798)	Anselin & Hoste (1996)	Holomediterranean
<i>Orthetrum brunneum</i> (Fonscolombe, 1837)	Navás (1902)	Holomediterranean
<i>Sympetrum sanguineum</i> (Müller, 1764)	Torralba-Burrial & Alonso-Naveiro (2009)	Holomediterranean
<i>Sympetrum flaveolum</i> (Linnaeus, 1758)	Navás (1914)	Eurosiberian
<i>Sympetrum fonscolombii</i> (Selys, 1840)	Ocharan Larrondo (1987)	Holomediterranean
<i>Sympetrum striolatum</i> (Charpentier, 1840)	Navás (1914)	Eurosiberian
<i>Sympetrum meridionale</i> (Selys, 1841)	this study	Pontic-Eastern
<i>Crocothemis erythraea</i> (Brullé, 1832)	this study	Ethiopian

Table II. Odonata biogeographical composition in La Rioja. / *Composición biogeográfica de los odonatos de La Rioja.*

Biogeographical element	Species in La Rioja	% in La Rioja	% in Andalusia*	% in Iberian Peninsula*
Holarctic	4	8.2	5	5
Eurosiberian	5	10.2	8	16
Pontic-Eastern	7	14.3	15	18
Holomediterranean	10	20.4	20	16
West Mediterranean	8	16.3	13	10
Iberian-Maghrebian	12	24.5	24	22
Ethiopian	3	6.1	15	13

* Data from Andalusia and Iberian Peninsula are obtained from Torralba-Burrial & Ocharan (2007)

Table III. Odonata general types in La Rioja / Caracterización biogeográfica general de los odonatos de La Rioja.

General Biogeographical element	% in La Rioja	% in Andalusia*	% in Iberian Peninsula*
Nordic (Holarctic and Eurosiberian)	18.4	13	21
Mediterranean (Pontic-Eastern, Holomediterranean, West Mediterranean and Iberian-Maghrebian)	75.5	72	66
Ethiopian	6.1	15	13

* Data from Andalusia and Iberian Peninsula are obtained from Torralba-Burrial & Ocharan (2007)

Threatened species

According to the updated “Spanish Red List of Threatened Species” (Verdú & Galante, 2009) and the recent revision done by Torralba-Burrial *et al.* (2010), 13 of the taxa cited in La Rioja appear under some threat status; eight of them are cited as “Vulnerable” (VU): *Coenagrion caerulescens*, *Coenagrion mercuriale*, *Coenagrion scitulum*, *Aeshna juncea*, *Gomphus simillimus*, *Onychogomphus costae*, *Orthetrum nitidinerve* and *Sympetrum flaveolum*; three are cited as “Data Deficient” (DD): *Platynemesis acutipennis*, *Aeshna affinis* and *Sympetrum meridionale* and two are cited under “Least Concern” (LC) category: *Calopteryx haemorrhoidalis* and *Onychogomphus uncatus*.

On the other hand, 5 taxa founded in La Rioja are included in the “European Red List of Dragonflies” (Kalkman *et al.*, 2010): one defined as “Endangered” (EN): *Onychogomphus costae*, another one classified as “Vulnerable” (VU): *Orthetrum nitidinerve* and three more under the “Near Threatened” status: *Coenagrion caerulescens*, *Coenagrion mercuriale* and *Gomphus simillimus simillimus*.

Coenagrion mercuriale is the only taxon of this provisional catalogue included in the Annex II of the Habitats Directive which gathers the species requiring the designation of Special Areas of Conservation (Council of the European Communities, 1992).

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Annex. Data about the 22 Odonata species cited for the first time in La Rioja in this study.
/ Datos de las primeras citas de las 22 especies de odonatos citadas por vez primera en este estudio para La Rioja.

Taxa	♂♂	♀♀	Date	Municipality	X,Y Coordinates*	Altitude (m.a.s.l.)
<i>Calopteryx xanthostoma</i>	1	1	19-VI-08	Fonzaleche	501833 4716328	546
<i>Calopteryx haemorrhoidalis</i>	2	1	07-VI-08	Cervera del Río Alhama	590849 4646355	590
<i>Lestes sponsa</i>	0	1	23-VI-08	Logroño	551995 4699538	475
<i>Lestes virens</i>	0	1	18-VI-08	Hervías	511029 4699866	630
<i>Lestes viridis</i>	0	1	13-VII-08	Arnedillo	566378 4673089	625
<i>Ischnura elegans</i>	0	1	11-V-08	Logroño	545019 4703615	390
<i>Enallagma cyathigerum</i>	1	1	25-V-08	Alfaro	593355 4666071	400
<i>Coenagrion scitulum</i>	1	0	09-VII-08	Sojuela	536612 4690096	740
<i>Erythromma viridulum</i>	1	0	14-VII-08	Calahorra	584070 4682349	360
<i>Erythromma lindenii</i>	1	0	20-VI-08	San Vicente de la Sonsierra	519683 4711293	429
<i>Platycnemis acutipennis</i>	1	1	31-VII-08	Cornago	573370 4655355	810
<i>Platycnemis latipes</i>	1	1	20-VI-08	San Vicente de la Sonsierra	519681 4711252	429
<i>Aeshna affinis</i>	0	1	29-VI-08	Sojuela	535379 4689663	850
<i>Aeshna juncea</i>	1	1	28-VIII-08	Lumbreras	528782 4649302	1,950
<i>Anax ephippiger</i>	1	0	20-VIII-09	Nestares	531230 4684927	1,470
<i>Boyeria irene</i>	1	0	12-VIII-08	San Román de Cameros	547196 4671297	1,000
<i>Gomphus simillimus</i>	1	0	04-VI-08	Logroño	544302 4701918	389
<i>Gomphus pulchellus</i>	0	1	11-VI-08	Sojuela	536607 4690101	740
<i>Orthetrum nitidinode</i>	1	1	07-VII-08	Logroño	550281 4699461	400
<i>Orthetrum cancellatum</i>	0	1	14-VI-08	Sojuela	536621 4690092	740
<i>Sympetrum meridionale</i>	0	1	29-VII-08	Villalba de Rioja	509290 4717289	540
<i>Crocothemis erythraea</i>	0	1	18-VI-08	Hervías	511005 4699868	630

*X and Y values referred to ETRS89_UTM 30N projected coordinates system