



AGRION

NEWSLETTER OF THE WORLDWIDE DRAGONFLY ASSOCIATION

PATRON: Professor Edward O. Wilson FRS, FRSE

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NEWSLETTER OF THE WORLDWIDE DRAGONFLY ASSOCIATION

AGRION is the Worldwide Dragonfly Association's (WDA's) newsletter, published twice a year, in January and July. The WDA aims to advance public education and awareness by the promotion of the study and conservation of dragonflies (Odonata) and their natural habitats in all parts of the world. AGRION covers all aspects of WDA's activities; it communicates facts and knowledge related to the study and conservation of dragonflies and is a forum for news and information exchange for members. AGRION is freely available for downloading from the WDA website at <http://ecoevo.uvigo.es/WDA/dragonfly.htm>. WDA is a Registered Charity (Not-for-Profit Organization), Charity No. 1066039/0.

Editor's notes

Keith Wilson [kdpwilson@gmail.com]

Conference News

The postponed 2011 International Congress of Odonatology, originally scheduled to be held at the Kanagawa Prefectural Museum of Natural History in Odawara City, Kanagawa, Japan in July-Aug 2011, has been rescheduled for 28 July to 2 August 2012 at the same venue. The 2012 ICO Home Page is at: <http://www.odonata.jp/ico2012/index.html>.

Details of the 2013 International Congress of Odonatology scheduled to be held 17-21, June 2013 in Friesing, Bavaria, Germany are available at <http://www.anl.bayern.de/english/events/odonata/index.htm>.

Treasurer Wanted

David Fitch has ably served the WDA Board of Trustees as Treasurer since 2003 and has indicated that after 10 years service he would like handover to a new Treasurer from 2013. If anyone would like to take on the position please contact Göran Sahlén, WDA President [Goran.Sahlen@hh.se].

Next issue of AGRION

For the next issue of AGRION, to be published at the beginning of January 2013, please send your contributions to Keith Wilson [kdpwilson@gmail.com] or Graham Reels [gtreels@gmail.com]. All articles, information and news items related to dragonflies or of interest to WDA members are most welcome and will be considered for publication. Please send all text and figure captions in a Word file by email, preferably, or on a disk by post. Please do not include artwork with the text but provide a separate file or files in soft copy form, ideally in a compressed format (e.g. 'jpeg' or 'gif'), or as files on disk if sent by post.

If you have an odonate photo illustrating any rarely observed aspect of dragonfly biology, or an unusual species, or simply a stunning dragonfly shot, please submit it for consideration for publication on the front cover of AGRION.

Cover photos: (top) *Apocordulia macrops*, male from Lachlan River, Gooloogong (credit: G. Theischinger); (bottom) *Apocordulia macrops*, female from Lachlan River, Gooloogong (credit: L. Müller). See article: 'Murray Darling Icon *Apocordulia macrops* closes the gaps', page 42.

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Message from the President

Dear WDA members,

This year started with the sad passing of our Secretary, Bob Reimer. Bob was a great asset to our society and put a lot of his capacity into his work. Wolfgang Schneider is preparing an Obituary which will appear in the next issue of *AGRION*. As you already know Sónia Ferreira gracefully accepted to serve as secretary until summer 2013.

First half of 2012 has otherwise been calm for the society with few unexpected events popping up - which was expected (sorry for the pun!). Our journal is catching up speed at our new publisher's, and I would like to express a great thank you to our editor Mike May and the editorial board for doing such a wonderful job! We are aware that the downloading of pdf copies has caused problems for a few of our members, but I hope that our publisher will soon be able to sort out what is causing this once and for all. If you have had problems logging in and downloading your recent or older publications from the T&F homepage, please let our secretary know about it and she will notify Taylor and Francis.

In just a few weeks I will set out to Japan and the Odawara Congress, and no doubt meeting quite a few of you. The tradition of WDA meetings filled with positive people in a friendly atmosphere continues. I know that our Japanese friends will do their utmost to welcome all international guests. In the next issue of *Agrion* there will be a rich account on what transpired during this meeting, to read for all of you who didn't have the possibility to attend this time. But speaking of meetings: already next year, on June 17 to 21 2013, it is time for the next Congress in the city of Freising, Bavaria, Germany. Perhaps we will meet then!

In the mean time, please consider spreading knowledge of WDA to the younger generation of odonatologists around the world. Our society needs to grow and attract also the students of today. There are many free memberships available thanks to a generous agreement with our publisher. Please make this known to people you deem would benefit from such an arrangement. I wish you a prosperous continuation of 2012 filled with innumerable dragonflyish encounters.

Göran Sahlén, WDA President
[Goran.Sahlen@hh.se]

Uppsala, 7 July, 2012

Rediscovery of *Proneura prolongata* (Zygoptera: Protoneuridae) and other new Odonata records from Colombian Amazon

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Abstract

As with most taxa present in Colombia, the study of dragonflies is still in its exploratory phase. This paper reports the results of a trip to the Amazon region in order to collect dragonflies. Seven new records for the country were found, including the rediscovery of *Proneura prolongata* Selys and an undescribed species in the genus *Calvertagrion* St. Quentin.

Resumen

Al igual que con la mayoría de taxa presentes en Colombia, el estudio de las libélulas aun se encuentra en su fase exploratoria. En este artículo se reportan los resultados de un viaje a la región amazónica con el objetivo de coleccionar Odonatos, entre las especies encontradas destacan siete nuevos registros para el país, incluyendo el redescubrimiento de *Proneura prolongata* Selys y una especie aun no descrita del género *Calvertagrion* St. Quentin.

Introduction

Based on well studied taxa such as vertebrates and vascular plants, Colombia is considered one of the megadiverse countries of the world, joining Brazil, Indonesia, Mexico and China among others (Díaz & Acero 2003, Rangel-Ch 2005). The information available for other taxonomic groups in Colombia is scarce, due to almost zero funding for national research and poorly conceived environmental laws which involve bureaucracy that presents numerous obstacles when applying for research permits (Fernández 2011).

Odonates are not an exception to this situation. Research on this group of insects by Colombian students has been scarce, with a publication in the 1930s and then starting again in the 1980s, although reports became more numerous after 2000. Recent listings of the number of odonate species from neighbouring countries indicate that progress in Colombia lags behind: Peru 481 spp. (Hoffmann 2009), Venezuela 487 spp. and Brazil 660 spp. (Pérez-Gutiérrez & Palacino-Rodríguez 2011). The species numbers indicate that much work is needed as only 338 spp. have thus far been recorded from Colombia (Bota-Sierra et al. 2010, Pérez-Gutiérrez & Montes-Fontalvo 2011, Pérez-Gutiérrez & Palacino-Rodríguez 2011, Rojas 2011).

The odonate fauna of the Amazon region is one of the most understudied in Colombia, as can be seen in the distributional maps for genera provided by Garrison et al. (2006, 2010). Here I present a species list based on a single field trip, highlighting the species that have been rediscovered and the ones that are new records for the country, with some notes on their habits and descriptions of unknown morphological characters.

Materials and Methods

Three localities (Figure 1) were visited during a field trip to the Colombian Amazon from July 19th to 23rd 2011:-

- Yahuaraca stream (4°9' S 69°57' W) at the Municipality of Leticia, crossing three ecosystems; running waters surrounded by forest, then Igapó (flooded forest) (Figure 2), and finally open lakes.
- Correo Lake (3°46' S 70°23' W) in the river Loretoyacu, with margins dominated by Igapó (Figure 3) and terra firme forest.
- Amazonas River near Loretoyacu's mouth (3°47' S 70°21' W), with margins dominated by open areas for housing and cultivation (Figure 4), both at the Municipality of Puerto Nariño.

Odonates were collected and photographed, and field notes were taken for every specimen. Specimens are deposited at the Colección de Entomología of the Universidad de Antioquia (CEUA). Illustrations were composed combining freehand and digital illustration techniques using Adobe Illustrator CS3. Map is based on a digital elevation model DEM-SRTM, with 90 resolution meters, downloaded from the CGIAR-CSI consortium for spatial information and modified with ArcGis 9.2.

Results

Thirty four Odonata specimens were collected and identified to species level, with the exception of some females and taxonomically unclear groups. Nineteen species were recorded (Table 1), including seven new records for Colombia, raising the species number for the country to 344, including four previously unrecorded genera. The collection highlights include the rare damselfly *Proneura prolongata* which had not been found again since its original description (Selys 1889), and an undescribed *Calvertagrion* species (which Dr. Ken Tennessen is working on; pers. comm.).

Figure 1:
Sampled
Localities

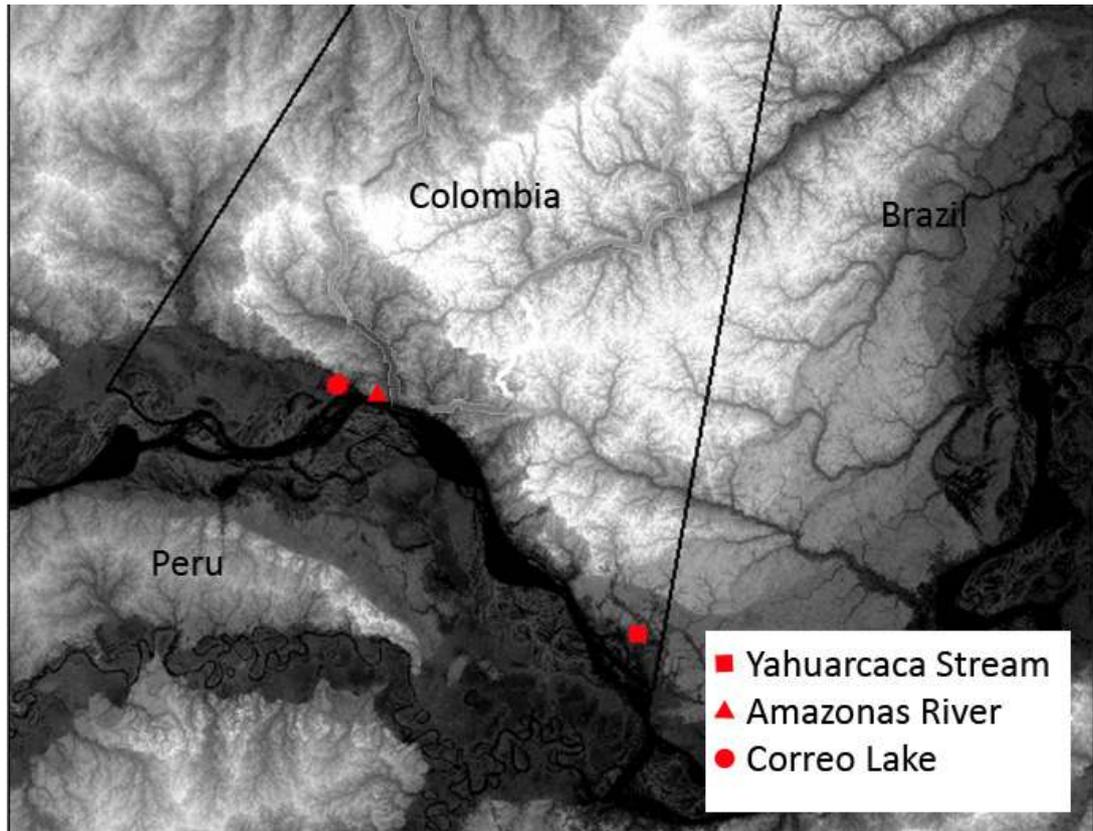


Table 1. Habitat and locality of the species collected

Locality	Family	Species	Habitat
Yahuarcaca Stream and lakes	Libellulidae	<i>Uracis fastigiata</i> (Burmeister, 1839)	Terra firme forest
		<i>Brachymesia furcata</i> (Hagen, 1861)	Lake
		<i>Erythrodiplax attenuata</i> (Kirby, 1889)	Lake
	Calopterygidae	<i>Orthemis</i> species group <i>discolor</i>	Stream
		<i>Hetaerina sanguinea</i> Selys, 1853	Stream
	Coenagrionidae	<i>Acanthagrion lancea</i> Selys, 1876 *	Lake
		<i>Aeolagrion inca</i> (Selys, 1876) °	Lake
Protoneuridae	<i>Proneura prolongata</i> Selys, 1889 °	Igapó	
Correo Lake	Libellulidae	<i>Perithemis lais</i> (Perty, 1834)	Lake
		<i>Perithemis bella</i> Kirby, 1889 *	Lake
		<i>Brachymesia herbida</i> (Gundlach, 1889)	Terra firme clearings
	Coenagrionidae	<i>Erythemis attala</i> (Selys in Sagra, 1857)	Clearings near the shore lake
		<i>Erythrodiplax unimaculata</i> (De Geer, 1773)	Terra firme streams
		<i>Orthemis</i> species group <i>discolor</i>	Terra firme clearings
		<i>Uracis imbuta</i> (Burmeister, 1839)	Terra firme clearings
		<i>Acanthagrion lancea</i> Selys, 1876 *	Lake
		<i>Acanthagrion apicale</i> Selys, 1876	Terra firme streams
		<i>Aeolagrion inca</i> (Selys, 1876)	Terra firme swamps
		<i>Ischnura capreolus</i> (Hagen, 1861)	Lake
		<i>Calvertagrion</i> sp. nov.	Terra firme streams
		<i>Metaleptobasis incus</i> Sjöstedt, 1918 °	Terra firme swamps
Protoneuridae	<i>Protoneura</i> sp.	Lake	
Amazonas River	Libellulidae	<i>Micrathyria</i> sp.	River shore
	Coenagrionidae	<i>Aeolagrion inca</i> (Selys, 1876) °	River shore
	Protoneuridae	<i>Neoneura bilinearis</i> Selys, 1860	River shore
		<i>Neoneura rufithorax</i> Selys, 1886 *	River shore

° First record of the genus from Colombia.

* First record of the species from Colombia.-



Figure 2. Igapó at Yahuarcaca Stream.



Figure 3. Edge between lake and Igapó at Correo Lake.



Figure 4. Amazonas River arm.

Acanthagrion lancea

This species is recorded from Argentina, Brazil, Ecuador, Paraguay, and Peru (Leonard 1977, Anjos-Santos et al. 2011; von Ellenrieder & Muzón 2008). At the Colombian Amazon it was very common and abundant at the macrophyte zone in the edge between the igapó and the open waters of the lakes. They were observed in copula near midday and it was also observed being preyed on by spiders (Figure 5).

Aeolagrion inca

The genus *Aeolagrion* is known to occur from Surinam and Trinidad throughout South America to the north of Argentina (Tennessee 2009, Garrison et al. 2010), and although its presence in Colombia was expected it had not been confirmed to date. *Aeolagrion inca* is recorded from Bolivia, Brazil, Ecuador, and Peru (Tennessee 2009). At the Colombian Amazon it was collected both in open places with high sun incidence (i.e. shores of the Amazonas river or of lakes without high vegetation cover), and at shaded swamps in the interior of terra firme forest. Tennessee (2009) states: “these damselflies are fairly cryptic shade-dwellers, especially females. Although



Figure 5. *Acanthagrion lancea*, male, Correo Lake.



Figure 8. *Calvertagrion* sp. nov., male, Terra Firme Stream near Correo Lake.



Figure 6. *Aeolagrion inca*, male, Yahuaraca Lake.



Figure 7. *Calvertagrion* sp. nov., female. Terra Firme Stream near Correo Lake.

the larvae and therefore the exact breeding habitat are not known ...". My observations show that males of *A. inca* also perch in open sunny areas, which expands the known microhabitat for this genus and maybe could point to their breeding places (Figure 6).

Calvertagrion sp. nov.

The genus *Calvertagrion* has been recorded for the Amazon forest in Brazil, Ecuador, and Peru (Garrison et al. 2011). At present only one species has been described (Garrison & Costa 2002) but Dr. Ken Tennessen is working on a revision of the genus which would increase the number of species to five (Tennessen pers. comm.). The species collected at the Colombian Amazon seems to be one of the undescribed species (Tennessen pers. comm.). It was observed flying in forest clearings crossed by little streams (Figures 7 and 8).

Mesoleptobasis incus

The genus *Mesoleptobasis* has been recorded for the Amazon forest in Brazil, Guyana, Peru, Surinam, and Venezuela, where according to Garrison & von Ellenrieder (2009) specimens are infrequently collected, and it is therefore likely that distribution ranges are larger than those indicated by existing specimens. Its presence in Colombia was therefore expected but it had not been confirmed to date. *Mesoleptobasis incus* was recorded in the Amazon regions of Brazil and Venezuela (Garrison & von Ellenrieder 2009). At the Colombian Amazon it was observed flying in a shaded swampy zone inside the forest (Figure 9).



Figure 9. *Mesoleptobasis incus*, male, Terra Firme Swamp near Correo Lake.



Figure 10. *Neoneura rufithorax*, male, Amazonas River shore.

Neoneura rufithorax

This species has been recorded in Venezuela, Northern Brazil, and Southern Peru (Garrison 1999, De Marmels 2007). In the Colombian Amazon, I collected it on a sunny shore of the Amazonas river, where it flew near the water surface and perched on overhanging dead wood (Figure 10).

Proneura prolongata

Baron Edmond de Selys-Longchamps described this species based on a single male collected in “Le Peba” (Selys 1889). He noted that the genus differed from all other Protoneuridae by “...the prolongation of the inferior sector of the triangle to about the end of the marginal cell after which the quadrangle is beneath....” [translated from the French]; in modern terminology this is described as CuA free, one cell long (Garrison et al. 2010). Machado (1985) discussed the ambiguity of Selys’ locality “Peba, Tefé [Amazonie]” indicating that it cannot be precisely located, not even for a country, but stated that it is certainly in the upper Amazon region of Peru or Brazil. Gloyd (1977) suggested that it could correspond to Pebas, in Loreto department in Peru, and Garrison et al. (2010) considered the latter to be the most likely locality. As noted by von Ellenrieder & Garrison (2007), the holotype is lacking the last seven abdominal segments. Fortunately, Selys had composed some free-hand colour illustrations of various species from his collection which were never published (Hämäläinen 2009), including one of the holotype male of *P. prolongata* (Figure 11). Rosser W. Garrison mentioned this to Marcel Wasscher, who was able to scan several of the plates including that of *P. prolongata*.

Proneura prolongata had not been recorded since its original description. In the Colombian Amazon it was observed flying within an Igapó (Figure 2), which could explain why it is so rare in collections because accessing this habitat is very difficult; I was able to approach and collect the single male seen from a kayak (Figure 12).

The species has been listed as “data deficient” by the IUCN as further knowledge about its range, habitat preferences, and biology is needed in order to evaluate potential threats (von Ellenrieder 2009).

Von Ellenrieder & Garrison (2007) provided illustrations of head, thorax, genital ligula, second and third abdominal segments and wings of the holotype. Here I provide illustrations of the tenth abdominal segment and caudal appendages in lateral view and a brief description.

Body length is 36.0 mm and abdominal length is 30.5 mm. Paraprocts are 4 times longer than cerci, 1.33 times longer than abdominal segment 10 (Figure 13), and are conical with tips curving inwards (Figure 14). Cerci are 2.5 times higher than long, ovoid with a wide base in medio-dorsal view (Figure 15). Abdominal segments 8 – 10 including cerci and paraprocts are covered with golden setae.

Perithemis bella

This species is recorded for Brazil, Ecuador, and Peru (Ris 1930, Hoffmann 2009, Garrison pers. comm.). Brother Apolinar Maria recorded *P. bela* (with the orthographic error) in 1939 for the Magdalena Valley Region in Colombia; nevertheless the specimens on which he based the report are lost and it seems unlikely that this species reaches the Magdalena Valley. This species was not recorded in the last check list for Colombian Odonata, this being the first reliable record. In the Colombian Amazon it was observed while it was perched on a macrophyte at the edge between the Igapó and the lake (Figure 16).

Discussion

This work reflects the state of knowledge of odonatology in Colombia. The majority of the entomological museums in the country keep regional collections and these are restricted principally to the Andean zone (Cardona et al. 2010), with relatively good representation of the Caribbean and Pacific regions, but the Orinoquia and Amazon regions, which are the most inaccessible, are poorly represented. So the findings made in only three

days in the field for the Amazon region evidence the necessity of expeditions to the Colombian remote zones with the scope of collecting Odonata for the improvement of knowledge of Colombia's odonate fauna.

Acknowledgements

To my family for their company and help during the field trip to the Colombian Amazon, to CEUA for the technical support, to Jérôme Constant and Marcel Wasscher who scanned Selys' drawings and to Natalia von Ellenrieder and Rosser Garrison who provided them, to Camilo Flórez who helped me with the illustrations, to Cintia Moreno who helped me with the map and to Ken Tennesen, Natalia von Ellenrieder and Rosser Garrison who reviewed and enriched the manuscript.



Figure 12. *Proneura prolongata*, male.

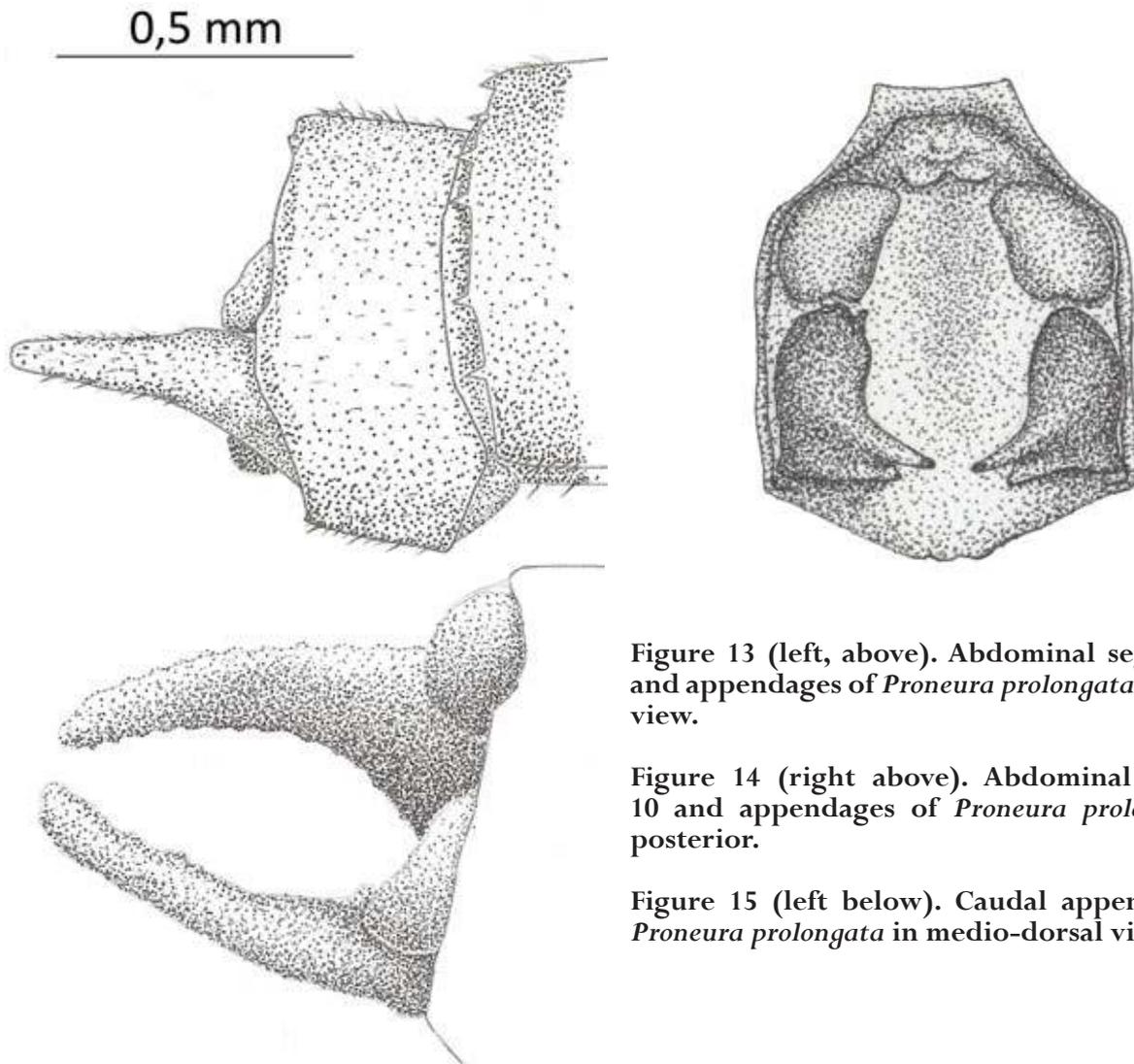


Figure 13 (left, above). Abdominal segment 10 and appendages of *Proneura prolongata* in lateral view.

Figure 14 (right above). Abdominal segment 10 and appendages of *Proneura prolongata* in posterior.

Figure 15 (left below). Caudal appendages of *Proneura prolongata* in medio-dorsal view.

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Figure 16. *Perithemis bella*, male, Correo Lake.

Murray Darling Icon *Apocordulia macrops* closes the gaps (Anisoptera: Austrocorduliidae)

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Introduction

The adults of the rare and enigmatic Australian dragonfly *Apocordulia macrops* (Nighthawk) (Figs 1, 2) were described by Watson (1980) after specimens bred from larvae collected in Victoria, Kiewa River, Killara (36°09'S/146°57'E). The larva of the species (Fig. 3, left) was described for the first time by Theischinger & Watson (1984) from Victoria and New South Wales collecting sites very close to the type locality, and from Rosedale (38°09'S/146°47'E) in Victoria. The crepuscular, non vagrant adults (Watson 1980, Theischinger 2009) and the difficulty collecting in most larval habitats (deep water, steep banks) of *A. macrops* are probably the reason why this very distinctive and reasonably large dragonfly remained undescribed until 1980 in spite of its existence in rather well populated areas. Over the next 20 years only a few more larvae were collected but almost exclusively in localities near the type locality. The distribution map in Hawking & Theischinger (1999) includes these records and a surprise record from the Gwydir River.

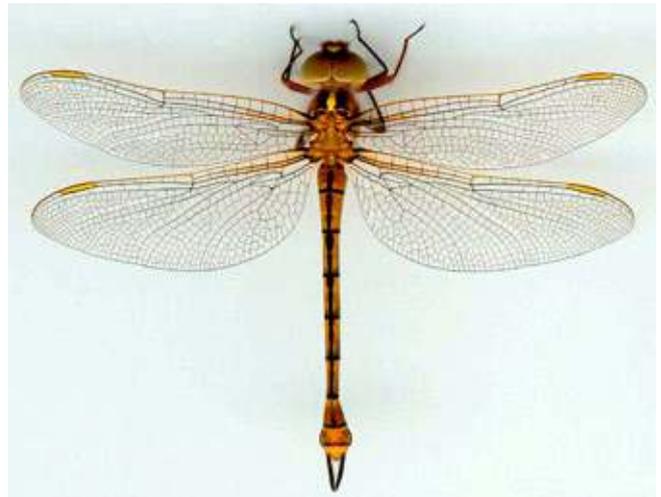
More recent distribution data

After a long stagnation it was left to a federal project to put *Apocordulia macrops* on the map and to establish its status as a true Murray Darling icon. The necessary inclusion of potential habitats within the randomly selected sites for the Sustainable Rivers Audit (SRA) in the Murray-Darling Basin (started 2004) and the commitment of GT to identify the collected dragonflies to the species level added significantly more information during the next eight years than had previously been accumulated over three decades. Now records of *A. macrops* are available from the Broken River, the Gwydir River, the Kiewa River, the River Lachlan, the Macintyre River, the Macquarie River, the Murray River and the Murrumbidgee River [some of these were previously

Figure 1 (top). *Apocordulia macrops*, male from Lachlan River, Gooloogong (Photo G. Theischinger).

Figure 2 (middle). *Apocordulia macrops*, female from Lachlan River, Gooloogong (Photo L. Müller).

Figure 3 (bottom). Final instar exuviae. (Left): *Apocordulia macrops*; (right): *Synthemis eustalacta* (Photo G. Theischinger).



listed by Theischinger (2009)]. Increasing the number of records was made easier by the fact that *A. macrops* have very strongly sclerotized exuviae (usually additionally strengthened by dried up hardened mud) that remain intact after the adults emerge longer than most other dragonfly exuviae.

Most recent record

Collecting was also difficult for the most recent record of *Apocordulia macrops*, on the afternoon of October 16th 2011 along the Macquarie River at Reality Bends, and macroinvertebrate numbers were low. It was apparent that control of river flow, and recent significant natural changes in water level, had contributed to these poor results. There was, however, habitat along the river similar to this where *A. macrops* was previously found in other catchments. Although we were unable to find larvae, eight exuviae were found on logs along a 100m stretch of the river bank at 31.774755°S/147.90230°E.

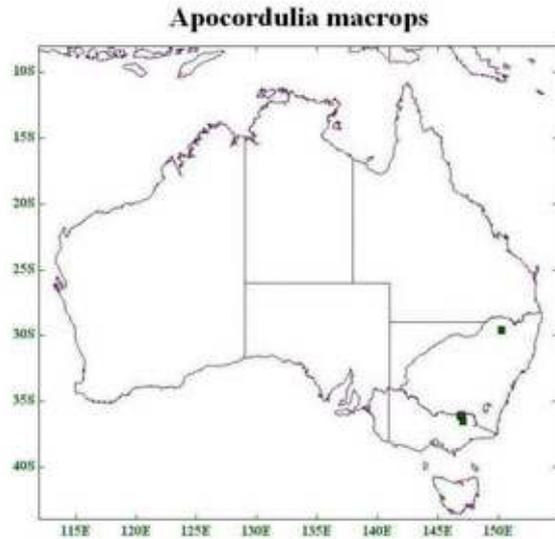


Figure 4. Distribution of *Apocordulia macrops* from Theischinger & Endersby (2009). (Based largely on adults in institutional collections).



Figure 5. Updated distribution of *Apocordulia macrops* (based on adults, larvae and exuviae) (Photo D. Mawer).



Figure 6. *Apocordulia macrops*: collecting site Macintyre River (Photo S. Jacobs).



Figure 7. *Apocordulia macrops*: collecting site Macquarie River, with GT pointing at exuvia in position of adult emergence (Photo S. Jacobs).

Apart from indications that the conditions would have been suitable for *A. macrops* for long distances up- and downstream of the sampled site, the adults had apparently emerged very early in the season, at the beginning of October or even earlier.

Discussion

The new record described from the Macquarie sub-catchment constitutes an important step forward to closing the gaps in the distribution of *Apocordulia macrops* in the Murray-Darling Basin. There has been a long delay since the publication of previous records and this latest find. In the remaining sub-catchments (see map) the species has not been collected during eight years of monitoring. It appears increasingly unlikely that more records will be found in these other areas because of an apparent lack of permanently suitable habitats. Therefore it seems appropriate to now revise the distributional information on *A. macrops* in available publications and databases, to summarize the information available only a few years ago and to compare it with what is known now.

It is now clearly established that the distribution of *Apocordulia macrops* includes the following sub-catchments of the Murray-Darling Basin: Border Rivers, Gwydir, Macquarie, Lachlan, Murrumbidgee, Central Murray, Kiewa River, Broken River. Further records of the species in the Warrego, Condamine, Paroo, Darling, Lower Murray, even in the Castlereagh and Namoi and in most of the small southern sub-catchments of the Murray-Darling Basin would come as a surprise due to extensive regulation of flow and lack of appropriate habitat. No records from outside of the Murray-Darling Basin have been forthcoming since 1974, in spite of concurrent coastal monitoring projects in New South Wales and Victoria. A record of *A. macrops* in a database that may have found its way into the hands even of non-Australian students of Odonata includes Killara with the coordinates 37.8000°S/145.4930°E and 37.800°S/145.5000°E. This is certainly a mistake originating from a mix-up of two different localities with the same name (Killara). The type locality Killara on the Kiewa River is at 36°09'S/146°57'E. Omission of the incorrect Killara record would make *A. macrops* an endemic of the Murray-Darling Basin were it not for another record of a larva collected 1974 in Victoria at Rosedale (38°09'S/146°47'E) as listed in Theischinger & Watson (1984). This happened as the data base was largely including only adult specimens in institutional collections. Watson et al. (1991), Hawking & Theischinger (1999) and Theischinger (2001), respectively show the occurrence of *A. macrops* in Victoria and south-eastern New South Wales. The distribution map in Theischinger & Hawking (2006) includes Victoria, south-eastern, north-eastern and inland New South Wales.

The first seven of the following records of *A. macrops* from Victoria, south-eastern, north-eastern and inland New South Wales and southern inland Queensland are from 1974-2003, the remaining twelve from after 2004.

Available records of *Apocordulia macrops* (altitudinal range of the Murray-Darling Basin localities 85-270 m asl)

Gwydir River, Gravesend (very close to 29.5815°S/150.3660°E)

Kiewa River, 36.1333-36.3333°S/146.9500-147.0333°E

Kiewa River, Bonegilla, 36.1384°S/146.9557°E

Kiewa River, Killara, 36°09'S/146°57'E

Kiewa River, Wodonga, 36.1167°S/146.8833°E

Murray River, Albury, 36°06'S/146°54'E

Rosedale, 38°09'S/146°47'E

Broken River, Goomalibee, 36.4628°S/145.8605°E

Gwydir River, 29.5356°S/150.3371°E,

Kiewa River, Old Tangambalanga, 36.2563°S/147.0306°E

Kiewa River, Huon Hill Parklands, 36.1288-36.1305°S/146.9519-146.9532°E

Lachlan River, Gooloogong, 33.6030-33.6100°S/148.4300-148.4360°E

Lachlan River, Paytens Bridge, 33.4917-33.5000°S/148.3004-148.3062°E

Macintyre River, 28.61300°S/149.88312°E

Macquarie River, Reality Bends, 31.774755°S/147.90230°E

Murray River, Campbells Island State Forest, 35.5549°S/144.0408°E

Murray River, Morebringer, 36.0215°S/146.6742°E

Murrumbidgee River, Cuba State Forest, 34.6262°S/146.1203°E

Murrumbidgee River, Narrandera Nature Reserve, 34.7737°S/146.5961°E

The locality-map presented in Theischinger & Endersby (2009), mainly based on adult specimens in institutional collections (Fig. 4), is compared with an updated map (Fig. 5) including new records of larvae and exuviae (mainly collected during the SRA). Figs 6 and 7 show two of the typical habitats the way they were when larvae/exuviae of *A. macrops* were collected.

The rare and enigmatic *Apocordulia* as a monotypic genus is of great interest and significance for biodiversity studies and conservation issues; the role it may play on the climate change scene is still not certain because of its

apparent rareness and patchy distribution. Hopefully the SRA monitoring project and the search for *Apocordulia macrops* in the Murray-Darling Basin can go on.

Comments on the relationships of the genus *Apocordulia*

Apocordulia was described under, and included in, the corduliid subfamily Gomphomacromiinae by Watson (1980), Theischinger & Watson (1984) and Watson et al. (1991). Following Bechly (1996), it was included in Austrocorduliidae by Hawking & Theischinger (1999), Theischinger (2001), Theischinger & Hawking (2006) and Theischinger & Endersby (2009). On the basis of the larval and adult morphology it appears that the predominantly inland genus *Apocordulia* is probably the sister group of the largely coastal genus *Austrocordulia* Tillyard. As *Austrocordulia* was found to belong in the GSI (*Gomphomacromia Synthemis Idionyx*) clade established by Ware et al. (2007) there is little doubt that *Apocordulia* belongs there too. Molecular analysis on *Apocordulia*, however, has yet to be undertaken. Even though *Apocordulia* is the only genus included in Austrocorduliidae by Theischinger & Endersby (2009) with a strongly divaricate discoidal field in the forewing (as is typical for the Synthemistidae) a placement of *Apocordulia* (exuvia: Fig. 3, left) and e.g. *Synthemis* (exuvia: Fig. 3, right) in the same family does not appear convincing.

Point of particular interest

After the study of the available larvae of all species of Australian Odonata, mature *Apocordulia macrops* larvae are still the only ones that regularly have more than 7, commonly 10, sometimes even 11, antennal segments. The only other genus in which I have found more than 7-segmented antennae, namely sometimes 8-segmented ones, is its supposed adelphotaxon *Austrocordulia* (additional antennal segments considered synapomorphy).

Summary

The rare and enigmatic Australian dragonfly species *Apocordulia macrops*, the nighthawk, is introduced with the inclusion of hitherto unpublished photos of adults and exuvia. The relatively poor collecting record and the subsequent rise to iconic status for *Apocordulia* in the Murray-Darling Basin are described. On the occasion of the latest record in the Macquarie River the distributional information available in publications and data bases is revised and discussed. The updated information is presented by locality-maps and a complete list of records. Habitat photos are also provided. A photo of an exuvia of a *Synthemis* species is presented for comparative purposes.

Acknowledgements

We wish to thank Alex Bush, Ian Endersby, Martin Krogh, Jan Miller, Leonard Müller, Tim Pritchard and Ros St Clair for help with the photos, extraction of data and for linguistic suggestions.

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Bali jewel-damselfly display

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In 2004 I witnessed the display of a male damselfly around a female which was laying eggs. He circled facing her with his white legs outstretched and smoky wings flashing iridescent colours in the sunlight. It was so attractive I thought it would be good if I could capture it on video.

On a visit last December I had the opportunity to do just this. The damselfly, *Rhinocypha fenestrata cornelii*, breeds in fast-flowing water and I found a site on an irrigation conduit near Ubud where there were many males and females active. I noticed that some of the females were laying eggs in objects near the flowing water and, seeing this, I moved a chunk of rotten wood to a place suitable for photography. Females soon arrived to lay eggs in it, and a male saw his chance and began defending the wood against other males. He displayed around the females laying eggs or settling nearby and I saw him fly off with one of them to mate on a fern leaf.

In the video the display is shown in real time and slow motion. The video can be seen on YouTube (http://www.youtube.com/watch?feature=player_detailpage&v=h18vryX4Jul) or search for key words: *Rhinocypha*, Bali, & Damsels.



Photo: Male damselfly, *Rhinocypha fenestrata cornelii*, displaying around a female in Bali, Indonesia. The female opens her wings to brush him off. Credit: Jan Taylor.

An Odonata Expedition to Usan Apau National Park, Sarawak Malaysia

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Located in north-eastern Sarawak within the division of Miri lies Usan Apau, an extinct volcanic mountain plateau of pristine mossy forest. The highest extinct volcano in the plateau is Bukit Selidang at 1433m above sea level (Hazebroek & Morshidi 2000). The entire plateau separates the headwaters of the Rajang and Baram Rivers. In 2005, an estimated area of 49,355 ha at the eastern part of the plateau was gazetted as a national park. In local dialect, Usan means top and Apau means plateau. Usan Apau is of historical significance for locals who are now mostly Kenyah people. An interesting anthropological account of Usan Apau by Arnold (1956) related stories of the great Iban Raid in the year 1882 which forced the Kenyah, Sebop and Penan people to flee across and down from Usan Apau. Currently the plateau is uninhabited. The 1955 Oxford scientific expedition remains the last major exploration of Usan Apau. From that expedition, we have knowledge of extinct volcanoes, deep valley rivers, steep cliffs and 800-foot high waterfalls (Arnold 1957). Odonata has never been sampled at Usan Apau. Thus with this historical backdrop and high likelihood of odonatological novelty, a 12-day expedition was launched to Usan Apau, the most remote and difficult to access national park in Sarawak.

The nearest city is Miri and that was where half of the team members gathered and planned for the expedition on 20th to 22nd April 2012. For two days in Miri, friendships were made and renewed between the three researchers (Rory A. Dow, Graham Reels and I), Luke Southwell (expedition manager) and Yusoff Tegong aka Bob (or Bobby). Yusoff was to be our lead guide, logistics co-ordinator and main local contact for Usan Apau. In accordance with our own Sarawak tradition, a late night of drinking and country music dancing was organised on our last day in the city.

On 23rd April, we left Miri for Long Silat, a Kenyah longhouse at the foot of the mountain plateau. After a scorching and bumpy seven hour drive, we reached our destination at dusk. In Long Silat, we met the rest of our expedition members who were to be our porters and guides: Njok Paulus Bilong, Calvin Wilfred, Ogang Uda, Beny, Aspar and Marhan. Hence a strong team of 11 members was finally assembled. After a refreshing meal and shower, we were honoured to have an elderly member of the longhouse captivate us with the haunting music of the Sape, a traditional Sarawak guitar. The old man is Aran Tasé, 90 years old. With the enthralling Sape music still ringing in our ears, we called it a night for a needed rest before the next day's long hike to the plateau.

A cool mist enveloping Long Silat greeted us in the early morning. Before setting off, the longhouse's headman gave us a blessing for safe passage and a successful expedition. As with all our fieldwork in Sarawak, we always seek permission from a local headman before any proper work begins, which in this instance we had done the night before. After photo taking to commemorate the occasion, we set off towards the mountains.

In an hour's drive, we reached the point where vehicular access up the mountains was no longer possible. After a final distribution and packing of field supplies among the porters, we



A group photo at Long Silat with the headman. He is seated in the middle of front row. (photo by Luke Southwell).



Aran Tasé, the old Sape player. (photo by Robin Ngiam).



A friendly bulldozer answered Yusoff's call for help. (photo by Luke Southwell).

commenced towards the plateau. The initial hike up was by means of a disused logging road. It was gruelling under the sweltering sun, more so for the heavily laden porters. We were forced to take several short breaks as progress up the steep slopes drained our energy rapidly. Along the way, common species such as *Xiphiagrion cyanomelas* and *Orthetrum pruinosum* occurring at logging ponds were collected.

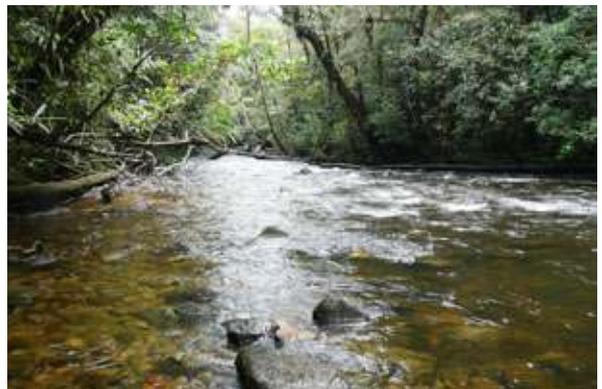
By early-afternoon, we were at the junction where the forest track phase of our ascent would start. Unfortunately, with fast impending rain, it was decided to camp for the night and hike up the forest the next day in more favourable weather. Thus our hope of reaching the plateau within a single day was not fulfilled, but we had already anticipated this was not going to be a straight and easy expedition. Meanwhile Njok and Yusoff headed back down the logging road to find help in bringing up the second load of field supplies left in the 4WD. Before setting off, Yusoff mentioned the possibility of getting help using motorcycles. Meantime, a *Podolestes* hidden among a thicket of Resam plants (*Dicranopteris* species) was a source of entertainment and frustration as we failed to net it after several attempts. As night settled, Yusoff's 'motorcycles' arrived but in the form of a friend's bull-dozer blazing a trail for the 4WD on the road that was inaccessible to cars just a few hours ago. This surprise was greatly cheered and all were impressed by Yusoff's and Njok's resourcefulness. Finally we made the best of a wet and muddy night with several rounds of hot coffee.

The next day brought excellent sunny weather. Very quickly, we had breakfast and broke camp. By now, the previous day's exertions had aggravated Njok's ailing knee and he headed back down the mountains for medical supply before rejoining us. Hence we pushed on without him. Tracking up the forest proved much more tolerable than the logging track as the canopy shielded us from the blazing sun. Slowly but surely, we hiked through several ridges and hills, always heading upwards. Soon our objective came into view from a distance: the powerful Julan Waterfall, reputedly the highest waterfall in Sarawak with a sheer drop of 250m (Hazebroek & Morshidi 2000). From afar, the roar of rushing water can be heard. And just above the waterfall is Usan Apau plateau, our final destination. Such an impressive sight renewed our vigour as we continued with determination. Led by Ogang and Yusoff through steep climbs, dozens of leeches, sighting of wild boar and colourful forest millipede, we reached the foot of a final vertical climb up the escarpment. By now, the habitat had transitioned from disturbed secondary to primary forest. At this point, we were at about 800m above sea level, this after a four hours hike. Ahead of us was another two to three hours of climbing and hiking.

The last phase of the ascent was a true test of our fitness and stamina. For much of the way, it was mostly climbing up on all fours, always taking care not to slip on the steep muddy slopes. After two hours, the terrain finally flattened and we had reached the plateau. But it was another one hour hike before base camp at Sungei (Malay for river) Julan. Along the way, we passed remnants of the



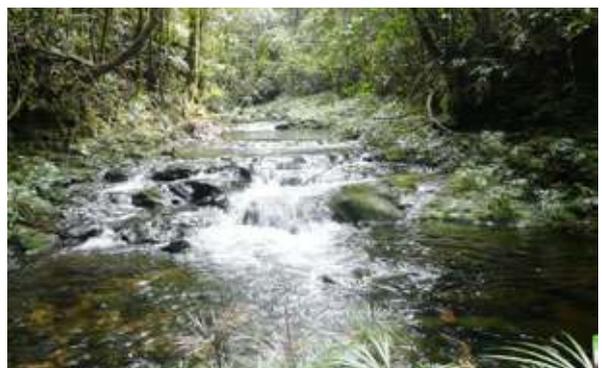
The mighty Julan Waterfall from afar. (photo by Robin Ngiam).



Sungei Julan. (photo by Robin Ngiam)



Dense mossy forest. (photo by Robin Ngiam).



Beautiful stream with dense vegetation. (photo by Robin Ngiam).

unsuccessful Millionaire's Club project to develop Usan Apau into a prestigious resort in the 1980's. The project was supposedly funded by a Singapore conglomerate; an unpalatable reminder of home for me. By 4pm, we had yet to reach base camp. Apparently the dense forest had got the better of our guides, confusing them to take a wrong turn. With daylight fading fast, we had to make camp by a tributary of Sungei Julan. However we were not disappointed because after an exhausting seven hours hike, at least we had reached Usan Apau plateau and were in pristine habitat. This was exemplified by Rory netting a *Matronoides cyaneipennis* just before taking a bath. As camp was hastily set up, Njok appeared. Despite us being at least a good two hours ahead of him, Njok managed to catch up with us within an hour on a troubled knee! His was one of many examples of the exceptional stamina and field craft of the locals.

Early next morning, led by Njok who was most familiar with the area, we hiked swiftly to the spot intended as a base camp beside the beautiful Sungei Julan. The timing was perfect; it was around 10am and sunny. While the rest busied setting up camp, Rory, Graham and I finally started our proper odonate collecting. The date was 26th April, three days after leaving Miri. We were about 990m above sea level. The three of us worked a tributary of Sungei Julan, Rory and Graham moving up a cascade of waterfalls while I collected up a side stream.

The mossy forest is dense with tall trees mostly about 50cm or so in girth. The canopy is generally open. The streams are absolutely picturesque. They are fast flowing, rocky and full of luscious Rheophytic plants (Family Dipteridaceae). With the sun shining down, odonates were at maximum activities. Some of the species netted from this first day included *Rhinocypha spinifer*, *Coeliccia cyaneothorax*, *Euphaea subcostalis*, *Indaeschna grubaueri* and a possible new platystictid species. It was a rewarding first day of collecting. When we returned to base, dinner was already cooking in a comfortable camp. After a revitalising bath and dinner, rounds of Vodka were shared as we celebrated a successful and safe journey to Usan Apau plateau.

For the next few days, we collected from several streams within the vicinity of our base camp. A variety of microhabitats was sampled; pebbly slow streams, boulderly swift streams, boulder pools, leaf litter pools as well as swampy pools near the disturbed habitat of the failed Millionaire's Club. More species were added; among others we got *Prodasineura hyperythra*, *Rhinagrion borneense*, a female *Gomphidia* species, *Euphaea subnodalis*, *Macromidia fulva*, *Macromia* cf. *cydippe*, *Neurobasis longipes*, *Vestalis beryllae* and *Coeliccia nigrohamata*. And of course as usual, many furtive gomphids were sighted but not netted. On some streams, we managed to reach as high as 1100m above sea level. While we did collecting, some of the porters returned to the 4WD to carry in the second load of supplies.

Meals were mostly rice or instant noodles with cooked vacuumed-packed cabbages, corned beef,



Slow flowing part of a stream where *Rhinagrion borneense* is abundant. (photo by Robin Ngiam).



Rhinocypha spinifer is very common at most of the streams. (photo by Graham Reels).



Prodasineura hyperythra. (photo by Robin Ngiam).



Female *Rhinagrion borneense*. (photo by Graham Reels).

sardines and luncheon meat supplemented with tasty fishes from the river. While in camp, jokes and stories were traded over coffee or Vodka. Plans on the possibility of hiking all the way to Bukit Selidang were discussed but dropped as Ogang, who was there almost ten years ago, was not confident in remembering the way. Instead in order to cover a wider area, it was decided that a group of Rory and Graham with six others would push further into the plateau for a sub-camp. This was carried out on 29th April.

Unfortunately, the guides could not find their way much further in due to the difficult terrain. Hence the sub-camp was situated only about 90mins hike from base camp. But the habitat around sub-camp was distinctively different. The water was wide and deep, very slow flowing over a sandy bottom. In fact the whole area is a series of medium size rivers meandering sluggishly past patches of small knolls. *Dysphaea dimidata* is abundant here. Small side streams and swamps feed into the rivers. Collecting along the deep water was difficult but amongst the swampy bits, an excellent find was made by Graham and Rory: a possible new *Podolestes* species.

Back at base camp, I crossed Sungei Julan. The habitat is similar to base camp with a lengthy rocky stream which flows into a high waterfall dropping down the escarpment. By 3rd May, the sub-camp group was back and we were into our last day of collecting. As a good finish to our expedition, another specimen of the possible new *Podolestes* species was collected. An additional good catch was *Hylaeothemis clementia*.

Weather was quite



The deep, sandy sluggish stream at the sub-camp area. (photo by Robin Ngiam).



Hylaeothemis clementia. (photo by Robin Ngiam).



The Usan Apau expedition members of 2012. Front row left to right: Ogang, Aspar, Graham, Njok, Calvin and Marhan. Back row left to right: Luke, Beny, Rory and Yusoff. (photo by Robin Ngiam).

favourable throughout our stay. We had mostly sunny days with two days of occasional rain in which we were still able to collect when the sun broke through the clouds. The days were cool and nights chilly.

On our last night, payments to our guides were made followed by a general debrief including a touching farewell speech by Graham. This is his last Sarawak expedition, at least in the foreseeable future. Perhaps that is why he was collecting photos of us in 'almost' naked state. With coffee in lieu of alcohol (the Vodka was finished by now), we cheered farewell to Usan Apau. On 4th May, we took a last round of group photos and started our long hike back to civilisation.

In total, 50 plus species were collected. There are two or three potential new species. A sizeable number of *Devadatta* and *Drepanosticta* specimens were also collected for the continual revision work of the genera by Rory. He will present a full species account in a future report which would be the first ever record of odonates from Usan Apau National Park. The area we sampled is a very small representative of a huge plateau. We hope that proposed plans to reach Bukit Selidang will bear fruit. Surely, more exciting discoveries await at the extinct volcano.

Acknowledgements

Rory, Graham and I are deeply grateful to the locals mentioned in this article. The expedition would be impossible without them. Collection permit is granted by the Sarawak Forestry Department. I thank National Parks Board, Singapore for funding my participation in the expedition. I thank Rory for once again including me in his Sarawak work.

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Correction of the identification of a *Libellago* specimen from Sri Lanka

By Nancy van der Poorten [nmgvdp@gmail.com]

In Hämäläinen *et al.* (2009), a specimen at the Sri Lanka National Museum that had been originally identified as *Libellago indica* was re-identified (by myself) as *Libellago adami*. This reidentification has proven to be incorrect. My colleague Karen Conniff and I had the opportunity to re-examine the specimen in June 2011 and it is clear that the specimen is actually that of a male *Libellago greeni*. The antehumeral stripe is very short, and though S10 and the anal appendages are missing, the markings on S1-S9 agree with *L. greeni*, not with *L. adami*. However, this error does not change the salient points of the article.

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New odonate book

The Dragonflies of Hong Kong 香港蜻蜓

Authors: Tam Tze-wai, Leung Ka-king, Boris S.P. Kwan, Karrie K.Y. Wu, Simon S.H. Tang, Ivy W. Y. So, Joesphine C.Y. Cheng, Edward F.M. Yuen, Tsang Yu-man, Hui Wing-leung and the Agriculture, Fisheries & Conservation Department



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I first visited Hong Kong in January 1991 when I took up a position with the Agriculture and Fisheries Department, which is now known as the Agriculture, Fisheries and Conservation Department (AFCD). The new name of the Department reflects the growing importance placed on the natural environment and its protection in Hong Kong. I authored the first book devoted to Hong Kong dragonflies which was published in 1995 and covered some 102 species. In 2003 the first Field Guide to the Dragonflies of Hong Kong was published, which recorded 112 species, and a second edition of this book was published in 2004. I was the author of both these Field Guide editions but a lot of assistance was provided by the AFCD Dragonfly Working Group (DWG), which was established in 2001. I enjoyed many field trips with members of the DWG during 2001 to November 2003 when I left AFCD. The 2nd edition of the Field Guide is now out of print and there have been several new dragonfly discoveries in Hong Kong in recent years. The 19th Century 'barren rock' status of Hong

Kong has now been thoroughly transformed by the establishment of extensive and biodiverse forests, which are now beginning to mature. The gradual and relatively recent natural recolonisation of these forests in Hong Kong and its territories by many forest dragonfly species has meant that a new updated Field Guide is certainly warranted. It gives me great pleasure to see the Agriculture, Fisheries and Conservation Dragonfly Working Group has risen to the challenge and produced this fine updated and revised Field Guide. It provides all the essential information for the identification both adults and larvae expected of a pocket-sized field guide.

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Introduction

Studies of dragonflies in Hong Kong started in the 1850s and *Euphaea decorata* was the first dragonfly recorded here by Baron de Selys Longchamps in 1854 (Selys 1854). Various studies were then carried out, and Asahina (1965) made the first comprehensive documentation of Hong Kong's dragonflies with details of 55 species provided in his document. New species were continuously added to the records of dragonflies in Hong Kong by the concerted efforts of various researchers (Asahina & Dudgeon 1987, Härmäläinen 1991, Wilson 1993). Eventually, Wilson (1997) updated and compiled the records of local dragonflies, and provided an annotated checklist of 107 Hong Kong dragonfly species. In 2002, Agriculture, Fisheries and Conservation Department established the Dragonfly Working Group to monitor the status of dragonflies and carry out intensive surveys territory-wide on the insect. In collaboration with Mr. Keith Wilson, the Dragonfly Working Group published the information on the distribution and status of dragonfly species of Hong Kong, including the five new dragonfly species (of which a species was new to science) discovered in the surveys (Wilson et al. 2004). Since then, the Dragonfly Working Group has continued to carry out the survey and monitoring work on Hong Kong dragonflies and provided the updated information on this insect group, including four new species recorded in 2005-2010, in this book.

At present, a total of 116 dragonfly species, including five families of suborder Anisoptera, ten families of suborder Zygoptera and two endemic ones, have been recorded from Hong Kong, making up 16% of the 700-odd species recorded from China. The diversity and uniqueness of the species make one see Hong Kong in a different light. Although laymen may not have a lot of knowledge of Hong Kong's dragonflies, this colourful and elegant little insect really merits our appreciation and conservation. With the publication of "The Dragonflies of Hong Kong", we hope it can drive home the message that Hong Kong is not just a city full of skyscrapers. Over the winding streams that pass through dense woodlands of our country parks and in open marshlands in the New Territories, there are many "winged jewels" waiting for us to cherish and conserve.

More back-yard dragonfly watching

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Wandering Gliders, *Pantala flavescens* are not a constant feature where I live in Perth, Western Australia, but in 2011 we were favoured with a large influx at the end of January. They came down with a mass of tropical air that also brought other insects from the north including locusts and butterflies. This dragonfly is often so abundant in tropical areas that I tend to ignore them there in favour of other species, but this influx provided an opportunity of watching them here.



Figure 1. *Pantala flavescens* hovering.



Figure 2. *Pantala flavescens* in tandem.



Figure 3. *Pantala flavescens* showing 90 degree head turn.



Figure 4. *Pantala flavescens* in wheel position.

Every day for the next six weeks I had the pleasure of seeing them flying over our swimming pool. Often the first to arrive was a female, which rapidly circled the pool, darting around near the surface before dabbing the tip of the abdomen in to lay eggs as it flew. After half a dozen or so dabs it would fly off at speed. Later on, after about 10am there was usually a male present, patrolling the pool at about 2 to 3 metres above the water. He had a rather leisurely flight pattern, sometimes with the abdomen hanging down at about 15 degrees to the horizontal. He would make dashes to chase off other males, or had brief interactions with a patrolling Australian Emperor (*Hemianax papuensis*) or Emerald (*Hemicordulia australiae* or *H. tau*).

Sometimes the male would strike it lucky with the arrival of a female. He would immediately chase and capture her and they would then fly for several minutes 2-3 metres over the water in the wheel position. I did not see them settle at all while mating. After that they



Figure 5. *Pantala flavescens* showing female head gripped by male.

might fly in tandem while she lays eggs by dipping the tip of her abdomen in the water as they actively fly around the pool. On other occasions they separated and the female circled the pool laying eggs while the male dashed around at speed to ward off other males, but without staying close to her.

When taking photographs of them I noticed that when a tandem pair banked in flight with the wings almost vertical, the male's head was turned almost 90 degrees to keep it horizontal to the ground below.

The other thing revealed by the photographs was how the male hangs on to the female's head with his anal appendages. In a way it is a surprising technology because it does not seem a very easy place to grip onto. I collected a couple of specimens to try and demonstrate how it is done. This is, of course, described in Philip Corbet's book, but it is interesting to see how the male's appendages work. The inferior appendage is placed on the top of the female's head while the superior appendages slot in behind. Muscles are used to grasp the back of the head between the two sets of appendages. It is recorded that grip marks may be seen on the female's eyes in some species.

In April the two emerald species, *Hemicordulia tau* and *H. australiae*, became the most frequent visitors. I have long wondered how best to distinguish them in flight, because eye colour and anal appendage structure are not easy to see. Mostly one has to rely on *tau* having brown eyes and *australiae* bright green eyes.

I noticed that *H. australiae* appears to be a more delicately built animal with a narrower body than *H. tau*, and it seems to hover more while patrolling. It also includes areas beyond the water and in shadow, while *H. tau* stays in the open over the water.

This set me thinking about the two species. *H. tau* occurs all over Australia and clearly does well in open areas while *H. australiae* prefers more vegetated regions mainly in the southern half of the country or in Queensland rainforest. Looking at their eye colours provided a clue – the brown upper eyes of *H. tau* reminded me of *Sympetrum striolatum* which is thought to have brown dorsal eyes to assist catching prey against a blue sky (Lobhart & Nilsson, 1995). This fits with *H. tau*'s range in open areas. On the other hand, *australiae* with its bright green eyes resembles other West Australian green-eyed species, *Hesperocordulia berthoudi*, which is often found along shaded forest streams and rivers in the southwest. This eye colour is perhaps better for catching prey in semi-shaded conditions. I remember seeing an *H. australiae* at Cania Gorge in Queensland patrolling a forest stream. Its eyes were such a bright luminous green that I thought it must be another species. The eyes of *H. australiae* patrolling my pool never seem to be that bright.

References

Lobhart, T. and Nilsson, D.-E. (1995) The dorsal eye of the dragonfly *Sympetrum*; specializations for prey detection against the blue sky. *J. comp. Physiol. A* 176, 437-453.



Figures 6-9. (6-7, left): *Hemicordulia tau* (brown eyes); (8-9, right): *Hemicordulia australiae* (green eyes).



Postscript

Last summer only one *Panatala flavescens* was seen to visit our swimming pool, but there was a big influx of the damselflies *Xanthagrion erythroneurum* and *Austrolestes annulosus* which I have only rarely seen in the garden before.

Worldwide Dragonfly Association Membership Application Form 2012

Since the beginning of 2011 Taylor and Francis has been managing the Association's membership as well as publishing and distributing the WDA's International Journal of Odontology. Membership benefits include free access to the odontological abstracts service posted twice a year on the WDA website [<http://ecoevo.uvigo.es/WDA>]. Those members who choose a membership option that includes a subscription to the journal will receive both online access and a print subscription.

Existing members were contacted by Victoria Gardner, Managing Editor, Taylor & Francis and Robert Reimer, WDA Secretary in November 2011 with details of renewal procedures. New members please fill in the form below and email it to the WDA Secretary [wda.secretary@gmail.com] and Victoria Gardner, Taylor & Francis [victoria.gardner@tandf.co.uk]. You will receive information on payment procedures.

Membership Category	Currency			
	GB £	US \$	Euro €	JP ¥
Memberships WITH Journal				
Sustaining (includes voluntary donation)	£74	\$115	€87	¥9,400
Single (with journal)	£52	\$82	€62	¥6,800
Family (with journal)	£66	\$103	€77	¥8,400
Student (with journal)	£34	\$53	€40	¥4,300
Affiliated Society (with journal)	£69	\$108	€81	¥8,800
Memberships WITHOUT Journal				
Single (without journal)	£24	\$38	€28	¥3,050
Family (without journal)	£35	\$55	€41	¥4,500
Student (without journal)	£7	\$11	€8	¥1,000

Name: _____

Email: _____

Address: _____

I/We wish to take out membership of the Worldwide Dragonfly Association: (from list above)

Currency: _____

Date: _____

Worldwide Dragonfly Association Membership Rates for 2013

Membership category				
Membership with Journal	GBP	US\$	Euro	Yen
Sustaining (includes voluntary donation)	80	124	100	9700
Single (with journal)	55	85	69	6700
Family (with journal)	68	105	85	8200
Student (with journal)	35	54	44	4200
Affiliated Society (with journal)	70	109	88	8500
Membership without Journal	GBP	US\$	Euro	Yen
Single (without journal)	25	39	31	3000
Family (without journal)	36	56	45	4400
Student (without journal)	8	12	10	970

Sustaining Membership

‘Sustaining Member’ is a category adopted beginning in 2006. The WDA expenditure, including the costs associated with the publication of the International Journal of Odonatology, are consistently more than the funds raised from subscriptions and other income. Sustaining Membership includes a voluntary donation. WDA has occasionally received donations that helped to continue publishing a larger and better journal, and granting fellowships and small research stipends. However, WDA hopes to continue and expand these activities. To encourage membership growth, especially among countries where access to funds and currency would otherwise make membership expensive, we would ask that any member financially able and inclined to do so, express their support by contributing an additional amount over the regular dues and subscription fees, as a ‘Sustaining Member’.