

# Databasing dragonflies: State of knowledge in the Neotropical region

Natalia von Ellenrieder [natalia.ellenrieder@gmail.com]

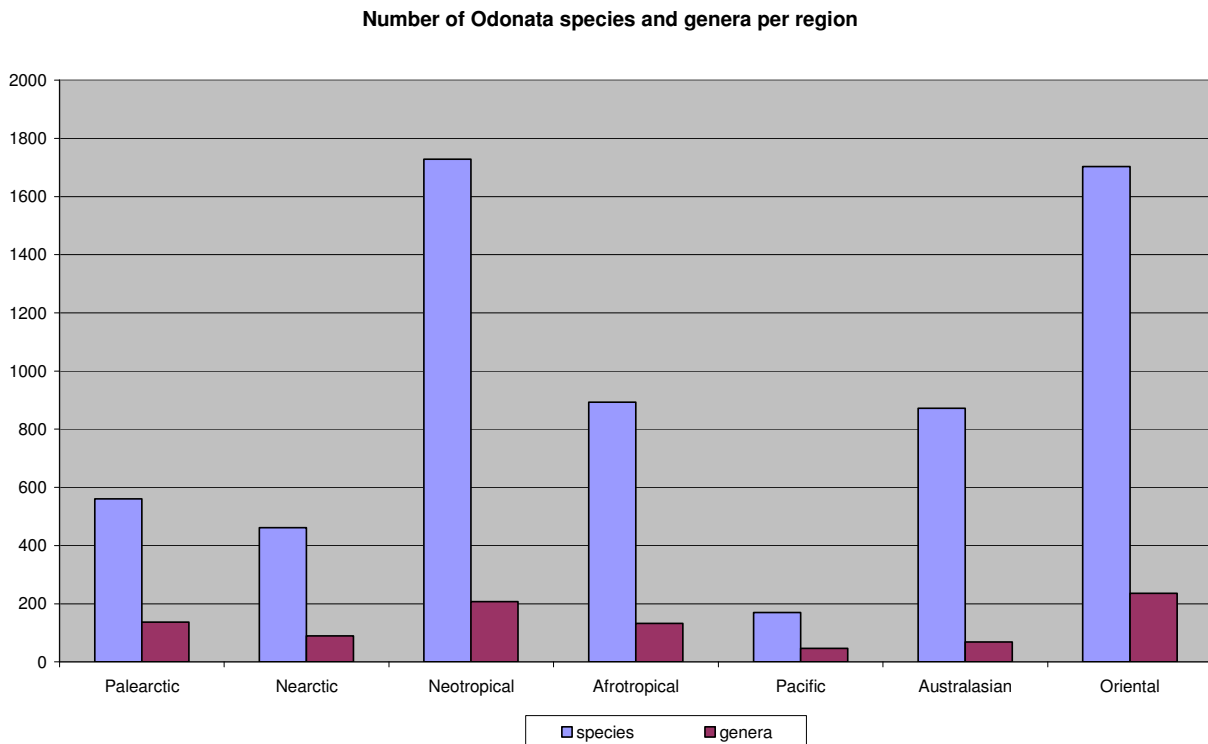
## Taxonomy

The Neotropical region extends from the lowlands of Mexico to central Argentina. The fauna from the highlands of N Mexico belongs to the Nearctic region, and that of temperate forests of SW Argentina and Chile to the Austral region (Morrone 2001). However, in order to simplify the analysis and to allow for comparison with previous studies (Paulson 2004; Kalkman *et al.* 2008), the entire area extending from all of Mexico to S South America will be here referred to as Neotropical region.

Thus defined, the Neotropical region is currently the richest in described species of Odonata (1,727), closely followed by the Oriental region (1,703 species), housing almost a third of the world total number of described species (Fig. 1). However, knowledge of the order in this region is still poor and lags behind other regions of the World. New species continue to be found and many are awaiting description in collections; systematics within some families, especially within Zygoptera, has not been properly settled yet, and larvae of two thirds of the described species and of a fourth of the genera are still unknown. The main causes for this are twofold: 1) a regional shortage of trained taxonomic specialists relative to the high diversity of the area, and until recently, 2) lack of a comprehensive literature base covering the entire region. No treatises exist to allow for the identification of all the odonates of this amazingly biodiverse region. This has severely hampered studies in many countries as the literature necessary to identify all known species is scattered and not easy to gather.

This is currently changing, as several identification guides have recently been published for the Neotropical

Figure 1. Comparison of number of species and genera of Odonata between different regions of the world (updated from Kalkman *et al.* 2008).



region: keys to species for Central America (Förster 2001), generic keys for adults of Brazilian Zygoptera (Lencioni 2005, 2006), generic keys for larvae of Brazilian Odonata (Costa *et al.* 2004), generic keys for the New World Anisoptera (Garrison *et al.* 2006), and generic keys for South American Odonata (von Ellenrieder & Garrison 2009). Two volumes authored by Heckman (2006, 2008) treat all species of Odonata described from South America; although the keys they include will not allow for reliable identifications, the compilation of references to specialized papers dealing with each taxon can be useful.

During the last five years (2004-2009) 93 new species (Table 1) and 11 new genera, and the larval stage of 90 species (Table 2) have been described from this region, doubling the number of new species described

in the previous five year period (Paulson 2004). Revisions were published during this period for some genera of Austropetaliidae (von Ellenrieder 2005), Corduliidae (von Ellenrieder & Garrison 2005), Calopterygidae (Garrison 2006), Protoneuridae (Pessacq & Costa 2007; von Ellenrieder & Garrison 2008b), and especially for the diverse family Coenagrionidae (von Ellenrieder & Muzón 2006; De Marmels 2007b; von Ellenrieder 2008a, b; von Ellenrieder & Garrison 2008a; Garrison 2009; Garrison & von Ellenrieder 2009; Machado 2009). Two field guides (Esquivel 2005 for Central America and von Ellenrieder & Garrison 2007a for the cloud forest in Argentina) and several faunal studies including distribution data of Odonata assemblages for particular areas (Table 3) have also been published.

### Researchers and Collections

The early stages of Odonatology in this region were the result of the work of several European entomologists; among them Burmeister (1839), Rambur (1842), Selys-Longchamps (including more than 30 contributions from 1853 through 1889, with synopses for families of Zygoptera, and Aeshnidae, Corduliidae, and Gomphidae), Brauer (1865), Mc Lachlan (1878, 1881, 1897), Martin (1907, 1908, 1909a, b, 1911, 1914, 1921, including synopses for Aeshnidae and Corduliidae, and lists for Argentina and Chile), Karsch (1890, 1891a, b, c, d), and Hagen (1860; 1861; 1868), all of which included numerous descriptions of new species. Navás published numerous listings and descriptions between 1911 and 1936, but his descriptions were extremely brief and include numerous synonymies, with the additional problem of most of his types being lost. A similar situation is encountered with Förster's contributions (1903, 1905, 1906, 1907, 1909, 1914). Kirby's illustrated revision of the subfamily Libellulinae (1889) and synonymic catalogue of the Odonata of the world (1890) are still used by students of the order, as is Ris' revision of the Libellulinae (1909-1919), which is still the most comprehensive reference available for some Neotropical genera. Ris (1904, 1908, 1913, 1918) also published listings and descriptions for Argentina and the Andean region. Fraser published monographs on the Austropetaliidae and Petaluridae (Fraser 1933), and described several new species from Peru (Fraser 1946) and Argentina (Fraser 1947, 1948).

Starting in the first half of the Twentieth century several entomologists from North America contributed to the study of the region. Calvert, whose most valuable contribution among his more than 250 publications dealing with Neotropical Odonata was a treatise of all odonate species from Central America (1901-1908, the *Biologia Centrali Americana*), Borrer, who provided important revisions and a key to Libellulinae genera (1931, 1942, 1945), and Gloyd, Kennedy, Montgomery, and Williamson among others with many important contributions.

Only during the second half of the Twentieth century did resident entomologists begin to study odonates in the Neotropical region, with Santos in Brazil, Rácenis in Venezuela, and Geijskes and Belle in Suriname. During the last thirty years research teams developed and are now active in Mexico (under the direction of Enrique González-Soriano, Rodolfo Novelo-Gutiérrez, Alejandro Córdoba-Aguilar), Costa Rica (Carlos Esquivel), Venezuela (Jürg De Marmels), Brazil (Angelo Machado, Janira Costa, Frederico Lencioni, Alcimar Carvalho), and Argentina (Javier Muzón, Natalia von Ellenrieder, Pablo Pessacq, Federico Lozano). Several visiting researchers from the USA and Europe (Jerrell Daigle, Nick Donnelly, Sid Dunkle, Bill Mauffray, Mike May, Dennis Paulson, Rosser Garrison, Ken Tennessen and Steve Valley among others) have conducted research in several countries and greatly contributed to the advancement of the knowledge of Odonata in this region.

Several collections house Neotropical Odonata, both in Europe (collected mainly around 1800-1900, and including many types) and in the New World.

### European Collections:

BMNH: British Museum of Natural History, Dept. of Entomology, British Museum (Natural History), Cromwell Road, London SW7 5BD, ENGLAND, UK. Large collection, mostly pinned and of old material, but containing type material described by Calvert (1901-1908) in the *Biologia Centrali Americana*, and by other authorities.

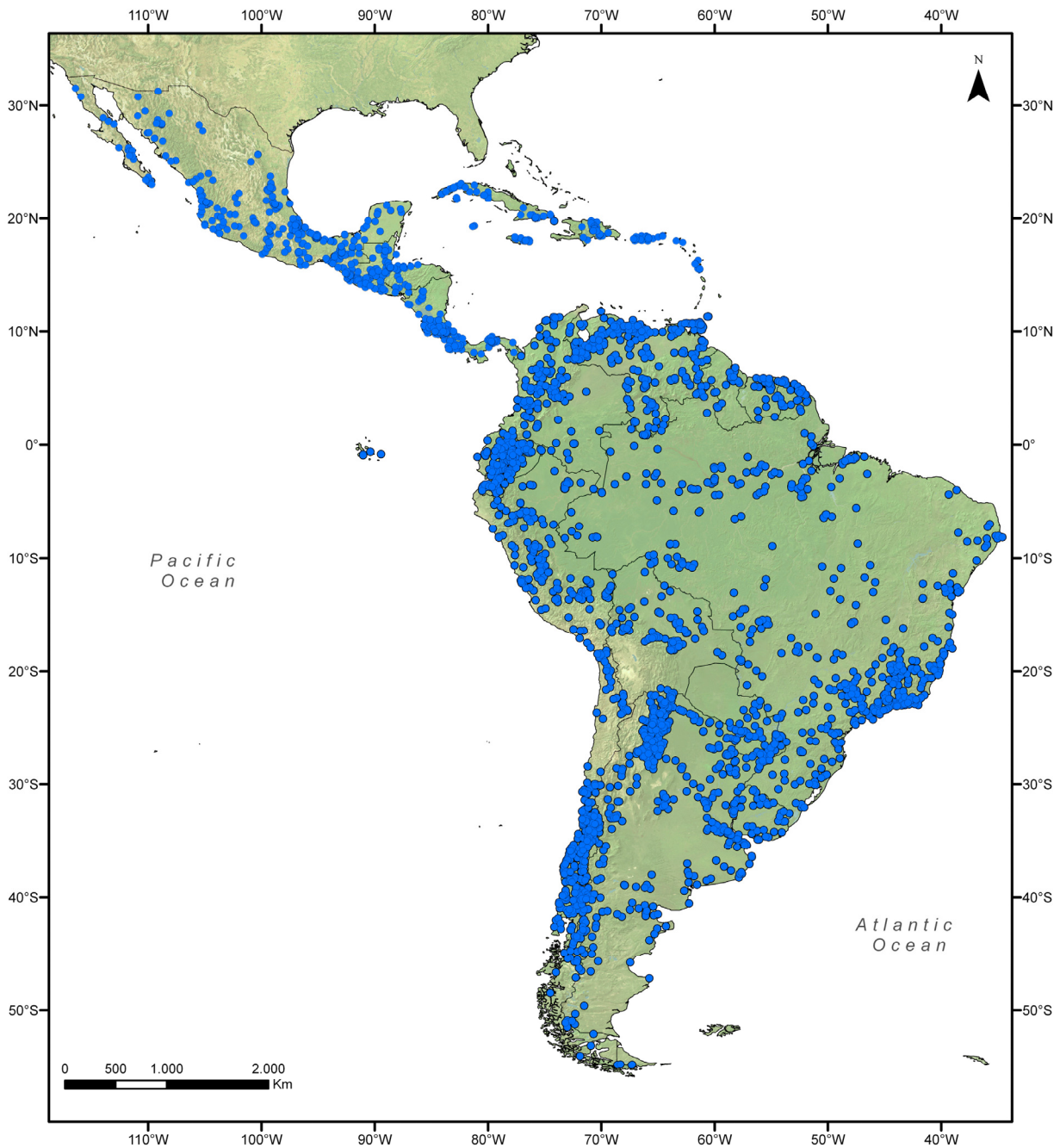
Type catalogs: Kimmins, 1966; 1969a; 1969b; 1970. No electronic database including locality data available.

FNS: Forschungsinstitut und Naturmuseum Senckenberg, Senckenberganlage 25, D-60326, Frankfurt-am-Main, GERMANY. Contains the papered collection of Friedrich Ris who worked on Odonata from the Andes (Ris, 1918). No electronic database including locality data available.

IRSN: Institut Royal des Sciences Naturelles de Belgique, 29, rue Vautier, B-1000 Bruxelles, BELGIUM. Very old collection containing the Odonata of Baron Edmund de Selys-Longchamps, considered the "Father of Odonatology" who described approximately one-fifth of the world's Odonata. Almost all of the collection is pinned and is rich in type material although no listing has ever been made. No electronic database including locality data available.

RNHL: Rijksmuseum van Natuurlijke Historie, Department of Entomology, Rijksmuseum van Natuurlijke Historie, Raamsteeg 2, Postbus 9517, NL 2300 RA Leiden, THE NETHERLANDS. Contains the collections of Jean Belle and Dirk Geijskes who collected for many years in Surinam. The collection is especially rich in neotropical Gomphidae. Type catalog: Lieftinck, 1971. Electronic database including locality data currently under construction (Wasscher & van t' Bosch, 2009).

Figure 2. Localities in the Neotropical region with databased Odonata records.



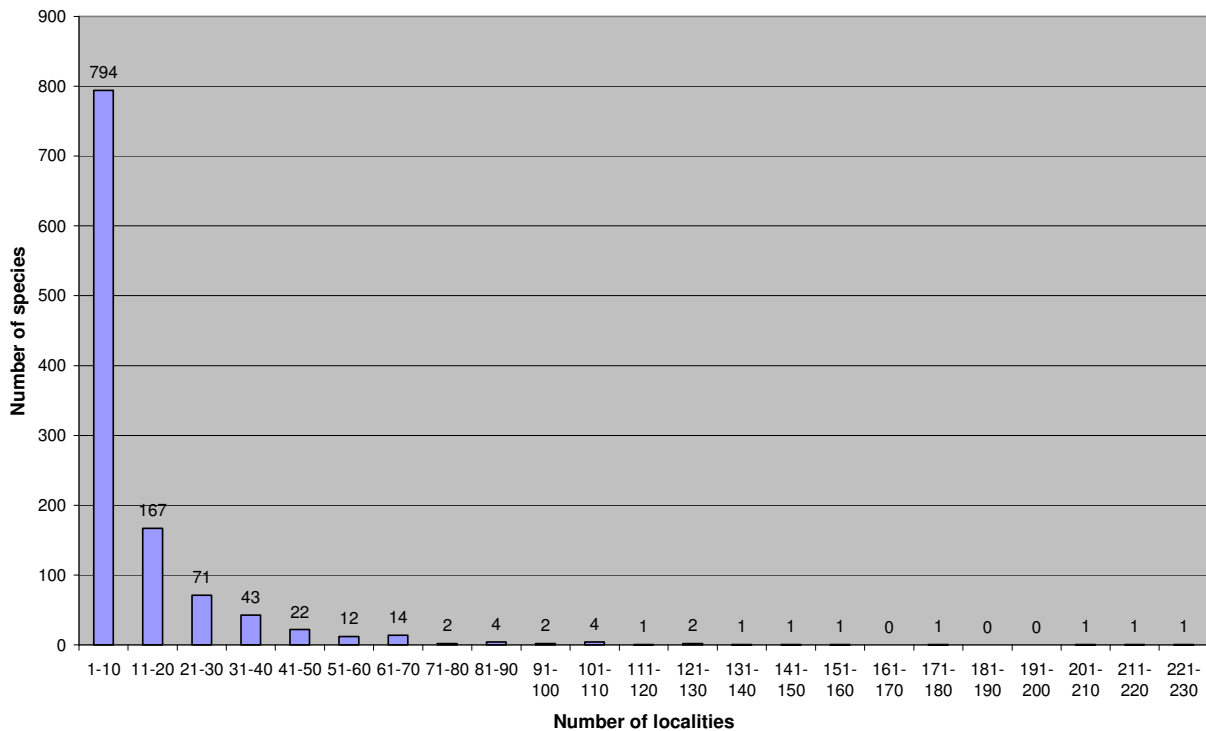
### New World Collections:

DRP (registered with FSCA): Dennis R. Paulson personal collection, Slater Museum of Natural History, University of Puget Sound, 1500 North Warner, Tacoma, WA, 98416, USA. Large well-curated collection of Odonata especially rich in New World specimens. Electronic database including locality data; not georeferenced.

FSCA: Florida State Collection of Arthropods, 1911 SW 34th Street, Gainesville, FL 32608-1268, USA. One of the largest holdings of New World Odonata in the United States, containing over 330,000 specimens (including 130,000 immatures in vials) collected over the last sixty years. Collection includes over 150 primary types, listed on line at: < <http://www.iodonata.net/> >. A list of all species is also provided on-line. No electronic database including locality data available.

MCZ: Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts 02138, USA. Very rich, old, pinned collection containing type material of Herman Burmeister, Toussaint de Charpentier, Herman Hagen, and others. Listing of over 550 types (some with images) on line at: < <http://insects.oeb.harvard.edu/mcz/> >. No electronic database including locality data available.

Figure 3. Number of databased species from the Neotropical region that occur in n number of localities in ranges of 10.



RWG (registered with USNM): Plant Pest Diagnostics, California Department of Food and Agriculture, 3294 Meadowview Road, Sacramento, CA 95832-1448, USA. Well-curated collection, especially rich in New World material with emphasis on neotropical fauna. Electronic database including locality data available; georeferenced.

TWD (registered with FSCA): 2091 Partridge Lane, Binghamton NY 13903, USA. Well-curated, world-wide collection containing numerous New World specimens collected over the last 50 years. No electronic database including locality data available.

UMMZ: University of Michigan, Museum of Zoology, 1109 Geddes Avenue, Ann Arbor, MI, 48109-1079, USA. One of the largest holdings of Odonata in the world, containing the collections of F. Förster, C.H. Kennedy, E.B. Williamson, and others. Particularly rich in neotropical material though vast amounts of this material await study. Type catalog: Garrison *et al.*, 2003. No electronic database including locality data available.

UNAM: Instituto de Biología, Departamento de Zoología, Apartado Postal 70-153, MX-04510, D. F. Large, well-curated, papered collection of Odonata from Mexico put together mostly by E. González-Soriano. No electronic database including locality data available.

USNM: National Museum of Natural History, Smithsonian Institution, Washington, D.C., 20560, USA. A large well-curated world-wide collection containing numerous neotropical specimens collected mostly by Oliver S. Flint, Jr. over the past 40 years. Type catalog: Flint, 1991. No electronic database including locality data available.

ABMM, Angelo B.M. Machado personal collection, Departamento de Zoologia, Instituto de Ciências Biológicas, Universidade Federal de Minas Gerais, Caixa Postal 486, BR-31270-901, Belo Horizonte - Minas Gerais, BRAZIL. Private collection including types of Brazilian material. No electronic database including locality data available.

IEUM: Instituto de Entomología “Prof. José Herrera G.”, Universidad Metropolitana de Ciencias de la Educación, Casilla 147, Santiago, CHILE. Collection including numerous unidentified odonates, including some collected in N Chile. No electronic database including locality data available.

MIZA: Museo del Instituto de Zoología Agrícola “Francisco Fernández Yépez”, Maracay, VENEZUELA. Particularly rich collection of papered Venezuelan Odonata including collected material by the late J. Rácenis and by Jürg De Marmels. No electronic database including locality data available.

MLP: Museo de Ciencias Naturales de La Plata, Departamento de Entomología, Paseo del Bosque s/n, 1900 La Plata, ARGENTINA. Rich collection including types of Argentine species. Type catalog: Muzón *et al.*, 2007. Electronic database including locality data currently under construction.

Figure 4. Recorded number of genera from the Neotropical region compared to their representation in database.

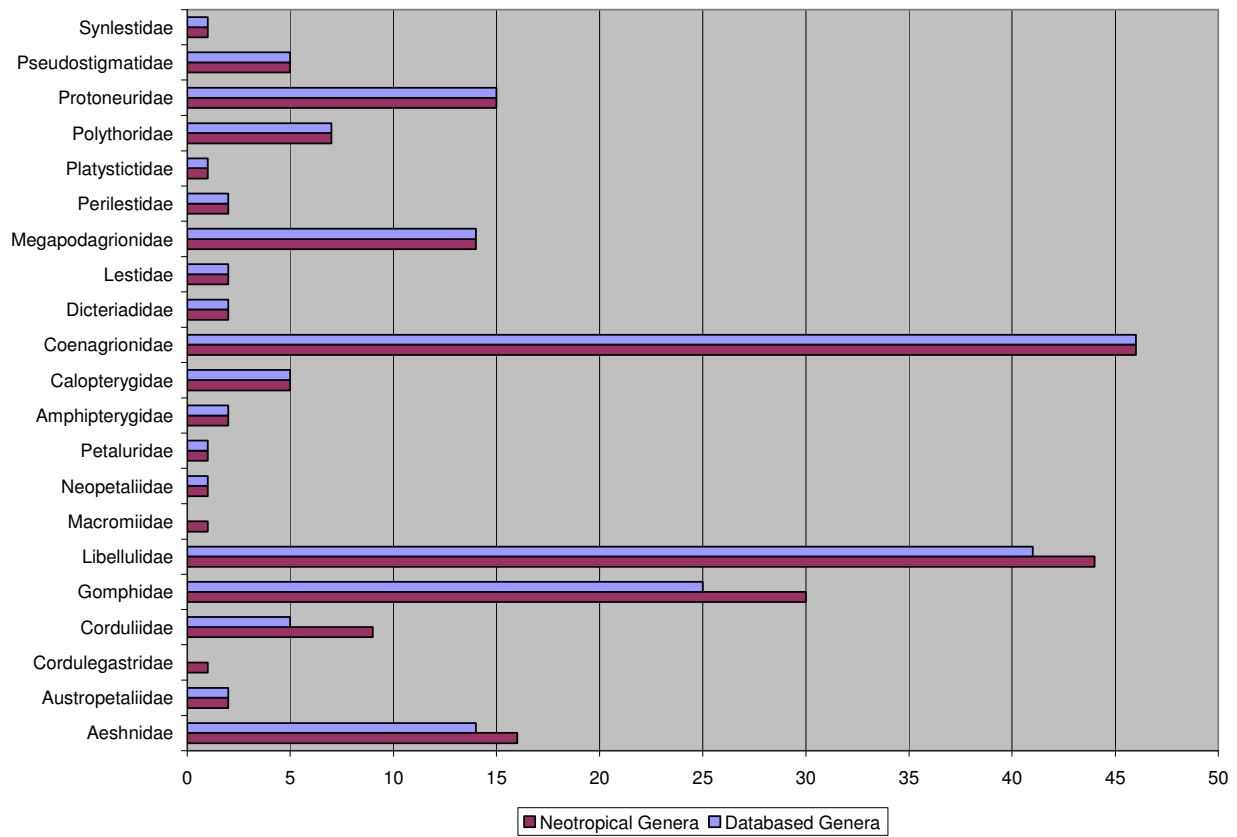


Figure 5. Recorded number of species from the Neotropical region compared to their representation in database.

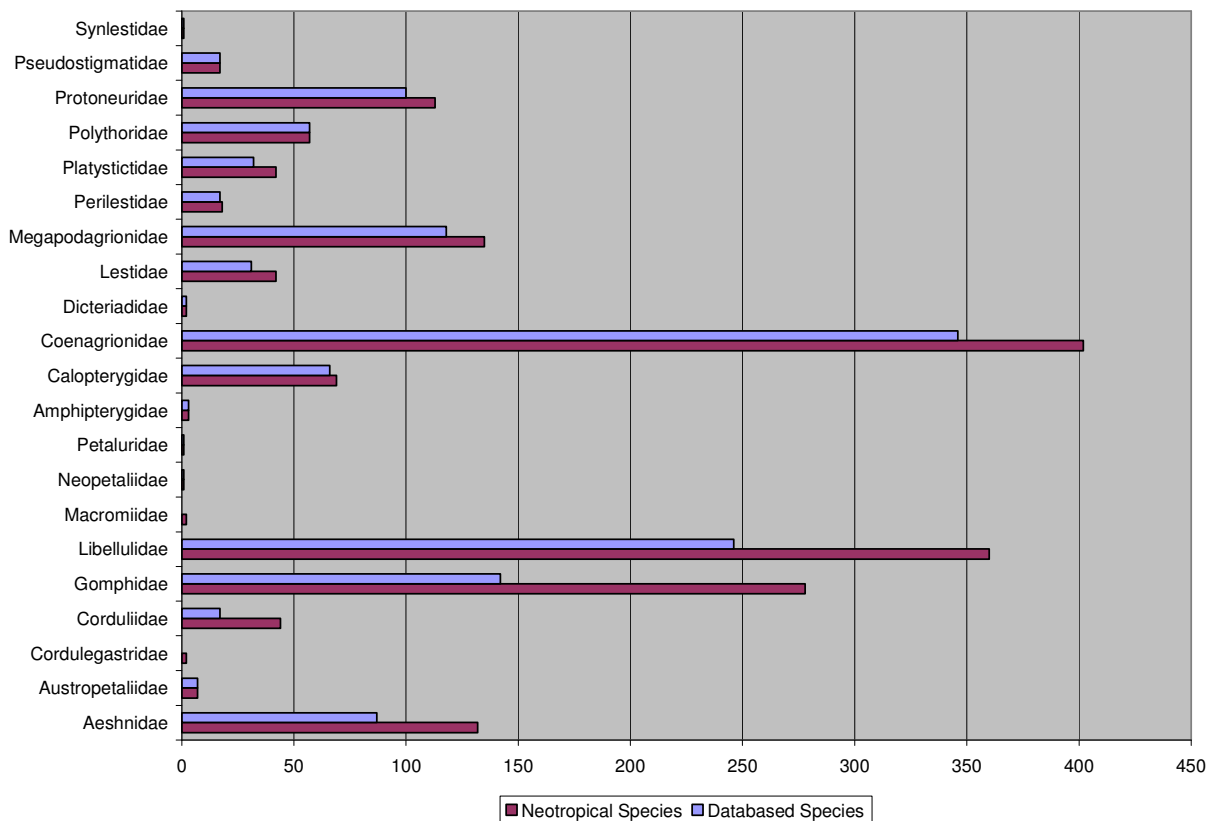


Table 1. Species of Odonata described from the Neotropical region between 2004 and 2009.

Family/Species	Author	Family/Species	Author
Polythoridae (1)		<i>Schistobos boliviensis</i>	(Daigle, 2007)
<i>Chalcopteryx machadoi</i>	Costa, 2005	<i>Telebasis carvalhoi</i>	Garrison, 2009
Calopterygidae (7)		<i>Telebasis corbeti</i>	Garrison, 2009
<i>Mnesarete drepane</i>	Garrison, 2006	<i>Telebasis farcimentum</i>	Garrison, 2009
<i>Mnesarete ephippium</i>	Garrison, 2006	<i>Telebasis leptocycla</i>	Garrison, 2009
<i>Mnesarete lencionii</i>	Garrison, 2006	<i>Telebasis levis</i>	Garrison, 2009
<i>Mnesarete loutoni</i>	Garrison, 2006	<i>Telebasis williamsoni</i>	Garrison, 2009
<i>Mnesarete machadoi</i>	Garrison, 2006	<i>Tepuibasis garciana</i>	De Marmels, 2007
<i>Mnesarete rhopalon</i>	Garrison, 2006	<i>Tepuibasis nigra</i>	De Marmels, 2007
<i>Mnesarete williamsoni</i>	Garrison, 2006	<i>Tepuibasis rubicunda</i>	De Marmels, 2007
Lestidae (1)		<i>Tepuibasis thea</i>	De Marmels, 2007
<i>Lestes fernandoi</i>	Costa <i>et al.</i> , 2006	<i>Tuberculobasis arara</i>	Machado, 2009
Megapodagrionidae (7)		<i>Tuberculobasis geijskesi</i>	Machado, 2009
<i>Heteragrion archon</i>	De Marmels, 2008	<i>Tuberculobasis guarani</i>	Machado, 2009
<i>Heteragrion bickorum</i>	Daigle, 2005	<i>Tuberculobasis karitiana</i>	Machado, 2009
<i>Heteragrion gracile</i>	Machado, 2006	<i>Tuberculobasis macuxi</i>	Machado, 2009
<i>Heteragrion luizfelipei</i>	Machado, 2006	<i>Tuberculobasis tirió</i>	Machado, 2009
<i>Heteragrion mantiqueirae</i>	Machado, 2006	<i>Tuberculobasis williamsoni</i>	Machado, 2009
<i>Heteragrion makiritare</i>	De Marmels, 2004	Aeshnidae (3)	
<i>Heteragrion tiradentense</i>	Machado & Bedé, 2006	<i>Gynacantha bartai</i>	Paulson & von Ellenrieder, 2005
Protoneuridae (20)		<i>Rhionaeschna itatiaia</i>	(Carvalho & Salgado, 2004)
<i>Drepanoneura donnellyi</i>	von Ellenrieder & Garrison, 2008	<i>Rhionaeschna serrana</i>	(Carvalho & Salgado, 2004)
<i>Drepanoneura flinti</i>	von Ellenrieder & Garrison, 2008	Gomphidae (3)	
<i>Drepanoneura janirae</i>	von Ellenrieder & Garrison, 2008	<i>Peruviogomphus bellei</i>	Machado, 2005
<i>Drepanoneura loutoni</i>	von Ellenrieder & Garrison, 2008	<i>Progomphus lambertoii</i>	Novelo, 2007
<i>Drepanoneura muzoni</i>	von Ellenrieder & Garrison, 2008	<i>Progomphus marcelae</i>	Novelo, 2007
<i>Drepanoneura tennesseii</i>	von Ellenrieder & Garrison, 2008	Corduliidae (7)	
<i>Epipleoneura demarmelsi</i>	von Ellenrieder & Garrison, 2008	<i>Laumacromia bedei</i>	Machado, 2005
<i>Epipleoneura janirae</i>	Machado, 2005	<i>Laumacromia pinguaba</i>	Carvalho <i>et al.</i> , 2004
<i>Epipotoneura machadoi</i>	von Ellenrieder & Garrison, 2008	<i>Neocordulia caudacuta</i>	De Marmels, 2008
<i>Forcepsioneura grossiorum</i>	Machado, 2005	<i>Neocordulia fiorentini</i>	Costa & Machado, 2007
<i>Forcepsioneura juruaensis</i>	(Machado, 2004)	<i>Neocordulia gaucha</i>	Costa & Machado, 2007
<i>Idioneura celioi</i>	Lencioni, 2009	<i>Neocordulia matutuensis</i>	Machado, 2005
<i>Neoneura anaclara</i>	Machado, 2005	<i>Neocordulia santacatarinensis</i>	Costa <i>et al.</i> , 2008
<i>Neoneura angelensis</i>	Juillerat, 2007	Libellulidae (8)	
<i>Neoneura kiautai</i>	Machado, 2007	<i>Elasmotheremis aliciae</i>	González-Soriano & Novelo-Gutiérrez, 2006
<i>Neoneura leonardoii</i>	Machado, 2005	<i>Elasmotheremis rufa</i>	De Marmels, 2008
<i>Peristicta jalmosi</i>	Pessacq & Costa, 2007	<i>Garrisonia aurindae</i>	Penalva & Costa, 2007
<i>Peristicta janiceae</i>	Pessacq & Costa, 2007	<i>Macrothemis meurgeyi</i>	Daigle, 2007
<i>Peristicta muzoni</i>	Pessacq & Costa, 2007	<i>Macrothemis taurepan</i>	De Marmels, 2008
<i>Protoneura romanae</i>	Meurgey, 2006	<i>Oligoclada garrisoni</i>	De Marmels, 2008
Coenagrionidae (36)		<i>Oligoclada rubribasalis</i>	von Ellenrieder & Garrison, 2008
<i>Acanthagrion aepiolum</i>	Tennessee, 2004	<i>Perithemis capixaba</i>	Costa <i>et al.</i> , 2006
<i>Acanthagrion hartei</i>	Muzón & Lozano, 2005		
<i>Aceratobasis nathaliae</i>	(Lencioni, 2004)		
<i>Andinagrion garrisoni</i>	von Ellenrieder & Muzón, 2006		
<i>Angelagrion fredericoi</i>	Lencioni, 2008		
<i>Angelagrion nathaliae</i>	Lencioni, 2008		
<i>Argia yungensis</i>	Garrison & von Ellenrieder, 2007		
<i>Bromeliagrion rehni</i>	Garrison, 2005 <i>in</i> De Marmels & Garrison, 2005		
<i>Denticulobasis ariken</i>	Machado, 2009		
<i>Denticulobasis dunklei</i>	Machado, 2009		
<i>Denticulobasis garrisoni</i>	Machado, 2009		
<i>Homeoura obrieni</i>	von Ellenrieder, 2008		
<i>Leptagrion alfonsoi</i>	Machado, 2007		
<i>Mesamphiagrion dunklei</i>	von Ellenrieder & Garrison, 2008		
<i>Mesamphiagrion ecuatorialae</i>	von Ellenrieder & Garrison, 2008		
<i>Mesoleptobasis elongata</i>	Garrison & von Ellenrieder, 2009		
<i>Metaleptobasis lillianae</i>	Daigle, 2004		
<i>Phoenicagrion paulsoni</i>	von Ellenrieder, 2008		

Table 2. Larvae of Odonata described from the Neotropical region between 2004 and 2009.

Family/Species	Larva described by		
<b>Polythoridae (2)</b>			
<i>Euthore fasciata</i> (Hagen in Selys, 1853)	De Marmels 2007a		
<i>Polythore spaeteri</i> Burmeister & Börzsöny, 2003	Etscher <i>et al.</i> 2006		
<b>Calopterygidae (5)</b>			
<i>Hetaerina medinae</i> Rácenis, 1968	De Marmels 2007a		
<i>Hetaerina mendezi</i> Jurzitza, 1982	von Ellenrieder 2007c		
<i>Hetaerina rosea</i> Selys, 1853	Pessacq & Muzón 2004; von Ellenrieder 2007c		
<i>Mnesarete grisea</i> (Ris, 1918)	Garrison 2006		
<i>Ormenophlebia imperatrix</i> (McLachlan, 1878)	Garrison 2006		
<b>Lestidae (3)</b>			
<i>Archilestes tuberalatus</i> (Williamson, 1921)	De Marmels 2004		
<i>Lestes apollinaris</i> Navás, 1934	De Marmels 2004		
<i>Lestes dichrostigma</i> Calvert, 1909	Muzón & Weigel Muñoz 2007		
<b>Megapodagrionidae (11)</b>			
<i>Heteragrion bariyai</i> De Marmels, 1989	De Marmels 2004		
<i>Heteragrion breweri</i> De Marmels, 1989	De Marmels 2004		
<i>Heteragrion chlorotaeniatum</i> De Marmels, 1989	De Marmels 2004		
<i>Heteragrion mitratum</i> Williamson, 1919	De Marmels 2004		
<i>Paraphlebia zoe</i> Selys in Hagen, 1861	Novelo-Gutiérrez 2008a		
<i>Philogenia mangosisa</i> Bick & Bick, 1988	Bybee & Tennesen 2008		
<i>Sciotropis cyclanthorum</i> Rácenis, 1959	De Marmels 2004		
<i>Teinopodagrion caquetanum</i> De Marmels, 2001	Pérez-Gutiérrez 2007		
<i>Teinopodagrion decipiens</i> De Marmels, 2001	von Ellenrieder 2006		
<i>Teinopodagrion meridionale</i> De Marmels, 2001	von Ellenrieder 2006		
<i>Teinopodagrion vallenatum</i> De Marmels, 2001	Pérez-Gutiérrez 2007		
<b>Pseudostigmatidae (4)</b>			
<i>Mecistogaster asticta</i> Selys, 1860	Lencioni 2006		
<i>Mecistogaster linearis</i> (Fabricius, 1776)	Salhén & Hedström 2005		
<i>Microstigma maculatum</i> Hagen in Selys, 1860	Neiss <i>et al.</i> 2008		
<i>Microstigma rotundatum</i> Selys, 1860	De Marmels 2007a		
<b>Platystictidae (1)</b>			
<i>Palaemnema clementia</i> Selys, 1886	De Marmels 2007a		
<b>Protoneuridae (4)</b>			
<i>Epipleoneura metallica</i> Rácenis, 1955	De Marmels 2007a		
<i>Neoneura fulvicollis</i> Selys, 1886	De Marmels 2007a		
<i>Peristicta forceps</i> Hagen in Selys, 1860	Pessacq 2007		
<i>Protoneura ailsa</i> Donnelly, 1961	Meurgey 2008b		
<b>Coenagrionidae (27)</b>			
<i>Acanthagrion aepiolium</i> Tennesen, 2004	Lozano <i>et al.</i> 2007		
<i>Acanthagrion vidua</i> Selys, 1876	De Marmels 2007a		
<i>Andinagrion garrisoni</i> von Ellenrieder & Muzón, 2006	von Ellenrieder & Muzón 2006		
<i>Argia adamsi</i> Calvert, 1902	De Marmels 2007a		
<i>Argia barretti</i> Calvert, 1902	Novelo-Gutiérrez 2008b		
<i>Argia croceipennis</i> Selys, 1865	Costa <i>et al.</i> 2008b		
<i>Argia joergenseni</i> Ris, 1913	von Ellenrieder 2007a		
<i>Argia sordida</i> Hagen in Selys, 1865	Costa <i>et al.</i> 2008b		
<i>Argia translata</i> Hagen in Selys, 1865	von Ellenrieder 2007a		
<i>Bromeliagrion rehni</i> Garrison, 2005 in De Marmels & Garrison, 2005	Torreias <i>et al.</i> 2008		
<i>Enallagma novaehispaniae</i> Calvert, 1907	Novelo-Gutiérrez 2005b		
<i>Ischnura ultima</i> Ris, 1908	Muzón & Pessacq 2005		
<i>Leptagrion andromache</i> Hagen in Selys, 1876	Muzón <i>et al.</i> 2009		
<i>Leptagrion bocainense</i> Santos, 1979	Costa <i>et al.</i> 2009		
<i>Leptagrion capixabae</i> Santos, 1965	Costa <i>et al.</i> 2009		
<i>Leptagrion dardanoi</i> Santos, 1968	Costa <i>et al.</i> 2009		
<i>Leptagrion elongatum</i> Selys, 1876	Costa <i>et al.</i> 2009		
<i>Leptagrion macrurum</i> (Burmeister, 1839)	Costa <i>et al.</i> 2009		
<i>Leptagrion perlongum</i> Calvert, 1909	Costa <i>et al.</i> 2009		
<i>Leptagrion vriesianum</i> Santos, 1978	Costa <i>et al.</i> 2009		
<i>Mesamphiagrion laterale</i> (Selys, 1876)		De Marmels 2007a	
<i>Mesamphiagrion tamaense</i> (De Marmels, 1988)		De Marmels 2007a	
<i>Oreiallagma quadricolor</i> (Ris, 1918)		von Ellenrieder & Garrison 2008a	
<i>Oxyagrion ablutum</i> (Calvert, 1909)		Pessacq <i>et al.</i> 2005	
<i>Oxyagrion bruchi</i> Navás, 1924		von Ellenrieder & Garrison 2006	
<i>Oxyagrion imeriense</i> (De Marmels, 1989)		De Marmels 2007a	
<i>Telebasis digitcollis</i> Calvert, 1902		Novelo-Gutiérrez & Gómez-Anaya 2005	
<b>Aeshnidae (3)</b>			
<i>Aeshna williamsoniana</i> Calvert, 1905		Novelo-Gutiérrez 2007	
<i>Castoraeschna colorata</i> (Martin, 1908)		Carvalho <i>et al.</i> 2006	
<i>Castoraeschna longfieldae</i> (Kimmins, 1929)		Carvalho <i>et al.</i> 2006	
<b>Gomphidae (7)</b>			
<i>Erpetogomphus bothrops</i> Garrison, 1994		Novelo-Gutiérrez 2005a	
<i>Erpetogomphus elaps</i> Selys, 1858		Novelo-Gutiérrez 2005a	
<i>Erpetogomphus eutainia</i> Calvert, 1905		Novelo-Gutiérrez 2005a	
<i>Erpetogomphus liopeltis</i> Garrison, 1994		Novelo-Gutiérrez 2005a	
<i>Erpetogomphus viperinus</i> Selys, 1868		Novelo-Gutiérrez 2005a	
<i>Phyllogomphoides joaquinii</i> Rodrigues Capitulo, 1992		Muzón <i>et al.</i> 2006	
<i>Progomphus dorsopallidus</i> Byers, 1934		De Marmels 2005	
<b>Corduliinae (3)</b>			
<i>Laumacromia pinguaba</i> Carvalho <i>et al.</i> , 2004		Carvalho <i>et al.</i> 2008	
<i>Neocordulia caudacuta</i> De Marmels, 2008		De Marmels, 2008	
<i>Neocordulia santacatarinensis</i> Costa <i>et al.</i> , 2008		Costa <i>et al.</i> 2008a	
<b>Libellulinae (20)</b>			
<i>Brechmorhoga archboldi</i> (Donnelly, 1970)		Meurgey 2008a	
<i>Brechmorhoga nubecula</i> (Rambur, 1842)		von Ellenrieder 2007b	
<i>Brechmorhoga praedatrix</i> Calvert, 1909		Fleck 2004	
<i>Cannaphila insularis</i> Kirby, 1889		Trapero-Quintana & Cuellar Araujo 2009	
<i>Dasythemis mincki clara</i> (Karsch, 1890)		von Ellenrieder 2007b	
<i>Dythemis maya</i> Calvert, 1906		Novelo-Gutiérrez & González-Soriano 2004	
<i>Dythemis sterilis</i> Hagen, 1861		Novelo-Gutiérrez & González-Soriano 2004	
<i>Elasmothermis aliciae</i> González & Novelo, 2006		González-Soriano & Novelo-Gutiérrez 2006	
<i>Erythrodiplax atroterminata</i> Ris, 1911		Garré <i>et al.</i> 2008	
<i>Erythrodiplax corallina</i> (Brauer, 1865)		Garré <i>et al.</i> 2008	
<i>Erythrodiplax fervida</i> (Erichson, 1848)		Trapero-Quintana & Reyes-Tur 2008	
<i>Gynothemis pumila</i> (Karsch, 1890)		Fleck 2004	
<i>Idiataphe longipes</i> (Hagen, 1861)		Oldrini & Mascarehnas 2005	
<i>Macrothemis hahneli</i> Ris, 1913		von Ellenrieder 2007b	
<i>Macrothemis ultima</i> González, 1992		Novelo-Gutiérrez 2006	
<i>Micrathyrta unguolata</i> Förster, 1907		Garré & Lozano 2007	
<i>Perithemis lais</i> (Perty, 1834)		Costa & Régis 2005	
<i>Tauriphila argo</i> (Hagen, 1869)		Fleck <i>et al.</i> 2006	
<i>Tholymis citrina</i> Hagen, 1867		Fleck <i>et al.</i> 2004	
<i>Zenithoptera anceps</i> Pujol-Luz, 1993		Costa <i>et al.</i> 2004	

Table 3. Faunal studies from the Neotropical region published between 2004 and 2009.

Country	Area	Source
Mexico	Coahuila State	Behrstock 2008
	Chihuahua State	Behrstock <i>et al.</i> 2007
	Baja California Sur State	Paulson & Mlodinow 2007
	Sonora State	Upton <i>et al.</i> 2007
	Sierra de Coalcomán, Michoacan State	Novelo-Gutiérrez & Gómez-Anaya 2008
Guadeloupe	Guadeloupe	Meurgey 2005
Cuba	Alexander Humboldt N.P.	Trapero-Quintana <i>et al.</i> 2004
	Refugio Monte Cabaniguán, Tuna Prov.	Trapero-Quintana <i>et al.</i> 2008
Colombia	Chocó Dep.	Pérez <i>et al.</i> 2007
Brazil	Marambaia, Rio de Janeiro State	Anjos-Santos & Costa 2006
Argentina	Meseta de Somuncurá, Rio Negro Prov.	Muzón <i>et al.</i> 2005
	Iberá wetland, Corrientes Prov.	Muzón <i>et al.</i> 2008
	Yungas cloud forest, NW Argentina	von Ellenrieder & Garrison 2007b

MNHN: Museo Nacional de Historia Natural, Casilla 787, Santiago, CHILE. Holds most of R. Martin's collection. No electronic database including locality data available.

MNRJ: Museu Nacional, Departamento de Entomologia, Museu Nacional, Univ. Federal Rio de Janeiro, Quinta da Boa Vista, BR-20942-040, Rio de Janeiro, RJ, BRAZIL. One of the largest Odonata collections in South America, containing specimens collected by N.D. Santos and J.M. Costa. Type catalog: Costa & Mascarenhas, 1998. No electronic database including locality data available.

PUC: Pontificia Universidad Católica del Ecuador, Apartado 2184, Quito, Ecuador No electronic database including locality data available.

### Existing Databases

Rosser W. Garrison and I maintain an electronic database which includes locality data and is also mostly (80%) georeferenced. It is a Visual FoxPro application which currently contains over 15,500 entries of about 1,150 species (about 66% of the described species for the region) occurring in the New World south to Mexico (Fig. 2). From these, most are known from a few localities, and only a few are widely distributed (Fig. 3) with the three most-recorded species being *Rhionaeschna diffinis* (217), *R. variegata* (216), and *Argia yungensis* (211). Coenagrionidae provide 27% of records, followed by Libellulidae with 19%, Gomphidae with 11%, Megapodagrionidae with 9%, and Protoneuridae with 8%, representing a proportional relationship to the total numbers known for the region for each family (Fig. 4). It was compiled from our personal collections (RWG, NVE), and from all literature records and examined specimens deposited in several Institutions that we examined for our work during the last few years. It includes complete distributional data for 364 species assessed by Dennis Paulson and myself for the Red List in 2005 and as part of the Global Dragonfly Assessment in 2007 (Appendix 1). Complete distribution data for another 211 species Rosser Garrison and I studied are also entered, thus a third (33%) of the total number of described Neotropical species can be considered satisfactorily mapped.

### Future

The information from our database can serve as a funding nucleus to build a unifying database for the Neotropical region. In order to achieve this, the following tasks should be undertaken:

1) Published records: Records from the literature need to be added to species not yet revised, including information from numerous regional lists published during the last 30 years.

2) Unpublished records: Large numbers of dragonfly records are stored in collections and have never been published. If all odonatologists interested in the region were to make their unpublished records available, the database could begin to provide us with a fairly good picture of the Odonate distribution patterns in the Neotropics. Some collections do have paper databases, which could be digitalized. In most collections there are also unidentified specimens awaiting examination, which could be identified by the specialists in charge of them or by visiting researchers.

3) New records: Fieldwork is still needed in most areas; the highest priority lies in the lowland Amazon rainforests, the continent's richest Odonata habitat. Of intermediate priority are regions with probably medium-rich faunas for which odonate records are not available, such as S Bolivia, N Paraguay, and E Colombia (Fig. 2).

### References

- Anjos-Santos, D., & J.M. Costa, 2006. A revised checklist of Odonata (Insecta) from Marambaia, Rio de Janeiro, Brazil with eight new records. *Zootaxa* 1300: 37-50.
- Behrstock, R.A., 2008. An Updated List of the Odonata of Coahuila, Mexico, including forty-one new State records and the first Mexican occurrence of *Libellula composita* (Hagen). *Bulletin of American Odonatology* 11:



1-7.

- Behrstock, R.A., D. Danforth & S. Upson, 2007. A list of the Odonata of Chihuahua State, Mexico, including new state records and the first Mexican record of *Argia alberta* Kennedy, 1918. *Bulletin of American Odonatology* 10: 52-63.
- Borror, D.J., 1931. The Genus *Oligoclada* (Odonata). *Miscellaneous Publications, Museum of Zoology, University of Michigan* 22: 42 pp.
- Borror, D.J., 1942. A revision of Libelluline genus *Erythrodiplax* (Odonata). Graduate School Studies Ohio State University, Contributions in Zoology and Entomology 4, Biological Series xv + 286 pp.
- Borror, D.J., 1945. A key to the New World Genera of Libellulidae (Odonata). *Annals of the Entomological Society of America* 38: 168-194.
- Brauer, F., 1865. Vierter Bericht über die auf der Weltfahrt der kais. Fregatte Novara gesammelten Neuropteren. *Verhandlungen der zoologisch-botanischen Gesellschaft in Wien* 15: 903-908.
- Burmeister, H.C.C., 1839. *Handbuch der Entomologie. Neuroptera*. T.C.F. Enslin, 2(2): 757-1050.
- Bybee, S.M. & K.J. Tennessen, 2008. Description of the female and nymph of *Philogenia mangosisa* from southern Ecuador (Odonata: Megapodagrionidae). *Zootaxa* 1787: 63-68.
- Calvert, P.P., 1901. Odonata. In: *Biologia Centrali Americana: Insecta Neuroptera*. R.H. Porter & Dulau Co., London pp. 17-72.
- Calvert, P.P., 1902. Odonata. In: *Biologia Centrali Americana: Insecta Neuroptera*. R.H. Porter & Dulau Co., London pp. 73-128.
- Calvert, P.P., 1903. Odonata. In: *Biologia Centrali Americana: Insecta Neuroptera*. R.H. Porter & Dulau Co., London pp. 129-144.
- Calvert, P.P., 1905. Odonata. In: *Biologia Centrali Americana: Insecta Neuroptera*. R.H. Porter & Dulau Co., London. pp. 145-212.
- Calvert, P.P., 1906. Odonata. In: *Biologia Centrali Americana: Insecta Neuroptera*. R.H. Porter & Dulau Co., London pp. 213-308.
- Calvert, P.P., 1907. Odonata. In: *Biologia Centrali Americana: Insecta Neuroptera*. R.H. Porter & Dulau Co., London pp. 309-404.
- Calvert, P.P., 1908. Introduction to the Odonata, in *Biologia Centrali Americana: Insecta Neuroptera*. R.H. Porter & Dulau Co., London. pp. i-xxx.
- Calvert, P.P., 1908. Odonata. In: *Biologia Centrali Americana: Insecta Neuroptera*. R.H. Porter & Dulau Co., London pp. 405-420.
- Calvert, P.P., 1908. Introduction to the Odonata. In: *Biologia Centrali Americana: Insecta Neuroptera*. R.H. Porter & Dulau Co., London pp. v-xxx.
- Calvert, P.P., 1909. Contributions to a knowledge of the Odonata of the Neotropical region, exclusive of Mexico and Central America. *Annals of the Carnegie Museum* 6(3): 73-280.
- Carvalho, A.L., L.G.V. Salgado & G. Fleck, 2008. Description of the larva of *Laurochromia pinguaba* Carvalho, Salgado & Werneck-de-Carvalho 2004, with a key to the genera of Corduliidae larvae occurring in South America (Odonata: Anisoptera). *Zootaxa* 1848: 57-65.
- Carvalho, A.L., P.H.R. Souza & E.R. Calil, 2006. Description of the larvae of *Castoraeschna colorata* (Martin, 1908) and *C. longfieldae* (Kimmins, 1929) (Insecta: Odonata: Aeshnidae), with a key to the known larvae of the genus. *Zootaxa* 1296: 19-28.
- Costa, J.M. & B. Mascarenhas, 1998. Catálogo do material-tipo de Odonata (Insecta) do Museu Nacional. *Publicações Avulsas do Museu Nacional* 76: 1-30.
- Costa, J.M. & L.P.B. Regis, 2005. Description of the last instar larva of *Perithemis lais* (Perty) and comparison with other species of the genus (Anisoptera: Libellulidae). *Odonatologica* 34: 51-57.
- Costa, J.M., J.R. Pujol-Luz & L.P.B. Regis, 2004. Descrição da larva de *Zenithoptera anceps* (Odonata, Libellulidae). *Iheringia, Série Zoologia* 94: 421-424.
- Costa, J.M., L.O.I. Souza & B.B. Oldrini, 2004. Chave para identificação das famílias e gêneros das larvas conhecidas de Odonata do Brasil: Comentários e registros bibliográficos (Insecta: Odonata). *Publicações Avulsas do Museu Nacional* 99: 3-42.
- Costa, J.M., C.T. Ravanello & G.M. Souza-Franco, 2008a. Description of a new species of *Neocordulia* Selys, 1882 (Odonata: Libellulidae, Corduliinae) from southern Brazil. *Zootaxa* 1704: 64-68.
- Costa, J.M., C.T. Ravanello & G.M. Souza-Franco, 2008b. The larva of *Argia croceipennis* Selys (Zygoptera: Coenagrionidae). *Odonatologica* 37: 265-271.
- Costa, J.M., B.B. Oldrini & D. Anjos-Santos, 2009. Eight new *Leptagrion* larvae from Brazil (Zygoptera, Coenagrionidae). *Odonatologica* 38: 93-111.
- De Marmels, J., 2004. *Heteragrion makiritare* sp. nov., with descriptions of hitherto unknown females and larvae of other species from Venezuela (Odonata: Megapodagrionidae, Lestidae). *International Journal of Odonatology* 7: 439-458.

- De Marmels, J., 2005. La larva de *Progomphus dorsopallidus* Byers, 1934, (Odonata: Gomphidae), con una clave para identificar las larvas de otras especies del género del norte del Río Orinoco, Venezuela. *Entomotropica* 20: 235-238.
- De Marmels, J., 2007a. Thirteen new Zygoptera larvae from Venezuela (Calopterygidae, Polythoridae, Pseudostigmatidae, Platystictidae, Protoneuridae, Coenagrionidae). *Odonatologica* 36: 27-51.
- De Marmels, J., 2007b. *Tepuibasis* gen. nov. from the Pantepui region of Venezuela, with descriptions of four new species and with biogeographic, phylogenetic and taxonomic considerations on the Teinobasinae (Zygoptera: Coenagrionidae). *Odonatologica* 36: 117-146.
- De Marmels, J., 2008. *Neocordulia caudacuta* sp. nov. from the Coastal Cordillera, Venezuela (Odonata: Corduliidae). *International Journal of Odonatology* 11: 15-20.
- Esquivel, C., 2005. *Libélulas de Mesoamérica y el Caribe [Dragonflies and damselflies of Middle America and the Caribbean]*. Instituto Nacional de Biodiversidad, INBio 319 pp.
- Etscher, V., M.A. Miller & E.-G. Burmeister, 2006. The larva of *Polythore spaeteri* Burmeister & Boerzoeny, with comparison to other polythorid larvae and molecular species assignment (Zygoptera: Polythoridae). *Odonatologica* 35: 127-142.
- Fleck, G., 2004. Contribution à la connaissance des Odonates de Guyane française: les larves des *Macrothemis pumilla* Karsch, 1889 et de *Brechmorhoga praedatrix* Calvert, 1909. Notes biologiques et conséquences taxonomiques (Anisoptera: Libellulidae). *Annales de la Société entomologique de France* 40: 177-184.
- Fleck, G., M. Brenk, & B. Misof, 2006. DNA taxonomy and the identification of immature insect stages: the true larva of *Tauriphila argo* (Hagen 1869) (Odonata: Anisoptera: Libellulidae). *Annales de la Société Entomologique de France (Nouvelle série)* 42: 91-98.
- Fleck, G., J. De Marmels & D. Grand, 2004. La larve de *Tholymis citrina* Hagen, 1867 (Odonata, Anisoptera, Libellulidae). *Bulletin de la Société entomologique de France* 109: 455-457.
- Flint, Jr., O.S., 1991. The Odonata collection of the National Museum of Natural History, Washington, U.S.A. *Advances in Odonatology* 5: 49-58.
- Förster, F., 1903. Neotropische Libellen. *Entomol. Wochenblatt (Insektenbosse)* 20: 355-356.
- Förster, F., 1905. Neotropische Libellen. II. *Entomologische Zeitschrift* 22(19): 75-76.
- Förster, F., 1906. Neotropische Libellen. III. *Entomol. Wochenblatt (Insektenbosse)* 23: 15-16.
- Förster, F., 1907. Neotropische Libellen. V. *Entomol. Wochenblatt (Insektenbosse)* 24: 153-154, 157, 16\*\*\*.
- Förster, F., 1909. Beiträge zu den Gattungen und Arten der Libellen. *Jahrbücher des nassauischen Vereins für Naturkunde, Wiesbaden* 62: 211-235.
- Förster, F., 1914. Beiträge zu den Gattungen und Arten der Libellen. III. *Archiv für Naturgeschichte* 80: 59-83.
- Förster, S., 2001. The dragonflies of Central America exclusive of Mexico and the West Indies. A guide to their identification [Second edition]. *Odonatological monographs* 2, Gunnar Rehfeld 141 pp.
- Fraser, F.C., 1933. A Revision of the Fissilabioidea (Cordulegasteridae, Petaliidae and Petaluridae) (Order Odonata). Part II. Petaliidae and Petaluridae and appendix to Part I. *Memoirs of the Indian Museum* 9(6): 205-260.
- Fraser, F.C., 1946. Notes on Amazonian Odonata in the Leeds Museum. *Transactions of the Royal Entomological Society of London* 97(18): 443-472.
- Fraser, F.C., 1947. The Odonata of the Argentine Republic I. *Acta Zoologica Lilioana* 4: 427-461.
- Fraser, F.C., 1948. The Odonata of the Argentine Republic II. *Acta Zoologica Lilioana* 5: 47-67.
- Garrison, R. W., 2006. A synopsis of the genera *Mnesarete* Cowley, *Bryoplathanon* gen. nov., and *Ormenophlebia* gen. nov. (Odonata: Calopterygidae). *Contributions to Science Series* 506: 1-84.
- Garrison, R. W., 2009. A Synopsis of the genus *Telebasis* Selys (Odonata: Coenagrionidae). *International Journal of Odonatology* 12: 1-121.
- Garrison, R.W., N. von Ellenrieder and J.A. Louton, 2006. *The dragonfly genera (Odonata: Anisoptera) of the New World: An illustrated and annotated key*. The Johns Hopkins University Press xiv + 368 pp.
- Garrison, R.W., N. von Ellenrieder and M.F. O'Brien, 2003. An annotated list of the name bearing types of species-group names in Odonata preserved in the University of Michigan, Museum of Zoology. *Occasional Papers of the Museum of Zoology, University of Michigan* 736: 1-73.
- Garré, A. & F. Lozano, 2007. Descripción del último estadio larval de *Micrathyria unguolata* (Odonata: Libellulidae). *Revista de la Sociedad Entomológica Argentina* 66: 5-9.
- Garré, A., J. Muzón & D.M. Ardohain, 2008. Description of the final instar larvae of *Erythrodiplax atroterminata* Ris and *E. corallina* (Brauer) (Odonata: Libellulidae). *Zootaxa* 1896: 45-50.
- González-Soriano, E. & R. Novelo-Gutiérrez, 2006. *Elasmotheremis aliciae* spec. nov., a new dragonfly from Mexico, Belize and Costa Rica with a description of its larva and a key to the known larvae of the genus (Anisoptera: Libellulidae). *Odonatologica* 35: 243-253.
- Hagen, H.A., 1860. Über die Neuropteren-Fauna Amerikas. *Stettiner Entomologische Zeitung* 21(4-6): 209-216.
- Hagen, H.A., 1861. A synopsis of the Neuroptera of North America with a list of the South American species.

- Smithsonian Institution Miscellaneous Collections* xx + 347 pp.
- Hagen, H.A., 1868. Odonaten Cubas (Fortsetzung). *Stettiner Entomologische Zeitung* 29: 274-287.
- Heckman, C.W., 2006. *Encyclopedia of South American Aquatic Insects: Odonata - Anisoptera*. Springer vol. 4, viii+ 725 pp, 793 illus.
- Heckman, C.W., 2008. *Encyclopedia of South American Aquatic Insects: Odonata - Zygoptera*. Springer vol. 5, viii+ 687 pp, 763 illus.
- Kalkman, V.J., V. Clausnitzer, K.-D. Dijkstra, A. G. Orr, D.R. Paulson & J. van Tol, 2008. Global diversity of dragonflies (Odonata) in freshwater. *Hydrobiologia* 595: 351–363.
- Karsch, F., 1890. Beiträge zur Kenntniss der Arten und Gattungen der Libellulinen. *Berliner Entomologische Zeitschrift* 33: 347-392.
- Karsch, F., 1891a. Kritik des Systems der Aeschniden. *Entomologische Nachrichten* 17(18): 273-290.
- Karsch, F., 1891b. Neue Odonaten von Ecuador. I. Agrionidae. *Societas Entomologica* 6(14): 105.
- Karsch, F., 1891c. Neue Odonaten von Ecuador. II. Calopterygidae. III. Libellulidae. *Societas Entomologica* 6(15): 113.
- Karsch, F., 1891d. Neue Odonaten von Ecuador. IV. Aeschnidae. *Societas Entomologica* 6(16): 121-122.
- Kimmins, D.E., 1966. A list of the Odonata types described by F.C. Fraser, now in the British Museum (Natural History). *Bulletin of the British Museum (Natural History)* 18(6): 173-227.
- Kimmins, D.E., 1969a. A list of the type-specimens of Libellulidae and Corduliidae (Odonata). *Bulletin of the British Museum (Natural History)* 22(6): 277-305.
- Kimmins, D.E., 1969b. A list of the type-specimens of Odonata in the British Museum (Natural History) Part II. *Bulletin of the British Museum (Natural History)* 23(7): 287-314.
- Kimmins, D.E., 1970. A list of the type-specimens of Odonata in the British Museum (Natural History) Part III. *Bulletin of the British Museum (Natural History)* 24(6): 171-205.
- Kirby, W.F., 1890. *A synonymic catalogue of Neuroptera Odonata, or dragonflies, with an appendix of fossil species*. Gurney & Jackson ix + 202 pp.
- Lencioni, F.A.A., 2005. *Damselflies of Brazil. An illustrated identification guide. 1 - The non-Coenagrionidae families*. All Print Editora iv + 324pp
- Lencioni, F.A.A., 2006. *Damselflies of Brazil. An illustrated identification guide. 2 – Coenagrionidae*. All Print Editora VIII + 419 pp
- Lieftinck, M.A., 1971. A catalog of the type-specimens of Odonata preserved in the Netherlands, with a supplementary list of the Odonata types described by Dutch scientists deposited in foreign institutional collections. *Tijdschrift voor Entomology* 114(2): 65-139.
- Lozano, F., A. Garré & P. Pessacq, 2007. Descripción del último estadio larval de *Acanthagrion aepiolum* (Odonata: Coenagrionidae). *Revista de la Sociedad Entomológica Argentina* 66: 1-4.
- Machado, A.B.M., 2009. *Denticulobasis* and *Tuberculobasis*; new genera close to *Leptobasis*, with description of ten new species (Zygoptera: Coenagrionidae). *Zootaxa* 2108: 1-36.
- Martin, R., 1907. Collections Zoologiques du Baron Edm. de Selys Longchamps. *Catalogue Systématique et descriptif*. Cordulines. 17: 1-94.
- Martin, R., 1908. Collections Zoologiques du Baron Edm. de Selys Longchamps. *Catalogue Systématique et descriptif*. Aeschnines. 18: 1-84.
- Martin, R., 1909a. Collections Zoologiques du Baron Edm. de Selys Longchamps. *Catalogue Systématique et descriptif*. Aeschnines. 19: 85-156.
- Martin, R., 1909b. Collections Zoologiques du Baron Edm. de Selys Longchamps. *Catalogue Systématique et descriptif*. Aeschnines. 20: 157-223.
- Martin, R., 1911. Odonata. Fam. Aeschnidae, Subfam. Aeschninae. *Genera Insectorum* 115: 1-34.
- Martin, R., 1914. Odonata. Fam. Libellulidae, Subfam. Cordulinae. *Genera Insectorum* 155: 1-32.
- Martin, R., 1921. Sur les odonates du Chili. *Revista Chilena de Historia Natural* 25: 19-25.
- McLachlan, R., 1878. VI. Calopterygina collected by Mr. Buckley in Ecuador and Bolivia. *Transactions of the Entomological Society* 1: 85-94.
- McLachlan, R., 1881. II. Notes on Odonata, of the subfamilies Corduliina, Calopterygina, and Agrionina (Legion Pseudostigma), collected by Mr. Buckley, in the district of the Rio Bobanaza, in Ecuador. *Transactions of the Entomological Society of London* 1881: 25-34.
- McLachlan, R., 1897. *Thaumatoneura inopinata*, a new genus and species of Calopteryginae. *The Entomologist Monthly Magazine* (2)8: 130-131.
- Meurgey, F., 2005. Contribution à la connaissance des Odonates de l'archipel guadeloupéen IV. Faune de l'île de Marie-Galante (Antilles françaises). *Martinia* 21(4): 51-58.
- Meurgey, F., 2008a. Description of the adult male and larva of *Brechmorhoga archboldi* (Donnelly) from the French West Indies (Anisoptera: Libellulidae). *Odonatologica* 37: 161-166.
- Meurgey, F., 2008b. Description of the larva of *Protoneura ailsa* Donnelly (Zygoptera: Protoneuridae). *Odonatologica*

- 37: 279-282.
- Morrone, J.J., 2001. Biogeografía de América Latina y el Caribe. M&T - Manuales & Tesis SEA, vol. 3. Zaragoza 148 pp.
- Muzón, J. & A. Garré, 2005. Description of the last instar larva of *Erythrodiplax paraguayensis* (Anisoptera: Libellulidae). *Revista de la Sociedad Entomológica Argentina* 64: 85-91.
- Muzón, J. & P. Pessacq, 2005. Description of the last larval instar of *Ischnura ultima* Ris (Zygoptera: Coenagrionidae). *Odonatologica* 34: 303-306.
- Muzón, J. & M.S. Weigel Muñoz, 2007. Description of the final instar larva of *Lestes dichrostigma* Calvert (Zygoptera: Lestidae). *Studies on Neotropical Fauna and the Environment* 42: 235-239.
- Muzón, J., P. Pessacq & L. Ramos, 2007. Odonata type specimens preserved in the Museo de La Plata, Argentina. *Odonatologica* 36: 301-306.
- Muzón, J., P. Pessacq & N. von Ellenrieder, 2006. Description of the female and larva of *Phyllogomphoides joaquina* Rodrigues Capitulo, 1992 (Anisoptera: Gomphidae). *Odonatologica* 35: 55-60.
- Muzón, J., G.R. Spinelli, P. Pessacq, N. von Ellenrieder, A.L. Estevez, P.I. Marino, P.J. Pérez Goodwyn, E.B. Angrisano, F. Díaz, L.A. Fernández, S. Mazzucconi, G. Rossi & O.D. Salomón, 2005. Insectos acuáticos de la Meseta de Somuncurá, Patagonia, Argentina. Inventario preliminar. *Revista de la Sociedad Entomológica Argentina* 64: 47-68
- Muzón, J., N. von Ellenrieder, P. Pessacq, F. Lozano, A. Garré, J. Lambruschini, L. Ramos & M.S. Weigel Muñoz, 2008. Odonata from Iberá Wetlands (Corrientes, Argentina): Preliminary Inventory and Biodiversity. *Revista de la Sociedad Entomológica Argentina* 67: 59-67.
- Muzón, J., S. Weigel Muñoz & R. Campos, 2009. Description of the last larval instar of *Leptagrion andromache* Hagen in Selys (Coenagrionidae). *Zootaxa* 2089: 65-68.
- Neiss, U.G., F.A.A. Lencioni, N. Hamada & R.L. Ferreira-Keppler, 2008. Larval redescription of *Microstigma maculatum* Hagen in Selys, 1860 (Odonata: Pseudostigmatidae) from Manaus, Amazonas, Brazil. *Zootaxa* 1696: 57-62.
- Novelo-Gutiérrez, R., 2005a. Five new *Erpetogomphus* Hagen in Selys larvae from Mexico, with a key to the known species (Anisoptera: Gomphidae). *Odonatologica* 34: 243-257.
- Novelo-Gutiérrez, R., 2005b. La larva de *Enallagma novaehispaniae* Calvert, 1902 (Odonata: Coenagrionidae). *Folia Entomologica Mexicana* 44: 219-224.
- Novelo-Gutiérrez, R., 2006. The larva of *Macrothemis ultima* González-Soriano, 1992 (Odonata: Anisoptera: Libellulidae). *Transactions of the American Entomological Society* 132: 151-156.
- Novelo-Gutiérrez, R., 2007. The larva of *Aeshna williamsoniana* (Odonata: Anisoptera: Aeshnidae). *Canadian Entomologist* 139: 195-200.
- Novelo-Gutiérrez, R., 2008a. Description of the larva of *Paraphlebia zoe* Selys in Hagen, 1861 (Odonata: Megapodagrionidae). *Zootaxa* 1876: 29-34.
- Novelo-Gutiérrez, R., 2008b. Description of the last instar larva of *Argia barretti* Calvert (Zygoptera: Coenagrionidae). *Odonatologica* 37: 367-373.
- Novelo-Gutiérrez, R. & E. González-Soriano, 2004. The larva of *Dythemis maya* Calvert, 1906 and a redescription of the larva of *Dythemis sterilis* Hagen, 1861 with a key to the larvae of the genus (Anisoptera: Libellulidae). *Odonatologica* 33: 279-289.
- Novelo-Gutiérrez, R. & J.A. Gómez-Anaya, 2005. Description of the larva of *Telebasis digiticollis* (Odonata: Zygoptera: Coenagrionidae). *Canadian Entomologist* 137: 61-66.
- Novelo-Gutiérrez, R. & J.A. Gómez-Anaya, 2008. A comparative study of Odonata (Insecta) assemblages along an altitudinal gradient in the sierra de Coalcomán Mountains, Michoacán, Mexico. *Biodiversity Conservation* 18: 679-698.
- Oldrini, B.B. & B.J. de A. Mascarehnas, 2005. Descrição da larva de *Idiataphe longipes* (Odonata, Libellulidae, Trameini). *Iheringia, Série Zoologia* 95: 431-433.
- Paulson, D.R., 2004. Critical species of Odonata in the Neotropics. In: Clausnitzer & Joedicke (eds.), Guardians of the watershed. Global status of dragonflies: critical species, threat and conservation. Special issue: IUCN Regional Reports. *International Journal of Odonatology* 7: 163-188.
- Paulson, D.R. & S. Mlodinow, 2007. New records of Odonata from Baja California Sur, Mexico, and a checklist of the odonate fauna of that state. *Argia* 19(2): 26-27.
- Pérez, L., Monroy, D. & E. Realpe, 2007. Local assemblage patterns of odonates in central Chocó, colombian pacific. pp. 183-199. In B. K. Tyagi (ed.) *Odonata: Biology of dragonflies*. Scientific Publishers.
- Pérez-Gutiérrez, L.A., 2007. The larvae of *Teinopodagrion caquetanum* De Marmels and *T. vallenatum* De Marmels (Zygoptera: Megapodagrionidae). *Odonatologica* 36: 307-313.
- Pessacq, P., 2007. *Peristicta aenoviridis* Calvert, 1909 and *P. forceps* Hagen in Selys, 1860: redescrptions and a new synonymy (Zygoptera: Protoneuridae). *Odonatologica* 36: 207-218.
- Pessacq, P. & J. Muzón, 2004. Description of the final stadium larva of *Hetaerina rosea* Selys (Zygoptera:

- Calopterygidae). *Studies on Neotropical Fauna and Environment* 39: 239-242.
- Pessacq, P. & J.M. Costa, 2007. Three New Species of *Peristicta* Hagen in Selys (Odonata: Zygoptera: Protoneuridae) from Brazil. *Neotropical Entomology* 36: 46-52.
- Pessacq, P., J. Muzón & N. von Ellenrieder, 2005. Description of the last larval instar of *Acanthagrion ablutum* Calvert (Zygoptera: Coenagrionidae). *Odonatologica* 34: 73-76.
- Rambur, P., 1842. Histoire Naturelle des Insectes: Névroptères. *Librairie Encyclopédique de Roret* xvii + 534 pp.
- Ris, F., 1904. *Odonaten*, 44 pp. In: Friederichsen & Co.: Hamburg Magallaenischen Sammelreise 1892/93. Hamburg.
- Ris, F., 1908. Beitrag zur Odonatenfauna von Argentina. *Deutsche Entomologische Zeitschrift* 518-531.
- Ris, F., 1909a. Collections Zoologiques du Baron Edm. de Selys Longchamps. *Catalogue systématique et descriptif. Libellulinen 1.* 9: 1-120.
- Ris, F., 1909b. Collections Zoologiques du Baron Edm. de Selys Longchamps. *Catalogue systématique et descriptif. Libellulinen 2.* 10: 121-244.
- Ris, F., 1910. Collections Zoologiques du Baron Edm. de Selys Longchamps. *Catalogue systématique et descriptif. Libellulinen 3.* 11: 245-384.
- Ris, F., 1911a. Collections Zoologiques du Baron Edm. de Selys Longchamps. *Catalogue systématique et descriptif. Libellulinen 4.* 12: 385-528.
- Ris, F., 1911b. Collections Zoologiques du Baron Edm. de Selys Longchamps. *Catalogue systématique et descriptif. Libellulinen 5.* 13: 529-700.
- Ris, F., 1912. Collections Zoologiques du Baron Edm. de Selys Longchamps. *Catalogue systématique et descriptif. Libellulinen 6.* 14: 701-836.
- Ris, F., 1913a. Collections Zoologiques du Baron Edm. de Selys Longchamps. *Catalogue systématique et descriptif. Libellulinen 7.* 15: 837-964.
- Ris, F., 1913b. Collections Zoologiques du Baron Edm. de Selys Longchamps. *Catalogue systématique et descriptif. Libellulinen 8.* 16 (Première partie): 965-1042.
- Ris, F., 1913c. Neuer Beitrag zur Kenntnis der Odonatenfauna von Argentina. *Mémoires de la Société de Belgique* 22: 55-102 (1-48 separate).
- Ris, F., 1918. Libellen (Odonata) aus der Region der amerikanischen Kordilleren von Costarica bis Catamarca. *Archiv für Naturgeschichte* A(9): 1-197.
- Ris, F., 1919. Collections Zoologiques du Baron Edm. de Selys Longchamps. *Catalogue Systématique et descriptif. Libellulinen 9.* 16 (Deuxième partie): 1043-1278.
- Sahlén, G. & I. Hedström, 2005. The larva of *Mecistogaster linearis*, with notes on its abundance in lowland rainforest of Costa Rica (Odonata: Pseudostigmatidae). *International Journal of Odonatology* 8: 59-66.
- Selys-Longchamps, Edm. de, 1853. Synopsis des Caloptérygines. *Bulletin de l'Académie royale de Belgique* 20(Annexe): 1-73.
- Selys-Longchamps, Edm. de, 1854. Monographie des Calopterygines. *Mémoires de la Société royale des Sciences de Liège* 9: xi + 291 pp.
- Selys-Longchamps, Edm. de, 1854. Synopsis des Gomphines. *Bulletin de l'Académie royale de Belgique* 21: 23-112 (1-93 reprint).
- Selys-Longchamps, Edm. de, 1857. "1856" [1857]. *Odonates de Cuba*. pp. 183-201, In: Ramón de la Sagra (Ed.), *Historia física política y natural de la Isla de Cuba. Segunda parte. Historia natural* [Natalia. Tomo VII. Crustáceos, Arácnidos é Insectos. Paris; Arthus Bertrand; Artículos de animales xxxii + 371.
- Selys-Longchamps, Edm. de, 1858. Monographie de Gomphines. *Mémoires de la Société royale des Sciences de Liège* 11: 257-720 (xiii + 460 reprint).
- Selys-Longchamps, Edm. de, 1859. Additions au synopsis des Caloptérygines. *Bulletin de l'Académie royale de Belgique* (2)7: 437-451 (1-16 reprint).
- Selys-Longchamps, Edm. de, 1859. Additions au Synopsis des Gomphines. *Bulletin de l'Académie royale de Belgique* (2)7: 530-552 (1-26 reprint).
- Selys-Longchamps, Edm. de, 1860. Synopsis des Agrionines, Première légion: *Pseudostigma*. *Bulletin de l'Académie royale de Belgique* (2)10: 9-26 (1-20 reprint).
- Selys-Longchamps, Edm. de, 1860. Synopsis de Agrionines, Dernière Légion: *Protonevra*. *Bulletin de l'Académie royale de Belgique* (2)10: 431-462 (1-34 reprint).
- Selys-Longchamps, Edm. de, 1862. Synopsis des Agrionines, Seconde légion: *Lestes*. *Bulletin de l'Académie royale de Belgique* (2)13: 287-338 (1-54 reprint).
- Selys-Longchamps, Edm. de, 1862. Synopsis des Agrionines, Troisième légion: *Podagrion*. *Bulletin de l'Académie royale de Belgique* (2)14: 5-44 (1-42 reprint).
- Selys-Longchamps, Edm. de, 1865. Synopsis des Agrionines, 5me légion: *Agrion*. *Bulletin de l'Académie royale de Belgique* (2)20: 375-417 (1-45 reprint).
- Selys-Longchamps, Edm. de, 1868. Note sur quelques odonates nouveaux du Mexique. *Bulletin de l'Académie royale de Belgique* (2)23: 1-12 (1-12 reprint).

- Entomologique de Belgique* 11: 66-71.
- Selys-Longchamps, Edm. de, 1869. Secondes additions au synopsis des Caloptérygines. *Bulletin de l'Académie royale de Belgique* (2)27: 645-680 (1-36 reprint).
- Selys-Longchamps, Edm. de, 1869. Secondes additions au synopsis des Gomphines. *Bulletin de l'Académie royale de Belgique* (2)28: 168-208 (1-45 reprint).
- Selys-Longchamps, Edm. de, 1869. Secondes additions au synopsis des Gomphines. *Bulletin de l'Académie royale de Belgique* (2)28: 168-208 (1-45\*).
- Selys-Longchamps, Edm. de, 1870. Resume d'une nouvelle classification des Cordulines. *Bulletin de l'Académie royale de Belgique* 14: 4-7.
- Selys-Longchamps, Edm. de, 1871. Synopsis des Cordulines. *Bulletin de l'Académie royale de Belgique* (2)31: 238-316 (1-128 reprint).
- Selys-Longchamps, Edm. de, 1873. Troisièmes additions au synopsis des Caloptérygines. *Bulletin de l'Académie royale de Belgique* (2)35: 469-519 (1-55 reprint).
- Selys-Longchamps, Edm. de, 1873. Appendice aux troisièmes additions au synopsis des Caloptérygines. *Bulletin de l'Académie royale de Belgique* (2)36: 610-619 (57-66 reprint).
- Selys-Longchamps, Edm. de, 1873. Troisièmes additions au synopsis des Gomphines. *Bulletin de l'Académie royale de Belgique* (2)35: 732-774, (2)36: 492-531 (1-87 reprint).
- Selys-Longchamps, Edm. de, 1873. Appendices aux troisièmes additions et liste des Gomphines, décrites dans le synopsis et ses trois additions. *Bulletin de l'Académie royale de Belgique* (2)36: 492-531 (47-87 reprint).
- Selys-Longchamps, Edm. de, 1874. Additions au synopsis des Cordulines. *Bulletin de l'Académie royale de Belgique* (2)37: 16-34 (1-24 reprint).
- Selys-Longchamps, Edm. de, 1876. Synopsis des Agrionines, 5me légion: *Agrion* (suite). Le genre *Agrion*. *Bulletin de l'Académie royale de Belgique* (2)41: 247-322, 496-539, 1233-1309 (1-199 reprint).
- Selys-Longchamps, Edm. de, 1876. Synopsis des Agrionines, 5me légion: *Agrion* (suite). Le genre *Agrion*. *Bulletin de l'Académie royale de Belgique* (2)42: 490-531, 952-991 (200-282 reprint).
- Selys-Longchamps, Edm. de, 1877. Synopsis des Agrionines, 5me légion: *Agrion* (suite et fin). Les genres *Telebasis*, *Argiocnemis* et *Hemiphlebia*. *Bulletin de l'Académie royale de Belgique* (2)43: 97-159 (1-65 reprint).
- Selys-Longchamps, Edm. de, 1878. Quatrièmes additions au synopsis des Gomphines. *Bulletin de l'Académie royale de Belgique* (2)46: 408-698 (1-106 reprint).
- Selys-Longchamps, Edm. de, 1878. Secondes additions au synopsis des Cordulines. *Bulletin de l'Académie royale de Belgique* 2(45): 183-222 (1-44 reprint).
- Selys-Longchamps, Edm. de, 1879. Quatrièmes additions au synopsis des Caloptérygines. *Bulletin de l'Académie royale de Belgique* (2)47: 349-409 (1-63 reprint).
- Selys-Longchamps, Edm. de, 1883. Synopsis des Aeschnines. Première partie: Classification. *Bulletin de l'Académie royale de Belgique* 3(5): 712-748 (1-40 reprint).
- Selys-Longchamps, Edm. de, 1886. Revision du Synopsis des Agrionines. Première partie comprenant les légions *Pseudostigma-Podagrion-Platycnemis* et *Protonevra*. *Mémoires couronnés et autres Mémoires, Académie royale de Belgique* 38(4): iv + 233.
- Selys-Longchamps, Edm. de, 1889. *Protonevra*, nouveau genre d'Agrionines de la légion des Protonevras. *Annales de la Société Entomologique de Belgique* 33: 172-174.
- Torreias, S.R.S., U.G. Neiss, N. Hamada, R.L. Ferreira-Keppler & F.A.A. Lencioni, 2008. Description of the larva of *Bromeliagrion rehni* (Odonata: Coenagrionidae) with bionomic notes concerning its phytotelmic habitat in central Amazonas, Brazil. *Revista Brasileira de Zoologia* 25: 479-486.
- Trapero-Quintana, A.D. & N. Cuéllar Araújo. 2009. Description of the last instar larva of *Cannaphila insularis funerea* (Carpenter, 1897) (Anisoptera: Libellulidae), with notes on the habitat of the species. *Zootaxa* 2034: 61-64..
- Trapero-Quintana A.D. & B. Reyes Tur, 2008. Description of the last instar larva of *Erythrodiplax fervida* (Erichson, 1848). *Zootaxa* 1688: 66-68.
- Trapero-Quintana, A., M.A. Tabet, B.R. Tur, Y.A. Jiménez & M. López, 2008. Notes on the Odonata of Refugio de Fauna Monte Cabaniguán, Las Tunas, Cuba. *Bulletin of American Odonatology* 11: 26-28.
- Trapero Quintana A. D., Y. Torres Cambas, C. Naranjo Lopez & O. C. Bello Gonza, 2004. Annotated list of the odonates in the Alexander Humboldt National Park, Guantanamo Province, Cuba. *Argia* 16(2): 16-19.
- Upson, S., D. Danforth, E. Gonzalez-Soriano, R.A. Behrstock & R.A. Bailowitz, 2007. A preliminary checklist of the odonata of Sonora, Mexico. *Bulletin of American Odonatology* 10: 23-51.
- von Ellenrieder, N., 2005. Taxonomy of the South American genus *Phyllopetalia* (Odonata: Austropetaliidae). *International Journal of Odonatology* 8: 311-352.
- von Ellenrieder, N., 2006. The larvae of *Teinopodagrion decipiens* De Marmels and *T. meridionale* De Marmels (Zygoptera: Megapodagrionidae). *Odonatologica* 35: 281-287.
- von Ellenrieder, N., 2007a. The larva of *Argia joergenseni* Ris (Zygoptera: Coenagrionidae). *Odonatologica* 36: 89-

94.

- von Ellenrieder, N., 2007b. Some libellulidae larvae from the Yungas Forest, Argentina: *Macrothemis hahneli* Ris, *Brechmorhoga nubecula* (Rambur) and *Dasythemis mincki clara* Ris (Anisoptera: Libellulidae). *Odonatologica* 36: 263-273.
- von Ellenrieder, N., 2007c. The larva of *Hetaerina mendezi* Jurzitza, with comments on *H. rosea* Selys (Zygoptera: Calopterygidae). *Odonatologica* 36: 405-414.
- von Ellenrieder, N., 2008a. *Phoenicagrion* gen. nov. for *Leptagrion flammeum*, with description of a new species, *P. paulsoni*, from Peru (Odonata: Coenagrionidae). *International Journal of Odonatology* 11: 81-93, pl. IVb.
- von Ellenrieder, N., 2008b. Revalidation of *Argentagrion* and redefinition of *Homeoura*, with the description of *H. obrieni* n. sp. (Odonata: Coenagrionidae). *Revista de la Sociedad entomológica Argentina* 67: 81-106.
- von Ellenrieder, N. & J. Muzón, 2006. The genus *Andinagrion*, with description of *A. garrisoni* sp. nov. and its larva from Argentina (Zygoptera: Coenagrionidae). *International Journal of Odonatology* 9: 205-223.
- von Ellenrieder, N. & R. W. Garrison, 2005. A synopsis of the South American genus *Gomphomacromia* (Odonata: Gomphomacromiinae). *International Journal of Odonatology* 8: 81-96.
- von Ellenrieder, N. & R. W. Garrison, 2006. Rediscovery of *Oxyagrion bruchi* Navás, 1924 from Argentina, with a description of its larva (Zygoptera: Coenagrionidae). *Pan-Pacific Entomologist* 82: 362-374
- von Ellenrieder, N. & R. W. Garrison, 2007a. *Libélulas de las Yungas* (Odonata). *Una Guía de Campo para las especies de Argentina / Dragonflies of the Yungas. A Field Guide to the Species from Argentina*. Pensoft Series Faunistica 67. Pensoft Publishers iv + 116 pp.
- von Ellenrieder, N. & R. W. Garrison, 2007b. *Dragonflies and Damselflies (Insecta: Odonata) of the Argentine Yungas: Species composition and identification*. Scientific Reports, Società Zoologica 'La Torbiera' 7: 1-95.
- von Ellenrieder, N. & R. W. Garrison, 2008a. *Oreiallagma* gen. nov. with a redefinition of *Cyanallagma* Kennedy 1920 and *Mesamphiagrion* Kennedy 1920, and the description of *M. dunklei* sp. nov. and *M. ecuatoriale* sp. nov. from Ecuador (Odonata: Coenagrionidae). *Zootaxa* 1805: 1-51.
- von Ellenrieder, N. & R. W. Garrison, 2008b. *Drepanoneura* gen. nov. for *Epipleoneura letitia* and *Protoneura peruviansis*, with descriptions of eight new Protoneuridae from South America (Odonata: Protoneuridae). *Zootaxa* 1842: 1-34.
- von Ellenrieder, N. & Garrison, R. W., 2009. Odonata. In: Dominguez, E. & Fernández H. R. (eds.). *Macroinvertebrados Bentónicos Sudamericanos*. Fundación Miguel Lillo, Tucumán.
- Wasscher, M. & J. van't Bosch, 2009. Database of Suriname dragonflies. *Agrion* 13: 27-28.

## Some Odonata from the Northern Sierra Madre Natural Park, Isabela, Luzon, Philippines

Reagan J. Villanueva [reaganjoseph@lycos.com],  
J. van der Ploeg and M. van Weerd

The Northern Sierra Madre Natural Park (NSMNP) covers an area of 359,486 ha (DENR 2001). The park harbors a variety of terrestrial habitats: mangrove forests and beach forests along the coast, ultra-basic forest, lowland dipterocarp forest, and montane oak-laurel forest and mossy forest at high elevations (Mallari et al., 2001). The NSMNP is one of ten priority protected areas in the Philippines: it holds 25 percent of the remaining primary lowland forest of the archipelago (Tan, 2000). The area has remarkably high levels of endemism: 30 percent of bird species and 62 percent of mammal species recorded in the NSMNP are endemic to the Philippines (Van Weerd 2002). Thirty-five globally threatened species are recorded in the protected area.

Logging, agricultural encroachment, the use of destructive fishing and hunting methods, and the conversion of wetlands form major threats to the biodiversity of the protected area. Government plans for infrastructural development and mining could have a severe impact on the park.

From 12 to 24 September 2008, we organized a biodiversity survey to sitio Dipagsangan, barangay Didian in the municipality of Palanan. We camped in lowland dipterocarp forest at Dipinantahikan (campsite 1), and in mid-elevation forest at Pinakdatdatin ti Bulayo (campsite 2) (see table 1).

	Altitude (m.a.s.l)	Location
Dipinantahikan (campsite 1)	300	N 16° 53.398' E 122° 20.471'
Pinakdatdatin ti Bulayo	700	N 16° 51.984' E 122° 18.859'

The following is an annotated list of the species encountered during the expedition. We only include species found in the forest areas; species encountered near Palanan town proper are not included. The short field survey revealed 35 species, and represents the first odonata survey in the eastern side of NSMNP. New records